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FUTURE OF NAUTICAL ECOTOURISM IN CROATIA

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ABSTRACT

The Republic of Croatia has an attractive touristic potential, above all the unique natural and cultural-historical heritage. Due to its natural beauties, especially the wonders of the Croatian coast and islands, as well as the wealth above and under sea level, it is possible for Croatia to welcome a number of cruising, sailing and sea journey enthusiasts. Many future tourists perceive our country as a relatively "new" destination with extremely varied scenery and rich biological diversity and plenty of active cultural traditions.
Ecological awakening in general introduced a new concept to tourism - ecotourism, as a term for tourism which is based on the tourists' sojourn in nature and clean environment, especially in areas with a certain degree of environmental protection. The WTO (World Trade Organization) market research shows that ever more people are interested not only in discovering new places, but also in experiencing different forms of tourism. They often look for an authentic experience based on local culture and tradition, which is in greater harmony with natural environment and which offers friendly, personalised service. One of the promising forms of tourism is nautical tourism as well.
Nautical tourism provides closer contact with nature, escape from noise and congested beaches. It is important to emphasize that the future competitiveness of the nautical tourism will be conditioned by the fact of how much authenticity it will be possible to preserve in the coastal area, territorial sea and internal waters of the Republic of Croatia.
This paper analyses the advantages and the development possibilities of the ecotourism in Croatia with emphasis on the advantages resulting from the nautical tourism in Croatia.

KEY WORDS
nautical tourism, ecotourism, development of nautical tourism

1. TOURISM TERM AND DEFINITION

1.1. Term tourism

About eighty definitions of tourism are used in the world today; therefore it is very difficult to specify the concept and the content of the term tourism, since theoreticians define it according to their miscellaneous experience, each of them trying to generalise it. The following definition: "tourism is the sum of the phenomena and relationships arising from the travel and stay of non-residents, insofar as they do not lead to permanent residence and are not connected with any earning activity" was formed by W. Henziker and K. Krapf in their "Die Grundriss der Allgemeine Fraemdenverkerslehe" from 1942 and was accepted by the International Association of Scientific Experts in Tourism (AIEST).

In these terms, nautical tourism could be defined as a sum of the phenomena and relationships arising from the stay of non-residents in a tourist destination which gravitates towards or is situated along the coastline, or from the travel across the sea without any earning activity.

1.2. Definition of tourism

Modern world imposes an extremely quick rhythm of life and strenuous psychological and physical effort; therefore it comes as no surprise that ever more people decide to change their everyday environment for their vacation in search of comfort and relaxation.
With its attractive tourist potential the Republic of Croatia can still offer an escape from the everyday noise, congested beaches and centres, as well as the contact with the nature of relatively intact and preserved environment. Precisely these are the basic values upon which the Republic of Croatia should further develop the strategy of tourism, the importance of which lies primarily in increasing the prosperity of the local people and their economy. At the same time, attention should be paid to avoiding adverse effects.
One of the ways to avoid the destiny of industrialized countries that ruined their original environment by investments rendering it undesirable both for the locals and for the guests, is the promotion of "nature based tourism" i.e. ecotourism. The development of the ecologically oriented tourism is an opportunity which Croatia (still) has for the development of its destinations that have so far been touristically neglected, and for sustaining and financing protected areas.

2. ECOTOURISM

Ecotourism is a form of tourism based in the nature, and in the contemporary world tourism it is considered a tourism with the fastest expansion; it promotes sustainable activities of small range close to the natural environment; it provides service to individual visitors or small groups, not to the mass of tourists; it puts emphasis on the product quality and personalized service; it prompts great interest for the local environment and local products; it helps to promote responsible behaviour and raise consciousness for environmental protection. It represents a special form of tourist offer which can be described as environmentally responsible visits to ecologically preserved destinations that is put into effect by promoting environment conservation with feeble influence on the environment insofar as to gain economic profit for the local people.

At a time the appearance of "nature based tourism" aroused a huge theoretical debate on the definition of this touristic phenomenon. According to a group of theoreticians (Boo: 1990; Sherman and Dixon 1991; Whelan 1991; WTTERC 1993) this phenomenon comprises all forms of tourism which in their essence have a relative specialization such as ecotourism or adventure tourism. Such points of view emerge from the logical assertion that these types of tourism are founded on relatively intact or well preserved natural environment. The other group of theoreticians accepts the thesis that the tourist phenomenon is based on natural environment; therefore it is absolutely inappropriate to assign that "natural basis" only to certain forms or types of tourism. Some theoreticians, though, argue that the term "nature based" is possible only for the forms of tourism which are directly linked to the use of a natural attraction (Ingram and Durst 1987; Goodwin 1996; Fennell 1999).
All in all, generally accepted definition of ecotourism does not exist, but there are some general features of tourism that can be considered ecotourism:

- contribution to the protection and conservation of nature;
- implementation in valuable and preserved natural destinations;
- educational feature which raises the consciousness of locals and tourists as the importance of nature preservation is concerned;
- it supports and improves life of local communities, and serves as a motivator and generator of new business opportunities in a region (especially in rural areas);
- it exerts the least possible influence on the environment and the socio-cultural features of a region;
- it is realised in small groups.

It can be said that the essence of the ecotourism is raising the consciousness of the local people about the need to protect their natural and cultural goods, as well as motivation of tourists to preserve the nature with the aim of creating economic gain to the local communities, organisations and authorities. By means of this, not only the preservation of the existing, traditionally exploited tourist attractions is rendered possible but also the more intensive valorisation of environmentally protected areas and ecologically acceptable agricultural production as an additional enrichment of the tourist offer. It is a movement which has a significant and positive effect on shared development and future of environment and tourism.

Examples of environmental protection:

- important natural areas are given an adequate degree of protection, which requires the change of legal approach through higher ecological standards and their strict control;
- the implementation of the "Blue Flag" standard should be supported on national basis by providing partial subventions needed to supply beaches for the required standard;
- inclusion of ecology in the programme of education in tourism;
- incentives and stimulation programmes for projects of ecological tourism.

Ecotourism provides solutions for:

- the development of entirely protected or still undiscovered area without a threat of tourist damaging or altering the original character and features of the area;
- the estimation of the number of visitors that ensures the continuity of the tourism development in an area, without causing damage to the substance or natural balance;
- building new or using the existing accommodation facilities, and provision of water and food supplies, waste disposal with least perturbation to the environment;
- ensuring that the funds from the travels be of use to the local economy;
- educating travellers and forming ecologically aware tourists – ecotourists.

According to the research of the Eurobarometer in 2009, nature is the most important factor to the Europeans when choosing their holiday destination. The latest research showed that ecotourism grows three times faster than the classical mass tourism and it is expected that it will overtake more than 20% of the European tourist market in the next 20 years. The principles imposed by ecotourism in the new way of organising tourist travels have brought to the creation of a new type of modern passenger who is socially and ecologically aware. This new type of passenger is called responsible tourist, or ecotourist.

Ecotourists crave for new experiences, though, through participation in the way of life of the locality they are visiting, as well as through protection, help and defence of the ecological integrity of the area. In this way an ecotourist contributes to the environmental protection and directly influences the reduction of the negative effects brought about by the mass tourism. Ecotourism is a means by which better life quality and healthier future can be globally ensured. We can say that it is tourism of the near future.

2.1. Development of ecotourism in Croatia

Croatia is a land of natural diversity; from the Panonian valleys through hills, prairies, forests and karst areas to Mediterranean cultures at the coastline. Owing to the natural wealth in which four different biogeographic areas come together, Croatia is, in terms of the diversity of vegetable and animal life, one of the richest countries in Europe. New species are discovered every year. When talking about the number of plant species, Croatia takes place among the three leading European countries. Many species exist only in Croatia, and they are nowhere else to be found. During the last Ice Age that had caused the disappearance of most European wild species 10 to 15 thousand years ago, Croatia got off relatively intactly. Many plants that can be found on Velebit and Biokovo are relicts, meaning that they have been growing there freely for millions of years. Croatia also houses significant population of rare mammals which are endangered in other parts of Europe. Almost half of all the birds in Europe (more than 230 species) nest in Croatia, and even more stay here during their yearly migration. Maritime environment is one of the richest and cleanest in the Mediterranean. More than 65 percent of all kinds of fish which are recorded to live in Mediterranean appear in the Croatian part of the Adriatic. All of the plant and animal diversity should be protected because it belongs not only to the Croatian, but also to the European biological heritage.

Comparative advantages of the Croatian tourism in relation to other Mediterranean countries lie primarily in natural resources, and not only due to their numerosity, but also due to their quality which can, among other things, be seen through their ecological preservation in comparison to a great number of other (touristic) countries, giving Croatia a characteristic of relative uniqueness.

It can, therefore, be concluded that in the context of considering comparative advantages of the Croatian tourism in relation to the competitive countries of the Mediterranean, the emphasis should be placed upon the term availability of natural resources. In tourism these resources represent goods, whose ecological component plays a very important role when trying to define them. In the up-to-present concept of the Croatian tourism, based on mass tourism of stationary, bathing type (»3S« - sun, sea, sand), the thesis on comparative advantages of the Croatian tourism is pretty doubtful, since each of the competitive countries have at their disposition relatively similar natural resources. Only the fact that these natural resources in Croatia have been ecologically more preserved in relation to the competition gives us right to talk about the relatively comparative advantages in relation to other Mediterranean countries. However, in contemporary conditions, when different demand preferences impose to the Mediterranean and other countries the change of attitude toward ways and forms of the tourist demand development, the up-to-present thesis on comparative advantages of Croatia in relation to other countries, based exclusively on natural resources, has no longer got a stronghold.

Natural resources in their diversity and beauty can remain the basic stronghold of the Croatian tourist offer, but only under condition that, in the context of the theory of comparative advantages other elements of our offer develop at the same time, and that by the market affirmation and free entrepreneurship the offer gets constantly improved and upgraded in accordance to the requests of the modern, ever demanding tourist.

In order for the natural resources, which are the basis of the development of tourism in Croatia and one of the strategic advantages in comparison to the competition, to get treated in conformity with the principals of the sustainable development it is necessary to:

- implement an active resource policy of the country as a long-term policy which must regulate and govern not only the exploitation of the natural resources and their utilisation (for general and touristic purposes), but also plan the recovery of renewable resources, i.e. to conserve spacious natural resources and utilise them properly later on;
- it is advisable to leave the static point of view on utilisation and protection of natural resources based exclusively on legal and institutionalized categories of defensive and conservation character. Also, it is necessary to implement a dynamic aspect when treating natural resources so as to make the principles of sustainable development in planning and utilisation of the resources the first and the last point in each space management and utilisation strategy of all the original and natural as well as artificially created goods on the area, for touristic purposes;
- create a network of institutions for preservation and renovating natural resources and generally for the up-keep of natural environment;
- use different measures and institutions of economic policies, primarily the fiscal incomes whose goal will be to promote the positive attitude toward using and preserving natural resources, but also to introduce various forms of fines for irrational usage of the renewable resources or charging special premiums and rents for inadequate utilisation of the land, sea, lakes, etc.;
- include local ecological institutions in the international system of institutions which deal with problems of exploitation and preservation of natural resources and environment.

In order to utilise the natural resources for touristic purposes in Croatia as optimally as possible, it is advisable to make plans and, within leading the tourism development, to introduce the concept of carrying capacities of an area, i.e. destination, in accordance to which zoning of touristic areas on the coastline and in the hinterland should be made with regard to the numerosity and vulnerability of natural resources as well as the possibility of absorption of a certain number of tourists which will not significantly affect the eco system of the area.

The problem of the treatment of natural resources as a basis for the realisation of the comparative advantages of the Croatian tourism, aside from the aspect of general principles of the tourist policy, can also be considered from the aspects of certain groups of natural resources which can be divided into:

- climatic conditions;
- touristic areas, i.e. coastal and water zones;
- natural touristic wealth and rarities.

In the context of global climatic changes it is important to emphasize that Croatia should join the great world campaign whose aim is to prevent further damages of the ozone layer. As far as the protection of the tourist area is concerned, it is necessary to use an approach based on prevention and prevision, not reaction. Education can make more evident the fact that development in general, and especially the development of tourism and ecology necessarily converge, and that is already one significant step in protection of natural resources for touristic purposes.

We can say that the natural resources of Croatia have sufficient quantitative and qualitative properties in order to be considered basis for the realisation of comparative advantages of the Croatian tourism in relation to the competition. What is more, it is indispensable to link up the ecological and tourist policies in a way that ecology becomes starting point of all the aims and instruments of the tourist policy of Croatia.

3. NAUTICAL TOURISM

Nautical tourism is a phenomenon which, in the past three decades, recorded one of the highest development rates ever in European and Croatian economy. The economy prognosticators of the tourism development agree that nautical tourism is only at its early stage and that high results are yet to come.

The beginnings of nautical tourism have been recorded in the documents on tourist regattas in the 16th century in the Dutch channels. Thomas Cook founded the first travel agency in 1857. The transport of passengers across the sea played an important role in this agency's trade. At that time, merchant and warships were getting provided and equipped with passenger accommodation. In 1720 the first yacht club was founded in Cork, Ireland. In the second half of 19th century nautical tourism grew into elite hobby and became a mass phenomenon for recreation in the USA and Canada. The two countries then took precedence over nautical tourism and have not yielded since. In 1907 the regatta Alger – Monte Carlo was organised. Between the two World Wars various sea and ocean going cruise pleasure trips, explorations and alike were organised all over Europe. In 1928 the construction of the first ports of nautical tourism – marinas began.

In the past three decades nautical tourism has become one of the most expansive forms of tourist circulation and recreation. Even so, the development of nautical tourism from the scientific point of view is still insufficiently represented in the science of tourism. In this sense, nautical tourism is defined from a few practical and scientific aspects, which in simple terms describe it as a multifunctional tourist activity with extremely emphasized maritime component. It is actually a branch of tourism whose activities are based on usage of vessels as well as sporting and recreational facilities. Nautical tourism includes the navigation and stay of tourists / navigators on a craft (boat, yacht and alike) as well as their sojourn in ports of nautical tourism for relaxation and recreation. According to the definition of L. Kos and L. Dončević nautical tourism includes all the services and relationships that arise from the circulation of people in vessels across the sea for touristic purposes.

According to the general definition of tourism, nautical tourism can be defined as a sum of the phenomena and relationships arising from the travels on floating objects and the stay of non-residents in coastline areas for recreational purposes without any earning activity. A nautical tourist is not obliged to know how to handle or how to participate in any way in handling the vessel. Nautical tourist can just recreate during the stay on the vessel.

The following are usually connected to nautical tourism:

- stay and navigation on small crafts (boats, yachts) with or without a fixed schedule at sea and inland waters;
- cruising across sea or inland waterways according to fixed schedule for recreational, sporting and other similar purposes;

- water and underwater sports (kayaking, rafting, rowing, sailing, water-skiing, surfing, sport fishing, underwater fishing etc.);
- biology of the sea, underwater life and inland waters.

Apart from that, nautical tourism includes the following services:
- letting out moorings to accommodate vessels (and tourists, navigators who stay on them);
- letting out nautical crafts for leisure and recreation (charter, cruising etc.);
- skipper services;
- reception, keeping and maintaining floating objects on moorings and on dry dock;
- supply services to navigators (water, fuel, provisions, spare parts, equipment, etc.);
- fixing and preparation of the floating objects;
- providing various information to the navigators (weather forecast, nautical guides etc.);
- sailing schools (courses for skippers and other services on navigators' requirements)

3.1. Development of nautical tourism in Croatia

According to the information above, a conclusion can be derived that Croatia already attracts many tourists to its coastline each year. What is more, there is still a lot of potential in its hinterland, national parks and nature parks. Besides, Croatia has a unique coastline which is ideal for the development of nautical tourism. Islands and coastline have numerous bays appropriate for the development of nautical tourism. The nature is mostly unpolluted; woods of the Aleppo pine are a common sight along the shore. The main comparative advantage of the Croatian coastline in relation to her main competitors is the great number of small places in natural ports.

Croatia has optimal natural conditions for the development of the nautical tourism: the most indented coast in Europe and Mediterranean (beside Greece). In Croatia the coastline indentation coefficient reaches the number 9.7. It has at its disposal 5 790 km long coastline comprising 4 012 km of insular line and 1 778 km of shoreline. There are 652 uninhabited and 66 inhabited islands, 78 reefs, and 398 rocks. The morphology of this part of the Adriatic excels in crystal clear water and favourable climatic conditions which makes Croatia naturally predestined for the safe and unobstructed sailing and for the development of nautical tourism.

The beginnings of the nautical tourism in the Croatian seaside go back to the 19th century, or more precisely to the 1844 when the excursion line Trieste – Rijeka was first introduced with putting in Novigrad, Poreč, Rovinj and Pula. The same year the first excursion from Trieste to Dubrovnik was organised with 153 passengers. Since then, the number of steamboat travel lines that connected both shore and islands as well as islands themselves across the Croatian coast, increased rapidly. Those travel lines enabled the development of tourism on the Croatian seaside.

As any other country, so does Croatia, in the domain of its strategic and economic interests intend to legally regulate its state in each activity of interest in a way to define and protect proper interests on the basis of the relevant legislation. For this reason each country regulates each activity differently. These differences are especially evident when comparing in what way an activity is regulated from the point of view of touristically emissive countries and touristically receptive countries. Still, great attention should be paid to this since no country is absolutely emissive or absolutely receptive. Croatia, as predominantly receptive country in nautical tourism, positioned the nautical tourism as an activity of strategic interest, in a way which outlines its development policy and the role of the government. Extremely lively activities in the Croatian administration, which regard the legal regulations of nautical tourism, have been taking place since the end of the 90s. In this period, Croatia has built a rich legislative system which relates to the nautical tourism.

To explain the contribution to the nautical tourism development through the development of the Croatian legislation, we herby specify the explanations and regulations of the basic factors in this activity.

Ports of nautical tourism are regulated by "Regulations on Classification and Categorisation of Ports in Nautical Tourism" (NN, 142/99) with a few amendments to these regulations. In the process of development of the ports of nautical tourism, the need for a new term nautical port emerges, which prompts the regulation with the amendment to the Regulations in the immediate future.

Vessels in the nautical tourism in sense of categorisation and estimation of minimal technical requirements are defined by "Regulations on Types and Categories of Nautical Vessels of Nautical Tourism" (NN, 11/1997) with a few amendments.

Skipper, as a notable subject of the nautical tourism and navigator whose commercial activity is transport of tourists and yacht handling is regulated to minor extent by "Maritime Code", and in detail by "Ordinance on Boats and Yachts" (NN, 27/2005). The Ordinance regulates almost all the terms which relate to nautical vessels and their trafficking, therefore also to the basic conditions of vessel construction and their registry.

Charter, in sense of defining vessels, ways of conducting business and business registry is determined by "Regulations on Conditions that Water Craft, Physical Person or Corporation Carrying Out Charter Activities must satisfy" (NN 41/2005). The issues of chartering business is partly regulated by "Ordinance on Boats and Yachts" (NN, 27/2005) and by the "Decree on Tax Amount for Registration in Croatian Register of boats and yachts".

Vignette and other fees and regulations on foreign yachts on the Croatian side of Adriatic are comprised in "Regulations on Requirements for Arrival and Stay of Foreign Yachts and Boats Intended for Sport and Recreation in Internal Waters and Territorial Sea of the Republic of Croatia" (NN, 40/2006) and "Decree on Tax Amount for Registration in Croatian Register of boats and yacht". (NN 41/2005).

Concession, as a very important characteristic in business of nautical ports, is determined by "Act on Concessions" (NN, 89/92) and "Decree on concession-granting procedure in maritime domain" (NN 23/2004), and it is regulated on state and county level based on maritime domain concession decision for the purposes of economic utilisation of specialized purpose ports, i.e. ports of nautical tourism or marinas, published individually in Official Gazette.

Fairways, maintenance of the aids to navigation (lighthouses), radio service and research activities are legally regulated by "Plovput Act" (NN, 73/97). Pursuant to this Act the realisation of an interesting nautical tourism project is ensured, a special offer of the lighthouses.

Who can get engaged in nautical tourism and how, in the domain of small personal entrepreneurship, is regulated by "Regulations on Tourism Services in Nautical Tourism that can be Provided by a Citizen" (NN 109/96). The issues on constructions in maritime domain, ecology and other important matters are regulated by means of other acts and subordinate regulations.

These legal regulations are being upgraded by amendments to acts and subordinate regulations asserting the dynamics of the legislative system evident in authorisation redesigning, and especially in gradual strengthening of county administration. This ensures stronger motivation for better administration connection between regional and local economy contributing to the better resource management. Particularly good results of such a profiled cooperation between administration and nautical tourism have been achieved by our western regions on Adriatic.

4. FUTURE OF NAUTICAL ECOTOURISM

Ever more important in the comparative competition on the market becomes the quality of environment, its attractiveness and preservation, i.e. the ecological value of a touristic product. Between tourism and environment there is a strong coupling and interrelation. On one hand the development of tourism depends on the environmental quality as one of its most important resources, on the other hand we witness the immense destruction of the environment by the mass tourism.

Sustainable tourism requires resource managing in a way to meet economic, social and protective requirements, as well as cultural, ecological and biological diversities. Maritime ecotourism is the most desirable form of tourism to the sea and coastal environment. It exists in all tourist countries in the world. There is a difference between developed European ecotourism and ecotourism in the developing countries or ecotourism on the American continent, where ecological tourism is based exclusively on natural features.

Along with extraordinary natural ambience and its high percentage of cleanness, for the

implementation of ecotourism, it is required to develop high ecological standards and to incorporate them in legal acts and create inspection and other institutions to supervise these processes. When defining measures of environmental protection, it is necessary to respect ecological and developing characteristics of certain parts of the European part of the Mediterranean. The mechanism of the preventive protection depends on chosen directions of development and decisions based on valorisation of natural contents. In relation to that, the direct environmental protection through development of various systems of protection will be respected (e.g. national parks, strict nature reserves, nature parks, special nature reserves, forest parks, important countryside, natural monuments, horticultural monuments, memorial areas and objects, some vegetable and animal species).
In order to define the environmental protection policy, it is necessary, above all, to determine the real state of the environment, especially the sources, the extent and the effects of air, water, sea and soil pollution, as well as the degree of vulnerability of natural resources. Ecological policy is strictly connected to the development and economic policy whose main aim today is not to create the highest possible economic growth, but the establishment of ecologically sustainable development. The main goals of the ecological policy are: preservation and protection of the sea, waters, forests, air and land as basic natural resources used for economic activities, tourism and recreation, cultural heritage, etc.
In the area of ecology the measures are directed towards:

- establishing the uppermost border of touristic construction
- prescription and control over ecological effects,
- determining guidelines for waste and waste waters disposal and
- ensuring hygienic quality on beaches.

It can almost be taken as a rule that the coastline is considered an area of quick profitability, and little attention is paid to how it will affect the environment and future development of the area. The coastline is being ruthlessly exploited. Localities and tourist marinas are being formed along the coast; the suburbs are being built around them creating a wall between the land and the sea. Residential and recreational activities get intertwined with industrial facilities on the same confined area. The coast management and utilisation should be planned on the part of the coast that is still intact. The key factor in decision making on the construction or expansion of marinas and ports as well as the other facilities in their vicinity is environment preservation and its maximal protection. The development must be within the boundaries of the capacity sustainability.
As far as marinas are concerned, location mistakes that consist in bay closures and construction of closed tourist localities should be avoided. On basis of current researches and maritime scientific knowledge it is possible to determine the most appropriate intention and to determine the preventive measures of the protection of the maritime eco-system. With reference to the state of pollution and endangerment of certain areas, the rough zoning of the sea surface is possible. However, in relation to the legal regulations, municipal decrees and decisions, the overall quality of sea surface remains insufficiently examined; therefore it is not possible to define "the boundaries of endangerment admissibility" for many interventions on some micro-locations. It is thus a requirement and an obligation of all coastal communities, that on basis of the exhaustive valorisation of sea surface, its natural characteristics, the existing states of biological communities and ecological situation as well as the traffic and economic forecasts, to determine the purpose of the maritime area adequate to the purpose of the land. In the same way, the nautical tourism location determination should be approached with great caution and a complex knowledge of the environmental area and its positive and negative effects caused by nautical facilities.
The two main sources of endangerment, i.e. of water pollution are: gas emission during the engine operation and direct emission of fuels, lubricants and waste materials from nautical vessels. Dangers and adverse effects of this type are effectively avoidable by construction of special reservoirs on shore for indirect or direct effusion of water with soap or detergent remains from nautical vessel into the reservoir, by construction and designing laundries in tourist ports, marinas and other

suitable places, by providing sufficient number of facilities with showers, warm and cold water, as well as by providing the travellers and nautical tourism crew members with other similar facilities and services.

In different parts of the world significant experiences have been gained, as well as the results and driving initiatives on the direction of the exact determination of the degree of pollution, the long-term and radical pollution protection due to the development of "coastal navigation", nautical tourism and water sports. Facts show that it is inevitable to develop a concept and guidelines of a long-term protection policy and to determine the basic carriers for guiding and executing the set tasks of protection, and it is also necessary to accept adequate rules, instruments and protection mechanisms.

The first set of activities in the concept of long-term policy of the protection of the sea has to be specifically directed to the overall evaluation of the current general state of the existing problems and foreseen tendencies in the protection of human environment in terms of nautical tourism, on every sea surface on the Mediterranean. The second fundamental assumption and starting point of the long-term protection policy consists in the necessity of organisation of special longer researches and resources monitoring, forms and degrees of endangerment and pollution of water areas where there is the greatest concentration of vessels and where the traffic is the most frequent. The third set of previous activities in creation of long-term protection policy consists in development of a special project with programmes of the operative measures, actions and tasks, after having completed the evaluation of the overall situation and specialized researches and experiments on suggested localities.

5. BLUE FLAG

Blue flag is an international educational programme of ecology whose main goal is the sustainable management of sea and coastline.

Blue Flag programme is implemented in most European countries, and each year more and more countries from different continents enter this programme.

Today, Blue Flag is an extremely appreciated touristic brand which serves as a main landmark for tourists when choosing their destination. Blue Flag tends to ensure the cooperation between tourism and environmental protection on local, regional, national and international level.

Blue Flag is the most recognised model of environmental education and public information on the issues of sea and coastline protection, and especially when the protection of coastline locations which suffer from the greatest strain are concerned, i.e. beaches and marinas in maritime domain.

The intellectual owner of Blue Flag is the Foundation for Environmental Education (FEE) which was founded by European Council for the promotional purposes of environmental education in a unique way at the level of entire, united Europe. Blue Flag is originally a French programme which, after two years of operating in France, was overtaken by FEE. It has been operating over Europe since 1987 and beyond the European borders since 2001. Until six years ago the name of Foundation and all its programmes had the adjective European, but the adjective was eliminated due to the fact that the programmes were recognised and began to spread beyond the borders of Europe.

Today Blue Flag is a global – world programme, and the same applies to the other programmes of the Foundation such as Eco-schools (universal programme of environmental education), Green Key (ecological programme for hotels), Learning about Forests (programme for protection of forests and forest communities), Young Reporters for the Environment (virtual, computer journalism) and other.

Legal framework for implementation of Blue Flag

On the level of United Europe, Blue Flag is conceived as a kind of a test programme for the implementation of national and European legislation in certain area. Since the very beginning they have been embedded in two EU Directives: the Directive of the Parliament and European Council on the management of bathing water quality and the Directive of the Parliament and European Council on urban waste waters. The member states of the European Union, as well as the candidate members are obliged to adjust their legal system to the European. This gives advantage to all the concession holders and beach and marina users who recognised Blue Flag from this aspect as well.

5.1. Blue Flag programme aims

Aims set before the Blue Flag programme can be conditionally divided into short-term and long-term:

- Short-term aims tend to set the standards of Blue Flag as soon as possible in order to make the destination more attractive and to set off the national and European legally binding dimension on responsible beach and marina management.
- Long-term aims tends to awake the principle of sustainable and balanced development as a mental category in the consciousness of everyone who utilises sea and coastline in any way, and above all in the consciousness of the local people, marina and beach operators, as well as tourists and guests.
- The beach awarded with the Blue Flag has the international acknowledgement at ISO-standard level. It has even more far-reaching qualities for the local community where the Blue Flag programme is implemented. For the Blue Flag criteria, it can be said that they opened a new page in the implementation of the Local Agenda 21.

5.2. Definition of a Blue Flag Beach

A beach with the Blue Flag is an officially determined area for bathing, with at least one point for water sampling. The name of the beach and its limits have to comply with the official limits and the name of the beach. The beach carrying Blue Flag has to have facilities and standards in order to meet the criteria of Blue Flag, and it has to be available to unannounced inspections by the Foundation for Environmental Education and Association "Lijepa naša". In the local self-government there should be an authorised person for dealing with the issues of the Blue Flag.

5.3.Blue Flag criteria

The basic criteria for the Blue Flag can be divided into four groups:

- Environmental education and public information
- Water quality
- Environmental management
- Safety and services

From the four mentioned groups, there are 32 criteria for beaches and 16 criteria for marinas, which set groundings for the Blue Flag. They are divided, according to their importance (severity) and their feasibility or infeasibility in certain parts of the world, into:

- Imperative criteria - which means that the beach must comply with them
- Guideline criteria – which set the preferable direction of the beach development
- Non-applicable criteria – which means that they are applicable only to some regions of the world, and not applicable to some other.
- Blue Flag programme organisation and way to obtain Blue Flag

Foundation for Environment Education has got a member organisation in each country (such as Croatian non-government ecological Association "Lijepa naša") which is responsible for the implementation of the Blue Flag programme on national level.

In order to obtain Blue Flag, interested local authorities (municipalities, towns or marina owners) must submit an application with all the relevant documentation to the national operator.

The application with the entire documentation must assure the implementation of the Blue Flag criteria.

The applications are approved by National Jury which consists of all the relevant participants on a national level (Ministry of Environmental Protection, Construction and Physical Planning, Ministry of Tourism, Local Officials Association, national associations for life-saving, marina experts, educational experts, Foundation for Environmental Education representatives, other non-government organisations, etc).

Blue Flag is an award given for one season. If the situation is discordant with the imperative criteria of the Blue Flag, it has to be withdrawn immediately, and national operator informed on the matter.

It is necessary to provide information about reasons for the Blue Flag withdrawal. During the season, national and international inspections are carried out. Furthermore, guests and beach/marina users are encouraged to inform the Foundation in case of criteria violation.

5.4.Plan Blue Flags

In Croatia, the Blue Flag programme for beaches and marinas has been carried out since 1998. In 2009, i.e. in the eleventh year of participation in the programme Croatia had 137 blue flags, of which 117 for the beaches and 20 for marinas. With this number of blue flags Croatia is roughly half way from obtaining the maximum number of blue flags; therefore we should tend towards providing the Blue Flag standards in other marinas and beaches. In that way, the Croatian tourist offer will be enriched with extremely big capacity to the delight of everyone who promotes sustainable kind of tourism and of all our beach and marina guests.
It is important to emphasize that both beaches and marinas on fresh stagnant waters (lake waters) can, under the same conditions, be the carriers of the international blue flag. There are 7 lake beaches in Croatia that carry the blue flag.

6. CONCLUSION

The European part of the Mediterranean surely makes the most attractive and best preserved part of the tourist area in Europe, which is still to experience its complete tourist valorisation and market affirmation in the future. The respect towards the area and the effort for a rational tourist development so as to permanently preserve the high standard of tourist attraction is, therefore, extremely important. In this sense Croatia as well, as a Mediterranean country, has to take into account the ecological protection and upgrading of natural resources, which will not be the comparative advantage of our country if they are not treated in accordance with certain principles.
In this sense, nautical ecotourism is one of the most desirable forms of maritime tourism, since on one hand it develops tourism on relatively intact and really protected area without the danger of damaging or altering its original character and appearance by tourist visits, whereas on the other hand it provides a possibility for utilisation of existing or construction of the new objects but in accordance with the principles of „sustainable development". Natural resources of the Croatian part of the Adriatic have sufficient quantitative and qualitative characteristics to remain the basis which needs to be further upgraded and enriched with other contents, so as to establish the comparative touristic advantages on the Mediterranean in comparison to other tourist countries. In order for them to be adequately evaluated for the tourism purposes, it is essential to carry out the ecological policy and to awake the consciousness of all participants in tourism, whether they are active participants, passive domicile population or tourist service offerers. With such a clear strategy it is possible to optimally influence the growth of the gross domestic product and employment and to attract the investment funds.

REFERENCES

1.Tihomir Luković; „Dileme Nautical tourism definitions and Dilemmas",

2.Dr.sc. Daniela Gračan, docent Dr.sc. Romina Alkier Radnić, docent,Fakultet za turistički i hotelski menadžment u Opatiji; „Ekološki aspekti razvoja nautičkog turizma europskog dijela Mediterana",

3.Vesna Brčić-Stipčević Kristina Petljak Sanda Renko Faculty of Economics and Business, Zagreb, Croatia, „Ekoagroturizam – pokretač održivog razvoja turizma"

4.V. Jadrešić, Nautički turizam, Pedagoška akademija, Zadar, 1978., str. 38

Pomorska enciklopedija, sv. 4., JLZ, Zagreb, str. .529.

5.Dr.sc. Vinko Vidučić: "Razvoj pomorskog turizma I"

BIOGRAPHIES

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She has been participated in a number of both national and international conferences where her papers and presentation were generally acknowledged as an active and valuable contribution towards the development of her profession. She is the author of books, journal and many conference papers. Her primary interest lies in the field of shipboard propulsion systems, with a special emphasis on electrical propulsion and its numerous applications (simulation methods). She also has a special interest in power management system, safety system and renewable energy especial on ship. Maja is also a member of several national and international societies for example: the Institute of Electrical and Electronics Engineers (IEEE), Croatian Society for Communications, Computing, Electronics, Measurement and Control (KOREMA); the International Emergency Management, Society (TIEMS...). She has taken part in two research project and she was member of Tempus Cards SCM 2006 (Project Quality assurance in University Teaching).

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AVIATION SAFETY RISKS IN MARITIME SEARCH AND RESCUE (SAR) OPERATIONS

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ABSTRACT

This paper address important issues regarding aviation safety in maritime search and rescue operations. Due to complexity of maritime search and rescue operations special attention is given to accident statistics and overall risks affected by number of persons for evacuation, short time of reaction, environmental issues, closeness to medical institutions, necessary equipment and type of aircraft selected for the certain operation. Lessons learned from statistical data are used for risk analysis. The paper presents proactive approach on SAR maritime operations which could be used for determining predictive techniques related to aviation risks mitigation strategies. Furthermore, the conclusion was defined based on future measurements for aviation safety risks mitigation or reduction in maritime search and rescue operations.

KEY WORDS
Aircraft, Safety, Maritime Operations., Search and Rescue.

1. INTRODUCTION

Nowadays, search and rescue (SAR) operations are provided by helicopter with specialized equipment suitable for the efficient conduct of search and rescue missions (ICAO, 1975).
Different strategies all over the world are used in SAR missions which depends on the type of SAR. Five basic types are in use: mountain rescue, ground, urban, combat search and rescue and air-sea rescue. This paper is based on air-sea rescue (ASR) which refers to the combined use of aircraft (such as flying boats, floatplanes, amphibious helicopters and non-amphibious helicopters equipped with hoists) and surface vessels to search for and recover survivors of aircraft downed at sea as well as sailors and passengers of sea vessels in distress (Algeo, 1993).

2. ACCIDENT STATISTICS

European Aviation Safety Agency (EASA, 2011) provides annual safety report based on the statistics from 2002. Since the issue of this paper is helicopter traffic, it is important to provide statistical data related to accidents which involved aircraft of take-off mass (MTOM) over 2250 kg in general aviation (Figure 1) and aerial work operations (Figure 2). General aviation means all civil aviation operations other than commercial air transport or an aerial work operation.
Aerial work is an aircraft operation in which an aircraft is used for specialised services such as

agriculture, construction, photography, surveying, observation and patrol, search and rescue (SAR), aerial advertisement. Following statistics includes only aircraft registered in EASA MS for the period from 2002 until 2011.

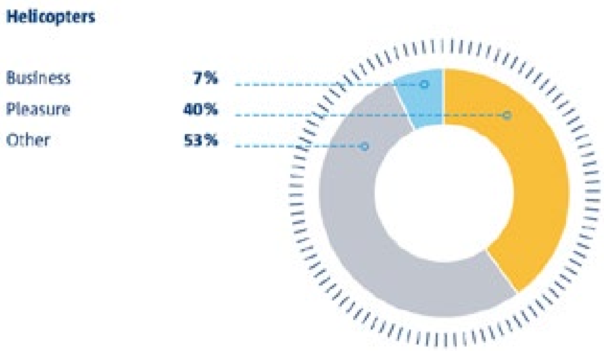

Figure 1. Fatal helicopter accidents in general aviation by type of operation.

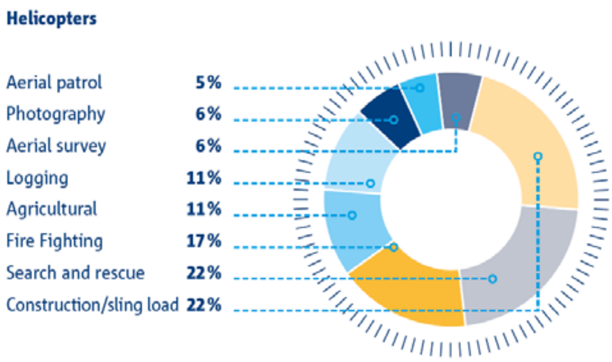

Figure 2. Fatal helicopter accidents in aerial work by type of operation.

2.1. Helicopters in General Aviation and Aerial Work operations

Fewer accidents have occurred involving helicopters in both general aviation and aerial work, in comparison to aeroplanes. This is also a reflection of the smaller fleet size of helicopters registered in EASA MS.

Figure 3 shows that 'Loss of control in flight' (LOC-I) represents the highest number of both fatal and non-fatal accidents in general aviation helicopter operations. This highlights that loss of control of helicopters remains an issue of concern.

In aerial work operations, helicopters are used for a variety of roles which involve manoeuvring at low altitude (LALT) and the carriage of external load (EXTL).

Under such conditions any safety issue such as an error in handling or a 'system or component failure related to an engine' may result in a 'Loss of control in flight' (LOC-I).

Figure 4 shows that such safety issues concern the majority of fatal accidents. It also shows that, for aerial work the percentage of fatal compared to non-fatal accidents in low altitude operations (LALT) is much lower for helicopters than for aeroplanes.

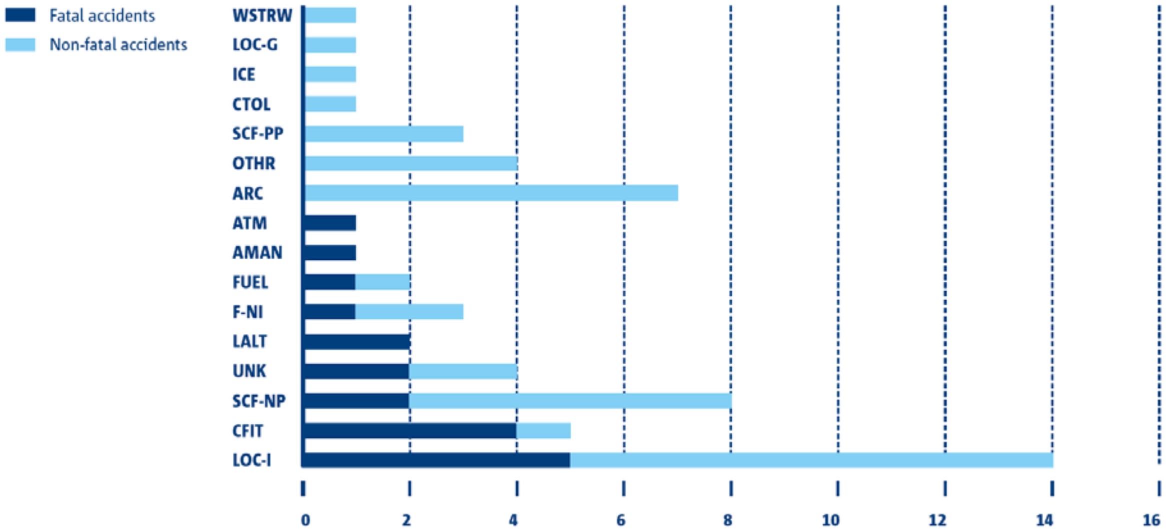

Figure 3. Accident categories for fatal and non-fatal accidents in general aviation – number of accidents by helicopters with MTOM above 2250 kg (2002 – 2011).

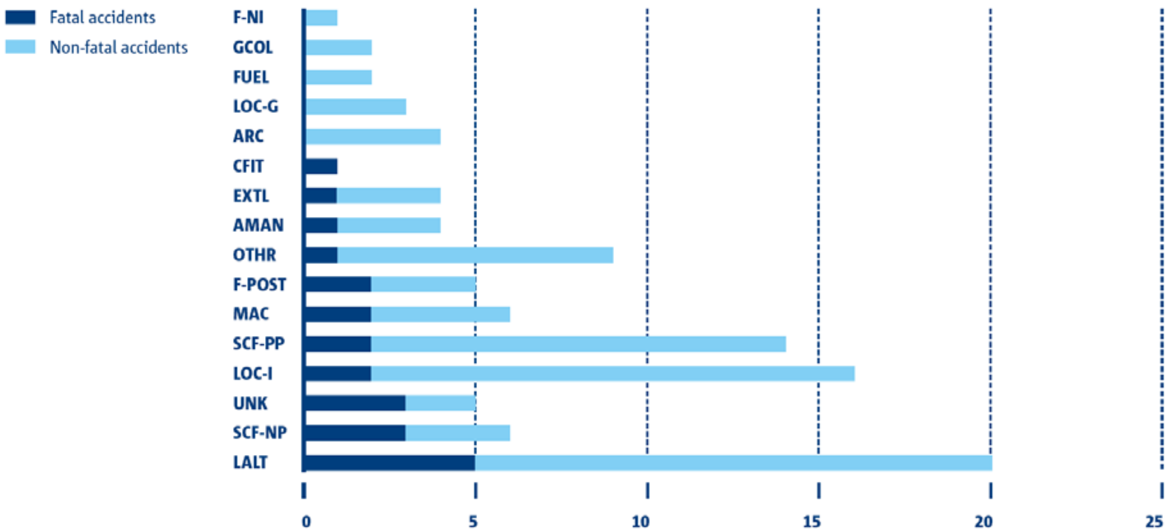

Figure 4. Accident categories for fatal and non-fatal accidents in Aerial Work – number of accidents by helicopters with MTOM above 2250 kg (2002 – 2011).

3. SEARCH AND RESCUE PLANNING AND OPERATIONS

SAR operations have been defined by the International Convention on Maritime SAR (IMO, 1979). The primary purpose of any SAR action is the speedy return to a place of safety of the survivors of a distress situation. It is essential that from the start of any SAR action, the Rescue Coordination Centre (RCC) plans for the rescue of survivors and ensures that the appropriate resources are alerted, briefed and positioned so that the rescue may take place with the minimum of delay after the location of the survivors. Without jeopardising the ultimate safety of survivors, foremost consideration shall be given to the potential impact on any medical condition of survivors by the method of recovery or the actions of unqualified persons. It must be assumed that the survivors of an emergency will be in need of medical attention, and arrangements should be made to include medically qualified persons in the rescue team.

The method of rescue to be used shall be decided after consideration of all relevant factors including:

- action taken by sighting unit and the action that can be taken by other units at the distress scene;
- location of the survivors;
- condition of survivors and medical considerations;
- number of persons reported to be on board the craft and number who have been located;
- environmental considerations;
- available SAR facilities and their state of readiness;
- effect of weather;
- time of day;
- any risks involved to SAR personnel at a crash site e.g. dangerous goods.

3.1. Crashed Aircraft

When it is known that an aircraft will crash or has crashed and the crash position is incidentally reported or known with reasonable certainty, the RCC shall confirm the crash site and ensure the provision of medical assistance to the occupants and rescue of survivors. Relevant authority (Civil Aviation Authorities or/and police) should be given early notification of a crash for a decision for their attendance at the crash site.

Health hazards during the aircraft accidents should be given special attention. Movement in the vicinity of crash sites can be extremely hazardous for ground parties on account of toxic fumes, dangerous substances and explosives.

Deaths have resulted from breathing noxious air and contacting extremely poisonous substances in the proximity of wrecked aircraft. It is also recognized problem for SAR team during the rescue at sea.

3.2. Rescue at Sea

Helicopters have taken a primary role in air-sea rescue since their introduction in the 1940s. Helicopters can fly in rougher weather than fixed-wing aircraft, and they can deliver injured passengers directly to hospitals or other emergency facilities. Helicopters can hover above the scene of an accident while fixed-wing aircraft must circle, or for seaplanes, land and taxi toward the accident. Helicopters can save those stranded among rocks and reefs, where seaplanes are unable to go. Landing facilities for helicopters can be much smaller and cruder than for fixed-wing aircraft. Additionally, the same helicopter that is capable of air-sea rescue can take part in a wide variety of other operations including those on land. Disadvantages include the loud noise causing difficulties in communicating with the survivors and the strong downdraft that the hovering helicopter creates which increases wind chill danger for already-soaked and hypothermic patients (Poulton, 1996). Helicopters also tend to have limited range and endurance.

The SAR Mission Coordinator (SMC) is responsible for the coordination of surface vessels engaged in the rescue of survivors in or on the sea except that in-shore rescue may be arranged and coordinated by the police. The RCC shall make flotation equipment available for use by survivors whilst awaiting transportation to the shore. When an aircraft has ditched or a vessel is in danger of sinking, or sunk, it is imperative that rescue action is taken immediately. The time that a craft will float may be very limited, entry to life rafts is difficult, especially for aged or infirm personnel in rough seas, and the sea is a hostile survival environment. When both maritime rescue units and helicopters are dispatched to the same distress scene, it may be advisable to transfer survivors to the helicopters for a more rapid delivery to medical facilities.

3.3. Use of Rescue Boats and Vessels

Specialised rescue boats are available only in scattered localities and their capacity is small. Each boat dispatched to a distress scene should, if possible, carry additional life-saving devices to enable those survivors, who cannot be immediately rescued, are able to stay afloat while awaiting the arrival of another boat. If neither specialised rescue boats nor rescue vessels are available, merchant vessels may be the only means of implementing an early rescue. However, if possible, support or alternative rescue units should be considered because merchant ships have significant limitations as a rescue platform, including:

- generally not readily available;
- relatively slow speed;
- restricted manoeuvrability;
- high freeboard, making retrieval of survivors difficult;
- small crew numbers; and
- language difficulties if there is foreign crew.

Ocean oilrigs maintain fixed positions for a period of time. It is desirable that SAR vessels be equipped to lift survivors from the water without expecting any help from the survivors.

3.4. Use of Helicopters for Rescue

When available, especially during the rescue at sea, helicopters should be considered for rescue work. While eminently suited to the task in many respects, helicopters do have specific limitations that may be summarised as:

- the adverse effects of turbulence;
- the need for a level, or near level, landing area;
- a requirement for a cleared landing area of specific dimensions to avoid rotor blade damage;
- a requirement for safe approach and take-off paths;
- potential for adverse effects on certain serious injuries;
- limited endurance;
- inability to hover with loads at high altitudes;
- limited accommodation.

Helicopters can be used to rescue survivors by winching or by landing at a suitable location. Owing to their unique flying characteristics, helicopters should be considered for use as a rescue unit as a matter of course. They are particularly suitable for rescues at locations where surface units are unable to operate. At the same time, some helicopter evacuations may be hazardous, particularly over rough seas. Such evacuations should therefore only be carried out by specially qualified and experienced crews and then only in the event of serious injury or illness or when lack of other means of rescue might result in loss of life. It is important that any information on the condition of survivors is considered by specialists before committing to helicopter use.

The helicopter's mass may be a factor limiting the number of survivors that may be taken aboard each trip. It may, therefore, be necessary to reduce weight by all possible means, e.g. removal of non-essential equipment, minimum fuel, use of advance bases with fuelling capabilities, etc. A medically qualified person, medical equipment and respiratory equipment, when available, should be carried on a helicopter recovery mission, at least on the first flight to the distress scene.

When being rescued by helicopter, survivors in a liferaft may have to leave the raft to catch the sling since the rotor downwash below the helicopter will blow the raft away. Survivors may not know how to operate a strop. A two-person winch is preferred to a single winch. A double strop allows one rescuer to supervise while being winched down and up again with each survivor. It is important to mention that a helicopter should not be approached unless directed and/or escorted by a member of the helicopter's crew. Helicopters may require approach from different aspects dependant on type.

3.5. Supply Dropping and Delivery of Survival Equipment

Situations will arise where the immediate recovery of survivors is not possible and arrangements will have to be made to deliver sustenance, medical and survival equipment. Where possible delivery will be by way of surface vehicle or craft, or by helicopter or aircraft landing nearby. An example of this would be a situation with seriously injured survivors who may need stabilising prior to being moved, or where specialised evacuation vehicles / craft needed are not immediately available. Supply of survival equipment by air should be considered where there is an expected delay in the recovery of survivors from remote locations either at sea or on land.

4. PREDICTIVE MEASURES

Aviation safety could be improved thought several approaches: reactive, proactive and predictive. Reactive method is based on events which are already recorded, such are incidents and accidents.

Reactive measures could be of insufficient efficiency. Therefore, proactive method is been used for safety risks identification based on organizational activities analysis. It generally provides good efficiency of the system safety, whilst predictive measures provide high efficiency. Predictive method is based on system performance analysis during the normal operations. For that reason, it is very important to evaluate crash rates during SAR operations. According to (Byrne, 1997), following methods are suitable for helicopter crash assessment:

- the Poisson process;
- aircraft crash data;
- screening criteria.

Based on (Čokorilo et al., 2010) the Poisson process is found to be suitable for developing methodology takes into consideration items determined to be important to understanding the risk from aircraft accident and safety appraisal. Poisson process is suitable if:

- the accident or incident (events) is assumed to be stationary;
- the events are assumed to be statistically independent;
- the events do not occur simultaneously.

Helicopter crash rates are influenced by factors which changed over a relatively long period of time, so it may be said that over a 10-year period the process is effectively stationary. Efficiency of using Poisson process is that the chi-squared distribution can be used to determine the mean value to any given level of confidence. If r is the number of crashes occurring in time period T, the chi-squared distribution relates the probability α that the mean is greater than or equal to a value θ, where:

$$\theta = \frac{\chi^2_{1-\alpha,2(r+1)}}{2T} \qquad (1)$$

Aircraft crash studies, show that the appropriate confidence level is calculated at the 50% (α=0.5). The helicopter crash rate during the SAR operations should be expressed in terms of crashes per square kilometre per year using the observed land area. For example, some calculations proved for England, Scotland and Wales are: England (1.304x105km2), Scotland (0.788x105km2), Wales (0.208x105km2).

5. SAR EFFICIENCY

SAR efficiency depends on several important factors: response time, mission efficiency, helicopter endurance, medical assistance, etc. Except procedural and strategic parameters, crew awareness is extremely important for any kind of mission, especially during rescue at sea. According to statistics related to helicopter operations (Čokorilo et al., 2012), pilot error is one of the key safety risks during the any kind of helicopter operations (offshore installations, etc.) Therefore, pilot in command must be capable to implement "Decide model":

- Detect the fact that a change has occurred;
- Estimate the need to counter or react to the change;
- Choose a desirable outcome for the success of the flight;
- Identify actions which could successfully control the change;
- Do the necessary action to adapt to the change;
- Evaluate the effect of the action.

In practice, success of SAR operations could be measured by following statistics (based on UK and overseas SAR, Table 1).

Table 1. UK and Overseas SAR Summary (2002 – 2011).

Year	Total Callouts	UK Helicopters	Overseas Helicopters	Fixed Wing Aircraft	Mountain Rescue	Marine Craft	Persons Moved
2002	1718	1558	34	47	79	0	1251
2003	1809	1597	91	37	80	4	1333
2004	1711	1532	67	39	67	6	1449
2005	1766	1592	63	37	73	1	1431
2006	1948	1756	73	33	86	0	1538
2007	2065	1850	92	21	102	0	1817
2008	2179	1963	96	29	91	0	1763
2009	2418	2237	81	14	86	0	1873
2010	2050	1921	67	3	59	0	1647
2011	1921	1799	65	0	57	0	1560

Table 1 shows increasing influence in helicopter use over fixed wing aircraft.

6. CONCLUSION

Nowadays, importance of SAR operations presents one of the key issues in aviation safety. The statistics show that one aircraft accident per week occurs somewhere in the world. It requires, rapid respond and evacuation in unavailable areas such are mountain regions and sea. Helicopter operations are crucial for this kind of mission, as well as crew awareness. This paper shows some inputs of calculation of safety risks for SAR, and important factors affected this kind of aircraft operations.

REFERENCES

1.Algeo, John. Fifty years among the new words: a dictionary of neologisms, 1941–1991, pp. 39, 106–107. Cambridge University Press, 1993. ISBN 0-521-44971-5

2.Byrne, J.P.,1997. The calculation of aircraft crash risk in the UK, AEA Technology plc, Risley, Warrington. p.93.

3.Čokorilo, O.; Gvozdenović, S.; Vasov, Lj.; Mirosavljević, P. 2010a. Costs of unsafety in aviation, Technological and economic development of economy: Baltic Journal on Sustainability. DOI: http://dx.doi.org/10.3846/tede.2010.12, 16(2): 188-201.

4Čokorilo, O., Mirosavljević, P., Vasov, L., & Stojiljković, B. (2013). Managing safety risks in helicopter maritime operations. Journal of Risk Research, (ahead-of-print), 1-12.

5.EASA, 2011. Annual Safety Review 2011. European Aviation Safety Agency, Cologne, Germany, p.76.

6.ICAO, 1975, ICAO Annex 12, SEARCH AND RESCUE

7.International Maritime Organization (IMO), International Convention on Maritime Search and Rescue, 27 April 1979, 1403 UNTS, available at: http://www.unhcr.org/refworld/docid/469224c82.html [accessed 12 March 2013]

8.Poulton, Thomas J. "Helicopter downdraft: A wind chill hazard." Annals of Emergency Medicine, Volume 15, Issue 1, pp. 103–104, January 1986.

BIOGRAPHIES

Olja Čokorilo was born on 02/02/1977 in Belgrade where she finished Mathematical grammar school in 1996 and graduated in 2002 at the Faculty of traffic and transport engineering (FTTE), Department of Air Transport (DAT). Graduate work was carried out in the EUROCONTROL CRDS (Budapest, Hungary). She won the Norway embassy scholarship for 2000 and awarded to the best student scientific research at the University of Belgrade for 2002/2003. By the organization of IAESTE, she finished student practice in AENA (Madrid, Spain) in 2001. She obtained her master degree at FTTE in 2007 and in 2010 defended her doctoral dissertation. She has been employed at the DAT since 2003. In October

2010, she became an assistant professor for the specialized scientific field of transport aircraft. She has participated in the development of over 20 projects and studies in the field of air transport. At the FTTE she is a lecturer on Transport aircraft 1, 2 and 3, Aircraft Safety and Aircraft Safety Management. She speaks English and Spanish. She is a member of the Serbian Chamber of Engineers (2007), Air Transport Research Society (2008) and Società Italiana Infrastrutture Viarie (2012).

LEGAL STATUS OF YACHTS IN MONTENEGRO

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ABSTRACT

In recent years, an increasing number of yachts sail into the sea shore and internal waters of Montenegro. This was particularly helped by the development of the former military port of Tivat into a top class marina – "Porto Montenegro". Montenegro has a great interest to stimulate that growth and development, having in mind the importance of nautical and yachting tourism for economic growth of a country, that Montenegro has been trying to improve. Although all of this can generate huge revenues for the state, on the other hand it brings a number of requirements which the state must comply with. In that sense, an especially important segment is the legal regulation of various relationships that occur as regards of yachts, through the adoption of legislation.
This paper presents and discusses the provisions of the Law on Yachts, which regulates many issues related to these vessels. It also gives special attention to the Montenegro Yachts Register.

KEY WORDS

Yachts, legal regime, Law on Yachts.

1. INTRODUCTION

After acquiring independence in 2006 Montenegro started creating a maritime legal framework by separation of certain areas of the Law on Maritime and Inland Navigation 1 and regulation of the same by special laws. In this sense, many laws have been passed2. One of those laws is the Law on Yachts, which was passed in 2007 and entered into force on 1 January 2008.3

[1] "Official Gazette of SRY", Nos. 12/98, 44/99, 74/99 and 73/00.
[2] Law on Sea ("Official Gazette of RMNE", Nos. 17/07 and 6/08) 2007, Law on Ports ("Official Gazette of RMNE", no.51/08) and the Law on Coastal Zone ("Official Gazette of RMNE", Nos. 51/08 and 21/09) in 2008, the Law on Marine Fisheries and Mariculture ("Official Gazette of RMNE" No.56/09) in 2009, and the Law on Protection of Sea Pollution from Sea-going Vessels ("Official Gazette of RMNE" No.20/11) in 2011
[3] "Official Gazette of RMNE", No.46/07. Pursuant to provisions referred to in Article 45 of the Law on Yachts, on the date of its entry into force the provisions of Part 3, Chapter 1 (Nationality of the vessel and identification of the vessel) and Chapter 2 (Registration of vessels) of the Law on Maritime and Inland Navigation related to yachts cease to be valid; Regulation on the Arrival and Stay of Foreign Yachts and Foreign Boats Intended for Leisure or Sports in Coastal Sea, Rivers and Lakes of the Federal Republic of Yugoslavia ("Official Gazette of the SFRY", No. 38/87, 33/88 and "Official Gazette of the FRY", No. 28/02); provisions referred to in articles 9 and 10 of the Ordinance on fees for the use of marine navigational aids in the waterways of the coastal area of the Republic of Montenegro ("Official Gazette of RMNE"

The main reason for adoption of the Law was to create a user-oriented legal framework for the development of nautical tourism in Montenegro. In this sense, by using the best international examples, the Law on Yachts regulates nationality, identification, registration of yachts, manner of entry, staying and leaving of yachts in Montenegrin waters in one place. The Law comprises 46 Articles divided in VII Chapters, such as: I General Provisions, II Montenegro Yacht Register, III Staying of Yachts in Territorial Waters of the Republic, IV Chartering of Yachts, V Supervision, VI Penal Provisions, VII Transitional and Final Provisions. Law on Yachts complies with all relevant and binding international conventions (including their amendments), as well as with the European Union regulations in this field.4

In order to simplify the procedures for registration of yachts and focusing of the port authorities on the priority task, which is inspection of safety and security of navigation, a new Department of Yachts Register was formed at the Bar Maritime Safety Administration, which performs tasks related to registration, entry of yachts, as well as publication and renewal of certificates prescribed by the Law.

No. 36/05) relating to yachts and provisions referred to in Articles 1, 2, 3, and 4 of the Ordinance establishing fees for forms issued by the Harbor Master's Office ("Official Gazette of RMNE" No. 29/03) relating to yachts.

[4] The Law is harmonized with: International Convention for the Safety of Life at Sea - SOLAS 74; International Convention for the Prevention of Pollution from Ships - MARPOL convention 73/78; 1966 International Convention on Load Lines adopted by IMO; International Convention on Tonnage Measurement of Ships, 1969; Convention on the International Regulations for Preventing Collisions at Sea - COLREG Convention 72; The International Convention on Standards of Training, Certification and Watchkeeping for Seafarers - STCW 78/95; The International Convention on Civil Liability for Oil Pollution Damage - CL Convention 69, The International convention on maritime search and rescue - SAR Convention 79; Recreational Craft Directive 94/25/EC and Declaration of Conformity; Economic Commission for Europe Inland Transport Committee, Resolution No.40 regarding International Certificate for Operators of Pleasure Craft (TRANS/SC. 3/147).

2.NOTION AND DEFINING OF YACHTS

The word "yacht" (Eng., Fr., Ital. and German Yacht, Rus. Jahta), pleasure boat, boat for sport and tourism, comes from the Dutch word “jaght” which, in the seventeenth century, was the name for a light, fast-sailing ship with one or two masts, used in fleet as a currier ship. This name then also related to ships built for leisure of rulers, commanders and rich men.5 In our law, the yacht was for the first time defined in Maritime and Inland Navigation Law as "a ship used for non-commercial activities intended for pleasure, recreational and sporting activities".6 The same law defines ship as "a sea-going ship and inland waterway vessel, except a warship".7 It was hard to conclude from legal definitions which type of ship is actually a yacht, especially because of the fact that establishment of a special yacht register was not envisaged. Montenegro Law on Yachts provides a more precise definition and points out that the yacht means "a navigable vessel intended for pleasure, recreational and sporting activities, in excess of 7 meters in length, not engaged in international trade".8 It can be noticed that the Law provides only a lower limit in terms of size of the yacht while the upper limit is not defined. Law on Yachts recognizes also the concept of a foreign yacht and defines it as "a yacht flying a foreign flag".9 Law on Sea of Montenegro provides similar definition acording to which a foreign yacht means "a vessel flying a foreign flag, over seven meters in length, intended for leisure, recreational and sporting activities and is suitable for long stays at sea.“10

It can be concluded from these legal determinations of a yacht that a cumulative fulfillment of two elements is required in order for a vessel to enjoy the legal status of a yacht. The first element is of a substantive nature, and that is a legal determination that a yacht can be used for leisure, recreational and sporting activities, which

[5] Military encyclopedia, Second edition, Part III, VIZ, Belgrade 1971, pages 797 and 798.
[6] Art.5 par.1 item 22 of the Law on Yachts
[7] Art.5 par.1 item 5 of the Law on Yachts
[8] Art.2. par. 1 of the Law on Yachts
[9] Art.2 par.2 of the Law on Yachts
[10] Art.3 item 9 of the Law on Sea

implies that a yacht can be used by an individual or a group of people solely in purposes established and allowed by the Law and in no other purposes.11 Another element is of the procedure (formal and legal) nature and requires that a vessel must be entered into the yacht register.

3. ELEMENTS OF YACHTS INDIVIDUALIZATION

Each yacht, similar as a seagoing vessel, has its own specific features which enable distinguishing it from other yachts. Those features are called marks (signs) of a yacht individuality. There can be more of them, however, the most important are: the name and marks of a yacht, nationality of a yacht, port of registry, class, data on tonnage measurement, IMO number, call sign, i.e. radio traffic number.

Name and marks of a yacht Yachts entered into the Yacht Register have name and marks in accordance with the Law. Name or marks of a yacht represents the basis of their mutual distinction, therefore the rule is that no two yachts having the same name may be entered in the Yacht Register of Montenegro. Marks of a yacht consists of internationally recognized insignia of the Republic and the registry number which actually is the ordinal number under which is yacht entered into the Register. Name of a yacht is displayed in a manner which does not affect the visibility of marks. Marks of a yacht is displayed on both sides of a yacht's bow or, if more appropriate, on a prominent position on both sides of superstructure. Also envisaged are the size of letters and numbers of a yacht's name and marks which shall be 200 millimeters at least. Decision on assigning name and marks of a yacht shall be made by the administration body, i.e. Maritime Safety Department, i.e. Yacht Register Office.12

Nationality Each yacht has its own nationality. Nationality of a yacht represents a legal bond (eng. genuine link) between the yacht and the state whose flag it is entitled to fly. Nationality of a yacht shall be acquired by the fulfillment of certain substantive and formal assumptions and each state determines the requirements for granting its nationality, requirements for entry into the register and the right to fly the flag. The yacht acquires nationality of Montenegro if it is entered into the Register of the Republic of Montenegro (Montenegro Yacht Register). Nationality of yachts is in principle independent of their actual legal, i.e. economic status. External mark of nationality is the flag the yacht flies. The yacht which acquired nationality of Montenegro has the right and duty to fly the flag of the Republic of Montenegro.13 The Law also stipulates the size of the flag, as well as a manner the flag should be flied.14 Namely, the flag flown on a yacht should have the ratio of width to length of 1:1,5. On motor yacht the flag is flown from the stern. On the yacht with sails the flag is flown from the mizzen mast, and if a yacht has only one mast, the flag is hoisted on it. Flag should be hoisted so that its upper edge reaches the top of the mizzen mast. If the flag is flown on the mizzen mast no other mark or flag should be hoisted on it. It is further stipulated that a yacht which was granted nationality of Montenegro is under the sovereignty of Montenegro although it is outside of the territorial sea, internal sea waters, rivers and lakes of Montenegro.

Port of registry Port of registry of a yacht is the port keeping the yacht register in which the yacht is entered. All administrative and legal matters and activities related to that yacht are carried out in the place designated as the port of registry. That is not the case in Montenegro, since Maritime Safety Department, i.e. Yacht Register Office keeps the yacht register. Law on Yachts does not envisage that a yacht should have a port of registry marked in a visible place.15 However, it is probably the ommission since all yachts, which by their characteristics are the size of a passenger ship, must have such a mark on the stern.

[11] The owner or lessee of a yacht cannot be engaged in transportation of passengers or cargo, because in that case the vessel would lose its status of a yacht.
[12] Art.5 of the Law on Yachts

[13] Art 3 par.5 of the Law on Yachts
[14] Art.4 of the Law on Yachts
[15] Maritime Code of the Republic of Croatia ("Official Gazette" Nos. 181/04, 76/07, 146/08 and 61/11) stipulates in Article184 that both the ship and a yacht must bear the name of the port of registry.

Data on tonnage measurement Tonnage measurement of a yacht is performed to determine tonnage measures of a yacht. Gross tonnage includes the total volume of all enclosed spaces of ships and yachts, while net tonnage means the tonnage arrived at after deduction of all spaces not intended for transport of people and cargo. Yachts tonnage equals to their gross tonnage, while net tonnage is not determined for these vessels. Tonnage measurement actually determines the exact volume of the yacht. Determining the volume is important because data on tonnage measurement serve as a benchmark for application of certain safety regulations, the minimum number of crew, number of passengers, payment of port taxes, insurance requirements, etc. Tonnage measurement of a yacht is carried out by the administrative authority in accordance with the Technical rules on tonnage measurement of ships and boats.16 Tonnage measurement of a yacht is carried out before its entry into the yacht Register. The following types of yachts are subject to tonnage measurement:

- Each yacht of more than 24 meters in length regardless the purpose, which is entered into the Yacht Register of Montenegro,
- Each yacht entered into the Yacht Register of Montenegro which, in the moment of its entry, does not have a Builder's certificate or a statement on compliance during construction,
- A foreign yacht which is, in Montenegrin ports, subject to payment of a fee whose amount is determined according to its tonnage if the same is measured according to the rules whose provisions are significantly different from Technical rules' provisions.

- Remeasurement and adjustment of tonnage is carried out in the following cases:
- If after a tonnage measurement of a yacht the changes in schedule, construction, capacity, use of space and number of persons allowed to be transported by a yacht occured,
- If there is a doubt that tonnage was not correctly ascertained,
- In the case of remeasurement, depending on the performed alterations/repairs of yachts, remeasurement or adjustment of tonnage can be carried out in whole or in part.

Class Classification is a degree of confidence given to a boat by a certain ship classification society based on its rules. Ship classification societies authorized under the Transfer authorization agreement IMO Res. A.739 (18) and Res. A.789 (19), by the Government of Montenegro, i.e. the Maritime Safety Department on its behalf, to carry out technical survey and issue statutory certificates to yachts intending to inscribe in the Montenego Register of Ships are Bureau Veritas (BV) and Russian Maritime Register of Shipping (RS).
International codes IMO number and MMSI number17 Yachts, depending on the number of passengers and gross tons, must have certain international codes. The yacht entered into the Register of Montenegro that carries more than 12 passengers and more than 100 gross tons must have an IMO number, which is not changed by changing ownership or register. While the yacht entered into the Register, which has a radio telephone and / or GMDSS system device18, must have a call sign and/or MMSI number, in accordance with regulations on international radio traffic.

4.MONTENEGRO YACHT REGISTER

Law on Yachts stipulates the establishment of a special yacht register. The objective is to provide sufficiently attractive register for both foreign and local yacht owners. The register may take the form of a book and / or an electronic record in which the data on their identity, characteristics, owners and

[16] Maritime Safety Department, i.e. Yacht Register Office issued Technical rules for Statutory Certification of Yachts, i.e Rules for Statutory Certification of Yachts in 2012. Rules are composed of four parts, as follows: Part 1: General, Part 2: Monitoring / assessment of compliance during construction of a boat or a yacht,Part 3: Yacht survey, Part 4: The minimum number of crew on yachts. This Rules clearly define a manner and intensity of technical surveys of yachts, navigation notation, standards to be applied by a boatbuilder during the construction of a vessel of 2.5 to 24 meters in length, the minimum number of crew on yachts for charter.

[17] MMSI (*Maritime Mobile Service Identity Number)*

[18] GMDSS *(Global Maritime Distres Safety Sistem)*

the lien are entered. It represents a public book which means that a person who, in good faith, relies on the accuracy of entries made, cannot suffer any damage.
Contents of the Yachts Register is stipulated under Article 11 of the Law on Yachts. Register, like all registers of merchant vessels in general, consists of the main book and a set of documents. Main book has three sheets, namely: sheet A where description of a yacht is entered (information on identity, intended purpose and basic characteristics of a yacht), sheet B where the owner of a yacht as well as all alterations in ownership are entered (data on owner, co-owner or co-owners, that is: name and address for legal persons, and for natural persons name, surname and address of a place of residence), and sheet C where so-called encumbrances over a yacht or share of a yacht, as well as rights acquired by such encumbrance, bareboat charter rights, pre-emption rights and all other limitations in the use of a yacht are entered.
Set of documents contains documents which are to be mandatory submitted along with application for entry of a yacht into the Register.

5. ENTRY AND DELETION OF YACHTS

Procedure of entry, keeping and deletion from the Register is carried out by the administrative authority. In Montenegro it is the Maritime Safety Department in Bar, i.e. Yacht Register Office. The administrative authority is obliged to issue a confirmation on entry into the Register to an authorized official or a person authorized by the owner, a co-owner or a charterer at their request, as well as copies of documents kept in the set of documents if the Register refers to them. As already stated, a yacht acquires Montenegrin nationality by entry into the Register. In order for a yacht to be entered into the Montenegrin Yacht Register and according to Article 13 the following documents need to be submited:

- Application for entry into the Register with the proposal for the name of a yacht (form within the Register), 19
- A certified copy of a natural person's identification document or registration document of a legal person, i.e. the owner,
- Proof of ownership. Declaration of use of a yacht and a power of attorney when application for entry into the Register is not submitted by the owner himself, a co-owner or a charterer (form within the Register),20
- A confirmation on mandatory insurance to the amount of at least 800.000,00 EUR,
- Application for issuance of the radio licence (form within the Register),21
- Deletion certificate from the previous Register, or, in the case of first registration, Builder's certificate,
- A certified copy of the Bill of Sale, or, in the case of the first registration, a Builder's certificate with the buyer's name included,
- Tonnage measurement Certificate or a Builder's certificate, where technical characteristics, included information on tonnage measurement are indicated.

The administrative authority is obliged, within the period of four days following the date of the receipt of the above mentioned documents, to issue Cerificate of Registration.
If the boat was entered into another Register, the administrative authority will consider a survey as a condition for entry into the Register, on the basis of the previous registration and the area of the yacht's navigation. For the first registration of a yacht, a condition for entry into the Register is a yacht survey, unless it was built according to EU Directive 94/25/EC, Code of Federal Regulations (Title 33) of the United States of America, Parts 181 and 183 or MGN Code 280 (M) and MSN Code 1792 (M) of the Maritime and Coastguard Agency of the United Kingdom. If there is a need for a survey in the previous cases, the administrative authority shall, at the expense of a yacht owner, appoint a surveyor to carry out a survey and submit the report.
While for yachts in the ownership of domestic business organizations, legal persons and entrepreneurs or natural persons the entry into the Register is mandatory, the yachts owned by foreign legal and natural persons are free to enter into the Register. Article 8 paragraph 2 of the Law stipulates that foreign yacht may enter into the

[19] Form No.1 “Official Gazette of RMNE”, No.43/10

[20] Form No. 2 ” Official Gazette of RMNE ”, No.43/10
[21] Form No.3 ” Official Gazette of RMNE ”, No.43/10

Register without any limitations and without the prior consent of the competent state authority, which is new, since until the adoption of the Law on Yachts, according to the Yugoslav law, the consent of the competent state authority had to be required and if the same refused to enter a foreign vessel, including a foreign yacht, into the Register, there was no right of appeal against such decision.
The specificity of the Register consists in the possibility for a yacht , when the yacht is held in the joint ownership, to be entered into the Register under the name of solely one co-owner.
A person who uses a yacht on the basis of a bareboat charter 22 may also be entered into the Register, and the entry lasts until the validity of the bareboat charter agreement. For the entry, it is required by law to submit a a bareboat charter agreement and the consent of a yacht owner. The law also prescribes the technical documentation (related to a yacht's ability to saill and a possible survey before the entry). The administrative authority issues a Certificate of Registration on the entry into the Register.23 For small vessels (carrying no more than 12 passengers and up to 24 meters in length) the Certificate is issued for the period of 3 years, and for other types (large vessels) the Certificate is issued for the period of 1 year.24
The Law stipulates in Article 14 a possibility for a yacht to be temporarily entered into the Yacht Register of Montenegro. The yacht, based on copies of documents, may be temporarily registered for up to three months, in which period the applicant is required to submit original documents for entry into the Register. The copies submitted are as follows: a copy of application for entry into the Register registration with the proposed name of the yacht, a certified copy of the identity document of a natural person or a certificate of registration of a legal person the owner of a yacht, proof of ownership, a statement of intended use of a yacht and a power of attorney when the application is not submitted by owner himself, co-owner or charterer, a copy of confirmation on mandatory insurance to the amount of at least 800.000,00 EUR, a copy of application for issuance of the radio licence. The administrative authority is obliged to issue a temporary Certificate on Registration on temporary entry into the Register within the period of three days.
Deletion of a yacht from the Register is carried out according to a decision of the administrative authority in case one of the following conditions is met: at owner's request, if a yacht has been ruined or it is assumed that it has been ruined, if a yacht is permanently withdrawn from service, if a yacht is entered into another Register, if a yacht no longer fulfill requirements for entry into the Montenegrin Register, if a yacht has been repaired or rebuilt without a previous written consent of the administrative authority and in case if a period of 30 days expires following the date on which the Certificate cease to be valid. A yacht owner or an authorized person shall submit an application for deletion of a yacht from the Yacht Register. Maritime Safety Department, i.e. Yacht Register Office issues a Deletion Certificate from the Yacht Register.

6. NAVIGATION NOTATION

According to Article 15 of the Law on Yachts of Montenegro, each yachts, depending on its size, construction and other characteristics is assigned one of the following navigation notation, as follows: A – unrestricted navigation; B – navigation limited to 200 nautical miles from a port of refuge; C1 - navigation limited to 60 nautical miles from a port of refuge and 25 nautical miles from the shore; C2 - navigation limited to 20 nautical miles from a port of refuge and 6 nautical miles from the shore; C3 – navigation, during the daylight and in favorable weather conditions, limited to 20 nautical miles from a port of refuge and 6 nautical miles from the shore. The competent administrative authority issues certain certificates on classification for each yacht. The assignment of navigation notation for yachts is performed based on technical rules for yacht survey. There are two

[22] Bareboat charter means contract for the lease or sub-lease of a yacht entered into between the yacht owner and charterer for a stipulated period of time, by virtue of which the charterer has whole possession and control of the ship including the right to appoint the master and crew of the ship for the duration of the charter, but excluding the right to sell or mortgage a yacht.
[23] Certificate of Registration is a document which proves that the yacht is entered into the Register and its seaworthiness;
[24] Art.13 par. 6 of the Law on Yachts

parameters that determine navigation notation of a yacht which are the condition of the hull / machinery and the equipment of a yacht

7. YACHT CHARTER

A yacht as a vessel can be used exclusively for pleasure, sport and recreation, however, they can also be chartered, but exclusively for the same purposes. Yacht chartering, by its very nature, represents economic and business activity of an extremely lucrative nature. Chartering may be performed by the companies that are registered for such activities, and also the entrepreneurs.[25] Such companies (and the entrepreneurs) may charter their own yacht or a yacht owned by other domestic or foreign legal or natural person, when they act as agents of these persons. If a lessor charters a yacht which is not his property, the lessor has all obligations, rights and responsibilities under this Law whereas the owner's liabilities in accordance with specific regulations are not excluded. The lessor may charter a yacht flying a domestic or a foreign flag. The lessor must keep the Record Book of yachts chartering. Captain or skipper of a chartered yacht must endorse the list of crew and passengers in the Harbor Master's Office or in the Harbor branch office the latest before departure. Endorsed list of crew and passengers must be kept on the yacht and the captain or skipper is obliged to present the same to an authorized person upon request. The form of the Record Book and the manner of its keeping are prescribed by the Ministry in charge of Maritime Affairs.[26]

8.YACHT CREW

Small yachts do not require a crew, however, each yacht, regardless of the size, must have a skipper who is required to pass the professional exam and thus to get skipper authorization. Large yachts, in addition to a skipper, always have a certain number of crew members. Very large yachts similar to a passenger ship, have a complete crew which, like on the other passenger ships, is divided into a deck crew, machinery maintenance staff , kitchen staff, staff who serve on the yacht and support staff that maintain cabins and other facilities on the yacht.

In accordance with the Regulation on ranks and certification of seafarers of RMNE,[27] the skipper authorization can be acquired for steering yacht up to 100 GT and the yacht up to 500 GT.

Certificate of qualification for a skipper of a yacht of up to 100 GT may be acquired by a seaferer who: has minimum 18 years of age, has no less than 12 months approved seagoing service on a vessel or 3 years approved seagoing service as a skipper of a yacht, who has completed the training under the prescribed program for a yach skipper of such category, meets the prescribed medical conditions and has a valid certificate of qualification.[28]

Certificate of qualification for a skipper of a yacht of up to 500 GT may be acquired by a seaferer who: has minimum 22 years of age, has no less than 24 months approved seagoing service as a skipper of a yacht of up to 100 GT, secondary school qualification in duration of at least 3 years, has completed the training under the prescribed program for a yach skipper of such category, meets the prescribed medical conditions and has a valid certificate of qualification for a skipper of the yacht of up to 500 GT. [29] In both cases certificates are issued for an unlimited period of time. In addition to the above mentioned certificate the yacht skipper is required to have a General GMDSS Radio Operator's License or Restricted GMDSS Radio Operator's License or basic VHF/DSC radio operator's license.

Since there are a lot of yachts over 500 GT in the world, then such yachts from the standpoint of the crew must be considered ships. In accordance with the navigation category such yacht, as a rule, is required to have a shipmaster, i.e. captain of ocean-going vessel who acquired that title by regular education and approved seagoing service, as well as by passing required exams. Certainly, according to practise on all merchant ships, the owner of a yacht appoints the shipmaster.

[25] Art.35 of the Law on Yachts
[26] Art .38 of the Law on Yachts
[27] "Official Gazette of RMNE", No.7/09
[28] Art .36 of the Regulation on ranks and certification of seafarers of RMNE
[29] Art.37 of the Regulation on ranks and certification of seafarers of RMNE,

9. CONCLUSION

For each destination and especially for Montenegro, as a country that is committed to the development of nautical tourism, it is very important to have a clear legal framework in relation to yachts. The fact that these are the vessels having a specific purpose in relation to all other vessels caused that they have a special legal treatment. Legal provisions governing maritime legal issues related to yachts in Montenegro are contained in the Law on Yachts of 2007. The adoption of this Law was a necessity due to increasing number of more complex requirements for legal regulation of various issues concerning yachts. The Law in a modern way regulates legal relationship in respect of that vessel. Especially important are the provisions of the Law relating to registration of yachts and forming of a special Yacht Register of Montenegro. Its objective is to provide for both foreign and domestic yacht owners a sufficiently attractive Register,having in mind the fact that in relation to entry into a Montenegrin Register, a full freedom of foreign ownership is left. Accordingly, obligation for captain of a yacht flying a Montenegrin flag to be a Montenegrin citizen does not apply. In addition to the Law on Yachts, of particular importance are also the Technical rules for yacht survey, i.e. Rules for Statutory Certification of Yachts issued by the Maritime Safety Department - Yacht Register Office adopted in April of 2012, which clearly define the manner and intensity of technical surveys of yachts, navigation notation, the minimum number of crew for yachts intended for charter and many other particulars related to this area.

REFERENCES

1.Milošević Pujo, B.et.al, Pomorsko pravo za jahte i brodice, (Split, 2008)

2.Petrinović, R. et al, Ugovor o najmu jahte i brodice, Zbornik radova Pravnog fakulteta u Splitu, Vol. 45, No. 4 (2008)

3.Kostović, Z., Postupak upisa jahti u upisnike jahti, Zbornik radova Pravnog fakulteta u Splitu, 4. Vol. 48, No. 4 (2011)

5.B.Ivošević, Pomorsko pravo, Tivat, 2011.

6.Pavić, D., Pomorsko imovinsko pravo, Književni krug, (Split, 2006)

7.Pavić, D., Osiguranje brodica i jahti – trajan izazov za osiguravatelje, Svijet osiguranja, No. 4 (2007).

8.Military encyclopedia, Second edition, Part III, VIZ, (Belgrade 1971)

9.Rules for Statutory Certification of Yachts, Maritime Safety Department, Bar, 2012.

10.Montenegro Yacht Register, Maritime Safety Department, Bar, 2011.

11.Law on Maritime and Inland Navigation, ("Official Gazette of SRY", Nos. 12/98, 44/99, 74/99 and 73/00)

12.Law on Sea, ("Official Gazette of RMNE", Nos. 17/07 and 6/08)

13.Law on Yachts ("Official Gazette of RMNE", No.46/07)

14.Maritime Code of the Republic of Croatia ("Official Gazette" Nos. 181/04, 76/07, 146/08 i 61/11)

15.Regulation on ranks and certification of seafarers of RMNE, ("Official Gazette of RMNE", No.7/09)

BIOGRAPHIES

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ANALYSIS OF THE LEGISLATION IN THE AREA OF ENVIRONMENT PROTECTION IN THE REPUBLIC OF CROATIA AND PROPOSAL FOR ACTIONS IN ORDER TO ADJUST TO EU LEGISLATION

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ABSTRACT

EU politics and politics of the Republic of Croatia in the area of environment protection contributes the realisation of: preservation, protection and improvement of environment quality; protection of human health, rational use of natural wealth and promotion of measures on international level which deal with regional and world environmental problems, especially regarding climate changes.
Solution to the problem of climate changes is the main challenge in the area of environment protection and this is just a part of environment protection policy. EU leads the way in their efforts to solve the problems causing climate changes with the purpose of decreasing power consumption and emissions. EU promotes adoption of similar politics worldwide, especially in industrialized countries and rapidly growing economies.
At the same time, standards for environment protection tend to act as a stimulus for usage of safer alternatives as well as a stimulus to not only manufacturers but also to housings for the usage of eco materials with the aim of ensuring possibilities of maximal recycling with minimal waste. EU funds stimulate and enable not only environmental protection but the development of other branches influencing the environment, e.g. infrastructure, energetic efficiency, technology etc. Croatia, without any doubts, has a possibility to use the EU funds in the best possible way and in order to achieve this it is necessary to adjust legislation along with knowledge.
Authors analyse legislation of the Republic of Croatia and EU in the area of environment protection and suggest measures for proceeding with the process of adoption. The purpose of the work is to establish possibilities for application and adaption to Legislation of EU.

KEY WORDS
legal basis, development strategy, climate changes, EU funds

1. INTRODUCTION

Every undesirable change in physical, chemical and biological properties of the air, land and water which has a negative effect on the environment that is organisms in it, represents environment pollution. Traffic in general (land/roads and railways/, marine/ sea, river and canal/ and air), as well as the industry have a huge influence on the environment. Application and the development of traffic, as well as infrastructure is an inseparable part of the application of environment protection measures. Due to the modern way of life, there is an increased use of all structures that lead to environment pollution. However, with the development of the awareness regarding environment protection and with the application of legislation and advanced technologies there is a tendency to decrease a negative effect on the environment.

State determines its relation to the environment protection by legislation which defines permitted activities and actions that influence the state of environment, as well as legal and financial obligations related to the environment. Legislation regarding environment protection in the Republic of Croatia is based on several laws, regulations and codes: Law on Environment Protection, Law on Environment Protection in Certain Areas (water, atmosphere, land, waste etc.), Law on Environment Protection, Regulation on Permitted Emission/Imission Values for Certain Areas, Regulations on Certain Actions (permitted that is unpermitted actions and activities) Legislation regarding Sea Protection and Marine Environment etc. Environment protection is one of 35 chapters of EU acquis communautaire established for the needs of negotiations on accession. EU acquis communautaire in the area of environment protection (Chapter 27) includes more than 200 legal acts which include horizontal legislation, water and air quality, waste management, environment protection, industrial pollution control and risks management, chemically and genetically modified organisms (GMO), noise and forestry.

2. LEGISLATION AND ADAPTION IN THE REPUBLIC CORATIA

Legislation in the Republic of Croatia is very complex and is still in the process of adaption to the EU acquis communautaire. An important issue is coastal area which belongs among the most valuable economical and natural wealth of the Republic of Croatia. This is the area of dynamic and interdependent natural processes which are initiated by mutual activities of sea and land as well as the area which is influenced by developmental pressures and relating negative influences which have or could have undesirable consequences on ecological systems. The question of administrative capacities for management and implementation of legislation is faced with numerous problems which need to be solved as soon as possible in order to avoid unwanted consequences (Kovacic et al, 2011).

2.1. Environment protection legislation in the Republic of Croatia

Preserving the environment and nature is one of the basic regulations of the Constitution of the Republic of Croatia. By the Constitution, Chapter II, Basic regulation, Article 2 it has been determined that Croatian Parliament and people, independently and in accordance with the Constitution and law, decide on the preservation of natural and cultural wealth as well as on its use (OG 41/01). First legal act on the area of environment protection which was brought by the Parliament in 1992 on the basis of the Constitution is Declaration on Environment Protection (OG 34/92). Declaration is based on the construction of the legal system in accordance with international agreements and standards of European and world community which will serve to ensure long term systematic and efficient environment protection (Lončarić-Horvat et al, 1997). The wish is to balance ecological and economical development with the purpose of preserving national heritage and various natural values for present and future generations. Top law in the area of environment protection of the Republic of Croatia is Law on Environment Protection (OG 110/07). A new one will be formed together with Law on Waste and Law on Nature. Law on Environment Protection determines the principles of environment protection and sustainable development and regulates the following: environment protection from overload influence, environment protection subjects, environment protection instruments, tracking the environmental state, approach to the information on the environment, participation of the public in issues regarding the environment, responsibility for damage, financing and general policy instruments on environment protection, administrative and inspection sector etc. Law on environment protection ensures a complete preservation of environment quality, quality of natural

communities and energy sources in the most favourable way for environment with the condition of healthy and sustainable development.
Through the national strategy of environment protection we give clear and long term concept of advanced state of the environment in the Republic of Croatia, with the purpose of sustainable development (OG 46/02). Constituent part of the strategy are action plans where the aims, measure, level of action, responsible persons, deadlines and connection to the directions of EU and international obligations are stated. Environment protection includes: protection of the air, land and earth crust, nature and forest area, water (ground and surface waters), sea and coastal area, waste management and others. Environment protection includes everything that has a negative effect on human health, landscape, plant and animal species living in that area.
Government of the Republic of Croatia defines the actions by different regulations and plans, and codes are defined by resource ministries.

2.2. Administrative capacity in the Republic of Croatia

Public administration, its efficiency and quality are connected to the quality of its officials. The importance of education, ethics and responding organizational culture are especially emphasized in the process of modernization of public administration and sector. The need for strengthening institutionalized capacities of administrative bodies is also emphasized because it represents the basis for inclusion into European integration (Musa et al, 2009).
Ministries in the Republic of Croatia that is the bodies on national level serve for the needs of strengthening administrative capacities and more efficient application on legislation in the area of environment protection. Implementation of the adjustment has started since 2007. In the period from 2007 to 2009, strengthening of the administrative capacities in the Environment sector has been implemented on the basis of Action plan and on the basis of new arrangements, employment of new officials in ministries and other institutions like inspection services. During 2009, there has been a slowdown in the planned employment process which was caused by financial restrictions when a new Decision on a ban of new employment of public officials in the administrative bodies was introduced.
Considering the need to fulfil the obligations which come out from EU acquis communautaire, an improved Decision was brought in December where it was permitted to employ only those officials who were directly connected to the process of entering EU and necessary for performing certain jobs.
Public administration in the Republic of Croatia is in the permanent reform state aligning with the challenges of public needs and concrete demands such as European integration. However, these reforms demand fast and efficient solutions.

3. EU LEGISLATION

In this chapter we will demonstrate recent development of environment protection policy in EU and the analysis of legislation in environment protection.

3.1. Development of environment protection policy in EU

Sixty years ago, none of the European countries had a clearly defined environment protection policy. During the last 30 years, EU realized a significant improvement in setting a wide range system of environment protection.
1972 – Meeting on a highest level in Paris: dedicating special attention on environment protection in the context of economical growth and improvement of life quality. The result is the First action plan for environment protection after what we adopted several similar programs and a number of directives.
1987 – Unique European Act: turning point in EU policy for environment protection (first appearance in the Community's agreements).
1992 – Maastrichta Contract: increasing the status of environment protection.
1999 – Amsterdam Contract: legal basis for wider environment protection has been strengthened and sustainable development throughout EU had been promoted.
Today, environment protection policy is closely connected to economic and social policy.
EU goal is to offer a suitable level of protection in whole EU without disregarding local factors and economical restrictions. Policy is based on the principle of „polluter pays". The polluter can „pay"

by investing in higher standards or through taxation of business or customer due to use of the product dangerous for the environment. Paying can include the demand for taking over, recycling and disposal of product on waste after the use. Illegal emissions of pollutants dangerous for air, water and land, illegal waste disposal and illegal trade of protected spices are a criminal act which includes criminal sanctions.

Environment is one of the sectors which are the hardest to control for EU. Member states can enjoy in European natural beauties, but they have to divide the burden of pollution such as acid rain, water pollution, polluted air and waste disposal. Extreme weather conditions have also become an increasing phenomenon which implies that climate changes are a problem that influences citizens and policy for environment protection on all levels (Labudović, 2002).

3.2. Legislation of environment protection in EU

Regional EU policy is one of the oldest common policies of EU which serves to achieve balanced development on the whole EU territory by decreasing and removing structure differences among European regions. The need for decreasing and removing differences among regions is already mentioned in Roman agreements (signed in 1957). Economical and social cohesion is established as an aim parallel to the completion of the establishment of unique market through unique European act. Maastrichta contract emphasizes social and economic policy as the only EU policy. Main instruments of implementing regional policy are structural fond and Cohesion fond. Single European Act among others has been introduced and signed in Luxemburg and Hag with an increasing development of awareness and care for the environment. It entered into force on the 1st of July 1987, enabled adjustments necessary for achievement of inner market and set foundations for the implementation of the decisions in the area of environment protection. It set the legal basis for the creation of EU inner market and defined new authorities of the Community such as: social policy, economical and social cohesion, research and technological development, environment protection, cooperation in the area of foreign affairs, wider authorities of European parliament and simple process of bringing decisions in the EU Council.

As a part of Paris summit in 1973, Environmental Action Programme (EAP) has been published and it represents the basis for the area of environment protection policy because Action programs for environment protection are being published after it.

EU environment protection programmes started in 1972 helped the integration of ecological aspects and aspects of environment protection in all areas of Community's policy. Sixth program „Environment 2010: Our future, our choice" which lasts from 2002 to 2012 – focuses on four main areas: climate changes and global warming, natural habitats and wild animals protection, ecological and health problems, preservation of natural resources and waste management.

Program is based on control system which is already applied in EU and enables equal protection of all member states which simultaneously have enough level of flexibility in order to satisfy local and regional demands. Issues that relate to several different areas are discussed through seven (7) different topic strategies which deal with: air pollution, waste and recycling, marine environment, land, pesticides, sustainable resource use and city centres. Six action program emphasizes the importance of the application of the existing laws on environment protection. The influence on the environment should be taken into consideration in overall EU policy, for example during decision making regarding agriculture, energy and traffic.

The conclusion is that the ecological systems have to be solved at their source and that is often connected to several areas.

4.CLIMATE CHANGES AND ENVIRONMENT

In this chapter we discuss climate changes and present measures for the protection and improvement of air quality, water protection, natural habitats protection (plants and animal species), better waste management, industrial pollution control, chemicals and GMO organisms which were accepted by EU member states through the environment protection policy. Basic features and effects of cohesion policy on economic development are especially being analysed.

4.1. Climate changes

A big number of authors agree that climate changes represent statistically significant changes of the middle state and variability of climate sizes which have been lasting for decades and longer (Glavač,1997). Climate variability can be caused by natural causes within the climate system itself, by inner factors (interaction of the atmosphere and oceans in the tropical part) and outer factors (vulcanise and sun shining).
Climate changes usually refer to today's big climate changes related to the human activities (traffic, technologies, fuels and similar) which leads to a greenhouse effect (the influence of greenhouse gases and further to heating the atmosphere.

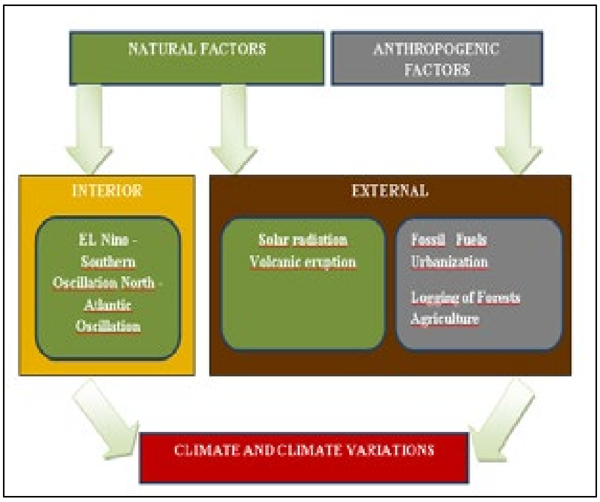

Figure 1. Example of natural and anthropogenic factors that influence the climate[7]

European Commission brought climate change related initiative in 1991 when the Strategy of the Community for restraining the emission of carbon dioxide (CO2) and improvement of efficient energy consumption was published. In 2000, European Commission started the first European Program for Climate Changes (ECCP). The program was started in order to create rules, measures and schemes for the trade in the amount of emission and in order for EU to decrease an emission level for 8% in the period from 2008 to 2012 in accordance with the obligations from the Kyoto Protocol. Second phase of ECCP started in October 2005 and it included several work groups: revision of ECCP I, aviation, CO2 and vehicles, collecting and storing carbon, measures of adjustment and revision schemes for trading the emissions.
EU scheme of trading emissions of EU ETS greenhouse gases has a key role in the European fight against climate changes. In January 2007, Commission suggested that EU decreases the emissions of greenhouse gases for 20% by 2020 in relation to the levels from 1990. EU tried to achieve this goal unilaterally, with and without international agreement on continuing the initiative after the expiry of the Kyoto Protocol in 2012. EU hopes that many countries such as US and China could follow this example. With the purpose of achieving this goal, Commission suggested starting common market for electricity and gas in EU. Renewable sources of energy such as solar energy and wind energy, must be used for 20% of overall energy consumption and 10% of fuel consumption must refer to biofuels.

4.2. Environment protection and EU fond for environment projects

Through balancing and through appropriate implementation of regulations for environment protection, the Republic of Croatia ensures high quality standards by which it contributes to the health protection of its citizens. By investing in environment preservation, the Republic of Croatia as a tourist country ensures a high status of desirable touristic destination.
The Republic of Croatia arranged a number of transitional periods in the area of environment protection, for example in the area of waste management, preserving water quality and stopping industrial pollution. This way we enabled additional time for coordinating with EU standards and for implementation of financially the most demanding projects, According to the official information of the governing ministry (Ministry of Regional Development and EU Fond), by additional coordination we gained a non-refundable help of EU for the area of environment protection for the period from 2007 to 2011 in the amount of 96, 7 million EUR.
Projects and financial possibilities of the Republic of Croatia are explained in the Manual on Financial Cooperation and Programs in Croatia supported by EU (2009).

We need to emphasize that some projects such as ISPA infrastructural projects in the Republic of Croatia related to the environment protection (water sector and solid waste sector) have been implemented. Projects: CARDS, PHARE, ISPA and SAPARD, substitute IPA program. IPA program is imagined as a help for Croatia in implementation of necessary reforms so that Croatia could become member state of EU with clear perspective and emphasis on the system construction in order to successfully manage future EU fond, significantly greater. IPA program consists of five (V) components out of which is a component:

- IIIa for Traffic;
- IIIb for Environment and
- IIIc for Regional competition.

IPA ensures directed pre accession financial help to candidate states and countries. IPA is established by The Regulation No 1085/2006[1] which determines overall frame of help and general help principles. Detail rules on implementation are presented in The Regulation 718/2007[2].
Component III – Regional development – IPA-RD is an extension of ISPA program and a part of PHARE program which refers to economical and social cohesion. Financial means will be secured for big infrastructural projects from the area of traffic and environment protection and projects that promote regional competition and equal regional development. This IPA component precedes the use of European Fond for Regional Development and Cohesion Fond which will be opened in Croatia after the accession. In the IPA context, Operative Program (OP) is a multiannual document which determines authorized state institution of a user country and which European Commission approves. Operative program defines priority areas and responding measures as well as necessary resources.

4.3. Ecological network Natura 2000

In accordance with ecological network of EU, we created national ecological network (in accordance with the Directive on habitats from 1992) which includes land and sea areas and which contributes to preservation of biological diversity NATURA 2000. NATURA 2000 is a central part of politics on nature protection and biological diversity of EU. The aim of the network is to ensure a long term survival of the European most valuable and most endangered species and habitats. It consists of Special Areas of Conservation (CAS) which were defined by member states in accordance with the Directive on habitats. It also includes Special Protection Areas (SPA) defined on the basis of Directive on birds from 1979. Long term nature protection is possible through the protection of the parts of the nature and this is why it is of extreme importance that European countries cooperate through NATURA 2000 in order to save endangered species and habitats in their natural areas, non depending on national, political and administrative borders. At the moment there are 2500 areas in the NATURA 2000 network which together cover a significant surface of 27 countries (fifth of the territory which is for example bigger than the surface of France.

4.4. EU Cohesion Policy

Cohesion policy is based on presumption that redistribution between wealthier and poorer European regions is necessary in order to balance the effects of further economical integration. Since 1988 the users of Cohesion policy were: Greece, Portugal, Ireland, Italy and Spain; and today's users are countries of middle and Eastern Europe. This is how so called NUTS[3] regions were created which were divided in accordance with the development of the regions.
Establishing statistical spatial units according to EU classification (so called NUTS) is a part of EU acquis communautaire which needs to be accepted by a candidate country before joining EU.
Within the frame of EU cohesion policy, statistical NUTS units serve in order to establish the level and kind of help EU uses to finance cohesion policy that is developmental activities of member states in accordance with the strategic directions brought on the level of EU. Statistic spatial units do not

[1] http://eut-lex.europa.eu/LexUriServ/site/en/oj/2006/l_210/l_21020060731 en00820093.pdf
[2] http://eur-lex.europa.eu/LexUriServ/site/en/oj/2007/l_170/l_17020070629 en00010066.pdf

[3] NUTS (Nomenclature of spatial units for statistics) regions

represent legal nor administrative division of the state territory. In accordance with the EU acquis communautaire, they do not even represent the obligatory basis for leading and creating policy of national development.

During aggregation of administrative units we must take into account relevant criteria such as: geography, history, culture and other factors which are very hard in the Republic of Croatia considering its great regional diversity without clear natural and historical borders among existing counties on the basis of which we could clearly define regional units.

Classification of the statistical regions is established according to NUTS methodology established through Regulation (EC) number 1059/2003 of the European Parliament and Council on the common classification of territorial units for statistics (NUTS) during the negotiation on statistics chapter. After joining EU, this classification is officially accepted as a NUTS region of new member state and, in accordance with the mentioned Regulation, member states can change the existing classification within next three years. From the point of view of classification for statistics, present system divides the territory of EU (territory of each member state) on five hierarchical level regions: three basic levels.

As a result of negotiations of the Republic of Croatia with governing Commission services (General Administration for Regional Policy, Eurostat), in the March of 2007, EU Commission confirmed the compatibility of the suggestion of the proposal regarding the division of the Republic of Croatia in three NUTS II regions (North western Croatia; Middle and East (Panonnian) Croatia and Adriatic Croatia). National classification of statistical regions in Croatia has been established and Croatian Statistical Institute has started collecting regional statistics in accordance with the structure of established classification.

Recent administrative division of the Republic of Croatia responds to the criteria of the statistical division on the following levels NUTS I (whole Croatia), NUTS II (North western Croatia, Middle and East (Pannonian) Croatia and Adriatic Croatia), NUTS III (counties) and LAU 2 (municipalities and cities).

A new change in the number of NUTS II regions which is coordinated with Eurostat that is European Commission during 2012 divides the Republic of Croatia in 2 statistical regions – Continental and Adriatic region. This is the result of the efforts to enable withdrawal of the highest possible amount for the purposes of financing the development of all Croatian areas and preparation of relevant developmental projects on which this development will depend on in long term.

Croatian Institute for Statistics as a main carrier of the official statistics system of the Republic of Croatia started to apply new National Classification of Spatial Units since January, the 1st 2013.

The use of new classification for the purpose of Cohesion policy starts from the 1st of July 2013 that is after Croatian joining the EU.

EU needs Cohesion policy due to:

- Decreasing regional inequality
- Improving functioning of unique market
- Promoting the stability and sustainable development.

Croatia is still not a member state so that it cannot participate in Cohesion policy and for now it does not have an access to the Structural instruments. After joining it will have an access to the Structural EU fond as a help in the realization of economical, social and territorial cohesion.

5. PRINCIPLES, MEASURES AND RECOMMENDATIONS IN THE AREA OF ADJUSTMENT OF LEGISLATION REGARDING ENVIRONMENT PROTECTION

Adjustment of the legislation of the Republic of Croatia in the area of environment protection according to the legislation of EU has a positive aspect. Problems appear in the application and action. Therefore, authors suggest systematically approach to accepting the principles[4] relating the definition of aims in managing land, water and living wealth as a subject of social choice. In order to realize set aims in the area of environment protection, it is necessary to decentralize management on the lowest appropriate level and in Croatia; this is the level of region. Region as a decentralized system of management can lead to

[4] Decisions V/6 from meetings of the Conference on Biological Diversities parties, www.biodiver.org/decisions

higher efficiency, successfulness and justice. As Fredotović (1994) and Cicin Sain (Cicin Sain et al, 1998) and others state, management has to involve all participants and bring balance to local community and broader social interest since management is closer to certain ecosystem, for example coastal regional area, the responsibility, ownership, informing obligation, participation and use of local knowledge is bigger,

It is clear that those who manage certain resources must take into account the effects (present and future) of their activities on neighbouring and other resources (Kovačić et al, 2011). Therefore, we need to establish agreements or ways of organization so that the institutions involved in decision making make suitable decisions. It is important to emphasize the responsibility of the public administration in acting in order to avoid the danger in changes caused by alternative use of resources or their overuse.

Often the one who has benefits from preserving does not bear the expenses and the one who causes the ecological expenses tends to avoid the responsibility (USA, China). The attention needs to be directed to the environmental conditions which limit natural productivity, ecosystem structure, functioning and variety of resources.

Systematic approach demands the appropriateness to spatial and time difference. Taking into consideration different time periods and effects of delay which characterize the actions, aims of managing need to be defined for a longer period. This is important in order to avoid inner conflicts and stop short term aims and gains in relation to long term ones.

Resource management needs to accept the necessity of changes and at the same time consider actions which will handle long term changes such as climate change.

In order to realize set aims along with the respect for principles in managing resources, it is important that public administration has suitable information which includes scientific knowledge, knowledge of natives and local knowledge.

It is logical to conclude that the systematic approach must include all responding sectors of social and scientific discipline. Most of the questions regarding resource management are complex, along with many interrelations, side effects and because of this we need to include necessary expertise of all participants on local, regional and international level.

6. CONCLUSION

Men influence the shape of his environment from the moment he is born and he must be aware of the fact that his life and development are limited to this planet Earth, to its land, water and air. The idea of environment protection is a recent idea although certain segments which are involved in it now have long been the subject of social and legal regulation. Pollution of men's environment, as a consequence of fast technological development especially in advanced countries, causes an increasing damage to the human health, biological goods, flora and fauna, materials, infrastructural objects and cultural heritage.

Today, pollution of life environment and overuse of resources is one of the characteristics of modern man, and this especially refers to marine environment. Because of this, we need to make efforts so that the system of norms (laws, conventions, protocols, international and national) is being developed, adopted and fulfilled. Cooperation of states in this area must be comprehensive and unique in international relations. No matter the political, economical, technical and technological and other different activities, it is necessary to direct our attention to realizing long term and complex aim, common aim and that is the preservation of the environment, especially marine.

Croatian space, especially the part of Adriatic, presents natural and economical value which needs to be protected and preserved for future generations. By entering EU, Croatia will officially become a part of global community which set the basic regulations in the policy of environment protection. On this way Croatia must preserve its character and diversity and at the same time perform an adjustment to the EU legislation. This complex task demands responsibility in managing and acting with resources in order to realize final aim, and that is balanced development of all social community.

REFERENCES

1.Cicin Sain, B. et al, Integrated coastal and ocean menagement (Concept and Practice), Center for the Study of Marine Policy University of Delaware, Washington DC (1998)

2.Fredotović, M., "Gospodarenje prostorom i prirodnim resursima u kontekstu integralnog upravljanja obalnim područjima: (mediteranski koncept razvojne strategije Hrvatske) // Radovi - Sveučilište u Splitu. Ekonomski fakultet. - 4 (1994), 11 ; str. 189-200.

3.Glavač, V., Uvod u globalnu ekologiju, Državna uprava za zaštitu prirode i okoliša i Hrvatske šume, Zagreb (1999)

4.Kovačić, M., Komadina, P., Upravljanje obalnim područjem i održivi razvoj, PFRI, Rijeka (2011)

5.Labudović, B., Obnovljivi izvor energije, Energetika marketing, Zagreb (2002)

6.Lončarić-Horvat, O. et al, Osnove prava okoliša, Organizator, Zagreb (1997)

7.Musa, A., Đulabić, V., Vukojičić, T., Škarica, M.,: "Obrazovanje za javnu upravu", Hrvatska javna uprava, god. 7.,, br. 2.,(2007) str. 289–317.

8.Ustav Republike Hrvatske (NN 41/01)

9.Zakon o zaštiti okoliša (NN 110/07)

10.Nacionalna Strategija zaštite okoliša (NN 46/02)

11.Deklaracija o zaštiti okoliša Republike Hrvatske (NN 34/92)

12.Državni zavod za zaštitu prirode, Ekološka mreža NATURA 2000 u RH, www.natura2000.hr/PageTemplates/ContactPage.aspx?pageId=39...

13.WCED (World Commission on Environment and Development): "Our Common Future", Oxford: Oxford University Press, (1987)

14.Ministarstvo vanjskih poslova i europskih integracija: Mali leksikon europskih integracija Petretićev trg 2, Zagreb (p. 61)

15.Središnji državni ured za razvojnu strategiju i koordinaciju fondova Europske unije, Europski fondovi za hrvatske projekte, Priručnik o financijskoj suradnji i programima koje u Hrvatskoj podupire Europska unija, (2009) www.mrrfeu.hr

16.http://www.zastita-prirode.hr/Aktivnosti-projekti-i-medunarodna-suradnja/Medunarodni-sporazumi/Konvencija-o-bioloskoj-raznolikosti-CBD

BIOGRAPHIES

Mirjana Kovačić was born on 14th September 1960 in Rijeka, where she completed her secondary school education and graduated from the Faculty of Economics in 1983. In 1998 she got a job in the public service at the County of Primorje and Gorski Kotar, where she is today employed as expert for maritime and concession affairs. In 2001 she enrolled in the postgraduate scientific study "Technological System in Maritime Transport", module "Planning of Maritime Domain" at the Faculty of Maritime Studies of Rijeka.
In 2004 she was awarded the masters diploma (M.S.), while in 2008 she acquired the academic title of doctor of technical science (Ph.D.). Besides the master's and doctoral dissertation, in her past scientific and research work, by herself or with other authors, she has published more than 50 papers (http://bib.irb.hr/lista-adova?autor=282483).
As a co-author she published books: Nautical Tourism and Ports of Nautical Tourism – Territorial Characteristics of the Croatian Adriatic Sea, Choice of Locations of Ports for Nautical Tourism, Coastal Management and Sustainable Development, and book, Planning and Projecting of the Nautical Tourism Ports.
At the University of Rijeka, Faculty of Maritime Studies, as a foreign associate she teaches the following subjects: Coastal Management, Planning and Projecting of Nautical Tourism Port, Nautical Tourism and Traffic in Tourism.

Majda Jurić was born on 4th June, 1967 in Zenica, where she has finished high school and acquired the title of Environmental Technician and where she also finished music school. She

graduated 1995, on the FACULTY OF CHEMISTRY AND TECHNOLOGY in Split, orientation - Environmental protection. She was enrolled postgraduate doctoral studies (2012) at the Faculty of Maritime Studies in Rijeka. During the years she has worked in jobs related to chemical technology, labor and management. Since 2006, she works in the Ministry of Environment and Nature in the Department of Marine and Coastal Protection.
She is involved in sports (recreationally) and music.

Vinka Jurić was born in 1980. in Split where she has finished high school.
She graduated on the American College of Management and Technology in Dubrovnik in 2000. In 2006. she also graduated on the Faculty of Maritime Studies in Split. At the doctoral programme "Marine" (Hydrographical engineering) in the Faculty of Maritime Studies in Rijeka, she passed all the exams. She works at the Hydrographic Institute of the Republic of Croatia since 2000. Since 2010. she is on the position of the assistant director for EU projects, funds and PR (Department for EU projects and funds). She is actively involved in sports, married.

BALLAST WATERS AND THE ENVIRONMENT

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ABSTRACT

One of the major ecological risk of maritime transport is the introduction of new species in marine environment by ballast waters, especially due to growing maritime transport. Current knowledge on harmful effects of ballast waters is incomplete because the monitoring is implemented on limited marine areas. Present ballast water treatment methods are not sufficient and several methods should be combined in order to meet strict criteria of The International Convention for the Control and Management of Ships Ballast Water and Sediments. It is essential to develop scientifically based strategy on ballast water pollution in the Republic of Croatia, and it should include unitary monitoring, which is vast and demanding project.

KEY WORDS
Marine environment, ballast waters, harmful effects, treatment methods

1. INTRODUCTION

Ballast water taken on in one ecological zone and released into another may introduce aquatic invasive species and non-indigenous organisms. This can drastically disrupt fragile marine ecosystems. Unlike other forms of marine pollution, where ameliorative action can be taken and from which the environment will eventually recover, the impacts of invasive marine species are most often irreversible. Due to the high volume and intensity of maritime traffic, the risk of invasive species introduction into marine ecosystems by ballast waters is high, together with other side-effects of ships ballasting.

2. THE NEGATIVE EFFECTS OF BALLAST WATER ON MARINE ENVIRONMENT

The introduction of invasive marine species into new environments has been identified as one of the four greatest threats to the world's oceans. International Maritime Organization (IMO) estimates that 10 billion tons of ballast water with 10,000 species of marine organisms is transferred each year worldwide.

The vast majority of marine species carried in ballast water do not survive the journey. Even those that do survive a voyage and discharging, the chances of surviving in the new environmental conditions, including predation by and/or competition from native species, are low. However, when all factors are favourable, an introduced species may become invasive, out-competing native species and multiplying into pest proportions. There are hundreds of examples of catastrophic introductions around the world resulting in economic and/or ecological impacts in the native environment, and causing severe consequences to human health.

The decline of production dependant on marine environment strongly influence local community and can result in the increase of unemployment and depletion of life standard. The influence local community can be calculated as the difference in net income before and after the invasion, magnified for the expenses for control and combat against invasion.

3. BALLAST WATER TREATMENT METHODS

There is no unique attitude on the best applicable method for ballast water treatment on ships. The method applicable to one ship type does not have to be optimal for the other ship type. There is no method that can fully prevent transport of living organisms via ballast water. Ballast water treatment methods have to meet following requirements:

- Security – it should avoid illicite stress on ship construction, local stresses due to high pressure in the tanks, etc.
- Ecological suitability – the chemicals that can negatively influence marine environment should be avoided;
- Technical efficacy – high mortality or elimination of potential invasive species should be accomplished;
- Low costs of implementation and maintenance of treatment plants should be accomplished;
- Practicality – the duration of treatment process, the complexity of performances including the possibility of failure, ect.

In ballast water treatment assessment the factors that should be taken into account are: the costs, the possibility of utilization, the effectiveness of the method, the negative environmental effects and the impact on human health. The real costs include: the cost of the equipment, the cost of human labour and time needed for the treatment process. The great majority of methods demand modification of existent ships or to build in the new equipment on new ships, ant it can be very expensive. Besides the regular job on the ship, the crew have to handle the ballast water treatment plants and it can in addition overload the crew. It is possible, that method slows down the ship operations and increases fuel consumption that results in more expensive freight.

4. LEGISLATION

The International Convention for the Control and Management of Ships Ballast Water and Sediments was completed and adopted in 2004, and now is available for ratification. It states that:

- Ballast water must be treated before it's released into another ecological zone.
- Vessels built during or after 2009 have to install a type approved Ballast Water Treatment system immediately once the convention enters into force.
- Vessels built before 2009 must install a certified Ballast Water Treatment system by 2014 or 2016 (depending on ballast water capacity of the vessel).

It is divided into articles and regulations including an annex which describes the technical standards and requirements: Regulation D-1 Ballast water exchange standard and Regulation D-2 Ballast water performance standard, Regulation B-3 Ballast water management for ships.

Ballast Water Management Plan. Until the Convention enter into force it is voluntary for the shipping companies to implement the use of a Ballast Water Management Plan onboard their vessels. It should be specific to each ship and should at least:

- detail safety procedires for ship and the crew;
- provide a detailed description of the actions to be taken to implement ballast water management requirements and supplemental ballast water management practices;
- detail the procedures for the disposal of sediments at the sea and to shore; include the procedures for co-ordinating shipboard ballast water management plan that involves discharges to the sea whith the coastal state authorities;
- designate the officer on bord in charge of ensuring that the plan is properly implemented;
- contain the reporting requirements for ships;
- The plan shold be written in the language of the ship. A translation into English, French or Spahish shall be included.

Ballast handling plan for a ballast voyage should be prepared in advance, similar to the preparation of a cargo plan for a loaded voyage, and with the same degree of thoroughness. The pre-planning is essential in oreder to maintain the required safe stability of the vessel. If there is any problem with performing proper ballast exchange it should be reported to the company. For ballasting in port, a plan for ballastinng should be prepared before cargo operation in order to minimise discharge or loading of any ballast water.

The GloBallast Project. In the year 2000, IMO joined forces with the Global Environment Facility (GEF), the United Nations Development Programme (UNDP), member governments and the shipping industry to assist less-industrialised countries to tackle the ballast water problem. The full title of this project was Removal of Barriers to the Effective Implementation of Ballast Water Control and Management Measures in Developing Countries. It was more simply referred to as the Global Ballast Water Management Programme, or GloBallast. The GloBallast is assisting developing countries to; reduce the transfer of harmful aquatic organisms and pathogens in ships' ballast water, implement the IMO ballast water Guidelines and prepare for the new IMO ballast water Convention.

Mediterranean Strategy on Ships' Ballast Water Management. As part of the draft Mediterranean Strategy on Ships' Ballast Water Management endorsed by the Focal Points of REMPEC, in May 2011, the Mediterranean Coastal States have adopted interim arrangements to address the risk of alien species invasions via ships' ballast water and sediment. The Harmonized voluntary arrangements for ballast water management in the Mediterranean region require ships sailing in the Mediterranean to exchange their ballast water in accordance with the requirements of the Ballast Water Convention. These arrangements are of a voluntary and interim nature as they will be applicable as from 1 January 2012, and until the date the Ballast Water Convention enters into force.

5. BALLAST WATER MANAGEMENT IN THE REPUBLIC OF CROATIA

Ballast water, pollution, and waste are in various ways the principal contributors to the degradation of Croatia's marine and coastal areas. It is apparent that many problems are connected to improper pollution control by ships, industries and waste management in general. The existing ballast water management system, characterized by numerous vessels operating without proper preventive measures fails in both technical and educational aspects.

In recent years, the public in Croatia has gained awareness of the need to manage ballast water. The problem of ballast water in the Adriatic Sea is extremely serious because eight million tons of ballast water is discharged every year. The Adriatic Sea is a shallow, semi-closed sea with a slow shift of currents. Although the maximum depth is 1300 meters, it does not exceed 100 meters in the North and 20 meters in the Trieste gulf. The Adriatic Sea's ecosystem is highly sensitive and the preservation of balance is of vital importance.

By adoption of the Maritime Code in 2004 (the new Code based about 80 % on the old one from 1994), the Minister in charge of maritime affairs, with consent of Minister of Environment, was obliged to bring legislation on ballast waters control and management within the period of two years from the enforcement of the Code. In 2007 Croatian Code for the management and control of Ship Ballast Water was set out (it entered on the force 01/09/2007). The recent Croatian initiative is to identify the Adriatic Sea as Particularly Sensitive Sea Area (PSSA).

Croatia has created a comprehensive legal framework for sound environmental management, mostly based on the command and control principle, but it has not been fully adopted yet. However, there is still a need for further adjustment of legislation by following contemporary environmental legal standards, especially those of the EU. These adjustments have to be done with respect to Croatian conditions and circumstances. Furthermore, a balancing of domestic environmental laws and regulations with some traditional laws covering related issues (coastal/marine management, water management) is necessary to make their application more efficient.

6.CONCLUSIONS

Current knowledge on harmful effects of ballast waters is incomplete because the monitoring is implemented on limited marine areas. Present ballast water treatment methods are not sufficient and several methods should be combined in order to meet strict criteria of The International Convention for the Control and Management of Ships Ballast Water and Sediments. It is essential to develop scientifically based strategy on ballast water pollution in the Republic of Croatia, and it should include unitary monitoring, which is vast and demanding project.

REFERENCES

1.Bax, N. (2003): Marine invasive alien species, a treat to global biodiversity /MaRINE Policy, 27, 314.

2.Radan, D., Lovrić, J. (2001): Prijedlozi provedbe nadzora izmjene balastnih voda na tankerima, Naše more, 48, 92.

3.Pećarević, M., Lovrić, J. (2004): Problematika unosa stranih organizama brodovima Ispust vodenog balasta u hrvatskim lukama, Pomorski zbornik, 42, 1.

4.Kurtela, Ž., Jelavić, V., Novaković, T. (2007): Štetno djelovanje ispuštenoga vodenog balasta na morski okoliš, Naše more, 54, 1-2.

5.Hoegh Fleet Services, 2010: Advanced Environmental Course

6.The International Convention for the Control and Management of Ships Ballast Water and Sediments/ http://www.ecolex.org/server2.php/libcat/docs/TRE/Multilateral/En/TRE001412.pdf

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SEA TRANSPORT OF MILITARY AMMUNITION, EXPLOSIVES AND OTHER HAZARDOUS CARGO WITH NATO WARSHIPS

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ABSTRACT

The aim of this paper is to show how some NATO warships are designed and equipped which transport military ammunition, explosives and other dangerous cargo. In this paper, we show the ability of these ships to continuously supply other warships of fleet and other military land forces with military ammunitions, explosives and other ordnance, individually or with other logistics ships from the NATO structure. Additionally, the role of the NATO logistics-amphibious warships is the ability to quickly and successfully deliver and supply airborne troops, combat helicopters, tanks and artillery with ammunition, explosives, fuel, food and medical equipment into dangerous hot spots worldwide. These ships have large C4I (Command Information System) capabilities.

KEY WORDS
Logistic-amphibious warships, Military ammunition and explosives, Sea transport, NATO Alliance

1. INTRODUCTION

North Atlantic Treaty Organization (NATO) enhanced mission spectrum has widened to involve extensive use of movement and transportation within the NATO Area of Responsibility (AOR) and Beyond NATO Area of Responsibility (BNAOR). Military Committee 336/2 (MC), NATO Principles and Policies for Movement and Transportation (M&T), states; "It is essential to the Alliance's military credibility that the capability exists through, inter alia, multi-national co-operation to deploy forces in a timely manner in order to undertake the full spectrum of Alliance roles and missions". This also applies to transportation for sustainment (re-supply), and re-deployment. In response to this situation, Allied Joint Publication (AJP-4), Allied Joint Logistic Doctrine (AJLD), was developed to address the logistic, movement and transportation, and medical doctrine. However, more detail was required for expanding the missions, tasks and responsibilities, and procedures that Movement and Transportation (M&T) staffs are expected to meet in Article 5 and non-Article 5 Crisis Response Operations (CRO). As such, AJLD doctrine was developed to assist nations and NATO to operate in a combined and joint M&T environment. NATO and nations have a collective responsibility for movement and transportation support. This responsibility extends from initial

M&T planning through the strategic deployment, Reception, Staging and Onward Movement (RSOM), sustainment and redeployment phases of an operation. Exchange of M&T information between NATO and national military and civil authorities is important for the efficient planning and execution of M&T tasks.

2. MILITARY AMMUNITION, EXPLOSIVES AND OTHER HAZARDOUS CARGO

Ammunition, explosives, their components, and weapons are known within the Army as 'ordnance' and require proper care when dealing with them.

Figure 1. Military ammunition

They are considered to be compatible if they may be stored together without significantly increasing either the probability of an accident or, for a given quantity, the magnitude of the effects of such an accident. The ammunition used by the NATO must be maintained in a state of readiness at all times. Improper, rough, or careless handling, storage, and shipping can result in malfunctioning ammunition and material damage or loss of life. All explosives, ammunition, weapon, and devices using conventional explosives, pyrotechnics, or incendiary material for their operation are included in the general term explosive devices. An explosives material is a substance (or mixture of substances) which is capable by reaction of producing gas at such temperature and pressure as to cause damage to the surroundings. Included are pyrotechnic substances even when they do not evolve gases. The term "explosive" thus includes all solid and liquid materials variously known as high explosives and propellants, together with igniter, prime pyrotechnic (e.g. illuminant, smoke, delay, flare and incendiary) compositions.

Figure 2. Military explosives

Naval ammunition is therefore optimized for great velocity (to reach those great ranges, to hit aircraft flying at altitude and also with the benefit of reducing the lead that has to be applied to hit a distant moving target) and to disable said machines, rather than rending human flesh. All operators of power-operated handling equipment, such as hoists, winching cranes, or forklifts, that are used in handling explosive devices must be certified and licensed to handle the particular piece of equipment. Personnel working with ammunition and explosives will be trained in the tasks they are to perform. Such personnel must understand the risks, standards, procedures, and precautions that apply to their tasks.

Figure 3. Military personnel working with ammunition

Each Army Commands (ACOM), Army Service Component Commands (ASCC), or Direct Reporting Units (DRU) will establish a certification program that will include all personnel directing, supervising, planning, or performing ammunition and explosives-related (AE-related) functions. The phrase "The life you save may be your own" is a good one, especially when you handle ordnance. In order to promote the safe storage and transport of dangerous goods, an International system for classification has been devised. The system consists of nine classes (1-9) of which Class 1 comprises ammunition and explosives. Class 1 is divided into six divisions. The hazard division indicates the type of hazard to be expected primarily in the event of an accident: mass explosion (Division 1.1), projection effects (Division 1.2), fire and radiant heat (Division 1.3), no significant hazard (Division 1.4), mass detonation with very low probability of initiation (Division 1.5) and detonation of a single article, with low probability of initiation (Division 1.6).

3. MILITARY SEA TRANSPORT

Sea Transport (ST) is a very economic mode of transport. Although relatively slow on short distances because of the loading and discharging time, on long distances this mode of transport can be the only suitable way to move as quickly as possible a whole force package. Examples of efficient usage of ST are for units with outsized and/or heavy cargo and hazardous cargo such as fuel or ammo. A further advantage is that there are almost no problems with border crossings. Military movement and transport resources will always be limited. Military movements may rely heavily upon vessels obtained directly from the commercial shipping market or upon utilization of normal liner services. However, nations may encounter difficulty in acquiring sufficient capacity of preferred types of ships to meet their military requirements. The “NATO principles and policies for movement and transportation” document reflects the need of the nations and the Alliance to provide flexible support to NATO operations.

Figure 4. Military sea transport of equipment

Nations should consider co-ordinating their acquisition activities in close co-operation with M&T planners from other nations and the Allied Movement Co-ordination Centre (AMCC) during movement planning conferences. Co-ordination should result in more efficient use of ships and could avoid increased charter rates. Movement and transfer of ammunition and explosives must comply with national, international, and host country-specific transportation regulations. Quantity Distance (QD) criteria apply to all transfer operations involving ammunition and explosives. NATO nations are responsible for providing the military or civil sea transport assets necessary to deploy, sustain and redeploy the forces they contribute to NATO military operations. All military shipping remains under national control. However, nations with surplus shipping may offer these assets for use by other nations. AMCC may also request nations to identify available surplus shipping capacity for co-operative or shared use. The transfer of ammunition and explosives at sea presents problems not met by pier-side or anchorage operations. Normally, replenishment at sea involves the transfer of fuel, supplies, stores, and ammunition simultaneously. Preplanning, ordnance training, and carefully handling ordnance prevent accidents caused by explosives. Hazardous cargoes may be carried provided that the following regulations are applied:

- International Maritime Dangerous Goods Code regulations (IMDG Code), or national regulations if more restrictive,

- NATO publication: STANAG 4441. Manual of NATO safety principles for the transport of military ammunition and explosives,
- specific dispensation granted by the Designated Operating Authority (DOA) from IMDG regulations for operational reasons, e.g. the carriage of nuclear waste.

4. LOGISTIC SUPPORT VESSELS (LVS)

After the end of the "cold war", the NATO has been transforming their roles. Monitoring and storage of oceanic routes were replaced by homework activities in coastal seas. As an integral part of the action in the operations in coastal waters is logistical support forces based ships and on land. It soon turned out that the implementation of such operations more difficult than expected. The main problem of the logistical support to forces in proportion increases with the distance of the units from their home base. In the areas of multinational operations, logistical support forces, theoretically, should be easy because each state should include their logistics ships which conveying military material from local bases to the battlefield. The problem is that in many parts of the world there is no adequate basis or the states in which they are, for political reasons, do not want to give to the use (case; bases in Turkey during the U.S. invasion of Iraq). An additional problem is that the bases vulnerable to terrorist attacks (cases; in Aden in Yemen and Aqaba in Jordan). The Logistics Support Vessels (LSVs) are the Army's largest powered watercraft. They are designed to carry up cargo from strategic sealift ships to shore during operations. The vessels are critical force projection enablers in that they primarily used in intratheater contingency operations and can "beach" themselves on shore to drop off cargo. The LSVs provide worldwide transport of general and vehicular cargo. LSVs missions include intratheater line-haul in support of unit deployment or relocation; tactical and sustained resupply to remote, undeveloped areas along coastlines and on Industrial Waste Water Services (IWWs); and support to the discharge and backload of ships in RORO or Logistics Over the Shore (LOTS) operations.

Figure 5. The logistic support vessel Gen. Frank S. Besson

Logistic vessels may be described as the work horses of the fleet, providing the invaluable support needed to maintain operations and deployments. Longer retention of naval forces in the particular field in which there are no adequate naval supply base, requires the use of special supply ships (fuel, ammunition, explosives and other military material) on the high seas. Using such "transhipment" ships that significantly extend the autonomy of other ships is not new. Transhipping is quicker and more efficient than direct shipping. Even during the Napoleonic Wars, the British Navy was using "transhipment" ships that supplied his ships which had been sealed off French ports. Transhipment ships remained in use until the late 20th century as an important component of the forces deployed in the ocean expanses. The primary role of these transhipment supply ship is a supply of other warships diesel fuel and other essential materials. Except fluids transhipment these ships deliver ammunition, food, and various types of explosives. In order to facilitate the work of transhipment solid materials, these materials are increasingly being packaged in special containers or pallets. Transhipment of liquid is possible only when both ships sail in a parallel course at the same speed in a relatively short distance. Transhipment is usually done up to sea state 4. It is possible at higher sea states, but it is not practiced because of the increased risk of collision. If the fuel supply is necessary reloading can be done over the stern (bow) up to sea state 7. In this case it is possible the simultaneous supply of only one ship. Most modern logistics warships have much greater autonomy and cruising speed 18-20 knots to keep track of other warships. Consequently the most modern logistics warships have specially adapted parts of the ship to accommodate In most modern "reload" ships have large landing deck on the stern in order to accommodate the largest helicopters and hangars for their enduring acceptance. Modern logistics warships must be able to suply multiple concurrent ships with a capacity of 600 m^3 of fluid per hour through the system for handling liquids (Replenishment at sea-RAS) at speeds of 12 to 14 knots.

Figure 6. Modern logistic support ship

Typical modern logistical warships Royal Netherlands Navy Amsterdam, French Navy Durance and Italian Navy Etna have the latest communication equipment. During the construction and use of logistics warships ever present awareness of the need to protect human life and the environment. A small part of the ship are complies with international regulations. For many such ships ports have restrictions on entering.

5. AMPHIBIOUS SHIPS

Amphibious operations, which are so much a feature of modern war, came fully of age only when suitable craft from which to launch seaborne assaults had been built. The design for larger landing ships was spurred by the need to transport and land large mechanized forces in the European theater. The role of the most modern warships in the 21st Century will not seem the most modern destroyers and cruisers or super modern submarines. That role will be assumed multipurpose amphibious warfare ships, able to the "hot" fields around the world quickly and successfully delivered airborne troops, combat helicopters, tanks, artillery, ammunition, fuel, explosives, food, and disposing of large interoperable communications solution Command, Control, Communication, Computer, and Intelligence Simulator system-(C4IS) capabilities. An amphibious warfare ship (or amphib) is a warship employed to land and support ground forces, such as marines, on enemy territory during an amphibious assault. The largest fleet of these types is operated by the United States Navy. Amphibious warfare ships are uniquely designed to support assault from the sea against defended positions ashore. They include several types of vessels designed to execute specific missions during amphibious operations-many developed during during World War II for use in the island campaigns in the Pacific Ocean and the invasions in Europe.

Figure 7. Amphibious war ship

5.1. Amphibious Transport Dock Ships

An amphibious transport dock, also called a landing platform/dock (LPD), is an amphibious warfare ship, a warship that embarks, transports, and lands elements of a landing force for expeditionary warfare missions. Amphibious transport docks are a combination of amphibious transports, amphibious cargo ships and the older dock landing ships. Their task is to transport and land troops for amphibious operations. Several navies currently operate this kind of ship. The ships are generally designed to transport troops into a war zone by sea, primarily using landing craft, although invariably they also have the capability to operate transport helicopters. Amphibious transport docks perform the mission of amphibious transports, amphibious cargo ships, and the older LPDs by incorporating both a flight deck and a well deck that can be ballasted and deballasted to support landing craft or amphibious vehicles.

Figure 8. USS San Antonio (LPD-17) and USS New York (LPD-21)

Amphibious transport docks play a critical role in helping the NATO military transport soldiers into combat zones. Navies in the U.S., England, France, Italy operate amphibious transport docks. The ships' main role is to transport and insert troops and materials into a war zone by sea. The ships typically land on shore in a combat area and soldiers disembark from a landing dock or ramp. However, most amphibious transport docks carry helicopters and troops can also be inserted into a war zone by air. The U.S. Navy has adopted San Antonio class ships as its primary amphibious transport docks. The ships have large cargo areas and can carry more than 600 soldiers and 14 expeditionary fighting vehicles at a time.

Figure 9. The well deck of the San Antonio

LPD ships are used to transport and land Marines, their equipment and supplies by embarked Landing Craft Air Cushion (LCAC) or conventional landing craft and Expeditionary Fighting Vehicles (EFV) or Amphibious Assault Vehicles (AAV) augmented by helicopters or vertical take off and landing aircraft (MV22). These ships support amphibious assault, special operations or expeditionary warfare missions and can serve as secondary aviation platforms for amphibious ready groups. The largest fleet of these vessel is operated by the United States Navy.

6. CONCLUSIONS

Efficient and timely movement of forces, including the deployment, staging and onward movement of large amounts of material and equipment, is a prerequisite for all military operations. NATO must be able to ensure the strategic mobility of troops and materiel by providing adequate lift, transportation facilities, equipment and infrastructure. Military ammunition and explosives are robustly designed for rough handling under wartime conditions and for storage for long periods of time. Sea transport of ammunition and explosives or hazardous material should be limited to absolute necessity. It should be planned, prepared, and carried out with care. Route, and time of ammunition and explosives transport should be selected so as to keep risk to an acceptable level. The following factors should be taken into account: operational requirements, public safety, security, efficiency, the condition of the ammunition, the time available, and environmental protection. The deploying unit is responsible for the completion of document certifications of ammunition, explosives, and other hazard material for movement by cargo vessel. Some NATO countries may not have regulations for the transport of military ammunition and explosives in sea transport. Other countries may have more stringent regulations to be observed by visiting forces. Military explosives should be stowed in a cool location. The best place is in a lower tween-deck hold or lower hold. Personnel should use the same priorities for selecting locations as those used for magazines.

REFERENCES

1.NATO Publications, "Allied ammunition storage and transport" (AASTP-1 to 5), Manual of NATO safety principles for the storage of military ammunition and explosives, Brussels, May 2010.

2.NATO Publications, "Allied joint movement and transportation" (AJP-4.4(A)), Brussels, December 2005.

3.NATO Logistics Handbook, Brussels 2011.

4.http://www.navy.gov.au/

5.http://en.wikipedia.org

6.http://www.naval-technology.com

7.www.hrvatski-vojnik.hr/

8.http://www.seatransport.com

9.http://www.globalsecurity.org

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SPECIFIC REQUIREMENTS FOR AUTOMATED IDENTIFICATION SYSTEM ON NATO VESSELS

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ABSTRACT

The aim of this paper is to inform on the specific requirements of the Automatic Identification System (AIS) on NATO warships. SOLAS regulations are not mandatory for warships, however many NATO nations voluntarily adopt SOLAS regulations as a means to enhance maritime safety by fitting AIS capable systems aboard their Naval and Coast Guard units. In 2000, the International Maritime Organization (IMO) introduced changes to the SOLAS (Safety of Life at Sea) Convention and fitting of the Automatic Identification System (AIS) is now required for commercial ships. The performance standards for AIS were adopted in 1998. This regulation requires that AIS shall: a) provide information, including the ship's identity, type, position, course, speed, navigational status and other safety-related information, automatically to appropriately equipped shore stations, other ships and aircraft; b) receive automatically such information from similarly fitted ships to monitor and track ships; c) Exchange data with shore-based facilities. AIS proved to be useful for maritime operations. However, at the same time Operational Security (OPSEC) and tactics may preclude the use of AIS. Therefore, specific requirements for implementing AIS on Warships must be taken into account. Participating Nations agree to implement AIS carriage requirements on their Warships in accordance with SOLAS chapter V Regulation 19. There are specific military requirements for implementing civilian AIS on Warships that defined by NATO STANAG 4669 which are not to be confused with Warship AIS (W-AIS, NATO STANAG 4668).

KEY WORDS
AIS, SOLAS, NATO warships, OPSEC, Navy, Coast Guard, W-AIS, STANAG 4669

1. INTRODUCTION

The Republic of Croatia is a seacoast country with a long coastline on the Adriatic Sea and since Croatia became a NATO Member Nation in 2010, the Croatian Navy's task range has broadened from its traditional duties of protecting the country sovereignty and defending its borders at sea to include her Coast Guard component with non-traditional naval peacetime duties. As a NATO Member Nation, the Republic of Croatia has implemented AIS on her warships and on Coast Guard vessels following NATO standards and guidelines. The Croatian Coast Guard has developed and executes tasks such as war against terrorism, trafficking people, smuggling contraband, goods and weapons, prevention of ecological disasters, search and rescue, securing sea routes and preventing illegal fishing. For the traditional warship fleet, much simply, commercial AIS on warships is used in different modes of operation that will not compromise Operational Security

(OPSEC) in military operations. To complete these tasks, AIS plays a major role in data communications that support the tasks of NATO member nation vessels. Even though IMO does not require warships to be equipped with AIS, Croatian Coast Guard vessels use AIS as common ships to and its AIS data to provides its whereabouts to VTS and naval coastal surveillance stations. The W-AIS version runs in passive mode to satisfy operational security requirements of a warship. The aim of this paper is to present the application of AIS technology during official duties of NATO vessels.

2. SOLAS CHAPTER 5 - SAFETY OF NAVIGATION

The Automatic Information System is a network of transponders that the
International Maritime Organization's (IMO) International Convention for the
Safety of Life at Sea (SOLAS) requires onboard ships with a gross tonnage (GT)
of 300 or more tons and all passenger ships with a gross tonnage (GT) of 300 or more tons and all passenger ships [12]. Regulations Title 70 Part 80.5 provides the official definition of AIS as: A maritime navigation safety communications system standardized by the International Telecommunication Union (ITU) and adopted by the International Maritime Organization (IMO) that provides vessel information, including the vessel's identity, type, position, course, speed, navigational status and other safety-related information automatically to appropriately equipped shore stations, other ships, and aircraft; receives automatically such information from similarly fitted ships; monitors and tracks ships; and exchanges data with shore-based facilities. [13] These transponders mainly operate within the VHF band and are restricted to Line-of-Sight (LOS) transmission.
Unless expressly provided otherwise, SOLAS Chapter 5 - Safety of Navigation - applies to all ships on all voyages, except warships, naval auxiliaries and other ships owned or operated and used only on government non-commercial service, however, warships, naval auxiliaries or other ships owned or operated by and used only on government non-commercial service are encouraged to act in a manner consistent, so far as reasonable and practicable.

2.1 Maritime Policy for the European Union

One of the elements of the integrated Maritime Policy for the European Union1 is enhanced interoperability and integration between existing maritime surveillance and monitoring systems, across the different maritime sectors. One of the individual systems include AIS. National and regional sharing of AIS data has widely developed, and Europe-wide sharing of vessel traffic data is progressing under SafeSeaNet based on the Community vessel traffic monitoring and information system directive of 2002. The EU regulation requires AIS carriage by ship of 300 GT and up, except for warships and state-operated vessels in public service.

2.2 Regional AIS networks in the Mediterranean Area

Many national authorities have recognized the value of combining the data of all local AIS receiving stations on their coast into a centralized national network. Moreover, in several regions, neighboring countries are collaborating to maintain a regional AIS network, in which the AIS data are in real time combined. This is the case for the Baltic Sea where the regional network is managed by HELCOM and for the North Sea where the network is managed by the North Sea Safety at Sea Working Group. There is a similar initiative in the Mediterranean whereby 10 Member States (Portugal, Spain, France, Slovenia, Italy, Malta, Greece, Cyprus, Bulgaria and Romania) work together, led by EMSA, set up a common AIS Mediterranean network by 2008. Finally, there are a number of military initiatives for AIS networks, mostly in the state of being built up. NATO operates MSSIS (Maritime Safety & Security Information System); the Italian Navy hosts the Regional Virtual Maritime Traffic Centre (V-RMTC, which integrates vessel traffic data, including AIS data, of various countries) that covers the Mediterranean; and the Turkish Defence manage the Black Sea Harmony network.

2.3 AIS coastal stations in the Republic of Croatia

The supply of equipment for the implementation of the Automated Identification of Ships (AIS) System in Croatia (EuropeAid/123414/D/SUP/HR) started in May 2008. The adoption of new Technical Rules which specified the obligations to implement AIS transponders on passenger and cargo ships in domestic trade of 300 gross tonnage and upwards and the new Technical Rules will apply to new ships upon their entering into force, whereas existing ships must be in compliance by the date of accession of the Republic of Croatia to the European Union at the latest. For the purpose of this project it is considered that the AIS subsystem as a part of future VTMIS is completed with AIS Main Control Centre in Rijeka MRCC and 17 AIS shore-based base stations.

3. IMO GUIDELINES FOR THE INSTALLATION OF A SHIPBORNE AUTOMATIC IDENTIFICATION SYSTEM (AIS)

The Sub-Committee on Safety of Navigation (NAV), at its forty-eighth session (2002), agreed on guidelines for the installation of a shipborne Automatic Identification System (AIS)2 and also agreed that they should be issued for use on a voluntary basis. The Guidelines describe the shipborne AIS installation matters and are meant to be used by manufacturers, installers and surveyors to ensure good installation practices.

3.1 Technical Specifications for AIS operation

The Maritime Safety Committee (MSC), at its seventy-sixth session (2002.), agreed with the Sub-Committee's views, approved the Guidelines as set out at annex and encouraged their use for AIS installation purposes. Member Governments were requested to bring the annexed guidelines to the attention of all concerned. The guidelines outline general survey and documentation of the project and covers:

- AIS installation regarding interference to the ship's VHF
- radiotelephone, VHF antenna installation, GNSS antenna installation, power source and synchronization.
- A recommended bridge arrangement3 for minimum keyboard and display, pilot plug, display system, installation of the BIT (Built-in Integrity Test) function.
- Dynamic data input from external sensors for position, COG and SOG, heading, rate of turn, and navigational status.
- Static Information that is entered at initial installation of AIS, a reference point of position on the ship and ship's dimensions.
- The AIS long-range function needs a compatible long-range communication system (e.g. Inmarsat-C or MF/HF radio as part of the GMDSS). If available, a connection between that communication system and the Class A mobile unit can be made. This connection is needed to activate the LR function of AIS. Its input/output port should meet the requirement of IEC 61162-2.
- Annex 1 Rate of Turn
- Annex 2 Type of ship table
- Annex 3 Recommended IEC 61162 sentences

4. AIS OPERATION ON VESSELS

AIS is a shipboard broadcast system, operating in the VHF maritime band, that is capable of sending ship information such as identification, position, course, speed, length, draught, ship type and cargo information, to other ships, aircraft and ashore. Ships reporting by AIS offer a large improvement in the quality, prominence and proximity of shipping traffic information, ensuring quicker response to emergencies, search and rescue incidents and environmental pollution4.

4.1 Benefits of AIS

- Better control and responsiveness in the event of marine incidents, SAR and marine pollution; with all ships (and SAR assets, including aircraft) fitted with AIS, on-scene co-ordination should be simpler and more efficient
- More accurate and efficient monitoring of the movements of ships and hazardous cargoes
- Provision of advance information on ships and their cargoes
- Facilitate enhanced navigational assistance including calculating the warship's squat and its prediction using AIS

- Contribute to the protection of the marine environment

4.2 Limitations of AIS

The AIS is a system with tremendous potential. Its characteristics and capability will make it an outstanding new tool for enhancing the safety of navigation and the efficiency of shipping traffic management. Specifically, the stability and accuracy of AIS tracking, its clear advantage over radar, and its ability to automatically exchange large blocks of information at high data rates, will bring about a quantum improvement in the efficiency of ship reporting systems. However, it is not a perfect system. Its success depends on 'cooperative' targets - that is, those that have the equipment fitted, serviceable, and most importantly, switched on. This will therefore exclude vessels not willing to participate (some military and 'hostile' vessels, for example), potentially creating serious implications for maritime security. Further, there is the very real possibility that thousands of small craft (including fishing vessels) will be excluded, many of which will be unlikely to afford the price of a current-generation device.

5. REAL TIME NAVIGATION AID: PREDICTING SQUAT USING AIS DATA

There are various methods of calculating ship's squat for predicting the danger of grounding. There are empirical formulas, technologies and various methods and their suitability for different types of ships and waterways5. Vessel Traffic Systems (VTS) services have detailed information regarding the waterways within their area of jurisdiction, and all static and dynamic ship data are available using the AIS system, therefore the possibility of integrating empirical formulas, the necessary ship's data retrieved from AIS system, and vector electronic charts can be used to predict "squat." The VTS services can approximately determine the squat of the ship underway, and predict imminent danger of grounding due to reducing under keel clearance below the critical value, best of all, calculations and conditions are proposed for predicting and alarming the critical under keel clearance in real time.

5.1 Vessel Traffic Systems and AIS

With technology today, we can say there is a wide range of construction of ships for different purposes. Ships are being built in dimensions that were not imaginable in the past. Ports and terminals worldwide often difficulty follow the trend of building larger ships, and because of the ports and terminals limitations, mostly in depth and width of waterways and berths, they cannot accommodate these larger ships. To lessen this problem, port approaches are being dredged and reorganized to receive ships that may have small under keel clearance (UKC). During the navigation in restricted waterways, ships are at risk of grounding due to small UKC or the "squat" effect. The squat effect can be calculated and predicted, but in practice it is unfortunately often omitted or miscalculated.
With the VTS (Vessel Traffic System) development in coastal nations, the safety at sea level is increasing. The combination of electronic charts, radar, automatic identification system (AIS), cameras and other systems and sensors, offers VTS to monitor and assist in controlling maritime traffic from shore. One of the new directions in data processing and organizational support development in VTS service is predicting dangerous situations at sea and warning traffic participants before the onset of such critical situations.
Methods for squat calculation and under keel clearance of the vessel can be done in real time using existing VTS services with AIS is a primary source of ship data. This integration would predict the occurrence of the squat effect of minimum allowed under keel clearance and appearance of grounding danger. VTS service would predict the squat automatically without additional communication or burden to the operators.

5.2 Predicting Squat Using AIS Data

The ship's data, received in VTS service via AIS, can be used for many purposes other than identification and traffic surveillance, such as broad analysis of maritime traffic and prediction of dangerous situations at sea. Such AIS data processes improve daily work of VTS centre and increase safety at sea in general6.
Squat can be defined as the ship's vertical drop in the water as it moves through the water.

While underway, a ship induces an accelerated flow of water along the hull and below the keel, causing a change in hydrodynamic pressure around the hull of the ship and, finally, the appearance of additional vertical drop. During navigation in open unrestricted waters, squat takes a very small value and can be ignored, but in navigation in littoral, shallow waters or canals, where the free flow of water beneath the hull is limited, squat value can be considerably important, in some cases only meters. The biggest danger with the squat phenomenon in shallow waters is stranding of the ship, which can lead to a number of other emergencies such as damage and breach of the hull, cargo damage, pollution and injuries7.

Squat appears when entering shallow waters or canals, where conditions for the squat effect is created and may be recognized in part by certain generally acceptable signs in seafaring. These signs are wave increase in the bow, steering difficulties, propeller rotation reduction, speed reduction, squat change, ship vibration and muddy water in the ship's wake.

5.3 Predicting squat using AIS data

Online analyses are used for real time situation and vessels' movement surveillance in the jurisdiction area. One of the goals is to make VTS service able to predict potentially dangerous situations and to warn the endangered ship or ships in time to prevent a marine accident. Squat prediction using AIS data belongs to a group of online analyses8 which deals with data in real time.

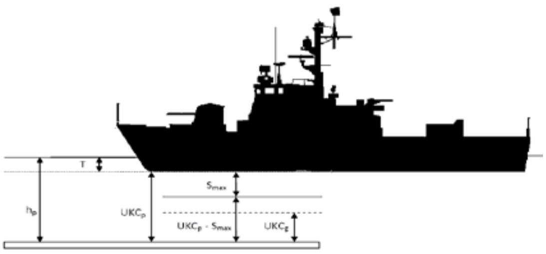

Figure 1. Display of subsea values for squat and UKC analysis.

AIS data can be used for an analysis of maritime traffic density, collision or impact hazard (Near miss analysis), passage line statistic; history tracks, separation scheme control, anchor position supervision, etc.

The second type are offline analysis, used for the processing of archived AIS ship data for the selected past time period, used mostly for the production of various daily, monthly and annual statistical reports.

By implementing VTS real time analysis of ship squat, it is intended to monitor and predict squat, the primary goal being the prevention of grounding. The method can be performed by integrating computer algorithms, well-known squat empirical formulas, a set of criteria, vector electronic charts and AIS ship data, calculating the current and future squat value and respective under keel clearance.

The ship's AIS transmits a series of data, which are divided into three categories: static, dynamic, and information about voyage and cargo. Static data are entered when installing the device and do not change during normal ship operation. They include basic information such as the ship's name, call sign, type, dimensions, etc. Dynamic or navigational data, such as speed, rate of turn or course, are variable in time and are automatically updated by ship's other equipment (GPS, Gyro). The voyage and cargo information is manually entered before and during the voyage, and includes squat, navigation status, dangerous cargo categories, time and port of arrival, etc.

VTS receives the necessary waterway data within the VTS jurisdiction, such as depth, underwater cross section and width provided by hydrographic institutes and vector electronic charts which include vector data of the seabed and depths (International Hydrographic Organization – IHO, standard S-57). With the help of computers, depth information can be corrected for tide oscillations in real-time. If additional equipment is available, like oceanographic buoys, salinity and wave heights can be taken into account as well.

Software integrates the necessary data from the vector electronic charts and AIS with selected methods for squat and UKC calculation. The software calculates and displays the current and predicted (simulated) conditions of the ship during passage in restrictive waterways. Ship speed and depth/draft ratio would be basic starting conditions for squat calculation because squat is primarily caused by the movement of the ship through water and grows approximately proportional to the square of ship speed.

The values from the ship's AIS data is updated with each received AIS message. Limiting values are determined by VTS service. After meeting the basic criteria, VTS service has to continue to monitor the ship, and predict the possible critical situation in shallow waters with the help of computers. To make this possible it is necessary to determine the criteria for calculating the minimum under keel clearance – UKC, taking into account the squat effect (Figure 1). In the case of exceeding the limit values, i.e. the value of minimum allowable UKC, it is required to trigger the alarm function (P) for the VTS shore operator.
The alarm activation (P) indicates to VTS operators that the ship exceeded the minimum allowable UKC. Therefore, their duty should be to promptly notify ship about the situation and advise on further action, such as reducing ship speed or turning the ship towards deeper waters if possible.
Given that a current position, velocity, rate of turn and course of the ship are known from AIS, it is possible to simulate and predict the future ship position to a certain degree. Logically, the further in time the position is simulated, the less credible it is. By simulating the position n minutes in future, it is possible to predict the under keel clearance UKCpn and depth hpn for the ship's future position at the n-th minute. In the same way a maximum squat Smax n is calculated.
Alarm activation (Pn) for the future critical UKC facilitates the VTS operator to predict a dangerous situation in time, and it gives more time to alert the officer of the watch before the potential grounding occurs. For example, predicting the ship future position may be determined for n=2, 4 and 6 minutes. The lack of simulations of the ship's future state is the poor possibility to predict the ship's turn, which can be partly predicted using the ship's rate of turn. Although Rate of Turn is an enterable field of the AIS data, it is often not entered, which defeats the aim of introducing the UKC critical alarm to draw attention of the VTS operator in case of potential grounding danger. The ship is required to confirm this warning, however, this action does not reduce the duty officer's responsibility for the ship's safety.
By predicting squat and under keel clearance using AIS data, VTS, reduces the risk of grounding of the ship and reduces the risk of major damage, pollution or injury.

6. NATO STANDARDIZATION AGREEMENT REGARDING AIS ON WARSHIPS

NATO standardization agreements (STANAG) documents set technical standards for NATO Member Nations. The STANAG-s that cover implementing AIS on NATO warships are:

- STANAG 4564 Standard on Warship Electronic Chart Display and Information Systems (WECDIS)
- STANAG 4668 – Warship – Automatic Identification System (W-AIS)
- STANAG 4669 - Automatic Identification System (AIS) on Warships

The aim of STANAG 4669 is to define the implementation of the Automatic Identification System (AIS) on NATO Warships. STANAG 46699 should not be confused with STANAG 4668 that defines the use of Warship-AIS, which is a military application of using AIS architecture which does not compromise the warship's Operational Security (OPSEC) in military operations.

6.1 Agreement to carry AIS

Participating Nations that agree to implement AIS carriage requirements on their warships do so according to SOLAS Chapter V., Regulation 19. Specific military requirements for implementing AIS on NATO warships are described in STANAG 4669.
The STANAG is implemented when the necessary orders/instructions have been issued to the NATO forces concerned.

6.2 Specific Requirements for Implementing AIS on Warships

In 2000, the International Maritime Organization (IMO) introduced changes brought by th IMO Maritime Safety Committee to revise of SOLAS Chapter V., Regulation 19., to the SOLAS (Safety of Life at Sea) Convention and fitting of the Automatic Identification System (AIS) required for commercial ships.

6.3 Performance Standards

The performance standards for AIS were adopted in 1998. This regulation requires that AIS shall:

a. Provide information – including the ship's identity, type, position, course, speed, navigational status and other safety-related information – automatically to appropriately equipped shore stations, other ships and aircraft;
b. Receive automatically such information from similarly fitted ships to monitor and track ships;
c. Exchange data with shore-based facilities.

6.4 Operational Use

SOLAS regulations are not mandatory for warships, however many NATO nations voluntarily adopt SOLAS regulations as a means to enhance maritime safety by fitting AIS capable systems aboard their Naval and Coast Guard units.
AIS proved to be useful for maritime operations. However, at the same time Operational Security (OPSEC) and tactics may preclude the use of AIS. Therefore, specific requirements for implementing AIS on Warships must be taken into account.

6.5 Military Requirements For Implementing Ais On Warships

Commercial AIS on Warships shall have the following modes of operation:
a. Active: The Commercial AIS on Warships will operate as any civilian AIS, i.e. it will transmit and receive information.
b. Passive: The Commercial AIS on Warships will receive information without any transmission. When operating in the passive mode, the AIS shall not transmit and it shall not be possible for a second party to discover that the warships' AIS is operating in a receive mode only. This means that the AIS shall not synchronize with other AIS stations in order to get assigned time slots for transmission. The Passive mode of operation is also sometimes
called the "Silent Mode" of operation.
c. Off: The Commercial AIS is switched off (not energized).

6.6. Standardization

The AIS shall be fully Compliant with the IMO, the International Electro-technical Commission (IEC) and the International Telecommunication Union (ITU) specifications for Universal Automatic Identification System (IMO MSC 69(74) – Annex 3, ITU-R M.1371, IEC61993, IEC60945, etc).
The AIS shall provide a standard interface with AIS information in the format of NMEA 0183/2000®/IEC 61162-3 Standard (National Marine Electronics Association 0183/2000®/International Electro-technical Commission 61162-3) when providing AIS data for distribution on a ship.

7. USE OF AIS ON NATO WARSHIPS

AIS Class A is a requirement for ships over 300 gross tons, however military vessels are exempt. Military vessels use the AIS system but the have the option to turn it off during combat and covert operations to hide their positions. Generally, military vessels would not advertise their position willingly, with the probable exception of entering or exiting civilian ports, where they turn over piloting to the local authorities. Once they pass the last harbor buoy and the pilot leaves the ship, they are a warship on official business.

7.1 Using AIS while under way

It is possible to use this system for deception as well. NATO vessels are usually equipped with an AIS device, complying to NATO STANAG 4669 but these AIS devices also come with a transmit inhibit, i.e., will receive information without any transmission when operating in passive mode, thereby AIS shall not transmit and it shall not be possible for a second party to discover that the warships' AIS is operating in a receive mode only, by disabling transmission of information but keeping the receiver running. Some navies also use W-AIS equipment, complying to NATO STANAG 4668, which include "spoofing" and covert options and secure layers of AIS communication.

7.2. AIS during official duty

AIS integrated in a warship's Maritime Surveillance system acts in detection to a suspicious vessel's behavior, such as subversive activities, piracy, smuggling or illegal immigration. It also provides support for search-and-rescue operations, disaster-relief and environmental-protection operations. Most large military vessels have AIS that have normal mode, silent mode (listen only), and secure

mode. Secure mode transmits the position and ship identification information over AIS message 8 with an encrypted payload. These are referred to as "blue force" units. In the US they are a part of the Hawkeye "Blue Force" system.
For the US Navy's "Blue Force" transmissions, they are done with type 8 messages, DAC 366, and FIDs 56 (256 bytes) and 57 (512 bytes). These are sent not only by military vessels, but also Homeland Security (USCG) and other law enforcement vessels.
From observations around UK, most warships, when active in home waters, are using AIS openly, but often with the vessel's identity reduced to "NATO warship" or similar. Most likely it helps the civilian navigator to make sensible decisions in crowded seas.

7.3. Operational specifications of Warship AIS (W-AIS) ON NATO VESSELS

NATO STANAG 4668 specifies Warship-AIS, is the type of AIS system which is adapted to warships. W-AIS system operates within the criteria ""Resolution MSC.74 Annex-3 Recommendation on Performance Standards for a Universal Shipborne Automatic Identification System (AIS)" issued by IMO (International Maritime Organization).

7.4. W-AIS spoofing mode

NATO STANAG 4668 specified Warship-AIS consists of modules for presenting AIS information on electronic maps and for "spoofing" own position on present AIS networks10.
The purpose of this module is to distort the ship's real position on the AIS network. The AIS „spoofing module" simulates GPS and gyro signals to the on board AIS unit. One can choose between three different modes of operation:

- OFFSET: The GPS position is given an offset before it is sent to the AIS unit (fixed or varying offset)
- DELAYED: A position from the position history log and the current time, is sent to the AIS unit.
- PRE-PLANNED ROUTE: Interpolated positions from a pre-planned route sent to the AIS unit.

The AIS spoofing module is typically installed on a regular PC running Windows 2000/XP while the VHF, GPS, Gyro and AIS are connected through standard RS232 or RS422 ports.

8. CONCLUSION

As a seacoast country and a NATO Member Nation in 2010, the Croatian Navy's task range has widened not only to cover its traditional duties but additionally to execute non-traditional naval peacetime duties. Even though IMO does not require warships to be equipped with AIS, AIS technology plays a major role in data communications that support official tasks of NATO vessels.
Implementing AIS accordingly to NATO standards on her naval warships and Coast Guard vessels, Croatia executes tasks such as war against terrorism, trafficking people, smuggling contraband, goods and weapons, prevention of ecological disasters, search and rescue, securing sea routes and preventing illegal fishing, but during military operations, commercial AIS on warships is used in different modes of operation that will not compromise Operational Security (OPSEC) in military operations.
Acknowledgments
Figure 1. Original artwork: Zoran Škrlec.

REFERENCES

1."Integrated Maritime Policy for the EU, Working Document on Maritime Surveillance Systems," European Commission/Joint Research Centre Ispra, Italy, 14 June 2008.

2.Guidelines For The Installation of o Shipborne Automatic Identification System (AIS), International Maritime Organization (IMO), Ref. T2/8.02 SN/Circ.227, 6 January 2003.

3.Resolution MSC.64(67), Annex 1 - Performance Standard for Integrated Bridge Systems.

4."Ship Reporting By AIS," Clive Davidson, Australian Maritime Safety Authority, IMO/IALA Seminar on AIS, IMO Headquarters, London, 15 & 16 July 2002.

5."Methods of calculating the ship's squat and its prediction using AIS in VTS, Scientific Journal of Maritime Research," 24/2(2010), str./pp. 229-246

6.Assistance with the implementation of an under keel clearance system for Torres Strait, North Sydney, Thompson Clarke Shipping, 2007. At the risk of draft danger can indicate the following list of known groundings due to this effect in the last 10 years: Riverdance, Ro-Ro ship, Blackpool, 2008.; LT Cortesia, container ship, Dover, 2008.; Emsland, general cargo, Montrose, 2006; Desh Rakshak, tanker, Melbourne, 2006.; Kentucky Highway, Ro-Ro ship, Parana River, 2005.; Eastern Honour, tanker, Marsden Point, New Zealand, 2003.; Don Raul, bulk carrier, Pulluche Canal, 2001.

7.Briggs, M. J., et al., Charleston Harbor Ship Motion Data Collection and Squat Analysis, Vicksburg, US Army Engineer Research and Development Center, 2004.

8.Dand, I. W., et al., "Squat Interaction Maneuvering," London, The Nautical Institute, 1995.

9.NATO/PFP Unclassified Document NATO Standardization Agreement (STANAG) 4669, edition 2, "Automatic Identification System (AIS) on Warships," Edition 2

10.Teleplan Globe AS, Norway, 11.www.teleplanglobe.no

12.Wikipedia, "Automatic Identification System," July 2009, http://en.wikipedia.org/wiki/Automatic_Identification_System (accessed September 2009).

13.U.S. Government Printing Office. (October 2009). US Code of Federal

Regulations Title 27 Part 80.5: Definitions. http://edocket.access.gpo.gov/cfr_2002/octqtr/pdf/47cfr80.5.pdf (accessed September 2009).

BIOGRAPHIES

Zoran Škrlec, a native of Zadar, was raised in the United States where he completed his elementary and technical education. He worked in Houston in Information Technology where he acquired valuable professional and technical skillsets. He relocated to Split in 1997, where he received his Masters of Engineering in Maritime Management from the Faculty of Maritime Studies in Split and currently works as a civilian IT analyst for the Croatian Navy. His maritime hobbies include crewman on both navy rowing cutters and sailboat regattas.

PORT SERVICE QUALITY INDICATORS – THE PASSENGER PERSPECTIVE

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ABSTRACT

Quality indicators are difficult to define and evaluate because of the nature and subjectivity of the quality. Furthermore, all indicators don't have the same importance and relevance to different users (passengers, port operators, port authority, etc.) and each user includes and evaluates each indicator in different way; different authors in their research determined a large number of service quality indicators. Main 'task' of every passenger port/terminal is to provide a satisfying level of services to passengers at a reasonable price, the quality of the passenger transport services depends on the satisfaction of passenger (customer) needs. Every passenger is different and therefore has different demands. The main aim of this paper is to explore the types of the services provided in the port for passengers using coastal shipping and quality of the passenger transport services in the port with special emphasis on the Croatian (public) passenger ports.

KEY WORDS
quality indicator, port service, passenger, coastal shipping

1. INTRODUCTION

According to the organizational aspect of business operations in sea ports, passenger ports can be designed for (i) liner passenger traffic, (ii) cruise traffic and (ii) nautical traffic. According to the organizational aspect, characteristics and types of ships these ports are equipped with necessary infrastructure and superstructure to provide services needed and expected by the passenger. In this paper main focus will be on the services provided in the liner passenger ports and the passenger perspective.
The first part of the paper gives an introduction to quality, importance of quality, description of most frequently used quality models, and the overview of quality indicators identified in studies and project analysed through literature review. The second part of the paper describes port and the specific characteristics of passenger ports, giving the emphasis on liner passenger ports. Then, to help to further identify quality indicators the list of port operation that can affect the overall passenger perception is analysed through literature review. In the following chapter, before conclusion, it is given a short overview on organisation of coastal liner shipping in Croatia and the importance of qualitative transport links with the islands.

2. QUALITY INDICATORS

There are different models to measure service quality. One of the frequently used is the model SERVQUAL (SERVices QUALity Model), constructed by Parasuraman, Zeithmal and Berry in 1985[1] which defined 10 basic dimensions of service quality: reliability, responsiveness, competence, access, courtesy, communication, credibility, security, understanding the customer and tangibles. In 1988 authors[2] have concluded that the model can be simplified by reducing the basic dimension to just five, this new scale in the literature is often referred as RATER scale using first letters of each dimension: reliability, assurance, tangibles, empathy, and responsiveness. SERVQUAL model defines difference between expected and participated service quality form the users point of view. The model was further refined by the authors in 1993[3] by brothering the concept enabling it to measure five dimension of service quality form the aspect of desired service, i.e. the level of service a customer believes can and should be delivered, and from the aspect of adequate service, i.e. the level of service the customer considers acceptable, and by adding the aspect of perceived values, i.e. the level of passenger expectations should be in the area from desired to adequate service. Another often used models that are based on analyzing the participated service, which are modified version of SERVQUAL model and mostly based on the elimination of the drawbacks of the this model, are models SERVPERF (SERvice PERFormance)[4] constructed by Cronin and Taylor and EP approach (Evaluated Performance) constructed by Teas.[5] In 1997 Philip and Hazlet[6] proposed the P-C-P model for measuring the service quality in a particular organization (as seen through the eyes of its customers), that takes the form of a hierarchical structure – based on three main classes of attributes – Pivotal, Core and Peripheral.

The issue of 'quality' gained importance in transport industry when it became evident that customer's perception of quality profoundly affects his behaviour and final decision regarding the selection of transport mode. The quality can be considered as the main factor of customer satisfaction and long-term competitive success of any port.[7] Quality of the service can be described as the requirements of users and their expectation.

The concept of service quality, its' measurement and improvement in maritime transport especially in ports is becoming more important and critical in achieving a differential advantage over competition. However, little literature directly addresses the dimensions or determinants of port service quality. Such dimensions or determinants are reflected only through the service factors in the selection criteria of transport elements, such as carriers or modes.[8]

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[1] Cf. 1) Parasuraman, A., Zeithaml, V., A., Berry, L.: Conceptual Model of Service Quality and Its Implications for Future Research, Journal of Marketing, Fall 1985, pp. 41-50

[2] Cf. Parasuraman, A., Zeithaml, V., A., Berry, L.: SERVQUAL: A Multiple-Item Scale for Measuring Customer Perceptions of Service Quality, Journal of Retailing, Spring 1988, pp. 12-40.

[3] Cf. Parasuraman A., Valarie A Zeithaml, Leonard L. Berry: Reassessment of expectations as a comparison tandard in measuring service quality: implications for futher research, Journal of Marketing, 58 (1994), 1, 99. 111 –124.

[4] 1) Cf. Cronin, J.J., Taylor, S.A.: Measuring service quality: a reexamination and extension‖, Journal of Marketing, Vol. 6 (July), 1992., pp. 55-68, and 2) Cf. Cronin, J.J., Taylor: SERVPERF versus SERVQUAL: reconciling performance-based and perception-minus-expectations measurement of service quality‖, Journal of Marketing, Vol. 58, br. 1, 1994., pp. 125-131.

[5] 1) Teas, K.R.: Expectations, performance evaluation, and consumers' perceptions of quality, Journal of Marketing, Vol. 57 (Octobar), 1993., pp. 18-34 and 2) Teas, K.R.: Consumer expectations and the measurement of perceived service quality, Journal of Professional Services Marketing, Vol. 8, No. 2, 1993., pp. 33-54.

[6] Philip, G., Hazlett, S.: The measurement of service quality: a new P-C-P attributes model, International Journal of Quality and Reliability Management, 14 (3), 1997, pp. 260–280

[7] Jolić, N., Kavran, Z., Lazibat, T.: Business excellence in the field of traffic and transport technology. Business Excellence, III, No 1, 2009, pp 131-144, p 138

[8] Cf. Thai, V., V.: Service Quality in maritime transport: conceptual model and empirical

Arabelin and Oral in their prestudy9 summarized the concept of service quality dimension by providing an overview of different methodologies used by different authors from 1978 until 2011 while identifying port service quality dimension in ports. In total 24 research papers were analyzed. This overview identified, as key quality port indicators due to their repetitiveness in different research papers, the following tangible quality indicators: infrastructure, availability of equipment and facilities, reliability of service performance like timeliness, accuracy, safety, and security, responsiveness and empathy, and lastly social responsibility. However it is important to state that most of these papers gave emphasis to cargo ports.
On the basis of existing studies (projects) dealing with the quality (IQ, ECMT, ISIC10) quality indicators that describes the service level of a terminal (i.e. customer requirements: types of services offered, expected service level, etc.) should cover the following quality dimensions: time (e.g., waiting time for trucks in terminal area); reliability (e.g., incidence of train delays in departure, duration of train delays); accessibility (e.g., opening times, loading closing times, rail accessibility time); flexibility (e.g., reaction to short term customer requirements); safety, security (e.g., % of cases with damage to goods, % of cases with loss of goods); service in general and frequency.
Quality can be perceived from different perspectives, from:11

- consumer (buyer or user) perspective as a level of embedded usage value of products or services to which it meets a specific need,
- manufacturer perspective is a measure that shows how a particular service is satisfactory in terms of design and delivery,
- market perspective is the degree to which a particular service meets specific customer in relation to equivalent service to the competition,
- society perspective is the degree to which certain services passed as buying and selling act and degree to which they have been confirmed as a commodity, and at the same time realizing, mandatory, profit.

Given the fact that the market, i.e. users define the quality of service it is necessary to anticipate their demands as the degree of satisfaction of these requirements has an impact on the approaching the service quality to their expectations.12 A demand of different port subjects differs. In this paper the focus will be given only to the demand of passengers who requires complete and qualitative service with minimum cost of service. Port services to a passenger are offered by different providers (port operators, shipping companies, public authorities etc), and the level of service that each provider provides to the passenger reflects to the overall satisfaction of the passenger with the port service.
For passenger (customer) quality of the service, in the first place, means getting adequate 'value for money'. The value can be expressed by many indicators of qualitative and quantitative nature. Given the fact that the importance of quality is rising regarding the demand and supply for port services, in order to establish a model of port service quality it is necessary to define qualitative indicators by which users can express how satisfied they are with the service value. Quality indicators of port services, their dimension, must cover the entire process of production and delivery of services to customers, with the most important can be distinguished: reliability, flexibility, availability,

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evidence, Asia Pacific Marketing and Logistics, Vol. 20, No. 4, 2007, pp 493 – 518, p 500

[9] Cf. Arabelen, G., Oral, E. Z.: Prestudy of port service quality dimensions: Port of Izmir as a case study, International conference 'Key developments in the port and maritime sector' WCTRS-SIG2, Antwerpen, Belgija, 21-22.05.2012., pp. 1-19.

[10] Martin ruesch, M., Abel, H., Karrer, R., Poersch, R., Fiedler, R., Reynaud, C., Vaghi, C., Siciliano, G.: Final Report Task D: Improving Quality of Intermodal Terminals. Project ISIC (Integrated Services in the Intermodal Chain), European Commission – DG TREN, 2005

[11] Lazibat, T.; Kolaković, M.: Međunarodno poslovanje u uvjetima globalizacije, Zagreb, Sinergija nakladništvo d.o.o., 2004., pp. 150.

[12] Kolanović, I.: Model za mjerenje kvalitete lučke usluge, Pomorski fakultet Sveučilišta u Rijeci, Rijeka, 2010. (doktorska disertacija), p 103.

security and complexity.13 In 1993 ZBP14in their expectation model draw attention that passenger perspective is also defined by personal needs, perceived service alternatives, self-perceived service role, situational factors, and past experience.

Although ports are fragmented in their operations, customers still perceive them as a unique entity and value them on a global performance basis.15 Measurement of customer-service quality perception from perspective of ferry passengers and their assessment of the quality provided by the maritime industry (ports and ships) is rather unexamined and little, if any, research work has been conducted or published in this area.16

Pantouvakis17 in his study, using data gathered through questioners from 403 passengers from three Greek ports (Piraeus, Patras and Heraclion) where the focus was given on identifying quality criteria in terms of the provision of peripheral services to ferry passengers, identified six factors that best describes multidimensional construct of port-service quality from passenger perception. The factors identified were:

- service – refers to the perceived level of service by the passenger (behavior of staff, assistance provided, compliance with the time schedule)
- security and safety – perception of security and surveillance inside the port
- cleanliness – passenger evaluation on the overall cleanliness of the port area and the adequacy of toilets and other hygiene places.
- guidance-communication – refers to accommodation facilities and communication in the port area, i.e. quantity and quality of communication facilities, eg telephones, faxes
- parking facilities – parking facilities (long-term and/or short-term parking area) and passenger vehicles
- information – information system facilities in the port, eg arrival and departure information provided, adequacy and efficiency of information signs.

Also, in his study, evaluating overall perceived quality attributes he identified two categories of passengers (cluster groups), first group was labeled as ‘frequent traveler’, while second group as a ‘tourist’. For the first group service and security and safety factors were identified as main factors of service quality, while for the second group the main focus was given to the cleanliness, guidance and information.

3. LINER PASSENGER PORTS

Passenger port can be defined as a place with facilities that enable passenger ships to embark and disembark passengers, usually directly to a pier. The role of a modern seaport can be summarized in the following UNCTAD definition (United Nations Conference on Trade and Development): ‘Seaports are interfaces between several modes of transport, and thus they are centers for combined transport. Furthermore, they are multi-functional markets and industrial areas where goods are not only in transit, but they are also sorted, manufactured and distributed. As a matter of fact, seaports are multi-dimensional systems, which must be integrated within logistic chains to fulfill properly their functions. An efficient seaport requires, besides infrastructure, superstructure and equipment, adequate connections to other transport modes, a motivated management, and sufficiently qualified employees.’18 Regarding their size some liner passenger ports are also referred as feeder port and

[13] Kolanović, I.: Temeljne dimenzije kvalitete lučke usluge, Pomorstvo, 21, 2, Rijeka, 2007, pp. 207-224., p 220.

[14] Zeithaml, V., A., Leonard L. B., Parasuraman, A.: The nature and determinants of customer expectations of service, Joumal of the Academy of Marketing Science, 21 (1), 1993., pp 1-12.

[15] Pando, J., Araujo, A., Maqueda, F.A., Marketing management at the world's major orts, Mritime policy and management, 32, 2005, pp 67-87

[16] Pantouvakis, A.: Port-service quality dimension and passenger profiles: an exploratory examination and analysis, Maritime economics & Logistics, Vol. 8, 2006, pp 402-418, p 403

[17] Ibidem

[18] Trujillo, L., Nombela, G.: Privatization and regulation of the seaport industry, Universidad de Las Palmas de Gran Canaria, Dpto Analisis Economico Aplicado, Spain 1999.

defined as:19 'a port constructed primarily to provide linkages among neighboring small islands and nearby urban centers. This port generally caters to small passenger and fishing vessels.'
Majority of maritime liner passenger ports are organized as multipurpose terminals, able to accept and accommodate all three types of liner passenger ships, (i) classic passenger ship, (ii) ro-ro passenger ship and (iii) very fast ships, due to the high costs for construction of maritime passenger ports and inflexibility of such investment to follow ship development. Specialized passenger terminals and units (automated ramps, bridges etc.) are thus constructed within one port enabling it to accept and respond to all requirements of passenger shipping and demand for maritime passenger transport.20 Some maritime passenger ports are able to accept also cruisers, and in the literature they are referred as hybrid ports.
Modern ports must provide varied and complex services to customers, whose demand for port services creates the need for execution of the full range of activities and processes in the port, and which should be viewed as a set of output-services in line with market demand.21 To provide port services to a ship and to a passenger, modern passenger terminal (for passenger liners and cruisers) needs to provide adequate superstructure capacities than enables quick and safe flow of passengers and vehicles ensuring required passenger comfort, specifically:22

- offer (services) in the ports: flow, range, accompanying programs, offer and accessibility activities;
- kindness of personal, hospitality and cordiality of providers of various services;
- ability and level of organization of employees on workplaces (customs, police);
- service and maintenance shops (repair services, mechanic's services, petrol stations);
- catering establishment and restaurants;
- refreshment and service areas, rest centers, motels, hotels, exchange offices;
- well supplied shops, stores, self-service shops;
- public toilets and sanitary facilities along the roads;
- parking lots (size, sufficient number of places, popular price);
- additional programs for passengers (movie houses, entertainment games).

4. PORT SERVICES

Port services can be divided into main port services: (i) cargo-handling services, (ii) passenger services, and (iii) technical-nautical services (pilotage, towage and mooring), and into ancillary port services: (i) water supply, (ii) bunkering, and (iii) waste reception facilities. ESPO report from 200423 gave an overview, within WP3, on the organization of port services for 22 countries24, and the result shown multiform types of the organization, varying from a country to a country and from a port to a port and preventing generalization. In most terminals/ports the management of passenger terminals/ports is entrusted to private concessionaries (private companies), but also there are cases where management is carried out by port authorities, port operators25, port companies, and carriers.26 Also,

[19] The National Statistical Coordination Board (NSCB) in the Philippines.: http://www.nscb.gov.ph/ru12/DEFINE/DEF-TRAN.HTM, 14.03.2013.
[20] Jugović, A., Mezak, V., Lončar, S.: Organization of maritime passenger ports, Pomorski zbornik, Vol 44, No 1, Rijeka, 2006, pp 93-104, p 97
[21] Kolanović, I.: Model za mjerenje kvalitete lučke usluge, Pomorski fakultet Sveučilišta u Rijeci, Rijeka, 2010. (doktorska disertacija), p 96.
[22] Holjevac Avelini, I.: Quality Management in Tourism and Hotel Industry, Faculty of Tourism and Hospitality Management, Opatija 2002, page 159.
[23] European sea ports organisation (ESPO): Factual report on the European port sector, 2004-2005, FR-WP3: the organisation of port services, Brussels, 2004, pp 117-170
[24] Countries analysed were: Belgium, Bulgaria, Cyprus, Denmark, Estonia, Finland, France, Germany, Iceland, Ireland, Italy, Latvia, Lithuania, Malta, Netherlands, Norway, Poland, Portugal, Slovenia, Spain, Sweden and United Kingdom.
[25] Some port operators are joint stock companies with 100% government shareholding, while others have mixed ownership or are privately owned.

the normal durations of contracts, concessions and authorizations varies from one year to 30/40 years, maximum being 100 years. In some cases maximum duration is not foreseen by law, i.e. it doesn't exist or is under review.

Trujillo and Nombela[27] divide port services to (i) infrastructure provision, (ii) berthing services (pilotage, towing, tying), (iii) cargo handling (stevedoring, terminals, storage, freezing), (iv) consignees - administrative paperwork for ship and cargo, permits-sanitary, customs, etc., and service hiring, and (v) ancillary services - supplies, repairs, cleaning, refuse collection, safety.

A survey[28] conducted in 20 major European passenger ports (in terms of coastal passenger and cruise passenger traffic) identified following 70 different passenger port services: [29]

- core services (17)[30] - services provided in all ports, which are further classified into six subgroups: (i) services to a vessels, i.e. pier, mooring-unmooring and berthing, (ii) environmental management services, i.e. anti-pollution equipment, ship waste management, (iii) services to vehicles, i.e. port road network, connection with road network, port area infrastructure for vehicles, (iv) safety and security services, i.e. security, safety, (v) services to passengers, i.e. passenger terminal station, embarkation/disembarkation, infrastructure connection with transport network, and (vi) navigation services, i.e. navigational channel, port basin, breakwaters, port signaling
- major services (18) - services provided in 10 to 19 ports. The services identified were: anchorage (19), water supply (17), towage (15), pilotage (14), ship supplies services (14), provision of electric power (14), ship repairs (13), bunkering (12), customs (16), fire-fighting services (10), shops (15), cafes (14), parking services (14), waiting areas (13), public phones (12), taxi station (12), baggage services (11), and information points (10)
- secondary services (35) – services provided in 1-9 out of the 20 ports. The services identified were: warehouse services (5), intranet-internet commerce (EDI) (5), floating crane (2), ice braking services (2), (un)loading unaccompanied trucks (2), barrage (1), vehicle provision for unaccompanied coaches (2), transshipment of cargo (truck to truck) (2), road traffic management inside ports (1), train network inside port (1), first aid station (6), tourist police (3), vessel traffic management (5), search and rescue service (1), check-in (8), ticketing (8), restaurants (8), transport of passenger inside the port (7), bank services (7), currency exchange (5), internet access points (5), weighbridge service (4), electronic information (internet radio) (4), pre check-in at the airport (3), cultural centers (2), entertainment areas (2), car rental (5), provision of telephone connection (4), postal services (4), automated teller machine (ATM) (4), hotels (4), vending machines (4), port guided tour (2), cooperation with airports for baggage transfer (1) and dredging services (4).

Out of this 70 port services the following 34 port services are identified by the authors as most relative for the measurement of port service quality, i.e. types of services offered: passenger terminal station, embarkation/disembarkation, infrastructure connection with transport network, parking services, waiting areas, taxi station, baggage services, information points, check-in, ticketing, shops, cafes, restaurants, transport of passenger inside the port, cooperation with airports for baggage transfer, bank services, automated teller machine (ATM), currency

[26] Carriers are mostly commercial independent ferry companies.
[27] Trujillo, L., Nombela, G.: Privatization and regulation of the seaport industry, Universidad de Las Palmas de Gran Canaria. Dpto Analisis Economico Aplicado, Las Palmas de Gran Canaria, Spain, 1999, p. 9-11
[28] 1) Pallis, A., A., and Vaggelas, G., K.: The passenger port: analysis of a multiform service system, Paper presented at 2nd National Conference of Hellenic Society of Systemic Studies (in Greek), Chios, 25-27 May 2006, and 2) Vaggelas, G. K., Pallis, A. A.: Passenger ports: Services provision and their benfits, Maritime policy and management, 37 (1), pp 73-89
[29] Vaggelas, G. K., Pallis, A. A.: Passenger ports: Services provision and their benfits, Maritime policy and management, 37 (1), pp 73-89
[30] Number in brackets represents the number of ports who provide service stipulated.

exchange, postal services, public phones, internet access points, vending machines, electronic information (internet radio), pre check-in at the airport, port guided tour, cultural centers, entertainment areas, car rental, provision of telephone connection, hotels, customs (for international lines), tourist police, road traffic management inside ports and train network inside port.

5. COASTAL SHIPPING – ISLAND CONNECTIONS

Croatian coastal maritime transport system covers 56 state lines (27 ferries, 16 fast shipping lines and 13 classic marine lines). Most of the state lines, in total 46, are operated by Jadrolinija, state owned company. Other operators (shippers) are privately owned. In total there is 13 shippers operating with 78 ships, 50 of these ships are under Jadrolinija ownership. Most of the lines are subsidised from the State Budge (in 2011 the state subsidised in total HRK 382,794 mln). Also, from the state budget reconstruction and development of passenger fleet was financed, 10 ships were built through this programme.[31] Current state passenger coastal lines connects 94 different ports alongside Croatian coast, these ports are of different meaning (state, county or local importance). Out of 94 ports 21 ports are located alongside mainland coastline, while 73 ports, situated on 43 different islands, are located alongside island coastline. Croatian island ports are of county or local importance and are under the jurisdiction of county port authorities, most of the islands ports are located within or close to the town centre, and so the level of the service provided within or in close vicinity to the port area varies according to the size and the offer of the town. The biggest mainland ports (from north to south) are national ports of Rijeka, Zadar, Šibenik, Split and Dubrovnik. Port of Split is the busiest Croatian liner passenger ports with annual traffic in 2010 of over 3.5 mil passenger excluding cruise passengers (3.523 mil according to EUROSTAT), while busiest cruise port is port of Dubrovnik with annual traffic of cruise passengers of almost one mil passenger in 2011 (986,000 pax[32]). National port of Ploče is connected with only one passenger state line, while the core port busies is cargo. Other passenger mainland ports are of county or local importance.

The importance of transport service and quality of transport to the island connectivity is shown by the results of project ESPON (02/2009-06/2010)[33], conducted in nine European islands located in five different countries (Cyprus, France, Greece, Italy, Malta). As part of the project ESPON research project was completed[34] that establishes the impact of transports on the attractiveness of insular areas as places to live and to develop economic activities. For the purpose of research 22 parameters were identified as important for attractiveness of insular areas as places to live while 24 parameters were identified as important to develop economic activities. The analysis was made on the basis of information from 31 island regions that are European statistical units (Member States, NUTS II or NUTS III) and nine case-study islands, for which data were acquired through the use of local research and the assistance of local stakeholders. In total, 48 chambers and 70 local authorities answered the questionnaire. The findings reveal that three out of the top ten parameters, regarding island attractiveness for developing economic activities, concern the transport sector, i.e. the following parameters: trip frequency, cost of travel and quality of transport.

[31] High level stakeholder conference: 'Setting an agenda for smart, sustainable and inclusive growth from the adriatic and Ionian seas', Zagreb, 6 December 2012, MoM.

[32] Yearbook 2012-2013, MedCruise, available at: http://www.medcruise.com/index.php/yearbook, 14.02.2013.

[33] The Development of the Islands – European Islands and Cohesion Policy (EUROISLANDS), The ESPON 2013 Programme, ESPON & University of the Aegean, Luxembourg, više o projektu: http://www.espon.eu/main/Menu_Projects/Menu_TargetedAnalyses/EUROISLANDS.html, 05.02.2013.

[34] Lekakou, M. B., Pallis, A. A., Vaggelas, G. K., Vitsounis, T. K.: Coastal shipping and island attractiveness: perspective from Europe, Paper presented at International Association of Maritime Economics (IAME) Conference, Santiago, Chile, 2011., pp. 1-20.

6. CONCLUSION

Quality indicators from passenger perspective is difficult to define and quantify because of the subjectivity and the nature of quality so it is necessary, when defining quality, to get a broader picture, but contextually specific, when defining a set of quality indicators of specific service. As one of the recommendations of the ISIC project is the development of terminal quality and performance by establishing and by certificating quality (Quality Label and Service Quality Standards). In passenger transport for the user, i.e. for the passenger quality indicators are of more importance than the performance indicators since they describes the levels and types of services available at the terminal, i.e. customer requirements (types of services offered, expected service level, etc.). Passenger perspective is not defined only by the current quality of the service but also by passenger personal needs, perceived service alternatives, self-perceived service role, situational factors and past experience.

In identifying quality indicators it is necessary to define desired, adequate, and perceived service, to define the minimum level of service that has to be met, i.e. to define minimum level of service that the user is willing to accept. Target quality represents the quality level that service providers seek to ensure. Questioners are most used methodology in research and studies dealing with quality measurement, where quality indicators have crucial importance and in the process of identification of the quality indicators it is necessary to understand the passenger demands, understand the port service and identify the port services that are crucial for achieve targeted quality level, and define the methodology to conduct the survey.

Most of the Croatian passenger ports are of county or local importance and are located within or close to the town centre, so the level of the service provided within or in close vicinity to the port area varies according to the size and the offer of the town.

For the overall development of the Croatian islands it is necessary to analyze the level of quality provided to a passenger in the port and the level of transport services, especially the frequency of the service, price of the trip and connection demands, to define the direction of further development.

REFERENCES

1.Arabelen, G., Oral, E. Z.: Prestudy of port service quality dimensions: Port of Izmir as a case study, International conference ‘Key developments in the port and maritime sector’ WCTRS-SIG2, Antwerpen, Belgija, 21-22.05.2012., pp. 1-19.

2.Cronin, J.J., Taylor, S.A.: Measuring service quality: a reexamination and extension||, Journal of Marketing, Vol. 6 (July), 1992., pp. 55-68

3.Cronin, J.J., Taylor: SERVPERF versus SERVQUAL: reconciling performance-based and perception-minus-expectations measurement of service quality||, Journal of Marketing, Vol. 58, br. 1, 1994., pp. 125-131.

4.European sea ports organisation (ESPO): Factual report on the European port sector, 2004-2005, FR-WP3: the organisation of port services, Brussels, 2004, pp 117-170

5.High level stakeholder conference: ‘Setting an agenda for smart, sustainable and inclusive growth from the adriatic and Ionian seas’, Zagreb, 6 December 2012, MoM.

6.Holjevac Avelini, I.: Quality Management in Tourism and Hotel Industry, Faculty of Tourism and Hospitality Management, Opatija 2002, p. 159.

7.Jolić, N., Kavran, Z., Lazibat, T.: Business excellence in the field of traffic and transport technology. Business Excellence, III, No 1, 2009, pp 131-144, p 138

8.Jugović, A., Mezak, V., Lončar, S.: Organization of maritime passenger ports, Pomorski zbornik, Vol 44, No 1, Rijeka, 2006, pp 93-104, p 97

9.Kolanović, I.: Temeljne dimenzije kvalitete lučke usluge, Pomorstvo, 21, 2, Rijeka, 2007, pp. 207-224., p 220.

10.Kolanović, I.: Model za mjerenje kvalitete lučke usluge, Pomorski fakultet Sveučilišta u Rijeci, Rijeka, 2010. (doktorska disertacija)

11.Martin Ruesch, M., Abel, H., Karrer, R., Poersch, R., Fiedler, R., Reynaud, C., Vaghi, C., Siciliano, G.: Final Report Task D: Improving Quality of Intermodal Terminals. Project ISIC (Integrated Services in the Intermodal Chain), European Commission – DG TREN, 2005

12.Mikulić, J.: Mjerenje kvalitete usluge zračnog prijevoza primjenom indeksa zadovoljstva korisnika. Zagreb: Ekonomski fakultet Sveučilišta u Zagrebu, Zagreb, 2009. (dokotrska disertacija)

13.Lazibat, T.; Kolaković, M.: Međunarodno poslovanje u uvjetima globalizacije, Zagreb, Sinergija nakladništvo d.o.o., 2004., pp. 150.

14.Lekakou, M. B., Pallis, A. A., Vaggelas, G. K., Vitsounis, T. K.: Coastal shipping and island attractiveness: perspective from Europe, Paper presented at International Association of Maritime Economics (IAME) Conference, Santiago, Chile, 2011., pp. 1-20.

15.Pando, J., Araujo, A., Maqueda, F.A., Marketing management at the world's major orts, Mritime policy and management, 32, 2005, pp 67-87

16.Pantouvakis, A.: Port-service quality dimension and passenger profiles: an exploratory examination and analysis, Maritime economics & Logistics, Vol. 8, 2006, pp 402-418, p 403

17.Pallis, A., A., and Vaggelas, G., K.: The passenger port: analysis of a multiform service system, Paper presented at 2nd National Conference of Hellenic Society of Systemic Studies (in Greek), Chios, 25-27 May 2006

18.Parasuraman, A., Zeithaml, V., A., Berry, L.: Conceptual Model of Service Quality and Its Implications for Future Research, Journal of Marketing, Fall 1985, pp. 41-50

19.Parasuraman, A., Zeithaml, V., A., Berry, L.: SERVQUAL: A Multiple-Item Scale for Measuring Customer Perceptions of Service Quality, Journal of Retailing, Spring 1988, pp. 12-40.

20.Parasuraman A., Valarie A Zeithaml, Leonard L. Berry: Reassessment of expectations as a comparison tandard in measuring service quality: implications for futher research, Journal of Marketing, 58 (1994), 1, 99. 111 – 124.

21.Philip, G., Hazlett, S.: The measurement of service quality: a new P-C-P attributes model, International Journal of Quality and Reliability Management, 14 (3), 1997, pp. 260–280

22.Teas, K.R.: Expectations, performance evaluation, and consumers' perceptions of quality, Journal of Marketing, Vol. 57 (Octobar), 1993., pp. 18-34

23.Teas, K.R.: Consumer expectations and the measurement of perceived service quality, Journal of Professional Services Marketing, Vol. 8, No. 2, 1993., pp. 33-54.

24.Thai, V., V.: Service Quality in maritime transport: conceptual model and empirical evidence, Asia Pacific Marketing and Logistics, Vol. 20, No. 4, 2007, pp 493 – 518, p 500

25.The Development of the Islands – European Islands and Cohesion Policy (EUROISLANDS), The ESPON 2013 Programme, ESPON & University of the Aegean, Luxembourg, više o projektu: http://www.espon.eu/main/Menu_Projects/Menu_TargetedAnalyses/EUROISLANDS.html, 05.02.2013.

26.The National Statistical Coordination Board (NSCB) in the Philippines.: http://www.nscb.gov.ph/ru12/DEFINE/DEF-TRAN.HTM, 14.03.2013.

27.Trujillo, L., Nombela, G.: Privatization and regulation of the seaport industry, Universidad de Las Palmas de Gran Canaria. Dpto Analisis Economico Aplicado, Las Palmas de Gran Canaria, Spain, 1999, p. 9-11

28.Vaggelas, G. K., Pallis, A. A.: Passenger ports: Services provision and their benfits, Maritime policy and management, 37 (1), pp 73-89

29.Yearbook 2012-2013, MedCruise, available at: http://www.medcruise.com/index.php/yearbook, 14.02.2013.

30.Zeithaml, V., A., Leonard L. B., Parasuraman, A.: The nature and determinants of customer expectations of service, Joumal of the

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PROPOSAL FOR PROCEDURES IN THE EVENT OF NAVIGATION ACCIDENTS ON INLAND WATERWAYS IN CROATIA

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ABSTRACT

Procedures in the event of navigation accidents on inland waterways in Croatia are not regulated by any subordinate legislation. Applicability of existing safety aspects of maritime regulations on inland navigation activities are analyzed in order to create a suitable legal basis for proposing procedures in the event of navigation accidents. In-depth asessment of relevant legislation was conducted to determine procedures for salvaging passengers, vessels as well as preventing water pollution caused by inland water transport. Nevertheless, functionality of river information services related to calamity abatement are presented as a support in search and rescue coordination processes. Authors determine an evident lack of search and rescue operations on Croatian inland waterways and propose restructuring of existing services modeled on the Danube river basin countries.

KEY WORDS
navigation accident, search and rescue, river information services, inland navigation.

1. INTRODUCTION

Procedures in cases of navigational accidents on inland waterways are regulated by any law or subordinate regulation. Article 8 of the Act of Inland Navigation and Inland Ports (Off. Gazette 109/07), in the second part "Safety of navigation", states the following: "The Minister shall prescribe a procedure for salvaging vessels and crew members in case of accidents on inland waterways and the process of intervention in case of threats of pollution from vessels. Main objective of this paper is to define the procedures for creating legal basis for search and rescue operations on inland waterways in Croatia under the existing laws, regulations and ordinances that are prescribed. This paper also defines the proposed procedure for two different cases of threatening safety on inland waterways:
The process of salvaging vessels and crew members in the event of an accident on inland waterways;
The process of intervention in case of threat of pollution from vessels;
The paper analyzed laws and regulations affecting safety and security aspects of navigation, the application of the existing maritime regulations on inland waterways, with an example of organized search and rescue operations in Hungary.
Regimes in the event of an accident of navigation and a comprehensive analysis of Calamity Abatement Service as part of RIS are defined as a

support in the coordination process of search and rescue on inland waterways.

2. ANALYSIS OF THE CURRENT LEGISLATIVE FRAMEWORK FOR THE EVENTS OF SEARCH AND RESCUE PROCEDURES

In order to define above mentioned procedures authors have studied relevant legislation that concern inland navigation safety aspects.
The most important legal documents which define the safety of inland navigation in Croatia are:
- Act on Navigation and Inland Ports (OG 109/07);
- Regulation on Inland Navigation (OG 138/08);
- Other rules and regulations related to the safety of inland navigation are:
- Regulations on Safety Inspection of Inland Navigation (OG 80/00);
- Regulation on testing navigation accidents on inland waterways (OG 56/00);
- Regulation on technical conditions for the port and the safety of navigation in ports and terminals (OG 32/09);

For the procedures of defining the process of interventions in case of pollution from vessels the following regulations are essential:
- Regulation on the transport and handling of dangerous goods by inland waterways (OG 80/00);
- The European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN Agreement);
- Protocol for the Prevention of Pollution from vessels to the Framework Agreement on the Sava River Basin;

3. APPLICABILITY OF EXISTING REGULATIONS WITH REGARD TO TECHNOLOGICAL SPECIFITIES OF INLAND NAVIGATION

On the basis of existing laws and subordinate legislation analysis, we can conclude that search and rescue on inland waterways should be formed on the model of the National Centre for the harmonization of safety and rescue on the sea, which would be included in the operational and rescue forces under the supervision of the Directorate for protection and rescue operations. Nevertheless, search and rescue procedures must be adapted to the technological specifities of inland navigation which differ in regard to maritime shipping activities. Overview of search and rescue procedures on Hungarian inland waterways could be an example of the future search and rescue services in Croatia.

3.1 Application of maritime regulations on inland waterways

From the maritime regulations segments of the National Search and Rescue Plan of Life at Sea should be taken with regard to the structure of the search and rescue operations as a basis for creating an official manual of search and rescue procedures, adaptive to inland navigation. The primary tasks of services for search and rescue at sea, are harmonization of search and rescue procedures, maritime traffic supervision and control of navigation safety. All provisions of the National Plan of search and rescue at sea concerning procedures in the event of an accident at sea can be applied to the future of search and rescue operations on inland waterways. The provisions of the National Plan of search and rescue at sea regarding the communications system can be partly applied to the search and rescue operations on inland waterways. Communications systems that will be used in search and rescue procedures on inland waterways are divided into systems of public communication (fax, telephone) and the communications system of inland navigation through the River Information Services.

3.2. Organization of search and rescue services on inland waterways in Hungary

The most important institutions for search and rescue operations in Hungary are:
- Ministry of Economy and Transport-which has a similar function as our Ministry of Maritime Affairs, Transport and Infrastructure;
- National transport authorities with a department engaged in inland navigation Administration's mixed functions and responsibilities that integrates operations of similar Croatian institutions: Agency for Inland Waterways, Croatian Register of Shipping, Directorate for Inland Navigation,

- Department of Disaster Management's function as Croatia Directorate for Protection and Rescue,
- The Danube river basin Police Authority has a mixed-function police and authorities,
- Office of Traffic Safety-in charge of the investigation of traffic accidents.

Under the direction of the National Administration for Traffic Operations Center established NAVINFO-Center for accidents that operate 24 hours a day and where shippers report accidents that occur in the Hungarian section of the Danube. Accidents are reported via VHF radio communication NAVINFO-Center. To confirm the authenticity of information, NAVINFO seeks feedback on the following data:
- Where did the required accident occurred?
- Do You need medical assistance?

After receiving reliable information and identification of the exact location of the accident NAVINFO-Center for accidents notifies the responsible institutions and organizations. During the entire process of search and rescue continuous communication is achieved between NAVINFO-Center, the Danube water authorities and vessels in the general average. Search and rescue on the accident location are coordinated by Danube river basin Police Authority. The following figure describes the flow of information for the collision, hull omission as well as sinking of vessels:

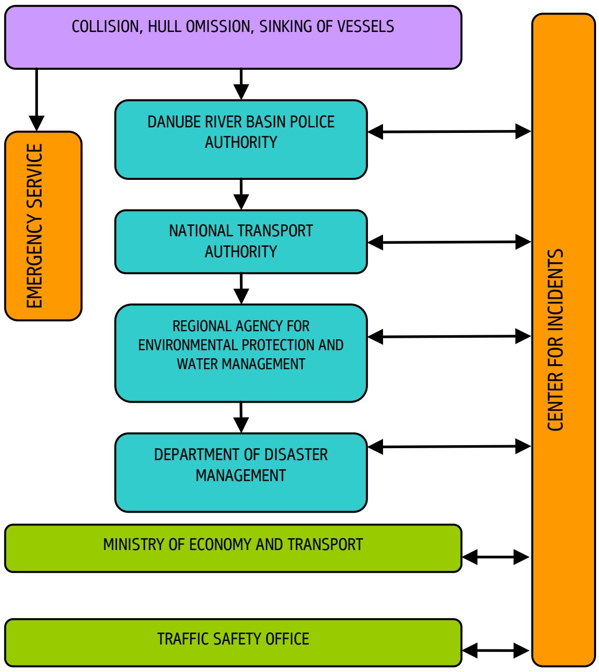

Figure 1. Information flow for collision, hull omission, sinking of vessels

Hungarian model could be applicable to Croatian waterways with an obligation to form a similar Center for disaster and information flow management. Hungarian model differs from the Croatian because Hungarian Harbour master offices have their water police so they can immediately take certain actions without waiting for the police authorities.

4. DEFINITION OF PROCEDURES IN THE EVENTS OF NAVIGATION ACCIDENTS

Procedures in the event of a navigational accident can be divided into two different cases of compromising safety on inland waterways:
The process of salvaging vessels and crew members in the event of an accident on inland waterways;
The process of intervention in case of threat of pollution from ships
These two processes are different due to the institutions that would be involved in the search and rescue operations.

4.1. The process of salvaging vessels and crew members in the event of an accident on inland waterways

The flow chart of the process is presented on figure 2 if the call is received at the headquarters of the National Search and Rescue on inland waterways:

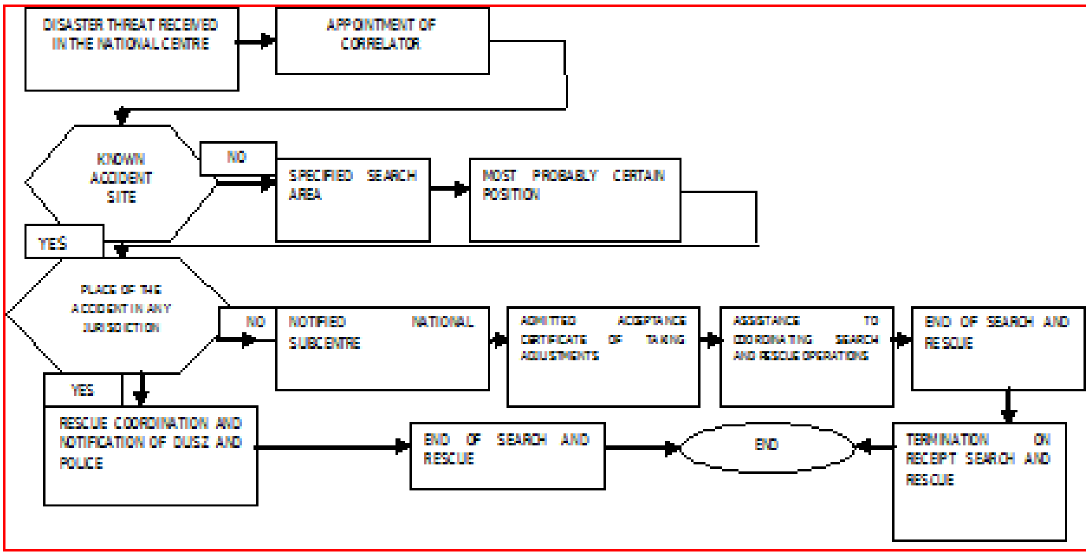

Figure 2. The flow chart of the process of search and rescue

Coordinator of search and rescue operations is duty employee of the National Center search and rescue on inland waters. He takes on the task of harmonizing the whole process, information and communication with National Headquarters / Sub headquarters, and information and communication with the National Protection and Rescue and Police.

4.2. The process of intervention in case of threat of pollution from vessels

This procedure differs from the rescue of persons and vessels in the event of an accident in inland waters by the fact that they are in the process of salvaging vessels and preventing pollution from vessels involved and Inspection of Environmental Protection and Water Management Inspectorate. So, in the process after it notifies the Civil Service Protection and Rescue and the police, it is necessary to inform the environmental inspection and report an accident, or an accident that results in damage to the environment, and the water rights inspect and report an accident that resulted in a reduction of water quality.

Diagram of information flow in the process of intervention in case of threat of pollution from ships is shown in the following picture:

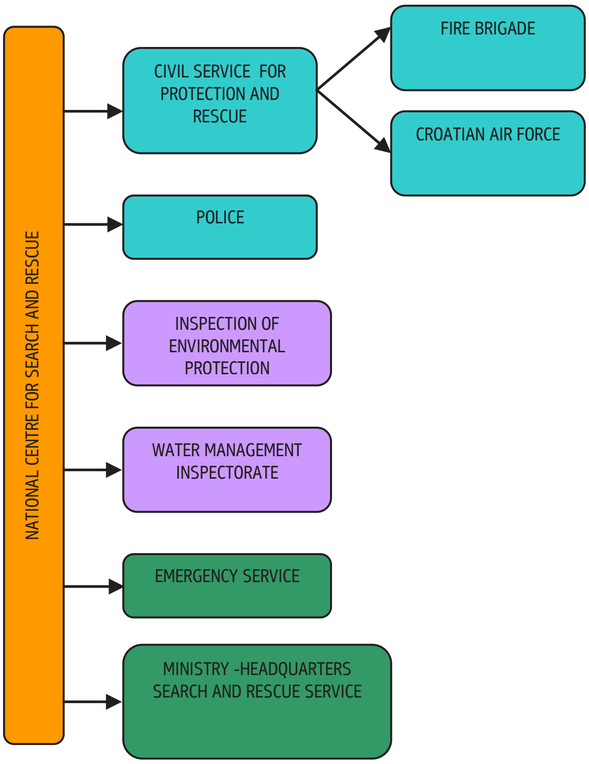

Figure 3. Diagram of information flow in the process of intervention in case of threat of pollution from vessels

5. RIS SERVICE CALAMITY ABATEMENT SERVICE

Calamity Abatement Support (CAS) are one of the 4 main RIS services which provide information regarding traffic on inland waterways. CAS is a service that registers the vessel and basic information about the vessel at the start of the voyage in the RIS center and during voyage regularly updates information about the vessel. CAS service is a kind of supplement to the Strategic traffic information, and can not exist independently of them.

Data supplied by RIS Center rescue and emergency services are as follows:

CAS.1 information accident focused on the traffic situation;

CAS.2 estimation of the traffic situation in the vicinity of the accident;

CAS.3 possible coordination support by patrol vessels;

CAS.4 estimation of potential effects accident on the environment, people and traffic;

CAS.5 Transferring information between patrol vessels, police vessels, fire vessels;

CAS.6 Initiation and coordination of search and rescue activities;

CAS.7 protection measures for traffic management, environment and crew members.

Depending on the risk assessment, the CAS service can only register types of vessels or any vessel or composition, eg, in the case of vessels carrying dangerous cargo. Configuration information system for the service to mitigate the consequences of accidents is shown in the following figure:

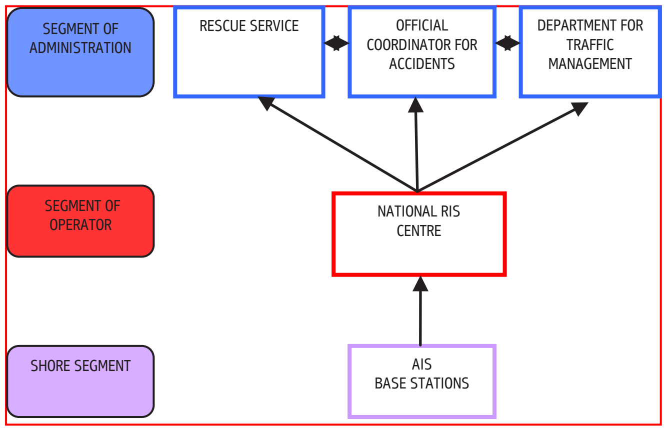

Figure 4. Information system of Calamity Abatement Services

5.1. Prerequisites for the implementation of CAS services in Croatia

In order to implement Calamity Abatement Services in Croatia it is necessary to meet all the provisions that were passed by the Act on Navigation and Inland Ports (Off. Gazette 109/07) and Regulation on River Information Services (Off. Gazette 99/08) which refer to implementation of RIS on inland waterways in Croatia. Full coverage of the network of inland waterways in Croatia with River Information Services would enable monitoring of vessel traffic in real time and every section of the inland waterway network. RIS centers would adequately be able to alert all relevant actors on search and rescue operations.

5.2. Description of the functioning of CAS services in practice

Calamity abatement Services requires three sets of data:

- Vessel position data;
- Static information;
- Cargo data.

These data are available in the RIS center through various services, primarily tracking and tracing of vessels through AIS and electronic reporting of cargo (ERI). Through AIS system, RIS center has access to the ship position if the vessel is equipped with AIS transponder. The exact position of the vessel is visible on the Inland ECDIS chart. Position is also possible to get as text format as longitude or river kilometer. Static data derive from the AIS system and are available only if the vessel is equipped with AIS transponder. The accuracy of static data received via AIS system depends on the captain of the vessel or any other person responsible for entering data into the AIS transponder. Data include:

- identification number;
- type of vessel;
- vessel dimension;
- number of crew on board.

ERI application is currently being developed in Croatia, but still not fully operative. Therefore, RIS center currently does not have data on the vessel cargo.
When ERI will be functional in Croatia, it is recommended to install Data-gateway application that integrates multiple types of RIS data as follows:

- Strategic and Tactical Information System (AIS);
- Information of cargo data (ERI);
- Information on certification of the vessel (Vessel hull data).

Calamity Abatement Service for search and rescue should have access to data-gateway applications with limited user rights only to vessels involved in the accident. This functionality is already implemented in the data-gateway applications and the possibility of recording accident, involving certain vessels. After RIS center record the accident and marked vessel accident participants, information on these vessels will be available for the service of search and rescue. In short, procedure would occur as following: RIS center monitors the movement of the vessel on the map via AIS system. When an accident occurs vessel will report via VHF or AIS safety messages to local RIS center. RIS center then activates accident data-gateway application and reports services for search and rescue operations. Services thereafter through data-gateway application have access to the AIS, ERI and information on the vessel's hull torn accident. If we assume that it will be applied to the inland waterway system as a search and rescue at sea, the National Center for coordination of search and rescue, as well as any Sub-Headquarters Search and Rescue will have a corresponding RIS center, which will use the Services to mitigate the consequences of accidents (CAS) and inform all relevant services for search and rescue.

6. CONCLUSION

After the analysis of the existing legislative framework for search and rescue incidents, analysis of the application of the existing maritime regulations on inland waterways, the analysis of the current situation regarding safety of inland waterway transport, defining the procedure in the event of navigational accidents and analysis of RIS in support of search and rescue, we can conclude following:

- Inland navigation search and rescue organizations needs to be modeled on the basis of maritime search and rescue services;
- Successful implementation of CAS Calamity Abatement Services in Croatia must be in accordance with the Act on Inland Waterways and Inland Ports, harmonized with four key RIS technologies Tracking and Tracing of vessels by AIS, Notices to skippers, Electronic navigational Charts and Electronic Reporting of cargo (ERI-Electronic reporting International).
- Search and rescue procedures must be adapted to the technological features of inland navigation which are different from maritime activities. Overview of search and rescue on the inland waterways Hungary could be an example of the future implementing search and rescue system on Croatian rivers.

REFERENCES

1.Zakon o plovidbi i lukama unutarnjih voda, NN (109/07, 132/09), Ministarstvo pomorstva, prometa I infrastrukture, Zagreb, 2007;

2.Pravilnik o riječnim informacijskim servisima, NN (99/08), Ministarstvo pomorstva, prometa i infrastrukture, Zagreb, 2008;

3.Studija ustroja Riječnih informacijskih usluga u Republici Hrvatskoj, CRUP d.o.o., Zagreb, 2007;

4.Governmental Decree No. 312/2011 (XII.23.) on the controlling of inland waterway and railway transportation of dangerous goods in the course of procedures carried out by professional disaster recovery organs and fines to be paid, as well as on detailed rules of authority tasks relating to levying a fine, Ministry of Economy and Transport, Budapest, 2011;

5.Government Decree No. 219/2007. (VIII.15.) on River information services, Ministry of Economy and Transport, Budapest, 2007;

6.IRIS Europe II: RIS Key Actors and Communication in case of a Calamity, Sub-Activity 2.5 - Calamity Abatement Service, Vienna, 2011;

INTERNATIONAL REGIME OR REGIONAL SOLUTION? AN OVERVIEW OF THE CURRENT STATE OF AFFAIRS OF POLLUTION LIABILITIES RESULTING FROM OFFSHORE OIL EXPLORATION AND EXPLOITATION ACTIVITIES IN SEABED AREAS OF NATIONAL JURISDICTION

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ABSTRACT

Oil drilling activities in deep water areas have increased over the years. Reasons for this boost could be: the discovery of oil reserves in the continental shelves of several countries, a higher demand for petroleum, or the development of far reaching drilling capabilities. Major oil spills, such as the blowout of the Deepwater Horizon rig in 2010 in the USA highlighted the problems faced by today's oil industry when dealing with this type of issues.
It is estimated that a third of the oil consumed today comes from offshore oil exploration, and this dependency continues to grow. The development of new technology will likely move these operations away from areas closer to the coast, increasing the risks of transboundary pollution.
Unlike international conventions that regulate pollution caused by maritime carriage of oil by tankers, there aren't any international legal instruments to regulate the pollution caused by offshore oil exploitation. The subject is usually left to national legislation. A proposal to adopt international standards was defeated at the International Maritime Organization this year.
The main idea of this paper is to analyze different initiatives that could lead to reaching minimum international standards to regulate the activities of the offshore oil industries, at the international, regional or national level.

KEY WORDS
Pollution liabilities – offshore exploration and exploitation – oil spills – transboundary pollution

1. INTRODUCTION

The activities for offshore oil extraction have increased dramatically in recent years. The reasons for this are varied: rising oil prices, growing demand worldwide for products of the oil industry, the discovery of large hydrocarbon deposits on the continental shelves, and several other advances in technology, which have enabled the industry to access remote areas off the coast.

Today, it is estimated that a third of the oil consumed worldwide comes from offshore platform operations and this trend will continue to rise. It is also anticipated that the development of new technologies will bring about exploration and exploitation operations of hydrocarbons further away from the coast and into deeper waters, increasing the risk of transboundary pollution (1).

Accidents in recent years, such as the explosion and subsequent sinking of the Deepwater Horizon platform in the Gulf of Mexico, in the United States, owned by BP, which caused an oil spill that lasted nearly three months, in addition to the deaths of 11 people; or the Montara platform accident in Australian waters, owned by the Thai company PTTEP Australasia, which caused an uncontrolled escape of oil and gaseous hydrocarbons into the air and sea for a period of 74 consecutive days, producing oil slicks that spread throughout 1,750 square miles of ocean, also affecting the neighboring coasts of Indonesia (2); have highlighted the problems the industry faces when dealing with this type of situations and their responsiveness and capabilities when it comes to stopping such spills.

The other problem that came up as a result of both accidents is the huge difference for the victims in terms of obtaining fair and prompt compensation from the operators of this industry. While BP established a US$ 20 billion fund for the accident compensation and so far has signed two compensatory agreements with most of the victims in an amount close to US$ 7.8 billion, in addition to the US$ 8.1 billion previously disbursed as payment to individuals, companies and government entities (3), the Indonesian government and fishermen have repeatedly complained about the lack of compensation from the company PTTEP Australasia, who even questions the existence of pollution damage on the coasts of Indonesia, thus preventing the possibility of reaching a compensation agreement (4).

At present time, there is no international agreement that addresses the issue of liability for damage resulting from exploration and extraction of hydrocarbons from the seabed exclusively, but this area has been developed by national laws in its majority, and only those aspects related to technical standards for the prevention, control, mitigation or elimination of spills platforms or installations are regulated in some Conventions. Hence the occurrence of these accidents has resulted in sectors of the international community wondering if it is enough for States to adopt national measures to regulate the activities of the offshore industry, if States are obliged to making an effort towards ensuring prompt and effective compensation to victims of pollution, including those that affected by transboundary pollution, and finally, whether to encourage the international community towards the adoption of regional agreements in this matter.

The aim of this paper is to carry out a study on the efforts made towards the establishment of an international system to regulate a liability regime for the compensation of environmental damages caused by activities of the offshore oil industry and to propose global and regional alternatives to achieve a tighter and more consistent regulation of this issue, which should hold among its objectives the prompt and effective compensation to all victims and the repairs of damages caused to the environment .

2. UNITED NATIONS CONVENTION ON THE LAW OF THE SEA

There are multiple responsibilities to States under international conventions for the protection of the marine environment. On the whole, the framework regulation on this issue is in the 1982 United Nations Convention on the Law of the Sea, which in Part XII establishes the obligation of States Parties to protect and preserve the marine environment. This obligation is not limited to marine areas within national jurisdiction of States, but includes all the marine environment (5). The Convention also grants the sovereign right of States to exploit their natural resources, provided that such exploitation

shall be pursuant to an environmental policy that protects the environment (6).
The obligations under the Convention for the protection of the marine environment vary according to the type of pollutant source, when it originates from: land-based sources (7), seabed activities subject to national jurisdiction (8), activities in the Area (9), pollution by dumping (10), pollution from vessels (11) or pollution from or through the atmosphere (12).
In the present case, the pollution caused by the activities of the offshore oil industry, or in the words of UNCLOS, the pollution from activities on the seabed subject to national jurisdiction, the coastal State is obliged to adopt laws and regulations to prevent, reduce and control pollution from such activities, which can be no less effective than international rules, standards, recommended practices and procedures (13).
These standards must be established by the States through "international competent organizations" or diplomatic conferences, and re-examined periodically (14). The Convention is not clear about who these "international competent organizations" are, so the United Nations Division for Ocean Affairs and the Law of the Sea, in an effort to assist States Parties to UNCLOS understanding of the Convention, prepared a report according to which these "international competent organizations" would be: the International Atomic Energy Agency (IAEA), the International Hydrographic Bureau, the International Labour Organization (ILO), the International Maritime Organization (IMO), the Inter-Governmental Oceanographic Commission (IOC), the United Nations Environment Programme (UNEP) and the United Nations Industrial Development Organization (UNIDO) (15).
Finally, in terms of responsibility, the Convention provides that the States shall be liable, in accordance with international law, for the fulfillment of their international obligations concerning the protection and preservation of the marine environment (16). In this regard, States should ensure that resources are available within their legal system for prompt and adequate compensation or any other relief in respect of damages caused by pollution of the marine environment by natural or juridical persons under their jurisdiction (17).
This will be done by the States through cooperation in the implementation of existing international law and by the further development of international law regulations for the assessment of damages and their compensation, for the settlement of disputes, and for the development of criteria and procedures for the payment of adequate compensation, such as compulsory insurance or compensation funds (18).
Currently, regulations pertaining to the offshore industry have been developed almost entirely by the national legislation of the States, while international standards and procedures are only limited to the prevention, reduction and control of accidents from platforms or installations. Liability and compensation for such accidents have not been regulated through any international convention by the States.

3. INTERNATIONAL CONVENTIONS FOR THE PREVENTION OF MARINE POLLUTION CONTAINING PROVISIONS ON PLATFORMS OR FACILITIES OF THE OFFSHORE INDUSTRY

Some conventions adopted within the IMO, whose main objective is the prevention of marine pollution activities, have extended their scope of application to sources other than vessels, such as platforms, facilities or man made structures at sea (19).
Such is the case of the International Convention for the Prevention of Pollution from Ships, as modified by the Protocol of 1978 (MARPOL Convention 73/78), which extends the scope of application of its provisions to fixed or floating platforms and requiring the later to have tanks for oil residues and to keep a record of all operations of allowed discharges, in other words, those with a dilution of oil that do not exceed 15 parts per million (20).
Meanwhile, the International Convention on Oil Pollution Preparedness, Response and Co-Operation (OPRC), sets out the actions to be taken after the occurrence of a discharge or leakage of oil, which requires offshore unit operators to have emergency plans in case of oil pollution and to promptly notify authorities of all discharge incidents produced in these facilities (21).

However, these agreements do not establish a liability and compensation regime in the event of oil discharges into the marine environment.

4. THE CONVENTION ON CIVIL LIABILITY FOR OIL POLLUTION DAMAGE RESULTING FROM EXPLORATION FOR AND EXPLOITATION OF SEABED MINERAL RESOURCES

The first initiative in this area took place when the United Kingdom (UK) decided to convene a Diplomatic Conference to adopt the Convention on Civil Liability for Oil Pollution Damage resulting from Exploration for and Exploitation of Seabed Mineral Resources, known for its acronym in English as CLEE. The Conference was attended by government representatives from Belgium, Denmark, France, West Germany, Ireland, the Netherlands, Norway, Sweden and the UK.

The Convention applies to pollution damages caused by contamination from the escape or discharge of oil from an installation, meaning any well or other facility, whether fixed or mobile, used for the purpose of exploring for, producing, treating, storing, transmitting or regaining control of the flow of crude oil from the seabed and its subsoil (22).

According to the Convention, the operator of the installation shall be liable for any pollution damage resulting from an incident, which occurrs beyond the coastal low-water line at an installation under the jurisdiction of a Contracting State (23). The operator shall be entitled to limit its liability to the amount of 40 millions Special Drawing Rights (SDR). The operator is required to maintain insurance coverage or other financial security to cover his liability; and claims for compensation for pollution damage may be brought directly against the insurer or other person providing financial security for the operator's liability for pollution damage.

The Convention provides a single level of compensation. A second tier, as the one provided by the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage (1971 Fund Convention), which is fed by contributions from the oil industry, was not foreseen (24).

The CLEE has not been ratified by any State, nor entered into force. Among the causes for its failure, it is said that it was due to lack of a competent international organization to serve as Secretary of the Convention and the last minute inclusion of an article reserving States the ability to set higher liability limits or no limits, which could result in a possible exposure to greater liability limits than originally planned for the industry (25).

5. OFFSHORE POLLUTION LIABILITY AGREEMENT

The Offshore Pollution Liability Agreement also known as OPOL, is a voluntary strict liability compensation scheme established among some of the major oil companies in the mid-70s, and which has been amended several times (26).

OPOL is intended to encourage prompt remedial action by operators of offshore facilities in the event of a spill.

OPOL applies whenever a damage occurs in a "designated State", meaning by this the United Kingdom of Great Britain, the Netherlands, the Federal republic of Germany, France, Greenland, the Republic of Ireland, Norway, the Isle of Man and the Faroe Islands (27).

In the original agreement, operators had the right to limit their liability up to US$ 60 million per incident. Today that amount has been increased up to US$ 250 million per incident (28).

Any person or public authority affected by the accident has the right to bring an action against the operator of the facility. For the purposes of the agreement, the operator must maintain evidence of financial responsibility to fulfil its obligations under the Agreement. Evidence of financial responsibility must be maintained throughout the period when operations are taking place.

The Agreement is governed by English law, and any disputes arising in connection therewith, shall be submitted to arbitration in London (29).

OPOL's main idea was to implement a compensation scheme for offshore operations of the oil industry, following the system adopted by the 1969 International Convention on Civil Liability for Oil Pollution Damage (1969 Civil Liability Convention), while the international community adopted a convention on the subject. But since it has not been possible to establish such an international regime, this industry agreement has remained in plceover time, and has been adapted to the new realities gaining importance.

6. INDONESIA'S PROPOSAL

In 2010, the Indonesian delegation brought to the attention of the Marine Environment Protection Committee (known by its acronym as MEPC) of the IMO, trans-border pollution damages to Indonesia caused by a well blow-out at the Montara offshore oil platform located in the waters of Australia, the action taken by both Australia and Indonesia to combat the pollution, and the proposal to establish a trust fund to compensate for damages caused by similar incidents in the future (30).
After talks with Secretary of the IMO, the proposal was taken to the Legal Committee, where the Indonesian delegation requested the Committee to add a new item to address liability and compensation for oil pollution damage resulting from offshore oil exploration and exploitation in the agenda of the Committee (31).
At the beginning of the discussions, most delegations were in favor of the inclusion of the new item on the Committee's agenda (32). However, two questions unfolded at the same time: Is the creation of a system of this nature within the competence of IMO?. And if so, can this item be included in the 5-year Strategic Plan of this Organization?.
As a result of these discussions, the Committee recommended the IMO Council to review the Strategic Directive 7.2 to include within the attributions of the Organization "... will focus on reducing and eliminating any adverse impact caused by ships or by offshore oil exploration and exploitation activities on the environment ... "LEG 99-13-1. However, this proposal did not meet the Council's approval, which in turn ordered the Committee to re-examine it at its April 2010 meeting.
During this session some delegations, including the Brazilians, expressed that the intended proposal to revise the directive fell outside IMO's sphere of competence, and that Article 1 of the IMO Convention confines the Organization's pollution prevention activities to vessel-source pollution, that the proposal to amend SD 7.2 does not clarify which authority would regulate and control the offshore oil exploration activities, that IMO could not duplicate, for the offshore oil sector, the liability rules applicable to oil leaks caused by ships, and that the issue of transboundary pollution damage arising from offshore oil activities would be better addressed through bilateral or regional agreements (33).
Other delegations were in favor of advancing the work for a new Convention. Among their arguments were the following: All States have an obligation to protect the marine environment, there is a compelling need to take measures to address this issue, some existing liability regimes can be used as models to develop a convention on the subject, the best practices from national and regional instruments can be used as a reference to develop a workable and achievable international instrument, the IMO is the most appropriate forum to address this issue due to its characteristics and expertise, UNCLOS does not preclude any IMO action, IMO has in the past taken on issues which were not explicitly mentioned in the IMO Convention, such as piracy and maritime security, including the Protocol for the Suppression of Unlawful Acts against the Safety of Fixed Platforms Located on the Continental Shelf of 1988 (34).
In view of the diverse stand taken by several attending delegations, the Committee agreed to inform the Council of its intention to further analyze the liability and compensation issue connected with transboundary pollution damages resulting from offshore exploration and exploitation activities, with the aim of developing guidance to assist States in pursuing bilateral or regional agreements, given that there was not a compelling need to develop an international convention on the subject. In the meantime, the Indonesian delegation informed the Committee that it would continue coordinating an informal consultative group for further discussion of the issue at stake (35).

7. REGIONAL CONVENTIONS ON THE PROTECTION OF THE MARINE ENVIRONMENT CONTAINING PROVISIONS RELATING TO ACTIVITIES IN THE SEABED

There are several conventions on the regional level, especially among some European countries, to regulate pollution from activities in the marine

environment that include among the sources of pollution those derived from seabed activities. Among them are:
The 1992 Convention for the Protection of the Marine Environment of the North-East Atlantic, known as OSPAR for its acronym in English, contains rules for the prevention and elimination of pollution of the marine environment and is primarily aimed at safeguarding human health, preserving marine ecosystems and when practicable, restoring marine areas that have been adversely affected (36). The Convention establishes a Commission whose main duty is to supervise the implementation of the Convention (37).
OSPAR contains Annex III, On the Prevention and Elimination of Pollution from Offshore Sources, which prohibits any dumping of waste from the offshore installations and states that the use on, or the discharge or emission from, offshore sources of substances which may reach and affect the maritime area shall be strictly subject to authorization or regulation by the competent authorities (38).
Meanwhile, the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean Sea against Pollution, known as the Barcelona Convention, obliges the Contracting Parties to take appropriate measures to prevent, reduce, combat and to the fullest extent possible eliminate pollution from the Mediterranean Sea.
The Convention contains The Protocol for the Protection of the Mediterranean Sea against Pollution resulting from Exploration and Exploitation of the Continental Shelf and the Seabed and its Subsoil (Mediterranean Offshore Protocol). The Protocol is especially important given the high likelihood of transboundary environmental pollution in the event of an accident in a semi-enclosed sea like the Mediterranean.
The Mediterranean Offshore Protocol contains rules relating to the granting of authorizations, removal of abandoned and obsolete facilities, utilization and disposal of hazardous substances, the safety of the facilities, and the development of contingency plans and pollution monitoring.
In terms of liabilities and compensation, it includes the obligation of the Parties to formulate and adopt appropriate rules and procedures for the determination of liability and compensation for damages. Pending development of such procedures, the Parties shall take all necessary measures to ensure that liability for damage caused by activities is imposed on operators, and that they shall be required to pay prompt and adequate compensation, and to make sure all necessary measures are taken so that operators maintain insurance coverage to ensure compensation for damages caused by the activities covered by the Protocol.
Ultimately, none of these instruments sets the liability and compensation amount to be paid out in the event of damages caused by discharges and emissions resulting from seabed activities.

8. CONCLUSIONS AND THE PROPOSED WAY

UNCLOS imposes the obligation on States to protect and preserve the marine environment through the establishment of standards for the prevention, control and elimination of pollution of the seabed and its subsoil and to establish liability and compensation schemes to ensure effective and prompt compensation for victims and repairs to the marine environment damage.
Unfortunately there is no international agreement regulating oil pollution damage resulting from the activities of exploration and exploitation of the seabed, and the latest proposal to accomplish one was not supported by IMO's countries, therefore most rules aimed at regulating the offshore industry continue to be scattered in several different conventions, and none of them focuses exclusively on the regime of liability and compensation for oil pollution damage.
However, several initiatives have been presented in order to achieve a tighter and uniform regulation for offshore industry activities. At the international level, the IMO Legal Committee will discuss at its next meeting the development of guidelines to assist States to conclude bilateral or regional agreements, while the Delegation of Indonesia continues to lead an informal consultative group working in the field.
At the regional level, there have been several initiatives in relation to the OSPAR Convention. The OSPAR Commission has been developing the so-called The North-East Atlantic Environment Strategy, which included a chapter on the Offshore Oil and Gas Industry. This strategy provides for the long-term reduction of the permitted oil discharge

levels, as well as the requirement to substitute some chemicals agents for cleaner ones. Unfortunately, nothing has been proposed in relation to the introduction of rules of liability and compensation for damages (39).
In addition, some organizations, such as the European Union have begun to take steps towards adopting changes in national legislation. In this sense, the Union decided to join the Mediterranean Offshore Protocol of the Barcelona Convention (40). The Protocol was adopted in 1994, but it was not until 2011 when it received the necessary ratifications for its entry into force. This adhesion is important as it allows EU countries to work together with other countries that are part of the Convention.
While UNCLOS States celebrate the anniversary commemorating its thirty years, they must find ways to fulfill their obligations under the Convention and to guarantee the realization of one of its most important objectives, the preservation of the marine environment.

REFERENCES

1.Rochette, J, “Towards an international regulation of offshore oil exploitation”, Report of the Experts Workshops held at the Paris Oceanographic Institute on 30 March 2012, pp. 3-13 available at: http://www.iddri.org/Publiucations/Collections/Idees-pour-le-debat/WP1512_JR_workshop%20offshore.pdf

2. Doc. LEG 97/14/1.

3.Available at: http://www.bp.com/genericarticle.do?categoryId=2012968&contentId=7074324

4. Available at: http://www.au.pttep.com/media/20778/government%20of%20indonesia%20compensation%20claim.pdf

5.Art. 192.

6.Art. 193.

7.Art. 207.

8.Art. 208.

9.Art. 209.

10.Art. 210.

11.Art. 211.

12.Art. 212.

13.Art. 208, par. 1,2 & 3.

14. Art. 208, par. 5..

15.Law of the Sea Bulletin, Nr. 56, p. 79.

16.Art. 235, par. 1.

17.Art. 235, par. 2.

18.Art. 235, par. 3.

19.Kashubsky, M., “Marine Pollution from the Offshore Oil and Gas Industry: Review of Major Conventions and Russian Law (Part I)” in: Maritime Studies, November-December 2006, pp. 1-11.

20.Doc. LEG 98/13.

21.Doc. LEG 98/13.

22.Art. 1.

23.Art. 3.

24.Doc. LEG 98/3.

25.Shaw, R., "Offshore Craft and Structures", Report of the Chairman, in: CMI Annuaire 1997, pp. 171 -178.

26. Last amendment was done the 4th of July 2012.

27.Guidelines for Claimants, available at http://www.opol.org.uk/downloads/opol-guidelines-oct10.pdf

28.Clause IV, A.

29.Clause XII.

30.Doc. MEPC 60/22, p. 7.

31.Doc. LEG 97/14/1.

32.Doc. LEG 98/13/1.

33.Doc. LEG 99/13/1.

34.Doc. LEG 99/14.

35.Doc. LEG 99/13/2 & Doc. LEG 99/13/3.

36.Art. 2, par. 1 (a).

37.Art. 10.

38.Art. 4 & 5.

39. The North-East Atlantic Environment Strategy, OSPAR Commission, Agreement 2010-03 available at http://www.ospar.org/html_documents/ospar/html/10-03e_nea_environment_strategy.pdf

40. 9.1.2013, Diario Oficial de la Unión Europea, L 4/13.

BIOGRAPHIES

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From 2005 to 2009 she worked at the International Affairs Office of the Venezuelan Maritime Administration (INEA) in Caracas, where she reached the position of Head of the International Office and represented her country in several international meetings at IMO and the IOPC Funds in London. During those years she was elected as President (ad-honorem) of the Advisory Committee on the Law of the Sea and Maritime Law by the Secretary of Transportation's Office of Venezuela; in order to produce maritime legislation proposals to be presented to the Secretary and subsequently to the Venezuelan Parliament.

She started her academic career in 2005 as a part-time Professor at the Universidad Nacional Experimental Marítima del Caribe (Venezuelan Maritime University), where she taught several courses dealing with Law of the Sea, Transport of Goods by Sea, and IMO Conventions, supervised master dissertations and acted as referee for several publications. She was also invited to teach at the Venezuelan Diplomatic Academy.

She joined WMU as an Assistant Professor in 2011. She currently teaches the following courses: Maritime Law & International Maritime Conventions, Law of the Sea and Maritime Security, Law and Policy related to the Marine Environment, Principles of Maritime Administration and Management, and Maritime Commercial Law. She is also in charge of organizing the annual Moot Court Competition for the Master of Science Law & Policy Specialization and serves as a member of the Professional Development Course Advisory Committee.

Her main areas of research are Law of the Sea, pollution liabilities, seafarer's issues, international maritime conventions, and the IOPC Funds.

THE ELEMENTS OF PROTECTION OF THE MARINE ENVIRONMENT IN GENERAL AVERAGE AS A TYPE OF CLAIM IN MARINE INSURANCE

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ABSTRACT

General average as a type of claim in marine insurance is usual for the hull & machinery and cargo insurance. The aim of a general average act is to protect the property involved in a marine adventure, and therefore it benefits the insurers of that property. However, in case of a marine accident it is sometimes difficult to separate the measures and expenses undertaken to protect the property involved in a marine adventure and those that contribute to the prevention or minimization of marine pollution. Often, the sacrifices and expenditures admitted in general average contribute to the protection of environment. Therefore, the measures of pollution prevention automatically contributing to the avoidance of the shipowner's pollution liabilities enter the domain of the marine property insurance, although by their nature they should fall under the typical P&I cover. The various sorts of measures and expenditures admitted in general average as a type of claim in hull & machinery and cargo insurance are analysed whilst the distinction and the possible overlap in relation to P&I insurance, i. e. the insurance of shipowner's liability, is clarified. The analysis and the discussion are based on the concepts adopted by the York-Antwerp Rules in the context of the standard clauses for the insurance of ships and cargo, i. e. the Institute Clauses, and the usual rules of the P&I clubs.

KEY WORDS
general average, marine insurance, marine pollution, protection of marine environment

1. INTRODUCTION

"There is a general average act when, and only when, any extraordinary sacrifice or expenditure is intentionally and reasonably made or incurred for the common safety for the purpose of preserving from peril the property involved in a common maritime adventure. General average sacrifices and expenditures shall be borne by the different contributing interests [...]"[1]

A general average loss as a type of marine insurance claim is a loss caused by or directly consequential on a general average act. It includes a general average expenditure as well as a general average sacrifice. Marine insurance normally covers the insured's liability for any general average contribution. Usually, hull insurance covers the

1 York-Antwerp Rules (hereinafter YAP) 1994 and 2004, Rule A; YAP 1974, Rules A and B.

ship's contribution to general average,[2] whilst cargo insurance pays for the respective cargo contribution thereto.[3] Hull and cargo insurance policies cover the risk of liability for general average contribution provided that the general average act was undertaken to prevent or minimize a loss otherwise covered by the hull or cargo insurance respectively. Therefore, general average originally is not a P&I risk. It is a risk covered by the standard terms of marine property insurance policies, because the aim of a general average act is to protect the property involved in the marine adventure, and therefore it benefits the insurers of that property. P&I insurance exceptionally covers any part of the ship's contribution to general average which the shipowner cannot recover from the hull policy[4] and any cargo contributions to general average that the insured shipowner cannot legally recover from the cargo interests, solely by reason of a breach of the contract of carriage.[5]

However, in the complex circumstances of a marine casualty, it is sometimes difficult to separate the measures and expenses undertaken to protect the property involved in a marine adventure from those that contribute to the prevention or minimization of marine pollution.

2. GENERAL AVERAGE EXPENDITURES AND SACRIFICES CONTRIBUTING TO THE PROTECTION OF MARINE ENVIRONMENT

Often, the sacrifices and expenditures admitted in general average also contribute to the protection of environment. The expenses made in connection with the avoidance of pollution are frequently undertaken in the common interest for the safety of the marine adventure, and are admitted in general average.[6] Therefore, the measures of pollution prevention automatically contributing to the avoidance of the shipowner's pollution liabilities enter the domain of the marine property insurance, although by their nature they should fall under the typical P&I cover.

An example of such an overlap is certainly the salvage award which may be fixed by taking into account inter alia the criterion of the salvors' skill and efforts in preventing or minimizing damage to the environment.[7] According to YAP 1974 and 1994 "[e]xpenditure incurred by the parties to the adventure in the nature of salvage, whether under contract or otherwise, shall be allowed in general average provided that the salvage operations were carried out for the purpose of preserving from peril the property involved in the common maritime adventure."[8] YAP 1994 further clarifies: "Expenditure allowed in general average shall include any salvage remuneration in which the skill and efforts of the salvors in preventing or minimising damage to the environment such as is referred to in Art.13 paragraph 1(b) of the International Convention on Salvage, 1989 have been taken into account."[9]

There are other examples of general average expenditures and sacrifices that contribute to the protection of marine environment. Let us imagine a tanker carrying oil stranded at a location where a great storm is expected to arrive shortly, and without any prospect of getting a timely assistance from a salvor. The ship's master decides to jettison a part of the cargo of oil to lighten the ship and refloat the ship before the storm arrives, thereby avoiding a far greater oil spill of which there is an imminent threat.

According to YAP 1974, the loss of cargo sacrificed by the jettison for the purpose of preserving from peril the ship and the rest of the cargo of oil involved in a common maritime adventure would

2 See e.g. Institute Time Clauses – Hulls 1/10/1983 (hereinafter ITCH 1983), cl. 11 General Average and Salvage; International Hull Clauses 2003 (hereinafter IHC 2003), cl. 8 General Average and Salvage.

3 See e.g. Institute Cargo Clauses (A) 1/1/1982 (hereinafter ICC 1982), cl. 2 and Institute Cargo Clauses (A) 1/1/2009, cl. 2.

4 See e.g. *UK P&I Club, Rules & Bye-laws 2013*, Rule 2, section 20 Ship's proportion to general average, whereby P&I covers any shipowner's excess liability for the ship's proportion in general average unrecoverable from the hull policy due to the higher contributory value than the insured value of the ship.

5 See e.g. *UK P&I Club, Rules & Bye-laws 2013*, Rule 2, section 19 Unrecoverable general average contributions.

6 Joint Hull Committee of the LMA and IUA, *Environmental Salvage Awards / General Average*, circular JH2008/001, 17th January 2008.

7 See International Convention on Salvage, London, 1989, Art. 13. 1. b).

8 YAP 1974, Rule VI; YAP 1994, Rule VI a).

9 YAP 1994, Rule VI a).

be admitted as a general average sacrifice. Moreover, all the direct consequences of the jettison (general average act) would also be admitted as general average, including any costs that the shipowner would be legally obliged to pay on the basis of his liability for pollution caused by the jettison.10

When CMI revised the YAP in Sidney in 1994 they excluded such pollution liability from general average, perceiving it as a typical P&I risk. The revised Rule C of the YAP 1994 reads as follows: "Only such losses, damages or expenses which are the direct consequence of the general average act shall be allowed as general average. In no case shall there be any allowance in general average for losses, damages or expenses incurred in respect of damage to the environment or in consequence of the escape or release of pollutant substances from the property involved in the common maritime adventure. [...]"

However, it was realised that frequently expenses relating to pollution avoidance, as opposed to liability, have to be incurred for the common safety, and it was felt that these should not be excluded from general average.11 Rule XI d) of the YAP 1994 provides:

"The cost of measures undertaken to prevent or minimise damage to the environment shall be allowed in General Average when incurred in any or all of the following circumstances:

- as part of an operation performed for the common safety which, had it been undertaken by a party outside the common maritime adventure, would have entitled such party to a salvage reward;
- as a condition of entry into or departure from any port or place in the circumstances described in Rule X a);
- as a condition of remaining at any port or place in the circumstances prescribed in Rule XI b) provided that when there is an actual escape or release of pollutant substances the cost of any additional measures required on that account to prevent or minimise pollution or environmental damage shall not be allowed as General Average;
- (iv) necessarily in connection with the discharging, storing or reloading of cargo whenever the cost of those operations is admissible as general average."

Further, Rule X a) of the YAP 1994 provides: "When a ship shall have entered a port or place of refuge or shall have returned to her port or place of loading in consequence of accident, sacrifice or other extraordinary circumstances which render that necessary for the common safety, the expenses of entering such port or place shall be admitted as general average; and when she shall have sailed thence with her original cargo, or a part of it, the corresponding expenses of leaving such port or place of refuge consequent upon such entry or return shall likewise be admitted as general average. When a ship is at any port or place of refuge and is necessarily removed to another port or place because repairs cannot be carried out in the first port or place, the provisions of this Rule shall be applied to the second port or place as if it were a port or place of refuge and the cost of such removal including temporary repairs and towage shall be admitted as general average. [...]"

In practice, therefore, one can perceive various measures undertaken for the purpose of preventing or minimizing damage to the environment, which are allowable in general average. Depending on the actual purpose of those measures, the costs connected therewith can be classified as:12

- the necessary costs directly related to the marine accident,13

10 YAP 1974, Rule C: "[…] such losses, damages or expenses which are the direct consequence of the general average act shall be allowed as general average. […]"

11 JH2008/001, op. cit. at fn. 6.

12 For a more detailed analysis see C. De La Rue – C. B. Anderson, *Shipping and the Environment: Law and Practice*, Informa, London, 2009, pp. 758-768.

13 E. g. as a consequence of a marine accident a ship suffers damage to the hull below the waterline, which presents a danger for the safety of navigation, i.e. for the common safety of the marine adventure. At the same time, the damage to the hull also presents a threat of pollution from the ship's bunkers. In such a situation, sooner or later it will be absolutely necessary to pump the bunker oil out of the ship's tanks, otherwise the ship will not be allowed in the dock for repairs. Therefore, if those measures are taken beforehand for the purpose of preventing pollution, but they would anyway have to

- the cleaning costs,14
- the costs incurred as a part of the operations undertaken for the common safety of the marine adventure,15
- the costs that had to be incurred as a condition for the entry in or departure from the port or place of refuge,16
- the costs that had to be incurred as a condition for remaining in the port or place of refuge,17
- the costs necessarily connected with the unloading, storage or transhipment of cargo.18

It follows that according to the YAP 1994 and YAP 2004 the expenses related to the protection of environment are allowed as general average only when they are connected with the measures of preventing and minimizing pollution or other damage to the environment.

On the other hand, when the YAP 1974 apply and the hull insurance policy is based on ITCH 1983, the hull insurers shall be exposed to the risk of the shipowner's liability for pollution under the general average clause, including liability for the cleaning costs when they are directly consequential upon the general average act (arg. ITCH 1983, cl. 11 in connection with YAP 1974, Rules A19 and C20).

If the YAP 1974 are applicable and the hull insurance is on the basis of ITCH 199521 or IHC

be carried out in the port of refuge as a condition for the temporary repairs and the continuation of the voyage, then those measures would be allowable as general average (arg. YAP 1994, Rule X d) in connection with Rule XIV on temporary repairs). On the contrary, the costs of mobilisation of the personnel, fleet and equipment for the coastal state's intervention in case of pollution and in relation with the entry of the damaged ship in the port of refuge would not be admitted as general average. The costs of these measures would be regarded as a pure P&I risk, even if they were parallel with the salvage operations.

14 YAP 1994, Rule XI d) iii. excludes cleaning costs from general average, but only when they are related to additional measures undertaken to prevent or minimise pollution or environmental damage when there is an actual escape or release of pollutant substances. However, any reasonable costs of mobilisation of personnel and equipment for the cleaning of a potential pollution and the costs of their maintenance in a standby position during the salvage operations are allowable in general average as costs of preventive and precautionary measures undertaken for the common safety of the maritime adventure.

15 For example, a ship needs to be refloated. It is in such a condition that it does not present a threat of pollution, but it is certain that during refloating it will sustain additional damage to the hull which could result in damage to the tanks and the potential bunker oil spill. Therefore, the bunker oil is pumped out of the tanks as a part of the refloating operations which are not undertaken as salvage, but under commercial terms at the shipowner's expense. It is also possible that the refloating operations be undertaken as salvage, but that the pumping of bunker oil is carried out at the sole expense of the shipowner. In both cases such shipowner's costs of preventive measures are allowable as general average. Further examples of such costs are also all those expenses that the shipowner incurs in respect of the measures ordered by the coastal state as compulsory for the continuation of the salvage operations (e.g. the coastal state forbids further salvage operations until the protective booms and skimmers be deployed to contain and concentrate the floating oil and thereby prevent any further spread of the spill). Generally, every shipowner's expense for the engagement of professional salvors under commercial terms excluding the application of the rules on salvage, but carried out for the common safety of the property involved in the maritime adventure is allowable as general average (YAP 1994, Rule X. d) i.).

16 Examples of such measures ordered by the coastal state as a condition for entry in or departure from the port or place of refuge are emptying of bunker oil, unloading or transhipment of dangerous cargo, deployment of protective booms, compulsory standby tugs, costs of bank guarantees or similar financial security for the potential pollution claims, etc.

17 E. g. coastal state orders temporary repairs and deployment of protective booms as a condition for remaining in the port or place of refuge. It is the shipowner's expense allowable as general average (YAP 1994, Rule XI d) iii.).

18 E. g. shipowner puts another ship from his fleet at disposal for transhipment of the oil cargo prior to the refloating of the grounded tanker. Both ships during transhipment are surrounded by the protective booms preventing the spread of any potential oil spill. All the related expenses (engagement of the shipowner's second ship, protective booms) are the shipowner's expenses allowable as general average which at the same time represent the costs of preventive measures against pollution.

19 See fn. 1.

20 See fn. 10.

21 ITCH 1995, cl. 10.5 reads as follows: "No claim under this Clause 10 shall in any case be allowed for or in respect of

10.5.1 [...]

10.5.2 expenses or liabilities incurred in respect of damage to the environment, or the threat of such damage, or

2003[22], the shipowner's liability for pollution and cleaning costs is expressly excluded from the insurance coverage. In such a case the hull insurance policy shall cover only the costs of preventing and minimizing pollution allowed as general average. The shipowner's liability for damage caused by pollution including the cleaning costs shall be partly calculated in the shipowner's contribution to general average, but it shall remain outside the scope of the hull insurance coverage, i.e. at the sole risk of the shipowner.[23] The remaining part of the shipowner's pollution liability and/or the cleaning costs that in general average falls on the cargo interests shall be recoverable through cargo contributions to general average. If the cargo is insured according to the most frequently used ICC 1982 or on the basis of ICC 2009, then the cargo insurers shall cover such cargo contribution to general average.[24]

3. CONCLUSIONS

Traditionally, the shipowner's liability for pollution and all his expenses related therewith are covered by his P&I insurance and are in principle excluded from hull and cargo insurance as marine property insurances. However, there are certain exceptions to such division of risks amongst the marine insurers. The exceptions arise from the fact that certain measures and expenses carried out for the purpose of saving the property involved in the maritime adventure also contribute to the protection of marine environment, i.e. to the preventing or minimizing the risk of pollution in case of a marine accident.

Since it is sometimes difficult to strictly separate the expenses benefiting the marine property in danger (ship, cargo, freight) from those that are related to the prevention or averting of pollution, there is some overlap amongst the hull, cargo and P&I insurance which is resolved through the special rules of general average.

By recognising the fact that certain expenditures related to the avoidance or prevention of pollution are at the same time incurred for the common safety of the maritime adventure or as a direct consequence thereof, the common rules on general average reflected in the YAP allow for such expenditures to be treated as general average.

In this article we have analysed some concrete examples of the elements of the protection of marine environment in general average as a type of claim in marine insurance. These examples show that the practice of marine insurance deals with the specific problems of pollution risks by relying on the traditional concepts of maritime law but at the same time ensuring the adequate flexibility and the adaptation to the real demands of the maritime industry and public interests.

REFERENCES

1.York-Antwerp Rules 1974, 1994 and 2004

2.Institute Time Clauses – Hulls 1/10/1983

3.International Hull Clauses 1/11/2003

4.Institute Cargo Clauses 1/1/1982 and 1/1/2009

5.UK P&I Club, Rules & Bye-laws 2013

6.Joint Hull Committee of the LMA and IUA, Environmental Salvage Awards / General Average, circular JH2008/001, 17th January 2008

7.International Convention on Salvage, London, 1989

8.C. De La Rue – C. B. Anderson, Shipping and the Environment: Law and Practice, Informa, London, 2009

9.F. D. Rose, General Average: Law and Practice, LLP, London, 1997

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as a consequence of the escape or release of pollutant substances from the vessel, or the threat of such escape or release."

22 IHC 2003, cl. 8.5. is equal to the ITCH 1995, cl. 10.5 cited in fn. 21.

23 It is likely that P&I insurance shall cover such part of the shipowner's liability.

24 ICC 1982, cl. 2 General Average Clause reads as follows: "This insurance covers general average and salvage charges, adjusted or determined according to the contract of affreightment and/or the governing law and practice, incurred to avoid or in connection with the avoidance of loss [...]". Equal clause is contained in ICC 2009, cl. 2.

BIOGRAPHIES

Dr. Adriana V. Padovan graduated law in 2002 at the Faculty of Law in Zagreb, where she also obtained her Ph. D. in 2011. She graduated at the IMO International Maritime Law Institute, Malta (IMO IMLI) in 2003, where she obtained her LL. M. degree. Currently, she works as a senior assistant at the Adriatic Institute of the Croatian Academy of Sciences and Arts. Dr. Padovan had been employed by Croatia Insurance Co. Plc. (Zagreb) from 2003 until 2010, at the Head office - Transport and credit insurance department, where she was responsible for the marine and aviation hull and liability insurance business. In the academic year 2007/2008 she was engaged as the assistant lecturer at IMO IMLI. She occasionally participates as a visiting lecturer in the undergraduate programme of the Chair of Maritime and Transport Law of the Faculty of Law in Zagreb. Dr. Padovan passed the Croatian Bar exam in 2006, after having completed an internship at the Municipal Court in Zagreb. She is regularly engaged by the Croatian Insurance Bureau to hold educational seminars in transport insurance and is a mediator at the Centre for Mediation of the Croatian Insurance Bureau. Dr. Padovan participates on the Professional committee for the revision of the Croatian Maritime Code. She has published a dozen articles and scientific papers, and is the author of the book "Uloga pomorskog osiguranja u zaštiti morskog okoliša od onečišćenja s brodova" published by the Croatian Academy of Sciences and Arts in 2012.

NEW INSTITUTE CLAUSES FOR CARGO INSURANCE, INSTITUTE CARGO CLAUSES, 2009.

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ABSTRACT

The new institute clauses for cargo insurance were published in 2009. at London's maritime insurance market under the name of the Institute Cargo Clauses, 2009. Given the fact that the institute cargo clauses are widely used in the world's commercial practice, particularly as they are unquestioningly applied in Croatian insurance market, it's preferable to get acquainted, from business and professional point of view, with the changes brought by the new revision. New clauses may be assessed as enhanced in respect to the I.C.C., 1982. as they adequately take into account changes in modern transportation system as well as the need for their language and terminology update.

KEY WORDS
Institute of London Underwriters, International Underwriting Association, Institute Cargo Clauses, marine insurance, cargo insurance, goods in transit.

1. INTRODUCITION

Institute Cargo Clauses are widely used standard terms for insuring cargo, goods in transit. In order to better meet the practice needs it's common to periodically review these clauses. The latest revision was in 2009.
The principal reasons for the revision were the changes in modern transportation system, the emergence of new risks, particularly of terrorism, then the changes in market practice made the redefinition of the scope of cover necessary, particularly in relation to the duration of the insurance because the concept of insurance ″from warehouse to warehouse ″ proved inadequate to modern needs, as well as the need for language and terminology update.
Given the fact that the Institute Cargo Clauses (I.C.C.) are widely used in the world's commercial practice, particularly as they are unquestioningly applied in Croatian insurance market, it's preferable to get acquainted with the changes brought by the new revision.
Paper begins with a brief description of the Institute Clauses most important features after which are commented those clauses that sustained not only terminological but also conceptual changes.

2. THE MARINE CLAUSES ON CARGO

Institute Clauses are sets of provisions that regulate the relationship between contracting parties. Clauses acceptance makes them an integral part of the contract. Institute of London Underwriters issued these provisions. It is an association of independent British maritime insurers, formed in 1884th. In 1999. Institute. merged with the association Limra and continued to operate under the new name International Underwriting Association (IUA).

As in the previous version of 1982., there are three sets of clauses for insuring maritime and transportation risks and special sets of clauses for insuring the risk of war and strike. New terms carry the same names as the previous ones: Institute Cargo Clauses (A), Institute Cargo Clauses (B), Institute Cargo Clauses (C). They are used for insuring cargo in maritime and multimodal transport.

The scope of the cover differs in three set of Institute Cargo Clauses (A), (B), (C) and is principally defined in Clause 1., described in margin as the Risk Clause. The widest form of cover is provided by the (A) Clauses, and the narrowest cover by the (C) Clauses. Apart from this, the three sets of clauses differ only in two other respects. The (B) and (C) Clauses contain one exclusion more than (A) Clauses in respect of deliberate damage to or destruction of subject-matter insured (Clause 4.7.). And, the scope of the War Exclusion Clause (Clause 6.) is narrower in (B) and (C) Clauses than in (A) Clauses where the risk of piracy is retained within the scope of the (A) Clause, and excluded in (B) and (C) Clauses. So the terms (A), (B) and (C) are identical, apart from these three differences.

3. INSTITUTE CARGO CLAUSES REVISON 2009.

Hereafter follows a comment of the I.C.C. provisions that sustained, except terminological also conceptual, content changes.

3.1. Risks Covered

Insured risks are set out in three clauses: Risks Clause, General Average Clause, Both to Blame Collision Clause. No substantial changes were made to these clauses, the text is amended with the intent of clarity, but basically its content and effect remains the same.

Risks Clause (clause 1.) setting out coverage remains intact in all three sets of clauses I.C.C. (A), (B) and (C). According to the Risk Clause this insurance covers all risks of loss of, or damage to the subject-matter insured except as excluded by the provisions of Clauses 4, 5 6 and 7 below. 1982. phrase ″except as provided″ is replaced by ″except as excluded″ which gives a clearer indication that the clauses referred to are exclusions.

3.2. Insufficiency or unsuitability of packing

According to the clause 4.3. this insurance in no case shall cover loss, damage or expense caused by insufficiency or unsuitability of packing or preparation of the subject-matter insured to withstand the ordinary incidents of the insured transit, where such packing or preparation is carried out by the Assured or their employees or prior to the attachment of this insurance.

Insufficiency or unsuitability of packing is also considered as a defect, so the damage by this cause is excluded from the insurance. This exclusion will apply when the packing or preparation is carried out by the Assured or their employees or when the packing or preparation is carried out prior to attachment of the risk.

The new clause sets out the standard for assessment of any insufficiency or unsuitability. The packing must be sufficient ″to withstand the ordinary incidents of the insured transit″. The insurance does not cover damage that occurred during the normal, ordinary course of transportation, and is the result of inadequate packing. Clause does not explain what is meant by unsuitability of packing. Type of packing varies according to the type of goods being transported, and must be performed in accordance with the custom of the trade or merchandise.

Clause states that the wording ″packing″ will, for the purpose of these Clauses be deemed to include stowage in a container. The obscure term ″lift-van″ no longer appears and the rather archaic term ″servants″ is replaced by the word ″employees″, with additional clarification that independent contractors are not to be considered as ″employees″. This exclusion is not found in the MIA nor clauses 1963. It's for the first time introduces in the I.C.C. 1982.

3.3. Delay

In clause 4.5.is said that this insurance in no case shall cover loss damage or expense caused by delay, even though the delay be caused by a risk insured against.

This exclusion is found in all three sets of clauses I.C.C., MIA and Pomorski zakonik (PZ). According to MIA, 55. t. 2b., unless the policy otherwise provides, the insurer on ship or goods is not liable for any loss proximately caused by delay, although the delay be caused by a peril insured against. According to PZ, inherent vice or inherent nature damages are excluded from insurance when the damage was due to the delay of transport (čl. 733. st. 2.). These provisions are of dispositive legal nature.

Exclusion remains the same as in I.C.C. 1982., except that the used phrase for the emergence of damage no longer reads like in the MIA ˝proximately caused by delay˝ but ˝ caused by delay˝. Leaving criteria˝proximately caused˝ obviously means that, in the application of the new conditions will be observed the extent to which delay was ˝predominant cause in effect˝ rather than in terms of the cause witch is in time closest to the damage.[1]

Opinions were that wording ˝proximately˝ may cause confusion in interpretation. The exclusion relates to physical as well as financial losses. Cause is not of relevance.[2]

3.4. Insolvency or financial default

Clause 4.6. says that this insurance in no case shall cover loss, damage or expense caused by insolvency or financial default of the owners, charterers or operators of the vessel where, at the time of loading of the subject-matter insured on board the vessel, the Assured are aware, or in the ordinary course of business should be aware that such insolvency or financial default could prevent the normal prosecution of the voyage.

Exclusion applies only when at the time of loading, the Assured was aware or should have been aware that the voyage might be prevented by the financial difficulties of the carrier. The purpose of this exclusion is to drive the Assured to use appropriate care when choosing a carrier. The Assured must exercise the common sense standards of a prudent businessman.

This exclusion shall not apply where the contract of insurance has been assigned to the party. Exclusion has been reduced in scope so that the innocent Assured or assignee is still protected by the policy in the event of financial default or insolvency bringing the voyage to an end.

3.5. Atomic or nuclear fission and /or fusion

In clause 4.7. is said that this insurance in no case shall cover loss, damage or expense directly or indirectly caused by or arising from the use of any weapon or device employing atomic or nuclear fission and/or fusion or other like reaction or radioactive force or matter.

This clause was first introduced in the Institute Cargo Clauses 1982. with the aim of excluding from insurance any use of nuclear weapons, as the use of nuclear weapons in the context of war risk was, and is now excluded by war risks exclusion clause.

The two changes were implemented in the new revision. First, the causal link between the adverse event and the loss has been extended. So, ˝arising from˝ is supplemented with ˝directly or indirectly caused by or arising from˝. And second, ˝weapon of war˝ becomes the wider ˝any weapon or device˝ which would include bombs and also home made bombs, the so called ˝dirty bombs˝ that are not used exclusively in the war but are typical for the terrorist attacks. This exclusion is limited to events with nuclear weapons and devices and is not intended to exclude other nuclear events or accidents such as those that may arise, for example, from nuclear power plants.

Broader application of this clause was achieved by these amendments.

3.6. Unseaworthiness and unfitness

There are two ways in which the cargo insurers control whether the ship, that will carry the subject-matter insured, is seaworthy. First, insurers can incorporate into the contract of insurance Institute Classification Clause. Two conditions are imposed by the clause: age of the vessel can not exceed a certain age limit and the ship has to have certain class of globally recognized classification society. Second way is provided with Institute Cargo Clauses. Insurers then with contractual clause exclude from insurance compensation for losses resulting from unseaworthiness or unfitness, provided that the insured was aware of it.

[1] See Dunt, John – Melbourne, William, p. 113.
[2] See Brown, Robert H., p. 177. – 178.

Unseaworthiness of vessel and unfitness of container are now separated in two subclauses. The exclusion applies if the assured is privy, aware of unseaworthiness or unfitness of the vessel or craft at the time of loading (5.1.1.). And, if the container or conveyance is unfit for the safe carriage of the goods and the loading is carried out prior to attachment of this insurance or the loading is carried out by the Assured or their employees and they are privy to that unfitness (5.1.2.). The container unfitness exclusion extends to employees of the insured because the condition of containers or other means of transport can be seen only by employees in a warehouse, factory or any other place where the goods are arranged in a container. 3 In the new revision "liftvan" as a mean for arranging the goods has been omitted and "servants" replaced with "employees".

It is not assumed that these inabilities were known to the policyholder. It has to be proven, and the insurer has the burden of such proof. So, in order to liberate of the obligation to compensate, the insurer must prove that the damage was caused by the ships unseaworthiness or by ships or container unfitness and that at the time of loading this circumstance was known to the insured or his employee.

The legal effect of this clause shall not extend to relationships in the contract of carriage. The clause doesn't relieve the carrier of his obligation to make the ship seaworthy nor will the shipper lose his rights towards the carrier arising from the contract of carriage. Thus, in the case of compensation for damages, the insurer is entitled to claim paid amounts from the carrier if the carrier is liable for damages.4

Exclusion above shall not apply where the contract of insurance has been assigned to the party claiming here under who has bought or agreed to buy the subject-matter insured in good faith under a binding contract (5.2.). This clause is new and protects the position of an innocent third party since it is unlikely they'll be in position to verify the condition of the vessel or container.

Insurers waive any breach of the implied warranties of seaworthiness5 of the ship and fitness of the ship to carry the subject-matter insured to destination (5.3.). In a voyage policy there is an implied warranty that at the commencement of the voyage the ship shall be seaworthy6 for the purpose of the particular adventure insured (MIA, 39. 1.). and that the ship is reasonably fit to carry the goods or other moveables to the destination contemplated by the policy (MIA, 40. 2.).

According to the stipulations of 1982., this rule is applied if the Assured or his employees were aware of the ships inability. With this assumption, the Assured in case of a breach of warranty was deprived of the right to compensation even thought the loss was in no way connected with the breach. While reviewing in 2009. it was concluded that this regulation goes too far in protecting the interests of the insurer and introduced an unconditional waiver of the insurer's complaints regarding violations of implied warranties of seaworthiness and fitness of the ship. In this way, insurers can no longer slip from liability on account of technical deficiencies in the ships ability that are not causally related to adverse event.

Overall, the effect is to narrow the scope of the clause and is clearly in favor of the Asssured.

3.7. Strikes exclusion

Strikes exclusion clause is the same in all three sets I.C.C. Although it's named Strikes Clause it also contains the risk of terrorism exclusion. The exclusions relating to strikes etc. (7.1. and 7.2.) remain unchanged but the terrorism exclusion has been extended. Extension refers to a person, means and motives of such actions.

In 1982. Clause is said that this insurance doesn't cover loss, damage or expense caused by any

[3] See Dunt, John, p. 160.

[4] Under the Hague Rules and PZ (čl. 460. st. 1.)., a carrier has a general liability to provide a seaworthy ship and to handle the goods with care. See Pavić, Drago, Pomorsko imovinsko pravo, Književni krug, Split, 2006.

[5] A ship is deemed to be seaworthy when she is reasonably fit in all respects to encounter the ordinary perils of the seas of the adventure insured (MIA, 39(4)).

[6] In a policy on goods or other moveables there is no implied warranty that the goods or moveables are seaworthy (40(1)).

terrorist or any person acting from a political motive.
The new terms redefined the concept of a terrorist risk as any act of terrorism being an act of any person acting on behalf of, or in connection with, any organization which carries out activities directed towards the overthrowing or influencing, by force or violence, of any government whether or not legally constituted (7.3.).
Exclusion has also been extended to reflect the range of motives that may be behind the attack. To the political motive contained in Strikes Clause (1982.), ideological and religious motive were added.

3.8. Duration

Institute clauses for cargo insurance contain three clauses regulating the duration of the insurance: Transit Clause, Termination of Contract of Carriage, Change of Voyage Clause.

3.8.1. Transit Clause

The provisions of this clause stipulates the duration of cargo insurance. Clause has undergone significant changes by the revision in 2009.
1982. Institute clauses provide cover ˝from warehouse to warehouse˝7. Goods are covered not only during maritime transport, but also during transportation by land, which precedes or follows the maritime transport (by road or rail) and during the time, before, during or after the transport by ship it is in warehouses or other places. According to the Transit Clause (1982.) insurance attaches from the time the goods leave the warehouse ... and generally terminates on delivery to the final warehouse at the destination named in contract of insurance.8 Goods were not covered during the loading and unloading operations in the warehouse. For some time it has been commonplace for brokers' wordings to extend coverage to include the process of loading and unloading and this has now been brought in to the standard cover.
According to the Transit Clause (2009.), this insurance attaches from the time the subject-matter insured is first moved in the warehouse or at the place of storage (at the place named in the contract of insurance) for the purpose of the immediate loading into or onto the carrying vehicle or other conveyance for the commencement of transit, continues during the ordinary course of transit.
In clause 8.1. ˝from the time the goods leave the warehouse˝ becomes ˝from the time the subject matter insured is first moved in the warehouse.... for the purpose of the immediate loading˝. Cover does not therefore extend to temporary storage prior to transit on vehicles or to such storage in holding areas within a warehouse. These actions must be done for the purpose of the immediate loading and the commencement of transit. Insurance continues during the ordinary course of transit. What is to be considered under ˝ordinary course of transit˝ is a factual question that depends on adopted and known practice in the relevant conditions. This means that in some geographical area even a transport with animals could be regarded as a common mean of transport.
Clause provided four cases of termination of insurance (8.1.1. – 8.1.4.) whichever occurs first.
In 8.1.1. and 8.1.2. minor changes were made, so ˝on delivery to˝ becomes ˝on completion of unloading˝.
Clause 8.1.3. is new and clarifies that the insurance also terminates if the goods remain in the carrying vehicle and the Assured or their employees elect to use it for storage, other than in the ordinary course of transit. The 1982. clause 8.1.2. referred only to the Assured making a decision about storage or distribution whereas the new Clauses 8.1.2 and 8.1.3 refer not only to the Assured but their employees as well. Assured will therefore need to be aware of decisions made at the warehouse floor level because of the impact on coverage.
Transit Clause stipulates termination of insurance in the case where prior to termination of this insurance change of destination is made (8.2.).

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[7] Under S.G. policy the cover would be confined to the period from when the goods were loaded on board the vessel to when they were discharged and safely landed. The principal effect of ˝Warehouse to Warehouse Clause˝ (I.C.C. 1982.) is to extend the cover.

[8] According to PZ, in voyage policy insurance attaches from the time the subject-matter insured is loaded into the carrying vehicle and terminates with unloading at the final destination named in insurance contract (čl. 732. st. 1.).

And that insurance will remain in force during delay beyond the control of the Assured, during any variation of the adventure arising from the exercise of a liberty granted to carriers under the contract of carriage (8.3.). In these two clauses some minor changes in the terminology used were made, but the effect remains the same.

3.8.2. Termination of Contract of Carriage

Only some minor changes in wording were made. ˝Delivery˝ becomes ˝unloading˝ to make it consistent with Clause 8., ˝named herein˝ becomes ˝named in the contract of insurance˝. As in the other clauses ˝goods˝ were replaced with ˝subject matter insured˝ and ˝underwriter˝ with ˝insurer˝.

3.8.3. Change of Voyage

Change of Voyage Clause was significantly modified by 2009. revision. These provisions change solutions in MIA, 1906.

The first provision applies to a situation where the insured will result in a change of voyage. Where, after the commencement of the risk, the destination of the ship is voluntarily changed from the destination contemplated by the policy, there is said to be a change of voyage. Unless the policy otherwise provides, where there is a change of voyage, the insurer is discharged from liability as from the time of change (MIA, 45.).9

Substituting Change of Voyage Clause in insurance terms avoids the application of this law, which is not favorable to the insured. According to 10.1.clause, where, after attachment of this insurance, the destination is changed by the Assured, this must be notified promptly to Insurers for rates and terms to be agreed. Such contractual provision existed in I.C.C. 1982. only now is more clearly formulated. The new clause avoids using the term ˝held covered˝ which has often been misunderstood and instead gives a clear indication of the action the Assured must take, and the coverage implications.

The new 10.2.clause deals with the so-called "phantom ship" situation in which a carrier after the commenced journey changes direction and transports the cargo to an unknown destination, typically for cargo theft. According to MIA, 44., where the destination is specified in the policy, and the ship, instead of sailing for that destination, sails for any other destination, the risk does not attach. Application of this provision would not, for example, cover cargo theft although the risk of theft is covered by ˝all risk˝ insurance. This clause also changes the MIA legal provision. In clause 10.2. is said that where the subject-matter insured commences the transit but, without the knowledge of the Assured or their employees the ship sails for another destination, this insurance will nevertheless be deemed to have attached at commencement of such transit. This clause ensures that an innocent Assured does not lose coverage because of the effect of section 44. of the MIA.

Insurance is provided with two conditions. First that insurance started in accordance with the provisions of clause 8.1., and that the insured and his employees were not aware that the ship has sailed for another destination.

3.9. Benefit of Insurance

In the latest revision a definition of the Assured has been inserted for extra clarity.

The Assured includes the person claiming indemnity either as the person by or on whose behalf the contract of insurance was effected or as an assignee (15.1.).

3.10. Note

Minor revisions have been made in accordance with the changes made to other clauses but in essence there is no change in the extent of the cover provided.

In the new note the term ˝held covered˝ is replaced with the descriptive wording.

4. CONCLUSION

Conducted I.C.C. amendments are in the interest of both parties. Changes made to the insolvency

[9] According to PZ, in voyage policy, if due to actions of the insured, there's been a significant deviation from the insured voyage insurer is not obliged to compensate for damages incurred after the deviation (čl. 702.).

exclusion clause, the unseaworthiness exclusion clause, changes of the ˝ held cover ˝ concept and terminology update are in favor of the Assured. On the other hand, broader interpretation of the term terrorist and weapons of war makes the insurers ability of defense of claims grater than before.
Acceptance of the new insurance terms will be gradual due to the fact that their application is not mandatory. It is realistic to expect that in the business practices the new clauses will for some time continue to apply with the 1982. clauses.

REFERENCES

1.Bennett, Howard, The Law of Marine Insurance, Oxford 2006.

2.Brown, Robert, Marine Insurance, Vol. 2, Cargo Practice, London 1985.

3.Pavić, Drago, Pravo pomorskog osiguranja, Zagreb 1997.

4.Pavić, Drago, Pomorsko imovinsko pravo, Književni krug, Split, 2006.

5.Rose, F.D., Marine Insurance: Law and Practice, London 2004.

6.Dunt, John, Marine Cargo Insurance, Informa, London, 2009.

RISK MANAGEMENT IN SEARCH AND RESCUE OPERATION

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ABSTRACT

The word "risk" has its roots in the old French word "risqué", which means "danger, in which there is an element of chance" (Littré, 1863). In everyday life we all take many risks, consciously trying to reach our goals with the least harmful sacrifices. Mankind is daily exposed to many delicate situations, and to solve the problem at the highest level, we need to develop a good strategy. For this we use Risk Management. As per one of the definitions, Risk Management presents external and internal parameters that organizations or individuals must consider, when deciding for optimum solution for their problem, although precise definition has not been given yet. Reason for this may be in wide range of activities that the term Risk Management covers. As per ISO 31000 2009, Risk Management is coordinated set of activities and methods that is used to direct an organization and to control many risks that may affect this organization in achieving its objectives.
On the other hand, SAR operation is a mission that by its nature is full of risks. Further more, it is a mission in which decision must be made promptly, in order to avoid development of further risks.
The question that is usually avoided is how safe are rescuers and do they have any time to assess their own risk in some complex mission.
In this paper, Risk Management and Risk Assessment principles are introduced as well as the possibility of their use in Search and Rescue Operation.

KEYWORD
Risk Management, Risk Assessment, Incident Investigation, Search and Rescue.

INTRODUCTION

It is 05:04 am. MRCC Rijeka receives distress call over Coast Radio Station Split, that Ro-Ro vessel "Und Adriyatik" is under fire. She was 13 Nm west of Rovinj, with 200 trucks and 9 tons of dangerous cargo on board. 22 crew-members and 9 passengers (truck drivers) are looking the death directly into eyes. Their lives depend of quick response from MRCC Rijeka. Everyone who has ever sailed or has had contact with the sea can imagine horror that is happening to these seamen. This is situation that every seaman is afraid of, and avoids even to think about, but when it happens, we ask question
"God is there anyone that can save us?"
On the other side, there are still humane people who, although limited with material resources are willing and obliged to render that help we are striving for.
After such accidents or incidents happen, there are a lot of "experts" that know how to criticize and solve the problem, but very few are asking question "Were the Rescuers safe?" They forgot that these

are normal human beings and not superheroes. Although there were a lot of argues and disputes if the response was the best possible and adequate, the fact is that all people were saved and all well organized, either by own power or help from expertise. To avoid similar discussion there is a “tool” that can help professionals to judge how safe they are, what are the risks in their task, and to which extent they can tolerate such risk, and still stay on the safe side. This tool is known as Risk Management. This paper will give short explanation about Risk management, Risk assessment, and their contribution in SAR operation. As well, it will describe principles of its use in SAR at sea by world leading maritime countries, and the possibility of its use in SAR operation in our region.

2. RISK MANAGEMENT SYSTEM

Many scientists, even today are trying to answer the question: What is it that distinguishes history from modern times? There’ve been a lot of ideas, but revolutionary idea that is the closest to explain the relation between modern and ancient times is connected to the mystery of risk. When people realized that future is not just a whim of gods, and that humanity is not passive to the nature, the idea of risk was born. Way back in Renaissance, there was a group of people whose brilliant vision revealed how to put future at the service of the present. Chavalier de Mere, a French nobleman challenged famous mathematician Blade Pascal to solve a puzzle. The question was how to divide the stakes of an unfinished game of chance (gambling game), when one of the player is ahead. Their idea in solving this problem was later used to develop “theory of probability” that became “heart of concept of risk”.
Without results of this theory which included risk, some brilliant ideas would have never been developed, for example travel to the space. When asked about his success, the Scientist, who developed Saturn 5 rocket for first Apollo mission, gave clear picture of risk management: “The biggest risk in our mission was leaking valve. Of course you want valve that doesn’t leak and you will try whatever possible to develop one. But real world provide you with a leaky valve. You have to determine how much leak you can tolerate”.

By showing the world how to understand risk, measure it and weigh its consequence, these people converted risk-taking into one of the best tools that drives modern times. Their achievement changed attitude towards “Risk Management”.
How important The Risk Management is, best illustrates the fact that almost in any sphere of business, there is a concept of it.
There are a lot of standards and regulations that are dealing with Risk Management, and differences in definitions and approaches to this complex system, but the concept is almost the same. Since there may be confusion in using different sources (Standards and Regulations), because they gave different names for the same thing, this paper will be focused on one of the most suitable in order to simplify explanation.
To understand Risk Management system it is important to understand risk.
Risk can be defined as the combination of the probability of an event and its consequences. In any kind of operation there are chances that it happens something that will be a possibility for success or a failure.
The Risk Management Process is the overall integrated process whereby organization addresses the risks and treats them in a way that their objective/s may be achieved. It is quite clear that any Organization must establish objectives to get ideas of risks that may affect them. Therefore in many Standards, Establishing the Context is actually the first step of Risk Management process. After the first step is completed, then Risk Assessment and Risk Management (Risk Treatment) may be developed as another two components of the system. In recent years, Risk Communication has become an important integrated component of this system. Some of the Standards mention Monitoring and Reviewing as component, until the others mention it as integrated part in each of before mentioned components and do not highlight it as separate one.
To get better idea of the system refer to figure 1.

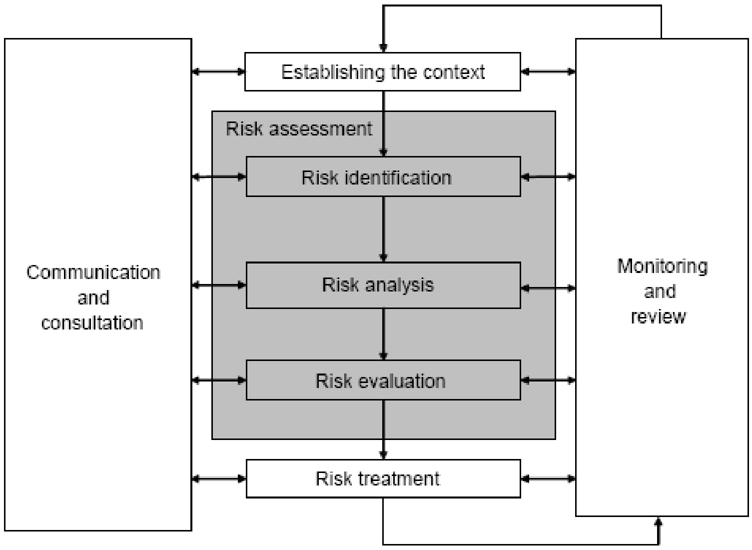

Figure 1. Risk Management Process (ISO 31000 Standard)

2.1. ESTABLISHING THE CONTEXT

Establishing the context in relation to risk management doesn't lay within Risk Management process alone (see figure-1) but actually within Risk Management System. System is compared to process more complex, and includes principles and framework that organization must set in order to address risk at all levels of organization. For effective risk management organization must comply with principles. Some of them are that Risk management creates and protects value; It's an integral part of all organizational processes; It's part of decision making; It explicitly addresses uncertainty, etc.

Framework on the other hand is not intended to prescribe a management system, but rather to assist the organization to integrate risk management process into its overall management system. For example organization must make commitment by its management to create risk management policy and set plan to achieve this commitment. Organization must design framework for managing risk, understand organization and its context.

When organization set principles and framework related to risk management, then the process of risk management may start. Establishing the context defines the basic parameters for managing risk and sets the scope and criteria for the rest of the process. Establishing the context includes considering internal and external parameters (the social and cultural, political, legal, financial, natural and competitive environment, whether international, national, regional or local; key drivers and trends having impact on the objectives of the organization; relationships with, the organization's culture etc) relevant to the organization as a whole, as well as to particular risk being addressed.

The context of the risk management process will vary according to the needs of an organization. It can involve, but is not limited to:

- defining the goals and objectives of the risk management activities;
- defining responsibilities for and within the risk management process;
- defining the scope, as well as the depth and breadth of the risk management activities to be carried out,
- including specific inclusions and exclusions;
- defining the activity, process, function, project, product, service or asset in terms of time and location;

- defining the relationships between a particular project, process or activity and other projects, processes or activities of the organization;
- defining the risk assessment methodologies;
- defining the way performance and effectiveness is evaluated in the management of risk;
- identifying and specifying the decisions that have to be made; and
- identifying, scoping or framing studies needed, their extent and objectives, and the resources required for such studies.

2.2. RISK ASSESMENT

Risk assessment is the overall process of risk identification, risk analysis and risk evaluation.

2.2.1. RISK IDENTIFICATION

This is a process of finding, recognizing and recording risks. Purpose of this process is to generate list of possible risks that may have effect in achievement of organization objective. It is very important that all risks are identified at this stage of Risk Management process, since non identified risks will not be evaluated and their impact on all organization may be fatal. As well, during this process it is essential to cover risks that their source is not under control of organization especially those risks whose control or source is not evident. There are many methods used for risk identification, which one is the best depends of objectives and risks that are involved. For this reason, it is always recommended that risk identification is carried out by competent and experienced people. When dealing with risk assessment there are many guides that are giving really detailed explanation of various methods and after reading same it becomes easier to choose appropriate one.

One very familiar method of risk identification is Incident investigation. This is a tool that clearly gives the list of risks that have been overlooked and that should be addressed at new Risk assessment process. Furthermore, this method is not only recommended but mandatory by many legislative regulations (for example, under SOLAS regulation I/21 and MARPOL articles 8 and 12, each Administration undertakes to conduct an investigation into any casualty occurring to ships under its flag subject to those conventions and to supply the Organization with pertinent information concerning the findings of such investigations). Connection between Risk assessment and Incident investigation is shown on Figure 2.

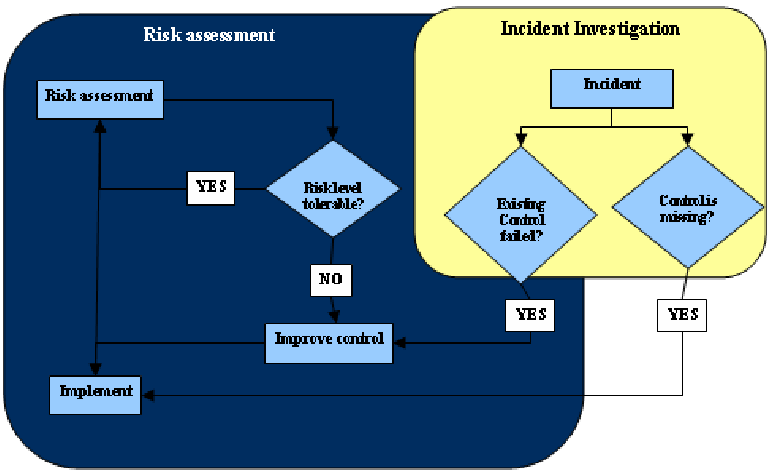

Figure 2. Link between Risk assessment and Incident Investigation

2.2.2. RISK ANALYSIS

Risk analysis develops understanding of the risk. It provides an input to risk evaluation and to decisions on whether risks need to be treated, and on the most appropriate risk treatment strategies and methods.
Risk analysis involves consideration of the causes and sources of risk, their positive and negative consequences, and the likelihood that those consequences can occur. Factors that affect consequences and likelihood should be identified. Risk is analyzed by determining consequences and their likelihood. Existing controls and their effectiveness and efficiency should also be taken into account. An event may have multiple consequences, and can affect multiple objectives.
Same as with Risk Identification, there are a variety of methods used for Risk Analyses. More than one method may be required for complex application.
After Risk Analysis is completed we should have idea whether risk needs to be treated or is tolerable. It is important to know different criteria for different risk. In order to explain Risk Analysis process ISO risk criteria may be used.

CONSEQUENCE					PROBABILITY/FREQUENCY				
					A	B	C	D	E
Severity Rating	People	Assets	Environ ment	Reputation	Rarely occurred in industry	Happened several times per year in industry	Has occurred in operating company	Happened several times per year in operating company	Happened several times per year in location
0	Zero injury	Zero damage	Zero effect	Zero impact					
1	Slight injury	Slight damage	Slight effect	Slight impact	Manage for continue improvement				
2	Minor injury	Minor damage	Minor effect	Limited impact					
3	Major injury	Local damage	Local effect	Considerable impact					
4	Single fatality	Major damage	Major effect	Major national impact					
5	Multiple fatalities	Extensive damage	Massive effect	Major international impact	Incorporate risk reducing measures			Intolerable	

Figure 3. ISO Risk Matrix

Inputs for this risk analysis are using different methods, but even without detailed explanation of them, risk analyzing process may be explained using this matrix. For example, if identified risk to the environment is “possible rupture of cargo pipe on oil tanker”. When existing control is known, for example Oil Spill equipment that is ready for use in case of such accident, consequence has local effect. If such accident happened several times in shipping business it is in GREEN range and as organization we should only improve our operation to be more safe. If it occurred in operating company, such risk is in Yellow range which means that additional measures have to be developed and adopted to reduce risk. If this accident happened several times per year in location, it means that such risk is in RED range i.e. INTOLERABLE and complete new control MUST BE developed in order to reduce risk to tolerable level.

On the other hand methods for Risk Analysis may be qualitative, semi quantitative and quantitative. The degree of detail required will depend of particular application, the availability of reliable data and the decision making needs of the organization.

Qualitative assessment defines consequences and probability by significant levels as “high”, “medium” and “low”, as such may combine consequence and probability and evaluates the resultant level of risk against qualitative criteria (above ISO risk matrix).

Semi-quantitative methods use numerical rating scales for consequence and probability and combine them to produce level of risk using a formula. Scales may be linear or logarithmic or have some other relationship.

Quantitative analysis estimates practical values for consequences and their probability, and produces values of the level of risk in specific units defined when developing the context. This type of analysis may not always be possible due to lack of information, data etc. In such cases comparative semi-quantitative or qualitative ranking of risks by specialist may be effective.

2.2.3. RISK EVALUATION

The purpose of risk evaluation is to assist in making decisions, based on the outcomes of risk analysis, about which risks need treatment and the priority for treatment implementation.

It involves comparing the level of risk found during the analysis process with risk criteria accepted when the context was established. Now these criteria must be revisited in more details, since more knowledge is obtained about particular risk. The decision whether and how risk will be treated may depend of the costs and benefits of taking the risk or costs and benefits of implementing control.

A common approach is to divide risks into three bands:

- upper band where level of risk is regarded as INTOLERABLE whatever benefits activity will bring, and risk treatment is essential whatever it costs
- middle band, where cost and benefits are taken into account and opportunities balanced against potential consequences
- a lower band, where level of risk is regarded as negligible or so small that no treatment is required
- The ALARP criteria system (As Low As Reasonable Practicable), shown on figure 4. best reflects this approach. This system is often used in safety applications.

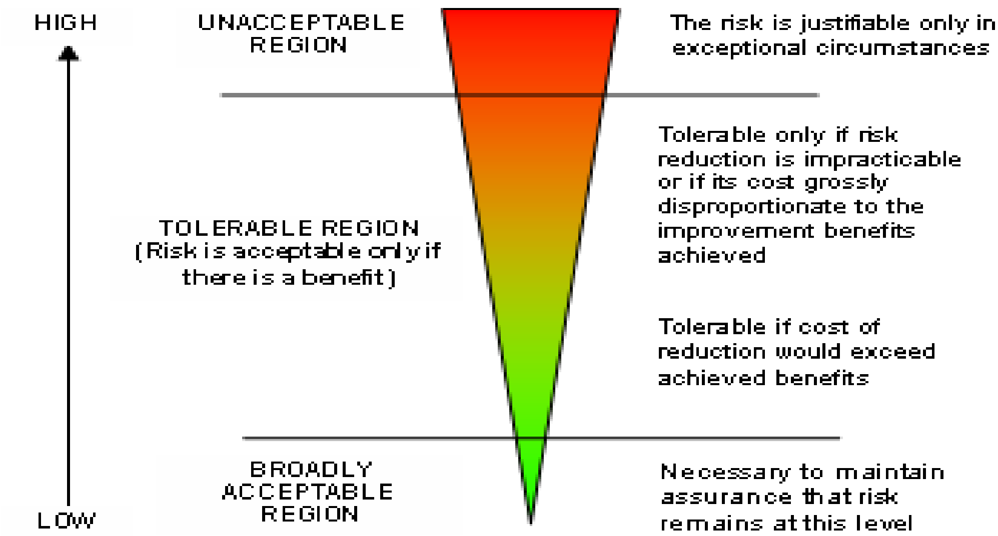

Figure 4. The ALARP principle

2.3. RISK TREATMENT

Having completed a risk assessment, risk treatment involves selecting and agreeing to one or more relevant options for modifying (reducing) the effect of the risk.
Risk treatment involves a cyclical process of:
- assessing a risk treatment;
- deciding whether residual risk levels are tolerable;
- if not tolerable, generating a new risk treatment;
- assessing the effectiveness of that treatment.

Risk treatment options are not necessarily mutually exclusive or appropriate in all circumstances. The options can include the following:
- avoiding the risk by deciding not to start or continue with the activity that gives rise to the risk;
- taking or increasing the risk in order to pursue an opportunity;
- removing the risk source;
- changing the likelihood;
- changing the consequences;
- sharing the risk with another party or parties (including contracts and risk financing);
- retaining the risk by informed decision.

Selecting the most appropriate risk treatment option involves balancing the costs and efforts of implementation against the benefits that can be achieved, with regard to legal, regulatory, and other requirements such as social responsibility and the protection of the natural environment.

2.4. MONITORING AND REVIEW

Effective risk management requires a reporting and review structure to ensure that risks are effectively identified and assessed and that appropriate controls and responses are in place. Regular audits of policy and standards compliance should be carried out and standards performance reviewed to identify opportunities for improvement. It should be remembered that organizations are dynamic and operate in dynamic environments. Changes in the organization and the environment in which it operates must be identified and appropriate modifications made to systems.

2.5. COMUNICATION AND CONSULTATION

Communication and consultation with external and internal stakeholders should take place during all stages of the risk management process.
Therefore, plans for communication and consultation should be developed at an early stage. These should address issues relating to the risk itself, its causes, its consequences (if known), and the measures being taken to treat it. Effective external and internal communication and consultation has to ensure that the people who are in charge of implementing the risk management process and stakeholders understand the basis on which decisions are made, and the reasons why particular actions are required.

3. RISK MANAGEMENT IN SAR OPERATION

SAR operation at sea may sometimes demand routine task to be performed, but on some occasions it may be quite complex and even composed of several integrated but separated tasks. It is very easy in such operation to oversee some of the risks that may endanger complete operation or to bring in question successful rescue. For rescuers, it is known that quick response is vital, but decision made should not be foolish to endanger people/ property/ environment to be rescued or even rescuers themselves.
In many world leading maritime countries, SAR operation is dealt with great caution and risk management is already utilized for some time. When the concept of Risk management described in this paper is well known it is easy to implement it in SAR operation.
Here is an example of risk assessment for accepting mission based on GAR model which requires scoring of each risk involved and the result taken into consideration of decreasing the risk or taking it

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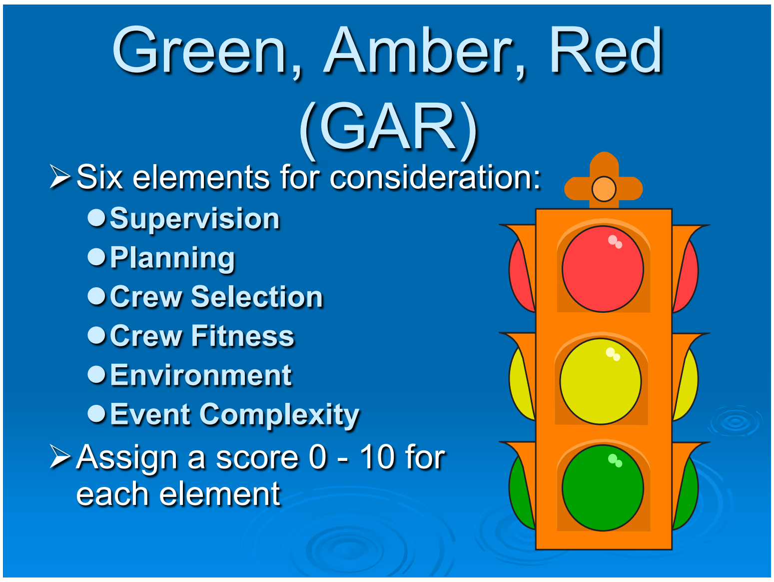

Figure 5. principle of GAR model

As shown on figure 5, there are 6 factors that need to be considered when assessing risk:

- Supervision
- Planning
- Crew fitness
- Crew Selection
- Environment
- Event Complexity

For easier understanding, which questions need to be answered in order to identify hazards refer to figure 6

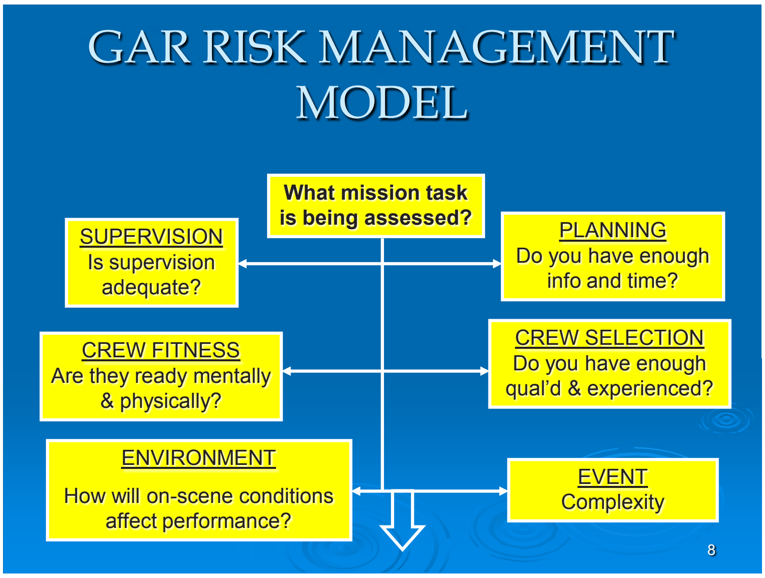

Figure 6. Identification of hazards for the proposed mission

To compute total degree of risk, for each hazard identified, a risk code from 0 to 10
must be assigned for each of these six
factors.
Based on this total score, it can be determined whether risk is acceptable, i.e. in green zone; too high and must be treated (in red zone), or at the end is in amber zone where attempt may be made to reduce it.
Practical use of this model is shown on figure 7. This risk assessment is carried out for risk analysis of utilization of particular salvage unit in SAR mission.

GAR Model in Action

Elements	Getting u/w	Initial call	On scene
Supervision	4	4	7
Planning	2	6	9
Crew Selection	5	5	9
Crew Fitness	2	2	2
Environment	2	3	10
Complexity	1	4	9

Green: 0-23 (Low risk) Amber: 23-44 (Medium Risk) Red: 44-60 (High Risk)

Figure 7. Risk Analysis and Evaluation for proposed mission

As explained, risk code from 0 to 10, is assigned for each hazard and for all 6 factors. For example, risk for non-adequate supervision of particular salvage unit during its preparation and preparation of mission is 4 (quite acceptable), but for on scene task, proper supervision is required and risk of not enforcing it, is 7 (in high zone).
Based on this calculation, total risk may be assessed. By this analysis, it is obvious that utilization of this salvage unit during getting under way and for initial call is acceptable (total score for getting under way is 16 – green zone, and for initial call 24 – lower part of amber zone). However, for using it on scene, risk is too high, and if same unit needs to be used on scene, risk must be treated, i.e. it must be reduced. Usually the key is to concentrate on risks with highest score, for example, if more planning is carried out or more experienced crew is selected, risk will be reduced.
Another example of use of Risk Management in SAR operation is connected with risk involved in Emergency Towing Response. In order to reduce risk involved during this operation, USCG developed computerized program that helps in making decision for best possible response to particular emergency towing request. The use of this program reduces or even completely eliminates risk related to human factor. All delays that are caused by human in searching various files, reading various books and making conversation with Tug Companies that render help, are reduced to minimum since program is giving best option based on few data that are entered by operator. These are just few clicks on computer, comparing with hours of work that human requires

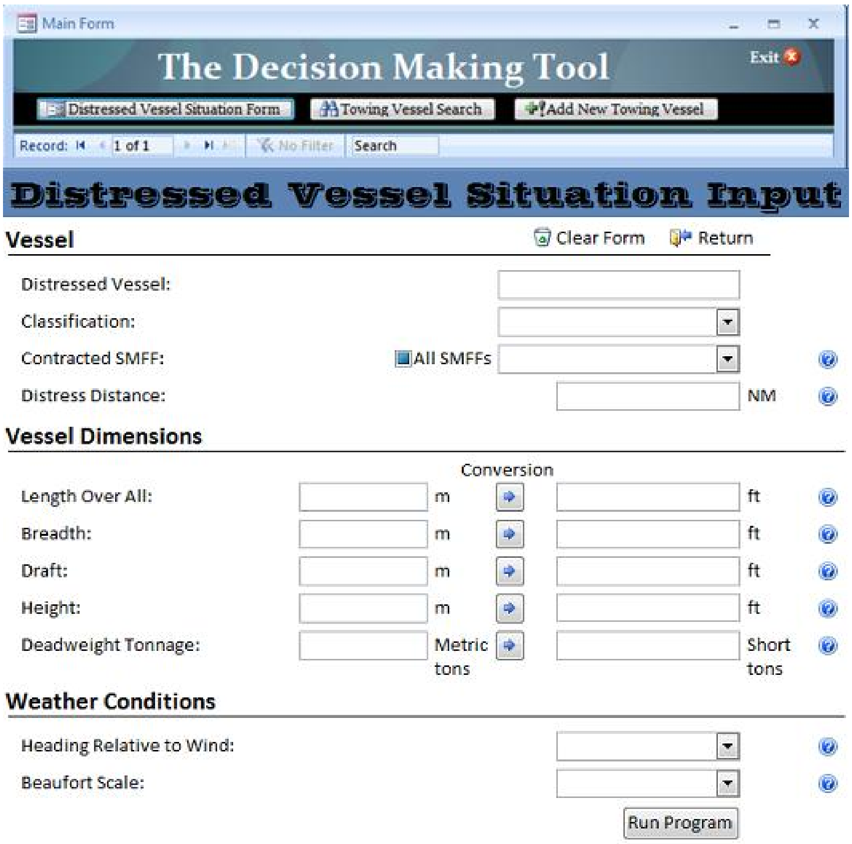

Figure 8. Decision making Tool – computerized program for emergency towing respond

These examples are just scratching of surface comparing to all other activities that these SAR Centers along the world utilize in order to preserve life, property and the
environment in their waters, and finally their own safety.

4. CONCLUSION

This paper is giving idea of Risk Management process and the possibility of its use in SAR operation. Section 3 shows that help of this process within SAR is endless. How much we will utilize it, depends on our legislation that hasn't recognized this process yet, neither in other spheres of business. Seamanship is trade that has potential of growing and if we would like to impress our possible clients, we must be prepared not only to respond in good times but also when something bad happens. In this way we may become leaders for respect.

REFERENCES:

1. Ministarstvo mora, prometa i infrastrukture RH, samostalni odjel za odnose sa javnoscu
2. US CG – Risk Based Decision making Guidelines
3. ISO 31000:2009(E), First edition, 2009-11-15 Risk management — Principles and guidelines
4. International Standard IEC/ FDIS 31010 - Risk management — Risk assessment techniques
5. A Risk Management Standard – UK (IRM, AIRMIC, ALARM)
6. ABS (American Biro of Shipping) – Guidance Notes on Risk Assessment Applications for the Marine and Offshore Oil and Gas Industries, June 2000

7. Marine risk assessment Prepared by Det Norske Veritas for the Health and Safety Executive – Offshore Technology Report 2001/063

8. DaGoB - Risk Management System – Risk Assessment Frameworks and Techniques - Project partly financed by the European Union (European RegionalDevelopment Fund) within the BSR INTERREG III B programme

9. U. S. COAST GUARD ADDENDUM TO THE UNITED STATES NATIONAL SEARCH AND RESCUE SUPPLEMENT (NSS) To The International Aeronautical and Maritime Search and Rescue Manual (IAMSAR)

10. Risk Management in Search & Rescue - Captain Scott LaRochelle, U.S. Coast Guard Chief of Search & Rescue

BIOGRAPHIES

I was born on 22nd May 1978 in Kotor. I have finished High School for seamanship, nautical department, in 1996. and graduated on Nautical College in Kotor in May 2000. From January 1999 started as active seamen on Japanese Company Mitsui OSK lines, crude department. At present I am sailing for the same company as Chief Officer on Crude Oil tankers. In mean time have graduated 4 years of University (nautical college) and enroll in master degree for nautical part. From 2004, started to work as part time instructor in Training Center Azalea in Bijela. Apart from my family, most of time dedicated to seamanship and to the possibility of its improvement in our region.

ECOLOGICAL ASPECTS OF NAUTICAL TOURISM

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ABSTRACT

The spatial planning is essential issue in nautical tourism because nautical tourism depends upon environmental quality. The cooperation of tourist economy, planning teams and local community is very important. The manufacturers can contribute to environmental protection by usage of ecologically friendly materials in the construction of yachts and recreational crafts because these materials can make waste disposal and recycling easy. The owners of the yachts and can significantly contribute to the pollution by irresponsible disposal of garbage, sewage and oily water in marine environment. All stakeholders should be included in environmental protection education particularly the owners in the yachts and boats.

KEY WORDS
ecology, nautical tourism, yachts, marinas, education

1. INTRODUCTION

According to IMO, nearly 50% of the population lives nearby sea (in radius within 60km from the coastline). The marine ecosystem is constantly under pressure from different human activities. Over the last three decades nautical tourism appears as one of the most expanding form of recreational tourism, creating additional pressure on the marine ecosystem. In order to obtain sustainable development, European nautical industry takes in to the consideration both the social and the environmental impacts of nautical tourism.
International Council of Marine Industry Associations (ICOMIA) promotes sustainable nautical tourism at an international level. ICOMIA's Environmental Committee promote environmental impact of recreational marine products form their design trough operation time until disposal i.e. product life-cycle approach.

2. DEPENDENCE OF NAUTICAL TOURISM ON THE QUALITY OF THE ENVIRONMENT

Degradation of marine ecosystem will produce direct negative impact to tourism. In particularly to nautical tourism, due to its dependence on ecologically clean areas. In order to obtain sustainable development of this positive social and economic activity it is necessary to preserve marine environment for pollution.
Marine pollution origin from different sources, but most of it comes from land based human activities (44%).

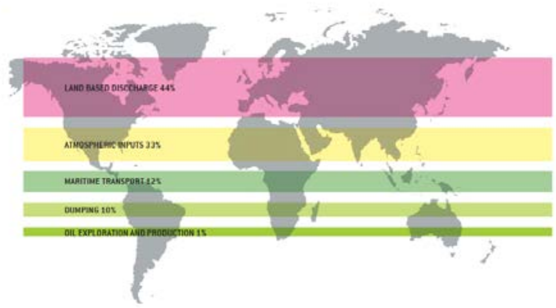

Figure 1. Sources of marine pollution [2]

Environmental impact of nautical tourism differs from environmental impact of maritime transport due to usage of different technology and operations. Although, especially in summer period nautical and other recreational boat are considered as significant sources of pollution in reality it contributes only 1% to marine pollution [2].

In order to "blue" marine environment in 2006 EU adopt directive 2008/56/EC – The Marine Strategy Framework Directive. All Member States are obligatory to take necessary measures to achieve or maintain good environmental status of marine ecosystem by 2020.

In order to protect the quality of marine ecosystem several international organizations act together and table below give overview of its scopes.

Table 1. Organization and its role in preservation of marine ecosystem [2]

Regulatory or supervisory organization	International Maritime Organization
Scope	Seagoing ship in national and international and waters
Focus on	Waste management and discharges Sulphur dioxide and Nitrogen oxide emissions Antifouling paint Transfer of organisms in ballast water
Application to recreational craft	Depending on size and engine power, recreational craft may fall under IMO jurisdiction for certain aspects
Regulatory or supervisory organization	European Union US Environmental Protection Agency
Scope	Commercial inland waterways and recreational craft
Focus on	Engine exhaust and noise emissions (EU/US EPA) Waste reception facilities in ports (EU)

3. THE POSSIBLE ENVIRONMENTAL IMPACT OF NAUTICAL TOURISM

In order to comprehend the environmental impact of nautical tourism it is necessary to take in to account many factors.

3.1. Hydrocarbons

Marine engines contribute only a small proportion of the total pollution of marine ecosystem by hydrocarbons.

Mainly oil and other hydrocarbons in marine environment originate from land-based sources (63%), while only 26% of oil and other hydrocarbons originate from maritime activities.

Small craft under 24 meters of length contribute only 2% of total oil in marine ecosystem. Due to the fact that this category includes also small fishing boat or commercial vessels, yachts and pleasure boats contribute significantly lower than 2%.

Emission of sulfur is low and limited with low sulfur fuel that is used for yachts and pleasure boats. The most relevant emissions from engines used in nautical tourism are nitrogen oxides (NOx), particulates (PT) and hydrocarbons (HC). Proportionally hydrocarbons (HC) represent the most significant emission from yachts and pleasure boats marine enginee.

Permitted levels of these emissions are strictly controlled in Europe with EU Directive 2003/44/EC [3]. This Directive amended emission levels form EU Directive 94/25/EC.

3.2. Noise

Detailed studies have shown that about 50% of the external noise from yachts and pleasure boats coming from the hull effects. Therefore, the reduction of engine noise only partially reduced the overall noise arising from pleasure boats, while the noise of the hull effects can be reduced only with innovative design and materials.

Figure 2. Comparison of noise produced by two engines of different power [2]

3.3. Waste water from yachts and pleasure boats

With Annex IV of MARPOL Convention, international law regulates the discharge of waste water, black water into the sea from ships over 400 GRT or carrying over 15 passengers. Therefore, this regulation does not apply to smaller yachts and pleasure boats. European Union directive on port reception facilities 2000/59/EC reduce discharges of waste, but the level of implementation of these guidelines differ from state to state.
There is no regulative restriction in black water discharges into the sea for yachts and pleasure boats, but the installation of tank to storage sewage is required.
Some, but not all yachts are equipped with storage tanks or systems for treating water. But these tanks have small capacity, and all its content is discharged into the sea,
The discharge of waste water is allowed at the distance no less than one nautical mile from the coast. Nowadays more and more yachts under the influence legislation or voluntary initiatives are equipped with tanks for waste water. These systems require a coastal station for the reception, which is an expensive process.
Nothing less of a problem is so-called gray water coming from cleaning products and detergents. Up to day there in no possibility to treat chemical agents found in detergents. In general, gray water is discharged directly into the sea without any treatment.

3.4 Antifouling paints

EU directive 76/769/EEC prohibits the use of tributyltin (TBT) in antifouling paints for boats less than 24 meters. IMO Convention prohibits the use of TBT on all ships, but that decision has not yet been ratified. Therefore, 60% of commercial ships still use TBT coatings included.
In the nautical sector, TBT has been replaced with copper and biocides, which are much less harmful to marine habitats. Active elements in the protective coatings are: herbicides (manufactured by the chemical industry to agriculture) and Copper oxide (commonly used biocide in antifouling paints). EU Directive 1998/8/EC on biocides gives list of authorized biocide substances.

3.5. Garbage and other waste

The pollution of sea with garbage is a critical issue, especially with regard to plastic waste. The sources of this pollution are not well known, but the amount of garbage shows that the majority originate from land and from commercial ships. Plastic and plastic containers are the most common form of waste in the sea.

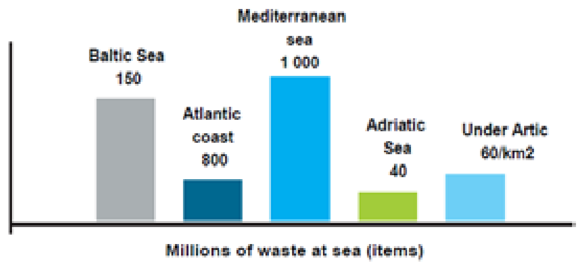

Figure 3. Quantity of waste by areas [2]

Although, most waste produced on board is similar to household waste ships also produce other types of waste, such as rechargeable batteries, electronics and fuel oil. Therefore, the proper care of such waste should be taken. Also, all marinas and ports of nautical tourism are obligated to have facilities for receiving and sorting waste according EU Directive 2000/59/EC.

3. CONCLUSIONS

It can be concluded that nautical tourism, especially yachts and pleasure boats have little effect on the pollution of the marine ecosystem. At the present time the majority of marine environment pollution originates from human activities on land.

The future of nautical tourism and their economic viability depends largely on the preserved nature. It is essentially to educate final users about their roles and opportunities in the protection of the marine environment.
It is necessary to introduce energy efficient technologies and biodegradable products.
It is important to try to impose the sustainability of economic development in balance with nature and the environment. Moreover, the degradation of environmental quality has a direct impact on the future nautical activities. Marine tourism is truly one of the most effective ways of raising public awareness of environmental issues.

REFERENCES

1.IMO's contribution to sustainable maritime development [http://www.imo.org/ourwork/technicalcooperation/documents/brochure/english.pdf]

2.Nautical activities: What impact on the environment, ICOMIA, 2009.

3.EU Directive 2008/56/EC – The Marine Strategy Framework Directive.

4.EU Directive 2003/44/EC amending Directive 94/25/EC

5.EU Regulations 76/769/EEC

6.EU Directive 1998/8/EC

7.EU Directive 2000/59/EC.

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MAINTENANCE OF COMPUTER EQUIPMENT IN VESSEL TRAFFIC MANAGEMENT INFORMATION SYSTEM

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ABSTRACT

The need of maintaining and ensuring high availability of services provided by subsystem have been reduced by increasing the reliability of computer equipment in VTMIS (Vessel Traffic Management Information System) However, increasing the reliability of the subsystem has its price, and cost-effectiveness. Repairing them after the outages should be as short as possible, and the security subsystem is very high. This means that in such systems simultaneously with the requirements for high reliability subsystems occur and demands for a high level of maintainability of hardware, software, and distributed database. Therefore, it is necessary to apply the new maintenance strategy or a combination of new strategies, levels and activity of maintaining computer systems, diagnostic system for hardware and software modules supported by computerized maintenance management system.

Key Words
VTMIS, maintenance, computer system, diagnostic, diagnostic programs, database, outsourcing.

1. INTRODUCTION

The system of maintenance is a management system of VTMIS subsystems and subsystem reliability VTMIS in the process of exploitation.
Maintenance of computer infrastructure in maritime system is a set of procedures and activities whose purpose is to prevent the emergence of states of failure and restore the state of the computer system in operational state in the shortest period of time and with the least possible cost under the given environmental conditions. The goal of maintaining computer equipment is to achieve maximum availability of marine systems with low costs of maintenance.
The main objectives of maintaining computer equipment VTMIS subsystems are:

- to ensure the necessary level of reliability subsystems, namely computer equipment, in the process of exploitation
- to ensure the availability of services provided by subsystems VTMIS and with less downtime
- minimize or optimize the total cost of maintenance

- increase the quality of services provided by subsystems VTMIS
- increase morale and motivation to work in the subsystems VTMIS operators and users (officers on board and other users of VTS services)
- keeping of computer resources in each subsystem
- improve training results of VTS personnel….

Traditional maintenance strategy cannot meet the set goal of maintenance because it encompasses preventive, corrective maintenance and combined maintenance. Therefore need to implement new strategies or a combination of new strategies supported by information technology in the detection, diagnosis and prediction of failure. Maintenance strategies are the main contributions in the organization and implementation of system maintenance. The objectives of the maintenance are minimal risks of failures and breakdowns, the maximum safety of personnel and the environment, and high availability. Modern maintenance strategies are [1]:

- Reliability Centred Maintenance, RCM
- Total Productive Maintenance, TPM
- Condition Based Maintenance, CBM)
- Predictive Maintenance, PM

System maintenance can be carried out as planned maintenance system or as a system with by condition. Modern systems maintenance cannot be imagined without the use of information systems, respectively computerized maintenance management system that allow maintaining the application of modern maintenance strategies. These systems can be designed as a server application (client server architecture) and as a standalone application for one computer. Also, computerized maintenance management system is commercial and open source.

Ideally, the strategy could be to declare that it can achieve the planned or target availability of computer systems with minimal (optimal) costs that will arise from the choice of the optimal mix of maintenance activities, the level of maintenance and adequate computerized maintenance management system.

Modern approach to maintenance of computer equipment is directed towards outsourcing. Outsourcing is a contractual relationship between the separations of individual or group activities (jobs) outside the company. In marine systems, the core activity is the execution of marine processes, while maintaining the computing infrastructure falls into no fundamental activity that can be implemented concept of outsourcing.

2. COMPUTERIZED MAINTENANCE MANAGEMENT SYSTEM

The implementation of modern maintenance strategies cannot conceive without the use of Computerized Maintenance Management System – CMMS. CMMS is a system designed to maintain a device, machine or system, and can be implemented as an application server, whether the server company that makes the software, or server user, and also as a standalone application for one computer. CMMS systems enable the effective and efficient way to manage the maintenance of computer equipment.

The basic principles underlying the CMMS [2]:
data and / or information is entered into the system where they occur

- data and / or information shall include only one
- requirements for data and information are set for those in which they are stored, thus rejecting the traditional way of reporting by the levels
- minimize manual work on documentation
- timely information to all levels of the management structure and the state of computer equipment in the process of operation and maintenance
- avoids the possibility of " hairdressing" reporting
- permanent storage (archiving) data
- possibility of evaluating the effectiveness of the maintenance of technical systems (computer equipment)

CMMS systems are developed and implemented modularly for different maintenance strategies, various models of maintenance, maintenance of various organizations and activities of the organization. However, all programs are common modules that they have, and which form the basis of all programs, including: maintenance plans, required staff, records maintenance, data on failures, data on downtime, data on the length of repairs etc.

Today, the CMMS is used for many purposes. Some systems have been developed for the maintenance of specific devices or systems, some for specific industries, and some are developed to meet the needs of a wide spectrum of applications. Examples CMMS system are: HolisTech™ Horizon, eWorkOrders, Apache OFBiz™, ININ*FMM i dr.[3,4].
Besides commercial applications for maintenance management, open source applications can be found on the market, which are FLOSS based and therefore free. The open source application gives the user the freedom to run, forward, distribute, study and adapt the program to their purpose and also to improve the software. These activities are only possible in the case of possession of all freedoms. Freedom for the user is the following:

- the freedom to run the program for any purpose (freedom 0)
- the freedom to study how the program works, and adapt it to users' needs (freedom 1), and to access it is only possible through the source code
- distribution of free software updates to benefit other user (freedom 2)
- the freedom to improve the program and release of your improvements to the public for the whole community benefits (freedom 3)

The example of the open source is Apache OFBiz (The Apache Open For Business Project).

3. LEVEL OF MAINTENANCE OF COMPUTER EQUIPMENT

How will the level of maintenance be organized it will depend on the strategy of maintaining the users, the complexity of the system and the type of system that will be maintained. In practice, the most commonly prescribed three levels of maintenance, and it could be higher (up to a maximum of five levels of military organizations)[5].
The first level (level job) of maintenance is performed by the system user. It includes activities and repairs in the ability to maintain, taking into account the available spare parts, tools and test equipment. This level of maintenance does not require a high level of expertise for maintenance activities that include periodic and planned actions, inspection, and cleaning, simple reinstallation of system and application software and replacement of faulty system elements. Replaced elements cannot repair, but are sent first specialized service (replacement printer, replacing the hard drive in a RAID array, etc.). At this level it is very important to obtain accurate information about the failure.
Second level (medium or company level) maintenance is performed by specialized services with special tools and technical documentation company using mobile, partially mobile or stationary service. At this level we can be repaired by replacing the main components, assemblies or elements, that is, those parts which are prescribed to be kept at the location of the system.
The third level (the level of the manufacturer or supplier) maintaining the highest level in the hierarchy maintenance and perform the tasks that go beyond the capabilities of the first and second level. Physically it consists of a specialized workshop or factory equipment manufacturer. At this level there are computer systems and appropriate support for all diagnostic procedures faulty system components. After repairing the faulty component, performed detailed testing of each component part.
For the first and in particular for the second level of maintenance essential are surveillance systems for computer equipment. Systems for monitoring computer equipment enabling all subsystems (centers) effective planning and monitoring of the various resources of computer system. Basic application monitoring system is the following:

- detection and correction of errors in the work component of the system
- monitoring the performance of hardware and software modules of computer system
- registration activities of computer equipment
- monitoring the effectiveness of hardware and software modules of computer system
- support module that performs resource management
- detection of security attacks and system vulnerabilities

Examples of surveillance of computer equipment are: Ganglia, Hawkeye, and Supermon ...

4. ACTIVITIES OF HARDWARE AND SOFTWARE MAINTENANCE

Maintaining of computer system covers maintenance activities of hardware and software.

Maintaining the hardware is exactly the same as for any electronic device, while maintaining the software process for modifying the software subsystem or module after delivery in order to eliminate errors, improve performance or other attributes, or adapt to changing environments.

Preventive maintenance is maintenance during which the fault predicts only maintenance is performed before a breakdown occurs. This maintenance is realized by using a number of activities that are defined as the operations and procedures of a preventive nature in the course of a computer system. Preventive maintenance includes the following activities: monitoring and control of the performance degradation modules and their reliability, prevention and inspection, search and elimination of weak spots in the computer system, the implementation of the control tests, preventive replacement of a module due to wear or aging, cleaning and lubrication, and planning tasks. Preventive maintenance, according to the method of determination, can be Planned Maintenance and Condition Based Maintenance. Planned Maintenance is performed at predetermined intervals, while by condition monitoring based on performance and / or parameters and actions that followed.

Benefits of preventive maintenance include: increased reliability of computer systems in operation, the possibility of planning takes place, and the ability to predict maintenance costs and thus easier control. Downsides include: increased possibility of failure due to the influence of errors computer maintenance personnel and higher maintenance costs. One of the activities is an effective preventive maintenance monitor of log files in the operating system that allows us to proactively administer, detect anomalies before they become a problem, configure the RS for better performance and reliability. Log files provide information on what is happening in the system, or at any time we change the system.

For server systems there are several log files: a systematic log files, application log files and backup log files.

Corrective maintenance can be described as a set of actions to be taken when a particular part or the whole system fails. It relates to the return of the part or system in operation. Corrective maintenance is based on the need to gather information about the fault, failure, causes of the failure, etc. On the basis of processing the collected data, we determine the extent to troubleshooting and correcting the causes of failures, especially those that are recurring.

Corrective maintenance is implemented specific procedures and methodology to repair or eliminate failures / errors of computer system. Corrective maintenance procedure includes a number of activities whose execution is achieved to rectify the damage and the system becomes operational, and these are:

- error report and information exchange
- detect malfunctions
- preparation and fault repair
- check the functioning of the system
- handing systems and operational commissioning

Of particular importance to this level of software maintenance, the following software features: reliability, testing, user-friendliness and convenience to the modification.

Based on the experience and practice, support for specific activities of preventive and corrective maintenance can be automated (software agents) and semiautomatic (telephone, internet and video conferencing system).

Adaptive maintenance includes all maintenance activities that are necessary because of frequent changes to the hardware subsystem (new hardware), as well as the software subsystem (the new version of the operating software, the new version of client software). Adaptive maintenance is very often performed as adaptation to changes in software and data requirements. For this activity, maintaining special meaning software with the following features: portability and convenience for modification.

Perfective (maintenance work training) maintenance includes all activities in order to improve performance or add new features of computer system. Perfective maintenance is performed in order to meet expanding user requirements in the user in terms of complementary software program functions, efficiency, features, changes in the business environment, etc.

5. DATABASE MAINTENANCE

Database maintenance is a continuous process where the database and its accompanying documents undergo constant change (evolution data base). For regular maintenance of the database is required in the previous phases of the development strategy, define a database management:

- how often performs backup and / or replication of databases?
- verification mechanisms that are needed?
- which users can perform that function?
- tools that people can use to access the data?
- that report and how often they need to deliver?
- analysis of performance indicators and problematic queries?
- introduce change and improve the system
- correct minor errors that are subsequently discovered
- customization
- upgrades that maintain the consistency of data, etc.

During the operational work, the database can be found in a state of disrepair. Reasons which may lead to malfunctioning of the database are: end the transaction, the transaction malfunction, an error in the software database management system (DBMS), the error in the query, and the error in the hardware (disk failure) or failure of computer systems.

The architecture of modern DBMS allows fast and effective "recovery" of the database. Recovering the database is performed automatically or in a relatively simple manner. DBMS, except database, maintained and some supplementary resources such as data backup (Backups) and / or replication of the database and journal files.

Backup data is obtained by recording the entire database to another medium (second drive) and when we consider that the database is in a consistent state. This activity can be systematically implemented in a predetermined time period, say one week and is one of the preventive maintenance of computer system.

Due to the reliable and safe operation of a distributed database, you need to replicate databases. Replication of databases is to maintain copies of databases on multiple servers. Replication requires two servers: master server and slave server. It is preferable that the slave server located in a different location from the main server. Data replication on slave server is not the same as backup, but it is possible to use replication for that. Replication uses are numerous:

- when the database server does not have enough capacity to store the backup (Backup data)
- when we want to increase the performance of applications that uses the database
- the database upgrade is best to do the upgrade first on slave server, so if all queries pass without error, then perform the upgrade on the main server
- when a natural disaster occurs at the location where the main server with the data, then it is good to have a server with the same data in a different location

The log file is a database file that registers every transaction that changes the state of the database after the last backup or replication of databases

In complex systems, this is an essential for database administration, or a set of people who have administrator privileges. Database administrators are people (managers) at the highest level of the organization and their job is to decide what information will be stored in the database, and then set the rules for their maintenance and use. Database Administrator is often the technician that provides centralized base solely on the technical level, or a technician responsible for the implementation of policy set by the administrator of the data and a series of administration actions. Database administrator with the assistance of utilities, it is affecting the security of data access, data storage, and data integrity. The main tasks of the database administrator are:

- software installation database servers and other computers in the system
- testing new modules and install new patches
- supervision of all databases in the system
- monitoring performance database applications and active
- creating backup and recovery database
- continuous monitoring of the list of security with the latest trends and solutions
- continuing education through courses and / or independently

According to [6] database maintenance can be carried out through several types of activities that differ in content and purpose of the requested changes. Corrective maintenance is reduced to a subsequent repair of errors that were detected during testing. Perfective maintenance is changing the database schema to accommodate new applications that did not exist during the initial determination and analysis requirements. Adaptive maintenance is necessary when we want to adapt to the new database, the DBMS, which is not used during the initial design and implementation.

6. SYSTEMS FOR DIAGNOSTIC OF COMPUTER SYSTEM

The main hardware component of VTMIS system is a computer as an independent subsystem computer (PCs, servers) or as complex components in other subsystems (subsystem radar, AIS, etc.). The computer is designated as a critical component with the highest risk of cancellation. Thus, modern information technology enables the development and deployment of new techniques with the ability to show the probability of failure is reduced to a minimum, and installation of diagnostic techniques as part of a module of computer systems already in the design phase.
According to [7] diagnostic system to successfully solve the problems of testing the functionality of the application programs and diagnosing faults in cases of malfunction detection to allow timely intervention and elimination of defects and restore system availability.
Modern diagnostic systems enable:

- technical examination modules
- verify that the module
- determine the location, shape, and pattern term future failure
- continuous comparison of the current state of the module with an acceptable condition

All methods used to test and identify faults in computer systems can be classified into methods of structural techniques and methods of functional techniques testing. From the standpoint of implementation, testing techniques can be grouped into hardware and software testing techniques. The hardware techniques includes a method of comparing techniques and methods of diagnostic testers, while in software testing techniques include the method of self-testing and self-diagnosis method, suitable for many positive characteristics. Self-diagnosis methods are classified into hardware testing techniques, and some of its variants occur in the frame of functional diagnosis. In principle, this method will involve the testing process object test, which is automatically realized and controlled its own microprocessor for detect and identify faults (see detail in the literature [5] [7]).
The simplest example of a diagnostic is POST (Power On Self Test) sequence at startup. It is in fact a series of tests that check the main system components (microprocessor, read only memory circuits to support the motherboard, RAM memory and input / output interfaces). These tests are short, quick and designed to detect permanent hardware errors. If POST sequence detects an error in the sequence of the motherboard, it stops the boot process and generates an error message that indicates the cause of the problem. POST sequence typically provides three types of output error message: sound codes, the message on the monitor and hexadecimal code sent to the address specified input / output port.
Various manufacturers offer advanced computer software diagnostic programs with broader capabilities to diagnose hardware and software such as:

- PCMark of company Futuremark Corporation - performing testing system, microprocessor, memory, graphics, hard drives and operating systems and their mutual operational. The application consists of three modules: the tests, the system and results.
- Sisoft Sandra of company SiSoftware - performing a complete test of hardware and software. This is a complex diagnostic program, which consists of six modules, and modules are the most important benchmark module, test module and a module listing.
- Everest of company Lavalys - has similar features as the previous two, and consists of nine modules.
- Micro-Scope of company Micro 2000 is a complete range of general purpose PC for testing system. Its uniqueness to other diagnostic programs by checking hardware interrupts and addresses of the input / output ports.

The system diagnostics can be applied not only in uniprocessor systems, but also in multiprocessor systems with a particular upgrade. This update applies to communication between the microprocessor in terms of testing.

7. MAINTENANCE OUTSOURCING

The modern approach to the management of the enterprise is to make a strategic choice of the core activities, ie those in which the best results are achieved when compared with the competition and focus all resources on their training, and other activities that are not core to be delegated to others, ie those who carry them out faster better, more professional and cheaper. Focusing on core competencies and outsourcing non-core activities, the company created its strategy of business growth and development in the global business environment.

Outsourcing is a contractual relationship-driven transfer to individual or groups of activities (jobs) to external partners (outsourcer), which thus assume responsibility for the performance of individual or group activities. Outsourcing is a business strategy under which the company relocated individual or a group of non-core activities of specialized firms [8]. Specialized companies (outsourcers) for specific IT services can be significantly more efficient, increase the efficiency and flexibility of IT processes, improve application functions, increase IT services and continuing to participate in the development and implementation of new information technology, etc.

In maritime organizations, the fundamental performance of maritime activity process, while maintaining the computational infrastructure falls into no fundamental activity that can be implemented concept of outsourcing. In other words, you can outsource maintenance activities of computer equipment and the transfer of responsibility for the proper performance of its partners in order to achieve a common goal, which is to increase maritime safety and environmental protection.

Jobs, which stands out as a rule they are:

non-core activities of the organization

in institutions that do not have specialized knowledge and personnel, skills, experience, everyday needs, basic needs and other resources, the necessary capacity, the necessary hardware and software, etc.

Effects achieved by outsourcing certain or a combination the following:

- cost reduction
- increase in the quality of results
- using others' resources that are expected to provide
- improvement of information technology services
- advantage of new technologies
- risk reduction
- rational use of their own resources

Benefits outsourcer may be in determining the high-level capabilities in existing and new technologies. Outsourcer can provide training of personnel and to assess the value, risk and the importance of new technologies. Engaging outsourcer significantly reduces the risk of investing in new technologies.

The rapid development of information technology, a hallmark of information and communication systems, causing the staff (operators and technical personnel) that is part of the lack of training or familiarity with new hardware and software products. Maritime organization / institution do not have enough time, money, infrastructure and specialized personnel to be devoted and invested in adopting new technologies. Therefore, maritime organizations / institutions choose to invest and acquire new technologies entrust a specialized IT company and the outsourcer.

The success of outsourcing depends directly on the success of the management of the organization, the most important factors are:

- proper choice of the specialized company-outsourcer
- properly determined business contract
- strategic plan and vision
- detailed financial structure determined
- honest and open communication
- use of external experts / consultants etc

Organization of outsourcing can be implemented in three phases:

- internal analysis and evaluation - analyze the need for outsourcer with special emphasis on the objectives to be achieved, the area it will be realized concept outsourcing and etc. This

phase realizes the highest level of management (strategic management).
- needs assessment and selection of areas - the management of the organization examines the organization's needs and carefully finding appropriate partners that will be able to meet the required needs.
- implementation and management - this phase includes activities to determine the attitudes of business in terms of management and control displaced business quickly and effectively solve problems. It is also important, as an essential activity, companies and people adjust to the new way of doing business.

Based on the professional and scientific literature suggests that the concept of outsourcing generally accepted model for today's modern organization. The management company must make strategic decisions to best improve the core activities, and for no foundation activities, hire the best partner / specialist companies.

8. PRICE OF MAINTENANCE OF COMPUTER EQUIPMENT

The total cost of maintaining computer system reaches and transitions cost of its development, especially software subsystems. On the basis of our own experience and the literature, we can reduce maintenance cost by increasing the quality of the development process. With the price of higher quality development of computer system, especially the systematic and application software, will be higher, but will create the computer system, which is cheaper to maintain later.
Factors that affect the cost of maintenance of computer system as follows:
- completeness and accuracy of the initial specifications - if at first include all the user requirements, after it will be less perfective maintenance
- design of the software - good design is cheaper to maintain. From the standpoint of maintenance, the practice has shown that a software system written in object languages is the easiest to maintain. These systems are composed of modules with strong internal cohesion and loose connections to the outside
- degree of integration with existing computing resources - if in the beginning we make integration with existing resources, will be less after the action of adaptive maintenance.
- degree verification software - well verified software has fewer errors, and will require less corrective maintenance actions
- degree is documented hardware and software subsystems and databases - correct, complete, accurate and well structured documentation facilitates maintenance and thus cost of maintenance
- quality user documentation - complete, accurate and well structured instructions for using the application function reduces the number of activities of technical staff to maintain and thus cost of maintenance
- way configuration management - if you apply the methods, tools and organizational configuration management policy, it is to maintain in the long run cheaper
- age of software - the software is older, it is more expensive to maintain because it is degraded material and is dependent on outdated development tools
- quality diagnostic program - which is a good quality diagnostic program facilitates monitoring of all modules and thereby reduces the number of layoffs, increasing availability subsystem
- characteristics of the work environment - if it is a stable environment where business rules rarely change, you will rarely need to appear for adaptive and perfective maintenance
- development team - maintenance of computer system, particularly software subsystems, is it cheaper if you deal with those people who have developed, because they do not have to spend time getting to know the system
- stability of hardware platforms - if we implement the software platform that will continue to be modern and meet the requirements of the software, you will not need an adaptive maintenance

9. CONCLUSION

In order to increase the availability of services provided by VTMIS subsystem we must arrange adequate maintenance strategies computing resources. Therefore, it is necessary to implement new maintenance strategies supported

computerized maintenance management system. Computerized maintenance management system should be viewed as a system of knowledge management tool that allows you to store, exchange and use of data, information and knowledge essential for managing the process of maintenance.
Distributed database is an important element of control centers VTMIS's. Therefore, it is necessary to organize the ongoing maintenance and database management to define strategy. Maintenance is required to constantly monitor the work of the base, and so that it does not interfere with tracking users. Database administrator should be made available to the appropriate tools.
The diagnostic system has three states:, namely: diagnosis by inclusion, diagnostics in operation and diagnostics for maintenance. After turning on the computer, capable of diagnosis, all the tests have shortened type without operator involvement. The state of diagnostics in operation in each cycle modules check the correctness and accuracy of resource functions. In the event of failure of one of the modules is done to deactivate the system. The condition diagnostics for maintenance exceeds the demand by the operator or in accordance with the generated technical warning. In this may require the execution of all standardized tests or just certain tests for specific module.
Based on the professional and scientific literature it is suggested that the concept of outsourcing is generally accepted model for today's modern organization. The concept of outsourcing largely improves the speed and quality of service delivery, reduce risk, better access to expert knowledge and new technologies and use them, to cut costs, the use of other people's resources, rational use of their own resources, etc.

REFERENCES

[1]Tomas, V., Šegulja, I., Čišić, D.: “Mogućnosti i problemi primjene suvremenih strategija održavanja u pomorstvu“, Pomorstvo, str. 29-41, Rijeka, 2005.

[2]Pokorni, S.: „Pouzdanost i održavanje tehničkih sistema“, Vojna akademija, Beograd, 2002.

[3]http://www.smpltd.co.uk/cmms/

[4]http://www.inin.hr/fmm_-_facility _ maintenance_management_/fmm_-_ facility_maintenance_management/default.aspx

[5]Ristov, P.: "Doprinos pouzdanosti i raspoloživosti sustava nadzora i upravljanja pomorskim prometom na Jadranu", doctoral dissertation, Faculty of Maritime Studies, University of Rijeka, Croatia, 2012.

[6]Manger, R.:“Baze podataka“, skripta, PMF–Matematički odjel, Zagreb, 2008.

[7]Tomas, V.: "Model distribuiranog dijagnostičkog sistema brodskih elektroenergetskih postrojenja", doctoral dissertation, Faculty of Maritime Studies, University of Rijeka, Croatia, 2003.

[8]Čagalj, A.: “Prilog modeliranju organizacijsko-tehnološke strukture suvremenog brodogradilišta”, doktorska disertacija, FESB, 2008.

BIOGRAPHIES

Pančo Ristov was born on June 23th 1954. In 2012 he received his PhD at the Faculty of Maritime Studies at the University of Rijeka. Since 2006 he has been employed at Faculty of Maritime Studies in Split, where she is currently holding a position of a Senior Lecturer. His area of interest is the application of computers in marine systems.

Pavao Komadina was born on June 29th 1946. He is currently Full Professor and Vice dean for cooperation with community and economy and employability in at the University of Rijeka. Before is coming on University he is sealing on ocean going vessel as master. During he is employed is also working in Ministry of Maritime Affairs, Transport and Communications as first president in Ministry.

Vinko Tomas was born on November 21nd 1957. He is currently Full Professor and Vice dean in Faculty of Maritime Studies at the University of Rijeka. Main activities and responsibilities are diagnosis and Fault Tolerant Control Systems, Ship engines, Maintenance mGBL Mobile Game Based Learning, Specific Targeted Research Project, FP6 and FP7.

Ante Mrvica was born on August 21th 1952. He is currently coordinator of the vessel area III Split. PhD student on University in Rijeka on Faculty of Maritime studies. He is classification as engineers of Chief engineers unlimited of power engineers.

USE OF UNIVERSAL PROTOCOL FOR ENTERING THE PORT OF DESTINATION IN AIS DEVICE

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ABSTRACT

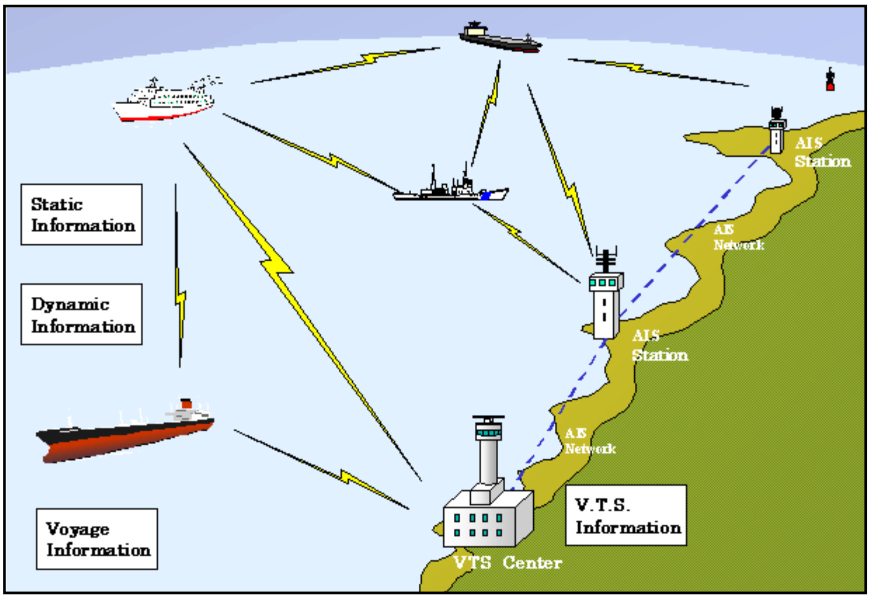
The Automatic Identification System (AIS) is an automatic tracking system used on ships and by vessel traffic services (VTS) for identifying and locating vessels by electronically exchanging data with other nearby ships and AIS Base stations. It is capable of sending and receiving ship information such as identity, position, course, speed, ship particulars and cargo information to and from other ships and shore. One such message includes a text field designated for destination. The mariner is able to enter the ship's destination into the AIS at the start of each voyage, and to keep this information updated. Evidence shows that mariners are using different names for the same location when entering destination data in their AIS units making it difficult for other ships and for VTS to identify the port uniquely. This situation leads to confusion and inefficiency in data interchange. Information about the destination allows to predict each other's courses, which will reduce the risk of collision and thus enhance the safety. Knowledge of the data on the port of destination contributes to the efficiency of VTS. Currently, this information is not provided for the exchange of AIS system. This can be achieved by using the existing destination field for entering both the port of departure and the next port of call. Therefore, there is a need to harmonize data input when entering port information, by adopting an available universal protocol. The International Maritime Organization (IMO) recommends the use of the United Nations code for ports and other locations (UN / LOCODE).

KEY WORDS
Port of destination, Automatic Identification System (AIS), Vessel traffic services (VTS)

1. INTRODUCTION

The Automatic Identification System (AIS) is an automatic tracking system used on ships and by vessel traffic services (VTS) for identifying and locating vessels by electronically exchanging data with other nearby ships and AIS Base stations. AIS information supplements marine radar, which continues to be the primary method of collision avoidance for water transport. A marine traffic coordinator uses AIS and radar to manage vessel traffic. AIS was introduced by the IMO in order to increase the safety of ships and the environment, and to improve traffic monitoring and maritime traffic services.

Regulation 19 of SOLAS (International Convention for the Safety of Life at Sea) Chapter V - Carriage requirements for shipborne navigational systems and equipment - sets out navigational equipment to be carried on board ships, according to ship type. In 2000, IMO adopted a new requirement (as part of a revised new chapter V) for all ships to carry automatic identification systems capable of



providing information about the ship to other ships and to coastal authorities automatically.

Figure 1: Automatic Identification System data[15]

The regulation requires AIS to be fitted onboard all ships of 300 gross tonnage and upwards engaged on international voyages, cargo ships of 500 gross tonnage
and upwards not engaged on international voyages and all passenger ships irrespective of their size. This requirement became effective by 31 December 2004 for all ships [1].
Information provided by AIS equipment, such as unique identification, position, course, and speed, can be displayed on AIS screen or an ECDIS (Electronic Chart Display and Information System) display. AIS is intended to assist a vessel's watchstanding officers and allow maritime authorities to track and monitor vessel movements. AIS integrates a standardized VHF (Very High Frequency) transceiver with a positioning system such as GPS (Global Positioning System) receiver, with other electronic navigation sensors, such as gyrocompass or rate of turn indicator. Vessels fitted with AIS transceivers and transponders can be tracked by AIS base stations located along coast lines or, when out of range of terrestrial networks, through a growing number of satellites that are fitted with special AIS receivers.

Ships fitted with AIS shall maintain AIS in operation at all times except where international agreements, rules or standards for the protection of navigational information.
The regulation requires that AIS shall:

- provide information - including the ship's identity, type, position, course, speed, navigational status and other safety-related information - automatically to appropriately equipped shore stations, other ships and aircraft;
- receive automatically such information from similarly fitted ships;
- monitor and track ships - exchange data with shore-based facilities.

The AIS range is limited by the VHF range, which is determined primarily by the height of the antenna. Typical range from a vessel at sea is 20 nautical miles.
Onboard ship, other vessel AIS information will be a supplement to radar-based information. Vessels equipped with AIS can be detected and identified. AIS uses a longer signal wavelengths than radar and therefore provides better coverage behind obstacles as long as the height of the terrain is not too large. In addition, AIS can help distinguish

ships that would otherwise blend in with land or other radar echoes.
In addition to AIS transponders for use on board ships that are encompassed by the IMO SOLAS Convention from 1974 (Class A AIS), AIS transponders have also been developed for use on land (AIS base stations), for beacons and markers, onboard pleasure craft (Class B AIS), and onboard rescue helicopters and planes.
AIS is an important tool for navigators on vessels and for the maritime traffic control centres that monitor and regulate the traffic.
AIS is used:

- in ship-to-ship situations to prevent collisions,
- as a tool for coastal states for obtaining information on a ship and its cargo, and
- as a tool for the maritime traffic control centre services for ship-to-shore purposes.

Therefore, the purpose of AIS is to improve vessels identification; to assist in target tracking; to simplify information exchange (e.g. reduce verbal mandatory ship reporting); and to provide additional information regarding situation awareness assistance. In general, data received via AIS will improve the quality of the information available to the OOW (Officer Of the Watch), whether at a shore surveillance station or onboard ship. AIS should become a useful source of supplementary information to that derived from navigational systems (including radar) and therefore an important 'tool' in enhancing situation awareness of traffic confronting users.

2. AIS INFORMATION SENT BY SHIPS

An AIS transponder on board a ship shall automatically, and with the required accuracy and update rate, provide other ships and coastal state authorities with information from the ship.
Such information are:

- Dynamic (position, course, speed)
- Static (identity, vessel type, dimensions, antenna position)
- voyage-related information (destination, estimated time of arrival, cargo, draught)
- Short safety-related messages [4].

This information is packaged into standardised messages and transmitted over internationally reserved channels in the maritime VHF band. Static and sailing-related information are transmitted every 6 minutes or when the data changes. Dynamic information are transmitted at an update rate ranging from 3 minutes to 2 seconds, depending on the vessel's speed and course change [2,3,8].

2.1. Dynamic information

Apart from 'Navigational status' information, dynamic information are automatically updated from the ship sensors connected to AIS.
These information includes vessel's present positions, speed over ground, course over ground, etc. Transmit interval varies depending on vessel's speed; minimum 3 minutes interval upon anchoring or moving at a speed of 3 knots or slower, and maximum 2 seconds interval upon moving at a speed of 23 knots or faster.

Table 1. Dynamic information[2]

Information item	Information generation, type and quality of information
Dynamic	
Ship's position with accuracy indication and integrity status	Automatically updated from the position sensor connected to AIS. The accuracy indication is for better or worse than 10 m.
Position Time stamp in Coordinated Universal Time (UTC)	Automatically updated from ship's main position sensor connected to AIS.
Course over ground (COG)	Automatically updated from ship's main position sensor connected to AIS, if that sensor calculates COG. This information might not be available.
Speed over ground (SOG)	Automatically updated from the position sensor connected to AIS This information might not be available.
Heading	Automatically updated from the ship's heading sensor connected to AIS
Navigational status	Navigational status information has to be manually entered by the OOW and changed as necessary, for example: underway by engines at anchor not under command restricted in ability to manoeuvre moored constrained by draught aground engaged in fishing underway by sail In practice, since all these relate to the COLREGs (International

	Regulations for Preventing Collisions at Sea) any change that is needed could be undertaken at the same time that the lights or shapes were changed.
Rate of turn (ROT)	Automatically updated from the ship's ROT sensor or derived from the gyro. This information might not be available.

2.2. Static information

Fixed or static information, which are entered into the AIS during installation, have only to be changed if the ship changes its name or undergoes a major conversion from one ship type to another. Static information include information necessary for identifying target vessels. Information is transmitted every 6 minutes [4, 5].

Table 2. Static information[2]

Information item	Information generation, type and quality of information
Static	
MMSI (Maritime Mobile Service Identity)	Set on installation. Note that this might need amending if the ship changes ownership.
Call sign and name	Set on installation. Note that this might need amending if the ship changes ownership.
IMO Number	Set on installation
Length and beam	Set on installation or if changed
Type of ship	Select from pre-installed list
Location of position-fixing antenna	Set on installation or may be changed for bi-directional vessels or those fitted with multiple antennae

2.3. Short safety-related messages

Short safety-related messages are fixed or free format text messages addressed either to a specified destination (MMSI) or to all ships in the area. Their content should be relevant for the safety of navigation, e.g. an iceberg sighted or a buoy not on its position. Messages should be kept as short as possible. The system allows up to 158 characters per message, however the shorter the message the more easily it will find free space for transmission. At present state, these messages are not further regulated, therefore keeping all possibilities open [4, 5].

2.4. Voyage-related Information

Voyage-related Information include present status information of ongoing/current voyage, e.g. vessel's draft, destination and Estimated Time of Arrival (ETA). Transmit interval is every 6 minutes.

Table 3. Voyage-related information [2]

Information item	Information generation, type and quality of information
Voyage-related	
Ship's draught	To be manually entered at the start of the voyage using the maximum draft for the voyage and amended as required (e.g. – result of de-ballasting prior to port entry)
Hazardous cargo (type)	To be manually entered at the start of the voyage confirming whether or not hazardous cargo is being carried, namely: - DG (Dangerous goods) - HS (Harmful substances) - MP (Marine pollutants) Indications of quantities are not required
Destination and ETA	To be manually entered at the start of the voyage and kept up to date as necessary
Route plan (waypoints)	To be manually entered at the start of the voyage, at the discretion of the master, and updated when required

2.4.1. Destination

The AIS text field for destination allows for "free text" up to 20 characters, resulting in numerous variations in the spelling of the same port, and making difficulties for other ships and shore authorities for unique port identification. Moreover, the use of the data in information systems is difficult or impossible without considerable manual effort. Irregularities that occur when entering the port of destination in AIS device are as follows:

- Error when spelling port name - when entering the name of the port, the errors can occur simply, whether by letters omission or by entering additional letters. It is observed that this was the most common mistake. (e.g. RJEKA, DOBROVNIK, SPLOT).

- Unknown port - in the AIS destination field, the name of a small town, bay or anchorage is often entered, difficult to determine where that location is. This case is common for yachts, but there were also situations concerning large passenger ships (e.g. TRI LUKE BAY is actually port of Sali anchorage).
- Entering shipyard names - there were reports of entering shipyard names (e.g. VIKTOR LENAC, 3 MAJ) instead of the port of destination.
- Entering the name of a country or region - entering the name of the state or region in the AIS destination field (e.g. CROATIA, DALMACIJA, ISTRA). This case was often recorded on yachts.
- Entering terminal names - entering the name of terminal or part of the port instead of the port (e.g. SV. JURAJ, SV KAJO).
- Short writing - observed on ships that are sailing on a specific line (eg. SPLIT – STG – SPLIT, RKA – ST – DBK).
- Name of the port entered in another language - ships and yachts that sail from neighboring countries often enter the names of Croatian ports in their own language (e.g. POLA, ZARA, FIUME, SPALATO).
- Destination with the same name - in Croatia there are ports that have the same names (e.g. NOVIGRAD, Istria; NOVIGRAD, Dalmatia). Moreover, entering the name of the island instead of the name of the port on the island (e.g. PAG instead of NOVALJA; HVAR instead of STARIGRAD).

Listed irregularities are leading to confusion and data interchange inefficiency. Destination information allows to predict vessel's courses, in order to reduce the risk of collision and thus improving the safety of navigation. Currently, this information is not provided for the exchange in AIS data. This can be achieved by using the existing destination field for entering both the port of departure and the next port of call. Therefore, there is a need to harmonize data input when entering port information by adopting an available universal protocol. The International Maritime Organization (IMO) recommends the use of the United Nations codes for ports and other locations (UN/LOCODE)

3. UN LOCODE

The identification of particular location is frequently required in information interchange in international trade and transport, to direct the movement of goods e.g. in addresses, in shipping marks and in data elements identifying ports of call, ports or places of loading and unloading, ports or places of transhipment and destination, etc.

The identification in a unique unambiguous way of any place involved in international trade is an essential element for facilitation of trade procedures and documentation. This can be achieved using agreed, unique coded designations for such locations; this would have the added advantage of permitting the exchange of data in a safer and more economic way. The International Maritime Organization recommends the use of the United Nations code for ports and other locations.

The United Nations Code for Trade and Transport Locations has been for years known as UN/LOCODE. Although managed and maintained by the UNECE (United Nations Economic Commission for Europe), it is the product of a wide collaboration in the framework of the joint trade facilitation effort undertaken within the United Nations.

Initiated within the UNECE Working Party on Trade Facilitation, UN/LOCODE is based on a code structure set up by ECLAC (United Nations Economic Commission for Latin America and the Caribbean) and a list of locations originating in ESCAP (Economic and Social Commission for Asia and the Pacific), developed in UNCTAD (United Nations Conference on Trade and Development) in co-operation with transport organisations like IATA (International Air Transport Association) and the ICS (International Chamber of Shipping) and with active contributions from national governments and commercial bodies. Its first issue in 1981 provided codes to represent the names of app. 8000 locations worldwide.

UN/LOCODE is used by most major shipping companies, freight forwarders and in the manufacturing industry around the world. It is also applied by national governments and in-trade related activities, such as statistics, where it is used by the European Union, by the UPU (Universal Postal Union) for certain postal services, etc.

Each code element consists of five characters, first two indicating the country (according to ISO standard 3166-1) and the following three representing the place name. Examples such as CHGVA, FRPAR, GBLON, JPTYO and USNYC remind for air travellers who are used to see the three last letters of these codes on their luggage tags [10]. UN/LOCODE picks up the IATA location identifiers wherever possible, to benefit from their association value and to avoid unnecessary code conflicts. In allocating codes, the secretariat tries to find some mnemonic association link with the place names, to aid human memorisation. This is of course increasingly difficult for large country lists where the 17576 permutations of three letters are near exhaustion.

3.1. Contents and layout of UN/LOCODE

The UN/LOCODE is presented in 11 columns, each with the following content:

- Change Indicator - it shows if the entry has been modified in any way or it has been marked for deletion.
- Column LOCODE - Column 1 in UN/LOCODE shows the ISO 3166 alpha-2 Country Code that is followed by a space and a 3-character code for the place name: XX XXX. The 3-character code element for the location name will normally comprise three letters. However, where all permutations available for a country have been exhausted, the numerals 2-9 may also be used. A code element added to a new version of the code list may be preceded by a plus sign (+); a letter X (X) means that the code element will be removed from the next version of UN/LOCODE and a vertical bar (|) indicates a change in the location entry. The code list is presented by country, in alphabetical country code element order according to ISO 3166, and with place names listed in alphabetical order within each country.

United Nations
Code for Trade and Transport Locations (UN/LOCODE)

(HR) CROATIA

Ch	LOCODE	Name	NameWoDiacritics	SubDiv	Function	Status	Date	IATA	Coordinates	Remarks
	HR ALJ	Aljmas	Aljmas		1-3-----	RL	0701		4532N 01857E	
	HR ATL	Antenal	Antenal		1-3-----	AA	0607		4519N 01333E	
	HR BAK	Bakar	Bakar	08	123-----	RL	0401		4518N 01431E	
	HR BAS	Baska	Baska	08	1-3-----	RL	1001		4458N 01445E	
	HR BVO	Baska Voda	Baska Voda		--3-----	RL	0501		4321N 01657E	
	HR BAT	Batina	Batina	14	1-3----B	RL	0907		4552N 01852E	
	HR BKC	Bedekovcina	Bedekovcina	02	-23-----	RL	0407		4602N 01559E	
	HR BLN	Beletinec	Beletinec		-----6--	RQ	1007		4613N 01619E	
	HR BEL	Belgrad	Belgrad		-----6--	RQ	1007		4513N 01444E	
+	HR BCA	Belica	Belica	20	-----6--	RL	1201		4624N 01631E	
	HR BLC	Belrce	Belrce		1-3-----	RL	0607		4542N 01825E	
	HR HBC	Benkovac	Benkovac	13	-----6--	RL	0901		4402N 01536E	
	HR BTC	Beretinec	Beretinec		-2------	RQ	1007		4613N 01619E	
	HR BTJ	Bestovje	Bestovje	21	-----6--	RQ	1007		4548N 01549E	
	HR BBJ	Bibinje	Bibinje	13	--3-----	RQ	0907		4404N 01517E	
	HR BNM	Biograd na Moru	Biograd na Moru		1-3-----	RL	0601		4356N 01527E	
	HR BJE	Bjelovar	Bjelovar	07	-23-----	RL	0401		4554N 01650E	

Figure 2: UN/LOCODE code list by country[16]

- Column Name - Column 2 shows the names of those locations that have been accepted for inclusion in UN/LOCODE in accordance with the provisions of the Recommendation. Place names are given, whenever possible, in their national language versions as expressed in the Roman alphabet using the 26 characters of the character set adopted for international trade data interchange, with diacritic signs, when practicable.

- Column Name Without Diacritics - This column shows the names of the locations which have been allocated an UN/LOCODE without diacritic signs.
- Column Subdivision - This column is intended to contain the ISO 1-3 character alphabetic and/or numeric code for the administrative division of the country concerned (state, province, department, etc.).
- Column Function - This column contains a 1-digit function classifier code for the location, where:

1 = port
2 = rail terminal
3 = road terminal
4 = airport
5 = postal exchange office
[6 = reserved for multimodal functions, ICD's, etc.]
[7 = reserved for fixed transport functions (e.g. oil platform)]
B = border crossing
0 = function not known, to be specified.

A group of digits "1234----" in this column means therefore that all four specified functions apply to the location.

- Column Status - This column is intended to indicate the status of the entry by a 2-character code e.g. whether approved by Government, by Customs, or based on a user requirement not necessarily recognised by an authority, etc. It is also intended to show the status of checking, e.g. that function indicators are not verified.
- Column Date - Reference dates, showing the year and month of request, entry into the code list, of latest approval, etc., as relevant.
- Column IATA - The IATA code for the location if different from location code in column LOCODE (second part of the code) [10].

3.2. Recommended use of the UN/LOCODE

The International Maritime Organization (IMO) recommends the use of the United Nations code for ports and other locations (UN/LOCODE).

Port is any location with permanent facilities at which vessels can load or discharge cargo moving in maritime traffic.

The recommended format is to indicate the port of departure at the first six positions of the data field followed by a separator and then the code for the next port of call.

- In order to identify that it is a LOCODE, to separate the locations and to indicate the 'from' and 'to' ports, a '>' symbol should be used as a separator. A ship is leaving Zadar bound for Veli Iž. Use of the UN/LOCODE would represent this voyage as below: "HR ZAD>HR VIZ"

⊟ AIS Track	
Name	HANIBAL LUCIC
Callsign	9A3042
Ship Type	Passenger Ship
Destination	HR ZAD>HR VIZ
Nav Status	Moored
Latitude	44°07.1273' N
Longitude	15°13.3816' E
Speed	0.0 kn
Course	0.0 °
Rot	-
True Heading	-
MMSI	238113340
IMO	9121936
Length	51 m
Width	16 m
ETA	3/15/2013 12:55:00 AM
Draught	2.9 m
Target Type	Class A
Time Stamp	3/15/2012 9:59:20 AM
Flag	HR

Figure 3: UN/LOCODE in AIS destination filed,

- If the next port of call is unknown, "?? ???" should be entered instead of the UN/LOCODE in the corresponding place in the data field. See example below: "HR ZAD>?? ???"
- If the port of departure does not have a designated UN/LOCODE then "XX XXX" should be entered instead of the UN/LOCODE in the corresponding place in the data field. See example below: "XX XXX>HR DBV"
- If the next port of call does not have a designated UN/LOCODE the commonly accepted English name of the destination port should be entered, preceded by "===" (3 "equals signs"). If no such name is known, the locally used name

should be entered. In this case, there may not be enough space available to indicate the port of departure. See example below: "===PRIGRADICA"

- If only the general area of destination is known the name or accepted abbreviation of the area preceded by "===" ("three equals signs") should be entered. See example below: "IT TRS> === HR JJ", Indicating a destination on the South Adriatic sea [6].

4. UN/LOCODE FOR CROATIA

The mariner is able to enter the ship's destination into the AIS at the start of each voyage, and to keep this information updated. Evidence shows that mariners are using different names for the same location when entering destination data in their AIS units, making it difficult for other ships and for VTS to identify the port uniquely. This situation leads to confusion and inefficiency in data interchange. This can be achieved by using the existing destination field for entering both the port of departure and the next port of call. Therefore, there is a need to harmonize data input when entering port information by adopting an available universal protocol. IMO recommends the use of the United Nations code for ports and other locations (UN/LOCODE). The UN/LOCODEs are listed in the Admiralty List of Radio Signals (Volume 6) for each port. However, entering UN/LOCODE in AIS destination filed has its drawbacks. On the UN/LOCODE list for Republic of Croatia is currently 303 locations, of which only half (153 locations) are destinations on the Adriatic coast suitable for entering into the AIS device as the port of destination. Other locations are related to the land locations (rail terminals, road terminals, airports, postal exchange offices, etc.). UN/LOCODE is not covering all locations that could be entered into the AIS device as a destination in the Adriatic coast.

5. CONCLUSION

AIS system gives information that is important to the navigator and that is also far more precise and real than in the ARPA devices, for instance. The analysis has demonstrated that the data AIS gives is more correct than any navigation system data. It is capable of sending and receiving ship information such as identity, position, course, speed, ship particulars and cargo information, to and from other ships and shore. One such message includes a text field designated for destination. The AIS field for the destination allows for "free text" of up to 20 characters. This results in numerous variations in the spelling of the same port, making it difficult for other ships and shore authorities to identify the port uniquely. Therefore, there appears a need to harmonize data input when entering port information. The International Maritime Organization (IMO) recommends the use of the United Nations code for ports and other locations (UN/LOCODE), however entering UN/LOCODE in AIS destination filed has its drawbacks. There is a need to harmonize data by adopting an universal protocol much more precise and detailed than the UN/LOCODE. Using these codes allows systems ashore to filter destinations correctly, avoids confusion, and may assist authorities involved in search and rescue operations. Information about the destination allows to predict each other's courses, which will reduce the risk of collision and thus enhance the safety.

REFERENCES

1.SOLAS Chapter V, Regulation 19.2, " Carriage requirements for shipborne navigational systems and equipment", 2000

2.IMO Resolution A.917(22), "Guidelines for the onboard operational use of shipborne automatic identification systems (AIS)", nov. 2001

3.IMO Resolution A.956 (23), " Amendments to the guidelines for the onboard operational use of shipborne automatic identification systems (AIS)", dec. 2003

4.IMO Resolution MSC. 74(69), "Recommendation on performance standards for an universal shipborne automatic identification system (AIS)", May 1998

5.IMO SN/Circ.227, " Guidelines for the installation of a shipborne automatic identification system (ais)", jan. 2003

6.IMO SN/Circ.244, "Guidance on the use of the UN/LOCODE in the destination field in ais messages", dec. 2004

7.IMO Resolution A.857(20), “Guidelines for Vessel Traffic Services”, nov.1997

8.IALA, “Guidelines on the universal Automatic Identification System (AIS)”, Volume 1, Part I - Operational Issues; Edition 1.3, Saint Germain en Laye – France, dec. 2004

9.IALA, “Guidelines on AIS as a VTS tool”, Saint Germain en Laye – France, dec. 2001

10.UNECE Recommendation No. 16, “UN/LOCODE - Code for ports and other locations”, Geneva, dec.1998

11.U. S. Coast Guard Research and Development Center, “Automatic Identification System (AIS) user requirments”, dec. 2000

12.Swedish Maritime Administration, “Automatic Identification System for Ships in the Future”, feb. 2004

13.Kasum, J., “Radioslužba za pomorce, HHI”, Split, 2005

14.Zec, D., “Sigurnost na moru, Pomorski fakultet u Rijeci”, Rijeka, 2001.

15.http://www6.kaiho.mlit.go.jp/kanmon/eng/mg_2.htm

16.http://www.unece.org/cefact/locode/service/location.html

BIOGRAPHIES

Serdjo Kos

Dr.sc. Serđo Kos was born in 1957 in Rijeka. In 1980/89 he was employed as a navigation officer in Croatia-line (ex Jugolinija) shipping company, as the Third, Second and Chief officer. In eight effective years of ocean-going service in navigation, Professor Kos sailed on vessels of various types, sizes, technologies and purposes. In 1986 he received B.Sc. degree at The Faculty of Maritime Affairs and Traffic, course Nautical Sciences. Since 1989, he has been fully employed at the Faculty of Maritime Studies, University of Rijeka, where he obtained his M.Sc degree (in 1992) and Ph.D. degree (in 1994). In 2009, professor has been elected as Full Professor at the Faculty of Maritime Studies in Rijeka, Technical Sciences Department, in the field of traffic technology and transport. Today, professor Kos is obtaining the role of the Dean at the Faculty of Maritime Studies.

Because his achievement in the domain of Navigation theory – Theory of Loxodromic navigation is internationally recognised, the biography of Professor Kos is included in the 8th edition of Who's Who in Science and Engineering, 2005-2006, by the world's eminent publisher Marquis Who's Who, from the United States of America. Amongst numeruous honourable memberships, Professor Kos is also Fellow of the Royal Institute of Navigation.

The Professor's scientific areas of interest are the following domains: Loxodromic and orthodromic navigation theories; Terrestrial, Electronic and Astronomic navigation; Satellite and inertial navigational systems (Positioning errors of the GPS/GLONASS system regarding ionospheric and tropospheric delay, Correction of the Klobuchar model, Positional dilution of precision of the GPS/GLONASS System, Satellite positioning errors related to the extreme space weather/ionospheric effects, GeoRSS systems and technologies, etc.); Ecology and environmental preservation, Multimodal transport networks; Intermodal, Integrated/Multimodal transport systems and Optimization and simulations in maritime transport.

Mate Vukić

Born in Zadar in 1979. After he finished Maritime high school in Zadar, Croatia, he sailed on tankers before he received the Certificate for the Officer of the Navigational Watch of ships of 3000 GT or more. In the period of 2003/2009 he sailed on crude oil carriers and ro ro passenger ships as the Third, Second and Chief officer. He has Certificate for Master of a ship of 3000 GT or more. Attended and graduated (2005) at the Faculty of Maritime Studies in Rijeka, Croatia. Since 2010, he has been employed at Ministry of Maritime Affairs, Transport and Infrastructure – VTS Croatia.

In 2007, he is enrolled in postgraduate studies at the Faculty of Maritime Studies in Rijeka.

David Brčić

Born in Rijeka in 1979. After he finished Maritime high school in Mali Lošinj, Croatia, he sailed on general cargo ships before he received the Certificate for the Officer of the Navigational Watch of ships of 3000 GT or more. In the period of 1999/2002 he sailed on chemical tankers in the rank of deck officer. Attended and graduated (2008) at the Faculty of Maritime Studies in Rijeka, Croatia. Enrolled at the same Faculty in postgraduate doctoral degree studies, as well as employed as research assistant in the field of Maritime navigation.

AWARD OF CONCESSION CONTRACTS IN LAW OF THE EUROPEAN UNION

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ABSTRACT

Concessions are partnerships between public sector and mostly private companies, where the latter exclusively operate, maintain and carry out the development of infrastructure or provide services of general economic interest. Unlike public procurement contracts which are regulated by secondary law of the European Union and public works concessions, which are partially regulated by European rules on public procurement, the award of service concessions is not subject to any secondary law provisions. It is regulated only by the general principles of the Treaty on the Functioning of the European Union (Treaty). This situation gives rise to potentially serious distortions of the Internal Market in sense of direct awards of concessions without any competition and generates considerable inefficiencies. At time of pressing demands for efficient spending of public money, there is an urgency in establishing a clear European legislative framework ensuring delivery of works and services at best value for money. This will be guarantied through a Union wide competition for high value concessions where all applicants are given a fair chance of winning the contract. So, the European Commission proposed to the European Parliament and the Council adoption of a Directive on the award of concession contracts (Proposal for a Directive on concessions, the Proposal), which is analyzed in this paper.

KEY WORDS
Service concessions, work concessions, contracts on public procurement, award of concession contracts

1. INTRODUCTION

The impact assessment carried out by the European Commission shows that rules and practices of Member States concerning the award of concessions are very different and that the principles of the Treaty are not understood and applied in the same way everywhere. Moreover, Germany, Belgium, Estonia, the United Kingdom, Finland, Greece, Ireland and the Netherlands have no rules on concessions. Absence or inadequacy of national rules for awarding concessions prevents the integration of national markets with regard to concessions and limits access by economic operators, especially small and medium-sized enterprises, to the economic opportunities offered by concession contracts.
The present initiative for the adoption of the Directive on the award of concession contracts (Directive on concessions) aims to reduce the uncertainty surrounding the award of concession contracts, and thereby benefiting public authorities and economic operators.

2. DEFINITON OF CONCESSION

The definition of concession is not contained in the Treaty. The only definition of concessions is that in

Directives 2004/17/EC and 2004/18/EC which are regulating public procurement system in the European Union. According to that definition concessions are contracts of pecuniary interest concluded between one or more economic operators and one or more contracting authorities or entities and having as their object the acquisition of works or services where the consideration consists, normally, in the right to exploit the works or services that are the subject of the contract. The execution of these works or services are subject to specific binding obligations defined by contracting authority or entity which are legally enforceable. Certain acts such as authorisations or licences whereby the State or public authority establishes the conditions for the exercise of an economic activity, should not qualify as concessions. This is also the case with agreements having as their object the right of an economic operator to exploit certain public domains or resources, such are land lease contracts whereby the State or contracting authorities or entities establish only general conditions for their use without acquiring specific works or services.

The current definition makes it difficult to distinguish between concessions and some other public agreements, especially public contracts, authorisation and licences. This situation have given rise to numerous judgements oft he Court of Justice oft he European Union. Out of twenty five Court rulings on concessions since the Telaustria1 landmark decision brought in year 2000, thirteen of them concerned the clarification of the notion of concession. Although the case law of the Court shed some more light on this definition, fundamental elements, such as level and types of risk, still remain unclear.2 The Commission provided some clarity in this respect in its interpretative Communication,3 explaining that the risk inherent in the exploitation of work or service which the concessionaire has to bear is the essential feature of a concession. Therefore, the definition of concession is clarified in the Proposal for a Directive on concessions in particular by referring to the concept of substantial operating risk. The main feature of a concession, the right to exploit works or services, always implies the transfer to the concessionaire of an economic risk involving the possibility that it will not recoup the investments made and costs incurred in operating the works or services awarded. That economic risk may consist in either of the following: (a) the risk related to the use of works or demand for the provision of the service; or (b) the risk related to the availability of the infrastructure provided by the concessionaire or used for the provision of service to users

3. CURRENT LEGAL REGULATION

Directive 2004/17/EC regulates public procurement procedures in water, energy, transport and postal services sectors (utilities sector) and Directive 2004/18/EC regulates public procurement procedures in classic sectors (all other sectors not covered by utilities).4 As we mentioned before, in the second chapter they also contain certain rules on concessions. Those Directives differ two types of concessions: public services

[1] Case C-324/98 *Telaustria*, [2000] ECR I-10745, where the Court stated that the contracting authorities need to comply with the Treaty principles of equal treatment and transparency when awarding concession contracts.

[2] The case law is still not sufficiently clear, in particular regarding the level of operating risk to be transferred to the economic operator so as a contract can qualify as a concession.

[3] Commission interpretative communication on concessions under Community law, OJ C 121, 29.4.2000, p.2-13 and Commission interpretative communication on the application of Community law on Public Procurement and Concessions to Institutionalised Public-Private Partnerships (IPPP), COM (2007) 6661, Brussels, 5.2.2008.

[4] Directive 2004/17/EC of the European Parliament and of the Council of 31 March 2004 coordinating the procurement procedures of entities operating in the water, energy, transport and postal services sectors, OJ L 134, 30.4.2004, p.1.
Directive 2004/18/EC of the European Parliament and of the Council of 31 March 2004 coordinating of procedures for the award of public works contracts, public supply contracts and public service contracts, OJ L 134, 30.4.2004, p.114.

concessions and public works concessions. Only the award of public works concessions the value of which is equal to or greater than EUR 5 000 000 is presently subject to rules of Directive 2004/18/EC, while the award of services concessions with a cross-border interest is subject only to the basic principles of the Treaty, and in particular the principle of free movement of goods, freedom of establishment and freedom to provide services, as well as to the principles deriving from that principles such as equal treatment, non-discrimination, mutual recognition, proportionality and transparency. There is a risk of legal uncertainty related to different interpretations of the principles of the Treaty by national legislators. Such risk has been confirmed by the extensive case law of the Court of Justice of the European Union but which has only partially addressed certain aspects of the award of concession contracts. So, by secondary law provisions are not regulated public works concessions in utilities sector, public works concessions in classic sector the value of which is under EUR 5 000 000 and public services concessions in both sectors, independently of their value. Therefore the European Commission decided that uniform concretisation of the Treaty principles across all Member States and the elimination of discrepancies in their understanding was necessary. In that sense, it proposed to the European Parliament and Council adoption of the Directive on concessions.

4. PROBLEMS CAUSED BY ABSENCE OF EUROPEAN RULES ON THE AWARD OF CONCESSION CONTRACTS

Absence of clear rules at Union level governing the award of concession contracts gives rise to legal uncertainty and entry barriers which hinder the access of European Union operators from one Member State to concession markets of another Member State. Legal certainty is essential to any economic activity and is particularly important in the context of long-term, high-value contracts such as most concessions. However, the award of concessions is currently impaired, on the one hand by the lack of a clear and adequate definition of these contracts in European Union law and, on the other hand by the imprecise character of the obligations arising from the Treaty principles. Uncertainty with regard to the definition of concession appears already at the stage of qualification of a given arrangement as falling within the scope of the rules on public purchases. The distinction between public contracts and concessions on the one hand and unilateral acts (licenses and authorisation) on the other hand, is unclear and operators reported that it is often difficult to know which legal regime applies to a given arrangement. This situation causes distortions in the functioning of the Internal Market of the European Union. Uncertainty exists also with regard to the obligations of the contracting authorities or contracting entities to apply Treaty principles of transparency, equal treatment and non- discrimination when awarding concession contracts.

Although the Court confirmed in Telaustria decision[5] that the contracting authorities or contracting entities which award concessions are bound to comply with the fundamental rules of the Treaty, it did not sufficiently explain the content of those rules. Besides, it is not easy to judge the adequacy of measures aimed at ensuring compliance with the principles of equal treatment, non-discrimination and transparency.

On the other hand, divergent national rules on concessions make barriers of entry into concession markets for operators from other Member States. Economic operators are faced with different levels of transparency resulting in unlevel playing field and often translating into lost opportunities to seek contracts. They generate costs related to legal advice and need to acquire knowledge of specific national or even regional or local rules on the award of concession contracts. Divergent national rules on concessions which create barriers of entry into the markets of Member States, or delay their entry; in particular for small and medium size enterprises who can not pay the costs of legal advice, put incumbent national enterprises at significant advantage. In that way the market stays fragmented and the rate of cross-border provision of services remains limited. This effectively means that European Union citizens may not be benefiting from quality services at best prices. At the time of pressing demands for efficient spending of public money there is an urgency in establishing a clear

[5] See footnote 1.

European legislative framework allowing for delivery of works and services at best value for money.

5. LEGAL ELEMENTS OF THE PROPOSAL

On 20 th of December 2011 the European Commission brought the Proposal for a Directive on concessions. The Commission's Proposal for a Directive on concessions is now sent to the European Parliament and Council of Ministers for adoption under co-decision procedure.

The main elements of that Proposal are: (a) clearer and more precise definiton of a concession. The Proposal for a Directive on concessions clarifies the definition of concession in particular by referring to the concept of substantial operating risk. The main feature of a concession, the right to exploit works or services, always implies the transfer to the concessionaire of an economic risk involving the possibility that it will not recoup the investments made and costs incurred in operating the works or services awarded;6 (b) in order to ensure transparency and equal treatment to all economic operators the Proposal provides for obligation for contracting authorities and contracting entities to publish in the Official Journal of the European Union their intention to award concession by means of a concession notice for concessions which value is equal or greater than EUR 5 000 000; (c) establishment of a minimum deadline of 52 days for the submission of applications for the concessions.7 It has been decided to provide for concessions a longer deadline than in case of public contracts, given that concession contracts are usually more complex;(d) establishment of certain obligations with respect to the selection and award criteria to be applied by contracting authorities or contracting entities when awarding concessions. These rules are less restrictive than similar provisions currently applicable to public contracts. However, they restrict the selection criteria to those that are appropriate to ensure that a candidate or tenderer has the legal and financial capacities and commercial and technical abilities to perform the concession to be awarded. All requirements shall be related and strictly proportionate to the subject-matter of the contract, taking into account the need to ensure genuine competition. Any candidate or tenderer shall be excluded from participation in a concession in case that he has been subject of a conviction by final judgement for participation in a criminal organisation, corruption, fraud, terrorist offences and money laundering. Member States may also provide that contracting authorities or contracting entities exclude from participation in a concession award any economic operator where it is aware of any serious violation of provisions of European Union or national law aimed at the protection of public interests compatible with the Treaty, or where the economic operator is the subject of insolvency or winding-up proceedings, or where the economic operator has shown significant or persistent deficiencies in the performance of any substantive requirement under a prior concession or concessions of a similar nature with the same contracting authority or contracting entity.

On the other hand, award criteria should ensure compliance with the principles of transparency, non-discrimination and equal treatment and that tenders are assessed in conditions of effective competition permitting to identify an overall economic advantage for the contracting authority or the contracting entity. These criteria should prevent arbitrary decisions by contracting authorities and contracting entities and must be published in advance and listed in descending order of importance. Member States or contracting authorities or contracting entities which so wish, may also provide for or apply (it isn't obligatory) "the most economically advantageous tender" criterion for the award of concessions.8 (e) no specific award procedures but instead of that definition of certain general guaranties aimed at ensuring transparency and equal treatment with particular reference to negotiation.9 These

[6] More about definition of concession see in the chapter 2.

[7] The time limit for receipt of tenders may be reduced by five days where the contracting entity accepts that tenders may be submitted by electronic means.

[8] Commission deems that the use of that criterion, in most cases, does not permit to take into account the complexity of such contracts.

[9] For example, contracting authorities and contracting entities shall indicate in the contract

guaranties aim at ensuring that the process is fair and transparent. This solution allows Member States to prescribe more flexible procedures for awarding concessions notably reflecting national legal traditions and permitting the award process to be organised in the most efficient way. (f) extension of the scope of application of the Remedies Directives (Directives 89/665/EEC and 92/13/EC, as amended by Directive 2007/66/EC) to all concession contracts above the threshold in order to guarantee effective channels for challenging the award decision in court and provide minimal judicial standards which have to be observed by contracting authorities or entities.10

(g) regulation of modification of concessions during their term. According to the Proposal a substantial modification of the provisions of a concession during its term shall be considered as a new award of the concession and shall require a new concession award procedure. A modification shall be considered substantial where it renders concession substantially different from the one initially concluded. A modification shall be considered substantial, in any case where one of the following conditions are met:: 1. It introduces conditions which, if had been part of the initial concession award procedure, would have allowed for the selection of other applicants than those initially selected, or awarding concession to another applicant or tenderer. 2. The modification changes the economic balance of the concession in favour of the concessionaire, or 3. The modification extends the scope of the concession considerably to encompass supplies, services or works not initially covered.11

A modification shall not be considered to be substantial where its value does not exceed threshold of EUR 5 000 000 and where it is below 5% of the price of the initial contract, provided that the modification does not alter the overall nature of the contract. A substantial modification also shall not require a new concession award procedure where the following cumulative conditions are fulfilled: 1. The need for modification has been brought about by circumstances which a diligent contracting authority or entity could not foresee. 2. The modification does not alter the overall nature of the concession. 3. In case of concession awarded by contracting authorities where any increase in price is not higher than 50% of the value of the original concession.

6. CONCLUSIONS

Current legal regulation of concession contracts in the European Union is not satisfactory for anybody. Economic operators, in particular small and medium-sized enterprises, are faced with legal uncertainty and consequently, barriers of entry on concession markets of other Member States, public authorities may, because of the partial regulation of concession contracts by secondary law of the

notice, in the invitation to submit tenders or in the concession documentation a description of the concession, the award criteria and the minimum requirements to be met, which shall not be changed in the course of the negotiations.

10 Council Directive 89/665/EEC of 21 December 1989, on the coordination of laws, regulations and administrative provisions relating to the application of review procedures to the award of public supply and public works contracts, OJ L 395, 30,12, 1989, p.33.

Council Directive 92/13/EEC of 25 February 1992, on the coordination of laws, regulations and administrative provisions relating to the application of Community rules on the procurement procedures of entities operating in the water, energy, transport and telecommunication sectors, OJ L 395, 30,12, 1989, p.33.

Directive 2007/66/EC of the European Parliament and of the Council of 11 December 2007 amending Council Directives 89/665/EEC and 92/13/EEC with regard to improving the effectiveness of review procedures concerning the award of public contracts, OJ L 335, 2. 12. 2007, p.31.

11 Obligation to pursuit a new award procedure shall not apply in the event of universal or partial succession into the position of the initial contractor, following corporate restructuring operations, insolvency or on the basis of a contractual clause of another economic operator that fulfils the criteria for qualitative selection initially established provided that this does not entail other substantial modifications to the concession and is not aimed at circumventing the application of the Directive on concessions.

European Union, fail to guarantee the efficient spending of public money and European Union citizens may, for the same reason, not be benefiting from quality services at best prices.

The Proposal for a Directive on concessions will bring concretisation of the Treaty principles of transparency, equal treatment, free-competition and non-discrimination in the field of award of concession contracts by prescribing concrete rights and obligations of economic operators and contracting authorities and other entities which are participating in that procedure. This will reduce the legal uncertainty which is currently the biggest problem in the field of award of concession contracts.

REFERENCES

1.Aviani, D., "Pravna zaštita u postupku dodjele javnih ugovora-harmonizacija hrvatskog prava s acquis communautaire", Zbornik radova Pravnog fakulteta u Splitu, Vol.45, No 1 (2008), pp., 175-195.,

2.Šikić, M., Staničić, F., "Pravna narav ugovora o koncesiji", Zbornik radova Pravnog fakulteta u Splitu, Vol.48, No 2 (2011), pp. 419-441.,

3.Borković, I., "Upravno pravo", Narodne novine, Zagreb, 2002., pp.39-40.,

4.Đerđa, D., "Ugovor o koncesiji", Hrvatska javna uprava, 3 (2006), pp.105.,

5.Commission interpretative communication on concessions under Community law, OJ C 121, 29.4.2000, p.2-13.

6.Commission interpretative communication on the application of Community law on Public Procurement and Concessions to Institutionalised Public-Private Partnerships (IPPP), COM (2007)6661, Brusseles, 5.2.2008.

7.Proposal for a Directive of the European Parliament and of the Council on the award of concession contracts, Brussels, 20. 12. 2011, COM (2011) 897 final.

BIOGRAPHIES

Božena Bulum was born in 1978. She graduated law at the Split Faculty of Law. In 2003 she passed bar examination at Ministry of Justice. She gained her LL.M. in 2005 and Ph.D. in 2008 at the Split Faculty of Law. She works as a research associate in the Adriatic Institute of the Croatian Academy of Sciences and Arts. She is author of one book Usluge pomorskog prijevoza i lučke djelatnosti u pravu tržišnog narjecanja Europske zajednice (Maritime transport services and port services in competition law of the European Community), and co-author of the book Europsko prometno pravo (European Transport Law). Furthermore, she has published around 20 scientific and professional papers. Her field of scientific interest covers maritime law, and European transport law. She is a member of the Editorial Board of the scientific periodical publication Comparative Maritime Law. She was a member of the Expert Commission which drafted Croatian Maritime Code. She is also a member of the Croatian Association of Maritime Law.

Vesna Skorupan Wolff was born in Zagreb. She has graduated law at the Faculty of Law, University of Zagreb (LL.B.) in 1993. In 1999 she gained her LL.M. She earned her Ph.D. in 2005 at the Faculty of Law, University of Zagreb. Her doctoral thesis was "Liability of the Maritime Carrier". She passed her Bar exam in 1995. Since 2003 she is employed at the Adriatic Institute of Croatian Academy of Science and Arts. She is currently senior research associate. She held two other posts before starting to work at the Adriatic Institute. She worked in a private attorney office and at the Supreme Court of Republic of Croatia. She has published over 50 scientific and professional papers. She has participated in numerous domestic and several international conferences related to maritime law. Since 2007, she is an associate on the scientific project "Croatian Maritime Legislation and the EU Law". She won the prize of the Croatian bar association - professional periodical publication "Odvjetnik" for the best paper in the 1995. She is a member of the Editorial Board of the scientific periodical publication Comparative Maritime Law. She was a member of the Expert Commission which drafted Croatian Maritime Code. She is a member of the Croatian Association of Maritime Law. Her scientific interests include maritime law.

Ivana Oršulić is research assistant at the Adriatic Institute of Croatian Academy of Sciences and Arts and postgraduate student at the Zagreb Faculty of Law. Areas of interest are maritime and commercial law. She graduated law at the Split Faculty of Law in 2003 and passed bar examination at the Ministry of Justice in 2005. Prior to joining Adriatic Institute she worked at the notary public office Karabotić-Milovac in Split, first as notary's trainee and then as legal associate. Afterwards, she worked at Siemens d.d. as corporate lawyer. Since 2009 she has been working on the scientific project financed by Croatian Ministry of Science, Education and Sport: "Croatian Maritime Legislation, International Standards and the EU Law". She is author and co-author of over 10 scientific and professional papers.

IMPACT OF THE GLOBAL WARMING ON SHIP NAVIGATION IN POLAR AREA

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ABSTRACT

Generally, navigating in polar areas has always been one of the most dangerous voyages. The main reason for the increased risk derives from ice, but also from the other unfavorable navigation conditions that occurs in the high northern and southern latitudes, for example: very low temperatures, ice-covered coastlines, sparse population, inability to escape from danger, difficult communication and positioning etc. So far, maritime traffic in area of high latitudes has been relatively small, and the main reason for this can be found in the absence of major ports in this region, and in the inability to use certain routes because of ice. However, significant changes are happening in the last few years, and those changes have announced a brand new role of polar areas in terms of new main routes for merchant ships, especially in Arctic area. These changes have occurred as a result of the increasing exploitation of mineral resources in the polar areas, the exploiting of fish stocks, development of tourism, military and political objectives, etc., including the development of modern technologies that enables us to use, and the people that are living and working in extreme polar conditions. All this is further encouraged by global warming and consequent melting of ice. Precisely, the melting of ice has opened the possibility of using new routes for ships, which today represents completely new challenges for the global shipping industry. This article handles the basic geographical and climatological characteristics of polar areas, maritime transport, and the impact of global warming on the possibility of opening new routes, including existing and upcoming changes in legal regulations for maritime navigation in this area. Special emphasis will be given to the new demands which are being placed in front of crew that are sailing in area of high latitudes.

KEY WORDS
polar areas, global warming, a new route for ships, crew training.

1. INTRODUCTION

Borders defined by IMO (International Maritime

the southern coast from Jan Mayen towards the island of Bjørnøya, Svalbard all the way to Kanin Nos, and from Kanin Nos it follows the north coast

° 00,0' N, λ = 056 ° 37,1 'W) to P5 (φ = 058 ° 00,0' N ; λ = 042° 00,0 'W). (Figure 1)
The Antarctic waters are the waters south of 60° 00,0´S. (Figure 2)

Waters covered with ice are the polar waters where ice conditions represent a threat to the ships.

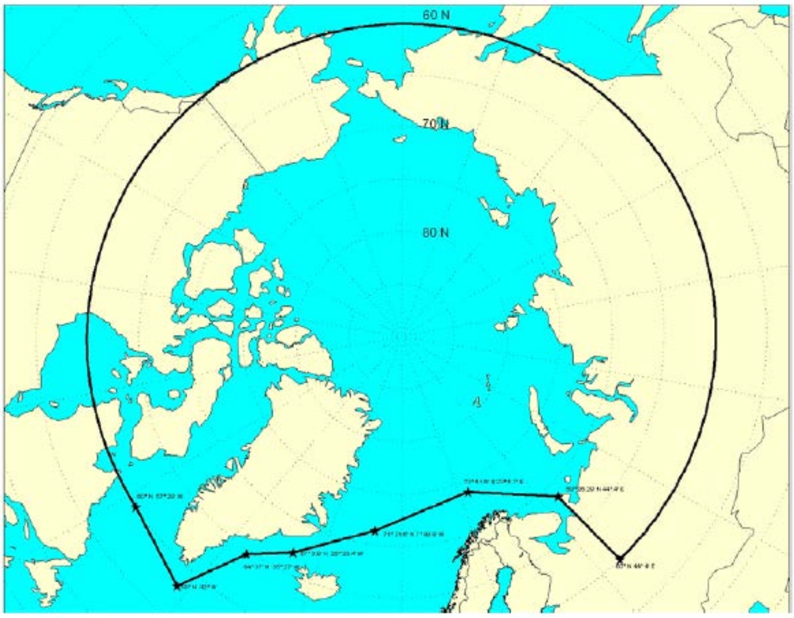

Figure 1. Borders on Arctic defined by IMO [40.]

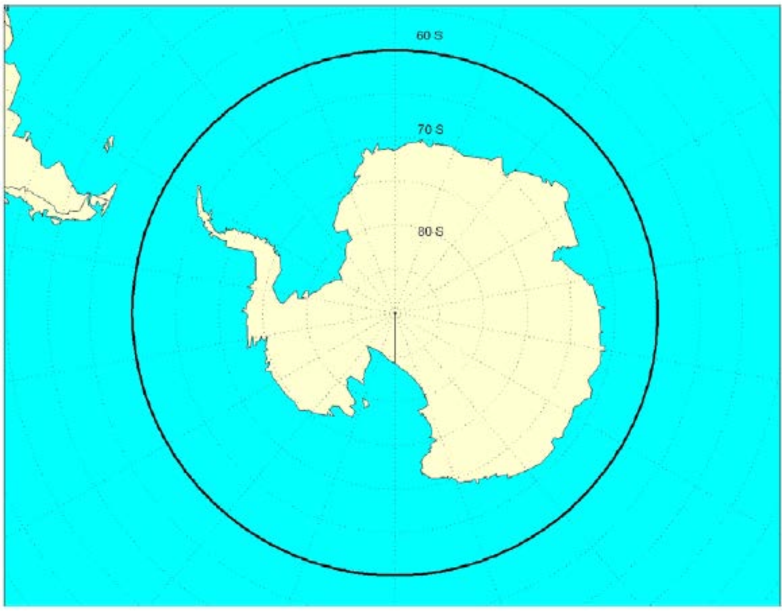

Figure 2. Borders on Antarctic defined by IMO [40.]

2. NAVIGATION PROBLEMS IN THE HIGH LATITUDES

The navigation in the polar areas can be difficult due to the lack of the vast number of the navigation devices. Natural land marks may not be shown on the map, or it could be difficult to identify it. Also the occurrence of certain changes in land can be changed under ice conditions. When snow covers the coast and extends for miles towards the sea, even the shore is hard to spot.

Ships navigating in the areas of the Arctic and the Antarctic are exposed to many risks and perils. Cold temperatures in these areas can reduce the effectiveness or even cause the interruption of function of some components on the board. Search and Rescue (SAR) operations or oil pollution operation can be very complicated and expensive due to the harsh conditions and the distance of the area. Navigation in these areas is a real challenge to mariners due to bad weather conditions, the relative reliability of navigational charts for the polar region, the interference of communication systems and the impact of harsh conditions on other navigational aids.

Not many geodetic measurements have been made in these areas and so the nautical charts for polar region are less reliable compared to the charts for other regions. Since not many depth measurements were made in this area, ships that enter the port often send boats ahead to check the depth of the water in front of them. However, the reliability of nautical charts in the Polar Regions improves constantly as new information becomes available.

Sky waves of Loran C are available throughout the Arctic, and ground waves only in some parts of Arctic. Ground waves and sky waves are not available in Antarctica. [35] Radar is useful, but the interpretation of range in Polar Regions is important for reliable results. Radio direction finder is useful only when radio signals are available. The use of electronics in the Polar Regions is further limited by magnetic storms, which are particularly severe in the auroral zones. [35]

There are difficulties in determining dead reckoning position in Polar Regions because the reliability of dead reckoning position depends on the availability of the precise measurements of direction and distance, or speed and time measurements. The direction is measured by compass. The magnetic compass becomes unreliable near the Earth's magnetic pole, and the gyro compass when seeking north becomes unstable near the Earth's poles. One of solutions may be the use of directional gyro (and inertial systems) which maintains its own axis in a certain direction, but must be returned at regular intervals, because of the gyroscopic drift.

In Polar Regions celestial navigation may be of great importance, and sometimes the only way to determine the position, or establish reference direction. When navigating at lower latitudes, navigators generally avoid observing bodies near the horizon because of the uncertainty of refractive correction. However, although the refractive refraction is uncertain, navigators often have no choice. Near the equinox the Sun may be the only body available in a few weeks, and it remains close to the horizon.During the polar summer the Sun is often the only celestial body that is available. In situations when only one celestial body is available, that body is observed in intervals.

Measuring distance or speed in the polar region does not represent a problem for airplanes, but it does for ships. When ships navigate in ice-covered waters, the sensor can be negatively affected or damaged by ice.

Determination of dead reckoning position for ships that navigate in ice-covered waters is problematic, not because of difficulties in measuring the course and speed, but of the fact that none of these two elements can not be constant for a long time.

During the developing of passage plan for Polar Regions, special attention should be paid to environmental protection, limited resources, and navigation information.

Passage plan should include the following factors:

- safe areas,
- no-go areas,
- overview of maritime corridors and contingency plans for the regions far from SAR areas,
- situations when it is not safe to enter the areas covered with ice or icebergs,
- safety distance from icebergs, and
- safety speed in those areas.

Country	Oil (bbs)	% World	Gas (tem)	% World
United States	30,9	2,2	7,7	4,1
Canada	32,1	2,3	1,7	0,9
Russia	77,4	5,6	44,8	23,9
Norway	6,7	0,5	2,0	1,1
Arctic states total	147,1	10,6	56,2	30,0
World total	1383,2	100,0	187,1	100,0

Table 1. World reserves of oil and gas in 2010

3. DEVELOPMENT OF MARITIME INDUSTRY IN POLAR REGIONS

According to the research, the Arctic can contain up to 20% of world's undiscovered resources of carbohydrate.[7] Of all the resources, it is believed that 84% are to be found in off-shore waters, i.e. in the waters where water depth is lower than 500m. Although these resources have not been discovered yet, they incite significant industrial activities in the Arctic region. Other industrial sectors also see diverse possibilities in this region, for example: excavation of rare minerals from the ground, fish abundance and the growth of tourism.
Exploitation operations of oil and gas in the Arctic are more demanding than in the North Sea, because of the harder working conditions in the Arctic. Extremely low temperatures and long periods of darkness create extremely difficult working conditions for the staff. However, such harsh conditions can affect the characteristics of materials and equipment performance and functionality. The harsh conditions may reduce the functionality and availability of safety barrier if not operated correctly.
Increase of activities in various industries in the Polar Regions is expected in next few years. International cooperation in such areas would lead to greater productivity and also reduce the possibility of maritime accidents, increase the efficiency of search and rescue operations, etc. In long term, further editing regulations, technologies and standards adapted to hard conditions of Arctic are way forward to achieve an acceptable level of risk for working on the Arctic. [33]
The number of seismic drilling operations in the Arctic is increasing each year. The future projects are based on the exportation of natural gas and minerals from the ice covered parts in the Arctic where the high technology ships are being used. After 40 years of negotiations, in 2010. Norway and Russia have agreed on Barents Sea border, which have opened up large areas for new seismic studies and the potential discovery of new oil and gas fields.
Areas of Antarctica and Arctic are not yet fully explored and additional data on resources, ice and weather conditions in this area are needed. Advanced studies and researches as well as systematic data collection will be of utmost importance for the prediction and risk management in the Arctic. Also according to the instructions of IMO Polar Code, companies are required to prepare their ships and to invest in education and training of staff in these areas.

4. GLOBAL WARMING AND CLIMATE CHANGES

4.1. Arctic

One of the world's leading ice specialists predicted the final collapse of Arctic sea ice in summer within five to ten years. What experts call a "global catastrophe" takes place in the far northern areas of high latitudes. Marine area each year freezes and melts at the lowest extent ever recorded.
Global warming is the result. Researches have shown that during the winter period the growth of ice decreases every year and during the summer months there is an increase in ice melting. In the summer months in 2011 the sea temperature in the Arctic was 7°C, which is too high for this area.
Given the above situation, urgent measures are needed to reduce global warming. However, on the other hand, the continuous increase of temperature in these areas causes ice melting and makes possible the opening of new geo traffic routes that will contribute to increase of marine traffic i.e., the

transport of goods in these areas. In this way new areas would be created where seismic explorations would be performed, and new sources of gas and oil would be discovered.

The satellite pictures of the Arctic from 2012, that were taken by National Aeronautics and Space Administration (NASA) Earth Observatory shows that the ice surface has reached its lowest level. Ice measurements in the Arctic have begun in 1979, and according to the recent results the amount of ice in the Arctic is 50% below average. On the photos taken by NASA we can see the amount of ice on 13/9/84 compared to amount of ice on the 14/9/12. (Figure 3)

According to data from The National Snow and Ice Data Center (NSIDC) in Boulder, Colorado, Arctic sea ice fell to its lowest level of 3.4 million square kilometers (1.32 million square miles) in 2012. This value is the lowest since satellites began to provide data in 1979. Average minimum ice extent for the period 1979 to 2000 was 6.7 million square kilometers (2.59 million square miles). [11]

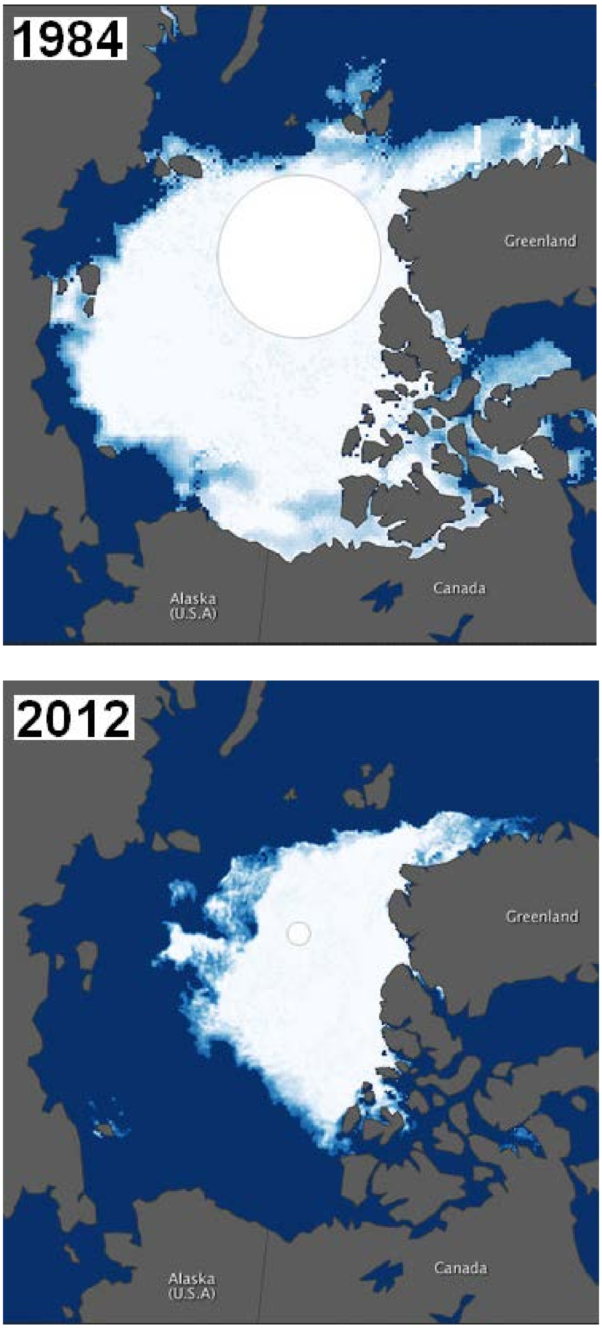

Figure 3. Satellite images of the Arctic ice from NASA Earth Observatory [11.]

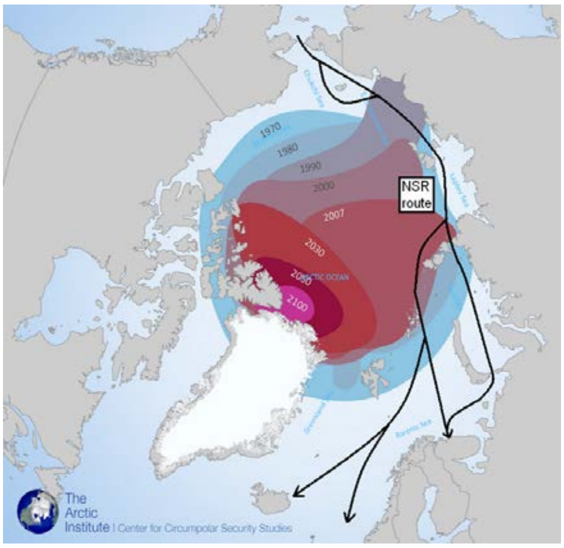

Figure 4. Further decline of ice in the eastern Arctic will reflect positively on the NSR route [15.]

A new study by the National Aeronautics and Space Administration (NASA) shows that the old thicker ice is disappearing faster than the newly created thinner ice. Furthermore, the distribution of the remaining summer ice will not be uniform across the Arctic Ocean. Studies show that the sea ice will continue to accumulate, mostly along the northern part of the Canadian Archipelago and Greenland, while the central and eastern part of the Arctic will be impacted as a significant decrease in ice. This case Northern Sea Route (NSR) route will last 141 days, from early July to mid-November. (Figure 4).
As regards to maritime transport, the global warming will have the most impact on the Arctic. According to the Climate Impact Assessment (ACIA) reducing the level of ice in the Arctic is very likely, and thus the increase of sea transport in these areas and the approaching of new sources for industry to exploit natural resources.
Intra-Arctic1 and trans-Arctic2 shipping may provide alternative solutions to new and shorter shipping routes versus using much longer routes for transportation, such as through the Panama and Suez Canal or the Arctic routes which are partly on land and partly by sea. (Figure 5)
It should be borne in mind that although in the future the summer will be without sea ice, the sea ice will continue to be present in the Arctic Ocean in lesser extent, but various other factors can affect the aggravation of navigation in these area.

Figure 5. The ratio of the length of navigable waterways between the Northern Sea Passage (NSR) and the Southern Sea Passage (SSR) [41.]

It can be expected that in the near future the high hydrocarbon prices will lead to a greater use of shorter trans-Arctic routes, and thus the increase of vessel traffic in these areas. It is also expected the increase of exploration and exploitation of hydrocarbon resources in the Arctic, that will contribute to increase of maritime transport in the Arctic marine area. A key role will have risk-assessments of classification societies and marine insurance industry for the economic viability of all sectors of shipping in Arctic Sea.

4.2. Antarctic

The concentration of sea ice in the Antarctic 2008 was 4.4% higher than in 1979 when satellite measurements began at the poles. In November 2008 the sea ice surface was 16.6 million square miles, and in November 1979 it was 15.9 million

[1] Intra-Arctic is navigation between two places in the Arctic Ocean, for example between Dudinka and Murmansk.
[2] Trans-Arctic shipping is navigation between the ports in the Pacific and the Atlantic Ocean that goes via the Arctic Ocean, for example between ports in Japan and ports in Germany, via Northeast Passage.

square miles. Sea ice concentration shows an equal increase of 11.2 million square kilometers in 1979, to 11.7 million square kilometers in 2008. [7] Apparently the southern hemisphere is not suffering from global warming. Satellite measurements show an increase of sea ice in Antarctic (Figure 6).

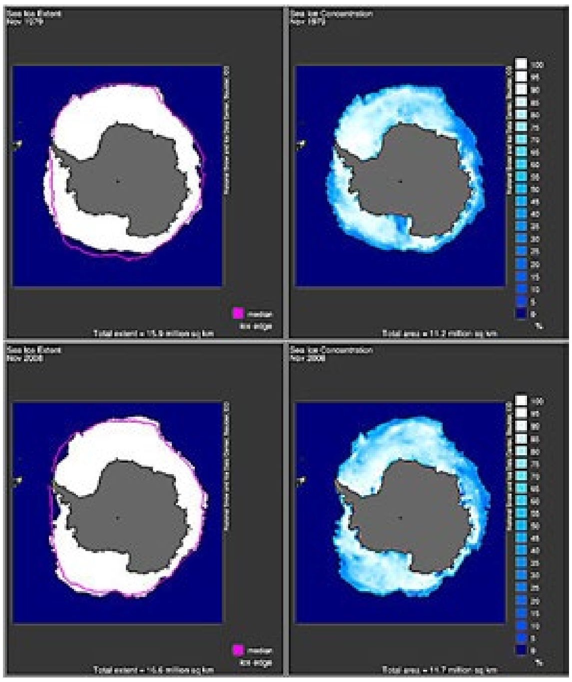

Figure 6. The concentration of ice in Antarctica through periodic measurements by satellite[14.]

According to National Oceanic and Atmospheric Administration (NOAA) GISS data winter temperatures in Antarctica have dropped by 1° F compared to 1957, where the coldest year was in 2004. [14] Anomalies of sea ice from 1979 to 2012 in the Arctic and Antarctic are shown in Figure 7. It can be seen that the sea ice from 1979 to 2012 has greatly reduced, while in Antarctica experienced a slight increase. Thick lines indicate 12-month running means, and thin lines ne monthly anomalies. [14]

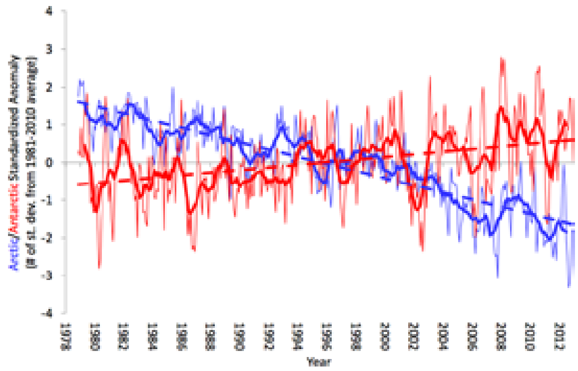

Figure 7. Arctic and Antarctic Sea Ice Extent Anomalies, 1979-2012;

Antarctica is also warming up, but not as fast as the rest of the world since it is colder. Also there is a difference of ozone loss in the stratosphere over Antarctica, which results in colder stratosphere. [30]
The amount of ice on the Arctic is decreasing, while on the Antarctic is increasing. The reason lies in fact that the North Pole consists of ocean, so that ice on the Arctic moves beyond the usual areas, that's why the consequences of warming atmosphere and ocean can be seen on the Arctic. Antarctica is a continent that is isolated from the rest of the world and has its own climate system. Winds in Antarctica blow in a clockwise direction but in a way that they make some kind of protective layer surrounding the land. For this reason the Antarctica is also warming up, but not as fast as the North Pole. [30]

5. TYPES OF MERCHANT SHIPS OPERATING IN POLAR REGIONS

Tankers have a very important role in the transport of crude oil and other forms of liquid cargo in areas such as the Arctic, Russia and several European parts in which is difficult to navigate during the winter period, where the water surfaces are covered with thick layers of ice. All ships that pass through those areas requiring assistance from icebreakers which are going forward and breaking thick layers of ice. This type of assistance from icebreakers requires additional costs for the company because they have to pay for such services.

For this reason it is important to mention DAS (Double acting ship) and DAT (Double acting tankers) ships that companies are using to reduce their costs, while navigating in polar areas. These are types of ships that are specially designed for sailing in the waters covered by thin ice. However, they can change direction and continue to drive astern in heavy ice conditions.

These vessels can operate in areas covered by ice without icebreaker assistance, and also have better performance in open water than ice breakers. Therefore, these ships were constructed to break the ice with the stern, and to navigate in open waters with bow. (Figure 8)

In order to avoid additional expenses and to enable ships to navigate in the waters that are covered by thick ice like in Russia, Canada or north Europe, without the assistance of icebreaker, the DAS and DAT ships are being used. DAT tanker can break and navigate in thick ice even without the help of ice breakers. The first such DAT tanker "Tempera" was delivered to shipping company in 2002. [38]

Double acting tanker navigates in the forward direction as any other ship. However, when it comes to breaking the ice, the ship is moving astern. The aft part of the hull structure is composed of special reinforced double skin with a fatigue life of around 40 years. [38]

Figure 8. The aft part of the hull structure in double acting ships is composed of special reinforced with a double skin which breaks the ice when moving astern [37.]

With these ships, conventional rudder and propeller were replaced with Azipod system that can achieve speeds above 15 knots. Azipod system consists of a high-power electric motor and a fixed pitch propeller that can rotate 360 degrees. Also on these ships a bow thrusters are added to provide excellent maneuverability in narrow channels and harbors. This design allows the DAT to reach speeds of more than 2 knots over the ice sheets thicker than 1mm when they drive astern. Propulsion on these ships is being used to generate streams of water between the hull and ice that lubricates the contact surface and reduces friction hull. [37]

Double acting ships are able to direct the propeller water flow to crush the ice and push it away. In this way, double acting ships navigate through the sea surface covered by ice without icebreaker assistance. [37]

In this kind of ships all bunker tanks are made of double hull because the main parts of stern are in contact with ice. The coffer dam and pump room are also protected by a double hull. [37]

6. EXISTING MARITIME TRAFFIC AND ITS ANALYSIS

Northeast Passage (NEP): connects the Atlantic Ocean and the Pacific Ocean in the north coast of Eurasia, from Murmansk to the Bering Strait. Northern Sea Route (NSR): NSR is known by its Russian name. The difference between NEP and NSR is that NEP includes NSR including Barents Sea. (Figure 9) According to the data from 2011, during the summer months in the Northeast Passage (NEP) more than 835000 t of cargo was transported (Table 2). That number can only increase over the next few years, taking into account the annual decline of ice in the Arctic. The North West Passage (NWP) was the first without ice in 2007. If the global warming effects continue, the Transpolar Sea Route (TSR) could also be opened for the merchant ships in the upcoming decades. The development of the offshore industry in the Arctic will contribute to the improvement of the economic activities and the integration of the Arctic economy into the global trade. With global warming, the Trans-Arctic routes could provide new and additional capacity for the growing marine traffic in years to come.

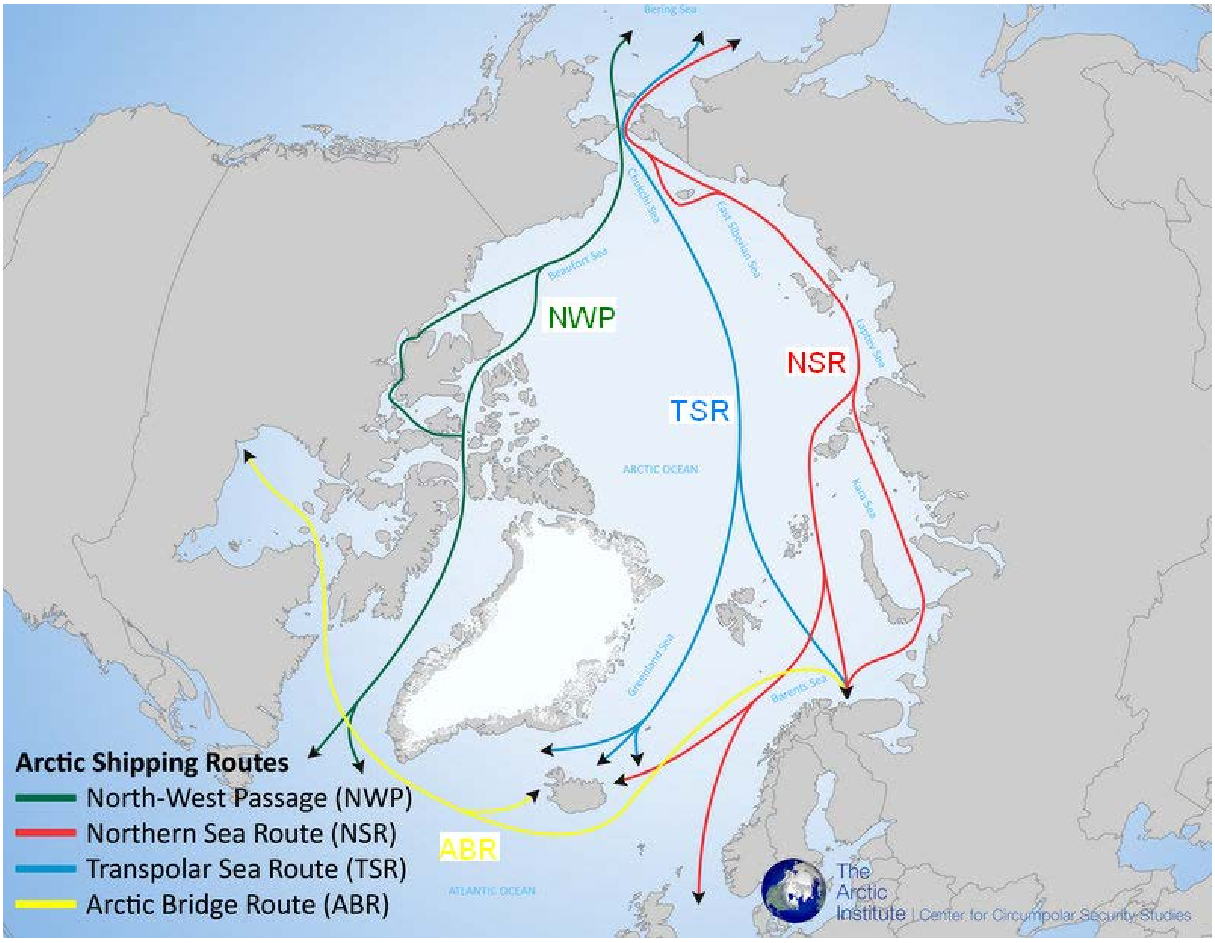

Figure 9. Arctic Shipping Routes [15.]

The main barriers for navigation in polar areas are floating ice and icebergs, especially during the warmer season when the ice begins to melt. Navigating through the Arctic the ships will save on distance, time and fuel. The energetic efficiency would improve while navigating from one port to another.

Savings on the way through the Arctic waterways is up to 40% compared to traditional routes, for example through the Suez Canal. Also smaller distance provides better efficiency in transport, so that the ship made multiple trips from one port to another which eventually resulted in higher profits for the shipping company.

Volume of transit cargoes transported on the Northeast Passage in 2011		
Cargo	Volume ton	Voyages
Gas condensate	600607	9
Kerosene	64500	1
Disel fuel	21409	5
Iron ore concentrate	109950	3
Fish	27535	4
General cargo	10930	4
Total	834931	26

Table 2. Volume of transit cargoes through Northeast Passage in 2011

Also the decrease of speed through shorter way will translate into a reduction of fuel consumption, i.e. energy efficiency would increase, and thus reduce of CO2 into the atmosphere.
However, the main problem in safety of navigation in the Arctic will remain in lack of reliable weather forecasts, icebergs (especially at the beginning of the warmer season when the ice begins to melt), and weather conditions. Ship operations in this area depend on three key factors: predictability, accuracy and economy. The lack of schedule reliability and highly variable transit routes along the Arctic, are major barriers to the development of shipping in the Arctic. Navigable waterways in the Arctic are the subject of restrictions and limitations on draft and traffic direction.

For example, ships from the Northern Sea Route (NSR) have to pass through many shallow and tight straits in Kara and Laptev Sea. Navigation through NSR begins at the port Murmansk in the south of the Barents' sea, and it proceeds through the Yugorsky Strait (Width: from 1.6 n.m. to 5 n.m.) or Kara Strait (width of the canal: 30 n.m.) until the Kara Sea. After the Kara Sea there is the canal Vilk'itskii Strait (canal's length: 60 n.m.; depth: from 12 to 30 m). After entering the Laptev Sea, the ships need to navigate through Dmitry Laptev Strait (Cnals' length: 63 n.m.; canal's width: 30 n.m.; width: from 10 to 14m) or through Sannikov Strait (canal's width: 30 n.m., depth from 10 to 20 m) to enter East Siberian Sea. [3] (Figure 10).

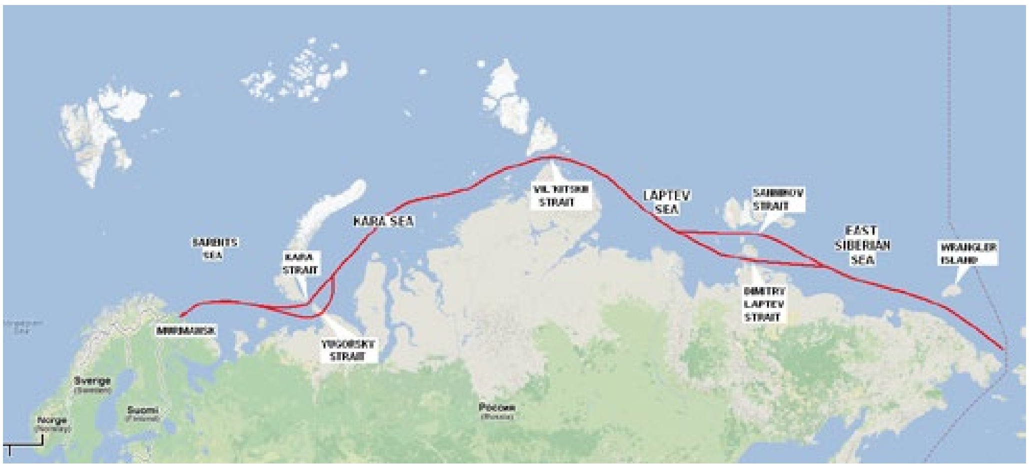

Figure 10. Ships in Northen Sea Route (NSR) must pass through a series of narrow passages and shallow straits

The Northern Sea Route is mostly free of ice. Russians have recognized this advantage and send many ships through that route, including the largest tanker ever went through that route.

Shipping in the Arctic is becoming a reality and all Arctic nations must be ready to take advantage that opportunity.

On the other hand, there is the Northwest Passage (NWP) for the ships, but the biggest problem of this passage is the disputable sovereignty over waters which might complicate the future of ships traffic in this passage. The Canadian government considers that this passage is a part of Canadian internal waters, while the USA and many other European countries claim that this passage is an international strait or a transit passage that enables free and easy maritime navigation. [39]

Until 2009, the Arctic ice prevented regular passage of ships most time of the year. However, the situation has changed with the effect of global warming. It must be mentioned that out of three sea routes, Northwest Passage (NWP), North Sea Route (NSR), Transpolar Sea Route (TSR), the Northwest Passage (NWP) was the first one to lose ice and to become available for the ships in 2007.

The Northwest Passage (NWP) is considered to be a passage that connects islands and Canada, rather than a real navigating path. From the historical point of view the Northwest Passage is better known as Strait of Anian, and which is the Spanish name for the passage that was believed to connect the Pacific and the North Atlantic in the 16th century, and was the famous trading route. This passage allows navigation from the North Atlantic Ocean, through the David Strait between Canada and Greenland continuing through the Arctic Archipelago to Beaufort Sea. Passage continues through the Chukchi Sea and the Bering Strait into the Pacific Ocean. There are always new potential routes for ships because of numerous islands in Arctic Archipelago. However, in some straits is better to navigate than in others due to the formation of land under water.

Arctic marine shipping mostly consists of waters within the Arctic, which dominated the summer from the Canadian Arctic side and from the east and west coast of Greenland. Year-round Arctic sea transport in the Russian Arctic is maintained between port Dudinka on the Yenisey River and Murmansk from 1978 to 1979. Since 2000, there have been only a small number of trans-Arctic voyages in the summer months for scientific research, and cruiser tourism across the Northwest Passage (NWR).

Not so long ago, there was an increase of explorations done by the ship in the Northwest Passage and Beaufort Sea, because of the consequences of climate change in the Arctic marine ecosystem. Since the 1980s travelling through this passage has become an annual event. Canadian Coast Guard icebreakers that operate in the Beaufort Sea on an annual basis since 2002 are providing assistance in navigation and assistance in carrying out researches. Since 1980s, tugboats, supply ships and tourist ships have used Northwest Passage. The commercial use of these ships, as well as the cruising tourism in the Arctic is increasing each year. [31]

Based on the latest research, the number of ships that pass through the Northwest Passage has increased from 4 to 20 per year in the period of 2009-2011. The ships that navigate in NWP are mainly coastguard icebreakers, investigation ships, tourist ships, tugboats and supply vessels. Other ships that navigate through this passage are oil tankers, seismic vessels, and cable vessels and buoy tenders. (Figure 11)

When looking from the late 1980s, most of the increase in the ships transit was due to increased activity of tug-supply vessels involved in the oil and gas industry in the Beaufort Sea. Their growth over the last ten years, we can see in Figure 11. When navigating through Northwest Passage, the vast majority of ships usually begin their journey through Beufort Admundsen Gulf (northwestern territory of Canada). It should be noted that only 11% of ships transit entering or leaving the Beaufort Sea are passing around Banks Island when navigating Northwest Passage route. Statistics of the annual number and types of ships passing through the Northwest Passage can be seen in Figure 11.

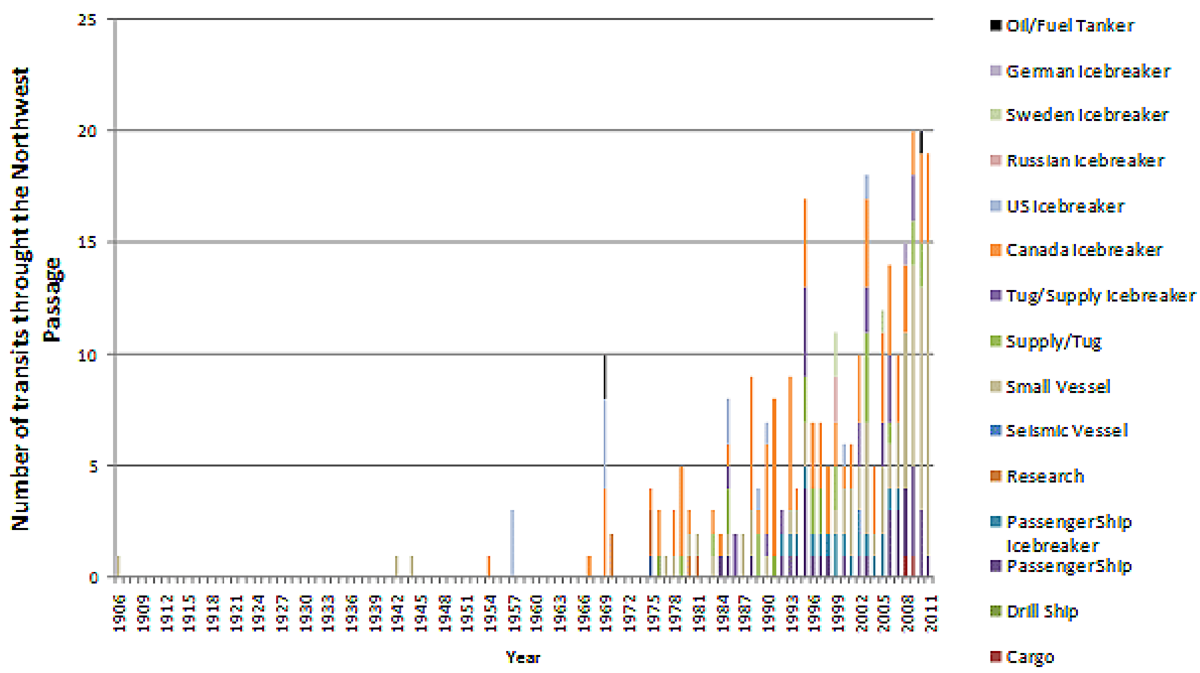

Figure 11. Annual statistics of type and number of ships passing through the Northwest Passage (NWP)

It should be mentioned that the amount of ice melting in the last few decades in the Arctic has fallen notably. According to the predictions, ice melting in the Arctic will continue and this will turn the Arctic waters into navigation passages. When the amounts of ice reduce in thw Arctic, further increasing of maritime transportation can be expected. When this will happen is still uncertain, and it depends on further climate change. However, given the economic challenges of the region, in the future the Arctic shipping will be profitable only for a limited number of operators.

7. MARITIME LEGISLATION

Present activities that are organized by IMO related to the navigation in Polar Regions can be found in "International Code of Safety for Ships Operating in Polar Waters".

Requirements contained in the IMO Conventions and in related codes, guidelines and recommendations are introduced and briefly explained in:

SOLAS (International Convention on the Safety of Life at Sea), safety requirements – relate to all ships that are part of "Convention operating in Polar waters". Chapter number V is especially important because it addresses safety requirements of navigation. Regulation V/5 : Meteorological services and warnings ; Regulation V/6: Ice Patrol Service ; Regulations V/31 and V/32: Danger messages

MARPOL (International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978). It covers necessary environmental protection for Antarctic and Arctic. They belong to special protected areas (Special Areas). Additional MARPOL measures can be found in Chapter 9, Annex I, and they refer to "Carriage of heavy grade oils in the Antarctic area" that entered into force in August 2011.

STCW (International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978) requirements. Adopted guidelines and recommendations for training and competency of officers and crew members on ships in the Polar Regions. Current recommendations and guidelines are important for the officers and crew members on board so they would have the necessary experience in the polar region. These are also the measures where the masters and officers who operate in the

polar region had the necessary training and experience.
UNICLOS (United Nations Convention on the Law of the Sea) – a legal framework for rights and responsibilities of the nations in their use of the world's oceans. The convention entered into force in 1994, and 162 countries have signed it so far. It is a legal framework that regulates rights and responsibilities of the countries that use the sea.
Torremolinos Protocol of 1993 to the Torremolinos International Convention for the Safety of Fishing Vessels, 1977 (Terremolinos Protocol). Regulation III/8 is especially important – Ice accretion – Icing allowances for stability calculations, ship designed to minimize ice accretion, means for removing ice.

8. CONCLUSION

Ships navigating in the Polar Regions may be exposed to numerous risks and dangerous. Such areas have not been fully explored and additional data on resources, ice and weather conditions needs to be made. Advanced studies and researches in polar areas will be of vital importance for the safety of navigation.
If there is a rise in temperature at the poles, global warming will mostly affect the Arctic where the new routes for ships will be created as alternative to longer routes, such as those that pass through the Panama and Suez Canal. The increase of maritime traffic in these areas will lead to increased exploration and exploitation of hydrocarbon reserves in the Arctic. The main barriers to navigation in Polar Regions may be the lack of reliable weather forecasts, floating ice and icebergs, especially during the warm season when the ice begins to melt. Navigating through the Arctic the ships will shorten their route, save on time and fuel. The energetic efficiency would improve while navigating from one port to another.
After several years of research it was discovered that in the past few decades, sea ice melting in the Arctic was in significant decline, so that over the last few years the maritime traffic has increased through NWP and NEP.
According to the further predictions, if melting of ice in the Arctic continues, the water in that area will transform into true navigational waterways. When this scenario could be expected is still uncertain and depends on further climate change. If the predictions of global warming come true and the amount of ice in the Arctic reduces, it could be expected that new areas for seismic exploration and extraction of oil and gas from new sources will be discovered. On the other hand it will also be possible to open the new geo traffic navigational routes for ships that will contribute to increase marine traffic in these areas.

REFERENCES

1.Bowditch, N.: The American Practical Navigator, DMAHTC, Maryland, 2002.

2.Guidelines for ships operating in Polar waters, IMO Resolution A.1024 (26)

3.William E. Butler: Northeast Arctic Passage (International Straits of the World), Sijthoff and Noordhoff, Netherlands, 1978

4.SOLAS Consolidated Edition 2009, International Maritime Organization, London, 2009.

5.STCW including 2010 Manilla Amandments, International Maritime Organization, London, 2011

6.MARPOL Consolidated Edition 2011, International Maritime Organization, London, 2011.

7.Marine Traffic in the Arctic - A Report Commisioned by the Norwegian Mapping Authority, Norwegian Mapping Authority, 2011

8.Markussen, J.: The High North, The Natural Resources, Northeast Passage, Norwegian Business Delegation to the Republic of Korea, Seoul 2012

9.http://blogs.discovermagazine.com/badastronomy/2010/01/21/our-ice-is disappearing/#.URLCBK6LMhQ

10.http://nsidc.org/

11.http://www.examiner.com/article/nasa-releases-imagery-comparing-record-low-sea-ice-to-average-levels

12.http://www.dnv.com/industry/maritime/publicationsanddownloads/publications/updates/arctic/2011/01_2011/index.asp

13.http://www.dnv.com/industry/maritime/publicationsanddownloads/publications/updates/arctic/2012/01_2012/Arctic_Update_No_1_2012.asp

14.http://www.globalwarminghoax.com/news.php?extend.96

15.http://www.thearcticinstitute.org/2012/10/the-future-of-arctic-shipping.html

16.http://www.imo.org/MediaCentre/HotTopics/polar/Documents/polarcodePPT2011.pdf

17.http://www.skepticalscience.com/antarctica-gaining-ice.htm

18.http://portlets.arcticportal.org/northwest-passage

19.http://www.encyclopedia.com/topic/Northwest_Passage.aspx

20.http://upload.wikimedia.org/wikipedia/commons/d/d0/Northwest_passage.jpg

21.http://www.infoplease.com/encyclopedia/world/northwest-passage.html

22.http://www.thearcticinstitute.org/2012/10/the-future-of-arctic-shipping.html

23.http://ine.uaf.edu/accap/documents/AMSA2009Report.pdf

24.http://news.nationalgeographic.com/news/2012/10/121013-antarctica-sea-ice-record-high-science-global-warming/

25.http://news.nationalgeographic.com/news/2010/08/100816-global-warming-antarctica-sea-ice-paradox-science-environment/

26.http://www.dailymail.co.uk/sciencetech/article-2216238/Now-theres-ice-South-Pole-So-global-warming-thawing-Antarctica.html

27.http://www.skepticalscience.com/antarctica-gaining-ice.htm

28.http://nsidc.org/cryosphere/sotc/sea_ice.html

29.http://portal.inter-map.com/#mapID=49&groupID=297&z=1.0&up=-311375.0&left=-827720.5

30.http://news.nationalgeographic.com/news/2012/10/121013-antarctica-sea-ice-record-high-science-global-warming/

31.http://www.enr.gov.nt.ca/_live/pages/wpPages/soe_human_activities.aspx

32.http://www.imo.org/MediaCentre/HotTopics/polar/Documents/polarcodePPT2011.pdf

33.http://www.dnv.com/industry/maritime/publicationsanddownloads/publications/updates/arctic/2012/01_2012/Arctic_Update_No_1_2012.asp

34.http://www.dnv.com/industry/maritime/publicationsanddownloads/publications/updates/arctic/2011/01_2011/index.asp

35.http://www.answers.com/topic/polar-navigation

36.http://www.islandnavigation.org/navigation.asp

37.http://www.marineinsight.com/marine/types-of-ships-marine/what-are-double-acting-tankers/

38.http://www.ship-technology.com/projects/tempera/

39.http://www.parl.gc.ca/Content/LOP/researchpublications/prb0561-e.htm

40.IMO A 1024

41.http://en.wikipedia.org/wiki/File:Northern_Sea_Route_vs_Southern_Sea_Route.svg

BIOGRAPHIES

Stipe Galić was born 25.04.1981 in Split, Croatia. Elementary School "Josip Pupačić" completed in 1995 in Omiš. Electro technical secondary school "Jure Kaštelan" finished in 1999 in Omiš. In year 2006 was graduated on Faculty of Maritime Studies of Split, field: Nautical studies, in duration of four years. From 2007 to 2010 he was working on merchant vessels. At end of 2010 he was working as a collaborator for the Faculty of Maritime Studies of Split. In early 2011 he laid a distinctive program and gained the title: Magister engineer. At end of 2011 he is employed as an assistant at the Faculty of Maritime Studies, and was subsequently enrolled in post-graduate studies "Technological Systems in Traffic and Transport" on Faculty of Transport and Traffic Sciences in Zagreb.

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Danijel Pusić was born 16.06.70 in Split, Croatia. He finished elementary and secondary nautical school in Split. From 1991 to 1996 he was working as an officer on merchant ships. Since 1997 he is employed in the Hydrographic Institute of the Republic Croatia as a nautical system support adviser. In academic year 2006/2007 graduated at the Faculty of Maritime Studies in Split, field: Nautical studies in duration of three years. In academic year 2008/2009 graduated at the Faculty of Maritime Studies in Split, field: Nautical studies in duration of two years and gained the title: Magister engineer. Since January 2010 he is hired part time as an assistant lecture at the Faculty of Maritime Studies. He is a member of the Croatian Chamber of traffic engineering technology - class maritime transportation and traffic engineers in the Inland Waterway.

MODELING IMPACT OF UNDERWATER EXPLOSION FORCED ON VESSELS HULL

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ABSTRACT

Ship shock tests have been conducted for shock qualification of hull integrity and proper operation systems and subsystems. The ship shock trial identifies design and construction and it also validates shock hardening criteria. The main problem is that ship shock trials are costly. Numerical modeling and simulation, using FEM, may provide information to look into the details of fluid model, dynamic characteristics of ship hull and its internal component. The ship shock modeling and simulation has been performed and the predicted results were compared with ship shock test data made into sea trials. The preliminary studies of shock analysis approach are presented and the important parameters are discussed.

KEY WORDS
Simulation, underwater explosion, minehunter, hull.

1. INTRODUCTION

Large capacity of the calculating hardware help to make assessments of short-term (fast changing) processes, such as the impact of the pressure wave from a no-contact underwater explosion near the hull of the ship. These are issues of great complexity and indirection, each should be treated individually. It is necessary to simplify the task in many areas, because too accurate descriptions of the phenomenon may give results far from the actual one. The task becomes much more complicated in case of including the interaction between the environment and the contemplated construction. The ship is located in two mediums: water and air. Taking into account the impact of these requires solving the double-linked task using for example the finite element and boundary element method. Then the solution, at the edge of a particular medium, eg. liquid, forms the input data for the load of the deformed structure impacting on the surrounding medium. Such mutual linkage is repeated n times and at every step of the data exchange it is necessary to obtain adequate convergence. The problem becomes more complicated due to numerous non-linearity. In the case of the impact loads by pressure wave it is not possible to disregard large displacement structures, nonlinearity of materials, failure criteria, etc. In the case of complex structures there will be contact. All these factors determine the complexity of the task and the processing power needed to obtain solutions in a reasonable time, with the possibility of assessing its results, making any corrections and repeating the calculations.

2. THE DYNAMIC EQUATION OF MOTION IN TERMS OF MES – EXPLICITE

To determine the motion parameters of the discrete model consisting of a finite number of elements in the MES the differential equation of the form [1] must be solved:

$$\mathbf{M}\ddot{\mathbf{U}} + \mathbf{C}\dot{\mathbf{U}} + \mathbf{K}\mathbf{U} = \mathbf{F} \qquad (1)$$

where:
K - the stiffness matrix of the structure;
M - matrix of inertia;
C - matrix of damping;
$U, \dot{U}, \ddot{U}$ - the vector of displacement, velocity and acceleration;
F - the vector of loads.

Stiffness matrix K reflects the material properties of the element and geometry. In MES stiffness matrix Ke for the element is defined as the product of the elasticity and deformation matrices in the form [2]:

$$\mathbf{K}^{e} = \int_{V} \mathbf{B}^{T} \mathbf{D}\, \mathbf{B}\, \mathrm{d}V \qquad (2)$$

where:
B - matrix deformation element;
D - matrix element of elasticity;
V - volume element.

Inertia matrix M - reflects the mass and the mass moments of inertia, is created the same way for the entire structure as the structure stiffness matrix K. The MES inertia matrix Me for the item is defined as a square shape functions [2]:

$$\mathbf{M}^{e} = \rho \int_{V} \mathbf{N}^{\mathrm{T}}\mathbf{N}\, dV \qquad (3)$$

where:
N - matrix of shape functions;
ρ - density of the element;
V - volume element.

C is the damping matrix. Most define it as a linear combination of the inertia matrix and stiffness matrix [2]:

$$\mathbf{C} = \alpha\mathbf{M} + \beta\mathbf{K} \qquad (4)$$

Where α and β are constant coefficients, which determine the manner specified in [3]. U represents the vector of generalized displacement of the nodes, whereas their derivatives over time represent velocity and acceleration of nodes, F is the vector of external nodal forces. These matrices and vectors in a given task depend on the type of finite elements used to describe the area in question, which translates into the size of the task. In these types of issues, reflecting the geometry of the study area and its discretization acquire a completely different dimension, as their depend on the size of the task, the computation time and the results obtained. The equation of motion with specified initial conditions at time t_0 is the basic system of equations:

$$\mathbf{U}(t_0) = \mathbf{U_0} \quad \dot{\mathbf{U}}(t_0) = \dot{\mathbf{U}}_\mathbf{0} \qquad (5)$$

The CAE program includes a number of ways of integration of equations of motion [1, 3, 4, 5]. The most popular are the so-called direct methods, also called step-by-step methods, or simply dynamic explicit. They are applied to any equations untreated by transformation. They are based on the assumption that the equation is satisfied in certain moments of time t_0, $t_0+\Delta t$, $t_0+2\Delta t$, ... , t_1, and not the entire time interval $\langle t_0, t_1\rangle$. The nature of variation, displacement, velocity and acceleration are assumed during the relevant time period $\langle t, t+\Delta t\rangle$. With these assumptions, the integration algorithm is reduced to finding a solution at time $t_0+i\Delta t$ by using the known values of the function in the moments preceding t_0, $t_0+\Delta t$, $t_0+2\Delta t$, $t_0+(i-1)\Delta t$. The most common methods of numerical integration of equations of motion are: Euler's, Newmark's and Wilson's [1, 2, 3, 4]. In Newmark's numerical integration method, the basic formulas are given by [1]:

$$\mathbf{U}_{t+\Delta t} = \mathbf{U}_t + \dot{\mathbf{U}}_t\Delta t + \left[\left(\frac{1}{2} - \beta\right)\ddot{\mathbf{U}}_t + \beta\ \ddot{\mathbf{U}}_{t+\Delta t}\right](\Delta t)^2$$

$$\dot{\mathbf{U}}_{t+\Delta t} = \dot{\mathbf{U}}_t + \left[(1+\gamma)\ddot{\mathbf{U}}_t + \gamma\ \ddot{\mathbf{U}}_{t+\Delta t}\right]\Delta t \qquad (6)$$

where β, γ are constant factors affecting the stability and accuracy of the method. It was shown that for the values $\beta = 0{,}25$ and $\gamma = 0{,}5$ the method is unconditionally stable in papers [1,3]. Solving equations (1 and 5) with respect to $\dot{\mathbf{U}}_{t+\Delta t}$ and $\ddot{\mathbf{U}}_{t+\Delta t}$ we obtain:

$$\ddot{\mathbf{U}}_{t+\Delta t} = \frac{1}{\beta\ (\Delta t)^2}\left[\mathbf{U}_{t+\Delta t} - \mathbf{U}_t - \dot{\mathbf{U}}_t \Delta t + (\Delta t)^2\left(\beta - \frac{1}{2}\right)\ddot{\mathbf{U}}_t\right]$$

(7)

$$\dot{\mathbf{U}}_{t+\Delta t} = \frac{\gamma}{\beta\ \Delta t}\left(\mathbf{U}_{t+\Delta t} - \mathbf{U}_t\right) + \left(1 - \frac{\gamma}{\beta}\right)\dot{\mathbf{U}}_t + \left(1 - \frac{\gamma}{2\beta}\right)\Delta t\, \ddot{\mathbf{U}}_t$$

Substituting vectors (7) to the equations of motion (1) gives the algebraic equation in the form:

$$\left[\frac{1}{\beta\ (\Delta t)^2}\mathbf{M} + \frac{\gamma}{\beta\,\Delta t}\mathbf{C} + \mathbf{K}\right]\mathbf{U}_{t+\Delta t} =$$
$$= \mathbf{F}_{t+\Delta t} + \mathbf{M}\left[\frac{1}{\beta\ (\Delta t)^2}\mathbf{U}_t + \frac{1}{\beta\,\Delta t}\dot{\mathbf{U}}_t + \left(\frac{1}{2\beta} - 1\right)\ddot{\mathbf{U}}_t\right] + \mathbf{C}\left[\frac{\gamma}{\beta\,\Delta t}\mathbf{U}_t + \left(\frac{\gamma}{\beta} - 1\right)\dot{\mathbf{U}}_t + \Delta t\left(\frac{\gamma}{2\beta} - 1\right)\ddot{\mathbf{U}}_t\right] \quad (8)$$

From the above equation displacement vector $\mathbf{U}_{t+\Delta t}$ can be calculated. Then, from equations (7) the velocity and acceleration vectors $\dot{\mathbf{U}}_{t+\Delta t}$ and $\ddot{\mathbf{U}}_{t+\Delta t}$ can be obtained. Repeating this procedure for successive moments we obtain a solution in the considered time interval $\langle t_0, t_1\rangle$.

Substituting $\beta = \frac{1}{4}$ and $\gamma = \frac{1}{2}$ we get the equation:

$$\left[\frac{4}{(\Delta t)^2}\mathbf{M} + \frac{2}{\Delta t}\mathbf{C} + \mathbf{K}\right]\mathbf{U}_{t+\Delta t} = \mathbf{F}_{t+\Delta t} + \mathbf{M}\left[\frac{4}{(\Delta t)^2}\mathbf{U}_t + \frac{4}{\Delta t}\dot{\mathbf{U}}_t + \ddot{\mathbf{U}}_t\right] + \mathbf{C}\left[\frac{2}{\Delta t}\mathbf{U}_t + \dot{\mathbf{U}}_t\right] \quad (1)$$

and

$$\ddot{\mathbf{U}}_{t+\Delta t} = \frac{4}{(\Delta t)^2}\left[\mathbf{U}_{t+\Delta t} - \mathbf{U}_t - \dot{\mathbf{U}}_t \Delta t - \frac{1}{4}(\Delta t)^2\ddot{\mathbf{U}}_t\right] \quad (2)$$

$$\dot{\mathbf{U}}_{t+\Delta t} = \frac{2}{\Delta t}\left(\mathbf{U}_{t+\Delta t} - \mathbf{U}_t\right) - \dot{\mathbf{U}}_t$$

The above procedure is implemented in a number of commercial applications. 'Dynamic explicit' gives a fairly stable solution, even for highly nonlinear problems. When the nonlinear static analysis obtaining a solution fails, it is recommended to repeat the task in terms of 'dynamic explicit'.

3. SELECTION OF TIME STEP IN A FAST-CHANGING ISSUES

The problem in dynamic analysis is the time step size [6]. The smaller its size, the smaller the size of the used finite elements. This relationship is very unfavorable, because the grid density is associated with a reduction in the time step. For example, doubling the number of items and selecting the appropriate time step to the new dimensions of elements may longer the computation time 10-20 times. For a dense grid time step values are of the order 10^{-6} s, and even smaller. In the fast-changing processes such as loading the construction with a pressure wave from the explosion, where the duration of load is a fraction of a millisecond in a row, time step is determined by the history of the load.

Experiments show that the solution of the dynamic task is stable when the initial time step value is less than 1/10 of the first period frequency. Good results are obtained through adoption of the time step, as the ratio of the smallest dimension of the grid elements to the speed of propagation of elastic waves (acoustic) in the material element, that is:

$$\Delta t = \frac{h}{a} \qquad (11)$$

where: h - the smallest dimension of the grid elements;

$a = \sqrt{E/\rho}$ - elastic wave velocity (acoustic).

After determining the value of time step, due to the size of the elements, one has to make sure it reflects the entire history of the load, if it should not be reduced by subsequent orders, which can lead to the range of 10^{-7}, 10^{-8} s.

3. REFLECTION OF THE GEOMETRY AND DISCRETIZATION OF THE RESEARCH

In formulating the task in terms of MES at the stage of reflecting the geometry the size of the task in relation to the computational capabilities must be taken into the account. Usually, we intend to faithfully reflect the geometry of the object. Unfortunately, the increase in accuracy will mainly increase the number of elements in the future discretization, reducing their size and the need for using solid elements of higher order. Experiments show that one should use the simplest elements possible to describe the structure. To describe the geometry of objects such as ships it is proposed to use the shell and beam elements, and equipment constituting interior modeled as concentrated masses of the respective nodes (Fig. 1).

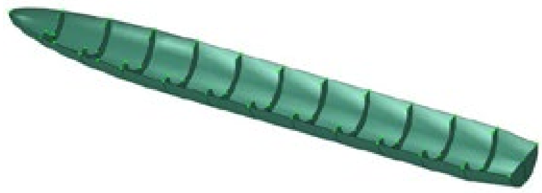

Figure 1. The geometry of the hull with the centered masses.

The possibility of applying the masses gathered in the MES software algorithms can significantly reduce the size of the task, by reducing the number of elements to describe the geometry. In the nodes of the elements the mass moments of inertia can be attributed [7]. Thus, to include in the calculation model of the equipment, for example, the generator, it is not necessarily a reflection of its geometry, it is sufficient to determine its mass and calculate the mass inertia moments given the point of the ship structure and assign these values to that point. It is recommended to "distribute" such data on a few points. To present the problem, the shape functions for linear (4-node) shell element and linear (8-node) solid element are summarised below. Shape function for the linear 4-node element [7]:

$$u(g,h) = \frac{1}{4}(1-g)(1-h)u_1 + \frac{1}{4}(1+g)(1-h)u_2 + \frac{1}{4}(1+g)(1+h)u_3 + \frac{1}{4}(1-g)(1+h)u_4 \qquad (12)$$

Shape function for the linear hexagonal 8-node element [7]:

$$u(g,h,r) = \frac{1}{8}(1-g)(1-h)(1-r)u_1 + \frac{1}{8}(1+g)(1-h)(1-r)u_2 + \frac{1}{8}(1+g)(1+h)(1-r)u_3 + \frac{1}{8}(1-g)(1+h)(1-r)u_4 + \frac{1}{8}(1-g)(1-h)(1+r)u_5 + \frac{1}{8}(1+g)(1-h)(1+r)u_6 + \frac{1}{8}(1+g)(1+h)(1+r)u_7 + \frac{1}{8}(1-g)(1+h)(1+r)u_8 \qquad (13)$$

The geometry of the mine hunter 206FM - Fig. 2, is presented below by 14 475 square coating components, coating 76 triangular elements, set in space by 11 753 nodes, which at the 6 degrees of freedom at each node gives 70 518 degrees of freedom of the whole structure. It is also the size of the matrix K, M and C.

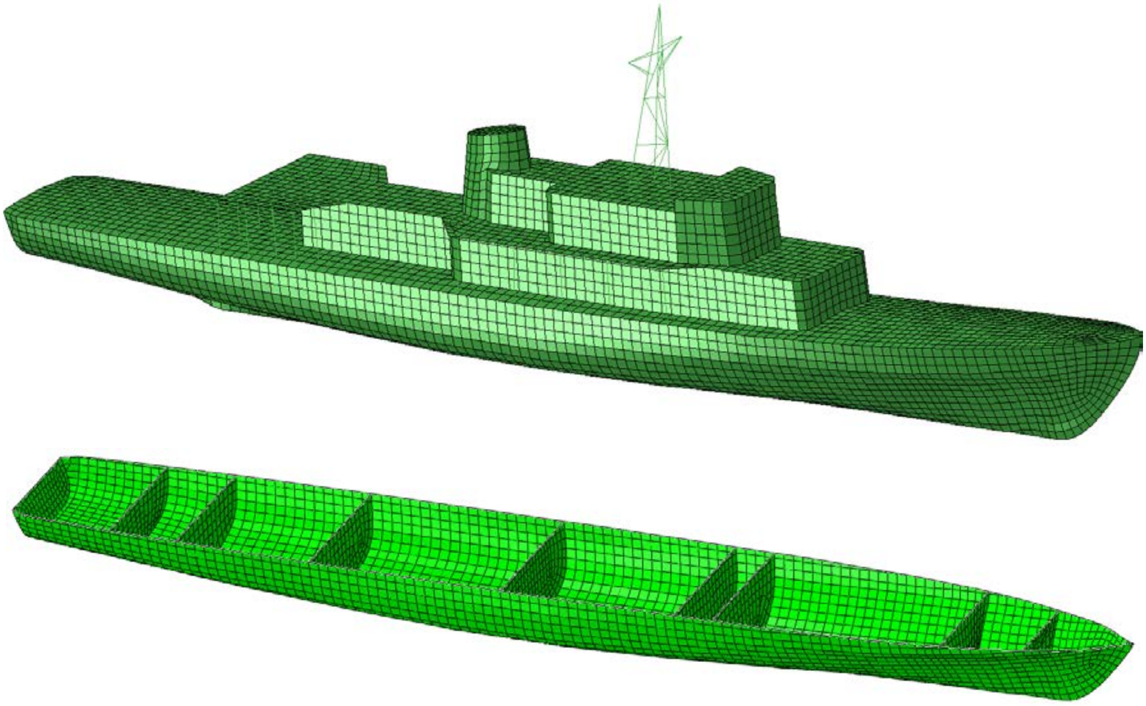

Figure 2. Polish mine hunter 206FM's - discrete model and its cross-section.

4. CONSTRUCTION LOAD – PRESSURE WAVE AFFECTING THE SHIP

Simplified descriptions of the pressure distribution as a function of time and distance from the explosion of pyrotechnic substance both in water and air are given in the literature of the twentieth century, and they can be implemented into computer programs. The explosion is the process of deflagration pressure increase that occurs in a very short time (milliseconds). The nature of this process is determined by the dynamic conditions in which the combustible mixture and, in particular turbulence medium is located. Pressure waves, called shock waves, formed during the explosion in air travel at the speed of 1000 3000 m/s and in liquid (explosion under water) or in solids reach up to 8000 m/s. Typical detonation velocity in the air range from 1500 to 3000 m/s, while the pressure reaches a value of 1 to 100 MPa. Before the arrival of the shock wave front the pressure is equal to atmospheric pressure. With the advent of the front, the pressure is rising rapidly up to a maximum value called the peak positive overpressure. Then the pressure drops to atmospheric pressure. The period of a further drop in pressure and the return to atmospheric pressure is called the period of negative phase. Important parameters of the process are: the maximum value of pressure and the area under the function describing the pressure dependence of time during the positive phase. The nature and mechanism of the explosion is determined by numerous parameters, which include:

- material properties (physical, chemical stability, heat of combustion, etc..)
- space in which combustion occurs (size, open, closed, barriers, etc.);
- properties of explosive mixtures (concentration, pressure and temperature);
- way of ignition (energy, temperature).

Here are the results of pressure measurements made on the range during the detonation of an equal mass of explosives such as hexogen (RDX), trinitrotoluene (TNT), metanite (2H), dynamite (20G5H) ammonite (54H), measured at a distance of 2 m from the burst's centre (Fig. 3). The experiment was carried out by employees of the Department of Mining and Geo-engineering, AGH University in Krakow [9].

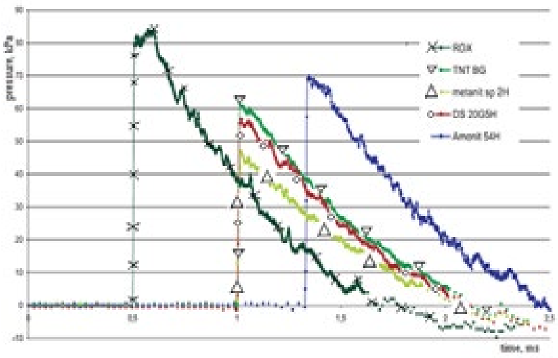

Figure 3. Pressure values at a distance of 2 m from the centre of detonation for various explosives [9]

For the strength calculations simplified models of the detonation wave are assumed [8], which usually does not take into the account the vacuum phase (Fig. 4). It is important that the time step used for the calculations included the entire history of the load, because in case of a bad choice, the phase of hypertension may be extended or completely omitted.

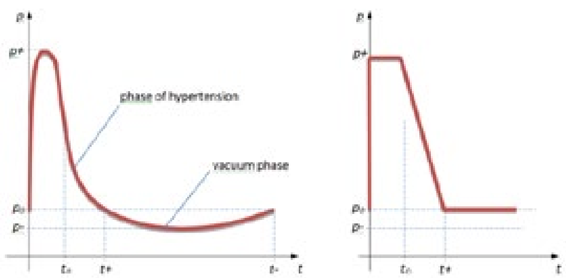

Figure 4. The structure of the shock wave and its simplification.

The TNT explosion is very well described by a perfect shock wave structure, with a rapid pressure rise, a short period of positive phase from 1 to 10 ms and hypertension to 100 MPa. In case of the closed or partially closed volume, there exist other phases of the shock wave associated with the reflection from the surrounding structures. In [9] quoted several ways to determine pressure and pulse of the pressure wave depending on the distance from the explosion and the mass of the detonated load. The type of explosive is also taken into an account. For the purposes of calculations and numerical simulations to determine the intensity of pressure on the front of the wave *p(t)* the historical, but still current dependencies are commonly used, known as Cole's model [10] of the form:

$$p_m(t) = 52.3\left(\frac{\sqrt[3]{m}}{R}\right)^{1.13} \cdot e^{C} \qquad (14)$$

$$C = \frac{-t \cdot 1000}{0.093 \cdot \sqrt[3]{m}\left(\frac{\sqrt[3]{m}}{R}\right)^{-0.22}} \qquad (15)$$

where:
p_m - the pressure on the front of the wave, MPa
t - time, s
R - distance from the load, m
m- mass of the load, kg

These patterns allow the determination of the pressure at the front of the shock wave in water and in function of distance from the epicenter of detonation, the payload and the time period from the time of the wave at a given point in space (and not from the moment of detonation). Thus, to apply the above description in MES, a procedure should be prepared (including the above formulas) developed to describe the pressure distribution in space as a function of time from the moment of detonation, and taking into account the angle of incidence of waves on an item as it has a particular direction and vector features (Fig. 5) [8].

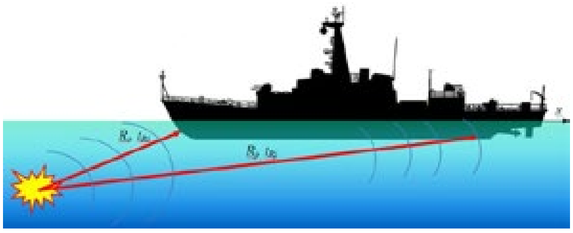

Figure 5. The distance of the element from the epicenter and the wave transit time.

In this procedure, the wave transit time from the moment of explosion until you reach the first point of the structure should be omitted. This procedure was repeated for each element in a given time step. Pressure wave velocity to be used in a given medium might be a problem as it is not constant. As mentioned above, in water in the first phase of the outbreak it reaches a speed of up to 8000 m/s, then moving on, the speed drops to the speed of sound in a given medium, i.e. for water to approximately 1500 m/s. Therefore, if the epicentre of the outbreak is far enough away from the structure (over 10 m), for the calculation, it can be assumed that speed of propagation of the pressure wave is constant - equal to the speed of sound. For smaller distances it should be a description of the wave velocity as a function of distance. Ultimately, this procedure gives states the load structure at discrete moments in time. This approach can be directly implemented in CAE.
Summing up, setting the load for a particular element of construction, the time in formulas (14), must move by the value of t_R which is:

$$t_R = {}^{R}/_{\upsilon_c} \qquad (16)$$

where:
t_R - time for the pressure wave to reach the component, s
R - distance from the load to the center of the element, m
υ_c - sound velocity in the medium surrounding the structure, m/s
The time interval from 0 to t_R element under consideration is not influenced. The speed of sound for sea water is 1500 m/s.
To take into account the angle of the wave for a given element (Fig. 6) it is necessary to appoint two vectors, the vector normal to the element n and the pressure wave vector R whose origin is at the epicenter of the outbreak K and which ends at the center of S.
If the shell element is determined, in space, by four nodes with coordinates:

$$\begin{aligned} &A\ (x_a; y_a; z_a)\\ &B\ (x_b; y_b; z_b)\\ &C\ (x_c; y_c; z_c)\\ &D\ (x_d; y_d; z_d)\end{aligned} \qquad (17)$$

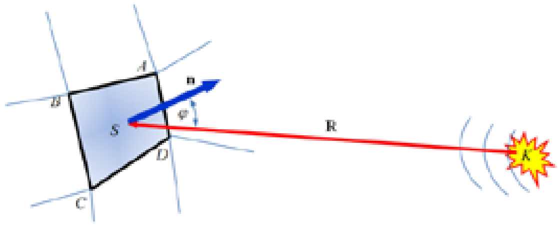

Figure 6. Element influenced by the pressure wave.

The coordinates of the centre element of $S\ (x_s; y_s; z_s)$) is calculated as the mean of these coordinates:

$$\begin{aligned} x_s &= \frac{x_a + x_b + x_c + x_d}{4}\\ y_s &= \frac{y_a + y_b + y_c + y_d}{4}\\ z_s &= \frac{z_a + z_b + z_c + z_d}{4}\end{aligned} \qquad (18)$$

Assuming that the epicenter of the outbreak is at the point $K\ (x_k; y_k; z_k)$, the components of the vector R are:

$$\begin{aligned} R_x &= x_s - x_k\\ R_y &= y_s - y_k\\ R_z &= z_s - z_k\end{aligned} \qquad (19)$$

The coordinates of the normal vector n to the element in question is obtained by multiplying two vectors such as AB and CB built on the sides of elements whose components are:

$$\begin{aligned} AB_x &= x_a - x_b \qquad & CB_x &= x_c - x_b\\ AB_y &= y_a - y_b \qquad & CB_y &= y_c - y_b\\ AB_z &= z_a - z_b \qquad & CB_z &= z_c - z_b\end{aligned} \qquad (20)$$

Then $\mathbf{n} = \mathbf{AB} \times \mathbf{CB}$:

$$n_x = AB_y \cdot CB_z - AB_z \cdot CB_y$$

$$\boldsymbol{n_y = AB_z \cdot CB_x - AB_x \cdot CB_z} \qquad (3)$$

$$n_x = AB_x \cdot CB_y - AB_y \cdot CB_x$$

Cosine of the angle φ between vectors **n** and **R** is determined from the definition of scalar product:

$$\mathbf{n} \cdot \mathbf{R} = |\mathbf{n}| \cdot |\mathbf{R}| \cdot \cos\varphi \qquad (4)$$

thus:

$$\cos\varphi = \frac{\mathbf{n} \cdot \mathbf{R}}{|\mathbf{n}| \cdot |\mathbf{R}|} =$$

$$= \frac{n_x \cdot R_x + n_y \cdot R_y + n_z \cdot R_z}{\sqrt{n_x^2 + n_y^2 + n_z^2} \cdot \sqrt{R_x^2 + R_y^2 + R_z^2}} \quad (5)$$

Eventually the value of the pressure influencing the element is:

for $\quad t_c < t_R \Rightarrow p(t_c) = 0 \qquad (24)$

for $\quad t_c \geq t_R \Rightarrow p(t_c) =$

$p_m(t_R + t) \cdot \cos\varphi \qquad (25)$

In CAE, the above algorithm for determining the pressure of the item must be made in the form of the calculation procedure. For example, in Abaqus such a procedure is done in Fortran.

The following are illustrative graphs of the pressure on the hull of the mine destroyer, project 206FM, at two points: on the bow and stern. After including the speed of propagation of pressure waves in water, equal to 1500 m/s, in the case of 250 kg of TNT, detonated at a depth of 15 m with a distance of 20 meters in front, the pressure of the wave reaches the maximum value of 11 MPa and continually decreases. At the second point on the stern of the ship the pressure amounts to about 5 MPa, and it appears on the fuselage 0.035 s under the first point on the bow.

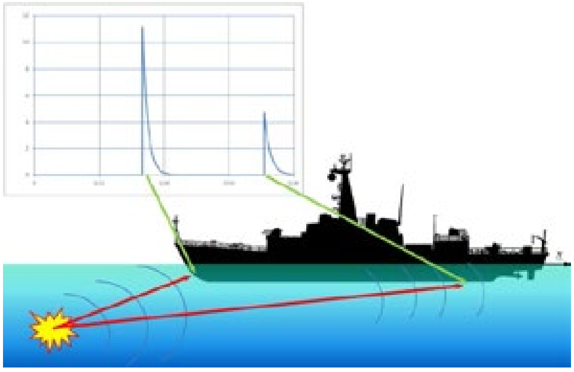

Figure 7. Pressure at two points of the ship at the bow and stern (detonation in the distance of 20 m in front of the ship, depth of 15 m, weight of 250 kg).

5. THE SIMULATION RESULTS ON THE EFFECTS OF UNDERWATER DETONATION OF THE SHIP HULL

Characteristics presented on the figure 8 shows simulation of the pressure at the front of detonation wave as a function of mass of the TNT load and distance from the epicenter, determined by the Cole's formula.

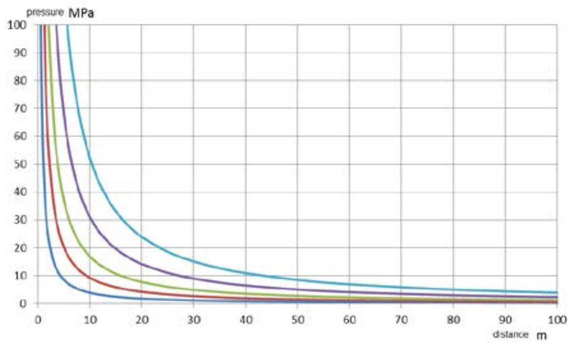

Figure 8. Pressure values at the front of the shock wave as a function of load mass of TNT of 1, 10, 50, 250, 1000 kg

Times that occur in the Cole's formulas, and is counted from the time of the wave pressures at a given point of space, does not include conveyance from the epicenter [4,6]. The pressure wave in the first phase of the explosion propagates at the speed of detonation of an estimated V = 5000 ÷ 8000 m/s. The velocity rapidly decreases to the velocity of sound in the medium [10]. After taking into account velocity of propagation of pressure waves in water of V =1500 m/s, the minehunter 206 FM type and TNT load equal mass m=250 kg, exploded at a depth of 15 m with a distance of 20 m from the bow or the stern, the pressure wave reaches the maximum value of p=11 MPa and decreases along the ship to the p=3MPa – figure 9. The total time of occurrence the load on the structure of the ship is 0.0376 s.

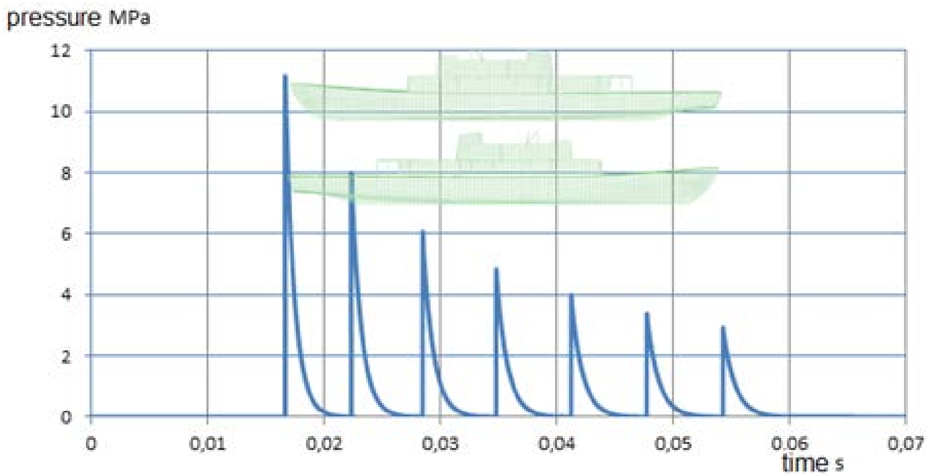

Figure 9. Pressure wave propagation along the length of the ship, detonation at a distance of 20 m before (behind) the ship.

For the same TNT load, exploded at a depth of 15 m with a distance of 20 m on the beam, the maximum shock wave pressure reaches p=11 MPa at amidships and decreases along the ship to the value of p=5.9 MPa at the bow and stern. The total time of occurrence load on the hull of the ship is more than a half shorter and equal t=0.0124 s. Distribution of pressure waves on the hull of the ship, coming from the TNT load exploded is presented on figure 10.

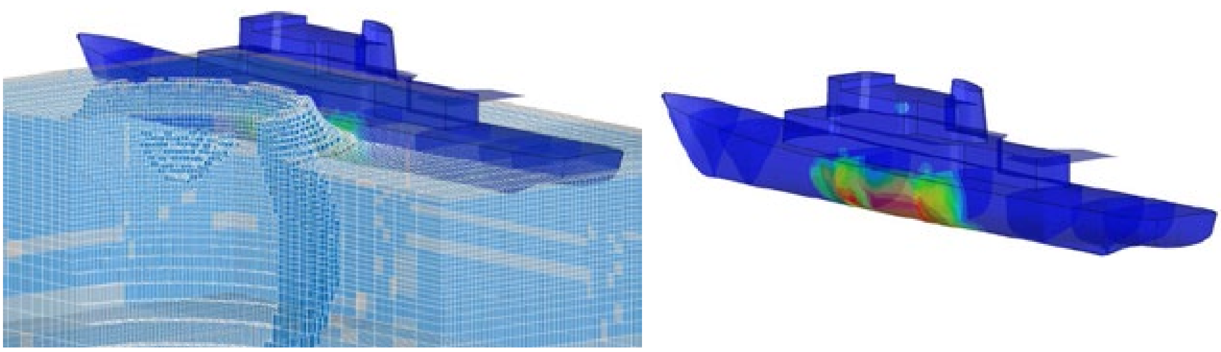

Figure 10. Distribution of shock wave (left figure) and values of pressure (right figure) on the hull coming from the TNT load explosion and

Pressure wave causes the hull load over its entire length. Figure 11 shows an example of the time course of the acceleration from the explosion of 250 kg TNT load at a distance of 20 m, at a depth of 15 m from the bow of the ship.

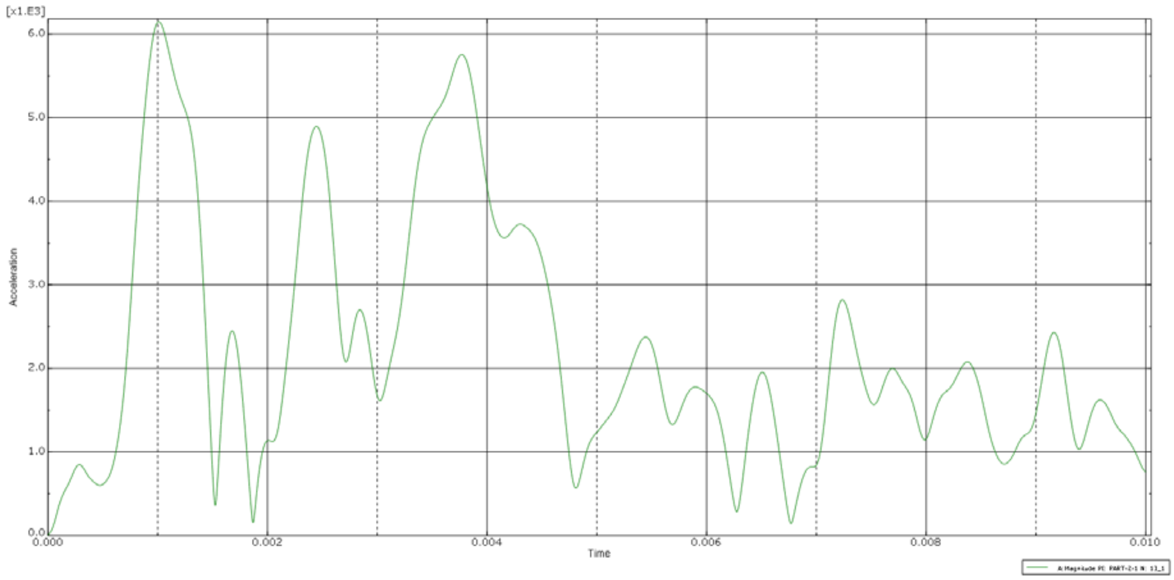

Figure 11. Acceleration received from a simulation of the keel of the explosion front of the bow the ship from a distance of 20 m, depth 15 m, TNT load mass 250 kg

6. CONCLUSIONS

The results of testing allowed performing simulations of a similar nature to the actual loads of underwater explosions. Virtual model of the hull of the ship responds in a similar manner to the real impacts. Most simulations were performed to calculate or estimate the strength of the hull of plastic deformation. Load model of 2 or 3 bulbs allows assessing the potential occurrence of resonance at any point of the hull. This is important in the design process because the stiffness of the fixing or changing the mass of the foundation, can arrange the marine device from the potential risks coming from the resonance of an underwater explosion.

The next step of research are modeling much more complicate structure of the hull, machinery and other equipments of mine hunter and then solving the problem of resonance between natural frequency of machines and periodical forces coming from first three bulbs effect of underwater detonation.

REFERENCES

1.Kacprzyk Z., Rakowski G., Metoda elementów skończonych w mechanice konstrukcji, Oficyna Wydawnicza Politechniki Warszawskiej, Wyd.2, Warszawa 2005 r. ISBN: 83-7207-589-1

2.Szturomski B., Podstawy Metody Elementów Skończonych, Wydawnictwo Akademickie AMW, Gdynia 2011, ISBN 978-83-60278-5

3.Bathe K. J., Wilson E. L., Numerical method in finite element analysis, Prentice-Hall, Inc. Englowood Clifts, New Jersey, 1976 r.

4.Kleiber M., Metoda elementów skończonych w nieliniowej mechanice kontinuum, Polska Akademia Nauk, Wyd.1, PWN, Warszawa-Poznań 1985

5.Zienkiewicz O. C., The Finite Element Method in Engineering Science, McGRAW-HILL, London 1971

6.Dobrociński S., Stabilność rozwiązań zagadnień odporności udarowej konstrukcji, Biblioteka Problemów Eksploatacji, Akademia Marynarki Wojennej, Gdynia 2000 r., ISBN 83-7204-163-6

7.Abaqus 6.10, PDF Documentation, Theory Manual, Simulia, Dassault Systems

8.Szturomski B., S. Dobrociński, L. Flis, „Analiza wytrzymałościowa konstrukcji pojazdu morskiego obciążonego niekontaktowym wybuchem podwodnym"., Zesz. Nauk. AMW, ROK XLIII NR 2 (150) 2003

9.Machowicz M., Oddziaływanie powietrznej fali uderzeniowej na otoczenie, ZN Górnictwo i Geoinżynieria, Rok 29, Zeszyt 3, Akademia Górniczo-Hutnicza, Kraków 2005

10.Cole R. H., Underwater Explosions, Princeton University Press, Princeton 1948

RIGHTS, OBLIGATIONS AND RESPONSIBILITIES OF BAREBOAT CHARTER PARTIES

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ABSTRACT

A bareboat charter is a legal form of use of a vessel characterised by a complex system of contractual obligations of the parties. With this fact as a starting point, the case study analyses primarily rights, obligations and responsibilities of contractual parties in this type of vessel usage. The principal rights and obligations of both parties are listed and elaborated, followed by a number of specific sub-obligations which have a direct impact on contents and the scope of the former ones. The parties' rights and obligations are determined and described in terms of "bare" vessel charters. A detailed overview is given of the parties' contractual responsibilities, with the interpretation of the ways in which they participate in the benefits and risks under such contracts.
In order to provide a wider framework for the subject of the paper, not only provisions of the Croatian maritime law, but also legal origins of the Croatian civil law have been analysed. The paper uses also solutions for contractual provisions contained in standard BIMCO bareboat charter forms under the code name BARECON – Standard Bareboat Charter, specifically the form of the contract from 2001 with the code name BARACON 2001.
Finally, the paper underlines all the important issues relevant for fulfilment of a bareboat charter and proposes several amendments of relevance in the provisions on the rights, obligations, and responsibilities of the parties aiming at a higher-quality legal regulation of the bareboat charter institute under Croatian law.

KEY WORDS
bareboat charter , rights, obligation, contractual responsibility

1. INTRODUCTION

The category of sea going vessel employment contracts is a general designation of a group of contracts that may be entered into in the vessels exploitation business. These contracts are associated with the performance of individual seafaring activities. Each of these activities is performed depending on the terms provided in the contract. The parties' actions must be defined in a legal form, a contract, between the party exploiting the vessel and the party enabling the above mentioned exploitation. One of the legal forms of employment of a sea going vessel is a bareboat charter.

Bareboat charter is different from other sea going vessel employment contracts, mainly because of its specific legal nature of a use contract (Latin: location rei), but also because of the complex structure of relationships between the Parties under a law of obligations. As the vessel is surrendered to the Charterer for his use, the bareboat charter becomes the basis for the Charterer's performance of seafaring activities. Therefore, the bareboat charter contract beyond any doubt has an important role in the scheduling and development of modern seafaring activities.

The scope of this paper is to analyze the rights and obligations of both Parties of the bareboat charter contract and the important issue of their contractual responsibility. Along with the detailed analysis of the Maritime Code (Croatian: Pomorski zakonik)[1] (hereinafter the MC) provisions, the paper analyzes also the provisions of the Obligations Act (Croatian: Zakon o obveznim odnosima)[2] (hereinafter the OA) with respect to all such issues that have not been covered in the MC. In parallel, solutions provided by BIMCO in contractual provisions of standard bareboat charter forms are used under the code name BARECON – Standard Bareboat Charter, i.e., the contract form from 2001 under the code name BARECON 2001 (hereinafter: BARECON).

2. BAREBOAT CHARTER PARTIES

According to the standard BARECON form, the bareboat charter parties are the owner and the bareboat charterer[3]. The term owner means the person registered in the Ships Register as the shipowner. In addition to shipowners, mortgage creditors may also be lessor (SKORUPAN WOLFF 2008: 540). The term bareboat charterer designates the user of the uncrewed vessel charter. It is the person that intends to get engaged or has already been engaged in the ship operating business, but owns a tonnage that is not sufficient for its business and therefore, wants to increase it.

These terms simply designate the parties entered in the corresponding box on the front page of the contract form (Pavić 2006: 289).

3. RIGHTS AND OBLIGATIONS OF THE PARTIES

3.1. Owner's rights and obligations

In the process of negotiation of a bareboat charter and determination of the parties' rights and obligations, the obligation of the owner to surrender the ship to the charterer is defined in the first place. In addition to this, the owner has two other principal obligations. The principal obligations include also: bearing specific ship repair expenses and the ship redelivery procedure after the contract termination.

3.1.1. Delivery of the vessel to the Charterer

The delivery of the vessel to the charterer means the delivery of the possession. Upon the takeover of the vessel, the charterer gains the possession of the vessel and thereby also the full control of the vessel and the freedom to use the vessel in compliance with the contract. The delivery of the possession of the vessel has taken place once the charterer is able to control the vessel.

According to the standard BARECON form, throughout the charter "[...] the Vessel shall be in the full possession and at the absolute disposal for all purposes of the Charterers and under their

[1] "Narodne novine", No. 181/04, 76/07, 146/08, 61/11.
[2] "Narodne novine", No. 35/05, 41/08.

[3] See *Box* 3 and *Box* 4, Part I, BARECON.

complete control in every respect [...]“ (BARECON: Part II, Sub-clause 10(a)).

The owner's obligation is to surrender the vessel to the charterer “in such condition that it may be used as intended under the contract or according to its intended use” (Article 660 Paragraph 1 of the MC). If a crewed vessel is surrendered, then the vessel's crew element shall be covered under the vessel's condition for the intended use “as contracted or as normally intended”.

According to the standard BARECON form: "The Owners shall before and at the time of delivery due diligence to make the Vessel seaworthy and in every respect ready in hull, machinery and equipment for service [...]“ (BARECON: Part II, Sub-clause 3(a)). Moreover, the standard form anticipates: “The Owners and Charterers shall each appoint surveyors for the purpose of determining and agreeing in writing the condition of the Vessel at the time of delivery [...]“ (BARECON: Part II, Clause 7).

The vessel will be delivered to the charterer at the contracted place and time. This issue is covered in the standard BARECON form, as follows: “[...] The Vessel shall be delivered by the Owners [...] at the port or place indicated in Box 13 in such ready safe berth as the Charterers may direct.” (BARECON: Part II, Sub-clause 3(a)). Moreover, the time of delivery of the vessel mentioned in the standard BARECON is, as follows: “The Vessel shall not be delivered before the date indicated in Box 14 [...] ” (BARECON: Part II, Clause 4).

3.1.2. Costs borne by the Owner

According to the provisions of Article 661, Paragraphs 3 and 4 of the MC, there may be two types of costs of the vessel borne by the Owner: the costs of repair of consequences resulting from the regular use of the vessel and of latent defects of the vessel. There is no definition of regular use (wear and tear) of the vessel in the MC, but the AO is somewhat more specific in that respect. Article 536, Paragraph 3 of the AO, in addition to “wear and tear of the item”, mentions also "deterioration". The vessel's wear and tear is incurred in the course of time and during normal use of the vessel, but the deterioration is a status identified as deteriorated almost exclusively due to the amount of time that has elapsed.

In compliance with Article 661, Paragraph 4 of the MC “the charterer shall not bear the costs of repair of the vessel needed for repair of the vessel’s latent defects“, therefore, the same obligation is on the side of the owner. The latent defects are those that existed at the time of delivery of the vessel to the charterer, for his use. If the parties have not contracted the condition of the vessel on delivery, then the defect shall be any defect that makes the vessel unseaworthy according to its intended use, as contracted or normally intended.

Latent defects are assessed from the charterer's viewpoint, since he has acquired the capacity of the ship operating entity based on the bareboat charter and may not invoke his qualification as the cause for his inability to identify the defect.

The standard BARECON form also consists of vessel repair cost provisions incurred due to latent defects of the vessel, stating: “ [...] the Owners shall be liable for the cost of but not the time for repairs or renewals occasioned by latent defects in the Vessel, her machinery or appurtenances, existing at the time of delivery under this Charter provided such defects have manifested themselves within twelve (12) months after delivery.” (BARECON: Part II, Sub-clause 3(c)).

3.1.3. Taking over the vessel after the charter termination

After the termination of the bareboat charter the owner is obligated to take over the vessel. This obligation is at the same time his right.

The standard BARECON defines this issue, as follows: “At the expiration of the Charter Period the Vessel shall be redelivered by the Charterers to the Owners [...] in such ready safe berth as the Owners may direct [...]” (BARECON: Part II, Clause 15).

3.2. Charterer's obligations

The charterer's principal obligations are the following: to take over and use the vessel, settle the operation and maintenance costs, pay the hire and return the vessel in the same condition as found at the time of delivery.

3.2.1. Taking over and use of the vessel

The MC and the OA do not have any provisions on the vessel take over; therefore, we will apply general principles of civil law. According to the same principles, the charterer cannot be forced to take over the chartered vessel but he shall be obligated to make sure the owner's legal position is the same as if the vessel were taken over and that the owner is compensated for any damage incurred due to the failure in the vessel takeover. He shall be obligated to pay the hire, in the first place and within the shortest charter term as anticipated in the contract. If the duration of the charter term has been precisely contracted, the hire shall be paid within the equivalent and contracted time limit, but if the term has not been contracted then it shall be paid until the expiration of the notice period (Skorupan Wolff 2008: 558).
As opposed to the non-accepted delivery of the vessel, entitling the owner to damage compensation, in the event of (the charterer's) refusal to use the vessel the owner shall not exercise any particular rights. The charterer's effective use of the vessel is solely at his discretion. In addition to the charterer's rights, the terms of use of the vessel shall be also part of his obligations. His right shall be also that the owner will not be allowed to disrupt him/the Charterer in the use of the vessel but his obligation shall be that the vessel must be used according to its intended use, as contracted or as normally intended (Ibid: 559).
The standard BARECON anticipates the charterer's obligation to compensate any losses, damage or costs to the owner, borne by the owner, resulting from the use of the vessel. The provision reads, as follows: "The Charterers shall indemnity the Owners against any loss, damage or expense incurred by the Owners arising out of or in relation to the operation of the Vessel by the Charterers [...]" (BARECON: Part II, Clause 17). With respect to the use of the vessel, the standard BARECON anticipates that the charterer shall not be authorized to make structural changes in the vessel, without the owner's consent. The provision reads, as follows: " [...] the Charterers shall make no structural changes in the Vessel or changes in the machinery, boilers, appurtenances or spare parts thereof without in each instance first securing the Owners' approval thereof [...]" (BARECON: Part II, Sub-clause 10(e)).

3.2.2. Payment of the hire

The hire payment obligation constitutes the legal grounds (basis) of the bareboat charter contract.
The hire is the pecuniary fee paid by the charterer to the owner for the performed service of delivery of the vessel for use. Based on the provisions of Article 665, Paragraph 1 of the MC "the hire shall be paid one month in advance, calculating from the starting date". This provision is optional and the parties may set another time limit in this respect. It is customary that the beginning of the hire payment term is calculated from the date of delivery of the vessel to the charterer, but the parties may contract another date as the starting date. The value of the hire shall be set out by the Parties in the contract.[4] Normally the parties set out the total hire as the lump sum for the duration of the entire charter term[5], provided that the charterer shall be obligated to pay the contracted sum in monthly installments, as anticipated.
According to the standard BARECON, "The Charterers shall pay to the Owners for the hire of the Vessel a lump sum in the amount indicated in Box 22 which shall be payable not later than every thirty (30) running days in advance [...]". (BARECON: Part II, Sub-clause 11(b)).
In the event of delayed payment of the hire, the MC provides: „If the charterer has not paid the hire on its due date, the owner may claim immediately the payment of the hire contracted for the entire duration of the bareboat charter term or may withdraw from the contract" (Article 666, Paragraph 1 of the MC). The previously mentioned rights are mutually exclusive; therefore, the owner who has claimed the payment of the fee shall not have the right to withdraw from the contract or, in the event of his withdrawal from the contract shall not be entitled

[4] If the hire has not been defined by the Parties in the contract, then the provisions of Article 534, Paragraph 1 of the OA may be applied, stating that the charterer shall be obligated to pay the charter fee/hire "as customary at the palce of delivery of the item".
[5] For determination of the term *Lump sum* see Cook, Young, Taylor, Kimball, Martowski, Lambert 2001: 270.

to claim the payment of the hire (Jakaša 1984: 190).
The standard BARECON along these lines, provides, as follows: "[...] the first lump sum being payable on the date and hour of the Vessel's delivery to the Charterers [...]" (BARECON: Part II, Sub-clause 11(b)). Also, the form provides for the interest payment obligation in the event of delayed payment of the fee: "Any delay in payment of hire shall entitle the Owners to interest at the rate per annum [...]" (BARECON: Part II, Sub-clause 11(f)).

3.2.3. Vessel costs borne by the Charterer

The charterer is obligated to bear certain costs. As per Article 661 of the MC, the charterer shall bear the vessel operation, maintenance and repair costs.
The costs of operation include all the costs necessary for use of the vessel and its proper operation. These include the costs of fuel, lubricants and other supplies for the vessel's operation; food and water supplies; crew wages; various fees, taxes and other levies relating to the use of the vessel.
The vessel maintenance costs include all the costs that may be anticipated and cannot be avoided in the intended use, as contracted or as normally intended and the costs of minor repairs needed for the vessel's condition not to deteriorate (Skorupan Wolff 2008: 560). The vessel repair costs shall always be borne by the charterer if these involve the vessel defects that did not exist at the time of delivery of the vessel. Otherwise, in the case of defects that existed at the time of the vessel's delivery to the charterer, the repair costs should be borne by the charterer (Article 661, Paragraph 4 of the MC).

3.2.4. Returning the vessel

After the bareboat charter term has elapsed, the charterer shall be obligated to return the vessel to the owner. In the event of the charterer's failure to return the vessel to the owner "for the exceeded time limit he shall be obligated to pay a double sum of the original fee" (Article 670, Paragraph 1 of the MC). This sanction serves to warn the charterer not to extend the period of use of the vessel beyond the contracted term (Grabovac 2005: 194). If the vessel is then returned with delay by the charterer, due to his fault, "he shall be liable to the owner for any damage exceeding the double hire that has been contracted". (Article 670, Paragraph 2 of the MC).
With respect to the condition and the place of return of the vessel mentioned in the MC, the charterer's obligation is to return the vessel "in the same condition and to the same place of the vessel's original takeover by the charterer" (Article 661, Paragraph 2 of the MC). This is the optional provision, which may be defined differently by the parties.
The standard BARECON provides for several solutions in terms of the place of return of the vessel: " [...] the Owners shall have the right to repossess the Vessel from the Charterers at her current or next port of call, or at a port or place convenient to them [...]" (BARECON: Part II, Clause 29).

4. PARTIES' RESPONSIBILITIES

4.1. The owner's responsibility for legal flaws in the fulfillment

The MC does not have the provisions on the owner's responsibility for legal flaws in the fulfillment of the bareboat charter; therefore, the provisions of the OA shall be applicable in that matter. In terms of legal flaws of fulfillment of the bareboat charter, the legal grounds for third party claims may be third party's ownership of the vessel, mortgage, privileges, charter, the ship operator's contract for a time charter for the entire vessel and other limitations of control of the vessel. Legal consequences of the existence of third party rights must be distinguished in terms of the owner's right being excluded or limited by legal flaws (Article 531, Paragraphs 2 and 3 of the OA). In the event of legal flaws excluding the charterer's right, the bareboat charter contract shall be terminated by operation of law, with the obligation for damage compensation. If the third party right is of such nature that it "only" limits the charterer's right to use the item, the charterer has a right of choice: he may terminate the bareboat charter and claim damages, or he may claim the reduction of the hire and damage compensation (Article 531, Paragraphs 2 and 3 of the OA).

BARECON consists the clause as follows: "The Owners warrant that they have not effected any mortgage(s) of the Vessel and that they shall not effected any morgage(s) without the prior consent of the Charterers, which shall not be unreasonably withheld." (BARECON: Part II, Sub-clause 12(a)).

4.2. The owner's responsibility in the event of no option for use of the vessel

In compliance with Article 662 of the MC "damage incurred due to defects that make the vessel unseaworthy or reduce its capacity for the contracted or normal use, which existed at the time of delivery of the vessel to the charterer, shall be the owner's responsibility, unless he is able to demonstrate that such defects could not have been identified with the exercise of due diligence". It may be derived from the quoted provisions that the owner is liable according to the assumed fault principle. Therefore, his responsibility is assumed only in the event of defects that existed "at the time of delivery of the vessel to the charterer". The defects that may or may not exist on the vessel at the time of delivery are defined in the bareboat charter contract. The owner shall always be liable for any defects that the owner was aware of or had to be aware of, and which he could have identified in the exercise of due diligence. The sole exception is in the provisions of Article 661, Paragraph 2 of the MC, whereby the owner shall not be liable for defects of minor relevance.

4.3. Charterer's responsibility for the loss of the vessel

In the event of loss of the vessel caused by the fault of the charterer or master, the charterer shall be liable for such damage to the owner in compliance with the MC provisions on the ship operator's responsibility. The charterer will not bear "the damage for the vessel's loss due to Force Majeure events" (Article 661, Paragraph 4 of the MC). In such event it is sufficient for the charterer to demonstrate that Force Majeure is a direct cause for the loss of the vessel (Jakaša 1984: 185).
The standard BARECON anticipates the charterer's obligation to provide the insurance against maritime risks for the vessel at his expense according to the terms approved by the owner. Therefore it is mentioned in the form that: "[...] the Vessel shall be kept insured by the Owners at their expense [...]". (BARECON: Part II, Sub-clause 13(a)).
Also, in the event of loss of the vessel, all insurance related payments shall be received by the owner "[...] all insurance payments [...] shall be paid to the Owners, who shall distribute the moneys between themselves and the Charterers according to their respective interests."(BARECON: Part II, Sub-clause 14(h)).

5. CONCLUSION

Based on the analysis of rights and obligations of the parties under the bareboat charter contract and the provisions on the parties' responsibilities contained in the MC and the OA, as the subsidiary source, one may conclude that this is a very complex contractual relationship. The legislator has not made compelling interventions in the parties' relationships and in the first place it has relied on their discretionary powers to govern their relationships. He has set only the general principles, according to which a potential dispute in a case will be settled, if their mutual obligations have not been unambiguously and sufficiently formulated in the contract.
By entering the bareboat charter contract and upon the delivery of the vessel to the charterer's possession, the owner transfers the ship operator's capacity (to the charterer) and exempts himself off the seafaring business activities, which are in the scope of the charter. In addition to the specific obligations concerning the ship, its capacity and the condition for employment as intended under the contract or normally, there are also a number of other obligations and liabilities on the side of the owner. In addition to the obligation to deliver the vessel for the charterer's use, he is obligated also, as follows: to bear the costs of removal of consequences resulting from the regular use of the vessel, the costs of repair of latent defects on the vessel, to take over the vessel after the contract termination but may be liable also for legal flaws of fulfillment of the contract under specific terms and for no option of use of the vessel in specific conditions. Therefore, it is prescribed in the MC that the owner shall be

liable to the charterer for any damage incurred due to defects, which make the vessel unseaworthy or reduce its capacity for the contracted or normal use, which existed at the time of delivery of the vessel to the charterer; unless he is able to demonstrate that such defects could not have been identified with the exercise of due diligence. However, these provisions under the MC are not compulsory; they are optional and will be applied only if the parties have not contracted otherwise.
On the other hand, the charterer also has a number of obligations and the matter of his liability is also important in the process of settlement of mutual relationships between the Parties. The payment of the hire is not his sole obligation; he is also obligated to bear the costs of operation, maintenance and repair of the vessel and after the contract termination to return the vessel to the owner. He shall be liable in the event of loss of the vessel, except for the loss resulting from an incident or Force Majeure.
The standard BARECON provisions that we have taken as example of the way in which mutual rights, obligations and liabilities between charter parties (in this case the bareboat charter) are contracted, define in a comprehensive and extensive manner charter contract relationships. They have been recognized as such at the global seafaring market. They may be used as example and their individual provisions, as proposed by us, may be included in legal vessel charters regulated under Croatian law with the scope of improving their quality standards. It would be good if we had a legal frame that would anticipate the appointment of surveyors for the purpose of determination of vessel seaworthiness upon delivery. This particular matter implies also the issue of the parties' liability in the event of no option of use/employment of the vessel. Then, there is also the issue of obligatory insurance of the vessel, again associated with the issue of liability. Our opinion is that the inclusion of these provisions, regardless of their optional nature, would encourage the parties towards setting higher quality standards in the negotiation of vessel charters.

REFERENCES

1.Cook, J., Young, T., Taylor, A., Kimball, J.D., Martowski, D., Lambert, L., Voyage Charters, LLP, (London, 2001) page 270.

2.Davis, M., Bareboat Charters, LLP, (London, Singapur, 2005).

3.Dworski, E., Ugovori o iskorišćavanju pomorskih brodova, I svezak, Viša Pomorska škola Rijeka, (Rijeka, 1969), pages 10-17.

4.Dworski, E., Ugovori o iskorišćavanju pomorskih brodova, II svezak, Viša Pomorska škola Rijeka, (Rijeka, 1969), pages 219-244.

5.Grabovac, I., Suvremeno hrvatsko pomorsko pravo i Pomorski zakonik, Književni krug, (Split, 2005), pages 193-195.

6.Jakaša, B., Sistem plovidbenog prava Jugoslavije, Treća knjiga, Ugovori o iskorištavanju brodova, (Zagreb, Čakovec, 1984), pages 157-196.

7.Pavić, D., Pomorsko imovinsko pravo, Književni krug, (Split, 2006), pages 287-292.

8.Skorupan Wolff, V., Pravno uređenje zakupa broad u hrvatskom pravu, „Zbornik Pravnog fakulteta u Zagrebu", 58, (1-2), (2008), pages 537-581.

9.Pomorski zakonik, "Narodne novine", No.181/04, 76/07, 146/08, 61/11.

10.Zakon o obveznim odnosima, "Narodne novine", No. 35/05, 41/08.

11.www.bimco.org

BIOGRAPHIES

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ABSTRACT

International Maritime Solid Bulk Cargoes (IMSBC) Code, adopted on 4 December 2008 by MSC Resolution 268(85), and made mandatory by amendments to chapters VI and VII of the International Convention for the Safety of Life at Sea (SOLAS) 1974,MSC Resolution 269(85), from 1 January 2011, deals with the problems and dangers involved in the carriage of solid bulk cargoes with the aim to facilitate the safe stowage and shipment of solid bulk cargoes by providing information on the dangers related with the shipment of various types of solid bulk cargoes and instructions or the procedures to be followed both on shore and on board ships, particularly concerning the hazards due to loss or reduction of stability during a voyage and chemical reactions of cargoes.
The hazards associated with the shipment of solid bulk cargoes relating to structural damage due to improper cargo distribution, huge quantities and weights, ship's condition and construction, and high loading rates, that have to be managed according other maritime international and national regulations, like SOLAS, STCW, Load Line, ISM etc...

KEY WORDS

IMSBC, IMO. Solid bulk. Bulk carrier.

1. INTRODUCTION

Transportation of bulk cargoes by ships has been identified with high risks of catastrophic accidents and with heavy loss of human life due to structural failure and foundering, or cargo related difficulties, due to chemical properties and liquefaction, or due to high terminal loading rates.
The findings of the Accident Investigations indicated that, among the other causes, there was no standardized international regulations for the safe transportation of bulk cargoes as the BC Code, first adopted in 1965, was not mandatory, and its provisions were not followed, particularly by shore personnel, shippers and terminals.
At the same time the increased demand for worldwide transportation of bulk cargoes, continued today, caused the increase in bulk carrier number and sizes and building of numerous bulk cargo terminals with high loading and unloading rates. One third of the world fleet today is made up by bulk carriers and it is of the great importance that the maritime transportation of bulk cargo is carried out safely and in accordance with the effective safety regulations and procedures to be followed not only by ship but also by shore personnel.
The total number of bulk carriers in 2012 topped over 9000 vessels, and mainly consists of three types as per Intercargo on 1 January 20122:
- 3448 Handy size, 10,000 – 49,999 Dwt;

- 2814 Panamax, 50,000 – 79,999 Dwt;
- 1879 Capesize, 80,000 Dwt and over.

According to Unctad's 2011 Review of Maritime Transport3 estimated seaborne trade (goods loaded) in the main bulk trades has grown to over 2300 millions of tones for the year 2010, compared to 968 millions in 1990 and 1,288 millions of tones in the year 2000.

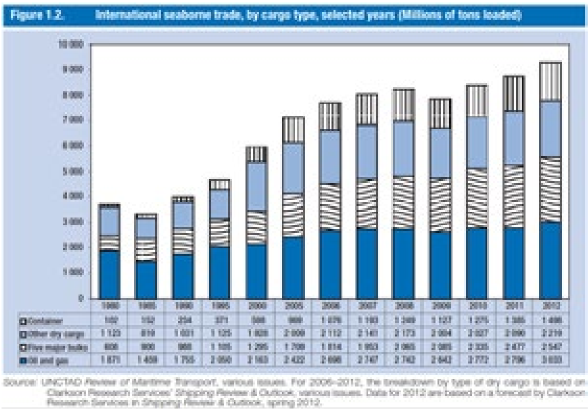

Figure 1. International seaborne trade.

According to Unctad's 2012 Review of Maritime Transport4 the major bulk cargoes transported by sea reached 2547 million of tons, four times more then in 1980.

2. IMSBC CODE

2.1. Development of the new regulations for transport of bulk cargoes and safety of bulk carriers

Following a spate of losses of bulk carriers in the early 1990s, particularly following the publication of the report into the sinking of the bulk carrier „Derbyshire“, IMO in November 1997 adopted new regulations in SOLAS containing specific safety requirements for bulk carriers, Chapter XII - Additional Safety Measures for Bulk Carriers. In the same month, the 20th Assembly of IMO adopted the "BLU Code" - the Code of Practice for the safe loading and unloading of bulk carriers (resolution A.862(20)).

IMO initiated a further review of bulk carrier safety, involving the use of Formal Safety Assessment (FSA) studies to help assess what further changes in regulations might be needed.

In December 2002, IMO adopted amendments to SOLAS chapter XII and the 1988 Load Lines Protocol and also agreed to a number of recommendations to further improve bulk carrier safety.

In December 2004, the MSC adopted a new text for SOLAS chapter XII, incorporating revisions to some regulations and new requirements relating to double-side skin bulk carriers, and also mandatory standards and criteria for side structures of bulk carriers of single-side skin construction and standards for owners' inspections and maintenance of bulk carrier hatch covers.

Finally, in order to improve safety of solid bulk cargo transportation by ships, on 4 December 2008, by Resolution MSC.268(85), the International Maritime Organization (IMO) adopted new regulations for the carriage of solid bulk cargoes. The new code, the International Maritime Solid Bulk Cargoes Code - the IMSBC Code – replaced the former Code of Safe Practice for Solid Bulk Cargoes - the BC Code and should be used in conjunction with other regulations, particularly the Blue Code.

Unlike the BC Code, which was only a recommendation, the IMSBC Code was made mandatory by amendments to the SOLAS 74 convention, Chapters VI and VII, from 1st January 2011.

The primary aim of the IMSBC Code is to provide information on the dangers associated with certain types of solid bulk cargoes and to provide procedures to be followed when shipping solid bulk cargoes. This should enable the masters and officers to take necessary measures to ensure safer transportation of bulk cargoes by ships, but also to ensure that bulk cargo is properly prepared for loading, and correct and proper information are presented to ship before loading as mandatory shipper's obligation.

All ships carrying solid bulk cargoes in general and dangerous solid bulk cargoes in particular will be required to comply with the new IMSBC Code, irrespective of their keel-laying date or gross tonnage. As a proof of compliance with the IMSBC Code, ships are required to have valid "Document of Compliance for the Carriage of Dangerous Solid Bulk Cargoes" on board. Carriage of Grains and Non-Cohesive solid bulk cargoes has to be in accordance with the IMO Grain Code, 19915.

The existing requirements of the International Convention for the Safety of Life at Sea (SOLAS) are applicable to cargo ships of 500 GRT or over that are constructed on or after 1984-09-01 and to cargo ships of less than 500 GRT that are constructed on or after 1992-02-01. Specific requirements concerning the carriage of dangerous goods, both in solid bulk form and as packaged goods, in addition to the requirements stated in the IMSBC Code and IMDG Code are stipulated in the SOLAS Convention, Reg.II-2/19 (or Reg II-2/54) and Chapters VI and VII.
Particular attention has to be taken when transporting „Environmentally Hazardous Cargoes (EHS)", as defined by the 2008 edition of the International Maritime Dangerous Goods (IMDG) Code, in chapter 2.9, which, if found by a range various of tests to be hazardous to the aquatic environment, have to be classified under the IMDG Class 9, UN 3077 or as having a Marine Pollutant as subsidiary risk. In such a case, provisions of Marpol Annex III and Annex V have to be complied with. The relevant carriage requirements for bulk cargoes which are found to be EHS have not been specifically addressed in the IMSBC Code so the „Provisional classification of solid bulk cargoes under the revised MARPOL Annex V" prescribed by MEPC.1/Circ.791, from 18 October 2012, should to be used6.
Handling of solid bulk cargoes in ports and carriage on board ships in Republic of Croatia is regulated by provisions of The Maritime Code (NN 181/04, 76/07 and 146/08) and The Ordinance on handling and carriage of dangerous cargoes (NN 051/2005, amendments NN 127/2010) requiring mandatory compliance with provisions of IMSBC Code.

2.2. The IMSBC Code and its content

The format of the IMSBC Code is similar to that of the former BC Code:

- Foreword
- Section 1 - General provisions
- Section 2 - General loading, carriage and unloading precautions
- Section 3 - Safety of personnel and ship
- Section 4 - Assessment of acceptability of consignments for safe shipment
- Section 5 - Trimming procedures
- Section 6 - Methods of determining the angle of repose
- Section 7 - Cargoes that may liquefy
- Section 8 - Test procedures for cargoes that may liquefy
- Section 9 - Materials possessing chemical hazards
- Section 10 - Carriage of solid wastes in bulk
- Section 11 - Security provisions
- Section 12 - Stowage factor conversion tables
- Section 13 - References to related information and recommendations
- Appendix 1 - Individual schedules of solid bulk cargoes
- Appendix 2 - laboratory test procedures, associated apparatus and standards
- Appendix 3 - Properties of solid bulk cargoes
- Appendix 4 - Index

Also, like the BC Code, the IMSBC Code categorizes cargoes into three groups - A, B and C:

- Group A Cargo consist of the cargoes which may liquefy if shipped with moisture content in excess of their transportable moisture limit; shall only be accepted for loading when the actual moisture content of the cargo is less than its TML;
- Group B Cargo consists of cargoes which possess a chemical hazard which could give rise to a dangerous situation on a ship and harm persons or enviroment (MHB, IMDG, EHS)
- Group C Cargo neither group A or B

Groups are indicated in Individual Schedule for each bulk cargo in Appendix1 and Index of all solid bulk cargoes is given in Appendix 4.
Not mandatory provisions in the IMSBC Code are:

- Security provisions (except subsection 11.1.1);
- Stowage factor conversion tables;
- References to related info and recommendations;
- Appendices other than appendix 1 Individual schedules of solid bulk cargoes;
- part of the texts in the appendix 1,

Meaning of the phrases used in text:

- Shall means Mandatory;
- Should means Recommendatory;
- May means Optional.

If a particular action is prescribed in IMSBC, but the responsibility for carrying out the action has not been specifically assigned to any particular person or organization in the code, then it remains the exclusive right of each Government to assign this responsibility.

2.3. About IMSBC requirements

General provisions regarding obligations of persons and organizations involved in transportation of solid bulk cargoes are given in Chapter 1.
It is noted that the other international and national regulations exist and that those regulations may recognize all or part of the provisions of this Code, in addition, port authorities and other bodies and organizations should recognize the Code and may use it as a basis for their storage and handling bye-laws within loading and discharge areas.
The shipper's obligation for every solid bulk cargo is to provide appropriate information about the cargo to be shipped (see section 4.2).
Where a solid bulk cargo is specifically listed in appendix 1 to this Code (individual schedules for solid bulk cargoes), it shall be transported in accordance with the provisions in its schedule in addition to the provisions in sections 1 to 10 and 11.1.1 of this Code. Typical cargoes currently shipped in bulk, together with advice on their properties and methods of handling, are given in the schedules for individual cargoes. However, these schedules are not exhaustive and the properties attributed to the cargoes are given only for guidance. Consequently, before loading, it is essential to obtain current valid information from the shipper on the physical and chemical properties of the cargoes presented for shipment. The master shall consider to consult the authorities at the ports of loading and discharge, as necessary, concerning the requirements which may be in force and applicable for the carriage.
In case of cargoes not listed in appendix 1 to this Code is proposed for carriage in bulk, the shipper shall, prior to loading, provide the competent authority of the port of loading with the characteristics and properties of the cargo in accordance with section 4 of this Code.
Based on the information received, the competent authority will assess the acceptability of the cargo for safe shipment. When it is assessed that the solid bulk cargo proposed for carriage may present hazards as those defined by group A or B of this Code as defined in 1.7, advice is to be sought from the competent authorities of the port of unloading and of the flag State. The three competent authorities will set the preliminary suitable conditions for the carriage of this cargo.
When it is assessed that the solid bulk cargo proposed for carriage presents no specific hazards for transportation, the carriage of this cargo shall be authorized. The competent authorities of the port of unloading and of the flag State shall be advised of that authorization.
The competent authority of the port of loading shall provide to the master a certificate stating the characteristics of the cargo and the required conditions for carriage and handling of this shipment. The competent authority of the port of loading shall also submit an application to IMO, within one year from the issue of the certificate, to incorporate this solid bulk cargo into appendix 1 of this Code. The format of this application shall be as outlined in the Code, subsection 1.3.3.
When a particular provision shall be complied with, a competent authority may authorize any other provision by exemption if satisfied that such provision is at least as effective and safe as that required by this Code. Acceptance of an exemption authorized under this section by a competent authority not party to it, is subject to the discretion of that competent authority.
Acceptance of an exemption authorized under this section by a competent authority not party to it, is subject to the discretion of that competent authority. Accordingly, prior to any shipment covered by the exemption competent authority(s) which have taken the initiative with respect to the exemption shall:
1. Send a copy of such exemption to IMO, which shall bring it to the attention of the Contracting Parties to SOLAS; and
2. Take action to amend this Code to include the provisions covered by the exemption, as appropriate.
The exemption shall be valid for max. 5 years. When the IMSBC Code is not amended the exemption may be renewed. A copy of the exemption or an electronic copy thereof shall be maintained on board each ship transporting solid bulk cargoes in accordance with the exemption, as appropriate.
In part 2, General precautions, mandatory measures are prescribed taking into account main risks in bulk cargo transport, like loss or reduction

of stability during a voyage, breaking and structural damage due to improper cargo distribution, chemical reactions of cargoes (Explosions, Fires, Loss of oxygen, Intoxication due the vapors of the cargo or fumigants, etc).

Regarding cargo distribution:

- The shipper must supply adequate information as specified in section 4,
- Reference is made to ships stability booklet and/or loading calculator,
- Master shall be able to calculate stability,
- Shifting is to be prevented by e.g. bulkheads,
- Special care is to be taken with high density (heavy) cargoes.

Regarding loading and unloading requirements are given for:

- Cargo holds inspection & preparation before loading,
- Special attention to the bilges, bilge lines and sound pipes,
- Ventilation should not blow cargo dust into the accommodation,
- Dust can damage moving parts of machinery on deck as well as navigational aids.

In part 3, Safety of personnel & ship, the principal dangers for personnel are identified and safety precautions defined regarding:

- General requirements, including obligation that the Medical First Aid Guide information has to be on board,
- Poisoning, corrosive & asphyxiation hazards,
- Health hazards due to dust,
- Flammable atmosphere,
- Ventilation,
- Fumigation.

In part 4, Assessment of acceptability, the following procedures are prescribed regarding:

- Identification & classification,
- Provision of information,
- Certificates of test,
- Sampling procedures,
- Intervals between sampling & loading,
- Sampling procedures including for concentrate stockpiles,
- Standardized sampling procedures,
- Required documentation:

DG stowage list (manifest) or Stowage plan;
Emergency response plan (dealing with incidents involving the cargoes)
Document of Compliance, as per SOLAS 74;
Bulk Cargo Shipping Name and (Shippers) Declaration - Each solid bulk cargo in this Code has been assigned a Bulk Cargo Shipping Name(BCSN). When a solid bulk cargo is carried by sea it shall be identified in the transport documentation by the BCSN– Bulk Cargo Shipping Name. The BCSN shall be supplemented with the United Nations (UN) number when the cargo is classified as dangerous goods or marine pollutant.

If waste cargoes are being transported for disposal, or for processing for disposal, the name of the cargoes shall be preceded by the word "WASTE".

The shipper shall provide the master or his representative with appropriate information on the cargo sufficiently in advance of loading to enable the precautions which may be necessary for proper stowage and safe carriage of the cargo to be put into effect. Cargo information shall be confirmed in writing and by appropriate shipping documents prior to loading.

General and special trimming procedures for various types of ships, including multi-deck ships, and various types of solid bulk cargoes are given in chapter 5, separately for cohesive bulk cargoes the differences of cargo heights are given, and non-cohesive bulk cargoes, that shall be transported as per IMO Grain Code provisions.

Methods of determining the angle of repose are detailed in chapter 6. An angle of repose of a non-cohesive solid bulk material shall be measured by a method approved by the appropriate authority as required by section 4.1.4 of this Code. If the Angle of repose is less then 30 degrees then the cargo has to be carried as per IMO Grain Code regulations.

The recommended test methods are Tilting box method, laboratory test, and Shipboard test method, which can be used by ship's personnel.

Particularly important are provisions for transport of cargoes that may liquefy, given in chapter 7 and describe condition of hazards and provision to be followed during transport including use of specially constructed or fitted ships.

The hazards of liquefaction are explained, as the shifting of cargo in holds on the voyage in form of „sliding failure“ or „wet base“ movement is known to have caused numerous accidents and loss of crew and ships so even without chance to send a distress.

The solid bulk cargo must not be accepted or given for transport if it contains moisture content higher then Transportable Moisture Limit (TML).

The number and seriousness of accidents of this type in the last and this year, has prompted IMO to issue a circular, MSC.1/Circ.1441, proposing interim measures for early implementation of the draft amendments (02-13) to the IMSBC Code expected to be adopted at MSC 92.

Test procedures for determining the properties of the solid bulk cargoes, e.g. moisture content and TML, are given in chapter 8, including description of the Liquefaction Test for master that can be undertaken on board.

The provisions for carriage, stowage and segregation of dangerous solid bulk cargoes are given in chapter 9, Chemical hazards, in accordance with IMDSG Code. Dangerous solid bulk cargoes are classified as class 4.1, 4.2, 4.3, 5.1, 6.1, 7, 8, or 9 and Materiel Hazardous in Bulk (MHB).

When transporting dangerous solid bulk cargoes the provisions of SOLAS 74, chapter VII, and IMDG Code, has to be complied with, but also the provisions of MARPOL 73/78, chapters III and V regarding remains of cargo on board after discharging and hold wash water.

Amendments that incorporate provisions for Environmentaly Hazardous Substances in IMSBC Code are not yet issued, so the „Provisional classification of solid bulk cargoes under the revised MARPOL Annex V" prescribed by MEPC.1/Circ.791, from 18 October 2012, should to be used.

Chapter 10 prescribes requirements for transport of Solid Wastes as bulk and includes regulations for:

- Dumping, incineration, other disposal;
- Trans-boundary movements (Basel convention);
- Documentation (Waste movement document);
- Classification
- Stowage & handling as schedule 1-9 & Group B requirements;
- Segregation and
- Accident procedures.

In transport of wastes there are numerous local or regional regulations that have to be complied with as well as mentioned provisions in this Code.

Provisions concerning security arrangements, chapter 11, are recommendations only and given for company, ship and shore-side personnel, including training and require particular attention when handling high-consequence cargoes.

Stowage factors and its conversions, given in chapter 12, and References, chapter 13, are also recommendation only, and given in Code as a guidance to responsible persons.

In Appendix 1 to IMSBC code Individual schedules of all known solid bulk cargoes is given totaling almost 150 different products in 244 pages. All schedules are given as information only and recommendation to be used unless the shipper provides different information on cargo properties.

Laboratory test procedures and associated apparatuses are described in Appendix 2:

Properties of solid bulk cargoes are detailed in Appendix 3 and relate to:

Non-cohesive cargoes:

Prior to completion of loading, the angle of repose of the materials to be loaded should be determined (as per chapter 6) so as to determine which provisions of this Code relating to trimming apply (chapter 5).

Non-cohesive cargoes shall be carried according to the provisions applicable to the stowage of grain cargoes (International Grain Code 1991).

All cargoes other than those listed in this appendix are cohesive, and the use of the angle of repose is, therefore, not appropriate. Cargoes not listed should be treated as cohesive until otherwise shown.

Cargoes which may liquefy;

Precautions for the cargoes which may possess a chemical hazard and use of MFAG.

Appendix 4 contains of Index of the solid bulk cargoes sorted by Solid Bulk Shipping Names and listing its group, (A, B, or C) and references.

In supplement to IMSBC Code useful Codes, circulars, guidances and recommendations are included:

- BLU Code - Code of Practice for the Safe Loading and Unloading of Bulk Carriers
- BLU Manual - Manual on loading and unloading of solid bulk cargoes for terminal representatives
- Uniform method of measurement of the density of bulk cargoes, MSC/Circ. 908 (4 June 1999)
- Lists of solid bulk cargoes for which a fixed gas fire-extinguishing system may be exempted or for which a fixed gas fire extinguishing system

is ineffective, MSC/Circ.1146 (75 December 2004);
- Recommendations for entering enclosed spaces aboard ships Resolution A.864 (20) (adopted on 27-11-1997) but REVISED by A.27/Res.1050 on 20 December 2011.

2.3. Implementation of IMSBC Code

The companies, masters and deck officers have to ensure that provisions given in the IMSBC Code are complied with and Safety Management Manuals should contain detailed procedures for loading, carrying and unloading of solid bulk cargoes.
IMSBC provisions have to be followed by shippers that have to prepare cargo and documentation for transport.
All responsible persons must be able to use the IMSBC Code and know its content and mandatory obligations and have to receive proper education and training.
For maritime personnel education and training is prescribed by STCW 2010 Convention and relates to masters (A-II/2), officers, able seafarer deck, (A-II/5), and officers and ratings responsible for cargo handling on ships carrying dangerous and hazardous substances in solid form in bulk, (B-V/b).
Training should be divided into two parts, a general part on the principles involved and a part on the application of such principles to ship operation and use of IMSBC Code:

- Knowledge of and ability to apply relevant international regulations, codes and standards concerning the safe handling, stowage, securing and transport of cargoes;
- Obtaining Information on dangers, hazards and special requirements;
- Carriage of dangerous, hazardous and harmful cargoes;
- Precautions during loading and unloading and care during the voyage;
- Effect of cargoes and cargo operations on trim, stability and stress of the ship;
- Limitations on strength of the vital constructional parts of a standard bulk carrier and ability to interpret given figures for bending moments and shear forces
- Operational and design limitations of bulk carriers;
- The detrimental effects on bulk carriers of corrosion, fatigue and inadequate cargo handling;
- Etc.

2.4. Future amendments to IMSBC Code6

As a result of world trade demands, new solid bulk cargoes with their own particular hazards are introduced and presented for shipment. Similarly, some cargoes that were previously only shipped in very limited quantities and were not included in the IMSBC Code are now carried more extensively. At the same time, expert understanding of the properties and hazards associated with established solid bulk cargoes and the safest means of handling and carrying such cargoes is continually being advanced. Therefore to keep pace with developments the IMSBC Code will in future be updated bi-annually. Contracting governments may apply the new requirements, in whole or in part, on a voluntary basis one year earlier.
The Amendment 01-11, which is the first amendment to the IMSBC Code since it became mandatory, follows a review of numerous submissions to IMO by the sub-committee on Dangerous Goods, Solid Bulk Cargoes and Containers (DSC) and was adopted on 20 May 2011, at its MSC eighty-ninth session by Resolution MSC.318 (89) and compliance with the amendments became mandatory on 1 January 2013.
Next Amendment 02-13 is already in preparation and will be mandatory from 1st January 2015. It is expected that it will include additional measures necessary for safe transport of solid bulk cargoes that may liquefy as recommended by MSC 90 in MSC.1/Circ 1441:
„SOLAS Contracting Governments should be invited to implement the draft amendments on the safe transportation of solid bulk cargoes:
SECTION 4
Assessment of acceptability of consignments for safe shipment 4.3.2 When a concentrate or other cargo which may liquefy is carried, the shipper
shall provide the ship's master or his representative with a signed certificate of the Transportable Moisture Limit (TML), and a signed certificate or declaration of the moisture content, each issued by an entity recognized by the Competent Authority of the port of loading.

4.3.3 When a concentrate or other cargo which may liquefy is carried, procedures for sampling, testing and controlling moisture content to ensure the moisture content is less than the TML when it is on board the ship shall be established by the shipper, taking account of the provisions of this Code.
Such procedures shall be approved and their implementation checked by the competent authority of the port of loading. The document issued by the Competent Authority stating that the procedures have been approved shall be provided to the master or his representative.
4.3.4 If the cargo is loaded on to the ship from barges, in developing the procedures under paragraph 4.3.3, the shipper shall include procedures to protect the cargo on the barges from any precipitation and water ingress.
4.4.3 For a concentrate or other cargo which may liquefy the shipper shall
facilitate access to stockpiles for the purpose of inspection, sampling and
subsequent testing by the ship's nominated representative.
SECTION 8
Test procedures for cargoes that may liquefy
8.4.2 If samples remain dry following a can test, the moisture content of the material may still exceed the TML."
Prompted by recent serious accidents IMO/MSC invites Contracting Goverments to implement aforementioned draft amendments on the safe transportation of solid bulk cargoes as an interim measure, prior to their expected date of entry-into-force date, on a voluntary basis.

3. CONCLUSIONS

The maritime transport of solid bulk cargoes represents near one third of total cargoes transported over seas. Safe transportation of such large quantities of cargoes can only be achieved by safe ships, safe terminals, safe procedures and competent crew.
To ensure the safe transport of solid bulk cargoes it is necessary to ensure that provisions of IMSBC Code are complied with and that every persons has full understanding and knowledge of his/her responsabilities, both on board and on shore, as the failure to observe regulations on shore often causes serious problems on board, including tragic accidents, that can not be avoided by proper actions by ship's personnel alone.
Shore personnel and ship's masters, officers and ratings need to be aware of the dangers arising from the nature of bulk cargoes and should have proper knowledge of safe handling procedures as well as emergency procedures. Proper education and training, in accordance with STCW, IMSBC and IMDG codes, about dangerous cargo handling ashore and on board should be an important part of maritime education process.

REFERENCES

1.DNV : www.dnv.com/.;

2.Intercargo.org:"Dry Bulk Trades";

3.UNCTAD.org: „Unctad's 2011 Review of Maritime Transport";

4.UNCTAD.org: „Unctad's 2012 Review of Maritime Transport";

5.IMO: The International Grain Code, 1991 - Resolution MSC.23(59);

6.AMSA Marine Notice 19/2010: „Understanding the limitations of the International Maritime Solid Bulk Cargoes Code (IMSBC Code)„;

7.IMO: www.imo.org/;

BIOGRAPHIES

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ADRIATIC TRANSPORT CORRIDOR IN THE PROCESS OF EUROPEAN INTEGRATIONS

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ABSTRACT

The extremely favourable geotraffic position of Croatia is an important factor for its fast integration into the European transport system. Economic development and investment abilities of the country correlate with the traffic network development and the possibilities of the Croatian traffic system integration into the trans-European transport networks. The strategic planning of Croatian transport development should be in the function of the overall economic development, dynamically adjusted to the objective investment possibilities of the public sector, whereby the conceptual approach should be in the context of the wider region growth. The globalization and market liberalization processes have a considerable effect on the formation of the world flow of goods, thus having a direct influence on the transport system, generating economic and especially transport growth. Therefore, any country striving for a fast and powerful economic growth must intensify the integration of sea transport routes into the transport system. This paper represents an overview of preliminary results based on research directed towards defining strategic guidelines for integrating transport systems, especially intermodal transport system and its potential in environment protection, pre-accession EU funds and harmonizing with the organizational concepts of the European transport network, thus achieving a sustainable economic development in Croatia. Among other things, the authors consider the ecological estimates of the Adriatic sea way (corridor), resulting in the proposal of the Adriatic Sea Corridor concept as a significant part of the Baltic-Adriatic corridor, in the function of achieving a sustainable economic development as the greatest strategic resource and challenge to Croatia.

KEY WORDS
intermodal transport, Adriatic transport corridor, sustainable economic development, environment protection model, Adriatic.

1.INTRODUCTION

Economic development and investment capacities of a country specify the principle of intermodality within the concept of transport network development and the possibilities of integration of both the Croatian transport system and the transport systems of neighbouring countries into trans-European intermodal transport networks.

Transport systems are most developed in EU member countries, while road transport is still dominant in all countries. The efforts to apply an integrated and coordinated approach to intermodal transport will result in creating infrastructural conditions for redirecting the traffic from road to sea, rail and inland waterways, as more energy efficient and environmentally friendly, with simultaneous development of land, port, rail and

other infrastructure connecting ports and hinterland. Therefore, intensifying and including the sea flow of goods into the traffic system is a must for any country or region aiming to strenghten economic development.
Market globalization and liberalization has a considerable influence on the formation of the flow of goods, at the same time strongly interacting with maritime transport, decreasing the costs of ship transport, and consequently influencing on transport and economy. The cheapest segment of the transport system is maritime transport, which is becoming by far the most important instrument of the process of globalization, both for the quantities and the value of the overall amount of the transported goods.
The Adriatic Sea is a unique spatial, economic, ecological and social resource, which is increasingly being burdened by a multitude of economic, technological, economic and socio-cultural processes, thus making the Adriatic one of the most endangered areas.
In the framework of thus defined scientific problem, the aim of the research is to define: the basic characteristics of development and integration of Croatia into the trans-European traffic network, the strategic guidelines for the integration of intermodal transport system and its potential in environment protection, as well as harmonizing with the organizational concepts of the European transport network. This emphasizes the significance of the principle of intermodality in the concept of transport network development, as well as the development of sea and land flow of goods in the region as important accelerators of European and Croatian transport and economic development.

2. GUIDELINES FOR EU TRANSPORT DEVELOPMENT STRATEGY

2.1. EU Guidelines

The European Commission has prepared general development guidelines, entitled Transport and Energy Infrastructure in South Eastern Europe, where they insist on a regional dimension and the establishment of connections within the region, encompassing Albania, Bosnia and Herzegovina, Croatia, Macedonia, Serbia and Montenegro.

The EU has issued guidelines to Croatia for the development of intermodal transport, which is under-developed in Croatia. Croatia has many funds and programs at its disposal, offering funds for co-financing intermodal transport development, pre-accession funds, most famous being IPA, various EU programs, as well as the bilateral and regional IPA components. In accordance with these guidelines, the EU emphasizes the need for developing a transport network in Croatia in complete harmony with the development of trans-European TEN-T network and the South East Europe Core Regional Transport Network. The agreement between Croatia and the European Commission was achieved precisely in that sense, regarding the future TEN-T network, in accordance with the Decision no. 1692/96/EC, as amended, and the priority project of European interest in the framework of this TEN-T network, which satisfies the standards, prescribed in the EU Common Positions, for closing Chapter 21 of the Croatian pre-accession negotiation (CONF-HR 31/07)1. In this context, the European Commission brought the Directive 2004/54/EC regarding the TEN-T network, which has become obligatory for all EU members since 19 November 2011. In that sense, it should be pointed out that, on the basis of the carried out development project in the sector of international public traffic, industry, energy, economics, finances, IT and other sectors, the EU has redefined the pan-European corridors and has given up the strategy of connecting the North Sea with the Black Sea through the corridor North Sea-Rhine-Maine-Danube-Black Sea, and has adopted a new strategy Baltic-Adriatic as well as the project aiming to connect the Adriatic with the Black Sea.
In the context of the EU development strategy, the European Commission has brought and adopted a series of long-term development plans and projects, which are extremely important for the development of Croatian economy, such as the Freight transport logistic action plan (2007)2 which determined the support for intermodal

[1] Conference on Accession to the EU, Common Positions, Chapter 21: trans-European networks, 30 September 2009, Bruxelles.
[2] Freight transport logistic action plan – in 2007, the European Commission adopted a plan suggesting a series of measures aiming to stimulate competitiveness of intermodal transport system, raising the level of maritime transport competitiveness, creating a framework which would ensure the modernization of European ports, promoting transport logistics and attracting investors, as well as analyzing the progress in sustainable mobility development .

transport development as one of the main priorities of the European transport policy [5]. In that sense, the European Commission has set a framework and guidelines to ensure the modernization of European ports and thus raise the level of competitiveness of maritime transport, attract investors as well as analyze the progress in the sustainable mobility development, including the development and stimulation of intermodal transport system competitiveness. Regional transport organization SEETO - South East Europe Transport Observatory, founded in 2004, issued a Memorandum of Understanding on the Development of the Core Regional Transport Network. The parties to the memorandum are Albania, Bosnia and Herzegovina, Montenegro, Croatia, former Yugoslav Republic of Macedonia, Serbia, UN Mission on Kosovo and the European Commission. SEETO was founded for promoting cooperation in the development of the main and auxiliary infrastructure on multimodal South East Europe Core Regional Network, promoting and enlarging local capacities for implementing investment programs, management and gathering data, as well as analyzing the Core Regional Transport Network [15].

2.2. EU Strategic Development Projects

As Croatia was not a member of the EU when EU transport needs were verified and evaluated in the context of TINA3, no appropriate complementary transport network was defined within Croatia which would fit into the pan-European corridors.4 In the context of conceiving the South East Europe Core Regional Network, the EU has reconsidered Croatia and its potential priority projects. Related to that, in 2000, the European Investment Bank published the Western Balkans Transport Infrastructure Inventory, regarding the basic transport network in the European southeast area, which formed the basis for the Transport and Energy Infrastructure in South Eastern Europe. This document expresses the need for connecting the region encompassing Croatia, Bosnia and Herzegovina, Serbia and Montenegro, Macedonia and Albania [15]. In the context of a wider approach to transport, that is, the adopted trans-European development program and Common Transport Policy program, the emphasis of development was placed on acknowledging environmental and safety aspects, efficient management of flows of goods supported by the application of intelligent transport systems and the interoperability of transport branches and transport means. The project of East Europe transport system development, carried out by Cyprus, Greece, Italy, Malta and Slovenia, within the EU TEN-T program, resulted in the Master Plan, with detailed analyses and plans for necessary modifications and investment into infrastructure, with Croatian ports being included into considerations. This document will serve European Commission to make development strategies and plans for related financial programs, which would stimulate investment and transport infrastructure development. After Croatian accession in July 2013, related EU funds will be available for investment into maritime and intermodal transport system on the Adriatic, enabling the inclusion of east Adriatic coast transport systems into the EU development programs. The European Commission expects Croatia to put up its strategic transport projects for Cohesion Funds, which would provide non-return use of 3.5 million Euros, when Croatia becomes a full member of the EU.

As it was mentioned before, the industrial growth in transition countries of central and eastern Europe shows a market expansion and therefore the need to expand international transport and transit flows of goods. In that sense, due to an obviously uneven level of development of different transport branches, the concept of intermodality is emphasized as a significant transport and economic resource which incorporates all principles of European transport strategy and corresponding transport policy of integration, interoperability and sustainability. Providing the construction of a double-track electrified lowland railroad and the multipurpose canal Dunav-Sava, as well as development of port capacities (Vukovar, Osijek, Slavonski Brod and Sisak), with the appropriate development and specialization of seaport

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[3] TINA – Transport Infrastructure Needs Assessment.

[4] Multimodal pan-European network includes 10 corridors with a total of 75000 km of roads and railroads, 20000 km of inland waterways and 300 airports and sea ports. In accordance with the Decision 1692/96/EC by the European parliament and the Council of the EU, related to the position of the partnership for the Trans-European network development, defined by the so called "joint interest projects» for the EU, the estimated amount of necessary investment in these projects is 400 billion Euros by 2010.

capacities (Rijeka, Ploče), this may be considered a priority infrastructural project in all aspects of regional development. Transport connection of the port of Rijeka with its hinterland – Slovenia, Austria and Hungary, and the port of Ploče with Bosnia and Herzegovina, Serbia, Montenegro and Hungary, will attract international transport flows. This especially relates to connection routes and good pan-European corridors junctions in the region, including the branches of TEN-T network. In that sense, according to the goals of the EU joint transport policy, the possibility of intermodal chain development, combining ecologically acceptable forms of inland waterway, rail and sea transport represents the most interesting option [5]. Geotraffic position and natural resources ensure extraordinary comparative advantages to Croatia in connecting pan-European corridors with the new TEN-T network priority project 21 – motorways of the sea. The realization of this project would ensure an extremely important geo-strategic position for Croatian transport system within the European transport network. This intermodal set of international routes also represents the foundation for planning and developing logistic centres in Croatia.

Through insight and analysis of the database, using the most contemporary methods and technologies for evaluating economic effects, the European Commission has conducted a research of the flow of goods and industrial transport flows through international projects IMONODE, NADOK-X, ECO4LOG, INTERIM. Imonode and Interreg IIIb projects establish the strategic justification of the integration of north Adriatic ports Rijeka, Kopar and Trieste into a system that would strengthen the European corridor V, directly integrating the junctions in Rijeka and Zagreb into it. In that sense, it is necessary to build a lowland two-track electrified railroad Rijeka-Kopar-Trieste, a railroad from Rijeka through Pivka to Austria, and along the Adriatic coast from north Italian ports to Greek ports with branches towards Zagreb and Hungary (Rijeka-Zagreb-Botovo), maximally 200 m above sea. This modern railroad would connect Croatia to the European railroad network thus making it a key factor for connecting the EU with the Adriatic-Mediterranean sea transport route, or overseas areas of Africa and Asia. Also, with this new railroad, the EU is trying to integrate north Adriatic ports into a key intermodal centre, which would act as a strategic transport connection between EU and Asia [12]. On the basis of this strategic goal, the ports of Trieste, Rijeka, Venice, Ravenna and Kopar have founded the North Adriatic Ports Association (NAPA) in 2010. The EU evaluated the NAPA project "ITS Adriatic Multi-Port Gateway" as extremely significant for the potential of port infrastructure and European market services, whereby NAPA ports were granted financial means in the amount of € 1,442,500 in a public tender by the EU for co-financing development projects within the TEN-T programme. Co-petitiveness (cooperation and competitiveness) shall in the future have a favourable effect on the creation of a unique information platform, which would manage services meant for the markets of the Far East, as well as central and eastern Europe.

ECO4LOG project relates to logistic goods services in international public transportation as value added services or economic multipliers which bring enormous benefits to countries through which they pass, and there are as many as 6 international transport corridors passing through Croatia [11]. INTERIM project relates to modern intermodal transport system ensuring the share of sea, rail and river traffic of more than 85%, and 15% of road traffic, in order to achieve the 3E goal (Environment, Energy and Economy) [13].

3.THE CONCEPT OF THE ADRIATIC TRANSPORT CORRIDOR IN THE CONTEXT OF THE BALTIC-ADRIATIC CORRIDOR

Transport connection of the Adriatic with Baltic countries

Maritime transport is certainly one of the main alternatives to road transport, which allows a significant modal shift of freight traffic from congested roads that create a negative environmental impact on the environment. The mentioned modal shift of freight from road to maritime transport could be achieved by improving the existing or developing new integrated intermodal maritime-logistics supply chain with quality maritime connections service necessary for connecting the strategic ports in Southeast Europe area.

The prerequisites for land transport connection of all countries from the Baltic to the Adriatic are made by revitalizing the flow of goods dynamics and the trend of port and rail traffic development within and between the Baltic and the Adriatic pools. The area along the Baltic and the Adriatic Sea are very similar in geographical, historical, economic and traffic sense. Owing to the dynamics of the flow of goods between Central Europe and pre-Asia area, that is the zone between the north and the south of Europe, as well as the intensification of economic growth, there has been a more progressive trend of development in both zones. The development of multimodal transport network and its connection with TEN-T corridors in the sectors of land transport (road and rail), within inland waterways, sea ports and airports, represent a precondition for strengthening national economies [2].

The concept of traffic connection Baltic-Adriatic should reintegrate navigable waterways of the Danube river basin with a canal for connecting river basins. The construction of a canal from the Danube to the Elbe, the Oder and the Vistula shall enable the navigation of river and river-sea vessels to all North Sea and Baltic Sea ports. The construction of the canal Vukovar – Šamac and the regulation of the river Sava to Sisak and Zagreb, as well as the river Kupa to Brod na Kupi and Tunnel Canal to Bakar shall provide the shortest possible navigable connection of the Danube area with the Adriatic [3].

Figure 1. The potential corridor V of the North Adriatic Ports Association (NAPA) and the interconnection with TEN-T land network. [4]

Transport corridor Adriatic – Aegean Sea – Black Sea

Besides the transport connection of Croatia with the northern European countries through the mentioned corridor Baltic-Adriatic, an important strategic interest for Croatia is also the connection with South Eastern Europe. In this sense, the counties of the region have initiated a project, ADB multiplatform, to achieve their joint interests. The principal idea of ADB multiplatform (Adriatic - Danube - Black Sea multimodal platform) project is to develop and promote environmentally friendly, multimodal transport solutions from the ports in the SEE programme area (Black Sea, Aegean, Adriatic) to inland countries and regions through the implementation of MoS (Motorways of the Sea) concept which has a positive impact on increasing the aforementioned modal shift of cargo, and thus on reduction of road congestion which is of utmost importance for environmental protection[1]. Furthermore, this aims to improve and integrate short sea shipping transport in the logistics chains crossing the Adriatic sea, and more specifically the provision of the best surroundings for the activation on intermodal rail-sea transport services between the ports and their own hinterlands. Currently, the Adriatic ports have different level of accessibility to the inland transport infrastructures: even if the ports and the national governments have undertaken significant investments to increase railway accessibility and the connection to the national railway network, not all the ports will be served in the present and medium term by railway services and infrastructures. Therefore, it is necessary to provide a clear picture on the available infrastructures and policy framework for intermodality to avoid the discrepancy of modal transport development between two different areas. One of the key opportunities for Croatia lies in one of the project's objectives supporting the develoment of main integrated rail infrastructure connecting the Black Sea with landlocked countries, with branches to main Adriatic ports. The underlying ideas is to integrate rail and water transport and promote rail-water intermodality as an effective way to protect and preserve the environment. This aslo involves the development of international agreements for developing economic, environmental and transport policies.

Development of transport corridors as a goal of regional development

Strategic planning of transport development should serve the overall economic growth. Planning the development of the Adriatic transport corridor in the context of the corridor Baltic-Adriatic should be adjusted to the conditions of a systematic design of wider region transport network development. Countries in the region differ according to the level of transport development and their priorities in development plans. EU transport policy has so far reflected the attitudes and development guidelines of only some, the most developed countries, so those countries have a relatively developed transport systems, while transitional countries have a more modest transport infrastructure and poorly organized, inefficient transport system. Also, transport policies differ from one country to another, just like the characteristics of their transport systems. Although transport, considering its international and transborder character, aims to connect economic entities and people regardless of the distance, still a part of EU countries hold on to their own interests in the development of their transport system, which is often contrary to the general interests of the EU (priority transport corridors, environmental principles, safety, etc.). This is because EU guidelines are not obligatory and do not proscribe any transport modality. In order to realize the unique role of transport in the most efficient way, Europe established a network of transport corridors as a network of priority transport routes which would greatly contribute to a better connection in the area of Europe. Croatian transport system cannot be analyzed nor planned separately from the EU countries transport system, especially when considering the processes of harmonization for the accession to the EU.

In general, transport system in all countries is not sustainable and cannot continue to develop in the same way. If the same approach is kept, the dependence of transport on oil could still be just below 90%5, and the renewable sources of energy could be just slightly above 10%, which is a goal set for 2020. The level of CO2 emissions from traffic would remain until 2050 by a third higher than the level in 1990. The cost of traffic jams will increase by about 50% by 2050 and the costs of accidents and noise6 will continue to rise [17]. Besides the tendency of transport system development and harmonizing with the transport standards of the EU, Croatia as a transitional country without a developed modern multimodal transport must have a strategic economic development and must adjust its structural political, legal and other socially significant reforms to satisfy the criteria for achieving the goal of entering into the EU. Transport integration of the wider region will make the market more dynamic and will evenly model national transport networks, that is the transport connection of peripheral, economically poorly developed areas. This is why the transport sector needs to conduct structural reforms which should separate regulatory functions of the state from the operative function in the area of infrastructure and service. These strategic reforms should ensure a legal framework for transition from the public into the private sector.

4. CONCLUSION

Strategically planned investment into infrastructure development for the transport corridor through the Adriatic and Croatian land with the purpose of long-term realization of strategic national economic interests, parallelly to satisfying EU interests, is one of the most important state priorities. Croatia has great potential for financing projects from EU funds and programs. Besides the current pre-accession funds and World Bank credits, along with the European banks loans, after joining the EU in July 2013, Croatia will have access to financial means for investment into the sea and intermodal transport system on the Adriatic, enabling it to incorporate east Adriatic coast transport systems into the EU development programs. Transport infrastructure development should be in the service of the overall economic growth of Croatia and the entire region, but also of foreign investors. Therefore, it is first of all necessary to implement a legal framework aligned with EU regulations, and start implementing a strategy of development.

[5] Even if this would realize, there would be a certain increase in the use of biofuel and electric power in comparison with the current situation.

[6] The description of the way transport could develop until 2050, if new policies do not change current trends (referent scenario), can be found in the Appendix III: “Referent scenario (2010-2050)” Estimates on the Effects of the White Paper on Transport Policy.

The current transport system in the region is under-developed, and it is characterized by development strategies of individual countries and their important ports. One of the solutions for its uniform development is the integration of activities, strategies and resources of the ports in the region, and their joint presence on the market. A systematic approach to integrated management of intermodal Adriatic transport corridor will generate a dynamic process of sustainable development and use of sea and coastal areas, which would encompass all relevant entities in social, economic and environmental relations. This is particularly important because of preserving the environmental integrity of the Adriatic coast, that is preventing the devastation and degradation of ecological resources of the Adriatic sea and coastal area because the area of the Adriatic has limited resources and absorption.

REFERENCES

[1]ADB multiplatform, Communication and Dissemination Plan, SEE Transnational Cooperation Programme, RSOE 2012.

[2]Božičević, J., Perić, T.: "Ekonomski pregled", Zagreb, vol. 56, No. (3-4), 2005, pp.185-203.

[3]Brnjac, N., Jolić, N., Jenić, V.: "Validation of Combined Transport Quality Criteria", Traffic, Vol.18, No. 4, 2006, pp. 245-249.

[4]East Mediterranean Master Plan of the Motorways of the Sea, (2009/2011), pp. 2-117

[5]Freight transport logistics action plan - Communication from the commission COM/2007/0607 final

[6]Freight logistics in Europe – key to sustainable mobility, COM (2006) 336 final

[7]Jolić, N., "Integracija sustava intermodalnog vodnog prometa u europskoj transportnoj mreži", Faculty of Transport and Traffic Sciences, University of Zagreb, Zagreb 2009.

[8]Kegalj, I., Cukrov, M.: "Influence of the Adriatic Transport Corridor on the Sustainable Development of Croatia", ZIRP, Zagreb 2012.

[9]Matešić, M.: "Principi održivog razvoja u strateškim dokumentima RH", Soc. ekol. Zagreb, Vol. 18, No. 3-4, 2009, p. 323-339.,

[10]Mediterranean Sustainable Development Strategy, A framework for environment sustainability and shared prosperity, UNEP/MAP (DEC)/MED IG.16/7 27 June 2005.

[11]Miloš, I.: "Strateška prometna promišljanja razvoja Republike Hrvatske", http://www.pomorskodobro.com/hr/projekti/156-strateska-prometna-promisljanja.html (20 October 2012)

[12]Quality Indicators for Transport Systems - QUITS, 2010, European Commission Transport RTD Programme. Available from internet: <http://www.cordis.lu/transport>

[13]Review of Maritime Transport 2010, http://www.nctad.org/en/Docs/rmt2011_en.pdf

[14]Rijeka Port Authority, http://www.portauthority.hr/razvojni_projekti/EU_projekti (10 February 2012).

[15]South-East Europe Core Regional Transport Network Development Plan 2010-2014, http://www.seetoint.org/wp-content/uploads/2012/11/SEETO_MAP_2010_2014_annexes.pdf

[16]White Paper, A Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system, European Commission, Bruxelles, 28 March 2011, COM (2011) 144 final

[17]http://www.tportal.hr/vijesti/svijet/242340/Hrvatska-od-2014-moze-raspolagati-s-11-7-milijardi-eura.html

BIOGRAPHIES

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SCOPE OF COVERAGE UNDER THE UNITED NATIONS CONVENTION ON CONTRACTS FOR THE INTERNATIONAL CARRIAGE OF GOODS WHOLLY OR PARTLY BY SEA (ROTTERDAM RULES)

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ABSTRACT

This paper considers the application provisions of the United Nations Convention on Contracts for the International Carriage of Goods Wholly or partly by Sea (Rotterdam Rules). Differences between Rotterdam Rules and international legislation in force are pointed out. It will also consider whether the application provisions have adequately addressed.
The scopes of coverage issues go to the heart of the new convention. This article highlights major topics relating to the scope of coverage. All aspects of this key issue are examined here: the geographic reach of the Convention, criteria that must be satisfied for the Convention to apply, types of transactions that the Convention might govern. Some of these questions have been particularly controversial. Moreover, this paper addresses the circumstances under which the Rotterdam Rules give way to other conventions. Authors discusses issues which may arise form the fact that Convention will covered inward as well as outward carriage. Also, it considers specific exclusions form the Convention.
One of the most significant changes made by the Rotterdam Rules to existing law is the expansion of its scope of coverage to include door-to-door transport. The Convention covers both inbound and outbound international shipments to or form a Contracting State. The Convention applies to contracts in both the liner and non-liner trades, but not to charterparties and other contracts for the use of a ship or of any space thereon. A volume contract to which Convention applies may provide for greater or lesser obligations and liabilities than those imposed by Rotterdam Rules.

KEY WORDS
Rotterdam Rules, scope of coverage, carriage of goods, multimodal transport

1. INTRODUCTION

Currently, several separate international treaties govern international maritime transport: the International Convention for the Unification of Certain Rules of Law relating to Bills of Lading, signed in Brussels on 25 August 1924, and its Protocols, and the United Nation Convention on the Carriage of Goods by Sea, signed in Hamburg on 31 March 1978. UNCTAD prepared and in 1980 adopted a United Nations Convention on International Multimodal Transport of Goods, which provided a regime governing combined transport sea-lend. The three maritime Conventions: Hague Rules, Hague-Visby Rules and Hamburg Rules went into force, not so the Multimodal Convention.

None of these conventions has managed to achieve the global level of acceptance necessary for international uniformity. Also, the technological and commercial developments that have taken place since the adoption of those conventions impose the need to consolidate and modernize them. Taking into consideration mentioned problems, and with goals to change the Hague-Visby and Hamburg system and to bring it up to date, to harmonies and modernize the liability system in the transport of goods by sea, promote legal certainty, minimize the causes for disputes and to generally promote trade and economic development the General Assembly of the United Nations adopted on 11 December 2008, the Convention on Contracts for the International Carriage of Goods Wholly or Partly by Sea. The Convention is known as "The Rotterdam Rules". A ceremony for the opening for signature of the Convention was held on 23 September 2009 in Rotterdam. So far, twenty-four countries signed new Convention. The Convention has not entered into force. So far, it has been ratified only by two states (Spain and Togo).[1]

The regulatory ambitious of Rotterdam Rules is to achieve legal harmonization, consistency and uniformity into the rules governing cargo claims for both sea transport and, to multimodal transport involving a sea leg.

One of the most significant changes made by the Rotterdam Rules to existing law is the expansion of its scope of coverage to include door-to-door transport. Convention cover multimodal transports with a maritime leg – the so-called "maritime plus" approach. The most controversial aspect of the Rotterdam Rules was the coverage of the entire contract of carriage, including land carriage preceding the loading of the vessel and land carriage subsequent to the unloading of the vessel.

The Hague and Hague-Visby Rules apply only tackle-to-tackle, while the Hamburg Rules cover port-to port shipments. The scope of application is now triggered not merely by the "port triggers" as is the case in the Hague Rules and Hamburg Rules, but also by the place where the custody of the goods started (place of receipt) and where it ended (place of delivery). If any of those places is located in a contracting state of the Rotterdam Rules, the Convention will apply. The Rotterdam Rules apply where the place of receipt and the place of delivery are in different States provided that, according to the contract of carriage, either the place of receipt or the place of delivery is located in a Contracting State. The Convention applies to wide range of documents and to contract in both the liner and non liner trades, but not to charterparties.

The most innovative aspect of the Convention and one of great practical value is the extension of the scope of coverage. This paper dealing with the scope of application of the Convention. The most important innovations as well as the most controversial points in the Rules shall be pointed out.

2. GENERAL SCOPE OF APPLICATION AND THE MEANING OF THE "CONTRACT OF CARRIAGE"

The Rotterdam Rules applies to contract of carriage in which the place of receipt and the place of delivery are in different States, and the port of loading of a sea carriage and the port of discharge of the same sea carriage are in different States, if, according to the contract of carriage, any one of the following place is located in a Contracting State:

- The place of receipt;
- The port of loading;
- The place of delivery; or
- The port of discharge.

The general scope of application of the Rotterdam Rules, constitutes a contract of carriage is therefore critical to the application of the Rotterdam Rules. The definition of "contract of carriage" is set out in Article 1.1: "Contract of carriage means a contract in which a carrier, against the payment of freight, undertakes to carry goods form one place to another. The contract shall provide for carriage by sea and may provide for carriage by other modes of transport in addition to sea carriage". Rotterdam Rules also defined in Article 1. carrier[2] and freight[3].

[1] Source www.imo.org (February, 1, 2013).

[2] «Carrier means a person that enters into a contract of carriage with a shipper"(Article 1.5.).

Several points emerge form the definition of contract of carriage:

- a sea leg must be included in the contract, although other types of transport can be used in conjunction with the sea leg;
- there is no restriction on the type of documents used;
- there is no restriction on the party with whom the contract is made [1].

3. INBOUND AND OUTBOUND COVERAGE

The Rotterdam Rules apply to inward as well as outward carriage. Under Article 5.1. the Rules apply if: ... any one of the following places is located in a Contracting State: a) the place of receipt; b) the port of loading; c) the place of delivery; or d) the port of discharge.
This contrasts with the Hague Rules and the Hague-Visby Rules, which applied to outward shipments.4 The Hague and Hague Visby Rules by their terms generally apply only to outbound coverage. In other words, these regimes govern carriage form contracting states but not to contrasting states. In practical terms, this means that consignees, who often bear the initial loss when cargo is damaged and who thus bring the recovery action against the carrier, do not benefit form the international regime that has been adopted in their own country [3].

[3] «Freight means the remuneration payable to the carrier for the carriage of goods under a contract of carriage" (Article 1.28.).
[4] Article 10. of the Hague Rules states: "The provisions of this Convention shall apply to all bills of lading issued in any of the contracting States". Article 10. of the Hague-Visby Rules provides: "The provisions of this Convention shall apply to every bill of lading relating to the carriage of goods between ports in two different States if: a) the bill of lading is issued in a Contracting State; or b) the carriage is from a port in a Contracting State; or c) the contract contained in or evidenced by the bill of lading provides that these Rules of this Convention or legislation of any State giving effect to them are to govern the contract, whatever may be the nationality of the ship, the carrier, the shipper, the consignee or any other interested person".

Like the Rotterdam Rules, the Hamburg Rules cover both inbound and outbound international shipments to or from Contracting States.

4. THERE IS NO RESTRICTION ON THE TYPE OF DOCUMENT USED

The Rotterdam Rules cover all types of documentation, including electronic transport records. The Rules deal specifically with certain types of documents: negotiable transport document, non-negotiable transport document, electronic transport record, negotiable electronic transport record, non-negotiable electronic transport record and the use of electronic transport records.
Transport document are defined by art 1.14.: "Transport document" means a document issued under a contract of carriage by the carrier that: a) evidences the carrier's or a performing party's receipt of goods under a contract of carriage; and b) evidences or contains a contract of carriage. A negotiable transport document is defined by article 1.15: " Negotiable transport document" means a transport document that indicates, by wording such as "to order" or "negotiable" or other appropriate wording recognized as having the same effect by the law applicable to the document, that the goods have been consigned to the order of the shipper, to the order of the consignee, or to bearer, and is not explicitly started as being "non-negotiable" or "not negotiable". A non-negotiable transport document is defined by article 1.16: "Non-negotiable" transport document means a transport document that is not a negotiable transport document.
The fact that no restrictions are imposed on the type of documents used will obviate many of the problems resulting form the restrictions imposed by the Hague and Hague-Visby Rules.5 These apply to "contracts of carriage" covered by a bill of lading or any similar document of title, which has the effect of excluding contracts contain in or evidence by

[5] Hague-Visby Rules applies only to contracts of carriage covered by a bill of lading or any similar document of title, in so far as such document relates to the carriage of goods by sea.

non-negotiable documents, such as sea waybills, form the mandatory application of the Rules [1].

5. APPLICATION TO CERTAIN PARTIES

Rotterdam Rules applies as between the carrier and the consignee, controlling party or holder that is not an original party to the carter party or other contract of carriage excluded from the application of Roterdam Rules. However, Convention does not apply as between the original parties to a contract of carriage excluded pursuant to article 6. Rotterdam Rules.6

This result would appear to be not dissimilar from the situation under the Hague-Visby Rules, which provide in Article 1 (b) that the Hague Rules will apply to any bill of lading or any similar document of title issued under or pursuant to a charter parity from the moment at which such a bill of lading or similar document of title regulates the relations between a carrier and a holder of the same.

A corresponding provision relating to bills of lading issued under charterparties can be found in Article 2.3. of the Hamburg Rules. Where a bill of lading is issued pursuant to a carter-party, the provisions of the Convention apply to such a bill of lading if it governs the relation between the carrier and the holder of the bill of lading, not being the charterer.

Under the Rotterdam Rules the definition of the carrier is of considerable importance in the context of the application of the Rules. The definition of carrier takes account of the fact that the Rotterdam Rules apply to other modes of transport in addition to sea carriage, as well as to a wide range of documents. It will bring any person who enters into a contract of carriage with the shipper in which he undertakes to carry goods from one place to another within the ambit of the rules. As well as charterers and shipowners, this could include persons such as multimodal transport operators and freight forvarders. However, the Rotterdam Rules recognise that carriers now frequently use third parties to perform part of their contractual duties and have therefore introduced the new concepts of "performing party" and "maritime performing party." A maritime performing party may also incur obligation under the Rules, whereas the carrier assumes responsibility for the breaches of a performing party [1].

6. UNIMODAL SEA CARRIAGE AND MULTIMODAL TRANSPORT AND DOOR-TO-DOOR-COVERAGE

Rotterdam Rules envisages both unimodal sea carriage and multimodal transport. The Rotterdam Rules may apply to international unimodal sea carriage and also to international multimodal transport involving sea carriage.

The coverage is contractual it is defined by the contract of carriage itself. If the contract covers land carriage preceding the loading of the vessel and land carriage subsequent to the unloading of the vessel, then the Convention does too. But if the contract covers only the maritime leg of a multimodal movement, then that is all that the Convention covers. In other words, if a contract of carriage provides for a shipment form one port to another port, then the Convention's coverage is simply "port to port". But if a contract of carriage provides for a shipment from the shipper's manufacturing plant to the consignee's warehouse, then the Convention's coverage is door-to-door [3].

This door-to-door coverage is somewhat narrower than full mulitimodal coverage. In a true multimodal regime, the contract of carriage could provide for any two (or more) modes of carriage. Multimodal Convention defining international multimodal transport as the carriage of goods by at least two different modes of transport on the basis of a multimodal transport contract from a place in one country at which the goods are taken in charge by the multimodal transport operator to a place designated for delivery situated in a different country.

The Rotterdam Rules, in contrast, requires a maritime leg. There must be a sea leg in the contract, but other types of transport can be used in conjunction with the sea leg. If the Rotterdam Rules are to apply, it is therefore mandatory that a sea leg must be included in the carriage, and if the parties wish to do so, they can include carriage by other methods of transport [1].

Thus, it could be describe as a "maritime plus" convention. Many feared that the new regime

6 Article 6. Rotterdam rules provide Specific exclusions.

would conflict with existing unimodal regimes, particularly CMR7 and CIM-COTIF8 (the European road and rail conventions) [3].
The Rotterdam Rules deal with those concerns by providing a narrow network system. Under a full network system, the liability rules for each leg would be determined by the rules that would otherwise be applicable to that leg, and the same rules would apply for both the performing party (the unimodal carrier that is generally subject to the relevant rules) and the contracting carrier. Under Rotterdam Rules, which attempts to keep the network system as narrow as possible, liability would be based on the relevant unimodal regime when it can be shown that the damage occurred during land transport that would otherwise have been subject to a mandatory applicable international convention [3].

7. SCOPE IN RELATION TO OTHER EXISTING INTERNATIONAL CONVENTIONS GOVERNING THE CARRIAGE OF GOODS BY OTHER MODES OF TRANSPORT

The Article 82 Rotterdam Rules goes on to refer to international conventions governing the carriage of goods by air, road, rail and inland waterways. It is, however, important to note that Article 82 does not specifically identify the conventions concerned. It refers to conventions governing these subjects, which are in force at the time the Rotterdam Rules enter into force, including future amendments to those conventions [1]. It therefore does not apply to conventions, which enter into force after the Rotterdam Rules come into force.
Also Article 82 attempts to deal with the problems of overlap between the Rotterdam Rules and existing unimodal conventions by providing that nothing in the new Convention affects the application of:

- Any convention governing the carriage of goods by air to the extent that such convention according to its provisions applies to any part of the contract of carriage;
- Any convention governing the carriage of goods by road to the extent that such convention according to its provisions applies to the carriage of goods that remain loaded on a road cargo vehicle carried on board a ship;
- Any convention governing the carriage of goods by rail to the extent that such convention according to its provisions applies to carriage of goods by sea as a supplement to the carriage by rail, or
- Any convention governing the carriage of goods by inland waterways to the extent that such convention according to its provisions applies to a carriage of goods without trans – shipment both by inland waterways and sea.

8. MATTERS NOT GOVERNED BY THE ROTTERDAM RULES

The provisions of the Rotterdam Rules do not affect the application of:

- any international convention or national law regulating the global limitation of liability of vessel owners and
- the terms in the contract of carriage or provisions of national law regarding the adjustment of general average.

Also, the Rotterdam Rules does not apply to a contract of carriage for passengers and their luggage. Pursuant to Article 86, no liability arises under the Rotterdam Rules for damage caused by a nuclear incident if the operator of a nuclear installation is liable under any other applicable international or national legal instrument.

9. SPECIFIC EXCLUSIONS

Article 6. of the Rotterdam Rules deals with specific exclusions for the Rotterdam Rules.

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[7] Convention on the Contract for the International Carriage of Goods by Road, 19 May 1956. (hereinafter CMR).
[8] Convention Concerning International Carriage by Rail (COTIF), 9 May 1980, provides that "international through traffic" is subject to the "Uniform Rules Concerning the Contract for International Carriage of Goods by Rail (CIM), which forms Appendix B to COTIF. These rules will be cited herein as CIM-COTIF. A new version of CIM-CITIF was promulgated in 1999.

Convention does not apply to the following contracts in liner transportation:9

- Charter parties; and
- Other contracts for the use of a ship or of any space thereon.

Article 6.2. deals with further exclusions. It provides that:
Rotterdam Rules does not apply to contracts of carriage in non-liner transportation10 except when:

- There is no charter party or other contract between the parties for the use of a ship or of any space thereon; and
- A transport document or an electronic transport record is issued.

10. MANDATORY APPLICATION

Hague Rules were intended to create a new balance in the shipper-carrier relationship. The context of the carrier's liability is a mandatory regime. Today it is much more important that such rules maintain international co-operation and harmonization in this area of law. There are indeed several reasons to question whether there is a need for mandatory rules.
First, it is not obvious that the cargo side is always a weaker party to the contract of carriage. Oil companies and large freight forwarders may have a very good bargaining position. It seems unwarranted to legislate for mandatory rules for their protection. Secondly, if the cargo owners cannot protect themselves, their insurers can. There is no need for governments to intervene by mandatory legislation to secure a certain risk distribution between P&I insurers on the one hand and cargo insurers on the other. Thirdly, the general law has developed a number of technique that can protect a weaker party, when necessary, in a much more flexible and even better way than it is possible with mandatory legislation. Abuse of dominant position is avoided by competition rules in general, and by rules of liner conferences in particular. In contract law, there are rules in many jurisdictions to censor unreasonable contracts. Indeed, it is open to doubt whether the weaker party in all jurisdictions would have had to accept rules so favourable to the carrier as the Hague-Visby Rules if they were established by contract. When the weaker party is better protected by other means then mandatory legislation, it is difficult to uphold mandatory legislation [2].
While the Hague-Visby Rules and the Hamburg Rules only protect the cargo side,11 as the presumed weaker party, this is still not settled in the Rotterdam Rules. Alternatively, the rules could also protect the carrier side, as in the CMR.12 This would resolve the problem that the Hague-Visby Rules sometimes protects only the stronger party, but would enhance the inflexibility of the rules, and still in many cases protect parties that do not need protection by mandatory rules [2].
Pursuant to Article 79 of the Rotterdam Rules, any term in a contract of carriage is void to the extent that it:

- Directly or indirectly excludes or limits the obligations of the carrier or a maritime performing party under this Convention;
- Directly or indirectly excludes or limits the liability of the carrier or a maritime perfoming party fore breach or an obligation under Convention;
- Assigns a benefit of insurance of the goods in favour of the carrier or a person referred to it article 18;
- Directly or indirectly excludes, limits or increases the obligations under this Convention of the shipper, consignee, controlling party, holder or documentary shipper; or
- Directly or indirectly excludes, limits or increases the liability of the shipper, consignee, controlling party, holder or documentary sipper for breach of any of its obligations under this Convention.

[9] Liner transportation is defined by Article 1.3 as meaning: "… a transportation service that is offered to the public through publication or similar means and includes transportation by ships operating on a regular schedule between specified ports in accordance with publicly available timetables of sailing dates."
[10] For the purpose of Rotterdam Rules Non-liner transportation means any transportation that is not liner transportation.

[11] Hague Visby Rules Article IV (8) and Hamburg Rules, Article 23(2).
[12] CMR Article 41.

A volume contracts to which Rotterdam Rules applies may provide for greater or lesser rights, obligations and liabilities than those imposed by Convention. The contract of carriage may exclude or limit the obligations or the liability of both the carrier and a maritime performing party if the goods are live animals.

11. CONCLUSIONS

Rotterdam Rules is designed to replace and supersede Hague, Hague-Visby and Hamburg Rules, because of the current legal regime governing the international carriage of goods by sea is lacks uniformity and fails to adequately take into account modern transport practices, including containerisation, door-to-door transport contracts and the use of electronic transport documents. Also the Rotterdam Rules is designed to legislate not only for international maritime carriage of goods but also for international multimodal carriage, where a maritime leg is provided for in the contract of carriage. It is best described as a maritime plus convention, because of the sea leg is always required for the Rotterdam Rules to apply.

The preamble of the Rotterdam Rules recognises the contribution to uniformity made by the Hague Rules and its Protocols, and the Hamburg Rules. However, it also highlights the need to consolidate and modernise these conventions in the light of the technological and commercial developments that have taken place since they were adopted.

The authors elaborates on important and controversial provisions of the Rotterdam Rules dealing with scope of coverage and explains how broadly should the Convention apply.

One of the most significant changes made by the Rotterdam Rules to existing law is the expansion of its scope of coverage to include door-to-door transport. The Rotterdam Rules will be applicable to both contracts for the carriage of goods by sea and also, subject to Article 82 and 26, contracts where another form of transport is used in conjunction with the sea carriage.

For the Rotterdam Rules to apply it is sufficient that the place of receipt, the port of loading, the port of discharge or the place of delivery be in a Contracting State. The Rotterdam Rules cover both inbound and outbound international shipments to or form a Contracting State. The Convention applies to contracts in both the liner and non-liner trades, but not to charterparties or alternate contracts for use of ship or space on it. The Rotterdam Rules does apply to contracts of carriage in the non-liner trade but only when a transport document has been issued. A volume contract to which Rotterdam Rules applies may provide for greater or lesser rights, obligations and liabilities than those imposed by Rotterdam Rules.

The Rotterdam Rules will also apply to a wide range of documents and a wide range of contracting parties. They cover all types of documentation, including electronic transport records.

Rotterdam Rules seems to be the proper tool to achieve international legal harmonization. It would be expedient if the Rotterdam Rules have achieved the greatest level of international acceptance.

REFERENCES

1.Goddard Kathleen S., The application of the Rotterdam Rules, The Journal of International Maritime Law, (2010), 16, p. 210-220.

2.Rosaeg, Erik, The applicability of Conventions for the carriage of goods and for multimodal transport, Lloyd's Maritime and Commercial Law Quarterly, (2002), Part 3, p.316-335.

3.Sturley, Michael, Scope of coverage under the UNCITRAL Draft Instrument, The Journal of International Maritime Law 10 (2004), 2, p. 138-154.

BIOGRAPHIES

Vesna Skorupan Wolff was born in Zagreb. She has graduated law at the Faculty of Law, University of Zagreb (LL.B.) in 1993. In 1999 she gained her LL.M. She earned her Ph.D. in 2005 at the Faculty of Law, University of Zagreb. Her doctoral thesis was "Liability of the Maritime Carrier". She passed her Bar exam in 1995. Since 2003 she is employed at the Adriatic Institute of Croatian Academy of Science and Arts. She is currently senior research associate. She held two other posts before starting to work at the Adriatic Institute. She worked in a private attorney office and at the Supreme Court of Republic of Croatia. She has published over 50 scientific and professional papers. She has participated in numerous domestic and several international conferences related to maritime law.

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GEOGRAPHICAL AREAS AND MEASURES OF PREVENTING PIRATE ATTACKS DURING THE PERIOD BETWEEN 2008 AND JULY 2012

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ABSTRACT

Maritime pirate attacks follow technological development solutions of sailing, while geographical scope of pirate attacks follows the World Trade Maritime Flows and navigational routes. For specific geographical areas, the International Maritime Organization (the IMO) found a solution in the form of the 1993 Resolution A.738 (18) which was concerned about piracy in the Strait of Malacca. A number of different technical and technological solutions have been implemented since then in order to solve problems with piracy in the maritime industry. As a result, the SOLAS convention was changed; ISPS and Djibouti codes were adopted along with a number of Resolutions, Circulars, Regulations and References such as BMP4. Also, Maritime Safety Information Centers were established and commissioned for suppression of piracy and armed robbery against ships and using the services of armed guards on ships sailing in high-risk geographical areas have become more common practice. According to the analysis of official reports the highest overall number of pirate attacks recorded was 41.05% in the East African region. Consequently, this paper gives a detailed analysis of the official IMO reports for that geographical area. The analysis includes: locations of the incident, ship operation under the attack, the number of people involved in the attack, the consequences for the crew, the weapons used by the attackers, parts of the ship attacked, casualties and the reports on the action undertaken by the captain and crew members sent to the coastal authority, to the country to which the attack was reported and/or to the international organization.

KEY WORDS

Pirate Attack, Geographical Area of Pirate Attacks, Committed Pirate Attacks, Attempted Pirate Attacks

1. INTRODUCTION

The earliest recordings of maritime piracy date back to the Ancient times. Maritime piracy is one of the oldest crafts. Throughout history, depending on the motive, it has changed its name, but not its essence which is attacking the ship with the aim of obtaining material or some other benefit. Maritime piracy followed the techinical and technological development , and the geographical coverage of pirate attacks followed the world's maritime trade flows. Today, the most endangered geographical area of pirate attacts is East Africa.The main initiator of the search for a solution to this ancient , if not the first problem of the maritime industry is the International Maritime Organization – IMO. The IMO initiated its official search by implementing numerous measures within the existing conventions, codes, decisions, circular letters, regulations and references. For example, in 1993, the Resolution A.738 (18) finally laid down the first manual for a specific geografical area referring to the Strait of Malacca. Other manuals regarding the best protection against piracy for a specific geographic area followed. In the search for a solution, the IMO was joined by other international organizations and international representatives of the maritime industry.

Figure 1 The map of current pirate attacks

2. GEOGRAPHICAL DISTRIBUTION OF PIRATE ATTACKS

The expansion of piracy today is not only limited to specific sea areas or zones, piracy has spread to almost every part of the world. Areas affected by piracy are the South China Sea, The China Seas, the Indian Ocean, East Africa, West Africa, The Arabian Sea, the Strait of Malacca, the Mediterranean, South America (the Atlantic), South America (the Carribean Sea), South America (the Pacific), North Atlantic Ocean, the Caspian Sea and the Persian gulf[1].According to the IMO statistical data and the map of current pirate attacks (Figure 1), published by the ICC International Maritime Bureau (Figure 1) the most piracy-affected areas are: Somalia, the Straight of Malaca, the South China Sea, the Gulf of Aden, The Gulf of Guinea, Benin, Nigeria, Indonesia, the Arabic Sea and the Indian Ocean[2]. The yearly statistical data of the pirate attacks according to geographical area are divided by IMO into two

[1] IMO: Piracy Reports, www.imo.org/OurWork/...fault.aspx 12.11.2012.
[2] http://www.marineinsight.com/marine/marine-piracy-marine/10-maritime-piracy-affected-areas-around-the-world/

groups[3]: committed pirate attacks (Table 1) and attempted pirate attacks (Table 2).

Table 1 shows the statistics of committed pirate attacks according to the IMO during the period between 2008 and 2011 per geographical area. The statistical data clearly show that the area of the South China Sea has the highest number of committed pirate attacts (34.3 %) after which follow the area of East Africa (22. 35%), the area of West Africa (16. 32%), the Indian Ocean (11.43%), South America -the Pacific (4.78 %), South America -the Atlantic (4.47%) and others (6.35 %).

[3] http://www.imo.org/OurWork/Security/SecDocs/Pages/Maritime-Security.aspx (11. 11.2012.)

Committed pirate attacks (eng. Regional Analysis Of Reports On Acts Of Piracy And Armed Robbery Against Ships Which Were Reported To Have Been Allegedly Committed During (period)....)																
	the South China sea	the China seas	the Indian Ocean	East Africa	West Africa	the Arabian Sea	the Strait of Malacca	the Mediterranean	South America (the Atlantic)	South America (the Carribean Sea)	South America (the Pacific)	the North Atlantic Ocean	the North Pacific	the Caspian Lake	the Persian Gulf	TOTAL
2008[4].	62		23	61	42			1	4	6	7					206
2009[5].	57		24	59	34				14	6	14		1	1		210
2010[6].	109		39	48	37	6		1	17	3	14				2	276
2011[7].	102	1	24	47	44	5	21	2	8	3	11	2				270
Total	330	1	110	215	157	11	21	4	43	18	46	2	1	1	2	962

Table 1 Statistical data on committed pirate attacks during the period between 2008 and 2011

Attempted pirate attacks (eng. Regional Analysis Of Reports On Acts Of Piracy And Armed Robbery Against Ships Which Were Reported To Have Been Allegedly Attempted During (period....)										
	the South China Sea	the Indian Ocean	East Africa	West Africa	the Arabian Sea	th Strait of Malacca	the Mediterranean	South Africa (the Atlantic)	South America (the Caspian Sea)	South America (the Pacific)	TOTAL
2008[8].	10	3	73	8	1	2	1			2	100
2009[9].	14	3	163	12	2			1		1	196
2010[10].	25	38	124	10	10			3	2	1	213
2011[11].	11	39	176	17	23	1		4	1	2	274
Total	60	83	536	47	36	3	1	8	3	6	783

Table 2 Statistical data on attempted pirate attacks during the period between 2008 and 2011

[4] IMO: Reports On Acts Of Piracy And Armed Robbery Against Ships, Annual report 2008. MSC.4/Circ.133, 19 March 2009.
[5] IMO: Reports On Acts Of Piracy And Armed Robbery Against Ships, Annual report 2009. MSC.4/Circ.152, 29 March 2010.
[6] IMO: Reports On Acts Of Piracy And Armed Robbery Against Ships, Annual report 2010. MSC.4/Circ.169, 1 April 2011.
[7] IMO: Reports On Acts Of Piracy And Armed Robbery Against Ships, Annual report 2011. MSC.4/Circ.180, 1 March 2012.
[8] IMO: Reports On Acts Of Piracy And Armed Robbery Against Ships, Annual report 2008. MSC.4/Circ.133, 19 March 2009.
[9] IMO: Reports On Acts Of Piracy And Armed Robbery Against Ships, Annual report 2009. MSC.4/Circ.152, 29 March 2010.
[10] IMO: Reports On Acts Of Piracy And Armed Robbery Against Ships, Annual report 2010. MSC.4/Circ.169, 1 April 2011.
[11] IMO: Reports On Acts Of Piracy And Armed Robbery Against Ships, Annual report 2011. MSC.4/Circ.180, 1 March 2012.

Table 2 shows the statistics of attempted pirate attacks according to the IMO data for the period between 2008 and 2011 per geographical data. Statistical data clearly show that the geographical area of East Africa has the highest number of attempted pirate attacks (68.45 % of the total number of attempted pirate attacks) after which follow: the Indian Ocean (10.6%), the South Cina Sea (7.66%), West Africa (6%), the Arabian Sea (4.60%) and others (2.69%). The overall statistical data of pirate attacks for the period between 2008 and 2011 include 962 committed pirate attacks and 783 attempted pirate attacks, with a total of 1745 pirate attacks for the above mentioned period. When analysed per each year, in 2008 the overall number of pirate attacks was 306, in 2009 it was 406, in 2010 it was 489 and in 2011 the number was 544. The numbers clearly show 2011 as the year with the highest number of pirate attacks (31.17% of the total number of attacks) after which follow: 2010 with 28.02%, 2009 with 23.27% and 2008 with 17.54% of the attacks.

Navigational (geographical) areas with the highest number of pirate attacts per year during the period 2008 and 2012 are as follows: the South China Sea (in 2008 with a total number of 72 pirate attacts), East Africa (in 2009 with a total of 222 pirate attacts), East Africa (in 2010 with a total number of 172 pirate attacks), the South China Sea (in 2011 with a total of 113 pirate attacts) and East Africa (in 2012 with a total number of 58 pirate attacks). The data indicates East Africa as the area with the highest number of pirate attacts during the period 2008 and 2011.
The latest statistical data on pirate attacts published on internet pages of the IMO for the period between January and July 2012 show monthly data for the above mentioned period. The data is divided by the IMO according to: type of ship, time, geographical area, location, details of the attack, consequnces for the crew, the ship and the cargo, the measures taken by the captains and other crew members, information on the reporting of the event: coastal authorities, country or international organizations and measures taken by them.

Statistical data on the pirate attacks during the period between January and July 2012 per geographical area

	South China Sea	the Indian OCean	East Africa	West Africa	the Arabian Sea	the Strait of Malacca	the Mediterranean	South America (the Atlantic)	the North Atlantic Ocean	South America (the Caspian Sea)	South America (the Pacific)	TOTAL
January[12]	11	5	13	4	4	2		1			3	43
February[13]	6	6	6	8	10	3						39
March[14]	3	9	11	5	6	3			1			39
April[15]	3	1	8	6	4	6	1				1	30
May[16]	7		8	4	7	2	2			2	2	34
June[17]	4	2	7	4	3	1						21
July[18]	5	1	5	7		1					2	21
Total	39	24	58	38	34	18	3	1	1	2	8	226

Table 2 Statistical data on pirate attacks for the period between January and July 2012

[12] Reports On Acts Of Piracy And Armed Robbery Against Ships, Issued monthly –Circ.181 10 February 2012.
[13] Reports On Acts Of Piracy And Armed Robbery Against Ships, Issued monthly –Circ.182, 30 April 2012.
[14] Reports On Acts Of Piracy And Armed Robbery Against Ships, Issued monthly –Circ.183, 30 May 2012.
[15] Reports On Acts Of Piracy And Armed Robbery Against Ships, Issued monthly –Circ.184, 22 June 2012.
[16] Reports On Acts Of Piracy And Armed Robbery Against Ships, Issued monthly Circ.185, 27 June 2012.
[17] Reports On Acts Of Piracy And Armed Robbery Against Ships, Issued monthly –Circ.186, 31 July 2012.
[18] Reports On Acts Of Piracy And Armed Robbery Against Ships, Issued monthly –Circ.187, 4 September 2012.

Table 3 shows the statistics of pirate attacks according to the IMO during the period between January and July 2012 per geographical area. The statistical data clearly shows East Africa as the geographical area with the highest number of committed pirate attacks (25.66% of the overall number of committed pirate attacks), the rest are as follows: the South China Sea (17.25 %), West Africa (16. 81%), the Arabian sea (15.05%) the Indian Ocean (10.62%) the Strait of Malacca (7.97%) and other areas (6.64%)
A more detailed division of geographical areas into belts of coastal waters regulated by the United Nations Convention on the Law of the Sea of 1982, the areas of pirate attacks are divided according to the location of the attack: ports, the territorial seas and international waters.
Table 4 shows statistical data on pirate attacks according to the IMO for the period between January and July 2012, based on the location of the attack. Of the total number of pirate attacks, 60.47% of committed and attempted attacks in January 2012 happened at sea and 39.53% in ports in the same period. In February 2012, the number of pirate attacks (committed and attempted) was 76.92% at sea and, 23.08% in ports for the same period. In March 2012, the number of pirate attacks (committed and attempted) was 69.23% at sea and 37.77% in ports in the same period. In April 2012 the number of pirate attacks (committed and attempted) was 70 % at sea and 30% in ports in the same period. In May 2012 the number of pirate attacks (committed and attempted) at sea was 67.65 % and 32.35% in ports in the same period.
In June 2012, the number of pirate attacks (committed and attempted) was 61.90% at sea and 38.10% in ports in the same period. In July 2012, the number of pirate attacks (committed and attempted) at sea was 47.62%, and in ports 52.38 % in the same period.
The overall statistical data on pirate attacks according to the location of the attack for the period between January and July 2012 was 66.37% for pirate attacks at sea and 33.63 % for attacks in ports. This data show the territorial seas and/or international waters as prime targets of pirate attacks. The above stated data shows the most threatened geographical areas during the period 2008 and 2012 in the following order: the area of East Africa, the South China Sea, West Africa and other previously mentioned geographical areas.

	At sea1	In ports	Number of attempts	Overall number of attacks
January 2012	26	17	Unknown	43
February 2012	30	9	Unknown	39
March 2012	27	12	Unknown	39
April 2012	21	9	Unknown	30
May 2012	23	11	Unknown	34
June 2012	13	7	Unknown	21
July 2012	10	11	Unknown	21
TOTAL:	150	76	Unknown	2261

Table 2 Statistical data on the pirate attacks from January to July 2012

3. TECHNICAL AND TECHNOLOGICAL SOLUTIONS FOR PREVENTING PIRATE ATTACKS

Technical and technological solutions for preventing pirate attacks include technical aids and technological solutions implemented by the IMO in the maritime transport industry through international conventions, codes, decisions, circulars, regulations and references. The very foundation for technical and technological solutions in the prevention of pirate attacks is the 1988 International Convention on the Prevention of Illegal Actions threatening safe navigation, the 1974 International Convention on the Protection of Human Lives at sea (SOLAS), and the International Book of rules on the safety protection of ship, port areas and other codes, decisions, circulars, regulations and references. In the context of technical and technological solutions for preventing pirate attacks it is necessary to point outt[19]: the Automatic Identification system, control and other appropriate measures, continuous monitoring measures, ensuring safe trade, Long-range Identification and Tracking System, Maritime Safety and Security Information System, Maritime Rescue Coordination Centres, duties for countries which adopted the SOLAS convention, Resolutions on preventative measures to prevent piracy and armed robbery of ships, measures to prevent piracy attacks against ships which are not subjected to the XI – 2 chapter of the SOLAS convention. The latest IMO solutions for the prevention of pirate attacks in geographical areas of the West Indian Ocean, the Gulf of Aden are the following: an anti-piracy best management practices manual against the Somali pirates and the Djibouti code of conduct.
In the further improvement of maritime safety protection the IMO is helped by international representatives of the maritime industry[20]such as: International Association of Independent Tanker Owners, the International Chambers of Shipping, The Oil Companies International Marine Forum, The Baltic and International Maritime Council, The International Association of Oil & Gas Producers, The International Association of Dry Cargo Ship owners, the International Group of P&I (Protection & Indemnity), International Association of liner shipping companies, the International Association of Maritime Insurance, Joint War Committee and the International Maritime Bureau.

4. THE BEST METHODS FOR AVOIDING PIRATE ATTACKS

The best methods of avoiding pirate attacks depending on the geographical area according to the IMO statistics are divided into: committed and attempted pirate attacks.
In this paper, the best methods of avoiding pirate attacks for committed pirate attacks, depending on the geographical area, are divided into: the measures taken, the reporting of the incident to coastal authorities, to the country to which the incident was reported and/or to the international organization.
The measures taken include: activating the alarm, fulfilling pirates' demands, cooperation of the crew with the pirates, intensified measures the ships take sailing through the pirates' territory, reports to the Port Facility Security Officer (PFSO), avoidance manoeuvres, the applying of non-violent methods and what, in reports, is defined as "other". The reporting of the incident to the coastal authorities includes: the Navy, the port authorities, the safety centre and what, in reports, is defined as "other" and "not stated". According to the IMO reports the division of committed pirate attacks includes: The Regional Cooperation Agreement on Combating Piracy and Armed Robbery against Ships in Asia (ReCAAP), ICC IMB, The North Atlantic Treaty Organization (NATO), The United Kingdom Marine Trade Operations (UKMTO) and others.
According to the IMO data on committed pirate attacks for the period between January and July of 2012 the geographical area of the South China Sea has the highest percentage of all reported attacks committed (27.31 %), West Africa (17.8%), the Indian Ocean (16.58%), the Strait of Malacca (12.7%), East Africa (11.5%), the Arabian Sea (10%), South America - the Pacific (3%), the North Atlantic Ocean (0.7%) and the Mediterranean (0.4%). From the mentioned data,

[19] http://www.imo.org/OurWork/Security/SecDocs/Documents/Maritime%20Security%20Documents.pdf (17.11.2012.)
[20] IMO: MSC.1/Circ.1332, 2009.

28.4% are cases of avoidance of pirate attacks, 36.6% are reports of incidents to the coastal authorities and 34 % are reports to the country and/or to the international organization. The best methods of avoiding pirate attacks practices for attempted pirate attacks, depending on the geographical area, are divided into: the measures taken, reporting of the incident to the coastal authorities and to the country to which the incident was reported and/or to the international organization. The measures taken include: activating the alarm, hiding the crew in a safe place on the ship, applying the Best Management Practices for Protection against. Somalia Based Piracy Version 4 (BMP4) measures, strengthened measures, reporting to the Port Facility Security Officer (PFSO), anti-piracy measures, avoidance manoeuvres, firing warning shots, anti-piracy water curtain and what, in reports, is defined as "other" and "not stated". The reporting of the incident to the coastal authorities includes: the Navy, the port authorities, the security centre and what is, in reports, defined as "other" and "not stated". According to the IMO reports, the division of committed pirate attacks in most cases includes: ReCAAP, ICC, IMB, NATO, UKMTO and others. According to the IMO reports on attempted pirate attacks for the period between January and July 2012 the geographical area of East Africa has the highest percentage of reported acts of piracy (49.1%), the Arabian Sea (25.61%), West Africa (9.01%), the Indian Ocean (6.76%), the South China Sea (3.48%), South America – the Pacific (2.04%), the Strait of Malacca (1.22%), South America – the Caribbean sea (1.8%) and South America – the Atlantic (0.8%). From this, 32.5 % refers to the methods of avoiding pirate attacks, 23.6% are reports of attacks to the coastal authorities, and 43.7% are reports to the country and/or to the international organization. A comparison of the percentages of measures taken between committed and attempted pirate attacks show a difference of 4.1% (for the attempted). A further comparison of attacks reported to the coastal authorities of the measures taken in committed and attempted pirate attacks shows a difference of 13% (for the committed) and the comparison of the reports to the country and/or to the international organization in committed and attempted piracy attacks is 9.7% (for the attempted). The results of this comparison clearly show that the number of measures taken in attempted pirate attacks and incidents reported to the country and/or the international organization is higher than in committed attacks.

5. ANALYSIS OF PIRATE ATTACKS

Pirate attacks are analysed according to: geographical areas, types of attacks and effectiveness of technical and technological solutions for preventing pirate attacks. Geographical areas and types of pirate attacks are analysed according to the official IMO reports which classify them, according to geographical areas, into: location of the attack, the ship operation during the attack, the number of people involved in the attack, consequences for the crew, the weapon used and part of ship through which the pirates attacked. The effectiveness of technical and technological solutions for preventing pirate attacks was analysed according to: the measures taken by the captain and crew members, international organizations and state authorities to which the pirate attack was reported and the measures taken by them. This paper analyses the geographical area of East Africa which was, in the period between 2008 and July 2012, the area with the highest number of pirate attacks (41.05 %[21]). The data of the analysis for the geographical area of East Africa in the period between 2008 and 2011 is the following:

According to the location of the attack: in international waters the percentage of committed pirate attacks is 85.12% and 66.98% for attempted pirate attacks; in territorial seas the percentage of committed pirate attacks is 8.84% and 31.34 % for attempted pirate attacks. The percentage of committed pirate attacks is 6.05% in ports and 1.68% for attempted pirate attacks.

According to ship operations during the attack: the percentage of committed pirate attacks of anchored boats is 10.23 % and 0.93% in attempted pirate attacks; during navigation the percentage is 79.53 % for committed and 95.34 % for attempted pirate attacks; the percentage of

[21] The overall number of pirate attacks during the period between 2008 and July 2012 is 1971, of which 809 refers to the area of East Africa.

attacks whose operation is not clearly defined is 10.23 % for committed and 3.73 % for attempted pirate attacks.

According to the number of people involved in the attack: the percentage of 1 to 4 persons involved in the attacks is 6.98% for committed and 7.46% for attempted pirate attacks; the percentage of 5 to 10 persons involved in the attack is 12.09 % for committed and 27.80 % for attempted pirate attacks; the percentage of more than 10 persons involved in the attacks is 6.98% for committed and 9.33% for attempted pirate attacks; the percentage of attacks with an inacurrate number of people involved in the attack is 73.95 % for committed and 55.41 % for attempted pirate attacks.

According to consequences for the crew: the percentage of real violence against the crew is 13.36 % for committed and 46.27 % for attempted pirate attacks; the percentage of repression against the crew is 5.07% for committed and 27.43% for attempted pirate attacks; the percentage of ship disappearance is 0.46% for committed and 0% for attempted pirate attacks; the consequences for the crew are not stated in 10.14 % of the cases for committed and in 26.31% of the cases for attempted pirate attacks.

According to the weapon used: the percentage of fire weapons used is 15.81% for committed pirate attacks and 42.35% for attempted pirate attacks; the percentage of knives used is 6.05% for committed and 0.37% for attempted pirate attacks; under the category “other” the percentage is 6.05% for committed and 9.51% for attempted pirate attacks and nothing was stated in 72.09% of the cases for committed and 47.76% for attempted pirate attacks.

According to the part of the ship through which pirates attacked the boat: the percentage of boarding the ship through the captain’s room is 0.57% for committed and 0% for attempted pirate attacks; the percentage of boarding the ships through the cargo area is 0.72% for committed and 0% for attempted pirate attacks; 0.64% entered through the storage rooms in committed and 0% in attempted pirate attacks; entrance through the engine room is 0.42% for committed and 0% for attempted pirate attacks; the percentage of pirates not boarding the ship is 0% for committed and 94.99% for attempted pirate attacks; the percentage of lives lost is 0.27% for committed and 0 % for attempted pirate attacks; the percentage of wounded crew members is 0.27% for committed and 4.75% for attempted pirate attacks; the percentage of missing crew members is 0.38% for committed and 0% for attempted pirate attacks; the percentage of hostages is 89.85% for committed and 0% for attempted pirate attacks; the percentage of attacked crew members is 1.10% for committed and 0% for attempted pirate attacks; the ransom percentage is 0.04% for committed and 0% for attempted pirate attacks.

Based on the analysis, the highest percentage of committed pirate attacks according to the area of attack in the geographical area of East Africa is in international waters (85.12%), and the highest percentage of attempted pirate attacks is in the territorial seas (31.34%). The highest percentage of committed pirate attacks according to ship operations during the attack is on the anchor (10.23%), and the highest percentage of attempted pirate attacks is during navigation (95.34%). According to the number of people involved in the attack, the highest percentage for committed pirate attacks is not defined (73.95%), and the highest percentage of the number of people involved in attempted pirate attacks during navigation is 5 to 10 people (27.80%). Based on the analysis, the highest percentage of committed pirate attacks according to consequences for the crew is ship kidnapping (70.97%), and the highest percentage for attempted pirate attacks is real violence against the crew (46.27%). The highest percentage of arms used for committed pirate attacks is not precisely stated (72.09%), and the highest percentage of the weapon used for attempted pirate attacks is fire weapon (42.35%). The highest percentage according to the part of the ship through which the pirates attacked the boat is the cargo area (0.72%), whereas for the attempted pirate attacks the highest percentage of not boarding the boat is 94.99%. For committed pirate attacks the percentage of taking hostages is 89.85%.

6. THE EFFECTIVENESS OF TECHINCAL AND TECHNOLOGICAL SOLUTIONS FOR PREVENTING PIRATE ATTACKS

The effectiveness of technical and technological solutions to supressing pirate attacks for the period of 2008 and July 2012 is shown in this paper in percentages from relations 1 – the percentage of committed pirate attacks for the period between 2008 and 2011 (44.87%) and 1 – the percentage of committed pirate attacks for the period between January and July 2012 (45.14%).

Further IMO reports on attempted pirate attacks for the geographical area of East Africa during the period between January and July 2012 analysed: measures taken by the captains and other crew members, coastal authorities, country and international organizations to which the pirate attack was reported and measures taken by them in 45 cases which comes to 77.58 % of the total number of attempted pirate attacks. In those 45 cases the total number of all the analysed measures was 243.

The analysis of the reports on the attempted pirate attacks for the geographical area of East Africa was carried out because attempts of preventing pirate attacks proved to be unsuccessful and is therefore the demonstration of the effectiveness of technical and technological solutions for supressing pirate attacks.

According to the reports, the measures taken by the captain and crew members are the following: activating the alarm in 31.94% of the cases, gathering the crew in a safe place in 1.39 % of the cases, applying the measures appointed by BMP4 in 1.39% of cases, the avoidance manoeuvres in 16.67% of the cases, firing warning shots in 29.17% of the cases, applying the anti-piracy water curtain in 2.78% of the cases and other anti-piracy measures in 16.66%.

According to the IMO data, the geographical areas of pirate attacks in the period between 2008 and 2012 are: the South China Sea, the China Seas, the Indian Ocean, East Africa, West Africa, the Arabian Sea, the Strait of Malacca, the Mediterranean, South America - the Atlantic, South America - the Caribbean Sea), South America (the Pacific), the North Atlantic Ocean, the North Pacific, The Caspian Sea and the Persian Gulf.

According to reports of the stated coastal authorities to which the pirate attack was reported are: the port authorities in 30.77% of the cases, security centres in 34.62% of the cases, and the Navy in 15.38% of the cases, the rest is not stated in 19.23% of the cases.

According to the reports of the stated international organization to which the pirate attack was reported: ReCAAP in 6.03% of the cases, ICC IMB in 32.76% of the cases, NATO in 28.45% of the cases and UKMTO in 32.75% of the cases.

According to the reports, the measures taken by the coastal authorities are: contacting the war ship in 33.33% of the cases, sending the commission for investigating the pirate attacks in 33.33% of the cases and sending the naval aircraft in 33.33% of the cases.

The highest percentage of anti-piracy measures taken by the captain and crew members is activating the alarm (31.94% of the cases). The highest percentage of reporting to the coastal authorities is reporting pirate attacks to security centres in 34.62% of the cases. The highest percentage of pirate attacks reports to international organizations is to ICC IMB in 32.76% of the cases. Unlike the previously mentioned highest percentages, the percentage of measures taken by the coastal authorities in the geographical area of East Africa is equal for all measures taken, and is 33.33%.

7. CONCLUSIONS

For the purposes of finding a solution to reducing the number of pirate attacks the IMO has implemented a series of technical and technological solutions in the maritime transport industry. This is the reason why the SOLAS convention was changed, why the ISPS and Djibouti codes were made, along with other decisions, circulars, regulations and references, such as the BMP4. Furthermore, marine security centres for supressing piracy and armed robberies were established (ReCAAP, ICC – IMB, UKMTO and the Maritime Security Centre – Horn of Africa (MSC – HOA).

The actions and procedures of the companies whose ships navigate in high-risk areas are regulated by the ISPS code, whereas the actions and procedures of crew members regarding pirate

attacks are regulated by the Ship Security Plan (SSP).
According to the IMO statistics, the best management practices of avoiding pirate attacks are divided depending on: committed and attempted pirate attacks and on the geographical area involved.
In this paper, the best management practices of avoiding pirate attacks are classified, depending on the geographical area, into: the measures taken, the reporting of the incident to the coastal authorities, to the country to which the attack was reported and/or to the international organization.
The analysed geographical area is East Africa, which, between 2008 and July 2012, was the area with the highest total number of pirate attacks (41.05%).
The highest percentage of measures of preventing pirate attacks taken by the captain and crew members are: activating the alarm, reporting to the coastal authorities, reporting pirate attacks to security centres, international organizations and other, by the IMO, acknowledged bodies.
The measures taken by the IMO so far allow for the implementation of new methods. One of these is the recent introduction of paid protection for the escorting of ships during navigation in pirate high-risk geographical areas.

REFERENCES

1.http://www.imo.org/OurWork/Security/SecDocs/Documents/Maritime%20Security%20Documents.pdf (17.11.2012.)

2.http://www.imo.org/OurWork/Security/SecDocs/Pages/Maritime-Security.aspx (11. 11.2012.)

3.http://www.marineinsight.com/marine/marine-piracy-marine/10-maritime-piracy-affected-areas-around-the-world/

4.IMO: MSC.1/Circ.1332, 2009.

5.IMO: Piracy Reports, www.imo.org/OurWork/...fault.aspx 12.11.2012.

6.IMO: Reports On Acts Of Piracy And Armed Robbery Against Ships, Annual report 2008. MSC.4/Circ.133, 19 March 2009.

7.IMO: Reports On Acts Of Piracy And Armed Robbery Against Ships, Annual report 2009. MSC.4/Circ.152, 29 March 2010.

8.IMO: Reports On Acts Of Piracy And Armed Robbery Against Ships, Annual report 2010. MSC.4/Circ.169, 1 April 2011.

9.IMO: Reports On Acts Of Piracy And Armed Robbery Against Ships, Annual report 2011. MSC.4/Circ.180, 1 March 2012.

10.IMO: Reports On Acts Of Piracy And Armed Robbery Against Ships, Annual report 2008. MSC.4/Circ.133, 19 March 2009.

11.IMO: Reports On Acts Of Piracy And Armed Robbery Against Ships, Annual report 2009. MSC.4/Circ.152, 29 March 2010.

12.IMO: Reports On Acts Of Piracy And Armed Robbery Against Ships, Annual report 2010. MSC.4/Circ.169, 1 April 2011.

13.IMO: Reports On Acts Of Piracy And Armed Robbery Against Ships, Annual report 2011. MSC.4/Circ.180, 1 March 2012.

14.Reports On Acts Of Piracy And Armed Robbery Against Ships, Issued monthly – Acts reported during January 2012., MSC.4/Circ.181 10 February 2012.

15.Reports On Acts Of Piracy And Armed Robbery Against Ships, Issued monthly – Acts reported during February 2012, MSC.4/Circ.182, 30 April 2012.

16.Reports On Acts Of Piracy And Armed Robbery Against Ships, Issued monthly – Acts reported during March 2012. MSC.4/Circ.183, 30 May 2012.

17.Reports On Acts Of Piracy And Armed Robbery Against Ships, Issued monthly – Acts reported during April 2012, MSC.4/Circ.184, 22 June 2012.

18.Reports On Acts Of Piracy And Armed Robbery Against Ships, Issued monthly – Acts reported during May 2012. MSC.4/Circ.185, 27 June 2012.

19.Reports On Acts Of Piracy And Armed Robbery Against Ships, Issued monthly – Acts reported during June 2012. MSC.4/Circ.186, 31 July 2012.

20. Reports On Acts Of Piracy And Armed Robbery Against Ships, Issued monthly – Acts reported during July 2012. MSC.4/Circ.187, 4 September 2012.

BIOGRAPHIES

Katarina Kušter graduated on the Faculty of Maritime Studies in Rijeka in 2012, in the area of Nautical Studies and Maritime Tranport Technology. Currently she is a PhD student at the Department of Geography (University of Zadar).

Iva Pezerović was born in Požega, Croatia (1989). Finished her undergraduate studies at the University of Zadar, the department of The Nautical Engineering and Maritime Transport Technology, and acquired the title of university bachelor nautical engineer (December 2012).

Marijan Gržan graduated on the Marine Military Academy in Split 1982. After graduate studies at ETF Zagreb ended in 1992 with the theme "Selective jamming radar systems" . Doctoral studies at the Faculty of Maritime Studies in Rijeka completed in 2012, with the theme "SELECTIVE INTERFERENCES OF RADAR SYSTEM AND THE IMPACT ON NAVIGATION SAFETY IN CONTEMPORARY THREATS". After 10 years in the Army and 18 years in business, 2009 was employed at the University of Zadar.

GEOTRAFFIC ANALYSIS OF MARITIME CONTAINER FLOW

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ABSTRACT

The intensive increase in container traffic has resulted in the overall growth of maritime trade and rapid development of container ships. This paper presents a chronological outline of the container ships development as well as an analysis of the influence of the container traffic's rapid growth on the sustainability of some of the existing flows. It defines the elements affecting the movement of container traffic flow in European and worldwide waters. Container flows reflect the global trade imbalances which have been growing since 1990s. The paper presents current development trends in supply and demand and their impact on the container shipping market in Europe and worldwide.

KEY WORDS
Container Traffic Flow. Development of Container Ships. Container Ports. Supply and Demand. Imbalance of Container Trade.

1. INTRODUCTION

The intensive development of the container traffic has resulted in the rapid growth of the overall maritime trade. The rapid growths of the container traffic and the recession in Europe and North America have led to an unbalanced flow of goods carried through the main container routes. Generally speaking, such a container traffic growth has strongly fostered the increase in container ship capacity, i.e. the size of these vessels. This paper presents a chronological overview of the increase in the size and capacity of container ships and provides an analysis of the reasons that have led to the phenomenon. Due to the considerable increase in size and capacity of the new vessels, relatively large container ships with the deadweight capacity of, for instance, 3000-5000 TEU have become feeder ships. The paper also defines the elements affecting the movement of major container maritime flows including Asia – North America, North America – Asia, Asia – Europe, Europe – Asia, Europe – Middle East and Middle East – Europe.

2. MARITIME CONTAINER FLOWS AND TRAFFIC

Today, most of general cargo is carried in containers. The containerization of general cargo is the very reason for a continuously increased maritime transport of goods. Due to the overall rise in maritime traffic, i.e. the increase in containerized cargo, the container flows are becoming the flows featuring dense traffic of large vessels. At the global level, these flows present an uneven distribution of cargo flow. For example, the container traffic flow from Asia towards North America is twice as large as the flow from North America to Asia. According to the statistics, 14.5 million TEUs were transported from Asia to America, whereas 5.6 million TEUs were conveyed from America to Asia. [6]

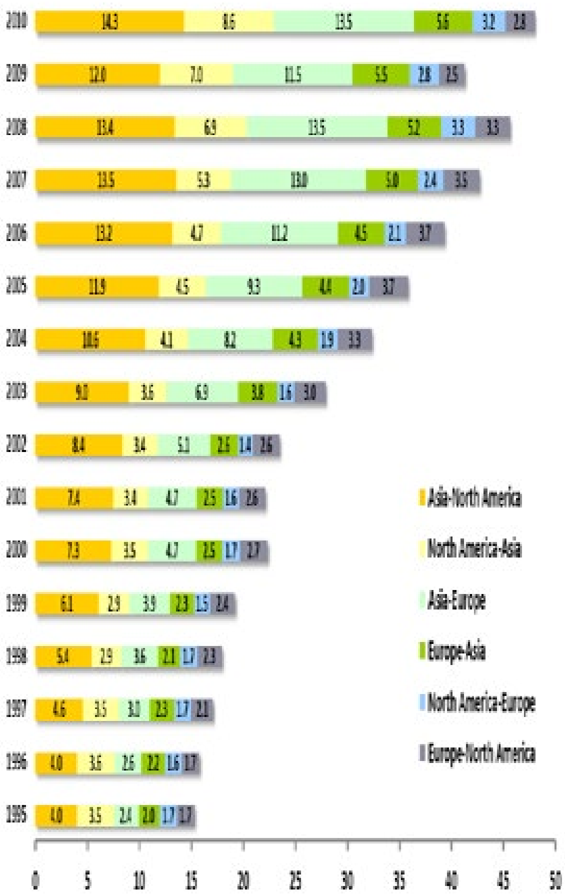


Figure 1. Ratio (1995-2010) of container trade with regard to the major container flows (10)

The great majority of the container units transported from North America are empty. The container trade flow between Asia and Europe presents similar imbalance, but to a considerably lesser extent than the previous route. These imbalances on the global maritime market have resulted in frequent chartering of container ships with the purpose of repositioning empty containers as well as in uneven freight rates within maritime container trade. The transport across the Pacific Ocean, for instance, is more expensive per TEU heading west than per TEU heading in the opposite direction. Likewise, the freights for the goods flowing towards Europe are higher than those for the goods heading towards Asia. The share of the container trade with regard to other traffic trades has considerably increased over the past 20 years, as shown in Figure 2.

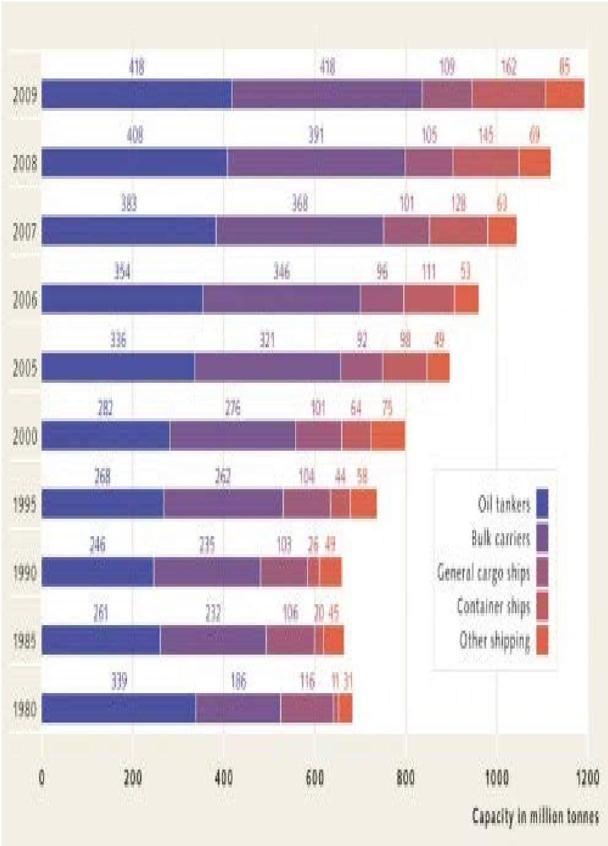
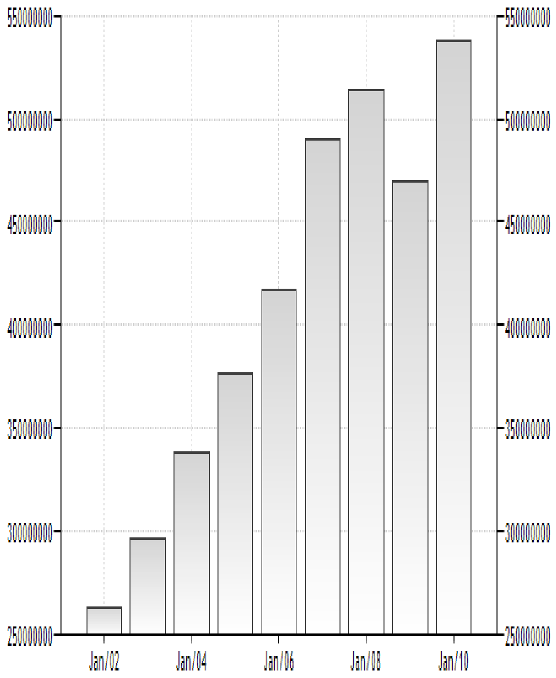
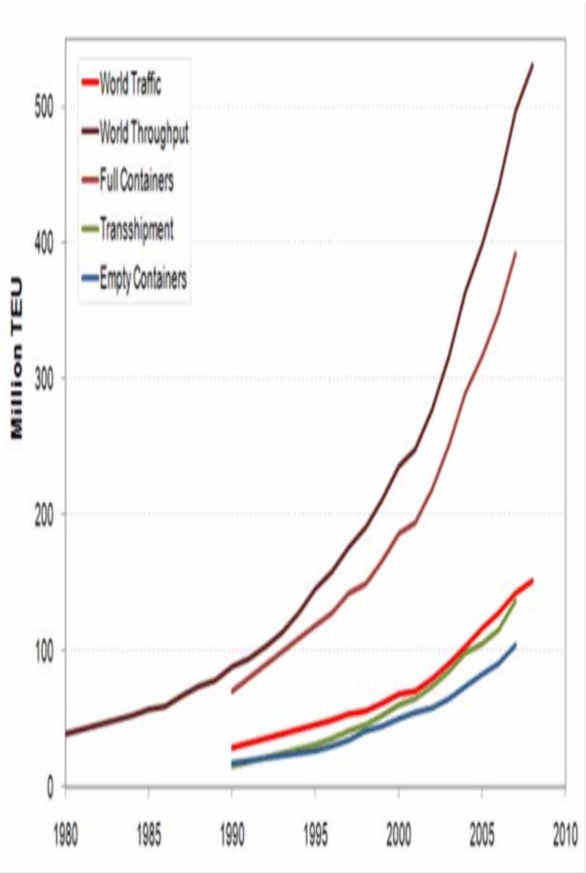


Figure 2. Share of the container trade compared to other shipping (10)

According to the recent reports, the overall container trade, at the global level, amounted to 538283754 TEU in the year of 2010. [8]



Graph 1. Share of container traffic in ports per TEU at the global level



Graph 2. Ratio of container traffic over container throughput [8]

From 1990 to 2008 container trade grew from 28.7 to 152 million TEU, an increase of 430% (Graph 2). During the same period, container throughput grew from 88 million to 530 million TEU (Graph 1), i.e. by about 500%. The rapid rise in container traffic has largely affected the container traffic flows, dividing them into primary and secondary flows. The divergence between the throughput and traffic becomes more emphasised as global supply chains become more complex. The surge of both container traffic and throughput is linked with the growth of international trade. The container throughput itself depends on technological factors and developments and their ability to follow the sudden growth of container traffic. The ratio of container traffic over container throughput is shown in Graph 2.

2.1 Major container flows

The major container traffic flows include:

- East–Westflow (export of containerized goods from Asia to Europe and North America, and from Europe to North America)
- North–South flow (China– South America)
- Intra–regional flow (export from China to Singapore, from Taiwan to China and Singapore, from China to the Philippines and Indonesia, and export from Singapore to China, Taiwan and Indonesia).

According to traffic intensity, the major container trade flows are classified into:

- trans-Pacific
- trans-Atlantic
- Europe – Far East

Figure 3. Major container traffic flows (10)

2.2 Secondary container flows

Secondary container traffic flows refer to feeder ship service or to the so-called pendulum routes. Pendulum routes are mainly used for containerized cargo. The main advantage of pendulum routes is achieving the balance between the sequence of ports and the optimization of the ship use. The structure of pendulum routes for container traffic flows may have various forms, depending on factors such as target markets, trade imbalance, etc.
Pendulum routes may be categorized as:

- symmetrical (involving a relatively similar number of ports of call);
- asymmetrical (involving a relatively small set of ports of call);
- between centers (directly linking main ports; the advantage of such routes is that it takes less time to service more ports, compared to the first two categories of pendulum routes).

2.3 Elements affecting the formation of container traffic flow

The strong expansion of container transportation implies the issue of defining those elements which are considered important when selecting containers routes / flows. It may be suggested that three elements require analyzing when selecting a container traffic flow / route:

- Cost
- Time and
- Risk.

On the basis of these elements (elements are chosen by various analyzes in container transport), the following flow chart diagram is suggested (Figure 4):

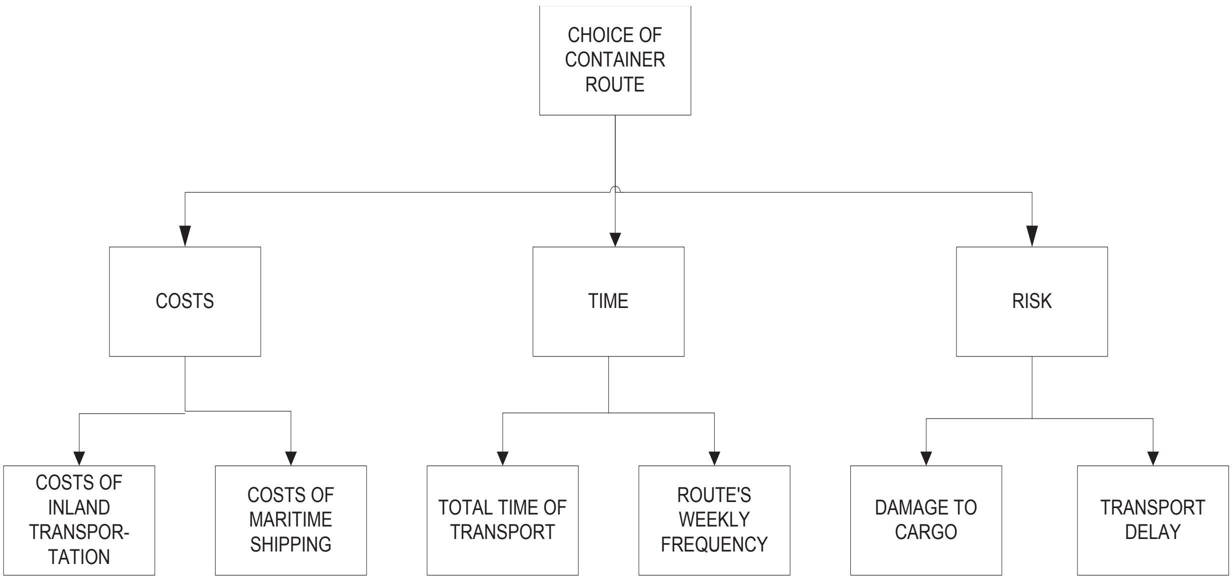
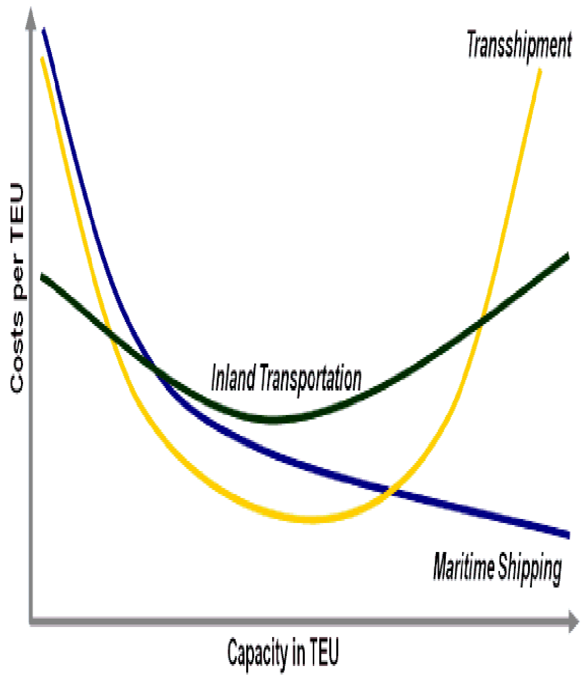


Figure 4. Flow chart diagram of the suggested elements affecting the choice of container traffic routes

3. INCREASE IN SIZE OF CONTAINER SHIPS

The constant increase in container traffic has been matched by the increase in size of container ships. As they get larger and provide larger cargo capacity, the freight per TEU decreases. The ratio of the costs to the ship size is presented in Graph 3.



Graph 3. Ratio of the costs per TEU to the ship's capacity [8]

The increase in size of the container ships has affected the structure and density of traffic in major container flows. The container ships that were once employed in major flows have been now transferred to secondary flows or, alternatively, have become feeders. The increase in ship capacity has reduced the number of vessels in maritime flows.

The container traffic flows may be presented as the function:

$$f(T) = (N,S) \quad (1)$$

T= container traffic flow,
N= number of vessels in the flow,
S= size of vessels.

The container ships have been continuously increasing their deadweight capacity since early 1950s when the first container ships were introduced in maritime shipping. The first vessels were rather small but each generation of new container ships featured larger cargo capacity.

3.1 Advantages and drawbacks of the container ship development

When compared to other forms of cargo traffic in maritime shipping, the container trade presents a number of advantages. The increase in size of the container ships results in lower costs per TEU. In order to reduce costs, the cargo capacity of container ships is constantly being enlarged, allowing for more traffic per year, which again enables the ship-owners and shippers to yield more profit. However, due to the global and rapid increase in container traffic, some of the traffic components have difficulties in coping with the increased size of container ships. These components mainly refer to transhipment facilities at container terminals, i.e. to the ability of terminals to accommodate more containers in shorter time intervals and ship them to their final destinations. The increased size of vessels implies difficulties regarding the draft of such ships, the reach of the portainers across the vessel's full beam, the number of portainers and other container cranes that are required for transhipment of a large number of containers on time. It is in the interest of ship-owners and shippers to reduce the turn-round time and, consequently, to reduce or eliminate additional dues. Port terminals strive to modify their technology in order to follow modern container trends and satisfy all participants in the container traffic chain. Today, TEU traffic in major maritime flows is performed to a great extent by large container ships (class D and class E). The continuing increase in size of container ships adversely affects the shipping companies which have not been following global trends in the development of large container ships so that they have not remained competitive on the main container flow markets and their vessels have not been employed to the full extent.

3.2 Supply and demand in container shipping

The year of 2008 was crucial in the container shipping supply and demand. The 2008 world financial crisis has led to the reduction in maritime transportation of almost all finalised products and, consequently, to the reduced demand for ship container capacity. The demand nosedived by the end of 2008. In 2008 the traffic of loaded containers grew at the average annual growth rate of 9% (which represented a decrease when compared to the average growth rate in the previous two years), whereas at the same time the supply of the ship container capacity grew by 13.1%. The difference between the traffic growth (demand) and the ship container capacity growth (supply) amounted to 4.1% in 2008. The decrease in demand for ship container capacity reached the bottom at the end of 2008 but continued throughout 2009 as well.

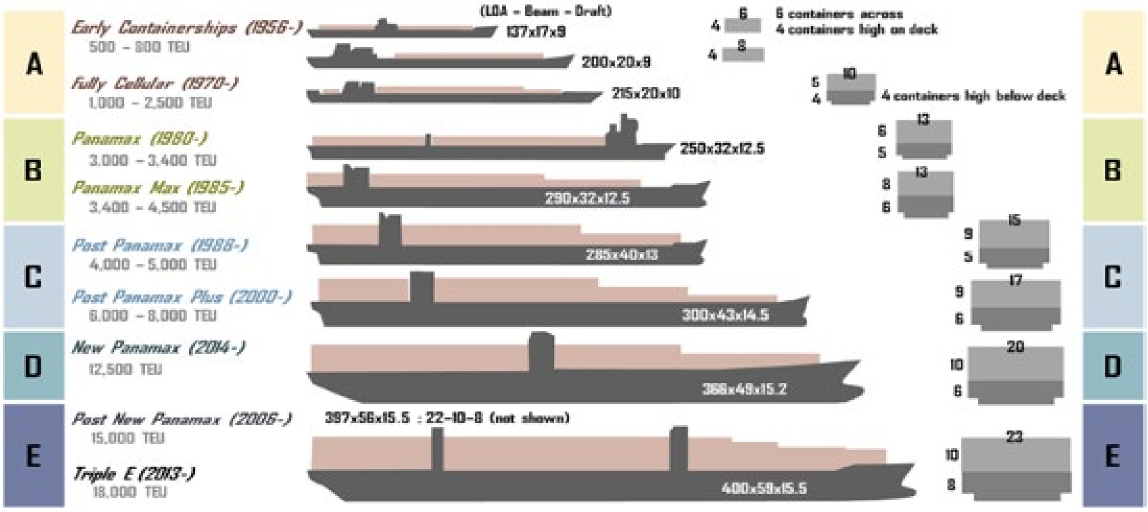


Figure 5. Overview of generations of container ships

4. CONCLUSION

An analysis of direction, intensity and dynamics of the global trends in container traffic flows reveals that the international container traffic has been growing much faster than any other maritime trade. An increase in container traffic flows has been followed by a rise in traffic in the world's leading container seaports. The analysis of traffic in major container ports shows that East Asia is one of the leading regions regarding the TEU traffic. The standing of this region results from the largest container traffic in major seaports of East Asia due to strong Chinese background. Next to East Asia, the leading regions of container traffic include Europe and North America. As it has been the case in the past 20 years, forecasts suggest further development in the world container trade, and the strongest growth is foreseen to take place in East Asia. According to the forecasts, it may be assumed that the major container traffic flows will refer to three markets: market lying in the East-West direction, market in the North-West, and inter-regional market.

REFERENCES

1.Mitrović, F.: Menadžment u brodarstvu i lukama, Split 2007.

2.Malić, A.: Geoprometna obilježja svijeta, Zagreb 1995.

3.Stražičić, N.: Pomorska geografija, Školska knjiga, Zagreb 1996

4.Tomić, I.: Prometna tehnologija luka, Institut prometnih znanosti, Sveučilište u Zagreb, Zagreb 1986.

5.Shipping Statistic and Market Review, Bremen, ISL, 2006, 2007.

6.http://worldoceanreview.com/en/transport/globalshipping(accessed:2013-01-12)

7.http://www.worldshipping.org/about-the-transport/globalshipping (accessed:2013-02-10)

8.http://people.hofstra.edu/geotrans/eng/ch3en/conc3en/worldcontainerflows.html(accessed: 2013-02-12)

9.http://www.sciencedirect.com/science/article/pii/S0966692310000359(accessed: 2013-02-12)

10.http://worldoceanreview.com/en/transport/globalshipping/

BIOGRAPHIES

Rino Bošnjak was born on 16th October 1975 in Imotski, Croatia, where he completed his primary and high school education. He moved to Split in 1995 and graduated in nautical studies at the University of Split – Faculty of Maritime Studies in 2000. From 2001-2011 he was sailing onboard ships of various types and sizes as chief officer. He has been holding the Master mariner license for ships over 3000 GT since 2007. He is an assistant in various courses, including Electronic navigation, Safety at sea, Navigational integrated system, Cargo handling, etc at Faculty of Maritime Studies in Split. Presently he attends doctoral studies at Faculty of Transport and Traffic Sciences in Zagreb.

Pero Vidan, Ph D was born on 9th September 1976 in Metkovic, Croatia. He graduated from the Faculty of Maritime Studies in Split in 2000 and then navigated at various ships. He is the Captain of the ships above 3000 GT. Since 2006 he has worked at the Maritime Faculty in Split. He has been Vice dean for Science since 2011. Since 2010 he has been head of Special program of education at Faculty of Maritime Studies in Split. He has been member of Croatian delegation at IMO STCW Committee in 2012.

SPLIT PORT AUTHORITY AND CRUISING – LEGAL FRAMEWORK AND STATISTICAL ANALYSIS

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ABSTRACT

This paper presents and discusses the legal framework within which the Split Port Authority operates, and provides a statistical analysis of the traffic of cruise vessels and their passengers passing through the area under jurisdiction of the Split Port Authority. The legal framework governing the activities of the Split Port Authority is primarily based on the regulations of the 2003 Maritime Domain and Seaports Act and sub-law regulations following the Act. The Split Port Authority was established by the government of the Republic of Croatia for the purpose of managing, constructing and using the port of Split. A significant share of the overall traffic of vessels and passengers in the area within the Split Port Authority jurisdiction refers to the cruise ships and their passengers. A statistical analysis of the share of passengers on cruise in the total transit of passengers emphasises the importance of this form of maritime traffic with regard to the overall traffic of passengers in the port of Split.

KEY WORDS
Split Port Authority, cruising, Maritime Domain and Seaports Act, statistical analysis

1. INTRODUCTION

The Government of the Republic of Croatia has established six state port authorities (in Rijeka, Zadar, Šibenik, Split, Ploče and Dubrovnik) and twenty-two county port authorities. By a decree of the Croatian government of 24th April 1997, and in pursuance of Article 31 par. 1 and 2 of the Maritime Domain and Seaports Act, the Split Port Authority was established for the purpose of managing, constructing and using the port of Split.
The Port of Split comprises a total of five port basins, out of which only the City Port has facilities for accommodation of cruise ships.
The area of the City Port basin covers around 18.1 km2 featuring twenty-eight ship berths. Ten of them can accommodate cruise ships up to 250 metres in length having a maximum draught of 8.2 metres. The accommodation and mooring of the cruisers are performed round the clock.
Perhaps more than any other form of travel, cruising offers a possibility to see a lot within a short period of time. This explains the increasing popularity of cruise travels, high growth rates of cruising and good prospects for the further long-term growth of this segment of tourism. Owing to the long and indented coastline and the abundance of islands, Croatian coast is a perfect setting for an intensive development of nautical tourism and cruise travels. Over the years, cruise ship travels have increasingly participated in the overall maritime traffic in the Republic of Croatia. These

are the reasons for designing and constructing specialised terminals in order to meet the requirements of this form of traffic. Trends in recent years have shown that Split is becoming an increasingly appealing cruising destination for tourists on the Mediterranean market.

2. LEGAL FRAMEWORK OF THE SPLIT PORT AUTHORITY OPERATION

The (state) Port Authority was founded for the purpose of managing, constructing and using the Port of Split as a port open to public traffic which is of exceptional (international) economic interest to the Republic of Croatia. Rights and obligations of the Republic of Croatia as the founder are exercised by the Government. The Port Authority is a non-profit legal entity whose establishment, management structure and activities have been governed by the 2003 Maritime Domain and Seaports Act.

The Government of the Republic of Croatia establishes a port authority by issuing a decree. If the Maritime Domain and Seaports Act does not stipulate otherwise, the provisions of the Institutions Act also apply to the port authority. The port authority acquires the form of a legal entity by entering the Commercial Court Register and loses the character of the legal entity by erasing from the Register. The Port Authority may acquire rights and obligations in legal affairs and its property consists of assets obtained from the founder and commercial income. [12]

In addition to the elements defined by the Institutions Act, the decree on establishing the port authority has to define the port area under the jurisdiction of the port authority and the port activities, building, superstructure and infrastructure within the port area.

In pursuance of Article 31 par. 1 and 2 of the Maritime Domain and Seaports Act, the Croatian government established the Split Port Authority on 24th April 1997, for the purpose of managing, constructing and using the port of Split. According to its function, the Port of Split is a port open to international public transport[1], while according to its size and importance, the port is of exceptional (international) economic interest to the Republic of Croatia[2]. The Decree and its amendments define that the port area under the jurisdiction of the Split Port Authority consists of: City Port basin, Vranjic basin, Solin basin, Kaštela basin (Basin A, Basin B, Basin C and Basin D – Resnik) and Komiža basin – for fishery needs.

The management structure of the Split Port Authority and its scope of activities are defined by the Maritime Domain and Seaports Act. This Act stipulates, inter alia, the classification of seaports, port area, establishment of port authorities, port activities and their implementation, construction and exploitation of port superstructure and infrastructure, and relevant issues regarding the conduct in ports. In addition to the Maritime Domain and Seaports Act, the port authority operation is greatly affected by a number of sub-law regulations that have been created on the basis of the Act. The sub-law regulations include Regulation on terms ports must abide by, Regulation on the classification of ports open to public traffic and special purpose ports, the Decree on the classification of ports open to public traffic in Splitsko-Dalmatinska County and Decree on establishing the Split Port Authority.

The activities of the Split Port Authority include: construction, maintenance, management, protection and enhancement of the maritime domain comprised within the port area; construction and maintenance of the port infrastructure that is funded by he founder of the Port Authority; professional supervision of construction, maintenance, management and protection of the port area (port infrastructure and superstructure); ensuring permanent and safe port traffic flow, ensuring technical-technological coherence and safety of navigation; ensuring the provision of services of public interest or services

[1] According to their function, ports may be classified as ports open to public traffic and special purpose ports. Both categories may be open to international and/or to local traffic. Their status is settled by the *Regulation on terms ports must abide by*. Seaports that are open to international traffic in the Republic of Croatia are determined by the *Regulation on determining the ports open to international traffic*.

[2] According to their size and importance for the Republic of Croatia, the ports open to public traffic are classified as: ports of exceptional (international) economic interest to the Republic of Croatiam, ports of county importance and ports of local importance.

which are not economically attractive to other economic entities, coordination and monitoring of concession holders engaged in economic activities within the port area; establishing and running the tax free zone in the port area in compliance with the regulations governing free zones; other activities as defined by the Maritime Domain and Seaports Act. [12]

The management of the Split Port Authority is headed by the Board of Directors and the Managing Director. The composition, competences and duration of the Board of Directors' mandate are defined by the Maritime Domain and Seaports Act. The Managing Director of the Split Port Authority is appointed by the Board of Directors. The position is advertised in compliance with the Maritime Domain and Seaports Act and the Statute of the Split Port Authority. The competences and mandate of the Managing Director of the Split Port Authority are defined by the Maritime Domain and Seaports Act.

All strategic decisions that are essential for successful port operation are made and implemented by the Split Port Authority. Proficient organisation of the Split Port Authority is exceptionally important for efficient running of the port at national and international levels. Part of activities performed within the jurisdiction of the Split Port Authority may be performed by third parties through granting concessions. As a non-profit legal entity, the Port Authority has to invest all profit into further development of the port. One of the fundamental tasks of the Split Port Authority is to engage in activities (reconstruction, better management practice, improved presentation, etc.) that ensure the accommodation of all vessels.

3. CRUISE TRAVELS AND THE PORT OF SPLIT

Cruise travel or cruising implies transport of passengers on advanced fixed schedule and according to the programs that include a variety of sports, entertainment, health-care and other activities and services which are provided for the relaxation, entertainment and recreation of passengers. [7] In the past two decades there has been an increase in interest in cruising. Over that period of time the number of passengers on cruise vessels has been globally growing at the rate of 8 to 9 % per year. [6]

Cruise travels represent an increasingly important segment of tourism on the international tourist market, as they offer a number of appealing options, in particular in the Mediterranean area. The fleet of passenger vessels engaged in cruising around the Mediterranean seas makes 20% of the overall world fleet. The Mediterranean is the most important receptive area for cruise travels in Europe. Although Croatia has been already recognised on the international tourist market as a country abounding in diverse cultural and historical sights and exceptional natural beauties, its tourism facilities have not yet been sufficiently developed and diversified, i.e. they are still not in line with market needs and demand. For instance, inadequate port infrastructure for the accommodation of cruise ships is one of the limiting factors for the development of this segment of tourism. One of the tasks of the Croatian port authorities is to ensure the accommodation of cruise chips. General guidelines have been designed at the state government level, and the task of each port authority is to ensure funds, assets and ways for bringing their respective ports in line with the market demands. In this sense, the Split Port Authority makes considerable efforts in order to position the Port of Split on the cruising market and to increase cruising traffic. [2]

The capacity of the port has become and increasing limiting factor in the development of cruising industry, and it is therefore necessary to take adequate steps towards the elimination of the existing drawbacks. Primarily, it is necessary to increase accommodation facilities in order to ensure a safe berth of the vessels that constantly increase in size and draught and to ensure the accommodation of the growing passenger population, which directly affects the quality of services provided in cruising business.

Trying to keep pace with the growing traffic and market demands, the Split Port Authority tries to increase the overall port capacity by new constructions and enlargement of the port. Since its foundation, the Split Port Authority has invested over 150 million kuna in the port infrastructure and superstructure in order to meet the prerequisites for the accommodation of the increasing number of ships in international traffic and ships operating in cruise business, as well as for traffic disburdening during tourist season. With its annual turnover of more than 4 million passengers and 650,000 vehicles in local and international traffic, the Split City port is in this regard the third port in the Mediterranean (after Naples and Piraeus).

While planning the port development and the increase in cruising traffic, consideration has been given to reposition the Port of Split and to turn it into both a transit port of call and a departure/arrival cruising terminal. This might increase the revenues generated from tourist and cruising activities, as mooring of cruisers generates more income than mooring of any other type of vessels. [2]

The Split Port Authority is a standing member of MedCruise organisation (the Association of Mediterranean Cruise Ports), one of the seven most influential port associations in the world. The Split Port Authority actively participates in all major events associated with the cruising industry.

4. STATISTICAL ANALYSIS OF THE CRUISE SHIPS AND PASSENGERS FLOW IN THE PORT OF SPLIT

The city of Split has become an increasingly appealing tourist destination for cruise travel passengers and is facing the increasing number of ship calls and passenger concentration. Table 1 provides data on number of cruise ships and their passengers calling at the Port of Split from 1997 to 2012.

Table 1. Number of cruise ships and passengers during the period 1997-2012.

Year	1997	1998	1999	2000	2001	2002	2003	2004
Number of passengers	1,199	7,763	1,132	437	6,765	20,616	46,105	34,134
Number of calls	13	6	7	2	37	82	141	132
Year	2005	2006	2007	2008	2009	2010	2011	2012
Number of passengers	47,315	46,999	99,281	121,525	13,833	172,378	181,963	245,451
Number of calls	183	162	185	256	232	257	252	269

The following bar graphs will make it easier to notice the increase in passengers arriving to Split onboard cruiser ships (Figure 1), and the increase in cruiser ships arriving to Split (Figure 2):

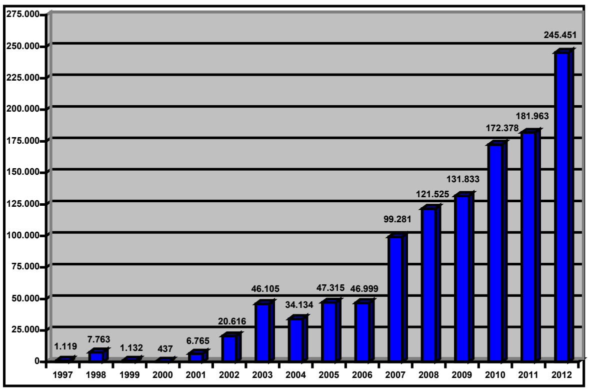

Figure 1. Number of passengers arriving to Split onboard cruiser ships from 1997 to 2012.

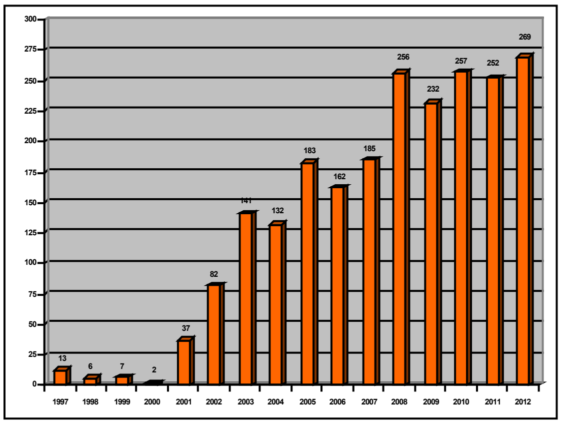

Figure 2. Number of cruise ships during the period 1997-2012.

Until 2002, the number of cruise ships and passengers calling at the Port of Split was almost negligible. Since 2002, there has been a rapid increase as shown Figure 3:

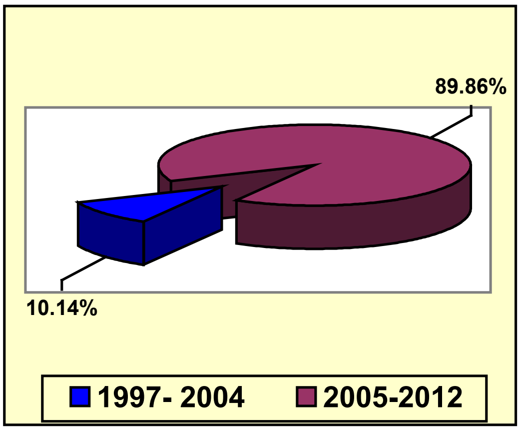

Figure 3. Percentage of passengers onboard cruise ships from 1997 to 2012.

It should be noted that the overall number of passengers on cruise ships calling at the Port of Split from 1997 to 2012 amounted to 1,164,896 passengers. By dividing this period of time into two equally long sub-periods (eight years each) it can be noticed that over the first observation sub-period (1997-2004) there were 118,151 passengers, i.e. only 10.14% of the overall traffic, whereas in the past eight years, from 2005 to 2012, the number of passengers amounted to 1,046,745 which makes 89.86% of the overall traffic during the entire period of observation. In other words, the number of passengers on cruise travels calling at the Port of Split increased by nine times, i.e. by almost 80% over the last eight years, an amount that the Split Port Authority, the tourist board and the entire administration have to take into careful consideration.

However, when taking into consideration the overall passenger traffic in the Port of Split during the period 1997-2012 (Table 2), it is obvious that a small share of passengers refers to the international traffic although this is the sector where the cruise travel passengers belong to.

Table 2. Overall passenger traffic in the Port of Split from 1997 to 2012.

Year	1997	1998	1999	2000	2001	2002	2003	2004
International passenger traffic	216,873	222,556	161,938	228,177	203,180	246,454	291,452	304,587
Local passenger traffic	1,511,772	1,438,820	1,446,796	1,747,409	2,083,228	2,316,240	1,511,772	1,438,820
Total	1,728,645	1,661,376	1,608,734	1,975,586	2,286,408	2,562,694	2,891,271	3,183,743
Year	2005	2006	2007	2008	2009	2010	2011	2012
International passenger traffic	336,753	289,857	339,005	337,270	355,000	471,018	490,482	524,263
Local passenger traffic	3,145,814	3,251,374	3,437,229	3,759,199	3,600,846	3,638,863	3,595,049	3,728,872
Total	3,482,567	3,541,231	3,776,234	4,096,469	3,955,846	4,109,881	4,085,531	4,253,135

The following bar graph will make it easier to notice the difference between the international and local passenger traffic with regard to overall passenger traffic in the Port of Split (Figure 4).

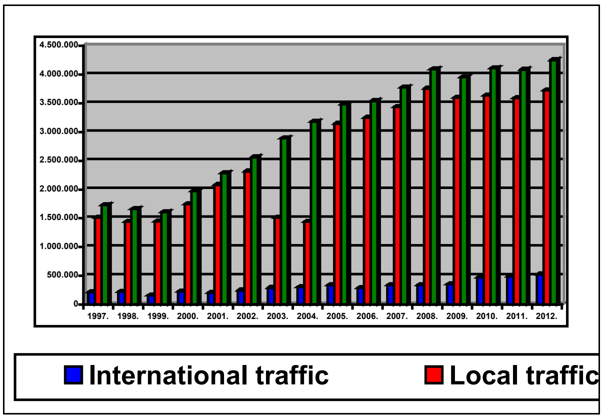

Figure 4. Overall passenger traffic in the Port of Split from 1997 to 2012.

From 1997 to 2012, the overall international passenger traffic in the Port of Split amounted to 5,018,865 passengers. Therefore, if the period 1997-2012 is again divided into two equally long sub-periods (each lasting eight years) and if the share of international passenger traffic is observed (see Figure 5), we may notice that during the first eight years (the sub-period 1997-2004), the international passenger traffic amounted to 1,875,217 passengers, i.e. only 37.36% of the total passenger traffic, whereas during the second eight-year sub-period, from 2005 to 2012, there were 3,143,648 passengers in the international passenger traffic, which makes 62.64% of the total passenger traffic in the observation period. In other words, the international passenger traffic in the Port of Split has doubled, i.e. has increased by 25% over the past eight years.

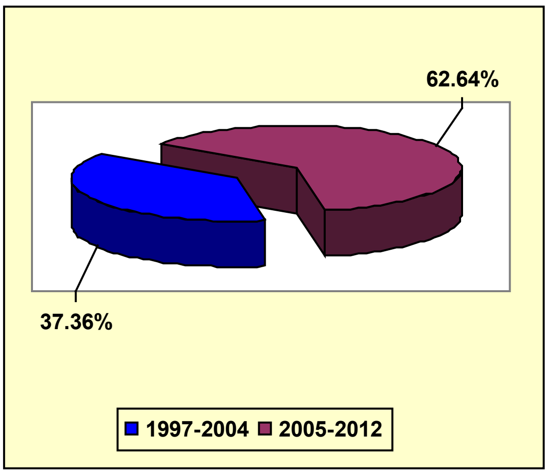

Figure 5. Share of passengers in the overall international traffic in the period 1997-2012.

A comparison of the cruise passenger traffic with the overall international passenger traffic in the Port of Split from 1997 to 2012 results in interesting information if the observation period is divided into two equally long sub-periods (eight years each), see Table 3. As for the overall international passenger traffic during the first sub-period (from 1997 to 2004), it can be noticed that the cruise passenger traffic made only 2.35% of the overall international passenger traffic. From 2005 to 2012, however, there was a considerable increase in passengers travelling onboard cruise ships compared to other forms of passenger traffic. During this eight-year sub-period, it amounted to amazing 20.86% of the overall international passenger traffic (just a few percents below the total of 23.21% achieved throughout the entire observation period, from 1997 to 2012).

Table 3. Total passenger traffic in the Port of Split in the period 1997-2012.

Year	1997 – 2004		2005 – 2012		1997 – 2012	
Cruise traffic	118,151	2.35%	1,046,745	20.86%	1,164,896	23.21%
Other international passenger traffic	1,757,066	35.01%	2,096,903	41.78%	3,853,969	76.79%
Overall international passenger traffic	1,875,217	37.36%	3,143,648	62.64%	5,018,865	100%

While the traffic of passengers onboard cruise ships in the Port of Split increased by 18% over the past eight years, in comparison with the previous sub-period, other international passenger traffic increased by only 6%. This clearly indicates an increasing flow of cruise ships and their passengers in the Port of Split. Figure 6 shows the growth of cruise travel passengers in comparison with the other forms of the international passenger traffic, both throughout time periods and totally.

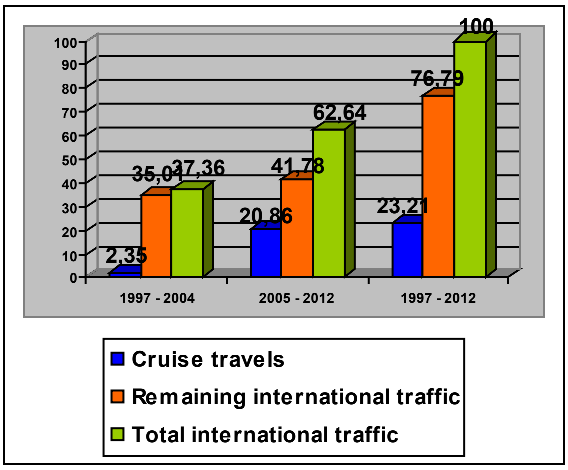

Figure 6. International passenger traffic in percents, from 1997 to 2012.

CONCLUSION

The 2003 Maritime Domain and Seaports Act settled the foundation, management structure and activities of port authorities as non-profit legal entities. In pursuance of this Act, the Croatian government established the Split Port Authority in 1997, for the purpose of managing, constructing and using the port of Split. Port authorities are one of the essential factors in efficient flow of maritime traffic in the entire port system of the Republic of Croatia. Therefore the port authority's activities are exceptionally important not only for the very port but also for the flow of the entire sea traffic. In the past decades the significant increase in calls in Croatian ports, particularly the cruise ships' calls, has particularly affected the boost in port activities. By coordinating all port activities in a high-quality way, the port authority achieves a better competitiveness of the port on local and international markets.

Croatian legislation framework, defining the rights, obligations and relationships associated with cruise travels, is mainly satisfactory. Croatia has signed and ratified all major international conventions and is continuously observing legal regulations at the international level.

However, limited port capacity and facilities present a major problem and it is necessary to additionally redesign the seaports for the accommodation of cruise ships. Since its foundation the Split Port Authority has been successful in recognizing new trends in global tourist travels. It has been conducting the project of upgrading and enlarging port capacities. The completion of the project will result in larger port capacities and the possibility to accommodate larger vessels carrying more passengers.

Intensive promotion of the Port of Split, participation in specialised fairs and membership in international port associations have led in making the port an increasingly appealing destination for cruise ships. The number of such vessels arriving to the Port of Split has been rising constantly, and the season has been extended towards December. In just a few years the number of cruise ship calls has increased from thirteen to almost three hundred per year.

Almost 1,165,000 passengers onboard cruise ships called at the Port of Split from 1997 to 2012. Over the past eight years (2005–2012) the cruise passenger traffic increased by approximately nine times in comparison with the previous eight-year period. When observing the share of cruise passenger traffic in the overall international passenger traffic in the Port of Split during the observation period, it can be noticed that from 1997 to 2004 the cruise passenger traffic amounted to only 2.35% of the overall international passenger traffic, whereas from 2005 to 2012 the cruise travel flow grew considerably, making 20.86% of the overall international passenger traffic. While the traffic of passengers onboard cruise ships in the Port of Split increased by 18% over the past eight years, in comparison with the previous sub-period, other international passenger traffic increased by only 6%. This clearly indicates an increasing flow of cruise ships and their passengers in the Port of Split, and their significant share in the overall international passenger traffic.

REFERENCES

[1]Lučka uprava Split, Strategija razvoja splitske Gradske luke (*Development strategy of the Port of Split*), Split, 2005.

[2]Marušić, Eli; Mandić, Nikola; Škiljo, Marija, Utjecaj Lučke uprave Split na razvoj kružnih putovanja, 1st International Maritime Science Conference (IMSC), Podstrana, 2008.

[3]Naredba o razvrstaju luka otvorenih za javni promet na području Županije Splitsko-dalmatinske, Narodne novine, No. 102/96, 37/98, 3/02 and 112/03.

[4]Odluka o osnivanju Lučke uprave Split, Narodne novine, No. 45/97, 155/98 and 72/11.

[5]Pomorski zakonik, Narodne novine, No. 181/04, 76/07, 146/08 and 61/11.

[6]Studija održivog razvoja kruzing turizma u Hrvatskoj (*Study of sustainable development of cruising ship tourism in Croatia*), Institut za turizam, Zagreb, 2007.

[7]Šamanović, Josip, Nautički turizam i management marina, Visoka pomorska škola u Splitu, Split, 2002.

[8]Tomašević, M., Ristov, P., Stanivuk T., Metodologija znanstvenog istraživačkog rada – statističke metode u istraživanju, Pomorski fakultet Sveučilišta u Splitu, Split, 2007.

[9]Uredba o razvrstaju luka otvorenih za javni promet i luka posebne namjene, Narodne novine, No. 110/04 and 82/07.

[10]Uredba o uvjetima kojima moraju udovoljavati luke, Narodne novine, No. 110/04.

[11]Zakon o morskim lukama, Narodne novine, No. 108/95, 137/99 and 97/00.

[12]Zakon o pomorskom dobru i morskim lukama, Narodne novine, No. 158/03, 141/06 and 38/09.

[13]www.portsplit.com, official web-site of the Split Port Authority, 2013 [access: 2013-03-14]

BIOGRAPHIES

Tatjana Stanivuk was born in Split, Croatia, in 1970. In 2012 she received her PhD in Economics Mathematics and Statistics from the Faculty of Economics at the University of Split, Croatia. Since 2007 she has been employed at Faculty of Maritime Studies in Split, where she is currently holding a position of a Senior Lecturer.

Nikola Mandić was born in 1985 in Split. He has graduated at the Faculty of Maritime Studies, University of Split, in 2007. He completed a post-graduate course in the Maritime Law and Law of the Sea at the Faculty of Law, University of Split, in 2010 and received a Master's degree (the title of thesis: Contract of Maritime Agency). From the year of 2008 he is employed at the Faculty of Maritime Studies as an assistant in courses: Maritime Law, Maritime Property Law, Maritime Law and Average, Maritime Agency and Forwarding and Contracting in Maritime. From the year of 2009 he cooperates with University Department of Marine Studies, University of Split, in the course of Maritime and Fishing Public Law. He participated on fifteen scientific conferences and also has published around twenty scientific papers. He is a member of Croatian Association of Maritime Law.

Tonći Tokić was born in Split, Croatia, in 1965. He graduated in nautical studies at the Faculty of Maritime Studies in Split. He has over twenty years of working experience in the maritime industry. Since 1994 he has been employed as a Master on merchant vessels (oil and chemical tankers and LNG carriers). From 2001 on he has held various positions as Senior Manager.

TRANSFER OF LNG CARGO AT INTERMEDIATE LOCATIONS

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ABSTRACT

The main objective of this paper is to carry out an analysis of LNG cargo transfer at intermediate locations. Two different ship designs are used for the analysis. In ship-to-ship transfer concept (STS), cargo transfer is performed side-by-side providing a relatively easy and to some extent proven alternative of cargo transfer between two different types/designs of LNG carriers. Shuttle ships should be dimensioned so as to be able to feed the transportation programme, and specifically equipped for ship-to-ship operations. Specially designed cargo equipment on one of the ships could use proven techniques to produce ongoing results on ordinary sized transfer lines. Such an arrangement, e.g. four loading arms, one of which is used for vapour, would represent a considerable investment onboard any ship. Typically, such arms would still be exposed to the relatively high heat transfer through their non-insulated parts as the liquid flows. One of the economic shortcomings is the loss of cargo during the cargo transfer due to an increased boil-off and flash gas. There are no published figures available regarding the cargo loss, but it is assumed to be excessive.

KEY WORDS

transport. LNG cargo transfer. ship-to-ship. cargo equipment.

1. INTRODUCTION

During the past few years several ship-to-ship cargo transfer operations have been successfully tested. By now (2012) some 70 commercial cargo transfers have been performed. The necessary procedures and special flexible LNG hose techniques have been developed by several companies, both shipping companies and equipment manufacturers.
The first LNG cargo transfers were performed between long-haul LNG carriers and stationary regasification ships which were either modified from ordinary LNG carriers or built specifically for the purpose. In any case the procedure of cargo transfer between any form of LNG carriers does not differ much from the below described procedures. Guidelines and rules have been shaped to set requirements for improved safety, standardization of equipment, their testing and procedures.
It can be stated that the ship-to-ship (STS) concept provides an easy an already proven alternative both in case of transfer between two different types of LNG carriers as in the case involving the optional trade pattern in question. It is worth noting that the size of shuttle ships and the fleet members of ordinary long-haul ships shall be satisfactorily close to each other.

2. DURATION OF THE SHIP-TO-SHIP TRANSFER OPERATION

As the result of practical exercises in cargo transfer between ships being moored alongside, it is estimated that the duration of the whole procedure may take 45 hours. The duration does not include slow speed approaching to and leaving the transfer site. It is assumed that the cargo transfer takes altogether 45 hours; the assumption has been used for the purposes of the respective transportation analysis in this study.
The cargo transfer procedure comprises the following phases (a proven example, according to Excelerate Energy presen-tations):

- Rigging fenders 1.0 h
- Approaching & manoeuvring at close distance 1.9 h
- Mooring 1.9 h
- Pre-transfer safety procedures, meeting 1.0 h
- Connecting flexible hoses between ships 2.5 h
- Hose purging (inerting), cooling down 4.0 h
- Cargo transfer (pumping) 25.8 h
- Hose drain and purging (inerting) 2.0 h
- Disconnecting of flexible hoses 2.0 h
- Release of the mooring lines 0.9 h
- Separating the vessels 0.3 h
- Recovering and fixing of fenders 1.0 h
- Total time 45 h

Attention is drawn to the actual cargo pumping time which is 70% longer than regular cargo loading or unloading time. This is due to the reduced pumping capacity that is applied during cargo transfer. The limiting factors include heat ingress through transfer hoses and excessive boil-off resulting from an increase in tank pressure (see Figure 1 and Figure 2).

Figure 1. LNG transfer at open sea [6].

Figure 2. LNG transfer at open sea [6].

3. TECHNICAL ISSUES OF LNG CARGO TRANSFER

Development efforts are being made by several companies and related parties to improve the cargo transfer safety, time and economy. The flexible cryogenic hoses applied in the first experiments were designed for the single use only which was absolutely intolerable in the long run. Later the hoses have improved to last five or ten times and

have been subject to regular testing and inspection.
Owing to high costs and ease of handling the special hoses are often "half-sized" and doubled in number between the flanges on both sides of the transfer operation. The shortcoming of some hose types is gas-freeing as their multi-layer internal surface allows permeability. Gas freeing of such hoses may take several hours.
One of the economic burdens is the loss of cargo during cargo transfer due to an increased boil-off and flash gas. No published figures are available but the loss is reportedly excessive. The boil-off gas is generated to such a magnitude that neither of the ships can consume the gas for some useful purpose. Therefore the surplus gas is destroyed by a gas combustion unit or, if the receiving ship is steam driven, the gas is burnt in its boilers and converted to steam. The surplus steam is then dumped. In any case, the ability to deal with excess gas can limit the cargo transfer capacity [3].
With regard to today's equipment and procedures, a typical maximum capacity of an LNG transfer is about 10,000 m3/h. In practice this leads to well over 20 hours of the actual cargo pumping only. The cargo transfer is time-consuming because the available flexible hoses are of small diameter and the excessive boil-off gas generation during cargo transfer exceeds the pumping capacity [1].
It is difficult to state any figure or share of the lost methane as there are many factors affecting the boil-off during cargo transfer. Agitation of the LNG cargo by pumping, reduced hose diameters resulting in long transfer times, throttling of liquid lines and LNG circulation, multiple hoses adding heat transfer surface, temperature of upper tank parts of the unloading and those of the receiving ships, ambient temperature, capability of the cargo tanks to tolerate increased vapour pressure - all these factors have an effect on the cargo boil-off during transfer.
The side-by-side STS transfer concept provides a relatively easy and, to some extent, a proven alternative, both in case of transfer between two different types of LNG carriers as in the case involving the optional trade pattern in question. It is worth noting that the size of the shuttle ships and the fleet members of ordinary long-haul ships shall be satisfactorily close to each other [2].
Shuttle ships shall be dimensioned to be able to feed the transportation program and specifically equipped for the ship-to-ship (STS) operation. Among other features, this additional outfitting comprises special flexible cryogenic hoses between the two ships and the indispensable large sized air-filled fenders between the ships moored side by side. The flexible hoses need to be fitted with an emergency release coupling part like the stationary loading arms. Additional safety lines are needed to prevent the release coupling part from hitting ship's side when opened. The hoses shall have saddle supports on both ships [4].

3.1. Optional equipment and methods

Specially designed cargo loading arms in one of the ships might handle ordinary sized transfer lines using long lasting proven techniques. Such an arrangement, e.g. four loading arms, one of which for vapour, would represent a considerable investment onboard any ship. Typically, such loading arms allow relatively high heat transfer to the liquid through their non-insulated parts (see Figure 3).
Specially designed "marine type" loading arms with improved flexibility and certain mechanical aids for targeting the connection have been developed for offshore use where the ship's movements at open sea condition are more pronounced compared to sheltered gas terminal conditions [5]. Typical applications include floating LNG production units and the cargo transfer facilities between the LNG carrier and the so-called Ground Based Structures.
A totally different approach could be the STS transfer via a jetty where both ships would be resting on opposite sides of the jetty. The pipeline connections over the jetty would engage the sets of ordinary or marine type mechanical loading arms, depending on the state of the waters. Alternatively both ships could be lying alongside a long pier like at a gas terminal but without intermediate storage capacity [8].

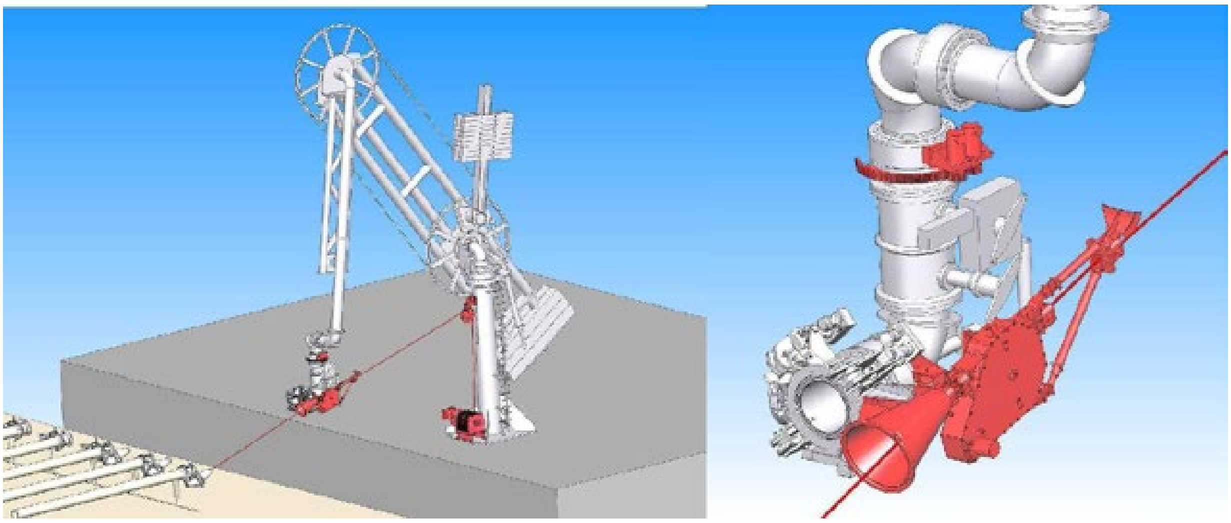

Figure 3. A special LNG loading arm structure for marine use with special rope targeting device [7].

4. NUMBER OF SHIPS REQUIRED FOR DEDICATED CARGO PER YEAR TRANSFER

The number of vessels varies depending on season. In order to describe this dependence and provide conclusions, the following part of this paper includes simulations.

Figure 4 shows a vessel with the capacity of 205,000 m3 which is required for conveying the nominal cargo quantity within 12 months. It can be noticed that the number of vessels fluctuates depending on the four seasons and on the season of maximum LNG export. For transferring the same nominal amount of cargo over the same period (as in Figure 4), Figure 5 shows the number of ships featuring less capacity, i.e. 183,000 m3.

It is obvious that the smaller capacity implies larger number of vessels and, consequently, higher LNG transport costs, proportional to the number of built units.

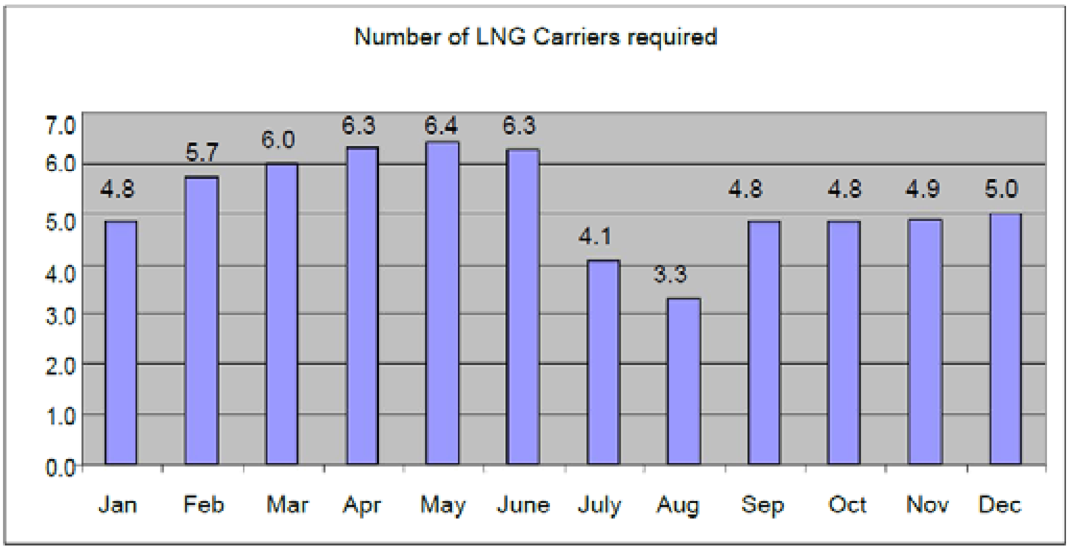

Figure 4. 205,000 m3 LNG carriers.

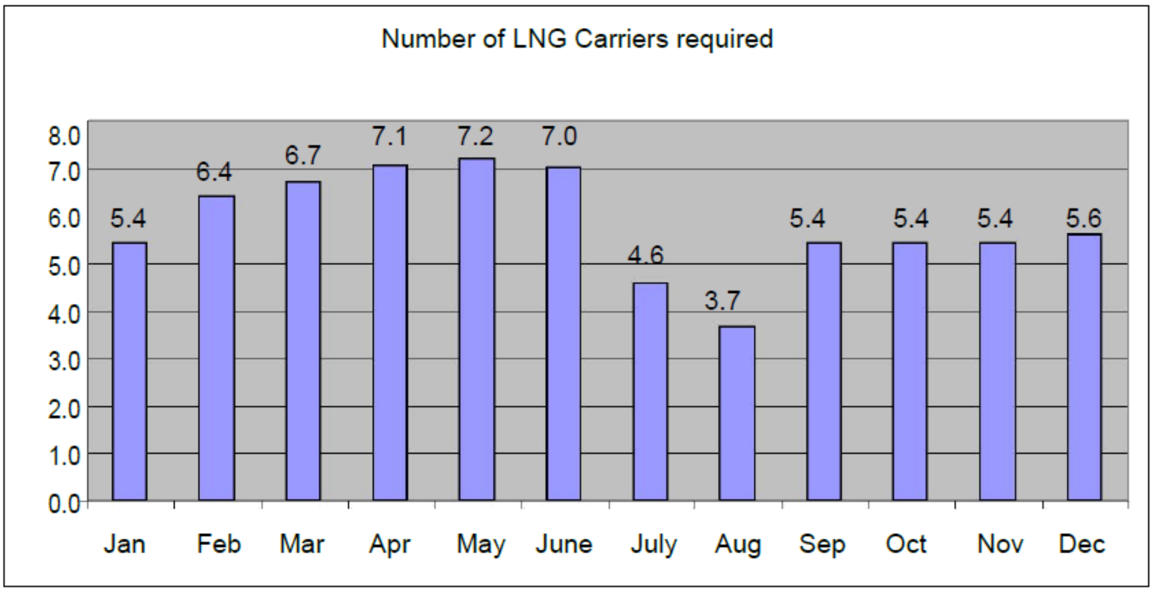

Figure 5. 183,000 m3 LNG carriers.

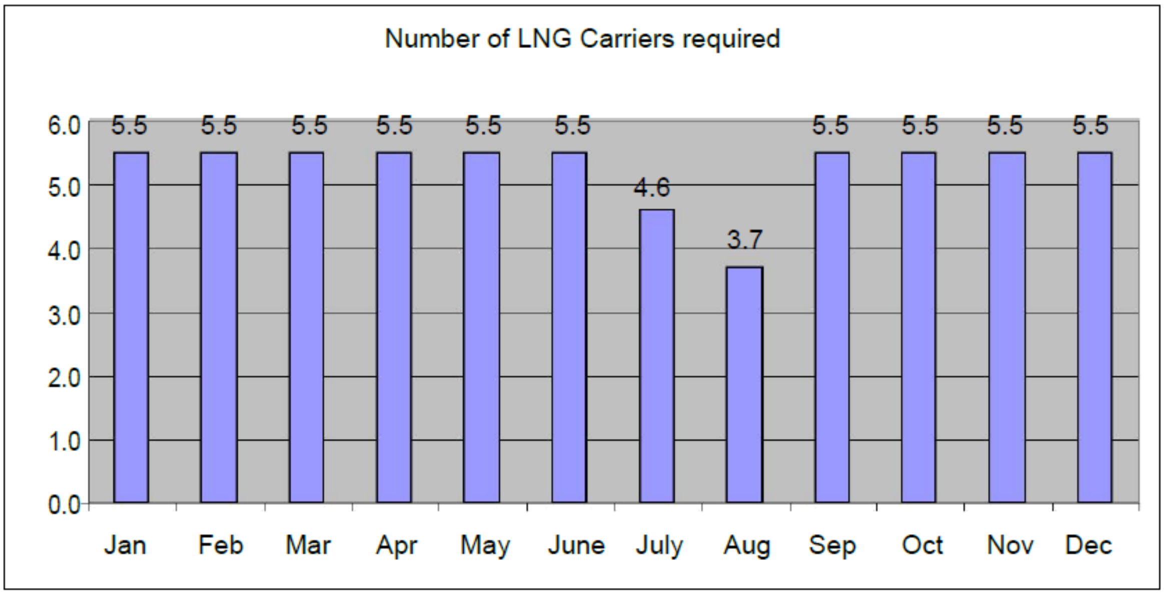

Figure 6. Number of Q-flex type LNG carriers required (example U.S.A. coast)

Figure 6 shows an estimated number of Q-flex type ships required for LNG transport from load ports to import terminals. The cost estimate is based on 280 million USD ship price.

5. CONCLUSION

The first ship-to ship (STS) transfer system for LNG deliveries was developed and implemented in 2005 in order to optimise the capabilities of regasification vessels and to provide a continuous supply to market. The system also resulted in considerable cost cuts during LNG transportation. Namely, LNG delivery operations imply significant losses that may be reduced by using special techniques related to the regasification. This approach presents a viable solution that enables the continuous market supply. The STS transfer system has been commercially accepted and applied to a variety of natural environments including offshore locations that lie between LNG load ports and market delivery points. Naturally, the LNG transhipment would be easier and safer at solid terminals under certain circumstances, e.g. in heavy weather conditions. It is exactly this issue that the paper deals with in more detail, so that simulations have been made for vessels operating in the same periods of the year but having different capacity. It can be noticed that, depending on the season, more vessels fearing less cargo capacity are required for the transhipment of the same amount of LNG which, eventually, results in higher transportation costs. Companies dealing with LNG have been increasingly adjusting to the market in order to meet the requirements of supplying their end users with LNG on time. Therefore, it is essential for these companies to define and plan the needed number of LNG carriers in advance, taking into account the requirements of specific markets as well as the season when the transport is performed. However, it is here important to note that the STS operation requires skills and expertise. The practice has become commonplace in other industries such as crude oil for many years and is now becoming recognised as efficient and safe in LNG industry as well. Slowly but surely, this market has become more flexible, particularly in the past few years.

REFERENCES

1.Beck, R., "Improve decision-making for LNG projects via an integrated technology", Hydrocarbon processing (July 2011).

2.CH – IV International, Safety History of International LNG Operation (2002).

3.Chan, A., Hartline, J., Hurley, J. R. and Struzziery, L., "Evaluation of liquefied natural gas receiving terminals for Southern California", University of California, Santa Barbara (2004).

4.Evans, M. and M. Gentry, "Optimizing LNG Plant Design and Operations with Aspen HYSYS and Aspen MUSE," AspenTech User Conference (May 2009).

5.Gucma, S., "Simulation methods in LNG terminal design", Scientific Journals Maritime, University of Szczecin, 25 (97), pp. 28–34, (2011).

6.http://www.tno.nl/content.cfm?context=overtno&content=nieuwsbericht&laag1=37&laag2=2&item_id=2012-12-17%2009:01:47.0&Taal=2

7.http://www.fmctechnologies.com/

8.http://excelerateenergy.com/news/excelerate-energy-performs-200th-ship-ship-transfer-lng [accessed: 2012-12-12]

BIOGRAPHIES

Tatjana Stanivuk was born in Split, Croatia, in 1970. In 2012 she received her PhD in Economics Mathematics and Statistics from the Faculty of Economics at the University of Split, Croatia. Since 2007 she has been employed at Faculty of Maritime Studies in Split, where she is currently holding a position of a Senior Lecturer.

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Ines Kolanović was born in Rijeka, Croatia, in 1974. In 2010 she received PhD degree in Technical Science, field – Technology of Traffic and Transport, form the Faculty of Maritime Studies, University of Rijeka. Since 2010 she has been employed as Assistant professor at the Faculty of Maritime Studies, University of Rijeka. She is member of various societies in the field of the traffic and transport.

Socio-psychological aspect of life, work and relationships seafarers

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ABSTRACT

In this paper, titled Socio-psychological aspect of life, work and relationships seafarers, will attempt to show systematically sociological relationships within marine group with particular emphasis on the uniqueness that characterizes the vocation of a seafarer. Particular attention will be dedicated to the fact of separation of seafarers from the environment in which live their families and friends, as compared to other vocations is what makes seamen really special vocation. Another factor of seafarers unique profession is the workplace/ship, it again in a special way in the sociological sense of the interconnection of crew members that emphasize the special marine profession.

KEY WORDS
socio-psychology, sailors, family, friends, boat, sailing, crew

1. INTRODUCTION

According to the personal experience of contact with sailors and seamen to him who say on Internet forums for seafarers, it was shown that the sailors do not recognize the writing and speech of people including experts on seafarers and maritime profession as such, who did not personally experience life and work in the maritime profession.

For this reason, and out of respect for the sailors generally sailor by vocation, this paper will primarily rely on these sources - personal interviews with the sailors, as well as Internet portals manifest sailors about himself, his vocation, his life in the sea.

In that sense, we're going to bring a part of the research for this study conducted among sailors existing at further education and training at the Faculty of Maritime Studies.

Few would have been one book and it should be a lot of words to write in how much they wanted to highlight the difference between life and work of the sailors live and work on the land. Perhaps thinking of the words that follow in this article contribute to a better understanding of socio-psychological aspects of work and life of seafarers!

Given the well-known saying of 'Bread with seven corps' insufficiently familiar with the life and work of seafarers will wonder why they decided to call this 'bread crust with seven' (separation from family, friends, country, ..) if is it so hard?

The answer could be in the famous aphorism, "Navigare necesse est ' - or rather how we're talking sailor friend said,' is simply a love of the sea and the job 'and then added' I can not mention another reason for a it's better earnings! '

The above factors in our modern era of globalization and the general economic crisis should be added the problem of finding jobs is a job that can provide security and earn a decent man.
With the possible misinterpretation of seafarers, maritime profession and the profession is another famous saying which can be heard among the people of the mainland and even from friends or even relatives of seafarers and that is 'easy to them ...'! Is it really that - is it really easy to them - sailors?
The answer could be in the following fact: if you take the average working life of a seaman who has spent 30 years at sea, how much of that time would be spent with his family? Probably around half of the time 15 years to seaman spent with his family, maybe less. In order to obtain exact data should take into account a number of factors which might affect the final number of years.
In this prospective fifteen year period of absence from his family most sailors have children who are already grown up, and it is difficult to know them because they did not have the time or the chance to meet. Each of their birthday, their every cry or joy not had the opportunity to live and be with their children because they have been separated from family togetherness. After all that has been said above should be repeated once again imposed a saying 'It is easy to them ...', wondering - is it really easy to them - sailors?

2. SOCOPSYCHOLOGICAL ASPECT IMPACT OF GLOBAL CRISIS ON POSITION AND VOCATION SEAMEN

Travelling every seaman, and thus, Croatian, vividly illustrates the idea that life is a novelist. Uncertainty navigation, family expectation of information from the distant sea and adaptation to terrestrial life are components of the rolling sea days and nights. Sailors now harder to come by boarding, which are forced to stay longer on the land. It brings into question the existence of the family and creates a high level of uncertainty. This is particularly true for lower-ranking crew, where cheap labor from underdeveloped, mostly eastern countries, flooded the market and knocked the price of labor. In better cases present a wage freeze and other social rights, but worse followed by a pay cut and layoffs. Croatian shipping is less and sailors through authorized agencies seeking boarding the "foreigners", but that is nothing new.1
Sailor who can not find work and are forced to pay taxes because they failed to meet the required number of days. Although the idea of inclusion seaman in the healthcare and pension insurance is basically a good, because it should provide a level of security and protection of seafarers and their families, its application in practice has shown all the flaws of our government, that the administration despicable aggravated already difficult placement of seafarers. Shipowners have long organized at a global level, as well as union response must be global. Small and disconnected sailors have no chance to fight against multinational companies and shipowners who have only one goal - profit. The company seaman considered cost as fuel or depreciation. Seaman, especially Croatian, trained and quality seafarer's value, not cost.2
Also present phenomenon "escape" from the ships in the so-called national so-called: Cheap registers. Unfortunately, these examples we have some Croatian shipping company, which then changed to a Croatian side crew (eg, Filipino).3

3. SEAFARERS IDENTITY – SOCIOPSYCHOLOGICAL ASPECT

What determines the emotional adult?? In addition to the general socio-characteristics that determine and affect the person's identity and personality individual in a special way to the identity of an individual affects his family, his profession, which deals with as well as his family.4

[1] By: Kapetan Slavica Ivica; Column Life Seamen, available online at: http://www.pomorac.net/portal_izprveruke/kolumna-adrijan-susa/3011-kolumna-zivot-pomorca (23.06.2012.)
[2] Compare: Tomislav Neven Sovagovic Melvan, Chairman of the Central Committee of the Union of Croatian Seafarers Seafarers should soften bread with seven crusts, available online at: http://www.glas koncila.hr (23.06.2012.)
[3] Same as before.
[4] Compare: Bread with seven crusts – invisible wounds of life seafarers, available online at:

All of the above can be applied to the identity of the sailor with one significant difference concerning the seafarer and his family. The key question that arises when it comes to the seafarer and his family is the problem of affirmation seafarer husband and father? More than a known fact that benchmarked mariner-family missing seaman daily affirmation as a father or husband. Separation of families caused by workplace seaman - boat - reduces the possibility of full affirmation seaman as a father and husband family. Given the circumstances of the absence of a seafarer family can somehow minor talk about his role as a father and husband. At the same time a family that was forced to land to get used to his absence and organize their lives without the essential role of father and husband. However, at a time when the sailor is at home or when hi is not navigating, so his 'visit' home is not enough to assert itself in the role of a father and his wife, who normally belongs as an important member of the family.5 Because their identity and belonging in the family role seafarers are not able to fully realize that identity is trying to find a way to achieve in his career and secure positioning among the crew on board.6

In the above given conditions sailor was forced to be dependent on intermediaries for him to represent the company. Thus, its direct intermediary between him and the employer (company) is superior to his commander. Rarely are occasions when the seafarer individual may apply directly to the employer, the more you can eda sailor spends a period of time and even life without ever personally do not know of his employer or owner of the company. In one word, the master is the one who mediates in economic affairs and relations between the seafarer and the employer.

When it comes to mediation outside the ship then these are officers of certain organizations or officials of the company who in the name and for seafarers performing administrative tasks. In addition to these agents, there are those outside the ship and the company and they occur in the form of welfare officials, religious person, trade union or charitable organizations who can have mediation in relation to family or country.

Numerous contacts with foreigners are more interested seaman-national than it is in other professions. In these circumstances, sailor showing his identity and acts as a representative of the nation and the society from which it came. The nation is an important part of their identity seaman.

4. RESEARCH: SOCIAL PSYCHOLOGICAL ASPECTS OF LIFE AND WORK OF SEAFARERS

Survey questions dealing with the personal problems seafarer as a individual (in some sense trying to be in your personal life to discover the identity of the sailor in relation to his family and closest environment); The questions asked respondents could answer marking one or more answers. The opinion poll was anonymous in the premises of Maritime Studies in Split.. Research conducted with the sailors who attend 'Special Education Program for seafarers' in the two-semester academic 2011./2012 period. year. Just as some sailors attended a special program by participating in completing the survey. Here it is necessary to emphasize the specificity of the survey because, as noted above it was a single or small group of seafarers (5-10 seamen) that given the free time attending a special program. This usually happened when the sailors are not on board, that is, when not sailing. In that sense, it was difficult to get to a certain number of relevant subjects so for this study surveyed 77 sailors.7

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http://www.pomorac.net/portal_sedmakora, (15.06.2012.)

[5] Same as before.

[6] Compare: Pavić, B.; Sailors women available online at; http://www.pomorac.net/portal_izprveruke/kolumna, (15.06.2012.)

[7] The survey questionnaire consisted of the author of this article (Andrija Nenadić) - questionnaire available from authors.

1.Question: Because of the specifics of his profession seaman; I feel the lack of affirmation as a father:

Table 1. As a father:		
	I am fully endorsed as a father	29
	Partial I affirmed as a father	44
	I can not even establish themselves as father	2
	Unmarried	2

Respondents in the first section (Table 1.) question about affirmation as the father 29 said that they were fully affirmed as a father. To partially affirmed us as a father claims 44 subjects. I do not affirm considered as the father of three subjects, while two of them identified themselves as single.

2. Question: Because of the specifics of his profession seaman; I feel the lack of affirmation as a husband:

Table 2. As a husband:		
a)	I fully endorsed as a husband	38
b)	I affirmed in part as a husband	35
c)	I can not affirm as husband	2
d)	Unmarried	2

The second section (Table 2.). Questions about afrimiranosti as husband respondents fully to affirm themselves as husband considers 38 of them, for a partial affirmation 35 respondents identified themselves as not at all to affirm themselves as husband considered only two subjects and two others pleaded that unmarried.

3. Question: Sense of alienation in the position sailors felt:

Table 3.		
a)	According to family	63
b)	According to friends	21
c)	According to colleagues	11
d)	According to someone else (the state, everyone, anyone)	23

On the question of alienation seaman (Table 3.), in the third issue of the respondents answered yes to these 63 families feel alienation, while the friends feel the same 21 subjects according to colleagues alienation felt 11 responders. According to another - the state of alienation is declared 11 responders and by all of the above stated sense of alienation also responders 11. Only one respondent said that the alienation felt neither anyone.

4.Question: In the case of social neafirmiranosti in his profession sailor looking for assistance in:

Table 4.		
a)	Friends	15
b)	Priest	3
c)	Maritime Organization	2
d)	Intermediary company	45
e)	Someone else (internet, wife)	16

When it comes to the social rank of seaman neafirmiranosti respondents to a question asking for help where they answered as follows (Table 4.). To seek help at a friend said 15 respondents while only three of them turn to the priest for help and advice. Maritime organizations to help address the two subjects as many as 45 addresses the intermediary company. For a possible answer to help pay for someone else, anybody out 11 respondents, one respondent argued that seeking the help of the internet, while four of them seek help from his wife.

Partial results from a study among the sailors show the complexity of professional seaman. First of all, the results show and confirm that seaman alienation from family, friends and environment seaman. In addition to the complexity of family, friends evident fact that these relationships are complex and among the members of the crew boat. In conclusion it can be said that the sailors forced into these complex relationships manage as best achieved possible. In all of these sailors were left to themselves.

The positive aspect is that through modern media (especially the Internet) seafarers are increasingly joining (solidarity associations, unions of seafarers, ...) and in this way, working together to point out the problems of seafarers and the possible solutions for seafarers.

5. SOCIAL STRUCTURE ON THE BOAT – POSITION, SALARIES, GATHERING AND PROGRESS

Positions on the board with respect to the total number of crew members can be divided into five groups according to: rank, position, salary, duty, and gender. Placements determine work schedules, meals and living and accommodation (room on the boat). The commander has a special status. His responsibility is particularly acute in many aspects of their work. All mail on the ship passes through his hands. The right to eat of the commander has the chief engineer, and deck officers do not have that right. Chief mate has a higher authority than the first engineer officer. Neither of the two officers in a parallel hierarchy have the same rank. Three officers on board and three officers of the machine are divided into three duty. Yet the pyramid of authority is relatively narrow. In industrial workers is the main difference between the worker and foreman. On board there are several ranks, five on five on the engine deck.

Rating is based on the seniors principle and depends on years of service in the profession. Among the crew are current informal norms that prohibit the careerist cringe order to gain trust. Possible favoritiziranje between groups within the crew usually has a negative impact on the overall relations on board. And the officers and crew of grown anti-favorites norms that help them to preserve objectivity. Rank among officers expressed the uniform, but it does not hold entirely for machinists. Among the officers there are significant variations in the use of uniforms. Meaning uniforms outlined sailor when it binds to its identity, and know is his position on the board.

Wage system on board is different. The overall budget for base salary enters several elements: working location, age, type of cargo being transported, the size of the boat, machine, etc. This type of climate can be added to overtime even though in principle it would be need. The system of payment is usually such that there is no doubt as to whom it belongs. On these general grounds for wages may be disputed, but it is rarely staged. Payment problem causes great divide between the sailors and officers and staff of the deck and engine personnel. On both sides there is a certain sense of injustice. Many think that the issue of salaries is so volatile that it should not be to lead a normal discussion, and it is not certain that from such a discussion may follow anything useful. On the one hand there are different payment systems, which can be evaluated from a different perspective, on the other hand very few people on the board have the same salary and equalizing the payment is excluded as a basis for the formation of collective solidarity ship.

Shaping a more compact system hinders collective duty or watchmen. Duty not to allow contact between members of similar rank, because they are on duty at various times. This means that once in office, others are resting and just do not have the opportunity to each other communicate more. Only when you can hang out in the breaks for eating in the living room, which is usually enough for the emergence of confidential relationships. On the other hand, the duty creates a constant contact between certain officers and certain members of the crew. On the whole duty to prevent partial contacts develop into intimate personal relationships. At the disruption affecting friendly ties and differences in rank and age differences between people on board.

At the top positions on the board coming up starting from lower positions. Commander, first officer and chief engineer have once been members of the crew. The crew of the two categories of sailors: those who will become officers and those who will never be more than a sailor. It may seem that way from the lower and the lowest to the highest position creates a huge amount of tension, but this is not so because progress does not happen on the same boat. When management improve a sailor or employee of the machine, leaving upgraded with a higher rank to another ship and the crew of the ship does not call into question the authority of government and no special emotion experienced improved in the upper range. It is also

considered that somebody going to school and the successful completion of the school being promoted.
Being a sailor permeates and encompasses the whole personality of the individual. Man is capable of doing on the boat must meet this interest. Seaman unless it needs to be able to overcome all the technological requirements of his position, but claims to know and general maritime culture and the culture of marine communities. It can not be taught in school.
Questionable assertion that the marine business that brings a lot of money, as it is usually considered with respect to the victims and sacrifices that carries rank seaman.
'The term a lot of money is a relative thing'. Fifth four sailors are generally paid while they are on board. Were home when they have no income, no guarantee he will be back on board the ship. Happy fifth is paid and the ship and home, but they also job more demanding and difficult.8
"One has to ask why the private ship-ready, the master, to pay off cc. 7600.00 euros per month on a container ship or the commander of the boat that gas and chemical loads even 10000.00 euros and more. This is a big responsibility crew boat - boats multimillion measured values (tens of millions of euros) as well as the measured values multimillion goods transported by ship.9

6. MARITIME LIFE TODAY IN LIGHT OF SOCIAL RELATION

Life sailors really hard because besides separation from family and friends, sailors have more work to IAS as a high-tech advances in shipping and increasing the responsibility of seafarers. The crew was reduced to some 36 members, ten years ago, only 18 which is the current average per boat. Business has remained the same, while wages rose only 20% in that same time period.
If we take for example the boarding container ship MSC, which goes Europe-China, for six months there is a possibility to pass sixty where the seaman, if ga presumed deserted, succeed to get only up to a Seaman's Club and possibly three times in Chiwan, Singapore and Valencia. Given that the working time on board 10-12 hours, you will hardly be out longer than 3-4 hours at best.10
During those six months on the board, it is possible, "still have twenty days of severe storms and a pitching ship, because if it flies in the winter it is a staple of the Mediterranean and the North Atlantic, and if it is summer, possible SW monsoons in the Indian Ocean and typhoons over China.
As for the fears and dangers that are possible during navigation then it depends individual experiences and overall unit seaman crew, board of the kind that flies and navigation area. It is normal that there is always the fear that your employer does not call for a re-loading due to cheap labor from the east. Also, there is a fear of injury during the performance of work on the ship, bad weather, from pirate attacks, fire or explosion on board ship collisions and groundings.
Opinion which prevails among sailors that have always left alone. It is difficult to interest in the individual and his family. A particular problem is the realization of social rights of our seamen in their homeland. From the first January 2008. in applying the mandatory registration and insurance compliance to health and pension insurance and regulation of tax return compliance. Rule of 183 days (that binds the seafarer to pay taxes in Croatia if fewer days spent at sea) was successfully changed to the Account these and days spent in traveling and training. Today, in a recession and increasingly severe employment, it is a rule specifically pushed to the absurd.11
So the reality is that the sailor finds a job through an authorized agency in Croatia, mostly they paid money for the insurance companies more peaceful age, treated at its expense (and will probably wait for a review of several months, which is the case in

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[8] By: Šuša, A..;Free time and " easy" to them, available online at: http://www.pomorac.net/portal_izprveruke, (06.26.2012)
[9] Same as above.

[10] According to:Kap.Slavica, I.; Life in the Maritime 30 years navigating only 12 years at home, available online at: http://www.slobodnadalmacija.hr/Split/tabid/72/articleType/ (26.06.2012.)
[11] By: Tomislav Neven Sovagovic Melvan, Chairman of the Central Committee of the Union of Croatian Seafarers Seafarers should soften bread with seven crusts, available online at: http://www.glas koncila.hr, (25.06.2012.)

the Croatian health system, because what if it does not fulfill 183 days).12

Number of seafarers in Croatia unfortunately decreases. Official data from the Ministry of Maritime Affairs-it's talking about 25 000 sailors, mostly officers. We have witnessed, in spite of the scholarships that are offered in enrollment in secondary or higher naval school, the number of interested is getting smaller. It's in today's totally understandable. Seaman pays excessive prices in separation from family and a demanding job, and in return gets the job insecurity and a very uncertain future. Economic calculation is less talk in favor of navigation. 'I'm a father and I was happy that my child decides to maritime profession, because I know how much sacrifice it demands.'13

Solidarity is the key word in the maritime industry. Solidarity among the seamen, solidarity among the different crews of ships under different flags. That the sea has no solidarity, no maritime tragedy would have been much higher. Sailors know it and are always ready to help regardless of the price.14

The Croatian Sailors' Union exists and the Solidarity Fund, which helps those that health and happiness are not monitored at sea or at home. This may not solve their problem, but if you can help, then it's worth and effort and money.15

As for the solidarity of seafarers, that's another story. They are perceived as wealthy individuals with good wages, and rarely looked at the other side. Their salary is something to be stretched over the whole year and the whole family needs to pay all of the above benefits, finance their education because they are constantly seeking new powers. Victim of separation from home and family is great, and a simple calculation shows that there are no resources for the seafarer. Only hard work and the average wage. In the former pay system was even smaller, but the social and health care was better. Now it is good when a person is healthy and can find a job, but not everyone is so lucky.16

Temptation is something that every person has a different experience and a different carry with temptations. Fortunately, sailors are usually strong and independent person, or otherwise can not survive in this cruel business. However, to have someone you can talk to, especially today when the crew made up of very different people, seafarer means very much. Linguistic, cultural and religious barriers are large and not easily overcome, so the sailors usually directed to a very narrow circle of people with whom they communicate regularly, if at all with anyone. Today are mono-ethnic crew rare, mostly to people not only from different countries, but also several continents. Just because they are citizens of the world sailors, this gap is difficult to bridge. Communication technology has helped many feel close to home. The constant contact with their family via the Internet, cell phone or satellite phone brings a lot of positive, and to help sailors resisted all sorts of temptations. Despite all the personal, human contact is irreplaceable, and there is the irreplaceable role of the Apostleship of the Sea. Maritime clubs around the world, organized by the Church, the gathering of sailors and the sailor can realize the need for conversation and socializing outside the narrow circle of people they used to, and that it is still understood. Difficult situations and scenes which oversees sailor in their life, are things that would be sufficient for many average life. Mentally it is very hard to bear and deal with it. Environment has much understanding mainly because they never experienced such a situation, and the consequences may be borne by the seafarer and his family.17

[12] Same as above

[13] By: Tomislav Neven Sovagovic Melvan, Chairman of the Central Committee of the Union of Croatian Seafarers Seafarers should soften bread with seven crusts, available online at: http://www.glas koncila.hr, (25.06.2012.)

[14] By:Kap. Slavica, I.; Sailors definitely remain without benefit work, available online at: http://www.novilist.hr/Vijesti/Gospodarstvo/Pomorci-definitivno-ostaju-bez-beneficiranog-staza, (06.25.2012).

[15] By: Peruzović, M.;The Government established the Headquarters for assistance to domestic shippers and crews by Vuko, available online at: (11.12.2012).

[16] Same as above.

[17] By: Šuša, A..;Free time and " easy" to them, available online at: http://www.pomorac.net/portal_izprveruke, (06.26.2012)

The case of Somali pirates at the annual meeting of the Apostolate has a very interesting argument and said the captain Mladen Russo. 'It is true that the media covers only one-sided view of the West to the problem, and there's a downside. But the tragedy is that the victims of this unsustainable situation again sailors, who are neither the cause nor the solution. I think that it is not necessary to explain how it feels man, imprisoned for months in inhumane conditions, in constant fear for his life, and the only sign of civilization is the automatic rifle in the hands of the attackers.'

Negotiations with the company last very long, there are a lot of uncertain bargaining ... and how to stay normal, to be back on board the ship? What if the sailor from the traumatic experience such business again brought into these unsafe areas? It is easy to call risk occupations and Pontius Pilate washed his hands. And it's not just Somalia.

Also probably not the solution to every ship boarded an armed escort, and potentially becomes a battlefield. The solution should be sought in relation fairer rich to poor countries and addressing the internal problems of Somalia and other potentially hazardous areas. I know my answer sounds utopian and unrealistic, but a better solution to the problem I see. Military ships and escorts are not a long term solution, and that's probably obvious. In doing so anyway not defends seaman, but capital and assets.

7. CONCLUSIONS

Taking into account the socio-psychological aspects of life, work and relationships of seafarers, at the end it can be concluded that this is a very complex relationship. Complexity of the profession in the maritime profession is primarily caused by specificity of the workplace - boat - from which derive all further socio-cultural relations of life, work and relationships within a profession seaman. Workplace as such (ship) and the work (navigation) are an important factor that the seaman way separated from their normal working and living environment. Separation and in some way and alienation in the maritime profession primarily manifested in the absence of family, friends and life environment in which they are located. The main objective of this work was through direct contacts (interviews with seafarers) and a brief research as well as through social networks on which the sailors advertised, from the very sailors find their personal opinions, experience in the profession seaman. Results from a survey among the sailors show the complexity of professional seaman. First of all, the results show and confirm that seaman alienation from family, friends and environment seaman (Questions1-4).
In conclusion it can be said that the sailors forced into these complex relationships manage as best achieved possible. In all of these sailors were left to themselves.

The positive aspect is that through modern media (especially the Internet) seafarers are increasingly joining (solidarity associations, unions of seafarers, ...) and in this way, working together to point out the problems of seafarers and the possible solutions for seafarers. Also the fact that through the modern media (internet, mobile phones, ...) seafarers are more likely than ever to communicate with their families on the land. In the end, someone might say that the title of the darkened sociopsychological sense has its own characteristics (strengths and weaknesses), as compared to other titles. With that being said can be said to be a seaman is to love their profession, like the sea, with all of the complexity that position seaman carries.

REFERENCES

1.Aronson, E., Wilson, D.T., Socijalna psihologija, Mate, Zagreb, 2005.

2.Arnautović, D., Međuljudski odnosi na brodovima jug.trgovačke mornarice, Čovjek na brodu, savjtoanje, Rijeka, 1988, str. 92-103

3.Aubert V., Arner O., The social system of the ship, Institute for social esearch, Oslo, 1962.

4.Becker H.S., Notes on the concept of commitment, American Journal of Sociology,6, 1960.

5.Biličić, M.,(2001.) Psihosociologija rada u brodarstvu, Visoka pomorska škola u Rijeci, Rijeka

6.Biličić, M., Probelm teorijske orijentacije u istraživanju socijalnih odnosa na brodu, Zbornik Pomorskog fakulteta u Rijeci, god VI, 1992, str. 23-35

7.Tomislav Neven Sovagovic Melvan, chairman of the Central Committee of the Union of Croatian Seafarers Seafarers should soften bread with seven crusts, available online at: http://www.glas koncila.hr (23.06.2012.)

8.Bread with seven crusts – invisible wounds of life seafarers, available online at: http://www.pomorac.net/portal_sedmakora, (15.06.2012.)

9.Pavić, B.; Sailors women available online at; http://www.pomorac.net/portal_izprveruke/ kolumna, (15.06.2012.)

10.Nikolić, S. Osnovi sociologije i socijalne psihologije pomoraca, Fakultet za pomorstvo, Kotor 2004.

11.Šuša, A..;Free time and '' easy'' to them, available online at: http://www.pomorac.net/portal_izprveruke, (06.26.2012)

12.Kap.Slavica, I.; Life in the Maritime 30 years navigating only 12 years at home, available online at: http://www.slobodnadalmacija.hr/Split/tabid /72/articleType/ (26.06.2012.)

13.Tomislav Neven Sovagovic Melvan, Chairman of the Central Committee of the Union of Croatian Seafarers Seafarers should soften bread with seven crusts, available online at: http://www.glas koncila.hr, (25.06.2012.)

14.Kap. Slavica, I.; Sailors definitely remain without benefit work, available online at: http://www.novilist.hr/Vijesti/Gospodarstvo/ Pomorci-definitivno-ostaju-bez-beneficiranog-staza, (06.25.2012).

15.Peruzović, M.; Sea unites us, not divides , available online at: http://www.pomorac.net/portal_izprveruke/ kolumna, (12.11.2012).

16.Peruzović, M.;The Government established the Headquarters for assistance to domestic shippers and crews by Vuko, available online at: (11.12.2012).

17.Wall M.R., Job satisfaction and personality of merchant navy officers, Maritime Policy and Management, 7(1980), 3.

BIOGRAPHIES

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I was born on the 3rd January 1964 in Šujica in Bosnia and Herzegovina. After finishing the elementary school in Šujica I attended Šalata Grammar School in Zagreb. I was awarded a BSc degree from the Jesuit Faculty of Philosophy in Zagreb. On passing the exam in librarianship I started to work as a library assistant at Faculty of Maritime Studies –
University of Split where I work today as Head of the library. In 2010 I completed the doctoral study in Information Science at Faculty of Arts in Zagreb, acquired a PhD degree and was appointed to Assistant Professor. In addition to being the Head of library I teach sociopsychology at the University of Split. I am the author or co-author of a dozen professional and scientific papers.

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INTEGRATED QUALITY MANAGEMENT SYSTEM – EXAMPLES OF GOOD PRACTICE

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ABSTRACT

With the activities which include exploration and production, processing, storage and sale of petroleum, petroleum products and natural gas, INA, as all other oil companies in the world, can significantly affect the environment, especially the marine environment. Therefore, in accordance to the legal requirements and best practices, basic indicators of environmental impacts, including: air emissions and water consumption, hazardous and non-hazardous industrial waste, accidents with impact on the environment and alike, are monitored and measured at all locations where necessary. In order to reduce negative impacts to the environment, a number of activities and projects which are directly or indirectly related to environmental protection are constantly being implemented. INA opts for sustainable development through systematic environmental management, which has become an integral part of its business policy. Environmental protection has been included into the basic activities of INA. The aim of this paper is to show that concern about environmental protection is becoming an integral part of business and organizational culture of every company.
The environmental management is implemented by taking preventive actions, constant measurements, by analysing and controlling key parameters and by carrying out programs which will reduce the environmental impact. It is also necessary to provide workers, suppliers and business partners with information and education so as to increase the concern about environmental protection and preservation. To achieve the key environmental objectives, not only the mentioned activities, but also the selection of raw materials and technology are directly related to reducing the environmental impact and consumption of raw materials and natural resources. For that reason precisely, INA can serve as a perfect example of an organisation working and operating in harmony with nature and attending for the protection of the environment we live in.

KEY WORDS
Quality management system. Sustainable development, Safety and environmental protection purposes

1. INTRODUCTION

The main goal of this research paper is to present the importance of environmental protection as one of the constitutive parts of business activities and organisational culture in each company. Environmental management is being implemented by taking preventive actions, performing continuous measurements, analysis and supervision over the key parameters which
affect environmental components and by carrying out programmes to reduce adverse effects on environment. It is also important to continuously educate and inform workers, suppliers and business

partners in order to increase awareness about environmental protection and preservation. Apart from the mentioned activities, the selection of raw materials and technology, as well as the usage of raw materials and natural resources are directly related to reducing adverse effects on the environment. For this reason, INA can serve as an excellent example of an organisation which works and operates in harmony with nature and attends for the protection of the environment we live in.

The paper contributes to the application of well known scientific results and to their adaptation for practical use.

Preliminary communication presents one or more original scientific results, but without details that allow the reported data to be checked. The papers of this category provide information on experimental research, small research projects, or progress reports that are of interest.

Reviews cover the state of the art and development trends in the specific theory, technology and application with given remarks by the author. These papers must include a comprehensive list of references for related fields.

Original scientific paper should report on original theoretical or practical research results. The given data must be sufficient in order to enable the experiment to be repeated with all effects described by the author, measurement results, or theoretical calculations.

2. INTEGRATED QUALITY MANAGEMENT SYSTEM – INA D.D.

INA was founded on 1 January 1964 through the merger of Naftaplin (company for oil and gas exploration and production) and the two refineries in Rijeka and Split. By the end of the decade INA grew to include Zagreb Oil Refinery, Trgovina (company for domestic trade), petrochemical plants OKI and DINA and Kutina Fertilizer Plant. In 1993 INA became a joint stock company. INA – Industrija nafte, d. d. (INA d.d.) is a joint stock company owned by the Hungarian oil company MOL (47.16%), the Republic of Croatia (44.84%) and private and institutional stakeholders. Since 1 January 2006 Ina's shares have been enlisted in London and Zagreb stock exchange. Today, Ina is a middle-sized European oil company which has the leading role in Croatian oil business and important role in the region, which means in oil and gas exploration and production, oil processing, and gas, oil and oil products distribution activities. INA is a modern, socially responsible and transparent company in a constant dialogue with the environment, it is oriented towards sustainable development, care for the safety and health of its employees and entire community. Following the global trends, from quality control, quality assurance to quality management, business operations in the area of production and customer satisfaction requirements were awarded ISO 9001 certificates in the middle of the 1990's. Today the certificate is constantly maintained on the company level.

INA is continually adapting the quality of its fuel in line with demands and EU Directives. Health and safety measures at the petrol stations are provided by regular cleaning and maintenance of the forecourts, regular maintenance and technical supervision, operating instructions for petrol station devices and equipment, and warnings on prohibited actions at petrol stations. All INA commercial products have appropriately prepared Safety Data Sheets containing basic information on the product, risk data, recommended safety precautions, transportation and emergency instructions. Danger signs are also included on the packaging.

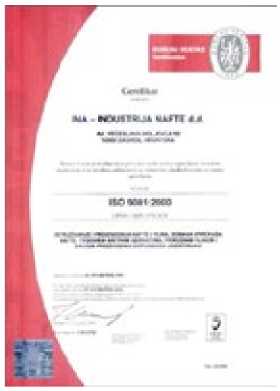
INA - INDUSTRIJA NAFTE d.d.
ISO 9001:2000

Figure 1. INA - ISO Certificate 9001:2000

All the macro organisational structures, which have a potential or real environmental influence, possess environmental management systems certified by ISO 14001, as well as their own environmental management policies. INA has introduced and maintained quality management system on the company level. The Quality Management Policy states that INA controls business procedures by:

- Continuously developing technologies, products and services, by considering and reducing the risk toward health, safety and environment to minimum.
- Implementing modern science and practice based on sustainable development principles, thus improving the product quality.

INA controls business procedures by:

- continuous development of management quality;
- meeting customer and holder requirements and expectations;
- attending for the quality of working and living environment and for the safety and contentment of the employees;
- implementing modern science and practice based on sustainable development principles.

The first certificate to prove that the standards had been met was awarded to Maziva Rijeka in 1995. The Environmental Management and Health and Safety systems have been introduced in accordance to the ISO 14001 standards and OHSAS 18001 specification and provide proof for highly developed awareness and responsibility for administration and employees. Attending for the product quality, following the global trends from the quality control, through quality insurance to quality management, has proved to be a process of continuous improvement. Work in the quality area resulted in a number of certificates. INA's experts participate with their research papers in symposiums, exchange experiences with the international experts; they are members of professional associations and participate in work of technical committees. Also, INA is currently implementing an integrated information system for monitoring business activities in order to connect processes in these operational segments; finances, procurement, human resources and sale (SAP). The term *quality* is not only connected to the products and business efficiency, but also to living quality of the employees and the society as a whole.

3. SOCIAL RESPONSIBLEBUSINESS PRACTICES

Business in INA is not carried out with an exclusive aim to gain profit but also to improve the society welfare, respecting people and environment. INA builds up mutual trust and common values between its stakeholders ensuring teamwork and close collaboration. INA is a member of Global Compact, the largest network for socially responsible business operations in the world. By adhering to the 10 principles of Global Compact in doing business, INA has been supporting and promoting fundamental social values in the area of human rights, labour rights, environment protection and the campaign against corruption.

INA celebrated the 60th anniversary of the UN Declaration of Human Rights and informed the employees about the content of the 1948 Declaration by means of its media. Code of Business and Ethics defines guidelines which include approach to work, collaborators, business partners, health protection, safety, environmental protection, compliance with provisions and tradition, and guidelines against the conflict of interests and surveillance mechanisms. For more than 40 years, INA has been providing citizens and Croatian and regional economic agents with fuels and lubricants. It is constantly readjusted in order to meet the demands of the local communities. The tradition of the funding infrastructure has been created for decades, especially in circles in Croatia where INA has carried out oil and gas exploration and production.

Building of schools, hospitals, health care institutions and resorts has been funded.

On annual basis, INA regularly informs the stakeholders about its progress within the area of social responsibility and it also takes part in global network communication. INA opts for contribution to sustainable development which makes one of the components of its business policy. Environmental protection is included in INA's basic activities.

In accordance to that, INA binds itself to:

- reduce risks arising from the technologies, processes and products to the lowest possible level
- prevent unexpected events and environmental pollution;
- conserve natural resources;

- fulfil the environmental liabilities caused by past operations;
- continuously improve environmental protection performance;
- comply with all relevant regulations;
- take active role in the creation of legislative regulations, and collaborate with authorities and other professional associations;
- ensure its employees with education and training required for the active implementation of environmental protection;
- open communication with everyone interested in activities and state of environmental protection in INA.

In order for INA's employees to get a better insight into areas of environmental protection, safety and health protection, there is a cycle of monthly lectures, within the organisation of Health Protection Sector with the aim of presenting and explaining new and existing legal regulations of the Republic of Croatia and the European Union.
During years, INA has invested millions of Kuna in various projects related to environmental management, safety and health protection. Adverse gas emissions in plant surroundings are being continuously monitored, water emissions and waste production are being supervised and huge investments made in order to reduce their effect on the environment to the lowest possible level. In that way, big modernisation projects for refinery have been launched to ensure the creation of fuels with as minimal percentage of adverse substances and to reduce significantly polluting substances. As each year, May – month dedicated to fire fighting, was celebrated with various informative, professional, educational and preventive technical activities with the aim of improving fire fighting system. Such activities have been taking place in INA since 1993. The priorities in fire fighting and protection of other adverse events are prevention and improvement of the safety operation, and overall safety of people and INA's assets. Undoubtedly, the investment in safety systems is very cost-effective and has many direct and indirect positive effects. The company tends to systematically develop of the awareness and employee efficiency in the area of health protection, safety and environmental protection and conservation. Since the employees are the biggest value of the company, further upgrading and new knowledge acquisition are still being invested in. Only professionals can produce good quality products and protect the nature and their working environment.

3.1. Department for Health Care, Safety and Environmental Protection

Department for Health Care, Safety and Environmental Protection is the central organisational unit in INA which is in charge of the mentioned areas. It operates within the frame of Cooperative business processes, aiming at unique management of health, safety and environment. This includes common policy, strategy and aim defining, and operating according to the rules laid down in accordance to the legal and other requirements. This department cooperates with other organisational units of INA on daily basis. Conformity of the environmental management activities is also ensured through Workgroup for environmental activity coordination appointed on the company level, whereas the health and safety activities, which relate to workplace safety and protection against fire, are maintained through Workplace safety committee. The department is responsible for:

- Defining aims and guidelines for environmental protection, occupational health and safety and protection against fire in accordance to legal and other regulations;
- Taking an active role in proposal development and commenting on legal and other requirements from ZZSO (Health, Safety and Environmental Protection);
- Surveying and controlling ZZSO activities;
- Creating documents on environmental management, and on health, safety and fire fighting management systems;
- Reporting, informing and educating in the fields above;
- Keeping register of waste and pollution emissions to air and waters;
- Surveying and analysing unpredicted adverse events;
- Controlling and analysing inspections and court proceedings which relate to environmental protection as well as analysing safety measures, injuries and professional diseases;
- Monitoring and analysing ZZSO expenses
- Coordinating ZZSO activities.

3.2. Health, Safety and Environmental Management System

Systematic control of risks and environmental effects caused by activities, products and services, as well as taking preventive actions to reduce/eliminate pollution and adverse effects on health and safety make the basis of INA's activities. All organisational units in INA with a potential or real significant influence on environment and risk to workers' health and safety have systems of environmental management certified according to the ISO 14001 standard, as well as health and safety management systems in accordance to the OHSAS 18001 requirements. The only exception is Sector for Retailing Network, which is only at the first stage of implementing health and safety management system.

- Oil Refinery Sisak - ISO 14001:2004
- Oil Refinery Rijeka - plant Urinj - ISO 14001:2004
- Oil Refinery Rijeka - plant Mlaka - ISO 14001:2004
- BD Oil and Gas Exploration and Production - ISO 14001:2004
- Sector for Retail Network Managemnt - ISO 14001:2004

Introduction of health and safety management system includes possibility to control risks in the area of health and safety and to improve working conditions and health for the benefit of the workers.

The certificates guarantee that all environmental, health and safety issues are under constant control, recognizing therefore that everything has been done in the area so far. Since the recognition of proper direct or potential influence on environment, according to the established criteria, makes the basis for ecological management, INA has defined all the possible aspects which have, or may have significant effect on environment. Air and water emissions, water consumption and water fees, hazardous and nonhazardous waste management, accidents with environmental effects and environmental protection costs are the basic indicators of the monitored state of environment.

3.2.1. Air emissions

The emission of H2S has been significantly reduced as a result of the efficient operation of Lo-Cat plant, which was built primarily to preserve and protect environment, or more precisely the air. On the other hand, the emission of SO2, NO2, and especially the emission of CO have increased. This was caused by the CO emissions from BD Oil and Gas Exploration and Production which are by 162% greater, and not because the emission measurements were taken from 22 sources more. The carbon dioxide emissions result from incomplete fuel combustion, the nitric oxide emissions depend on the working regime of process furnaces, while the emissions of sulphur oxide and solid particles depend on the quality of consumed fuel.

Constant measurements of the air quality are being carried out at four measuring stations in vicinity of Oil Refinery Rijeka. In 2005 emission monitoring at OR Rijeka included 19 stationary sources. Measuring results show the emission reduction of most parameters, except of SO2 emission which was by 7.1 % higher than in 2004. The SO2 emission increase was caused by usage of fuels saturated with more sulphur compounds. The emission of NO2 was reduced by 35.8%, of CO by 7.2%, of solid particles by 5.1%, and of CO2 by 0.9%.

Maziva Rijeka is carrying out continuous emission monitoring at two measuring stations. Emissions are measured at 13 operating stationary sources. The SO2 emission is by 23.8% higher than in 2004 as a result of the usage of fuel oil with higher percentage of sulphur compounds. All the other emissions, on the other hand, are lower than last year: CO by 61%, NO2 by 6% and solid particles by 21.7%.

At BD Oil and Gas Exploration and Production plants the measurements have been carried out at 187 measuring places:

Šumećani, Etan-Ivanić Grad, Molve, Stružec-Popovača, Šandrovac-Bjelovar, Vinkovci, Benićanci, Koprivnica and Žutica, i.e. at 22 sources more. The results show a significant decrease of the H2S emission by 56.2%, whilst the CO2 emission was reduced by 9.9%. However, the CO, NO2, SO2 and solid particles emissions have been considerably increased. At OR Sisak, the emissions

were measured at 22 stationary sources. The total emission is lower due to the decrease of primary (9.7%) and secondary refinement(18.1%). Therefore, the SO2 emission is by 4.5% lower than last year, NO2 emission by 16.1%, CO emission by 16.3%, solid particles emission by 15.9%, whereas the CO2 emission was reduced by 16.3%.
Since the OR Sisak has had difficulties with emission/immission of hydrogen sulphide in the past few years, the immission monitoring has been carried out by the Refinery and the city of Sisak. In the industrial zone of the city the quality of the air unfortunately remained at the third category as far as hydrogen sulphide is concerned but the average annual immission concentration in the basin was lower by 48.5% in relation to the year before, thus improving the air quality from the third to the first category. The problem of increased concentrations of hydrogen sulphide will be permanently resolved by constructing Amine and Claus acid gas treatment plants for production of elementary sulphur.
In the OR Rijeka fuel gas with 0.47% of hydrogen sulphide and fuel oil with 2.3% of sulphur were evenly used as fuels, whereas the OR Sisak used more often the refined gas with the concentration of sulphure from 0.7 to 3.1%. Maziva Rijeka used mixed gas, fuel oil with 2.16% of sulphur and recycable hydrogen, and BD Oil and Gas Exploration and Production used natural gas without sulphur. The overall air emission trend shows the tendency of reduction in years time. The amounts of pollutants have been reduced in comparison to year 2010, except for the emission of carbon monoxide which has been increased by 16.41%. The emissions of sulphur dioxide were significantly reduced (by 23.14%) in comparison to previous year, due to the improved quality of fuel (lower concentration of sulphur in fuels).

3.2.2. Water emissions

The overall emission of the following pollutants into water has been reduced: phenol by 34.3%, complete oils and fats by 18.7% and COD by dichromate method by 1.7% in relation to past year. The emission of suspended substances is greater by 5.5%, BOD5 by 14.2% whereas the mineral oil emission increased significantly, by 101,6%. At the OR Rijeka, the emissions of suspended substances were reduced by 2%, COD by 4.6% and complete oils and fats by 7%, whereas the emissions of other pollutants to water were somewhat higher (BOD5 by 10.1%, phenol by 25% and mineral oils by 3.2%)
After making a complete revision of waste water processing gear in Maziva Rijeka, the emission values of all measured parameters increased in comparison to year 2004, but were still lower than values admissible in the water management permit. At the OR Sisak the value of BOD5 increased by 36.6%, the value of COD emission remained roughly the same. The measurements obtained the values of pollutants emitted to water in plants of Šandrovac, Etan and Okoli. All the other emission values were lower than the year before.
The mean values of yearly analysis do not exceed legally admissible values, however in some analysis certain parameters (most commonly COD and BOD5) were higher than allowable values.

3.2.3. Water consumption and water fees

Since 1 January 2006 three types of water fees have been charged from the operation and business of INA: water usage fee, water protection fee and water basin fee. In 2009 INA paid 22.8 million HRK for water fees, which means 19.2% more than the year before. 46.9% of the amount went to water protection, 20.6% to water usage fee, 30.3% to water basin fee, and 2.2% of the amount was paid for concessions. 6.24 million m3 of water were affected , i.e. 25% less than in 2004. It released 5.6 million m3, i.e. 28% less water. Along with these amounts the OR Rijeka affected 48.7 million m3 of sea water which serves as a cooler in technological process.

3.2.4. Waste management

In INA hazarduous and nonhazarduous waste is collected, processed and registered. Most of the hazarduous waste is created in OR Rijeka and OR Sisak, and then in Maziva Rijeka and Sector for Retailing Network Management. The least hazarduous waste is created in BD Oil and Gas Exploration and Production. Naimly, in Koprivnica Plant and Molve Okrug Podravina Plant certain types of technological fluids have been permanently disposed in a deep hole Kal-6. In 2005 there were disposed 11 123 tons of waste. The most common types of hazarduous waste in INA

include mud from tanks, mud from oil/water separators and oily mud from equipment maintenance. Maziva Rijeka processes used lubricant oils of the first and third category as well as oily metal barrels, whilst all the other hazarduous waste is sent to authorised processors. The OR Rijeka processes certain types of oily waste by injecting useful hydrocarbons in crude oil.
The strategy of waste management in INA Group for the period from 2011 to 2015 is drawn up so as to improve the waste management by the development of technology and industrial trends in that area. Their tendency is to meet the expectations of the social community, as far as possible. Maziva Zagreb is the concession holder for collecting waste lubricants and concession holder for thermal recycling of waste lubricants. The mentioned activities contribute to the usage of valuable properties of the waste while deriving certain economic benefits. The amounts of produced hazarduous and nonhazarduous waste show the tendency of decreasing in relation to the last year.An internal Waste Catalogue contains a list of all types of waste produced, collected, processed or treated in INA Group in the past five years, but also recommended processing or disposal methods for each waste type. In INA Group, waste is collected separately and ingredients which may be reused are submitted for recovery. At most locations waste paper, waste batteries and accumulators are collected in separate containers, while empty toner packaging is disposed of appropriately as well.

3.3. Projects for health, safety and environmental protection purposes

Activities related to the realisation of 17 projects, financed by the loan of European bank for Reconstruction and Development in the amount of 36 million EUR along with a certain amount of proper funds, began at the end of 2001. The projects are to improve the current state in health, safety and environmental protection and to upgrade the surveillance over working environment and overall ecosystem. A new vacuum distillation furnace has been built in Maziva Rijeka providing an increased economical operation, decreased fuel consumption and considerable reduction of waste gas emission, primarily of nitrogen oxides (NOx) and sulphur dioxides (SO2). The burner noise has been reduced within permitted values as well.
The sulphide waters processing plant, which eliminates gaseous pollutants (hydrogen sulphide, mercaptans, hydrocarbons, ammonium) from acid technological waters, has been completed.
The completion of the project of the reconstruction of basins and platforms for pouring bitumen into cars/tankers, because of the recovery of the gaseous phase system into basins, considerably reduced the bitumen emission. In OR Sisak, a new separator for oily processed waters and precipitation waters was launched in operation. It returns all the collected hydrocarbons into system for reprocessing. Recycling waste hydrocarbons results in raw material and fuel savings and improves the quality of the waste waters released in the river Sava. The reconstruction of KP-2 in HDS of gas oils and coking fuel will produce diesel fuel of the European quality. Lower concentration of sulphur in produced fuel directly influences the reduction of sulphur compound emission from traffic to air. Recycling heat from the process flux within the plant reduces heat loss in environment and saves the fuel for process furnaces, reducing the pollutant emissions to air as well. A plant for sulphur mud desiccation was built in CPS Molve III at BD Oil and Gas Exploration and Production. This solves the problem of sulphur mud disposal and reduces the amount of emitted hydrogen sulphide, whereas the extracted CO2 is used to increase oil extraction ratio. The other project at CPS Molve III, the project that aims at reducing emission of H2S/RSH by catalytic conversion, reduces also the emission of hydrogen sulphide and mercaptan in frames of legal regulations. Both of the plants are in trial operation. The third project, the mobile plant for waste disposal that impresses the waste into deep holes permanently and safely deals with disposal of gases with unpleasant odour (H2S, SO2, CO, CO2, ketones, aldehye etc). This directly contributes to the improvement of conditions in working environment, but also indirectly to the improvement of the conditions on wider area around lubricant plants of specific technological fluids. The intervention is in conformity with the EU Water Framework Directive (2000/60/EC), and it is included in the new strategy of waste disposal in the Republic of Croatia adopted by the Parliament in 2005. Within the project of leakage

elimination, the sanction of 26 (out of 38 in total) basins has been completed. Flooring sections have been restored and covering sections installed into nine basins. The restoration of the tenth basin is in process. In terms of the project for modernisation of level control systems in basins, the work on new instrumentation line routing has been completed, and 12 level gauges put into operation.

EBRD projects – Activities related to the realisation of 17 projects, financed by the loan of European bank for Reconstruction and Development in the amount of 36 million EUR, and to a certain amount by proper funds began in the end of 2001. The projects are to improve the current state in health, safety and environmental protection and upgrade the surveillance over working environment and overall ecosystem.

3.4. Initiatives for reducing effects on environment

INA has been systematically controlling risks and effects of proper activities, products and services on environment, and taking preventive measures to reduce effects on environment. With the aim of producing cleaner fuel, INA has initiated the modernisation of its refineries in Rijeka and Sisak. The realisation of the first stage of the refinery modernisation was to be completed by the end 2012. The construction of new plants which will increase middle distillate production and sulphur extraction from products, will also ensure the production of the fuel with sulphur concentrate lower than 10 ppm in accordance to EURO V standard. The entire principle of refinery modernisation is based on the employment of the best disposable technology.

- By the end of Decembre 2006, the Regulation on technical standards of environmental protection from volatile organic compound emissions by storage of petrol and its distribution (OG No. 135/06) entered into force in the Republic of Croatia. It prescribes technical standards of environmental protection for the equipment for fuel storage and pouring off in terminals, filling stations and mobile tanks used for fuel transportation from one terminal to another or from one terminal to a filling station, as well as the dates for the completion of the process. The Regulation determines the date when the existing storage gear in terminals and filling stations must be adjusted to the prescribed technical standards, i.e. the 31st December 2012. In conformity to the Regulation, INA made a Plan on existing terminals and filling stations adjustments according to the prescribed technical standards of environmental protection, and they delivered it to the Ministry of the Environmental and Nature Protection by the beginning of 2008. When REACH Regulation was put in force, the new system of chemical management was established in EU. It introduced an obligation for the industry to register substances / preparations. Harmonisation of Croatian legislation with EU has been carried out continuously, and it includes legal alignment in areas which can have the most significant effects on INA's business – IPPC (Integrated Pollution Prevention Control), ETS (Emissions Trading Scheme), REACH (Registration, Evaluation, Authorisation and restriction of Chemicals), VOC (Volatile Organic Compounds) and Seveso regulations.

4. CONCLUSION

The introduction of the environmental component into strategic management of a company ensures the prerequisites of sustainable development. The possibility to include ecological component into strategic management also presents a means of separating good companies from the inferior companies. INA can serve as a perfect example of an organisation which works and operates in harmony with nature and takes care of the protection of the environment we all live in. From the nineties of the twentieth century, the quality systems, environmental protection systems, and health and safety systems are being introduced in certain parts of INA company. ISO 9001 standards have been applied, through the company's unique system, to basic processes and to processes for management and activity support purposes. This was acknowledged by the ISO 9001:2000 certificate in 2005. The implementation of SAP in 2006 confirmed that business processes and business quality are constantly being upgraded. INA, as a member of Global Compact banded itself to promoting their principles in doing business. By adhering to the 10 principles of Global Compact, INA has been supporting and promoting fundamental social values in the area of human rights, labour rights, environment protection and the campaign against corruption. On annual basis, INA makes regular reports about its progress within the area of social responsibility and it takes active part in the global communication network called "Communication on Progress".

REFERENCES

1. http://kvaliteta.inet.hr/e-quality/prethodni/17/povelje.htm

2. http://www.maziva.hr/web/index.php?option=com_content&view=article&id=195&Itemid=5 (05.02.2013.)

3. http://www.poslovna.hr/ (03.02.2013.)

4. http://www.ina.hr/default.aspx?id=100 (11.02.2013.)

5. http://www.hdkvaliteta.hr/drustvo/clanovi/ina-dd (11.02.2013.)

6. http://issuu.com/kvaliteta.net/docs/name353094 (12.02.2013.)

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MECHANISATION OF PORTS AND TERMINALS

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ABSTRACT

Sea transportation has always played an important role in the transportation system, especially in international trade. Extensive development od sea transportation begins with the application of the steam engine, which replaces the sails and sailing boats of that time. Further development of techniques and technologies affected the ever growing speed of sea transportation development, as well as other means of transportation. Capacity and strength of ships have continuously increased, their exploitational and constructive characteristics have been improved, as well as the gross to net weight ratio, speed, safety, manoeuvre capability etc. In this means of transportation, along with the increase in the ship capacity, another trait is their specialisation for some types of goods and transport types. Today about 75% of all transport by sea is consisted of mass shipment (oil, coal, wood, ores, grains). Together with the development of sea transportation, ports and terminals have been improved, as well as facilities – the mechanisation used during loading and unloading of goods from ships of different purposes.

KEY WORDS
sea transportation, marine transportation, port, dock, container, mechanisation, loading

1. INTRODUCTION

Ports and docks are the main traffic junctions, without which successful classic or modern transportation cannot be imagined. They are the connection and crossing spots of all sorts of transportation. In today's modern world, in the application and development of various ways of integral, multimodal and combined transportation systems, port and dock (and storage) container terminals, modernly equipped, allow for very fast, high quality and economical transshipment of goods, based on the unique technological system "from door to door". Port and dock container terminals have a very important role in the optimal contemporary development of sea and river shipping, those being main transporters of the international trades. Efficiency of rail, road and river traffic is also affected by equipment and development of port, dock and storage terminals.
This is why, there are many large, medium and small cotainer terminals in the world. The choice of the port location, especially from the aspect of development and application of modern transportation technologies, containerisation, Ro-Ro, LASH and other systems, should be carefully observed and planned on several levels. This includes in the first place geographic, topographic, and maritime constituents, then economic potential of so-called gravitational economic background, then the present state of needs and possibilities of development of terrestrial infrastructure and modern high-speed roads: rails, road, river and air ways along with the development of modern terrestrial cumulative-distributional terminals and junctions, storages and

stations. Marine interconnection with different ship lines and with as many world regions as possible is very important, together with quick adaptation of transforming classical lines into container and Ro-Ro. Developed trades, industry and banking in the very port allows for faster transformation of a classical port into a modern one. In addition, it is important that such a port is located relatively far from a competitor port or a potential new port.

Figure 1. Port container terminal

An important element of a port container terminal are movable loading container bridges and container gantry cranes, consisting of a supporting framework that can traverse the length of a quay or yard, and a moving platform called a "spreader", that automatically attach and lock container. They are varying in sizes and can be calssified as: Panamax (ships 12–13 containers wide), Post Panamax (normally about 18 containers wide) and Super-Post Panamax (vessels of about 22 or more containers wide). They lean over the ship towards the sea side, and on the coast side over the rails, road vehicles or storages in the range of 20 to 45 m, depending on the size and capacity of the container crane. Beside the container cranes and container gantry cranes in port container terminals, an important role is seen in movable transportational means.

2.MECHANISATION OF PORTS AND TERMINALS

In order to be able to perform these and other tasks, the transportation sector needs to have appropriate technical resources and trained manpower, skilled in that line of work.

Required technical resources include primarily a varied vehicle fleet, by means of which transport can be performed. Besides, appropriate cranes need to be available, as well as different sorts of forklifts for work with pallets, portable carts, bars, mats, portable bridges, bulk wood, equipment for carrying furniture, scales, carts, pliers, hammers, and similar accessories.

Manpower doing the jobs in the transportation sector of the international shipping must be, not only reliable, but also trained, so that they could do everyday, often complicated tasks. Of course, such manpower must be well payed as well, in order to avoid fluctuations. Manpower that is changed often is not reliable, cannot be trained enough in work, and also, customers don't appreciate having different workers do the work for them. In case the given task cannot be completed with the owned technical resources, the transportation sector will hire them (trucks, cranes, etc.) from another organisation, that is, it will give an instruction to another organisation to do the specified work. The same goes in case of a lack of manpower for a specific sudden job, in which case the transportation sector will hire external work force.

Loading, unloading and reloading of goods is done by shipping companies, as ordered from a customer, given in the disposition. This may involve loading of goods from a storage into a road vehicle or a rail vagon, unloading from a road vehicle, rail vagon, ship or barge into the storage, as well as loading the goods from one vehicle into another (for instance, from a rail vagon into a truck, or the other way round).

Loading-unloading-reloading of goods can be done manually, with the use of simple equipment and tools, or with the use of mechanisation.

Manual loading-unloading-reloading is the classic but most expensive way, and it is used usually with loading-unloading rail vagons and road vehicles. Its drawback is that it lasts longer and causes bigger expences, and its advanatage is greater resillience, since the work force can always be adapted to the task and specific traits of the goods. The work can be done by transport workers who are constantly on loading-unloading spots, or workers who are addedd to road vehicles, that is, are hired from case to case. Loading-unloading done by workers added to the road vehicles is used commonly when

shipping the goods in town, or collecting cumulative shipment.
Mechanized loading-unloading-reloading is less often used in shipping. This is because the forwarder manipulates different sorts of goods in different places, so the mechanization of works is less easily applied. The exception to that is appropriate mechanization in shipping storages, in case the conditions for palletization are met. If palletizated goods are storaged, the forwarder will manipulate such goods through forklifts that can be manual, electrical or motorized.
The advantage of mechanization is that it reduces the use of live work force and significantly incdreases productivity, thus making the work process cheaper. The drawback is that it is not suitable for goods of different sorts, and also requires a large turnover in order for the mechanisation to be lucrative.
Loading of goods into a vehicle (vagon, truck, ship) is done by certain regulations that are set for the specific traffic branch. Of course, the forwarder needs to know the regulations, especially since it is he who often conducts the loading, and if he doesn't, it is his duty to monitor that process and protects the interests of the owner, i.e. his ordering party.
By reloading we mean loading of goods onto a vehicle, unloading the goods from the vehicle and direct reloading from one vehicle onto another. In a broader sense, reloading includes moving goods in storages because of preserving, packaging etc.
Intermodality enables saving on transportation system, where certain means of traffic are used in the most productive way. Techniques of moving cargo from one means of transportation onto another have been perfected, which made intermodal reloading easier. Beside automatization and mechanization of reloading, an important improvement in the context of intermodality is adapting the cargo to the reloading mechanisation.
The change of the means of transportation within an intermodal transportation chain requires the cargo to be adapted to the mechanisation on transport terminals, as well as the cargo area of different vehicles. The main goal is to allow the door-to-door transportation not to be threatened by time losses in tranferring from one vehicle to another (reloading). (Stakić, Milan: 1985. str. 182).

The most important techniques that improved the reloading in intermodal transportation and transportation in general are:
- palletization
- containerization
- techniques of combining transportation means (traffic means of transportation of other vehicles)

Means of reloading of containers can be divided into two groups:
- movable reloading means and
- portable cranes and carriers

Each group has several types of carrying devices.
Movable shipping means have a theoretically infinite area of moving. Depending on the profile, containers can be loaded, reloaded, moved and unloaded. Practically those are forklifts and cranes, i.e. lifters and movers of containers of different dimensions and lifting abilities (lifting capacity: 5,10,20,30,35 and 40 tons). Those means have the following ways of approaching the container:
- laterally (from the side)
- frontally (from the front)
- straddler for vertical lifting and lowering of containers

Figure 2. Movable means of reloading

Another group of reloaders is commonly moving on wheels on tracks. That's a reloading bridge that straddles, that is, under which rail tracks are found, as well as road tracks and space for containers. These reloaders move along the rails, and have their own manipulator for width, a device on the bridge for moving left and right. Those cranes have a 22m span and capacity od up to 40 tons, although some with a smaller capacity can be found.

Figure 3. Straddler for vertical lifting and lowwering of containers

The main advantages achieved from the aspect of the operator by using the mechanization are:

- simplifying and increasing the speed of technological operations in the transport chain
- decreasing the needs for manual work
- lowering the cost of manipulation per transport work unit
- decreasing multiple times of loading, reloading and unloading durations

decreased time of turnover of transportation means and containers with the increase of delivery speed

increased number of turns of vehicles and containers

increased utilization rate of the vehicles' capacity and mechanization

universal application of unique technologies all over the transportation road

The main advantages from the aspect of the user are:

- saving on the cost of packaging and goods insurance
- possibility of horizontal and vertical manipulation
- protection of goods from negative environmental influences
- reduced wastage of goods
- simplifyng of commertial and customs operations
- possibility of use for special kinds of goods (special containers)
- saving on the cost of storaging etc.

3.CONCLUSION

Reloading exists ever since the emergence of transportation, thus, along with the search for solutions that will facilitate transportation, the options of perfecting reloading have also been developed. The first reloading means were certainly arms and backs of people with no helping equipment. However, the word manual reload is wider than that, and includes reloading that involved helping devices run by human force. Such devices, that emerged long in the past, but are used today as well for reloading less heavy cargo, include simple lever, shovel, carts, pulleys, winches, hoists and hand cranes. Steam crane was desined shortly after the steam engine was invented, and electrical crane was designed shortly after the electromotor was invented. Since in the beginning, steam and electrical cranes were owned only by the richest and largest world ports, devices for lifting cargo that used steam or electricity were built into ships. Movable cranes (autocranes) with liquid fuels appeared a bit later. Thus, when we associate the improvement of reloading mechanization with modern times and the integration of transportation, by that we mean the additional impulse of increasing the process that lasts for centuries. Beside the increase in capacity, speed and efficiency of the work of reloading devices, reloading operations are being automated, which achieves bigger precision of loading, piling cargo,etc. At the same time, just as vehicles, reloading devices are ever more specialized in work with specific types of cargo.

In marine traffic, loading-unloading of goods from and into the ship is done mainly by specialized port companies, having particularly trained work force. However, loading-unloading, as well as piling goods in ship storages can be done in shipping companies as well, especially in inner sails and river trade. In both cases, the forwarder needs to know the technique of the work. Basic rule when piling goods in ship storages is that the heavy cargo should be put on the bottom of the ship, and light

goods towards the top. Further, heavy goods should be piledd in the middle, and light goods towards the ship sides. Of course, these rules do not apply when shipping homogenous goods used to fill up the whole space (such as ores, grains,etc.). Piling cargo in shipping transport space requires full attention, because if it isn't done carefully, it leads to damage to the cargo, or to irrational usage of ship space. Based on centuries long experience, so-called factors of piling have been determined for certain kinds of goods, that is, for certain types of packages. Those factors show how big a volume is needed for 1 ton of some goods in a certain package, so according to that, the ship space is planned. For transportation of dangerous goods in marine transportation, clauses of the International marine codex for dangerous goods (IMDG) apply. (W. Rotermund, Die Ladung - Band II (3. Auflage), Hamburg, 1949, pp. 269-304.)
Piling of goods in barges in river trade is similar to piling goods in marine boats. Loading also ought to be regularly distributed, and as for the control of appropriate piling and distributing, scale drafts are used.

REFERENCES

1.„50 godina kontejnerizacije u retrospektivi", Luka Rijeka,(2006).

2.„Buduća generacija kapaciteta terminala", Luka Rijeka, (2007).

3.„Isl monthly container port monitor", Institute of shipping economics and logistic ISL, volume I /(2007).

4.Barberić Ivan „Kontejneri u integralnom transportu", Luka Rijeka.

5.Čarapić Lj. (1987): Organizacija prevoza sa integralnim transportom, Viša železnička škola, Beograd.

6.Davidović Branko (2000): „Savremene tehnologije kombinovanog transporta", Beograd.

7.Marković Ivo (1990): „Integralni transportni sustavi i robni tokovi", Fakultet prometnih znanosti, Zagreb.

8.Perišić R (1995): „Savremene tehnologije transporta II", Saobraćajni fakultet, Beograd.

9.Rodrigue Jean Paul, Comtois Claude, Slack Brian,(2006): „The geography of transport systems", New York.

10.Rotermund W., (1949): Die Ladung - Band II (3. Auflage), Hamburg.

11.Stakić, Milan (1985): Međunarodni transport i špedicija, Beograd: Viša ekonomska škola.

12.Stanković M (2006):, Ekonomika spoljne trgovine, Zaječar.

13.Zelenika, R.(1996): Međunarodna špedicija, Ekonomski fakultet, Rijeka.

BIOGRAPHIES

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LOF 2011 – NEW REVISION OF THE LLOYD'S STANDARD FORM OF SALVAGE AGREEMENT

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ABSTRACT

The British Lloyd's Standard Form of Salvage Agreement (Lloyd's Open Form – LOF) is the most common and applied standard form of contract that has been used in international maritime trade for salvage of property at sea from maritime peril. By signing the salvage agreement, the clauses stipulated in the Form become the agreement's constituent part and override statutory provisions of Maritime Property Law regarding salvage at sea. The Lloyd's Open Form has been based on the traditional principle no cure – no pay. The Form has been applied for more than a hundred years. It was standardised for the first time in 1908 and was revised ten times during the 20th century. It was last amended in 2011. The most important changes to the form were introduced in 1980 (LOF 80), when the principle no cure – no pay was weakened in order to protect marine environment; from that moment on, awards have been permitted in cases where pollution has been avoided or mitigated. The most recent changes in LOF 2011 have been aimed to improve the contract in the light of developments in shipping.

KEY WORDS
Salvage, salvage agreement, no cure - no pay, standard Lloyd's Open Form – LOF, LOF 80, LOF 2011

1. INTRODUCTION

Salvage is a specific legal institute of Maritime Law. The term salvage implies any necessary and useful service and assistance rendered to the property and the persons at risk or in distress at sea. The very salvage activity is aimed at preserving and protecting the vessel, property and persons onboard the vessel from the threats related to the maritime navigation which may result in loss of life or property. [4] While the traditional salvage once referred to mandatory tasks such as saving life and property threatened by sea accidents, one of today's most important tasks include prevention of environmental damage.

In classical terms, salvage was an activity having a useful result. Property recovery may have been complete or partial, but a salvage operation without useful result was considered merely as a salvage attempt. The salvor was entitled to a satisfactory salvage award for successful rescuing a vessel or other property. The salvage award was limited by the value of the recovered property and represented the essential principle of the no cure – no pay system [3].
A salvage operation forms a property-right relationship where one party requires a salvage award while the other owes remuneration to that party, i.e. the salvor. Therefore there are two salvage entities: an active entity providing a

salvage service – the salvor (a professional salvor or any other person rendering salvage service), and a passive entity, the user of salvage operation, i.e. the owner of the property at risk.
As an important maritime law institute, salvage was regulated at the international law level in 1910 by the Brussels Convention for the Unification of Certain Rules of Law Relating to Assistance and Salvage at Sea (amended by the 1967 Protocol) which was overridden in 1989 by the London International Convention on Salvage that entered into force in 1996. The essential amendments introduced by the Convention refer to granting the salvor additional incentives for participating in the marine environment preservation and protection. The Republic of Croatia signed and ratified the 1989 Convention on Salvage so that the Maritime Code [8] have been harmonised with the Convention.
Regarding the salvage matter, there is a difference between obligatory and voluntary salvage. Saving life is obligatory. Unlike saving human lives, it is not obligatory to save other persons' property, except for saving the other vessel in case of collision. The voluntary property recovery may be spontaneous (non-contractual) or contractual. As the term implies, spontaneous or non-contractual salvage is a voluntary salvage action which is performed without salvage agreement. Although a voluntary salvage represents a typical form of salvage as it corresponds to the very nature of the salvage institute, in practice it is most often performed on the basis of a salvage agreement made between the salvor and the owner of the property at risk [9].
In the 20th century, in addition to two international conventions on salvage, an autonomous salvage right was formed and defined by standardised agreement forms. The most common salvage agreement form applied in international maritime practice has been the British Lloyd's Standard Form of Salvage Agreement (Lloyd's Open Form - LOF) [1].

2. SALVAGE AGREEMENT FORM - LLOYD'S OPEN FORM (LOF)

2.1. Origins and Development of LOF Form

Conventions and legal regulations regarding salvage are largely dispositional in their legal nature. This means that, if the contractual terms are not breaking enforced legal norms, the salvage agreement has the advantage over the legal regulations. By this form of agreement, one party, the salvor, agrees to undertake the operation aimed at rescuing the vessel, her cargo and other property and assets onboard the vessel, whereas the other party agrees to pay an appropriate award for the rendered salvage operation.
Salvage agreements have not been defined by maritime law regulations. These agreements are informal legal business whose setting-up and validity do not require to be made in a specific form. Salvage agreements may be made orally, by telephone, through radio contact, e-mail, and the like. The parties can agree that the agreement shall be valid only if made in specific form. In spite of the flexibility in communication, a salvage agreement is commonly made in writing, most often by using any of the standardised forms as they facilitate the making of an agreement and provide adequate legal safety given the fact that the parties are familiar with the agreement's contents and terms in advance. By signing a salvage agreement, the clauses contained in the standardised forms become the agreement's constituent parts. In international agreements, the most frequently applied form is Lloyd's Standard Form of Salvage Contract – Lloyd's Open Form (LOF). According to the data provided by International Salvage Union (ISU), more than half of all salvage actions worldwide have been performed by using LOF.
The origins of LOF date back to the 1890s and the efforts of Colonel Sir Henry Hozier, then Secretary to Lloyd's, to introduce a standardised salvage agreement form and reach an understanding with salvors in the Dardanelles/Black Sea region. This led to the introduction of a new system allowing the Committee of Lloyd's, or the Committee's appointed arbitrator, to adjust prices agreed for salvage services if the amounts were disproportionate and subsequently considered

inappropriate. In this way, the Committee of Lloyd's, or the appointed arbitrator, could increase or reduce the salvage award.

It took nearly twenty years before the concept of standardised salvage agreement form was widely accepted. LOF's first edition was published more than 100 years ago, in January 1908. Under the terms specified in the first edition, salvors were obliged to report the level of security that they required to the Committee of Lloyd's or the arbitrator, upon the completion of salvage services. Regardless of whether or not the parties to the agreement stipulated a fixed price, the final remuneration payable was determined by the Committee of Lloyd's or its appointed arbitrator (unless, upon the completion of salvage services, all parties were satisfied that the price agreed was fair).

LOF has been revised many times over the 20th century. By the time the Committee of Lloyd's had declared it the English salvors' exclusive type of salvage agreement, it was regularly amended in 1891, 1896, 1897 and 1908. Further revisions of Lloyd's Open Form as a standardised agreement were carried out in 1924, 1926, 1950, 1953, 1967, 1972, 1980, 1990, 1995 and 2000. It was last amended in 2011. The principle no cure - no pay has remained dominant in all LOF versions. In the meantime, LOF has become commonly applied worldwide, mostly due to legal security that the form offers to the parties, but also due to stable criteria and the reputation of Lloyd's Arbitrations settled by LOF. [6]

2.2. Effects of Marine Environment Protection on LOF Form Revision

Nowadays, LOF 1995, LOF 2000 and the newest LOF 2011 are in use. These versions supersede LOF 1990 and LOF 1980. The latter is often regarded as an important milestone in the history of the form. Nine years before the 1989 Convention on Salvage that ensured additional incentives for the marine environment protection and prevention from pollution, LOF 1980 introduced the first safety net system having the same goal – to motivate salvors for marine environment protection.

Following the experience regarding the Amoco Cadiz accident in 1978, the form LOF 1980, for the very first time, introduced an exemption from the widely applied and long established no cure – no pay principle into the right of salvage. The change was aimed at marine environment protection and implied remuneration through the safety net system. According to this system, the salvor was entitled to reward despite the fact that: the salvage attempt was not successful; the salvage attempt was partly successful; or the salvor was unable to complete salvage service [1].

According to LOF 1980, the salvor was entitled to such a reward only if recovering an oil tanker, and the reward was materialised exclusively by the shipowner. The reward was in line with the salvor's justified expenses (including the expenses with regard to towboats and other craft, salvage equipment and personnel that the salvor used during the salvage operation); the overall sum was increased by a bonus amounting up to 15% of the recognised financial losses (the so-called safety net clause). However, the safety net system could be applied only in case the expenses and bonus were higher than any price payable as the standard salvage award, with regard to any property rescued by the salvage services. The revision of LOF in 1980 and the introduction of the safety net clause hastened the new Salvage Convention in 1989 which, in addition to standard salvage awards, introduced a special compensation as an amendment to the safety net clause.

In order to motivate salvors to engage in marine environment protection when performing salvage operations, Article 14 of the Salvage Convention introduced a system of special compensations payable exclusively by the shipowner (i.e. the insurer of the shipowner's liability – the P&I club whose member was the shipowner). In this way the salvor was entitled to special compensation only when recovering the vessel or the vessel's cargo that represented a threat to marine environment and if the salvor did not materialise the right to salvage award stipulated in Article 13. If these two requirements had been met in a cumulative way, and the salvor could not prevent or mitigate the damage to the marine environment, he was entitled to special compensation that amounted only to the actual expenses. However, if the salvor was entirely or partly successful in preventing or mitigating the damage to the marine environment, then the special compensation included a bonus amounting up to 30% of the actual expenses, exceptionally up to 100%. The special compensation was granted to the salvor up to the sum that exceeded the standard award for saving the property at risk [7]. Aiming at better protection of marine environment, the clause mitigated, to a certain extent, the traditional right of salvage principle (no cure – no pay) in a way that the salvor was entitled to special compensation even though the salvage operation may not have had useful result, i.e. when the salvor did not succeed to earn the reward by applying standard criteria.

Although the Convention on Salvage, in the time it was adopted, represented a huge step forward towards pollution prevention, its implementation showed that it did not provide effective instruments for motivating salvors to engage in protecting the marine environment which was daily threatened by pollution. Stylisation of the clauses on special compensation in Article 14 turned out rather awkward and insufficiently clear for application in judicial and arbitration practice.

After the decision, reached in the House of Lords in The Nagasaki Spirit case, which was supposed to provide guidelines for lower courts on acting in cases where the Convention was ambiguous, the professional public (particularly the professional salvors) remained disappointed. The trend devised by the 1989 Convention on Salvage – to provide incentives for salvors (the endangered sector of shipping business) to engage in protecting the marine environment from pollution, was not much encouraged by the decision. The decision reached by the House of Lords regarding that case defined that the calculation of the special compensation to salvors would not recognise the elements of profit as the salvage expenses. Likewise, the salvage expenses would not include the "elements of market", e.g. the income that the salvage vessels would have yielded, had they been chartered instead of performing an unsuccessful attempt of property recovery.

LOF 1980 was revised in 1990. The most important changes that were introduced to LOF 1990 referred to the Convention on Salvage which was adopted the year before. The new LOF included the criteria for determining the salvage reward from Article 13 and the special compensation clause from Article 14 of the Convention. In this way, by means of standard agreement forms, the principles of the Convention on Salvage were applied even before it actually came into force (the Convention entered into force in July 1996). Five years later, LOF was revised again. The essential reason for the introduction of LOF 95 resulted from the fact that Great Britain had ratified the Convention. As LOF is a British form, it was necessary to harmonise it with the Convention.

3. GENERAL CHARACTERISTICS OF LOF 1995 FORM

In its essence, LOF 1995 [4] remained identical to its earlier versions, stating that without useful result there is no right to reward. Its title clearly points out the same principle: NO CURE – NO PAY. A salvage agreement can be made by authorised entities including the master of the vessel at risk and the master of the vessel rendering salvage assistance, the shipper operating the vessel which is at risk and the shipper operating the vessel rendering salvage assistance, cargo owners regarding the salvage of their cargo, and the master or the shipper operating the vessel at risk, on behalf of the owner of other property onboard the vessel.

The salvors (referred to in LOF agreement as the Contractors) thereby agree to use their best endeavours to salve property and to prevent or minimise damage to the environment. In modern practice it seldom occurs that the award is fixed in advance, hence newer LOF versions do not include a box for entering the price of the award. The latter is defined by arbitration in London in accordance with the criteria for determining the salvage awards. These criteria include: a) the salved value of the vessel and other property; b) the skill and efforts of the salvors in preventing or minimising damage to the environment; c) the measure of success obtained by the salvor; d) the nature and degree of the danger; e) the skill and efforts of the salvors in saving the vessel, other property and life; f) the time used and expenses and losses incurred by the salvors; g) the liability risk and other risks run by the salvors or their equipment; h) the promptness of the rendered services; i) the availability and use of vessels and other equipment intended for salvage operations; j) the state of readiness and efficiency of the salvor's equipment and value thereof. The criterion referring to "the skill and efforts of the salvors in preventing or minimising damage to the environment" should be particularly pointed out as it motivates the salvor to engage in preventing pollution and in protecting the environment. The same criterion can be found in the Convention on Salvage and in Maritime Code.

According to LOF 1995, the owner of the vessel at risk and the crew members shall cooperate fully with the salvor (contractor). The contractor may make reasonable use of the vessel's machinery, gear, equipment and supplies free of expense. Having completed the salvage service, the salvor notifies the Council of Lloyd's of the amount of security required from each individual property interest (owners of the vessel, cargo and other property). The owner of the ship at risk has to procure the security from the cargo owner prior to delivering the cargo. In case the salvage operation did not have useful result, but the marine environment was threatened by pollution, the shipper / owner of the vessel at risk shall provide the salvor with the security for special compensation [4]. According to LOF 95, the salvor/contractor has the lien (maritime lien law) over the recovered property until he is given the security for salvage award payment. The security should be the person that is acceptable to the salvor or the Council of Lloyd's (if the Council decides on the acceptability of the security, the security provider's headquarters must be in Great Britain). Upon the parties' request, the Council appoints a single arbitrator who settles the salvage award on the basis of the contractual criteria. If any party is dissatisfied with the arbitrator's settlement, a complaint can be filed to the Council that, if such a case arises, appoints the appeal arbitrator for the complaint settlement. This arbitrator's decision is final. The relationships described in LOF 95 are governed by English Law, but parties may agree to apply another state's law.

4. SCOPIC CLAUSE (LOF 2000 FORM)

LOF 2000 is the tenth edition of the form since its establishment. The relative failure of conventional incentives for the salvors to protect marine environment through the right on special compensation, resulted in efforts made by professional salvors and P&I clubs (as liability insurers paying the special compensation) to design and launch a specific tariff system for defining compensations, which eventually became the SCOPIC clause (Special Compensation of Protecting and Indemnity Clause). This clause was added to LOF 2000 in such a way that agreeing on SCOPIC clause terms is just an option that may or may not be used in addition to LOF. The essential SCOPIC clause feature is that it ensures a higher possibility of award materialisation for the salvors, compared with the special compensation, and a possibility for P&I clubs to monitor salvage operations.

This clause defines remuneration on the basis of pre-agreed tariff rates. By agreeing on SCOPIC terms, Article 14 (special compensation) of the Convention on Salvage ceases to be effective. LOF 2000 allows the salvor to invoke SCOPIC clause at any time, at any stage of salvage operation, provided that certain conditions are met, whether there is a threat to marine environment or not. By agreeing on SCOPIC clause, the salvor ensures to receive the reward from the owner of the vessel or from his P&I club, according to the agreed price. The clause allows the salvor to compensate for his cash losses as well.

Irrespective of agreement on SCOPIC clause application, the salvage award is defined by Article 13 of the Convention on Salvage, and the remuneration foreseen by the SCOPIC clause is paid only if it is higher than the salvage award. If the SCOPIC remuneration is lower than the salvage award, the salvage award is 25% less than the difference between the salvage award and the remuneration defined by SCOPIC clause. The salvor may stop rendering salvage services if his expenses exceed the value of the property that can be recovered and all the rewards that he would be entitled to in accordance with SCOPIC clause [4].

As the SCOPIC clause features clearly show, the clause allows the salvors to materialise salvage remuneration in a safer and faster way, but the clause itself has not sufficiently contributed to the marine environment protection so that the public and legal issues arising from the Convention on Salvage are still present [5].

5. NEW REVISION OF LOF 2011

The statistics of the International Salvage Union (ISU) indicate that each year the salvors perform more than 200 salvage operations whose aim is to prevent or minimise damage to the marine environment. In seventeen years, from 1994 to 2012, professional salvors, ISU members, recovered 17.047.014 tonnes of various pollutants (oils, fuel oils, chemicals), which amounts to over a million tonnes per year. ISU salvors participate in more than 90% of all salvage operations worldwide. More than half of these operations are performed on the basis of LOF agreement [11].

Practical experience has proved that the existing convention and autonomous regulations on salvage awards and alternative special compensations have not sufficiently encouraged professional salvors to engage in marine environment protection and prevention from pollution. Therefore, in addition to standard salvage awards, the salvors have been recently suggesting the introduction of environmental salvage awards as a parallel remuneration for the salvors who have prevented or minimised the pollution of the marine environment. Their persistent requests have resulted in the procedure for introducing amendments to the Convention on Salvage, which is now in progress, as well as the new revision of LOF, expected by the year of 2010.

The revision of LOF was completed one year later, in 2011, but it included only minor amendments to the existing LOF. The amendments do not contain any changes related to encouraging the salvor to engage in environment pollution prevention. Just like before, they are entitled to special compensation or SCOPIC clause in case that the salvage services are rendered under LOF 2000 (i.e. LOF 2011).

Two new clauses have been added to LOF 2011. The first enables publishing of LOF awards on the Lloyd's website in order to make the processes more transparent an inclusive. The second requires the salvage contractor to notify Lloyd's within 14 days of their engagement to services under LOF 2011. [2]

Other amendments have been introduced to the clause Lloyd's Standard Salvage Arbitration - LSSA, which has been the constituent part of the Lloyd's standard salvage agreement from since 2000 (LOF 2000), along with Lloyd's procedural regulations. In 2000, most of the administrative and process solutions from LOF 1995 were transferred to a special clause called LSSA, and this has considerably simplified the very salvage agreement form [10].

Changes to the LSSA 2011 clause include new provisions with regard to guarantees for the arbitrator and appeal arbitrator's fees and publication of awards. The changes from Special Provisions (Articles 13, 14 and 15) of LSSA are most significant for salvors and relate to unrepresented cargo in container vessel cases. These changes should speed the process of conducting and setting laden containership cases. Firstly, communication with unrepresented cargo interest shall be deemed proper if it is sent to the party providing the salvage guarantee in respect of that property. Secondly, subject to the express approval of the arbitrator, where a settlement agreement is reached between the contractor and the owners of salved cargo comprising at least 75% of value of the salved cargo that agreement shall be binding on unrepresented cargo interests. Thirdly, again subject to the express approval of the arbitrator, any salved cargo with a value below a figure to be agreed on a case by basis may be omitted from the salved fund and excused from liability for salvage where the cost of including such cargo in the process is likely to be disproportionate to its liability for salvage. [2]

6. CONCLUSIONS

The salvage agreement has not been defined by maritime law regulations as it is a non-formal legal business whose making and validity do not require a defined form. In practice, however, the salvage agreement is most often made by using one of the standardised salvage agreement forms as they ensure quick procedure and adequate legal safety due to the fact that the parties are familiar with the agreement's contents in advance. By signing a salvage agreement, the clauses contained in the standardised forms become the agreement's constituent parts. In international agreements on recovering property at sea, the most frequently applied form is Lloyd's Standard Form of Salvage Contract – Lloyd's Open Form (LOF).

The history of this form is more than a hundred years long. In the meantime, LOF has become commonly applied worldwide, mostly due to legal security that the form offers to the parties, but also due to stable criteria and the reputation of Lloyd's

Arbitrations settled by LOF. It is common that the changes and new trends in shipping occasionally result in LOF revisions. Still, the principle no cure - no pay has remained dominant in all LOF versions. The most important changes to the form were introduced in 1980 (LOF 80), when the principle no cure – no pay was weakened in order to protect marine environment; from that moment on, awards have been permitted in cases where pollution has been avoided or mitigated. The 2000 revision is quite interesting. By agreeing on LOF 2000 the parties may invoke SCOPIC clause that defines remuneration on the basis of pre-agreed tariff rates. The system ensures a higher degree of legal safety and a higher possibility of award materialisation for the salvors, compared with the special compensation. By agreeing on SCOPIC terms, Article 14 (special compensation) of the Convention on Salvage ceases to be effective.

Practical experience proved that the existing convention, special compensations and SCOPIC clause did not sufficiently encourage professional salvors to engage in marine environment protection and prevention from pollution. Therefore, in addition to standard salvage awards, the salvors have been recently suggesting the introduction of environmental salvage awards as a parallel remuneration for the salvors who prevented or minimised the pollution of the marine environment. Their persistent requests have resulted in the procedure for introducing amendments to the Convention on Salvage and to the new revision of LOF, aimed at better preservation and protection of the marine environment.

However, the revised LOF 2011 included only minor amendments to the previous version. The amendments do not contain any changes related to encouraging the salvor to engage in environment pollution prevention. Just like before, they are entitled to special compensation or SCOPIC clause in case that the salvage services are rendered under LOF 2000 (i.e. LOF 2011).

The goal of the latest changes introduced to LOF 2011 is to tune the salvage agreements to recent trends in modern shipping. Two new clauses have been added to LOF 2011. The first enables publishing of LOF Awards on the Lloyd's Agency website, the intention being to make the process more transparent an inclusive. The second requires the salvage contractor to notify Lloyd's within 14 days of their engagement to services under LOF 2011. Other changes have been incorporated into Lloyd's Standard Salvage Arbitration clause – LSSA 2011 which includes new provisions with regard to guarantees for the Arbitrator and Appeal Arbitrator's fees and publishing the awards. The changes from Special Provisions of LSSA are most significant for salvors and relate to unrepresented cargo in container vessel cases. These changes should speed the process of conducting and settling laden containership cases.

As for pollution prevention and the associated appropriate rewards, the professional salvors shall wait for the new Convention on Salvage which would establish a new international legal framework for introducing a more efficient system of compensations for the salvors engaged in pollution prevention and protection of the marine environment. Only then may a new LOF revision be expected.

REFERENCES

1. Darling, Gerald; Smith, Christopher, LOF 90 and the New Salvage Convention, London, 1991.

2. ISU SALVAGE WORLD, International Salvage Union, June 2011.

3. Mandaraka-Sheppard, Aleka, Modern Admirality Law, London, 2002.

4. Pavić, Drago, Pomorsko imovinsko pravo, Split, 2006.

5. Petrinović, Ranka; Plančić, Bisera, Hrvatsko pravo spašavanja u uvjetima europskih integracija, Poredbeno pomorsko pravo, No. 1, Zagreb, 2007.

6. Petrinović, Ranka; Plančić, Bisera; Mandić, Nikola, Revizija Lloyd's Open Form (LOF 2010) – učinkovitija zaštita morskog okoliša?, Naše more, Vol. 56, No. 1-2, Dubrovnik, 2009.

7. Petrinović, Ranka, Zaštita morskog okoliša kao element suvremenog prava spašavanja (doktorska disertacija), Split, 2005.

8. Pomorski zakonik Republike Hrvatske, Narodne novine, No. 181/04, 76/07, 146/08 and 61/11.

9.Rose, Francis D., Kennedy and Rose, The Law of Salvage, six edition; London, 2002.

10.Štambuk, Darijan, Novi Lloyd'sov standardni obrazac ugovora o spašavanju 2000, Osiguranje – Hrvatski časopis za teoriju i praksu osiguranja, No. 4/2001, Zagreb, 2001.

11.www.marine-salvage.com (accessed: 2013-03-14)

BIOGRAPHIES

Ranka Petrinović was born in 1960, graduated from the Faculty of Law, Split University, in 1983, completed a post-graduate course in the Maritime Law and Law of the Sea and received a Master's degree in 2001 (the title of her thesis: Insurance of Shipowners's Liability for Damage in Collision). She was awarded in 2005. Her doctoral thesis is entitled Protection of the Environment as the element of Modern Right to Salvage. She worked first in "Split" Shipyard in the Sales Department as a legal consultant for Shipbuilding Contracts and Newbuilding Insurance (1986-1996) and later in the Legal Department of Shipping Company Jadroplov BE Ltd. (H.&M. Insurance and Registry of Ships) (1986-2002). At Faculty of Maritime Studies, she worked as lecturer (since 2002), assistent professor (since 2006) and associate professor (since 2009). Associate Dean for Financial Affairs (2006-2010). She attended several professional seminars in the field of maritime law and marine insurance. Member of Croatian Association of Maritime Law (Rijeka).

Vesna Skorupan Wolff was born in Zagreb. She has graduated law at the Faculty of Law, University of Zagreb (LL.B.) in 1993. In 1999 she gained her LL.M. She earned her Ph.D. in 2005 at the Faculty of Law, University of Zagreb. Her doctoral thesis was "Liability of the Maritime Carrier". She passed her Bar exam in 1995. Since 2003 she is employed at the Adriatic Institute of Croatian Academy of Science and Arts. She is currently senior research associate. She held two other posts before starting to work at the Adriatic Institute. She worked in a private attorney office and at the Supreme Court of Republic of Croatia. She has published over 50 scientific and professional papers. She has participated in numerous domestic and several international conferences related to maritime law. Since 2007, she is an associate on the scientific project "Croatian Maritime Legislation and the EU Law". She won the prize of the Croatian bar association - professional periodical publication "Odvjetnik" for the best paper in the 1995. She is a member of the Editorial Board of the scientific periodical publication Comparative Maritime Law. She was a member of the Expert Commission which drafted Croatian Maritime Code. She is a member of the Croatian Association of Maritime Law. Her scientific interests include maritime law.

Nikola Mandić was born in 1985 in Split. He has graduated at the Faculty of Maritime Studies, University of Split, in 2007. He completed a post-graduate course in the Maritime Law and Law of the Sea at the Faculty of Law, University of Split, in 2010 and received a Master's degree (the title of thesis: Contract of Maritime Agency). From the year of 2008 he is employed at the Faculty of Maritime Studies as an assistant in courses: Maritime Law, Maritime Property Law, Maritime Law and Average, Maritime Agency and Forwarding and Contracting in Maritime. From the year of 2009 he cooperates with University Department of Marine Studies, University of Split, in the course of Maritime and Fishing Public Law. He participated on fifteen scientific conferences and also has published around twenty scientific papers. He is a member of Croatian Association of Maritime Law.

Defining Factors of Nautical Tourism Ports Competitiveness in the Republic of Croatia

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ABSTRACT

In the Republic of Croatia, over the last fifteen years, nautical tourism has been experiencing a strong expansion. Despite the general recession that prevails on the global market, nautical tourism in Croatia, according to the recent studies, has been recording high annual growth rates. In order to maintain competitive position on the market of the nautical port services which become highly dynamic and demanding, supply of such services should be continuously adapted to the increasing nautical tourists` demands as the main beneficiaries of the nautical port services. In order to enable optimal development of nautical tourism ports as the major accelerators of the nautical tourism prosperity, in this paper the factors that indicate the competitiveness of the nautical tourism ports have been determined and defined. Also, systematic analyses of elements which contribute to the overall competitiveness of the nautical tourism ports have been performed. Number of berths, price of berths, marinas` infrastructure and catering facilities are just some of the evaluated parameters. Such analysis is carried out with a goal dedicated to improvement of the long-term sustainability of the nautical services quality in the Croatian nautical tourism ports.

KEY WORDS
Competitiveness, nautical tourism, ports of nautical tourism, nautical services.

1. INTRODUCTION

The east coast of Adriatic Sea is a favorable place to sail due to many islands and beautiful bays with suitable weather conditions.However,attractive geographical characteristics along with marina berth are no longer sufficient to satisfy constantly growing requirements of nautical tourist`s. Therefore, it is of the crucial importance to evaluate also other relevant parameters that influence the competitiveness of nautical tourism ports. As regards to previous research on this topic, a competitiveness of Croatian nautical tourism study is worth of mentioning. In the paper [4] authors analyze nautical tourism supply, price competitiveness and nautical tourists` perceptions of competitiveness. According to the results obtained in the aforementioned study the natural resources are the strongest Croatian advantage, while infrastructure and services are on a lower standard level.
Another interesting study on the similar subject is an analysis of nautical tourism in the Republic of

Croatia in 2009. by means of system approach [9]. The following conclusion drawn by the authors is that the overall lack of complementary services in Croatian nautical tourism ports generates lower level of nautical tourist`s satisfaction.
According to our knowledge this is the first paper that considers comparative features of Croatian marinas. In this paper, competitive features like berth capacity, daily berth price, marinas` infrastructure and catering facilities are determined, quantified and eventually interpreted. Parameters covered by this analysis are measured for all five costal Croatian Counties, more specifically: Istria County, Primorsko-goranska County, Zadarska County, Šibensko-kninska County, Splitsko-dalmatinska County and Dubrovačko-neretvanska County.
Moreover, parameter average figures corresponding to particular County are graphically indicated and properly interpreted.
In Section 2, analysis of sea/dry berth daily prices is performed. Section 3 and 4 give information about number of sea and dry berths in Croatian marinas, respectively. Furthermore, Section 5 gives an overview of infrastructure equipment in Croatian marinas. Finally, in the Section 6, some concluding remarks are given.

2. SEA BERTH DAILY PRICE AS A COMPETITIVENESS FACTOR

As far as competitiveness of nautical tourism ports is concerned, the berth price is definitely the one of the most important factors that should be taken into consideration. However, the favorable cost of berth is not the only element that attracts nautical tourist to call the nautical tourism port. In addition, the other important elements that participate in someone`s decision to call the nautical tourism port are as follows: infrastructural equipment, security in marina, video-surveillance, an exchange office, laundry, nautical equipment shop, technical service, parking area, the petrol station, a WLAN Internet system, entertainment facilities ect. In order to make a more precise and a more accurate analysis, 61 marina of Republic of Croatia are included into an examination. The majority of considered marinas are listed at the Ministry of Maritime Affairs, transport and infrastructure web site [23]. Marinas that are not included in the aforementioned list are added in the analysis in order to obtain a more comprehensive picture of the Croatian nautical tourism port offer. Therefore, Aci Piškera, marina Agana, marina Seget Baotić, marina Maslinica are added in calculation of average daily berth price for corresponding County. The Figure 1. indicates current situation as the daily berth prices are subject to change by the port management. In order to get the most accurate results, daily berth prices for vessels of 11 and 14 meters in length are taken as a point of reference in this study. Furthermore, the daily berth prices in the period of the month of May, July, August and October are the part of the analysis. The comparative analysis is made taking into consideration average berth price of each county during low and high nautical season. Namely, the prices that are taken into account relate to price for the period of May, July, August and October for the vessels of 11 and 14 meters long.
At the first glance it can be seen on the Figure 1. that the highest price is for the vessels of 14 meters in the period of high season (July, August) that call the nautical tourism ports in Duboravčko-neretvanska County. While for the same characteristics Zadar County seems to be the most convenient area to visit from the financial aspect. Furthermore, in the month of May and period of beginning of the nautical season, the lowest average berth price is recorded in Primorsko-goranska County for the vessels of 14 meters length. Whereas for the same boat characteristics and same period of nautical season, the highest average price to pay for a berth is in a Dubrovačko-neretvanska County. With regards to the month of October and the end season period, the most favorable average berth price for the 14 meters long vessel is in Istarska County.

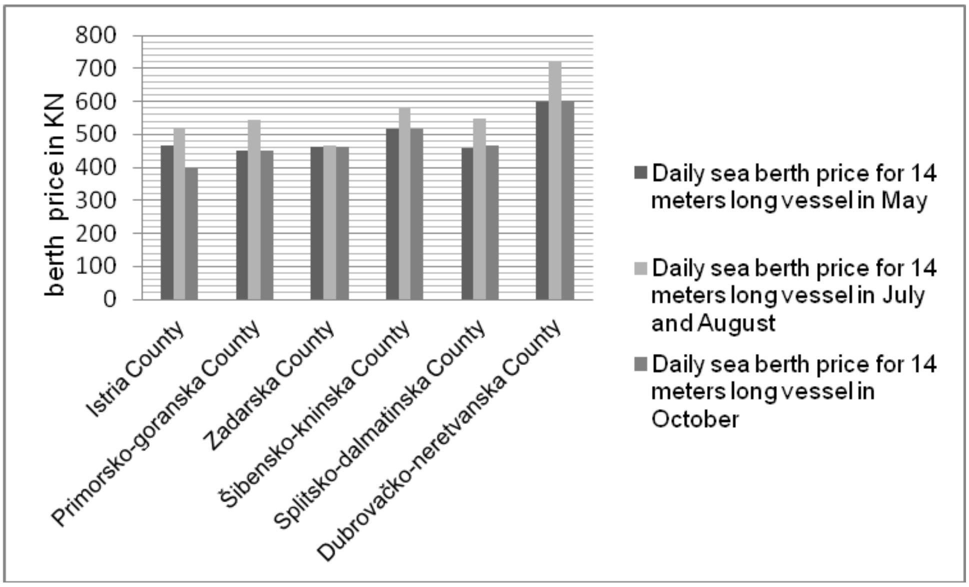

Figure 1. Average daily price of sea berth in month of May, July, August and October for 14 meters long vessels

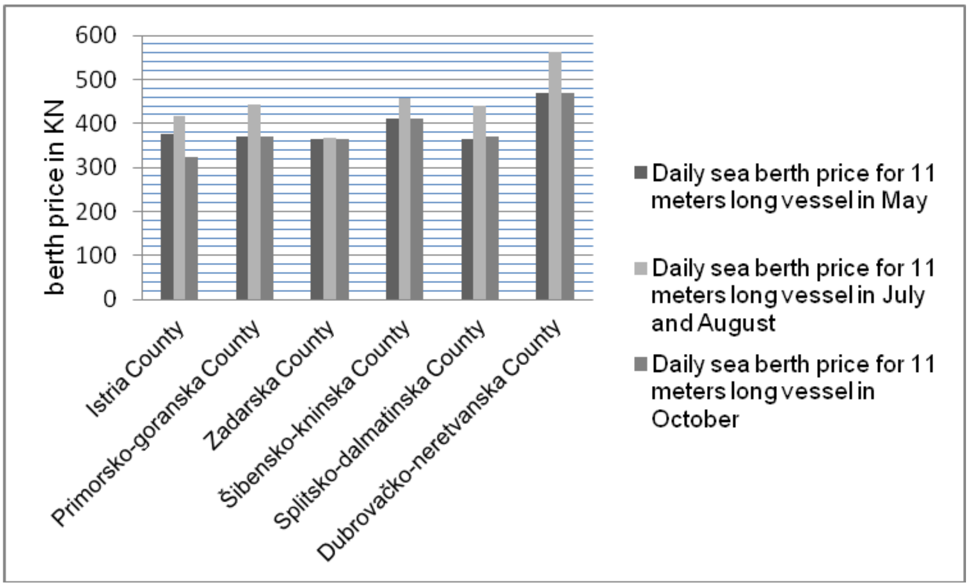

Figure 2. Average daily price of sea berth in month of May, July, August and October for 11 meters long vessels

As per results shown in the Figure 1. for the same boat characteristics and for the same nautical period, the most expensive ports are in Dubrovačko-neretvanska County. In the following paragraph the average berth prices will be examined per each nautical period whereas 11 meters long vessels are taken into account. As far as high season is concerned, the lowest average berth price for 11 meters long vessels is in Zadarska County, while the highest is in Dubrovacko neretvanska County.

In terms of low season and month of May, it came up that the most favorable cost to be paid for a berth place is in marinas of Zadarska County, while the greatest amount to be paid for the berth is in Dubrovačko-neretvanska County for the same period.

As regards to the end season and month of October, the smallest amount to be paid for a berth of 11 meters vessel long is in Istria County, and Dubrovačko-neretvanska County records the highest costs to be covered for a berth place in the same season period.

3. THE NUMBER OF DRY BERTHS AS A CAPACITY INDICATOR

For nautical tourism ports it is of utmost importance to secure optimal acceptance capacity along with other relevant services in order to fulfill nautical tourists` requirements. In the purpose of gaining the greatest possible marina revenue it is necessary marina to have larger and improved offer. However, according to previous research, the income derived through berth rent constitutes the largest proportion of total revenue.

In the following section the total amount of dry berths and berths in the sea for each nautical tourism port were evaluated. As it can be seen from the Figure 3. Primorsko-goranska County disposes with the highest number of dry berths making 25% of the total dry berth supply. On the contrary, Dubrovačko-neretvanska County offers the lowest number of dry berths making only 4% of the total dry berth supply.

4. THE NUMBER OF SEA BERTHS AS A CAPACITY INDICATOR

Data related to sea berth availability of particular marina are gathered based on pilot guide' reports and by direct phone contact with marina`s employees. With regards to the number of berths in the sea, Figure 3. clearly shows the advantage of Istria County that is making 24% of the total berths availability in the sea. Furthermore, only 4% of the total sea berth offer belongs to Dubrovačko-neretvanska County. High unit berth price in Dubrovacko-neretvanska County can be explained with lower overture of (dry/sea) berths in this county.

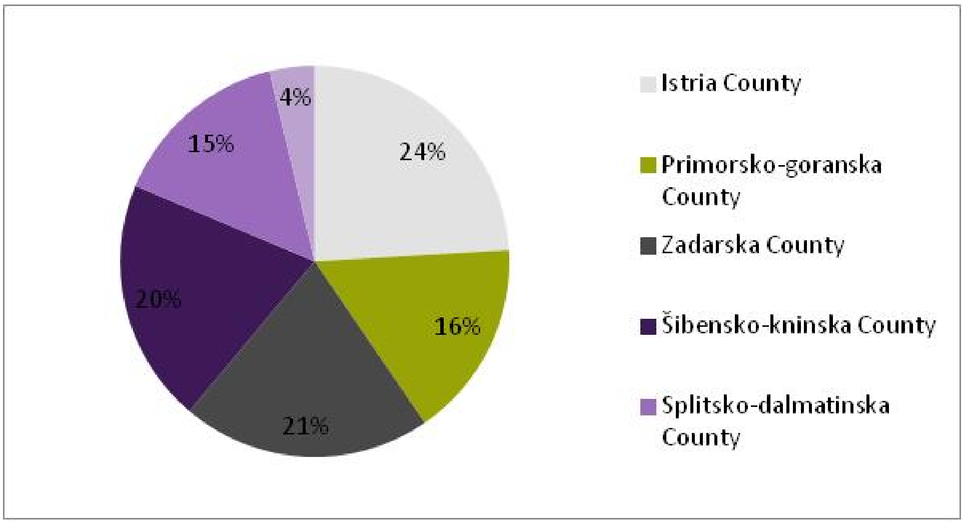

Figure 3. Sea berth share of particular County among the total sea berth supply

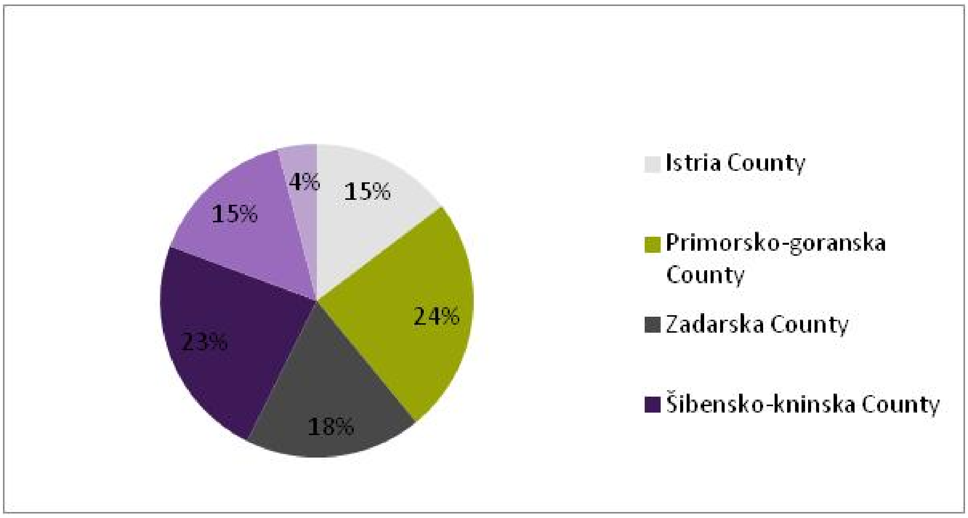

Figure 4. Dry berth share of particular County among the total dry berth supply

Obtained results are presented on Figure 4 relating to comparative analysis of dry berth capacity. As per analysis performed it turns out that Primorsko-goranska County disposes with the highest number of dry berths making 25% of the total dry berth supply. Moreover, Dubrovačko-neretvanska County constitutes only 4% of the total dry berth offer.

5. COMPARATIVE ANALYSIS OF INFRASTRUCTURE EQUIPMENT

According to the collected data, all marinas that are included in this analysis have water/power supply and toilet facilities except Marina Zirona on Drvenik Veliki Island which is under construction in the moment of writing.

When referring to existence of maintenance and repair shop in marina presented in Figure 5, it can be seen that in Istria County 94% of marinas are offering this kind of nautical facility. In the Primorsko-goranska County, there is a possibility for a vessel to be repaired in all analyzed marinas or in their nearby area. Furthermore, 75% of marinas located in Zadarska County offers maintenance and repair services. While for Šibensko-kninska County this percentage is a little bit lower and amounts 67%, for Splitsko-dalmatinska County this percentage is slightly lower and amounts 64%. Finally, 67% of marinas in Dubrovačko-neretvanska County offers maintenance and repair services as a part of their nautical offer.

Moreover, fuel service is one of the most important factors that enriches nautical tourism port offer. Therefore, this parameter is considered as well. However, fuel service that is in the area of one kilometer from the marina is also included in this analysis. Consequently, in the Istria County, 57% of the considered, marinas offer fuel service to the nautical tourists or a fuel station is located in the marina vicinity. Furthermore, 80% of marinas that are considered in the Primorsko-goranska County dispose with fuel facilities. In the Zadarska County 75% of marinas offer this type of service. In the Šibensko-kninska County, this share is 67%, while in the Splitsko-dalmatinska County is slightly lower and amounts 50%. All three marinas that are analyzed in Dubrovacko-neretvanska County dispose with above stated service.

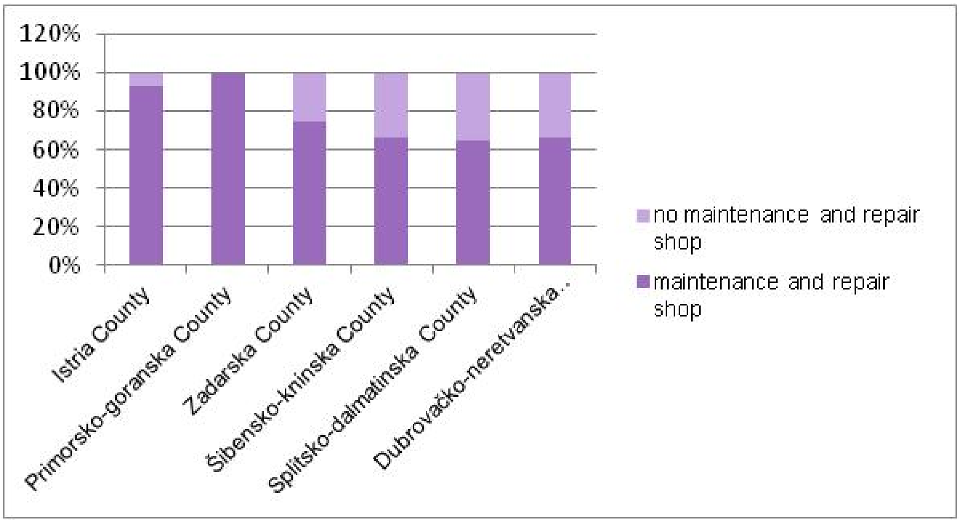

Figure 5. The proportions of marinas with maintenance and repair shop per each county

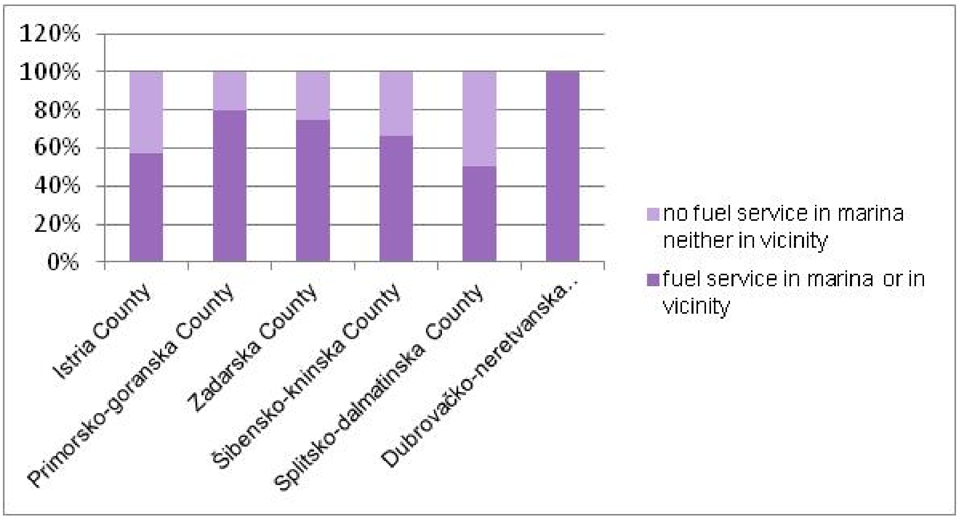

Figure 6. The proportions of marinas with fuel service in marina or in vicinity per each county

Marina management should provide nautical tourists with the feel of personal safety as well as with the protection of their property. In order to enable this sort of safety, many marinas have installed video surveillance equipment. Therefore, the current situation relating this issue is observed. As it can be seen in Figure 6, the Splitsko-dalmatinska County is in advantage relating to the video surveillance coverage in marinas. Aforementioned County is followed with the Istria County having 77% of marinas that have video surveillance. Moreover, in 75% of marinas in the Primorsko-goranska County and Šibensko-kninska County, video surveillance facilities are set up, while in the Zadarska County this percentage is on a lower level and amounts 57%. Furthermore, in the Dubrovačko-neretvanska County it came up that 67% from considered marinas are equipped by this kind of secure facility.

Due to nautical tourism development catering industry had an opportunity for expansion and specialization. In order to meet "boater's requirements" small restaurants offering famous delicacies were developed on the islands and coast as well [3]. All marinas included in the analysis have catering facilities or this sort of service is provided in nearby area.

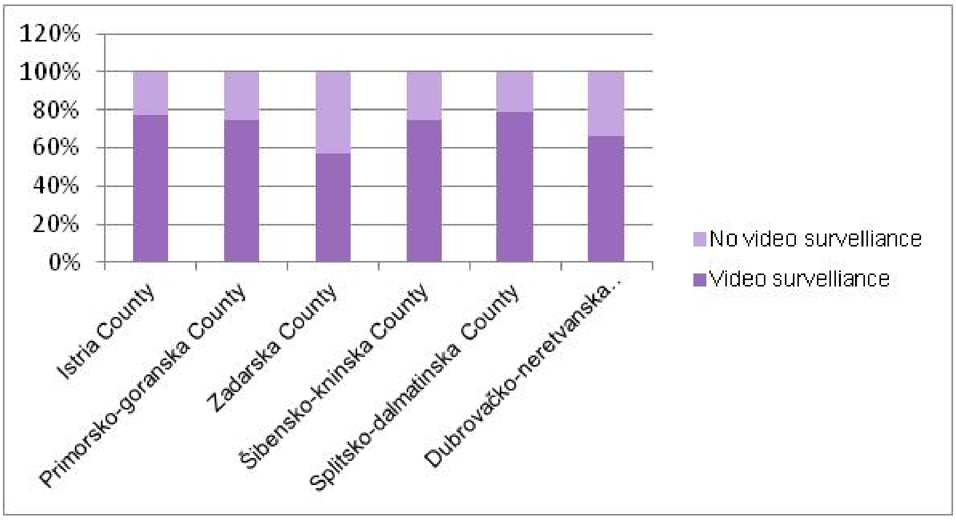

Figure 6. The proportions of marinas with video surveillance per each county

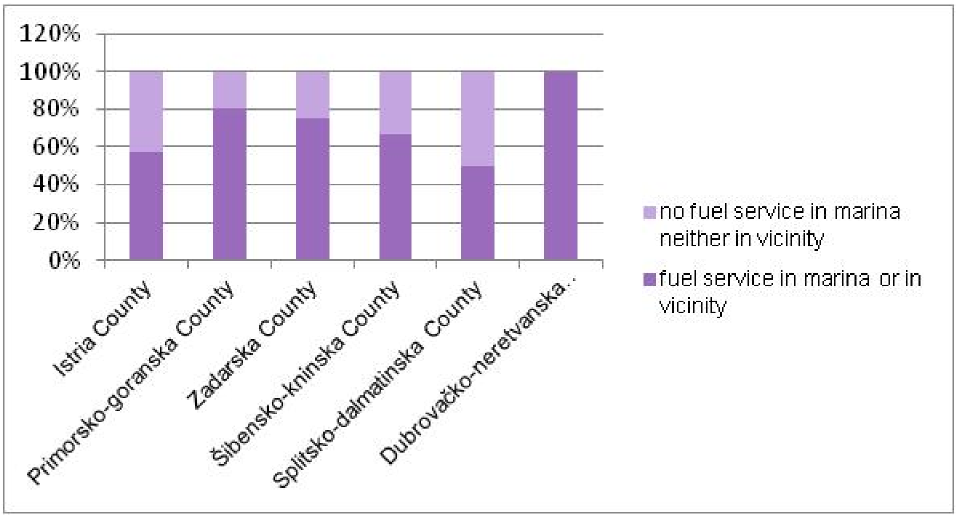

Figure 7. The proportions of marinas with crane or travel lift facility per each county

Among other supply, marinas should be equipped with cranes and travel lifts having appropriate carrying capacity. In that way, marina matches one aspect of boater`s demand related to technical support. The present situation in terms of port cranes and travel lift availability is shown in the above Figure 7.

As it can be seen from the Figure 7., all marinas considered in the analysis in both, Istria County and Primorsko-goranska County disposes with crane or travel lift. Furthermore, in Zadarska and Šibensko-kninska County 75% of all considered marinas offer this sort of technical support. As far as Splitsko-dalmatinska County is concerned, this proportion of marinas amounts to 57%. Finally, in Dubrovačko-neretvanska County 67% of considered marinas dispose crane or travel lift as a technical support.

6. CONCLUSION

In order to meet growing nautical tourists` demands the analysis of factors influencing competitiveness of nautical tourism ports is elaborated in this paper. In this context, a sustainable solution is the improvement of the nautical tourism port infrastructure, price competitiveness and service enrichment as well.

According to the analysis performed, where daily sea berth for 11 meters long vessels are taken into account, it turns out that the Zadarska County is in the most convenient position in relation to the other counties at the beginning of the nautical season and in high season period. The same thing applies for Istra County in the end season period.

On the other side, the most favorable County to be visited when taking berth costs into consideration relates to Zadarska County for vessels of 14 meters length, for the period of high season. As per analysis examined in a paper, it came up that Istria County offers the most favorable average berth daily price in the period of October and Primorsko-goranska in the month of May.

According to the results obtained it came up to the conclusion that the most expensive berths are in Dubrovačko neretvanska County for all periods of nautical season.

The following conclusions can be drawn on the above stated: due to scarce sea berth offer, the increased demand could not be covered, therefore marinas in Dubrovačko-
neretvanska County are able to keep high costs of sea berths.

According to the results obtained upon comparative analysis of dry/sea berth capacity it turns out that Primorsko-goranska County disposes with the highest number of dry berths making 25% of the total dry berth supply. While, Istarska County is making 24% of the total sea berths availability.

Furthermore, in Primorsko-goranska County there is a possibility for a vessel to be repaired in all analyzed marinas or in their nearby area. Comparative analysis referring to video surveillance facility indicates that the major part of marinas in Splitsko-dalmatinska County disposes with that sort of facility. The same thing applies for Istria and Primorsko-goranska County when cranes and travel lift availability is concerned.

The important tasks of nautical tourist port management are continuous follow-ups of nautical market trends and prompt adjustments to nautical tourists` needs. The competitiveness of nautical tourism port depends upon development of their infrastructure and superstructure as well as the service quality in the nautical port.

REFERENCES

1.Bestandig, K. et al, Atlas of ports and bays of Croatia, Slovenia and Montenegro (Zagreb, 2012), pp. 70-81.

2.Dulčić, A., Nautical tourism and nautical tourism port management, Ekokon (Split, 2002), pp. 23-27.

3.Favro, S. et al, "Natural characteristics of Croatian littoral area as a comparative advantage for nautical tourism development", Geoadria, Vol. 12, No.1 (2007), pp. 59-81.

4.Horak, S. et al, "Competitiveness of Croatian Nautical Tourism", Tourism in Marine Enviornments, Vol. 3, No. 2 (2006), pp. 145-161.

5.Kovačić, M., Optimisation of selection of the location and facilities of a nautical tourism port, Faculty of Maritime Studies (Rijeka, 2008), pp. 36-53.

6.Penovic Buble, M. et al, "Mental and Verbal Model of Sustainable Development of Nautical Tourism on Croatian Islands", Suvremeni promet, Vol. 30, No. 1-2 (2010), pp. 94-97.

7.Šutej, M. et al, Nautical guide of the Croatian Adriatic, Masmedia (Split, 2010)

8.Vidučić, V. et al, "Information Model of Nautical Tourism Development in Croatia", Suvremeni promet, Vol. 29, No. 5 (2009), pp. 39-345.

9.Žanić Mikuličić, J. et al, "Analysis of Nautical Tourism in Croatia in 2009 by System Approach", Suvremeni promet, Vol. 30, No. 1-2 (2010), pp. 123-126.

10.www.aci-club.hr

11.www.baotic-yachting.com

12.www.cervar-porat.com

13.www.nauticahotels.com

14.www.marina-agana.hr

15.www.marinaborik.hr/

16.www.marinafrapa.com

17.www.marina-kastela.hr

18.www.marinakornati.com/

19.www.marinakremik-adriatiq.com

20.www.marinatribunj-adriatiq.com

21.www.marina-mandalina.com

22.www.marina-veruda.hr

23.www.mppi.hr

ANALYSIS AND DEVELOPMENT TRENDS OF CRUISE TOURISM IN PORT OF KOPER

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ABSTRACT

The port of Koper is one of the northern-most ports of the Adriatic Sea and at the same time the only Slovenian port with an international passenger terminal. The number of passengers has steadily been increasing since 2005 since the opening of the passenger terminal. The majority of the traffic can be attributed to cruise lines and therefore represent mostly passengers involved in cruise tourism activities; furthermore most of the traffic is of a daily nature, most of the cruisers spending only a day in the port, enabling the passengers to visit the city of Koper and nearby tourist destinations. The following paper analyses the development of the Port of Koper passenger terminal, its guidelines, the strengths and weaknesses of its geographical location in reference to cruise passenger transport, and describes a potential future regarding cruise passenger traffic at the international passenger terminal.

KEY WORDS
Port, passenger traffic, passenger terminal, traffic flows.

1. INTRODUCTION

Being one of the northern-most ports of the Adriatic Sea, the Port of Koper offers an interesting geographical position as a home port or port of call for passenger ships. Although the passenger terminal has a short history from its establishment in 2005 until today it has had an almost constant increase in passenger numbers.

Operating on a single 420m long berth with maximum depth of 10m the international passenger terminal has in the last 5 years recorded an average call of 55 ships yearly to the port of Koper. The highest number of arriving ships was recorded in 2011 when 78 ships carrying a total of 108,729 passengers arrived. According to data published on Luka Koper website 51 ships are scheduled to arrive in 2013.

Slovenia, with 46 km of coastline, doesn't have any public maritime passenger traffic system. We can safely conclude that a constant flow of passenger cruisers in the port of Koper contributes to a growing tourism economy in the region not only on the coast but also in the hinterland.

The paper will introduce the reader to the development of the Port of Koper passenger terminal and contribute to better understanding of the importance of proper future development of international passenger terminal in port of Koper.

2. NORTHERN ADRIATIC AS A CRUISE DESTINATION

According to MedCruise (The association of Mediterranean cruise ports) the Mediterranean is the world's second most popular cruising arena, behind only the Caribbean. Where in the year 2000 the Caribbean share of the cruise market was about 40% and Mediterranean market share about 12%, by the year 2010 the Caribbean market share had dropped to about 35% and the Mediterranean share has risen to almost 18%. Since the overall market rose by 93% over this same time period we can safely conclude that the cruising market comprises a significant segment of maritime traffic. Being a member of MedCruise association gives port of Koper a great opportunity to take advantage of this fact.

2.1. Ports of call for cruisers in the Northern Adriatic region

The northern Adriatic ports consist of 12 destinations visible on Figure 3. In 2011 almost 2.5 million passengers visited these ports, calling on 1785 cruisers. 72% of all passengers visited Venice. Koper was fifth on the list with 4.39% of all passengers, just behind Split (7.34%), Ravenna (6.31%) and Ancona (5.84%), while all the other ports of the region took in 4.09%.

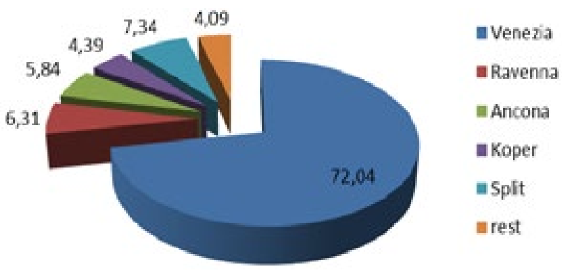


Figure 1: Passenger shares by ports
Source: adapted from (The passenger terminal of the port of Koper: Prospects of development in cruising)

Analysis of calls to ports with the largest market share aside from Venice show similar conclusions: Split (252 calls carrying 181,963 passengers), Ravenna (79 calls carrying 156,374 passengers), Koper (78 calls carrying 108,820 passengers) and Ancona (52 calls carrying 144,721 passengers).

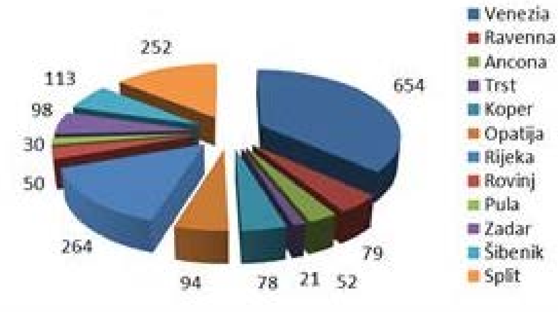


Figure 2: Ship calls to northern adriatic ports

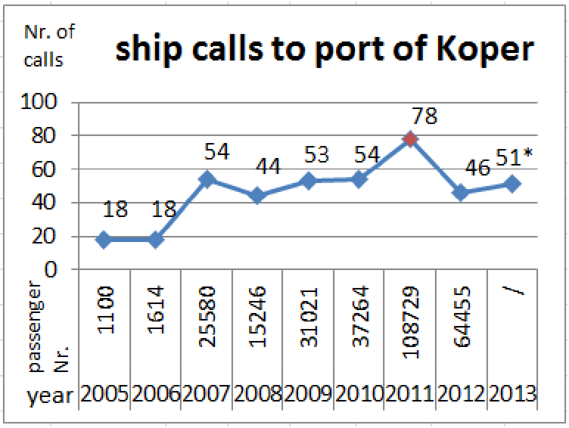
passengers (such as Rijeka and Šibenik).

3. PORT OF KOPER PASSENGER TERMINAL

International passenger terminal operates on a single 420m long berth with maximum depth of 10m. Its unique position just 200m from the center of the city brings passengers almost in the heart of the city, thus making the terminal very attractive to the visitors resulting in increasing numbers of passengers from establishment of passenger terminal till present time.

3.1. Overview of historical development of cruiser traffic in port of Koper

The first passenger vessel called on the port of Koper in 2005, with 17 more to follow that year. The next year again 18 arrivals were recorded, but by 2007 the number was up to 54 and arrivals have averaged more than 50 per year since, the most being 78 (with a total of 108,729 passengers) in 2011. And though the number of ships has remained relatively constant (with the exception of 2011) in the last 6 years the ships have been bigger or have been carrying more passengers than in the beginning.



* Forecast for 2013

Figure 3: Evolution of Ship calls to port of Koper[9]

The biggest cruiser thus far was the 311m long Voyager of the Seas, capable of carrying 3800 passengers. In 2012 16 different shippers brought 46 cruisers to the port of Koper, of which Thomson Cruises with their Thomson Majesty ship arrived 13 times and Celebrity Cruises with the ship Celebrity Silhouette arrived 7 times.

Table 1: Shipping agencies and nr. of calls to Koper in 2012[9]

Nr.	Shippers	Nr.of calls
1	Yachts of Seabourn	3
2	Norwegian Cruise Line	2
3	Princess Cruises	4
4	Thomson Cruises	13
5	Costa Crociere	1
6	Harmony G Maritime ltd - Piraeus	3
7	P&O Cruises	3
8	Phoenix Reisen	1
9	Fred Olsen Cruise Line	2
10	Celebrity Cruises	7
11	Mano Marine	1
12	Royal Carribean cl	3
13	Cristina Cruises	2
14	Voyages of Discovery	1
	total	46

There are 51 ships scheduled to call to port of Koper in the 2013, beginning at the end of April. The last is scheduled for the middle of November.

4. PORT OF KOPER: HOMEPORT OR PORT OF CALL?

At the moment the port of Koper acts solely as a port of call, meaning that cruise lines use the port just as a stopping point, for shore stops, usually lasting from 4 to 8 hours, depending on the tourist offer of the port of call. In some ports passengers enjoy activities in the near vicinity of the terminal, exploring the nearby city, its historic monuments, local food offer and cultural events, take inland excursions or just go to the beach for the duration of their stay (Brida et.all, 2012).

Figure 4. Port of Koper passenger terminal[9]

4.1 Benefits of acting as a home port

A home port, where cruisers start and end their trips, generally brings more tourist money to local businesses. Where the passengers at a port of call represent a direct income to the businesses in the area on the first level, from passengers and crew shopping, eating in restaurants, taking short excursions using tourist agencies and so on, a home port brings business to other sectors of tourism such as hotels, motels, public transport, taxi services, bus stations, train stations, airports, etc. We can safely conclude that being a home port brings added value to the regional economy and furthermore there are positive economic effects brought to the port itself. Ports tend to develop their offer to a higher level for ships that use the port as a home port, since the ship usually takes in all the provisions and other goods for the entire duration of the trip at the home port, which isn't the case at ports of call and in addition with the development of higher quality services the port can also raise their charges, further generating additional income.

4.2. Influential factors for homeport selection

In 2011 the port of Venice handled almost 1.8 million passengers. We can safely conclude that in the near vicinity of the Port of Koper there is a major market for cruisers. Since more or less all cruisers that arrive to the port of Koper before arrival or immediately after departure also visit Venice it is safe to assume that some of those cruisers might be inclined to perform a turn-around (exchange of passengers) at the port of Koper in order to avoid the more crowded port of Venice, thus making it a home port instead of port of call. This may not be as easy as it seems.
When cruisers consider making a port its home port, the port has to fulfill certain requirements using selection criteria.
A study performed by Lekakou and others (2009) set 80 different factors that influence the industry's home port selection criteria and ranked them from most to least influential regarding choosing a certain port to be a home port. Recently a separate study on prospects of development in cruising, for purposes of Luka (Port of) Koper, was carried out using these same factors determined by previous studies.
The following table provides a list of the ten most influential criteria for a home port in order of importance:

Table 2. Ten most influential factors for the home port selection

Nr.	Top 10 most influential factors
1	Availability of international transport
2	Safe and secure environment
3	Air connections
4	Reliable air transport
5	Capacity for handling a large number of passengers simultaneously
6	Port depth
7	Infrastructure for passengers embarkation/disembarkation
8	Cabotage policy
9	Services relating to security
10	Capacity of the airport

According to Marti (1990), major factors influencing the choice of a home port can be separated into the two categories ″site″ attributes and ″situation″ attributes; site attributes refer to port infrastructures and superstructures, whereas situation attributes refer to physical or cultural qualities like proximity to markets of cruise passengers and the attractiveness of the port region for cruising.

4.3. Strengths and weaknesses of port of Koper passenger terminal

When evaluating this list of attributes from Lekakou's study against the situation at the port of Koper we can safely conclude at which criteria the port might get less than favorable marks. Air connections, reliable air transport and capacity for handling passengers simultaneously, therefore terminal infrastructure and superstructure, seem to be the weakest points in the passenger terminal portfolio.
Current facilities are just barely sufficient for performing the role of port of call. It is safe to assume that in order to be properly equipped for taking on the role of home port the passenger terminal needs an upgrade in infrastructure and superstructure that would suffice for extended services to cruisers and passengers.

Figure 5. Current state of passenger terminal and planned future development[13]

The other major problem is the connectivity of port of Koper to air transport.

Though two international airports can be found in the port of Koper catchment area, the connections to these airports are inadequate. ˝Situational˝ characteristics require reliable transport (national and international bus services, national and international road infrastructures, reliable air transport, national and international rail infrastructures, cooperation of land transport providers, good air connections and cooperation with air transport providers (Lekakou, 2009).

Figure 6. Some distances to airports and tourist attractions[9]

In regard to this description, hinterland connections to the port of Koper for the most part are insufficient. Though Slovenia has built a highway cross following the Pan-European corridors V and X, as seen in figure 7, and also a railway cross following these corridors (V and X) (Zanne et all.2012) in reality passenger connections are almost nonexistent.

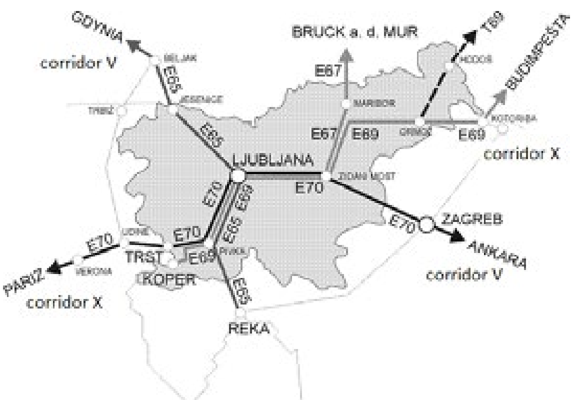


Figure 7: V and X Pan-European corridors[14]

Rail connection on a Koper – Ljubljana route only provides 5 passenger trains per day in each direction, which renders any demand for this kind of transport somewhat unattractive). Similarly, bus connections from Koper to Ljubljana only take place on average 8 times per day in either direction.
For the purpose of transporting passengers to and from the port of Koper it is essential to determine a way to provide cruise passengers with high quality transportation adapted to the level of their expectation. The connections to the two airports in the vicinity (Airport Jože Pučnik Ljubljana and Airport Trieste) are indirect and don't run often enough. Therefore emphasis should also be given to improving passenger rail transport and especially transport from and to airports, since it is safe to assume that this is the means of transport most passengers residing more than a couple of hours drive by road are most likely going to take.

5. CONCLUSIONS

The development of the cruise market in the world and in the Mediterranean, despite the global economic crisis, is on the rise. The port of Koper has a great chance to embrace this growing trend and take advantage of its geo-strategic position near the most northern corner of the Mediterranean. With the direct proximity to the port of Venice, which is the largest cruise destination in the Mediterranean, the port of Koper with great service, upgraded infrastructure and superstructure, could offer an attractive alternative to the overcrowded port of Venice for operations of embarking and disembarking passengers. However to achieve this goal of becoming a home port Koper has to cross several hurdles. The biggest hurdle is the lack of a terminal building at the international passenger terminal and poor connections to the hinterland for transport of departing and arriving passengers.
Hopefully all the bureaucracy and problems relating to necessary investments will soon be resolved and the modernization and upgrade of the current state of the terminal will soon be resolved.
We can safely conclude that only strong partnership among all shareholders (port, government, investors, shipping agencies, transport providers, tourist workers, etc.) will result in achieving the goal to become a home port in the future.

REFERENCES

1.Maria B Lekakou, Athanasios A. Pallis and George K. Vaggelas, Ist this a Home-port? An analysis of the cruise industry's selection criteria, International association of Maritime Economists (IAME) 2009 conference

2.Juan Gabriel Brida, Manuela Pulina, Eugenia Riano, Sandra Zapata-Aguirre, Cruise passengers' experience embarking in a Caribbean home port. The case study of Cartagena de Indias, Ocean & Coastal Management 55, 2012, pg.135-145

3.Igor Trupac, Elen Twrdy, The inclusion of the port of Koper passenger terminal in the Mediterranean cruise market, Naše more, Znanstveni časopis za more i pomorstvo, Vol.57 No. 5-6, 2010

4.Marina Zanne, Patricija Bajec, Elen Twrdy, Maja Stojaković, Can hinterland connections cope with the expanssion plans of the port of Koper?, IMSC 2012 proceedings, Split, Croatia, June 2012, pg. 26-34

5.Bruce E. Marti, Trends in the World and extended-length cruising (1985-202), Science Direct, Marine Policy 28, 2004, pg.199-211

6.Riposte Turismo s.r.l., The passenger terminal of the port of Koper: Prospects of development in cruising, 2012, study

7.Seatrade Cruise Review, MedCruise 2012/13 Yearbook, A directory of Cruise Ports & Professionals in the Mediterannean & Adjoining Seas, 2012

8.Osnutek državnega prostorskega načrta, 2011, info:http://www.zivetispristaniscem.si/index.php?page=static&item=17

9.Luka Koper, statistični podatki, info: www.luka-kp.si

10.Državni prostorski načrti, retrieved February 15 2013 from:http://www.arhiv.mop.gov.si/si/delovna_podrocja/prostorski_nacrti/drzavni_prostorski_nacrti/

11.Direktorat za železnice in žičnice, Nadgradnja ljubljanskega železniškega vozlišča PI, avg. 2009, marec 2010

12.www.slo-zeleznice.si

13.www.zivetispristaniscem.si

14.http://arhiv.mm.gov.si/mop/javno/zeleznisko_vozlisce_ljubljana/

BIOGRAPHIES

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Legal aspects of the development of the seaport policy in the European Union

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ABSTRACT

The development of specific law relating to the sea ports in the framework of European integration has been very slow in getting started as well as in its development. The historical development of European integration in the evolutionary framework of the Common Transport Policy (common transport policy, CTP), the development of an explicit policy of the European Union with regard to the port sector can be divided into four periods, each of them has special characteristics. Fundamental freedoms of the EC Treaty (freedom of establishment, free movement of labor, goods and services), as well as provisions on competition, apply to the port services sector. Nearly fifty years after the establishment of the community there is still no specific legislative framework relating to the provision of port services, which makes it the only transport services sector where, in the case of certain problems with respect to application of the above-mentioned freedoms, decides on the principle of the case to case. Port services market is characterized by complexity and diversity of national and other applicable regulations, as well as the heterogeneous nature of port services and port diversity (in terms of status, ownership, management types, functional and geographic characteristics). Therefore, the adoption of a legal framework at EU level, that would establish ground rules applicable in all ports of the Union, is extremely important. Such rules should ensure that competition within and between ports takes place according to the principle of equality. States have always had an important role to the seaport: they had them owned, controlled, and monitored. European law aims to reduce the state's role in relation to the port. Therefore states preclude granting illegal aid, denial of access, discrimination between port users and service providers. Effects of European law are evident in the improvement of quality of service while reducing the cost, while the ports become more attractive to investors. The fact is that because of the internal market increased competition between ports, resulting in improved quality of services provided to the satisfaction of the port users.

KEYWORD
European law, legal aspects, seaports, seaport policy, legal framework.

1. IMPORTANCE AND ROLE OF THE SEAPORTS IN THE EU

Length of the European coastline is about 100 000 km, on them are over 1200 sea ports. In addition to hundreds of inland ports, they are a key link to international logistics and economic chains and are of great importance for the performance of over 90% of Europe's international trade. In addition to their importance in supporting the general European transport policy1through them, they

[1]Communication from the Commission to the Council and the European parliament, Keep Europe Moving – Sustainable mobility for our continent

serve 43% of internal trade of the European Union2. Ports are essential for cohesion in Europe through the development of passenger and road traffic. Sea ports and with them directly related activities generate added value of around 20 billion euros, while the added value generated by the overall European maritime cluster is estimated at 111 billion euros.

Seaports are very important for the development of coastal connectivity (Short sea shipping3), as well as for the development of inland waters. Maritime and inland waterway transport are two economically important transport models and can replace less long-term sustainable transport models. Ports are, directly or indirectly, a source of employment for more than half a million people, are important economic multipliers are important for the development of cities and entire regions, including LDCs, which is in line with the Lisbon strategy4.

The European Union has recognized their importance, especially in terms of meeting future transport needs of the Union, and has launched a public consultation among all stakeholders of the port system in 2006 - 2007. in the adoption of integrated maritime policy of the European Union5, adopted in October 2007. with the aim of promoting economic growth and job creation on the principles of sustainable development. More than 3.5 billion tons of various cargo transshipment annually is handled in European ports, and through them pass more than 350 million passengers6. Traffic growth is in line with the growing demand for energy, particularly in respect of liquefied natural gas. Ro-Ro7 traffic consists 14% of total traffic, while general cargo accounting for 10%. For container traffic, which has experienced strong growth, accounts for one third of the total turnover. Anticipated that the container traffic by 2015. rise by more than 50%, which means that there will be a need for increased port capacity in terms of building new quays and improving the efficiency of the provision of port services.

Ships on the direct container lines are now increasing, primarily due to economies of scale, hence there is a need to build new port facilities and expand the existing sea ports. Construction of new port facilities will and already had a serious problem due to the demanding environmental regulations that have already stopped and slowed

mid-term review of the European Commission 2001, Transport white paper, COM (2006) 314.

[2]ESPO - The Association of European seaports established in 1993. represents the port authorities, port associations and port management seaports of the European Union. The organization's aim is to influence the political body of the European Union that there is a safe, effective and environmentally sustainable European port sector, which will function as a key element of transport industriy in which, to the greatest extent possible, the conditions of the free market prevail. ESPO-European Sea Ports Organisation: www.espo.be

[3]Includes transport of cargo by sea within the same continent without crossing the ocean. The European Commission is promoting this form of transport for the relief of European roads and reduce air pollution.

[4]The Lisbon agenda was in response to the European Union recognized lag of the Union for the United States and fast-growing Asian countries. Was taken at the European Council in Lisbon in 2000. With a view to the EU "by 2010. Become the most competitive and dynamic economy based on knowledge, capable of sustainable economic growth with more and better jobs and greater social cohesion" (European Council, 2000). Lisbon Agenda (Lisbon strategy) included a broad reform program. To achieve this goal, it was necessary to prepare for the transition economy and knowledge-based society by better policies, completion of the internal market and the modernization of the European social model and creating the conditions for growth by an appropriate macroeconomic policies.

[5]Communication from the Commision to the European parliament, the Council, the European economic and social commitee and the committee of the region, An integrated maritime policy for the European union COM (2007) 575.

[6] ESPO: www.espo.be

[7]Roll on / roll off ships (or abbreviated RoRo ships) are designed for the transport of rolling freight such as cars, trailers, etc. are the opposite lo-lo vessels (England lift on / lift off). RoRo vessels have built-in internal ramps which allow the cargo to roll out of the ship when in port. RoRo used for navigation of large ocean liners.

down several major port projects8. More than 30% of the total container traffic in the European Union is handled in three Western ports: Rotterdam, Antwerp and Hamburg, while the nine largest ports along the Mediterranean tranship only 20% of the total container traffic, which indicates a completely uneven traffic distribution. This can be attributed to the higher costs of different transport models, and the unavailability of adequate transportation infrastructure in the Mediterranean area. Taking into account the above considerations, the European ports in the future will have to meet the following challenges:

- The growing need for international maritime traffic increased by its lower cost price, and the growth that is faster than economic growth, which further enhances the interest of investors in the port system;
- Major technological change, marked by strong growth in container traffic, more efficient, faster and safer port operations, which requires a new port facilities as well as human resources and, in particular, the use of new information, navigation and telecommunications technologies;
- The obligations of port development on the principles of sustainable development, which primarily involves the reduction of greenhouse gas emissions and improve air quality, reduce congestion on the European roads and encouraging the use of other types of traffic, such as rail, river and sea transport, which will result in better geographical distribution of land transport and better utilization of port facilities;
- The need to continue the dialogue in relation to efficiency and developing ports among all stakeholders in the port system, as well as representatives of local, regional and wider community. Dialogue is primarily needed to ensure social understanding and acceptance of improved ports and their sometimes poor image, increase their efficiency and achieve better spatial arrangement. Such a dialogue should contribute to the sustainable development of the welfare of the immediate and wider community;
- The need to coordinate the development and management of the ports on the principles of transparency, competition, and with the rest of the EU acquis.

Within the European Union there are no standard or equivalent ports; they differ in terms of ownership, organization, institutional structures, working methods, markets, servicing, strategic importance to the EU and Member States, etc. Sea ports play an important role in developing the economy of the European Union. Although they are important for each country in the context of the common or internal market, which includes the free movement of goods and people, the port has an even more important role for the Union.

Seaports are important for the development of local infrastructure that is essential for a number of industries located in ports or in their hinterland. It is important to emphasize that the port in an economic sense is very important, especially in two aspects: it is the creation of direct and indirect value added and in terms of direct and indirect employment. Direct employment includes those who are employed in the direct provision of services: towing, navigation, cargo handling, port pilotage, cargo stowage, etc., while indirect employment includes those employed in maritime agencies, underwriting, legal advice, funding, and so on. The fact is that many ports suffer from low efficiency, therefore, is a task and a challenge for the European Union to help ports to become more efficient. Some of these inefficiencies have the cause in the restrictive port practice, small investments in port facilities and, especially, the lack of commitment of those who control the ports. The European Union must recognize the wider economic importance of having seaports. Commercial role of ports is essential for their understanding, and it is extremely important to keep this in mind as part of the European Union, especially in the creation of laws and policies because otherwise there is a danger of making unrealistic and inapplicable laws. Port fees and business practices have a direct impact on the profit and loss accounts of shipping companies, the shippers and, finally, the consumers of goods that are transported through the ports. This is because the ports are logistic and economic chains, so there is a need that shippers and goods carriers have the

[8]Projects: Dibden Bay (Southampton), Second Maasvlakte (Rotterdam), Severn Estuary (Bristol), Seine Estuary (Le Havre and Rouen).

ability to reduce costs and increase efficiency in the fullest extent.

Ports can speed up or slow down, make more or less efficient, more expensive or less expensive the entire economic and logistic chain. They are important links to logistics chain, so European Union should ensure that port policies and legal regulations aim at increasing the competitiveness and efficiency of European ports.

Regardless of what the European Union has great political significance for the world in general, the European Union is primarily economic and trade union. Union is established on the concept of the common or internal market in which goods, labor and capital can move freely without obstacles or restrictions. The basic legal act regulating the principle of joint and internal market in the European Community is the Treaty establishing the European Community (hereinafter EC Treaty or the Treaty9). In Article 14 (2) of the Treaty on European Union states that, "internal market is to comprise an area without internal frontiers in which is insured the free movement of goods, persons, services and capital in accordance with the provisions of the Treaty." The creation and maintenance of the internal market was a long and difficult task that is in large part realised through the program implemented in 1992. under the name "Internal Market", which was promoted by the Commission under the leadership of Frenchman Jack Delors. Question of the internal market is at the core of European Union law and is a major motivator for the European institutions in their decision making10.

The EU is already the world's largest trade bloc, in this respect, sea ports are vital. Efficient ports are extremely important for the movement of goods and passengers within the Union, as well as in their movement towards the EU and beyond. Efficient ports can stimulate competition and reduce costs on the market, for example by reducing transaction costs for those jobs that are located near the port. The European Union comprises 27 member states. Switching ports that were until recently controlled by the Eastern bloc is a major challenge for the European Union, given that many of them are without necessary funds and are not used to competition, inefficient, even with serious environmental problems.

2. ESSENTIAL ASPECTS OF THE PORT POLICY IN THE EUROPEAN UNION

Within the European Union there are differences with respect to the level of involvement of Member States in port policy. The UK is almost entirely privatized its port, while Belgium does not interfere with port issues because they are under the jurisdiction of the city governments. In the EU there are different views about this issue, there is a great support in the international terms of the application of the concept of subsidiarity and to allow the ports themselves to find the best solutions11. Document and Communication of the European Commission in connection with the port policy also offers the concept of so-called soft law, allowing Member States to choose the best solutions at the local level12. Associated principles with the subsidiarity are particularly described in Article 5 of the Treaty establishing the European Community:

"In areas which do not fall within its exclusive competence, the Community shall take action, in accordance with the principle of subsidiarity, only if the objectives of the proposed action can not be effectively achieved by the Member States and the

[9] Treaty Establishing the European Community (Consolidated Version, Official Journal of the European Union, C 321, 29.12.2006.). Number of articles in this paper are specified according to this version of the EC Treaty.

[10] For example, any arrangement between the ports which would have the effect the prevention, restriction or distortion of competition between Member States should be severely punished by the European Commission, because it could harm the creation and maintenance of the internal market.

[11] See: Geneva Convention and the Statute of the international regime of Seaports (1923)., Article. 3rd which states that the statute should not in any way restrict "freedom of authorized port authorities to take measures that they deem to be necessary in order to port activities performed in an appropriate manner, while taking into account that these measures are in line with the principles of equal treatment ".

[12] Communication on a European Ports Policy COM (2007) 616 final.

objectives can be better achieved by the Community. Any action by the Community shall not go beyond what is necessary to achieve the objectives of this Treaty. "

In the relations between the European Union and the member states, most of the issues related to the ports are much more under the jurisdiction of the Member States than the EU itself.

Funding ports. There are different models of financing ports within the European Union. Many ports have traditionally been publicly owned and financed by the public sector. At the same time more and more there is a trend to move away from the port of public ownership and turning to private sources of finance13. Private financing certainly reduces the possibility of problems with the state aid to ports, around which there was a lot of mutual accusations and lawsuits among the member states. The issue of state aid in the ports of the European Union is still very controversial, namely the Commission's Communication on state aid research14 argues that public support for infrastructure, in principle, should not be considered state aid pursuant to Article 92 Paragraph 1 of the Treaty. However, there are some indications that in terms of state aid could be a change in their positions on these issues. In the ports of continental Europe, many ports are receiving significant support from the cities who manage them, such as Hamburg and Rotterdam, which may significantly affect competition and setting of the equal operating conditions (level playing field).

Although we can not claim with certainty that there is a competition between all ports in all cases, competition between some of them is there, and the competition among service providers within the port as well. This requires the establishment of equal conditions for all candidates. Accordingly, one of the important issues that the European Union should edit is the question of public financing of the ports. In relation to public funding of ports, the Commission in its document on European port policy in October 2007. announced the adoption of the Guidelines on state aid to ports. The conclusion is that the information regarding the public financing of any ports need to be transparent.

Within Guidelines 2006/111, there is already such obligation, but it applies only to the port whose income is above 40 million Euros. Since a large number of ports, some of which are extremely important for the member states and the European traffic in general, are below this limit, it is necessary to consider the abolition of this provision. The Commission has announced that action is taken to expand the provisions of the Transparency Directive 2006/111/EC15 on all commercial ports, regardless of annual income, which will provide a comprehensive overview of financial flows from public sector to the ports16.

A growing trend in many ports of the Union is that they are built on the basis of the public - private partnership, which includes a combination of public and private funding. Regardless of the type of funding, the Union and the port users and entrepreneurs need to be careful that finance of the ports is in accordance with the provisions of the acquis communautaire concerning state aid.

Surveillance of ports. There are not any tendencies by the European Union regarding the monopoly to the supervision of the ports. European Union law is applied if no applicable national law of the Member States and vice versa. It is very likely that this concept of shared responsibility and so calledsoft lawwill be long followed, what confirms a document on European port policy in October 2007. year. European Union law is neutral in terms of ownership of the goods17, which means that the union does not want to prescribe a model or the method by which the port should be organized and supervised. There is great freedom for Member States to regulate its ports in accordance with their

[13]Most ports in the UK has been privatized since 1980- 2000. year.

[14]General Study on State Aid in the Port sector (DOC.VII/ 103/89).

[15]Commission Directive 2006/111/EC of 16 November 2006 transparency of financial relations between Member States and public undertakings as well as on financial transparency within certain undertakings (Codified version) Official Journal L 318, 17.11.2006.

[16] Communication on European Ports Policy, SEC (2007) p.9.

[17]Treaty establishing the European Community, art. 295th

own needs and the laws. With these questions is fully applicable principle of subsidiarity.

Liberalization. Under the liberalization implies the reduction and elimination of regulations that have emerged over the years. Liberalization is generally, but not always positive, as it reduces costs and encourages a competitive spirit. Within Member States there is a difference in the degree of liberalization, which means that some are more and some less liberal. Ports in the UK are probably the most liberal in the whole European Union. Liberalization within the EU is not the same in all sectors, it can be concluded that most of liberalization has in relation to the provision of cargo handling services, while the lowest is in providing nautical and technical services (port pilotage, harbor towing, mooring and unmooring of the ships).

The Port efficiency. The prevailing opinion is that there is a clear need to enhance the efficiency of European ports. European Union law is very effective in terms of eliminating inefficiencies. Competition law prohibits inefficient performance of the port companies that have a dominant position, where the inefficiency to perform activities is essentially considered as abuse of dominant position18.Also, parts of European law relating to public procurement help to the ports to purchase needed goods and services in the most appropriate manner19.

Ports, maritime security and environmental protection. Ports play an important role in matters of maritime safety and protection at work onboard the ships. Ports are often in a better position in terms of promoting safety of navigation than Flag States under whose flag ship sails, because the port State are in better position to carry out surveillance in their ports. Theoretically, the ship may never sail into the port of the Flag State, which is often the case; except that the port State are particularly interested that in their ports substandard ships are not sailing what can cause numerous problems, from environmental to security. All maritime countries of the European Union are full members of the Paris Memorandum20, an organization that deals with monitoring the safety of navigation, in order to eliminate substandard ships through a harmonized system of port state control. Ports have a very important role in the protection of the marine environment, this is particularly important with regard to tankers calling at ports of the Union, especially in terms of control of their navigation and their structural and technical condition. The European public is very sensitive on these issues, which is understandable, if we recall the recent large maritime environmental disasters21.

Numerous construction of new terminals in European ports had significant repercussions in terms of environmental issues in relation to environmental impact studies, in terms of performance of port activities and port development in general. Since global trade growth affects the growth of maritime trade, there is a need for increased port capacity in terms of building new terminals and acceptance of all large ships. Ports need adequate port capacities and appropriate links with the mainland. For historical reasons, ports and port equipment were simply not built or equipped for the reception of modern ships of various kinds, especially not those carrying containers whose traffic is increasing day by day. It also appears a need for a kind of re-routing the acceptable models of traffic from road to sea and river. Therefore, the Commission supports the project with the aim of linking the coastal ecological improvement and relief of European roads22. Increasingly, new port facilities and the

[18] See: Case C -179/90 Merci Convenzionali Porto di Genova v Siderurgica Gabrielli SpA[1991] ECR I-5889, [1994] 4 CMLR 422, [1994] 1 CCH 196.

[19] See: "WETT Directive", which refers to the sectors of water, energy, transport and telecommunications (OJ L 297, 29.10. 1990th and OJ L164, 30.6.1994.).

[20] Paris Memorandum of Understanding on Port State Control, www.paris.mou.org,

[21] Cases with ships "Erika" and "Prestige".

[22] See: EU project Motorways of the Sea (short sea shipping), an increase in traffic, cargo and passengers led to an overload of the routes that they can no longer absorb the growing amount of traffic, resulting in unexpected problems relating to traffic congestion, increased costs and pollution environment. It was necessary to find a suitable alternative that would fully meet all the criteria of the user, and was able to track the current and future economic expansion, an increase in trade

necessary transport infrastructure, are moving outside urban areas, that the former port areas could be better dispose of to the satisfaction of their citizens. In the case of new and reconstruction of the old port capacity, apply the acquis communautaire relating to the protection of the environment using the following Directives: habitats23, bird24, water25 and waste management26.

Ports are strategic points for the supply of goods and energy (ie, liquefied natural gas)27, and key economic clusters. For the development of ports are needed public and private investments, so it is necessary to provide an adequate level of legal certainty. Lately, numerous port projects encountering problems due to environmental regulations in connection with the guidance of the Birds and Habitats Directives, which caused a great deal of legal uncertainty for participants in these port projects. The Commission is aware of the difficulties arising from the application of these guidelines in port infrastructure projects. Therefore, has published several documents in support of the Member States on the application of the guidelines related to the protection of the environment, as well as for their better understanding by citizens and other participants in the project.

The Commission is also committed to publish guidelines for the implementation of European legislation concerning the protection of the environment, in conjunction with the development of ports28. It is important to mention another guideline for the protection of the environment, and refers to the port reception facilities for the reception of oily water and waste from ships29, which had not yet become fully operational in the application, there is a need to make additional efforts for full implementation.

Public and commercial port functions. In European law always existed demarcation between public and commercial functions. This distinction is very important from the point of application of competition law. Towing, mooring and stowage is usually considered a commercial activity and therefore apply to them competition law. On the other hand, the protection of the environment, maintenance of aids to navigation, etc., can be considered public services and therefore to them does not always apply competition law. Ports can also be defined as providers of public services, could be said to have a special place in the economy of many countries. This means that Article 86 of the Treaty are fully applicable to the port as a provider of public services. It also means that they need to apply special rules on public procurement as the case of companies that provide a public service.

Competition in ports. Economists argue that the competition usually leads to increased efficiency in general, which usually results in lower prices for products and services. Ports, like any other essential infrastructure (eg. airports) need the competition from which they have some benefits. Competition in terms of ports is taking place in several spheres:

- competition between operators within a port,
- competition between ports and
- competition between groups of ports30.

Competition within the port involves competition between different service providers; different stevedore compete who will provide services to carriers. Also different providers of towing, also competing for their services. There is also competition between ports that cover the same

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and population growth. As a possible solution, the European Union has proposed a program of coastal shipping integration, which is a kind of innovation, which aims to relieve the increased road traffic, as well as an alternative maritime routes.

[23] Directive 92/43/EEC.

[24] Directive 79/409/EEC.

[25] Directive 2000/60/EC.

[26] Directive 99/31/EC

[27] See:Communication from the Commission to the Council and the European parliament, Priority Interconnection Plan COM(2006) 846 i SEC(2007) 1283.

[28] See: Communication from the Commission to the European parliament, the Council, the European economic and social committee and the Committee of the regions, An Integrated Maritime Policy for the European Union COM(2007) 575, SEC (2007) 1278.

[29] Directive 2000/59/EC

[30] For example, a group of ports in the area of Hamburg to Le Havre includes the port of Rotterdam, Antwerp, Zeebrigge etc.

market in their hinterland. In case the shipping companies have a choice between different ports, then these ports are competing in terms of price, quality of service, time, speed, marketing, etc.

It is not always easy to decide which ports are competition to each other, since no two are completely identical ports. Selection of ports depends on many factors, such as length of trip, type of cargo (bulk, liquid containers, passengers, etc.). Also, depending on the type of cargo that is usually handled, some ports are equipped with specialized equipment and terminals. Natural features and other characteristics of the ports can also affect their competitiveness, such as the allowable draft, length of quays, the availability of berths etc. There is also a competition between groups of ports, such as the case with the Dutch ports in relation to northern France ports who compete with each other for trade with transatlantic countries.

Maintaining balance. Any law or policy decision taken by the European Union must reflect the necessary balance between the different and often conflicting interests. There is no definitive list of these competing interests, but they, among others, include: a) the Member States as well as regulators in the ports, b) Member States as port owners, c) Member States as port users, d) the owners of facilities in ports, e) carriers, f) shippers, g) passengers, h) local authorities, i) citizens, j) competitive port. It is quite clear that European law relating to port operations, must take into account the existence of different interests and find the best possible legal solutions that none of the interested parties would not be unduly damaged.

3.DEVELOPMENT OF THE SEAPORTS POLICY IN THE EUROPEAN UNION

The development of specific law relating to the sea ports in the framework of European integration has been very slow in getting started as well as in its development.

The historical development of European integration in the evolutionary framework of the Common Transport Policy (common transport policy, CTP), the development of an explicit policy of the European Union with regard to the port sector can be divided into four periods, each of them has special characteristics. The first period lasted from 1957. to 1973. It is characterized by the exclusion of the port sector in the framework of the Common Transport Policy (CTP). The second period was marked by the so-called. policy of "no intervention" in the port sector; lasted since 1974. to 1990. The third period began in 1991. year, and lasted for a decade, characterized by retake of initiative and make suggestions with regard to establishing a common path towards a European port policy. Events in the area in the 21st century were marked by the search for a long-term strategy for development of the port sector in the European Union, which is the fourth period of development.

3.1. I. Period: 1957 to 1973: absence of maritime transport31 in the Common Transport Policy

In Article 3 of the Treaty establishing the European Community 32states that it is necessary to take

[31]Maritime policy is part of the economic policy of the state. It affects the state and directs the development of various activities related to the sea. Maritime policy entails a systematic and comprehensive approach to the development of shipping and exploitation of the sea as a transport model and natural resource. Thus, maritime policy is not only politics of maritime traffic. Maritime transport is one of the components of the maritime policy, which is extensive and includes the marine system. Components of maritime transport policy principles or rules of conduct and action, which aims to determine what should be done, and instruments or measures that define how it should be done. Maritime policy defines the principles, objectives and measures undertaken by different social and economic agents in order to achieve optimal development of the maritime system of the country.

[32]Rome Treaty, signed 1957th in Rome, founded the European Economic Community (EEC) and the European Atomic Energy Community (Euratom). EEC has established a customs union between the signatory states (Belgium, Italy, Luxembourg, the Netherlands and Germany) and established criteria and the basic objectives of a common market that would ensure the free movement of people, goods, services and capital. Euratom has set goals of research development of nuclear energy and its use for civilian purposes. With the entry into force of the Treaty on European Union, the European

specific actions at Community level in order to define a common transport policy. The goal of the states that established the European Union (Belgium, France, West Germany, Italy, Luxembourg, the Netherlands), in terms of emphasizing the importance of the transport sector is not surprising, since the free movement of goods, persons and capital arein the very essence of the common market[33]. The first efforts to create a supranational transport policy have been reported in the institutional framework of the European Coal and Steel Community (ECSC[34]).

Special part of the Treaty (Articles 74 - 85) mentioned traffic as the area in which action is needed in order to define a common transport policy. It is important to stress that inthat time the Treaty provisions regarding traffic were more vague in nature and limited in scope[35]. In Article 3 of the Treaty there was no direct reference in relation to the traffic models, but in the article 84 (1) stated: "The provisions of this Article shall apply to transport by rail, road and inland waters." Maritime transport is only mentioned in Article 84 (2), which states that "the Council, acting uniformly, to decide when, and to what extent, and with what procedure, appropriate provisions can be made for sea and air transport." Interpretation of the latter item suggests that the maritime (and air) traffic felloutside the framework of a common transport policy, as well as out of the other provisions of the Treaty, such as market competition[36].

The first period is characterized by a common transport policy "poor performance"[37] and poor results, because "the system was unable to translate the general obligation to participate in shared decision-making in an acceptable set of

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Economic Community was renamed the European Community (EC) and the EEC Treaty became the EC Treaty.

[33] EU single market stands out among the greatest achievements of the member states work together. The process of harmonization of technical, legal, administrative, cultural and protectionist provisions relating to the operation of free trade and movement of people and goods in the EU started in 1985. year, and resulted in the common internal market first January 1993. year.

The results of that in the period since 1993. year to date are: opening 2.5 million jobs, the possibility of direct competition from companies of all Member States, greater choice and lower-priced products. In addition,to European companies a common market is at the same time the starting point for placement of their goods at the global level.

By the creation of a customs union and the abolition of tariffs and quotas in trade between Member States in 1968. year,were created first requirements for the creation of a single market, and the processes of globalization in the last 30 yearscreated a need to work together to achieve a high level of competitiveness in the global market.

The common market valid four fundamental freedoms: free movement of persons, goods, capital and the freedom to provide services and establishment. Free movement of goods implies the abolition of restrictions on the purchase and sale of goods lawfully manufactured in another EU country. Free movement of persons refers to the right of movement and work in any member state of the Union, and the freedom to provide services means that businesses have the right to provide services in other EU countries as well as the freedom of establishment. Free movement of capital means the elimination of obstacles to the movement of capital and payments within the EU, and the Union's relations with third countries.

Opening of the common market not for all sectors and activities took place at the same speed. The service sector is the slowest adapting common terms, especially activities such as finance and transport, where talking about a separate national markets, especially in rail and air transport.

[34] Treaty establishing the Community for Coal and Steel (Treaty of Paris, 1951.) explicitly mentions many basic requirements regarding the transportation charges for the transport of coal and steel production, publication of fees and discriminatory use of transportation charges, during the transitional period to the eventual harmonization.

[35] See: Bayliss, B.T. „ Transport Policies in the European Communities“, Journal of Transport Economics and Politics, 13(1), 1979, p. 28 - 43.

[36] Council Decision no. 141/62, of 26.11.1962. excludes maritime and air traffic from the common policy on competition.

[37] See more in: Despicht, N., The transport policy of the European Communities, London, 1969, Chatam House, i Button, K.J. , „ Road Haulage Licensing and EEC Transport Policy“, 1984, Aldershot, Gower.

rules and regulations."38 The existence of different regulatory systems in the national markets has discouraged any progress in the political sense39. It is believed that in an attempt to launch a far-reaching proposal by the Commission received very little support from the national governments of the member states, with (eg Germany), represented by "the doctrine of social services," while others argued "commercial doctrine" (eg the Netherlands). Such a situation has led to a critical lack of any common attempts to concrete progress in the development of transport policy. The question is whether any relevant political factor, including the institutions of the European Union at the time, believed that the common transport policy is of vital interest to the Union. Some authors40 believe that the common transport policy is part of the Treaty because of sectoral approach to European integrations and not due to the fact that the founder members were aware that such a policy would be a prerequisite for the establishment of a common market41. Presentation of the common transport policy was a political compromise between the Netherlands, which had a large economic interest in traffic on the Rhine, and five other member states42. Functioning of the European Union and the shortcomings in the decision-making process, at the time, had a significant influence on any progress towards a common transport policy.

[38] See: Lindberg, L.N. i Scheingold, S., Europe's Would-be Policy, 1970, New York, Practice Hall, p.165.
[39] See: Gwilliam, K.M., „The Common Transport Policy“, u El-Agraa, A.M. (ed.), The Economics of the European Community (3 izd.), London, 1990: Harvester Wheatsheaf, p. 230-242.
[40] See: Abbati, D.E., Transport and European Integration, 1986, Luxembourg: Official Publications of the EC i Vickerman, R.W., The Single European Market, 1992, London, Harvester Wheatsheaf.
[41] Sectoral approach to the integration process "(a) is limited to specific industries or sectors of the economy, or certain holdings and (aa) the gradual action successively from sector to sector, Machpul, 1977, p.33.
[42] Vidi u: Swann, D., The Economics of the Common Market (6.izd), 1988, London, Penguin.

Erdmenger43 considered that "legalistic and dogmatic in nature" work in the field of transport during the initial years can be interpreted as the result of "certain institutional dogma." It is important to emphasize that the first attempt to solve the problems related to European ports at the supranational level has been made in the early seventies. The first initiative was launched by the Commission in a document from 1970. year (Note on port options on a Community basis), and report to the European Parliament on the port policy within the European Community in 197244.

3.2. II. Period: 1974 - 1990: The Politics of "no intervention"

The first expansion of the European Community in 1973. has had a significant impact on the content of a common transport policy. Significantly increased the importance of maritime transport in the new community of nine members, which led to the inclusion of maritime issues as an integral part of the common transport policy, on the agenda of the community. Joining three maritime States (Denmark, Ireland and the United Kingdom) has significantly changed the economic structure of European integration. Among other things, it has increased the importance of maritime traffic, traffic models, because most of the trade between the newcomers and the rest of the community members was carried by sea. Number of ships under the flags of the member states has almost doubled, and the number of ports within the community. Expanding Community with countries of the Mediterranean in eighties (Greece in 1981., Spain and Portugal in 1986.) further strengthened the importance of maritime transport in the economy of the European Community.
The major political reform was in relation to the expansion of interest in terms of community involvement of maritime traffic models under the framework of a common transport strategy. The

[43] See more in: Erdmenger, J., The European Community Transport Policy: Towards a Common Transport Policy, 1983, Aldershot: Gower.
[44] Report on Port Policy within the Framework of the European Community, European Commission, Document 16/VII/71 (24/03/1970) i Doc.EP 10/72 (12/04/1972).

Commission in 1974. did particular test toward European Court of Justice in terms of trying to resolve issues of whether the provisions of the EC Treaty apply to maritime traffic. Court in its decision upheld the view that the provisions of the Treaty apply to maritime transport45. This was the verdict with significant legal and political implications: it has incorporated this model of transport in the process of European integration, which is why it is considered the most important case in the European Court of Justice in the field of maritime transport46. After that, the focus of interest is directed towards the European Union's efforts to help find solutions to specific sectoral issues. Following the initiative of the Commission in 1974. The working group was formed that consisted of representatives from the European Union ports. The working group were studying the institutional framework and governance of European seaports in terms of defining the possible actions in order to increase the competitiveness of the port industry47.

By the end of the eighties, the ports and related activities is guided by the policy of non-intervention. The European Commission has accepted and adopted the opinion of the Working Group on the port, that there are not enough reasons for the adoption and development of a specific policy in relation to the sea ports. At the same time, the Commission announced the existence of certain contentious issues related to ports, which are of interest to the community, as a link between the port of maritime and inland waters. To this end, the Commission has adopted the view that the issues related to ports should be considered in the context of maritime and river transport models. Consequently, the Commission proposed to determine the affects whether, and to what extent, national and European policy in respect of port charges and government grants on port competitiveness. The document48 called Progress towards the common Transport policy: Maritime transport, the Commission has conducted a review of its work in relation to the port to 1985. , stating that "the working bodies of the Commission worked closely with representatives of the major port authorities in the European community, in developing two reports. The first report describes major differences in practice regarding the financing of infrastructure and superstructure of activities between the different ports of the Member States and between ports within a country. A second report was aimed to determine whether these differences lead to a serious distortion of competition. "(CEU, 1985, art. 102)49. The fact that most of the experts and stakeholders considered that there is no separate port policy in the European Union, the main reason is a kind of inertia in this area. At the same time, the Commission considered that there are different aspects of port policy in which the actions of the community would be beneficial. As the European ports are key link routes and links between maritime and inland waterway transport, it was considered useful that ports policy issues are put within framework of maritime and riverine aspects of a Common transport policy. Furthermore, the Commission found it necessary to take into account the suggestions of the European Parliament, emphasizing the fact that the port policy should be taken very seriously. In order to define the possible initiatives, the Commission has decided to specifically explore two questions:

- The impact of national and European transport policies on competitive conditions between ports of the Member States,
- The impact of billing practices for port fees and state aid on competition between ports of the Member States.

[45] Case 167/73 Commission v France (1974) ECR 359.

[46] See: Power, V., The EC Shipping Law, 1992, London Lloyd's of London Press.

[47] Report into Current Situation in the Major Community Seaports (Port working Group, CB-22-77-863).

[48] Progress towards a Common Transport Policy, Maritime Transport, Commission communication and proposals to the Council transmitted on 19 March 1985., COM (85) 90 final, 14 March 1985., Bulletin of the European Communities, Supplement 5/85.

[49] Below are the two statements: (a) Report into the Current Situation in the Major Community Seaports (Working Group CB-22-77-863) and (b) Report of the Working Group (VII/440/80).

With regard to the impact of national transport policies and the terms of competition between European ports, the Commission concluded that the market structure of maritime transport has a significant effect on competition between ports in the European Community. At the same time, the European Union is considered a set of different geographical areas. Everyone in this areas can use several different ports, and not only for reasons of constant improvement of technical and organizational efficiency of maritime transport. The Port competitiveness can only function optimally if each of these markets is regulated on the same principles. The main principle of this period was the "harmonization".

This concept led to thinking how to solve problems of undermined competitiveness between German ports and ports around Amsterdam, Rotterdam and Antwerp, where the traffic conditions of the market in Germany were much more rigid compared to the more liberal conditions that existed on other traffic markets. This problem has had an impact on the competitiveness between the ports of the European Union, which caused the continuation of initiatives at the community level. There are many considerations that need to first make the liberalization of markets, and then harmonization. It was felt that is needed to abolish all restrictions on the free access to the transport market, especially in terms of quotas and tariffs for all transport corridors to all ports of the European Community.

On the basis of the above principles the Commission has launched a public consultation in the context of the Memorandum of 1985. and submitted its proposal to the Council. The Commission was in favor of inaction in terms of other important issues, such as various government grants and payment of port fees. Despite significant differences over port fees, their implications in terms of competition between the port community, at that time it was not considered useful or necessary to cope with the demanding task of harmonization. The decision was based on the report of the Working Group made up for the ports (1980), which found that only about 5% of all transport costs accounted for port fees, which has led to the conclusion that the port fees are not a decisive factor when choosing a port. In terms of state aid to ports Commission has decided not to make the special instructions for the application of the Treaty, but that will be decided on a case-by-case basis, if necessary, directly on the basis of Articles 92 and 93 of the Treaty. In relation to state aid, the conclusion of the Working Group was that support to national ports did not cause serious distortion of competition. Nevertheless the Commission has decided to periodically monitor the overall condition and continues to monitor the differences in national approaches. Compatibility of other state financial aid (eg regional funds, to promote certain economic activities) with the common market are also taken into account. These efforts of the Commission in connection with ports culminated in the 1981. year, by submitting a report to the European Parliament on its activities to the port policy at EU level. The European Parliament adopted a document called. "Carossino Report" about "the role of ports in transport policy."50

Legal factors also contributed to the policy of "not intervening" in the port industry, and make progress in the formation of the European port policy. This is primarily related to the lack of any reference in relation to the sea port in the Treaty establishing the European Community, and ambiguous legal interpretation of the Treaty in respect of voting in the Council of Ministers of the European Union on issues related to ports and port operations. In fact, it was not clear whether the port issues should be decided according to the principle of unanimity, or the principle of relative majority. The presence of (a) different rules for maritime and inland waterway transport (issues related to river transport require a majority vote, while issues related to maritime transport requires unanimity), in addition to (b) different national doctrines regarding port organization and management, and (c) differences in terms of port policy at the community level, did not allow the integration of ports into one of the above two categories of voting, nor a clear definition of the conditions under which Member States may express their comments on specific policy initiatives by the European Community.

[50]The report adopted by the European Parliament 11th March 1983.

Until the end of 1990. there were no specific directives or policies regarding the port that has been adopted or published.

The Commission did not want to make suggestions that would be conflicting views, but decided to continue cooperation with representatives of the port industry in order to establish common positions to prepare the ground for future proposals. During this period, the development of a common transport policy is characterized by an attempt to harmonize the rules that regulate river traffic within a single market oriented toward the free market competition. Initiatives51 under the Common Maritime Transport Policy have been developed in several different directions: the national government considered the shipping sector in particular because of its international character and great economic importance, and the Commission has not proceeded with measures to create a common market in the sector. All relevant political factors agreed that any involvement of the community was unwelcome on the et interventions that effectively works. Development of a comprehensive common transport policy in this period was negligible.

At the end of seventies Union was not any closer to the actual Common transport policy than it was twenty years earlier52. Diversity of institutional priorities was crucial. Commission, in particular the European Parliament, at the time they realized the importance of a common transport policy, while, on the other hand, Member States through the Council were not willing to accept it53. Request for unanimous adoption of decisions further strengthened the position of those countries that were to maintain the current situation, what after the Luxembourg compromise54 allow them the use of veto to defend their interests. Netherlands and the United Kingdom have often used the veto in a number of issues regarding the traffic in the seventies, including issues of infrastructure costs and investments, and, apparently apolitical themes become a major stumbling block55. Abbate56 has concluded that the short-term interests of Ministers of Transport, and the fact that the Commission was in the role of an arbitrator in order to achieve consensus, greatly influenced the design of transport policy in this period.

The institutional framework is in itself a precondition of progress towards a common transport policy in all models of transport. The lack of progress prompted the European Parliament (EP) to initiate proceedings against the Council, accusing him of inaction in the field of transport57. The European Parliament in 1982. began proceedings against the Council for breach of Treaty. In fact, Parliament had already expressed dissatisfaction with the slow progress on the actual traffic policy at Community level. The European Court of Justice confirmed the inability of the Council to translate the recommendations into

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[51] See more in: Pallis, A.A., The Common EU Maritime Transport Policy: Policy Europeanisation in the 1990s, 2002, Aldershot, Ashgate i Stevens H.: Agendas alternatives and Public policies, 1984, New York, Harper Collins.

[52] See: Button, K.J., „Road Haulage Licensing, and EEC Transport Policy“, 1984, Aldershot, Gower.

[53] Vidi opširnije u: Ross, J.F.L. Linking Europe Transport Policies and Politics in the European Union, 1998, London: Praeger.

[54] At the beginning the agreement was that the Council of Ministers, the central body of EEC (EEC), by the Treaty of 1 First 1966th starts adoption of decisions with majority votes over unanimous votes. The French government led by De Gaulle firmly rejected it. When in the mid-1965th was not able to reach agreement on the financing of agriculture, the French government withdrew its representative from the Council, so as to thereby prevent the adoption of decisions. This so-called policy of "empty chair" was the first crisis EEC (EEC). This crisis has been overcome in January 1966. so. Luxembourg compromise. In that compromise the member governments have agreed not to hold a majority decision, as it was agreed in advance, in the case when it comes to the vital interests of the Member States. It is, in fact, still valid principle of reconciliation, which is the form that characterized the traditional intergovernmental cooperation. This is certainly left a clear mark on the history of integration.

[55] See: Bromhead, P.A. (1979), „Transport Policy“ in Coffey, D. (ed.), Economic Policies of the common Market, London: Macmillan, p. 122-145.

[56] See: Abbati, D.E., Transport and European Integration, 1986, Luxembourg, Official Publications of the EC.

[57] OJ C49, od 19.2.1983, p.10.

practice and ruled that the Commission was obliged to make a proposal for the establishment of a common transport market by 1992. year58. It was the first case in the history of the European Communities, that the Court declared Council guilty of violating the provisions of the Treaty. Parliament's actions and judgments of the Court encouraged the Commission to the reaction, which included the publication of policy documents regarding maritime traffic in March 1985. , in which so much was said about the significant lack of relevant activities in the European Union in terms of sea ports and performance of port operations.

Eighties was characterized by a dramatic decline in the tonnage of ships registered under the flags of the member states, which required the taking of specific measures by the European Community. The European Community has adopted during the eighties, a number of measures and policies59 for the purpose of rejuvenating and strengthening the European fleet, which had a positive impact in relation to the port. These measures, however, are more focused on shipping than on the ports. Some of casualties (Ro-Ro passenger ships, tankers) with severe consequences had a significant impact on the adoption of regulations with regard to safety of navigation, which again is in some way influenced the ports, especially in connection with inspections conducted by the Port State (Port State Control60).

[58]Case 13/83, the European Parliament against the Council of Ministers (1985) ECR 1513.

[59] Measures to improve the working conditions of Community shipping, third August 1989., A Future for Community shipping industry: Measure to improve the operating conditions of Community shipping, COM (89) 266 final. Maritime accidents: Herald of Free Enterprise (1987), Estonia (1994), Erika (1999), Prestige (2002).

[60]Paris Memorandum of Understanding on Port State Control, organization consists of 27 maritime administrations and covers the waters of European coastal States and the North Atlantic Basin of North America and Europe. The organization aims to eliminate the substandard ships through harmonized port State control system. www.parismou.org

3.3. III. Period: 1991-2001: According to the European port policy

In the early nineties, the European Community institutions were carrying out policy initiatives in terms of overcoming a long period of inertia and the lack of progress in forming a complete Common transport policy61. As part of the initiative, it was emphasized that the competitiveness of the European transport sector is an important precondition for the successful completion of the internal market, which has made the reaffirmation of the strategic importance of the transport sector. The emergence of a single European market, due to changes that have already occurred (removing borders, liberalization, etc.), was a turning point also for the transport sector. In order to facilitate and promote the effective functioning of the European single market, the European Community decided to accelerate the liberalization and harmonization of transport market and define a policy that should result in the linking of the European transport system. For this purpose, a resolute move was done towards inclusion in the common transport policy provisions designed to protect and regulate the existing and potential environmental problems caused by economic growth that is associated with increased traffic operations. The nature and the fundamental philosophy of the political initiatives of the European Union in the nineties showed that the community aspires to adopting a comprehensive strategy for the development of the Common Transport Policy. The strategy has taken into account all traffic models, as well as parts of the transport networks. He also defined the direct and indirect common policy objectives to be achieved. Partial objectives (eg between local networks) and those parts of the transport system (eg European ports) that were ignored in the past, they had to be part of a new political agenda. The long-term goal of this strategy was to create a framework at Community level to ensure sustainable mobility in Europe.

These initiatives also engaged the principle of subsidiarity, which is involved in the practice of the European Union's signature and entry into force of

[61]Strategy documents regarding the progress of the CTP, CEU, 1992a; 1992b.

the Treaty on European Union (Maastricht Treaty): political action at the European Union level shall be taken only when, and if, the objectives of the proposed action can not be corresponding realized by lower levels of administration, or local government or the Member States individually, and therefore, due to their dimension or scope of action, the better can be achieved by the European Union. In addition to the enlargement of the Common transport policy objectives, the Treaty of Masstricht has also meant a new beginning. Been explicitly expressed need for a comprehensive policy approach, while the statutory provisions relating to the trans-European transport networks62 and mobilization towards ratification of future policy initiatives related to social and economic cohesion of the European Union, provided a basis for further development. At the strategic level, the Commission presented an overview of progress, along with a proposal regarding the objectives of the Common Transport Policy, at end of 1998. year, together with the publication of two documents to the Council and the European Parliament. The first document is related to the relationship with the common transport policy and sustainable mobility for future development63. The second document is focused on strengthening economic and social cohesion, competitiveness and sustainable development, through coordinated efforts of Common transport policy and structural policy64. Meanwhile, the Treaty of Amsterdam (1997) strengthened the role of the European Union support in the promotion of social and territorial cohesion. Within this framework, the Union tried to stress the importance of redistribution of traffic flows in favor of maritime traffic, trying to reduce the problems associated with congestion of European roads, and reduce the impact of transport on the environment. Maritime policy itself, political initiatives on the port industry, or any other branch of maritime traffic except shipping, were not on the political agenda until 1990 year65. Commission initiative on horizontal policy of the European Union, aiming explicitly to the entire maritime transport system66, meant a change in course. Taking into account the current and future challenges, the Commission expressed the view that the level of the European Union must do the following:

- Take action to various questions that bothers the entire maritime industry translated into a dimension that is of interest to the common policies of the Union, and
- Identify appropriate ways to publicize the maritime interests of the citizens at the European Union level.

Parallel to the above initiatives, the Commission and the European Parliament have made special draft activities in order to define a port policy of the European Union. The European Parliament in

[62] Trans-European Transport Networks (TEN-T), thanks to the abolition of borders and greater liberalization and harmonization, the creation of a single market marked a milestone in the development of the common transport policy. In December 1992. The Commission published a Notice on the future development of the common transport policy, which marked a shift from the previous sector in an integrated approach to the common transport policy, and highlighted new issues, such as traffic safety, environmental protection, social security, foreign relations, and pricing policies. The same document, the initiative of creating trans-European transport networks in the wider project Trans-European Networks (TEN), a project to establish common European networks in the energy, transportation and telecommunications. Among the priority projects of TENS
as removing bottlenecks on the main east-west inland waterway linking the Rhine, Main and Danube, a program to regulate traffic on the roads outside the EU coasts, several rail upgrades in a north-south and east-west.

[63]Initiative of the EC regarding the importance of the transport to the advancement of the sustainable mobility CEU, 1998a.

[64]Initiative of the EC regarding the importance of the transport to the socio-economic cohesion CEU, 1998b.

[65] See: Cafruny, A.W. „Toward a Maritime Policy“ in Hurwitz, L. And Lequesne, C.(eds), The State of the European Communities, vol.1, policies, institutions and debates in the transition years, 1991, Colorado: Lynne Rienner, p. 285-299. i Power, V., The EC Shipping Law, 1992, Lloyd“s of London Press.

[66]Policy agenda of the EC to give special attention to the maritime economy “as a whole”, CEU, 1991.

the 1993 introduced the following principles of "possible" European port policy (EP, 93):

- the availability and modernization of port facilities;
- free and fair competition between ports and port operators, in accordance with the principles of the Treaty;
- the inclusion of ports in the common transport policy, and efforts to create a European transport system;
- social acceptance policy of the European Union and the port development, with special emphasis on environmental protection.

Advances in defining European port policy was confirmed by reconsideration of principle of "non-intervention" with the Commission's document entitled Green Paper concerning sea ports and maritime infrastructure67, by the new report from the European Parliament in 1999. and with the sensibilization and mobilization of all stakeholders in the port sector (port authorities, users, social partners), as well as those to which port policy affects (local authorities, carriers, etc.) towards the formation of specific proposals in relation to the role and content of the initiatives of the European Union. This is also confirmed by consensus statements within the Council of Ministers.

Accepted proposals of the Commission which have been confirmed by the European Parliament concerning action programs and systematic preparation of new initiatives include the following topics:

- Integration of port policy in the Common Transport Policy,
- EU enlargement and relations with neighboring countries,
- Development of coastal connectivity,
- Port as a point of distribution within the multimodal transport chain,
- Financing transparency and harmonization of payment of port fees,
- Port, maritime security and environmental protection,
- Port services and market access,
- Research and development.

[67]Green Paper on Sea Ports and Maritime Infrastructure (CEU, 1997a).

3.4. IV. Period: Port Policy of the European Union in the 21st Century

Although at the beginning of the 21st Century comprehensive European ports policy aimed at the detailed regulation of all issues related to the port industry did not exist, nor was preferred by several politically important factors, several shaky proposals represent significant progress towards the European Port Policy. The main areas of interest can be divided into three groups:

- the inclusion of ports in the Trans-European transport network and its common transport policy in general terms68;
- a systematic approach to the regulation of market access to port services;
- the financing of ports.

In conjunction with participating of the seaports within the Trans-European transport network, the broader framework at EU level regarding the establishment of an integrated, intermodal transportation system was defined in 1996. The decision agreed to by the Council and the European Parliament. Despite the provisions of the guidelines in relation to specific projects and the need for consensus for the inclusion of European ports in the Trans-European network, an agreement has been reached about which ports should be included in the plans of European transport networks. The main reason for disagreement were the criteria in terms of quantity and / or type of cargo that port should be meeting for inclusion in the transport network. On the basis of the debate between the EU institutions and representatives of the port, the Commission has once again made an assessment of the situation and committed to further specify the criteria for the inclusion of ports in the trans-European transport networks. As a result, it was suggested, on the basis of objective criteria, the inclusion of 300 European ports in a busy network. Adoption of common positions in the Council of Ministers endorsed the political will of the EU to include ports in the Trans-European transport flows. Finalizing the convergence criteria is the

[68]See more in: Pallis, A.A., : The Common EU Maritime Transport Policy: Policy Europeanisation in the 1990s, 2002., Aldershot: Ashgate.

result of different views expressed by the European Parliament, the Council and the Commission. In January 2001. The Council and the European Parliament agreed on the content of the amendments to the Decision no. 1962/96. which allows financing port just in case of filling one of the following criteria:

- international port (Category A), whose annual traffic exceed 1.5 million tons, or 200.000 passengers, with intermodal connections with the Trans-European transport networks;
- community port (Category B), whose annual traffic exceeds 500.000 tons or varies between 10.000 and 199.000 passengers with intermodal connections with the Trans-European transport networks;
- local port (category C) that do not meet the criteria of categories A and B, but they are located on islands or remote inland areas and are considered necessary to maintain permanent links with particular areas.

Certainly one of the most important characteristics of European port policy at that time was a proposal from the Commission regarding port services in order to improve the quality of port services (CEU, 2001a). This proposal was part of a group of proposals known as "port package", which also included the results of research conducted by the Commission in relation to public funding and practices regarding port fees in the ports of the Union, proposals for the transparency of port accounts, update of the Green Paper regarding port and maritime infrastructure (CEU, 2001 b).

Guidelines on port services aimed to establish common rules for the application of the principle of freedom to provide services, granting concessions and permission to provide port services, limitation to the number of providers of port services, self handling, duration of the concessions and individual approvals, and procedures to be followed. The long-term goal was to introduce at least two providers for each port service within three service categories. First, technical and navigational services concerning (a) pilotage, (b) towing, and (c) mooring and unmooring ships. Secondly, cargo handling services, including: (a) the loading and unloading of cargo, stowage, handling direct and indirect, (b) storage, depending on the category of cargo, and (c) to collect cargo. Third, passenger services, including boarding and disembarking them.

It turned out that the Commission's proposal was largely controversial, and has caused many disputes. The most disputed questions were: Potential management of the pilotage regime, self handling of the ship's crew, the transparency of financial relations, granting concessions and permission to perform port activities, etc. The reasons for this were large differences in European ports in terms of ownership, management, size, geographical position and employment of port workers. After lengthy consultations with stakeholders and hard negotiation process between the institutions of the Union, there has been a compromise on the most controversial issues. The compromise included: (a) the obligation of each port and port system to submit reports on their financial relationships, (b) the obligation of the current providers of port services to compensate previous providers, (c) the application of the rules regarding pilotage, in accordance with safety criteria and requirements of the public services, and (d) conditionally allow cargo self-handling. Notwithstanding the compromise, a plenary session of the European Parliament proposal did not pass (November, 2003), and the legislative process has failed.

In line with its commitment to provide free access to all services within the single European market, the European Commission re-opened the debate and announced (in October 2004), Proposal for a new Directive on port services (CEU, 2004 a). Compared with the text that was rejected by the European Parliament in November 2003. year, a new proposal was almost the same or very similar, in terms of the objectives, scope, definitions (except cargo self-handling), the procedure for selecting consultants, neutral provider of concessions and permits, and regulations concerning pilotage and financial transparency. New elements to the initial compromise has more stringent and binding transitional regime concerning the granting of concessions and permissions, shorter maximum period of concessions and authorizations as well as a new and broader definition of self-handling of cargo. Discussion on the proposed Directive has been very active for several reasons. The European Court of Justice examined the case of the award of concessions to providers or workers' organizations under the principle of case-by-case basis. Then, the Commission has already been presented guideline to eliminate barriers that hinder the provision of services across Europe (CEU, 2004). At that time it was not clear whether the scope of its activities, which could exclude transport services on a legal basis, apply on port services as well. Certain parts of the port sector or port users liked the establishment of free market access to port services. Their interest groups have tried to put these issues back on the agenda of the European Union when the EU institutions have been willing to improve political integration in the area of maritime transport. At that time, Commissioner responsible for transport, said that the revised draft will be officially released before the end of 2004. (De Palacio, 2004). The whole process is further strengthened by the document White Paper on European transport policy (CEU, 2001 c), which had implications for the port sector, as the "port package" referred mainly to competition within the port, and to a lesser extent between ports, while The White Paper is aimed to address the key aspects of competition between transport models. On the other hand, the possibility of formulating regulations in the European Union regarding public financing of port, in accordance with the "special regime" applied in accordance with Article 73 of the Treaty in other transport sectors (shipping, aviation), at that time still seemed unrealistic and unachievable. After the debate by releasing the Green Book69, the opinion prevailed that there was no need for a separate political action in this regard, but for the application of the Guidelines on the transparency of financial relations between Member States and public undertakings as well as transparency within certain companies70. Details of the legal process of formulation and implementation of these guidelines are considered as a means of defining the conditions for long-term performance of port operations. Specific Guidelines advocates the separation of accounts for each economic activity. It also gives the Commission the authority to investigate whether companies that carry out activities of general interest are over privileged, and whether some commercial activities receive illegal state aid. The view that is similar guidance needed only when a particular economic sector receives significant support (this is not the case in the port sector) was gaining more and more support. This does not mean that there were no participants who supported the need for explicit policy framework at EU level, to prevent any direct financing of seaports. The Commission considered that the general provisions of the Treaty apply to the port sector, in relation to public funding of ports, when it is probable that could distort competition. Given the critical lack of support from the politically relevant actors and stakeholders, adoption of specific guidance in terms of financing port at that time it did not seem likely.

After a long period of consultation the European Parliament by a majority vote in January 2006. for the second time rejected a proposal guidelines on port services. It was the second failed attempt by the Commission to establish a legislative framework in terms of providing services and conducting activities in the ports of the Union after the first rejection of the proposal in October 2004. year. With the assistance of the fundamental features of the economic environment, mainly due to the heterogeneity of the European port sector and the difficulties that this heterogeneity causes any attempt to accept a uniform solution acceptable to everyone at the supranational level, the position of organized maritime interests decisively contributed to the second rejection of the initiative of the European Union.

Within the context of an integrated maritime policy of the Union was recognized the role of seaports as important parts of economic chains on which the economy of the European Union is dependent. Development of port facilities should be consistent

[69]Green Paper on Sea Ports and Maritime Infrastructure (CEU, 1997); by the publication of the Green Paper on seaports and maritime infrastructure in 1997 the European Commission announced the adoption of a legal act, which will be at the level of the European Union to liberalize the market of port activities. Thereafter the Commission to the European Parliament and the Council twice submit the proposal for adoption Guidelines on market access to port activities. Both proposals, however, have failed.

[70]Directive 2000/52, dated, 29. 7. 2000.

with the growth of European domestic and international trade, but at the same time is compatible with related EU policy objectives, particularly with regard to competition and environmental protection. As part of an integrated maritime policy71, the European Commission has committed:

- Propose a new port policy, taking into account the multiple roles of ports and the wider context of European logistics;
- Make proposals to reduce the levels of air pollution from ships in ports;
- Develop guidelines for the application of relevant legislation of the European Union in the field of environmental protection in relation to the development of ports.

In October of 2007. the Commission adopted a very important document72 in conjunction with the port policy, aimed at making the port system capable of coping with the transport needs of the Union. The document contains an action plan to achieve the goals set, which is a result of extensive consultation (2006-2007) with all stakeholders in the port sector. This document is also in line with the recently adopted Communication on Integrated maritime policy73, which covers all areas associated with the sea and activities as a means of promoting economic growth and job creation in a sustainable manner.

Finally, on 27 March 2011 The Commission has published a long-awaited White Paper on transport policy74. This document contains 40 different concrete initiatives for the next decade to build a competitive transport system that will increase mobility, remove major barriers in key areas and to stimulate growth and employment.

With respect to the ports this document contains the initiatives in the area of infrastructure, port services, finance, maritime safety and security protection. With regard to infrastructure was discussed in relation to involvement in the transport network. The Commission has previously determined the basic criteria for inclusion in a comprehensive port transportation network and is expected to soon publish specific folders. Commission in the document emphasizes the need to possess a more efficient entry points into the European market, while avoiding unnecessary use of European roads. Regarding port Services Commission has announced its intention for reconsideration of restrictions regarding port pilotage. With regard to the financing of ports, the Commission aims to improve transparency in the way of reducing the threshold of general guidelines on transparency75. This should help elucidate the pathways of public financing of various port activities in order to avoid distortions of competition. Finally, in relation to maritime safety and security protection system SafeSeaNet76 will develop into a fundamental system for all relevant maritime information tools needed to support maritime safety and security protection as well as protection of the marine environment from pollution by ships. The Commission has also announced measures to improve the security protection of cargo in the ports. In general, the approach used in a document is positively evaluated by representatives of the port sector.

In the 2012, the Commission Vice-President Siim Kallas announced the review of the European policy framework for ports and the preparation of a new set of measures for 2013, the Commission launched a number of studies to contribute to this process. Some of the preliminary results were presented and discussed at the European Ports

[71] Communication from the Commission to the European Parliament, the Council, the European economic and Social Committee and the Committee of the regions „An Integrated maritime policy for the European Union“ COM(2007) 575 final.

[72] Communication on a European Ports Policy COM(2007) 616 final.

[73] Communication from the Commission to the European Parliament, the Council, the European economic and Social Committee and the Committee of the regions „An Integrated maritime policy for the European Union“ COM(2007) 575 final.

[74] Roadmap to a Single transport Area-Towards a competetive and resource efficient transport system COM(2011) 144 final.

[75] Directive 2004/59/EC.

[76] Directive 2002/59/EC adopted by the Parliament and the Council of 27.6.2002., as amended by Directive 2009/17/EC, was established at the EU level a system for monitoring and surveillance of maritime traffic in order to improve maritime safety, prevention of accidents, search and rescue etc.

Policy Conference which was held on 25-26 September in Brussels. The conference was organised by the European Commission and aimed at exchanging views with stakeholders on the challenges the port sector is facing. At the conference, PricewaterhouseCoopers/NEA presented the initial results of the stakeholders' consultation survey which was launched in July. Large number of replies (more than 500) were collected from shipping companies, port authorities, port users, terminal operators,workers and service providers. With this exercise, the Commission intended to identify the potential inefficiencies and problems in order to take action in these areas. While waiting for a more elaborated analysis of the results, a number of the initial conclusions of the survey appeared to be remarkably positive. In particular, 70% to 80% of the respondents said they did not encounter any particular challenges for port services. The preliminary results of the study on port labour were also presented at the conference. The study analyses the organisation of labour market, training and health and safety in seaports in Europe. The report, which will be available before the end of the year, describes the current situation in Members States and identifies the restrictions that exist on employment and working practices. After its publication, the study will possibly deliver policy actions at EU level.

There is a need to acknowledge the potential of the European Union to be a positive force in establishing a renaissance of port management and policy. This can be achieved by ensuring a level playing field and legal certainty on the one hand, and by fostering growth and development of ports on the other hand. Among the specific challenges for port authorities, access to port land features as a specific point of attention. The way port authorities give operators access to this vital asset is essential, together with the ability to balance transparency and flexibility when using lease agreements or public domain concessions. These points were also made in the discussion on the Commission's Directive proposal on the award of concessions[77], which was issued in December last year. The proposal is part of a wider package on public procurement. It aims at bringing clarification on the application of the Treaty principles on transparency and at equal treatment to the award of service concessions. It imposes rules on prior and post-publication notices, technical specifications, selection and award criteria, negotiations, deadlines imposed on tenderers and procedural safeguards. Furthermore, the proposal aims at providing a clearer and more precise definition of a concession, building on case law of the European Court of Justice. It provides judicial protection to interested parties through the extension of the scope of application of the Remedies Directives

There is a need to clarify the scope of the proposal. Land lease contracts and public domain concessions in the port sector are not to be considered as service concessions in the meaning of the Directive proposal, given that these do not involve the acquisition of services. In this sense, it is proposed to clearly exclude these types of contracts from the scopeof the Directive. For other services in the port sector, such as technical nautical services, the Directive applies. On the actual substance of the proposal, it is underlined the fact that the provisions are very heavy-handed, especially where it concerns modifications of contracts. These concerns were also voiced in the relevant working groups and committees of Council and Parliament. Both institutions are working on amendments to substantially simplify the Directive proposal. Some voices have been very critical, favouring its rejection, but this is unlikely to happen.

4.CONCLUSION

As part of its activities, the European Union underlines the importance of the port system to the expected sustainable development of Europe. For this purpose promoted a number of initiatives in terms of building an efficient port system in conditions of free competition. The European Union has at its disposal two methods to achieve their goals: identifying specific regulations and financing of port projects. Other parameters of activities in European ports are based on the principle of subsidiarity and remain the responsibility of national governments. A well-thought port policy is not just a question of new

[77] Directive of the European parliament and of the Council on the award of concession contracts, COM (2011) 897 final.

legislation and policy documents, it is also a matter of proportionate application of the existing legislation, which is often a more general nature.

The political integration of the EU Member States is primarily a dynamic process. When seeking a balance between liberalization and harmonization the current European agenda incorporates several dimensions. Therefore, even the rejected policy proposals coming back on the agenda, suggesting an irreversible process of Europeanization policy. The search for the long-term strategy and progress towards the European port policy already stressed the importance of the diversity of European ports.

The existence of the European Union is based on the principles of an open market economy with free competition. European competition law is the means by which ports can become more competitive.

States have always had an important role to the seaports: they had them owned, controlled, and monitored. European law aims to reduce the state's role in relation to the port. Therefore states preclude granting illegal aid, denial of access, discrimination between port users and service providers. Effects of European law are evident in the improvement of quality of service while reducing the cost, while the ports become more attractive to investors. The fact is that because of the internal market increased competition between ports, resulting in improved quality of services provided to the satisfaction of the port users.

European law seeks to ensure transparency in public financial flows to the port sector, in order to establish an equal business conditions within and between ports. Public investments in ports have a significant impact on the competitive position of the port within the Union.

European law is not yet fully succeeded in ensuring full accessibility and openness of the market of port services. And after fifty years since the establishment of the European Union, there is still no specific legislation regarding the provision of port services. Port services market is characterized by complexity and diversity of national and other applicable regulations, the heterogeneous nature of port services, and port diversity (in terms of status, ownership, management types, functional and geographic characteristics). Therefore, it is necessary to adopt a legislative framework at the EU level that would establish ground rules applicable in all ports of the Union, which should ensure that competition within and between ports takes place according to the principle of equality.

The development of new port projects was strongly influenced by the guidelines of the European Union: the Birds Directive (2009/147/EC) and the Habitats Directive (92/43/EEC) with a network of protected areas known as "Natura 2000". The prevailing opinion is that European environmental law does not provide sufficient legal certainty for port development in protected areas, as evidenced by stopping or slowing the numerous port projects across the European Union.

REFERENCES

1.Banister, D.- Stead, D.- Steen, P. - Dreborg, K. - Nijkamp, P. - Schleicher - Tappeser, R., European Transport Policy and Sustainable Mobility, Spon Press, London and New York, 2000.

2.Blanco, L.O. - Van Houtte, B., EC Competition Law in transport Sector, Clarendon Press, Oxford, 1996.

3.Bluman, C. - Dubouis, L., Droit institutionel de l`Union européenne, LexisNexis Litec, Paris, 2005.

4.Brooks, M.R. i Cullinane, K. (eds)., Devolution, Port Governance and Port Performance, Elsevier, London, 2007.

5.Craig, P. & De Burca G., EU Law (text, cases and materials), Oxford University Press, New York, 2003.

6.Despicht, N., The transport policy of the European Communities, Chatham House, London, 1969.

7.Erdmenger, J., The European Community Transport Policy: Towards a Common Transport Policy, Gower, Aldershot, 1983.

8.Evans, A., European Community Law of State Aid, Oxford, 1997.

9.Foster N., EC Legislation, Oxford University Press, New York 2004/2005.

10.Fischer, H.G., Europarecht, Verlag C.H.Beck, Munchen, 2001.

11.Greaves, R., EC Transport Law, Longman, Pearson Education Ltd., 2000.

12.Gwilliam, K.M., The Common Transport Policy, u: El-Agraa, A.M. (ed.), The Economics of the European Community (3 edn), Harvester Wheatsheaf, str. 230-242, London, 1990.

13.Kandžija, V., Gospodarski sustav Europske unije, Ekonomski fakultet u Rijeci,

Rijeka, 2003.

14.Kandžija, V. - Cvečić, I., Ekonomika i Politika Europske Unije, Ekonomski fakultet sveučilišta u Rijeci, Rijeka 2011.

15.Lindberg, L.N. - Scheingold, S., Europe"s Would-be Polity, Practice Hall, New York, 1970.

16.Machpul, F., A History of Thought on Economic Integration, Macmillan, London, 1977.

17.Pijnacker Hordijk, E.H., - Van Der Bend, G.W., - Nouhuys, J.F., Aanbestedingsrecht, Sdu. str. 682. Den Hag, 2004.

18.Ross, J.F.L., Linking Europe Transport Policies and Politics in the European Union, Praeger, London, 1998.

19.Stevens H., Agendas alternatives and Public policies, Harper Collins, New York, 1984.

20.Stopford, M., Maritime Economics, Routledge, 2002.

21.Swann, D., The Economics of the Common Market (6 izd.), Penguin, London, 1988.

22.Vickerman, R.W., The Single European Market, Harvester Wheatsheaf, London, 1992.

23.Abbati, D.E., "Transport and European Integration", Official Publications of the EC, Luxembourg, 1986.

24.Batur, T., "Pravni status morskih luka i lučka politika u Republici Hrvatskoj", Zbornik radova Pravnog fakulteta u Splitu, god 47, 3/2010, str. 677-692.

25.Batur, T. „Ugovor o koncesiji u funkciji razvoja morskih luka", Doktorski rad, Pravni fakultet u Splitu, 2012.

26.Bayliss, B.T., "Transport Policies in the European Communities", Journal of Transport Economics and Politics, 13(1), 1979., str. 28-43.

27.Bromhead, P.A., "Transport Policy" in Coffey, D. (ed.), Economic Policies of the common Market, Macmillan, str. London, 1979., str. 122-145.

28.Brooks, M.R. - Pallis, A.A., "Assessing port governance models: process and performance components", Maritime Policy & Management, 35:4, 2008., str. 411-432.

29.Button, K.J., "Road Haulage Licensing, and EEC Transport Policy", Gower, Aldeshot, 1984.

30.Carbone, S.M. - Munari, F., "Port services ancillary to navigation between market and safety requirements", Lloyd`s Maritime and Commercial Law Quarterly, Part 2, 1996., str.67 – 91.

31.Carbone, S.M. - Munari, F., "The regime of Technical-Nautical Services (Pilotage, Towage, Mooringmen) under European law", European Seaports Law, The regime of Ports and Port Services under European Law and the Port Package, Van Hooydonk, E. (ed.), Antwerpen – Apeldoorn, Maklu, 2003., str. 187 – 223.

32.Cafruny, A.W., "Toward a Maritime Policy", in Hurwitz, L. And Lequesne, C.(eds), The State of the European Communities, vol.1, policies, institutions and debates in the transition years, Lynne Rienner, Colorado, 1991., str. 285-299.

33.Carlton, D. - Perloff, J., "Modern Industrial Organisation", Harper Collins College Publishers, New York, 1994., str.110.

34.Churchill, R.R. - Lowe, A.V., "The law of the sea", 3rd Edition, MellandSchill Studies in International Law ,1999., str. 61-64.

35.Gomez Ibanez, J. - Meyer, J., "Going Private", The International Experience with Transport Privatization, The Brookings Institution, Washington DC, 1993.

36.Goss, R., "Economic policies and seaports – part 3: Are port authorities necessary?", Maritime Policy and Management, 17, 1990., str. 257-271.

37. Jacobs, J., "Systems of survival: a dialogue on the moral foundations of commerce and politics", Random House, 1992.

38. Maguire, "EC Law and Ports – Plotting a New Course" , IJOSL 63 and 154, 1998.

39. Notteboom, Th. - Winkelmans, W., "Structural changes in logistics: how will port authorities face the challenge?", Maritime Policy and Management, vol.28, nr.1, 2001., str. 71-89.

40. De Palacio, "Ports Policy in Europe", General Assembly of European Ports, Tarragona, Spain, 26 May 2000

41. Pallis, A.A., "The Common EU Maritime Transport Policy: Policy Europeanisation in the 1990s", Ashgate, Aldershot, 2002.

42. Policy Research Corporation and Institute of Shipping Economics and Logistics, Economic Impact of Maritime Industries in Europe. European Commission, DG 3,

43. Power, EC Shipping Law (2nd ed., 1998), 2001.

44. Power, Vincent J. G., "European community competition law and seaports", Il dritto marittimo, br. 1., 2001.

45. Power, V., "The EC Shipping Law", Lloyd's Of London Press, London, 1992.

46. Psaraftis, H.N., "EU Ports Policy: Where do we Go from Here?", Maritime Economics and Logistics, Br.7., str. 73-82.

47. Psaraftis, H.N., "Europe port 'patchwork' needs to be redesigned", Lloyd's list, London, 2005.

48. Trujillo, L. - Nombela, G., "Privatization and regulation of the seaport industry", Universidad de Las Palmas de Gran Canaria, 2000.

49. Commission Green Paper: Towards a future Maritime Policy for the Union: a European vision for the oceans and seas [COM (2006) 275 final - Not published in the Official Journal].

50. Communication from the Commission to the European parliament, the Council, the European economic and social committee and the Committee of the regions, An Integrated Maritime Policy for the European Union, COM (2007) 575 final.

51. European Commission Guidelines for Successful Public-Private Partnerships, 2003.

52. European Commission Green Paper on Public-Private Partnerships and Community Law on Public Contracts and Concessions COM (2004) 327 final.

53. GREEN PAPER "Towards a future Maritime Policy for the Union : A European vision for the oceans and seas", COM (2006) 275 final

54. Treaty Establishing The European Community, (Consolidated Version, Official Journal of the European Union, C 321, 29.12.2006).

55. The Treaty on the Functioning of the European Union, (Consolitaded version, Official Journal of the European Union C115/47, 09.05.2008).

56. Law of the Sea Convention 1982, (UNCLOS 82).

57. UNCTAD Review of Maritime transport, United Nations, New York and Geneva, 2009.

58. WHITE PAPER Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system COM(2011) 144 final.

ADVANTAGES AND DISADVANTAGES OF MULTINATIONALITY AS A BASIC CHARACTERISTIC OF SHIP'S CREW

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ABSTRACT

Over the last thirty years, the world merchant fleet has become significantly multilingual and multicultural in crew composition. Today, about two thirds of the world's merchant marine vessels sail with a crew composed of several nationalities. At times, the crew mixture may experience behavioral problems both at work and off duty that can affect ship's safety, pollution prevention and security. A ship with a multinational crew should be an interesting and positive challenge. It is understood that crews must be committed, loyal, devoted and able to communicate effectively without prejudice. All human beings need communication in order to relate with others, one needs a common language that can be shared with people around. The aim of this paper is to point out on advantages and disadvantages of multinational crews on board. We based our statements on survey we conducted among 62 seafarers who are different nationality.

1. INTRODUCTION

In today's world of shipping, running a vessel with only a single nationality onboard is nearly impossible. The reason for this, of course, is economic. It is now fact that multinational crews are a common feature aboard more than 65% of the world's merchant fleet. In this respect it is of vital importance to ensure that these multinational crews can communicate with each other effectively with no prejudice to any nationality represented on board and that they can talk, laugh and joke together because the more seafarers can understand each other the more likely they are to run not just an efficient and safe ship, but a happy ship on which personal and working relationship can be built up. Having differences is undeniable, but we may be able to tackle the troubles associated with them if we try to identify and analyze the root causes. Cultural awareness plays a very important role when we are talking about mixed crews in highly stressed marine environment. People see, interpret and evaluate things in different ways. This can lead to both positive and negative changes which in one way or another affect the whole organization. One's attitude to certain things, events or to life in general is greatly influenced by cultural values. The difference in perception can lead to conflicts, especially in the closed environment such as ship. Misunderstandings could be a serious risk in achieving a quality operation/management. This also plays a vital role in achieving what is defined as quality shipping. We can not have quality shipping without a quality crew that is able to work together and that can communicate without difficulty. With crew educated and trained to work in diversity safety and work performance innovations will follow.

2. POLICIES AND PRACTICES THAT ACCELERATE CREW'S EFFICIENCY ON BOARD

Competition among shipping companies, along with the sharp decrease of ship officers from the traditional maritime nations and the ample supply of low-cost seafarers from third world countries, led to the prevalence of multiculturalism among ship crews. As a result, recruiting multinational crews has become one of the most distinctive features of modern shipping. There is a growing conviction among seafarers and persons working in the land based sector of the maritime industry that staff onboard and on shore should be prepared to work with crews and groups whose members come from different countries and cultures and speak different languages. The problem, though, is which culture will have to surrender and which will dominate? Perhaps to understand oneself and be knowledgeable about others is a better way to avoid eventual conflicts. Shipmaster's attitude is one of the most important factors that affects on moral and satisfaction of crew. Over 80% of examinees evaluated with mark 5, on scale from 1 to 5, that it is most important to adequately resolve conflict situations between crew members in order to improve crew's efficiency. If conflict situations are not solved at time and adequately it can lead to disagreement which can affect safety on board. This also may have impact on master's authority and may lead to crew's disobedience. Shipmaster needs to resolve problems without offending or imperiling crew members. Seafarers find that implementing anti-discrimination policies and practices on board is essential for work efficiency. They gave average mark 4.6. Companies have to be more proactive in encouraging multi-ethnic relations on board. Seafarers evaluated with average mark 4.4 ensuring high levels of fluency in the working language of the ship among both officers and ratings. It is well known in maritime industry that English is the main and only language that should be used in any type of maritime communication. English is the international language that is used worldwide and therefore the shipping industry accepted it as the main language on board ships and in communications ship-to-ship and ship-to-shore. Miscommunication can cause problems when working together and undertaking job-related tasks. Whether classified as merely irritating or actually hazardous, such problems tended to be exacerbated by the unwillingness of individuals to admit their difficulty in understanding or communicating. In seafarers opinion promoting social activities on board via masters and senior officers is at fourth place evaluated with average mark 3.8. If master doesn't encourage and ignore those activities it can lead to social isolation and disaffection of crew members. It is necessary to have capable and experience leaders who will abet communication, resolve conflicts and won't hesitate to take drastic measures when necessary. At last place in seafarers opinion is avoiding conversation about cultural and national stereotypes. Stereotypes make communication even more difficult and should be ignored and rejected. This is the only way to have good working conditions on board and satisfied crew.

Educated and trained crew for work in multinational environment is essential for both company and seafarers. In an environment where crew members are different nationalities and where are presented many different languages inherent leadership competency and efficient communication is a necessity. All crew members should be trained for work in multinational environment.

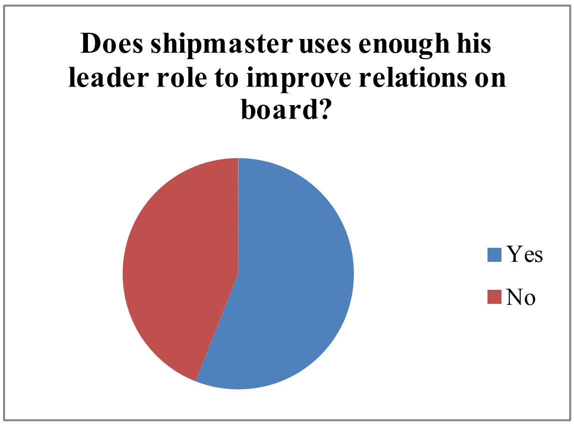

Figure1. Does shipmaster uses enough his leader role to improve relations on board

It is essential that master uses his leader role as much as possible to improve relation between crew members. 56 % of respondents think that master does so and 44% disagree.

3. ADVANTAGES AND DISADVANTAGES OF MULTINATIONAL CREW

Working in an multinational environment has many advantages for example you can learn something new about other cultures and religions, teamwork, possibility to learn foreign languages, etc. If seafarers realize those advantages it could help to avoid expensive mistakes and to reduce accidents at sea. The most importnat thing is to accomplish that seafarers communicate effective and without prejudice. At ship we meet with many differences with whom we have to obtain. According to BIMCO's study majority of seafarers comes from Far East and minority from European countries1. The center of gravity of the manpower industry has continued to move away from most of the traditional maritime countries in Europe, Japan and North America towards countries in the Far East, in the Indian sub-continent and Eastern Europe. Those three regions supply about 81% of manpower in maritime industry. The global labour market for seafarers has emerged and has become established through a worldwide network of agencies and organizations dedicated to crew management. This was due to:

- Open register ships which accounted for more than half of the world's internationally trading fleet.
- European countries relaxed their crew nationality requirements. This encouraged seafarers to move freely between flags, a freedom created by the ship owners and managers.
- Ships whose flags and entire crew share the same nationality are mainly owned in the world's developing countries are the suppliers of seafarers for the ships of the open register.
- The cuts in labour costs made by ship owners and ship managers.
- Union also played an important part in creating the global market.

Around the mid-1980s, these nations ended their dependency on the established and regulated labour markets they were tied to and in which their businesses were located, and were free to choose from every world region that was on the market offering low cost seafaring labour.
And so, every world region that was able to offer cheap seafaring labour immediately became a potential source of supply. Consequently nationality became irrelevant. This laid the defining feature of the global labour market for seafarers2.
Seafarers think that the most important advantage in multinational crew is that you have many different approaches to resolve problems at ship. Also one of the very important advantage is a possibility to learn foreign language which is evaluated with mark 3.9. Understanding and learning something new about other cultures is not less important. Seafarers evaluated this advantage with mark 3.4. Understanding differences can improve communication between seafarers, which is relevant for ship's safety and security. In an isolated social environment such as ship is, making new friendships is very important for seafarers in order to be in touch with other people. 82% of respondents think that making new friendships is important and 18% think that it is less important. If educational institutions pay more attention to the importance of these advantages then it could contribute that next generation of seafarers have less repulsiveness and prejudice towards other seafarers that come from different countries.

Table1. Evident problems among multinational crews on board[3]

PROBLEMS	AVERAGE MARK
Prejudice	4
Religion	3.6
Previous bad experience	3.5
Distrust	3.4
Different systems of education and training	3.3
Communication difficulties	3

[1] BIMCO/ISF 2000 Manpower Update

[2] Петрович Шухнов Виктор, 2009, “Some intercultural differences aboard ships with multinational crews and possible ways of their leveling out”, 57th International Youth Scientific and Technical Conference "YOUTH - SCIENCE – INNOVATION“

[3] Research data collected by Jovana Odalović

Customs and traditions	2.9
Historical problems	2.7
Social isolation	2.6
Political problems	2.4

It can be seen from Table 1.that prejudice and religion are most evident problems between multinational crew members. Those are the most obvious disadvantages of mixed crews. It is necessary to discard all prejudice about people coming from different countries in order to have effective crew. Next most preferred answers are previous bad experience and distrust. Another issue that makes seafarers reluctant to work with people of other nationalities is communication difficulties. The most common form of communication problems is language barrier because at ship there are people who speak different languages and some of them don't speak English good enough. One of the communication problems are accents. What we all agree is the fact that at times a pronunciation or incorrect statement in another language may be the base for disagreement which can leading to problems, due to misconceptions or misunderstandings. So if we want effective communication on board along with English language knowledge it is necessary to understand many different accents4. Custom and traditions, historical problems and social isolation are almost at the same level with average marks from 2.6 to 2.9. Social isolation on board can be very dangerous and can affect security and safety of ship, crew and cargo. There are three fundamental factors that are determinative for each person's behavior when working in a group or organization, namely organizational socialization, perception and motivation. So, socialization is very important at ship because it is limited environment with time and space. According to respondents political problems are at the last place of disadvantages.

The influence of human factor is very important for safety at sea and it is prime characteristic of overall system. In maritime context term human factor refers to interaction between humans, systems or automatization on board. Maritime International Organization (IMO) defines term human factor as a complex and multidimensional problem that affects on safety at sea and pollution. According to research of British Marine Insurance Company 80% of accidents at sea are caused by human factor. Despite automatization, contemporary equipement and educated seafarers still accidents happend. In maritime industry human factor is crucial for safety, but still the main cause of accidents at sea5.

Table 2. Human factor as a cause of maritime accidents6

HUMAN FACTOR	AVERAGE MARK
Fatigue	4.5
Failure to follow procedures	4.3
Vagueness and ambiguity	4.2
Communication	4.1
Confusion	3.9
Not following the trip plan	3.5
Wrong commands	3.1
Managing style	3.1
The system of assumptions, beliefs, values and norms of behavior	3

The importance of reducing human and organizational error through the management of human element and human factors has to be the key focus. It is evident from studies of maritime accident reports where, in the chain of causation, 'human error' has been identified as a significant factor, that it is possible to break down this category further and to identify that crew communication failure has played a key role in the incident. Poor communication between crewmembers from the same culture who are speaking the same language can, through misunderstandings and mistakes, be a threat to the overall safety of a vessel and pose an additional threat if one considers the risk of subsequent pollution. If one adds the additional variables of crews using English as a second language and the cultural differences which may be experienced, then the odds of miscommunication may be increased. In turn, it is recognized that maritime safety can be enhanced by the improvement of

[4] Kamal Abd Elkhalik, Rashed Sameh K, 2010, "Maritime english holds a great stake in the both safety and security of merchant vessels", 22nd International Maritime English Conference

[5] Ćorović Branislav, 2011, Upravljanje brodskom posadom, FZP, Kotor

[6] Research data collected by Jovana Odalović

crew communication, facilitated through training in the use of Standard Marine Communication Phrases (SMCP)[7]. As it can be seen from the table 2. , majority of respondents think that fatigue is the most common factor that causes accidents at sea. It is clear that fatigue can be an obvious threat to the safety of ship, crew and cargo. It is concerning that failure to follow procedures took second place. Procedures should be followed no matter what, especially in dangerous situations.

4.CONCLUSION

Multinational crews from different cultural backgrounds, speaking different languages are particularly impressive in their ability to overcome cultural barriers. Normally, a person with different views and ideas is an asset. Different thinking comes with cultures, believes and languages. New ideas should be welcome in a competitive environment. It is better to have different ideas than no ideas at all. Particularly people from other cultures should be more than welcome in maritime industry. In short, this research has tried to formulate an answer to the question: Are multinational crews an advantage or not? There are many benefits of working with people from different ethnic and cultural background, the negative side is that it is much harder to communicate effectively. Educated seafarer has to be able to understand the similarities and differences among people and to develop the capacities to solve problems. It is important to know that a skilled, satisfied and loyal crew helps a company to provide safe and efficient services as well as protecting the marine environment. The results from the survey revealed that prejudice, previous bad experience, distrust, different systems of education and training, etc. could be factors which negatively affect multinational crews. In contrary there are many advantages that derive from multinational crews which contribute to safety at sea.

[7] Pyne Robyn, Koester Thomas, 2005, “Methods and means for analysis of crew communication in the maritime domain“ , The archives of transport, vol.17, NO.3-4

REFERENCES

[1]BIMCO/ISF 2000 Manpower Update

[2]Ćorović Branislav, 2011, Upravljanje brodskom posadom, FZP, Kotor

[3]Kamal Abd Elkhalik, Rashed Sameh K, 2010, “Maritime english holds a great stake in the both safety and security of merchant vessels”, 22nd International Maritime English Conference

[4]Петрович Шухнов Виктор, 2009, “Some intercultural differences aboard ships with multinational crews and possible ways of their leveling out”, 57th International Youth Scientific and Technical Conference "YOUTH - SCIENCE – INNOVATION“,

[5]Pyne Robyn, Koester Thomas, 2005, “Methods and means for analysis of crew communication in the maritime domain“ , The archives of transport, vol.17, NO.3-4

[6]Research data collected by Jovana Odalović (part of questionarie conducted among 63 seafarers from Croatia and Montenegro.

TRANSPORT POLICY OF THE REPUBLIC OF CROATIA WITHIN THE CONTEXT OF EUROPEAN TRANSPORT POLICY AND MOS PROJECT

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ABSTRACT

European transport policy was published in 1992 in the document called White Paper on Growth, Competitiveness and Employment, which emphasizes two systems of unification: 1) the integration of means of transport by ensuring interconnection between different branches of transportation and 2) the linking of national transportation networks in interrelated European structure of networks. Later, the White Paper on Growth, Competitiveness and Employment was published under the title European Transport Policy for 2010 – Time to decide, and as the main goal it pointed out the balance between economical growth, safety and qualitative requirements of the society for the purpose of modern transportation system. In this document, European Commission suggested more than 60 measures for the development of transportation system, which should exert effect on reduction of road traffic and restoration of railway traffic, on controlled growth of air traffic and promotion of maritime and inland waterway transport. The Motorways of the Sea – MoS project is, precisely, one of such measures which aims at improving the existing or introducing new, integrated intermodal chains of logistics based on the development of maritime lines. These systems are commercially more efficient, they ensure good alternative to road transport ensuring, by means of that, redirection of road haulage from congested roads to alternative transportation systems (sea, railways, inland waterways). This paper will call attention to the importance and need of implementation of European transport policy and MoS into Croatian system of transportation.

Keywords
European transport policy, transport policy of the Republic of Croatia, Motorways of the Sea – MoS

1. INTRODUCTION

In terms of transport geography, the position of Croatia as a Middle-European, Danubian and Adriatic country is not sufficiently estimated as far as it regards the attraction of international traffic flows and optimized utilization of both natural resources as well as the existing infrastructural facilities.

Up-to-present experiences of an inconsistent development fragmented into different transport branches without a clear concept of system-based progress, without an appreciation for real conditions and with an exclusive foundation on financial resources of public sector, indicate the priorities of transport policy. The critical issues should be dealt with the purpose of: restructuring non-profitable state owned companies in transport sector, rational management of transport

infrastructure, establishing equal trade conditions for all transport branches, transport management, induction of demand for off-road transportation forms as well as public transport, defining and implementing measures for the reduction of external traffic expenses, and especially with the purpose of the employment of scientific potential.
Strategic aims of transport development include integration in Trans – European Transport Network, rightful pricing in transportation, environmental protection, increase in transport safety and consolidation of transport market.
Investing capacities of a country and its economic situation, as well as the aims of transportation development, determine the principle of intermodality within the concept of transportation network progress. Upon the present nonlinearity in the progress level of each transport branch, this actually refers to increased investments in traffic infrastructure of railroad, combined and water traffic.
Future, integrated transport network along with the main international corridors that pass through Croatia – X., XA., VB., VC., VII., also includes the new priority route of TEN-T network – Adriatic Ionian motorway of the sea as well as the extensions of V corridor branch, especially the route Zagreb – Split – Dubrovnik.
Competitiveness of transportation activities on international and national market should be ensured by restructuring public sector infrastructure and transportation with appropriate legal and administrative prerequisites for commercialization and privatisation.
Efficient management of transport sector, i.e. transport processes, including the logistic dimension, should be provided by integrated information surrounding and by application of intelligent transport systems.
With the aim of improvement in transportation safety, environmental protection and reduction of external expenses, it is necessary to make analysis in selection and future offer of optimal transport options.
Implementation of transport development goals primarily implies the regulatory autonomy of the transport department and permanent cooperation between departments in order to ensure the efficiency in key standpoints: regulatory policy, transportation management, investment policy, policy of prices and fees, regional planning and social policy.
Guidelines of necessary legal changes emerge from the status of Croatia in the process of political and economic transition, as well as the strategic goals for admission to the EU.
Transport, as one of the important activities of every society, is also the key factor in the success of a unique market, since it helps to reach two basic goals in European integration: free movement of persons and goods in order to meet the demands of more integrated, but still distant markets, and the need to find profitable alternative solutions for congested roads. This brings the maritime transport policy into centre of attention.

2. MAIN FEATURES OF EUROPEAN TRANSPORT POLICY

Open boundaries and convenient transportation provided the citizens of EU with high level of personal mobility. Goods are delivered quickly and efficiently from factory to end-users, often in different countries. The EU made a contribution to competitiveness by opening national markets and to free movement by eliminating physical and technical obstacles.
Although many issues of transport policy are a matter of national government authorities, it makes sense that the unique European market has a unique transportation structure. In the last 10 years, the EU opened national transport markets to competition all over the Union, especially the road and air traffic, and to minor extent, the railroad traffic.
Liberalisation of air traffic resulted in greater competitiveness. It reduced ticket prices for passengers, and increased flight connections between member countries. After years of negotiation, in March 2007, the EU signed a contract with the USA on “open skies” which enabled each airline company from the EU to fly from any port in the EU to any city in the United States. This agreement ought to extend benefits of the Union’s liberalisation to transatlantic travels.
EU promotes main projects of the transport infrastructure, the so-called Trans-European Networks (TENs). The priority projects of TENs include:

- elimination of bottlenecks on main inland waterways that connect Rhine-Main-Danube from east to west
- programme for regulation of transportation off the coasts of Europe
- railroad expansion in north-south and east-west direction,
- transport redirection from roads to sea, inland waters and railroads (MoS project and alike)

2.1. WHITE PAPER

In the White paper on transport, which was adopted in September 2001, and which represented the most important strategic document for a long-term development of the common transport policy for the following ten years, the Commission set goals for each of the sectors, most of which have been achieved. The document contained an action plan for the improvement of quality and efficiency of European transportation. It was based on sixty measures whose aim was the reorganisation of the existing transport policy to render it sustainable and to avoid big economy loss due to the congestion of roads, to reduce pollution and road accidents. The final strategic aim was to reach the balance between different forms of transport by the 2010 by means of an active policy which should have restored the railroad traffic and promoted maritime and inland waterway traffic. In terms of such transport policy, in 2006, the European Union concluded that the short-term focus of the future action plan should have be directed toward the realisation of the greater competitiveness of railways, the development of ports and intelligent transportation systems, charging the utilisation of the infrastructure, production of greater amount of bio-fuels and toward the research of means for minimizing the congestion in cities.

The most important novelties which regard the balance shift between different means of transport imply selection of right locations for every single means of transport and operational organisation. The chain link which misses refers to the lack of close connections between the sea, inland waterways and railroads. With these guidelines, the European Union emphasizes the established tendencies of transport development activities. The main tendencies can be summed up to:

- the balance shift between the means of transport
- the elimination of bottlenecks
- putting the customer into the centre of transport policy, and
- managing the results of the transport globalisation.

2.2. EUROPEAN POLICY OF TRANSPORT

The common policy of transport in EU tends to achieve more sustainable modal balance, greater competitiveness between transport companies and integrated attitude towards infrastructural development. The aims of the common policy are as follows:

- to determine common rules which apply to international transport from or to the territory of a member country, and
- to determine conditions under which the hauliers, that do not have headquarters nor residence within the area of a member country, may provide services of haulage within that country.

2.3. GREEN PAPER

Green Paper represents the document which authoritatively raises an issue in order to open a debate and to get a certain legal frame for that issue. The Green Paper has a certain form which has to be adhered to. In the EU there is a great number of Green Papers which relate to different issues. About ten of them relate to traffic.

Maritime and railroad transportation ought to have greater role in the new European transport strategy whose aim is to reduce pollution. The project of Trans-European Networks (TEN-T), i.e. the project of integration of the European transport infrastructure, was developed 15 years ago when the European Union had only had 15 member countries, therefore it is necessary to revise it. Last year, the European Union set itself ambitious goals to act against climate changes which anticipate the reduction of CO2 emissions by 20 percent by the year 2020, the energy efficiency increase and greater consumption of bio-fuels. The analysis of transport situation showed the need to eliminate bottlenecks on land and waterways and to link up transport routes with the world through marine and air ports. The new infrastructure has to be designed so as to be safe for climate and to be sufficiently resistant from the very start, and the hydrogen technology can be very useful in airline and marine transport on long-term basis. So far, 400 billion Euro has been invested in the European transport networking, of which one third from the European funds. However, the project is, in many segments running behind and is far from complete. A successful example is the fast railway that connects London, Paris, Brussels and Köln. It is, however, necessary to build or restore almost 20 thousand kilometres of roads, more than 20 thousand kilometres of railroads and 600 kilometres of inland waterways, which require about 500 billion Euro.

3. THEORETICAL GUIDELINES OF THE MOS

The concept of the Motorways of the Sea – MoS has set as its goal the improvement of the existing or the introduction of the new, integrated intermodal chains of logistics which are based on maritime transport, and have high-quality maritime connections with the restricted number of chosen ports on strategic positions of the European coast. These services are commercially more sustainable and more efficient, they provide an alternative to road haulage and by means of that they ensure considerable shift of freight transport off the congested roads to alternative transportation systems (maritime transport, railroad and inland waterways).
The incitement of the development and the introduction of the concept Motorways of the Sea will improve the approach to the markets all over Europe and unburden overloaded road system in Adriatic region and European Union.
The development of five main European corridors in the Motorways of the Sea and their funding is comprised in the latest guidelines of the European Commission for Trans-European Networks (TEN-T). The European Commission has divided the European transportation system into four areas, and for each of them it financed and prepared a Master Plan of the development. Among these, there is also the East Mediterranean MoS Master Plan, which connects the Adriatic Sea with the Ionic Sea and the East Mediterranean (including Cyprus). The area of eastern Mediterranean has been recognised as the main international transport arena whose "knots" and corridors are of global importance. However, due to the fact that Croatia, Bosnia and Herzegovina, Montenegro and Albania are not member countries of the EU, they have not been actively included in creation of the original MoS Master Plan for the eastern Mediterranean. The proposed project is the extension of that Master Plan, and its wider objective is the development of the MoS Master Plan for the Adriatic transportation system which would make a constituent part of the East Mediterranean MoS Master Plan.

Chart 1: Potential routes of the "Motorways of the Sea" in the Republic of Croatia

4. GUIDELINES FOR TRANSPORT POLICY OF THE REPUBLIC OF CROATIA

There are numerous definitions of transport policy. As every other, so is the economy policy and the derived transport policy, the sum of all measures and actions oriented toward achieving the set goal. It is the sum of measures undertaken by various social and economic entities for the optimal development of the transport systems of a country. The transport policy is the constituent part of the overall economy and development policy of a country, and such a mutual relation between goals, instruments and entities must ensure optimal structure of transportation system and its successful operation.[1]

[1] Padjen, J.: Prometna politika, Informator, Ekonomski institut, Zagreb, 1996, p 3-4

The aims of transport policy can be classified from different points of view. The basic aims of the transport policy are: 2

- constant contribution to economic growth and national welfare,
- increase in efficiency and economics of the transportation system
- elimination or reduction of adverse effects of the transportation system, and
- fulfilment of social and transport demands.

Within the Adriatic MoS project, the Republic of Croatia started the cycle of maritime transport recovery by renovating and modernising its ports. In 2011 the system of control and supervision of maritime transport (Vessel Transport System - VTS) was put in trial operation. Croatia has also, almost completely, renovated and constructed the motorway network (the construction of the southern part which will connect Split and Dubrovnik is still expected) which will make a significant contribution to the MoS system. The greatest efforts still have to be invested in railroad construction, since the existing railroad infrastructure does not correspond to the planned growth of the maritime and harbour traffic nor to the demand for the good quality cargo handling as required by the modern European market.

The advantages, i.e. positive effects of the implementation of the MoS project can be expected through the following:

- modernisation and development of ports and port terminals
- employment,
- economic growth and development,
- increase and affirmation of maritime transport, and
- increase and affirmation of railroad traffic as an ecologically adequate form of land transport, especially regarding the transportation of mass cargo.

Transport policy of the Republic of Croatia is to develop an efficient, safe, ecologically acceptable and modern transport system, completely integrated in the network of main international traffic roads that makes the best use of the transportation and geographic position of the Republic of Croatia and meets the demands of freight and passenger transport.

5. ACTIVITIES AND MEASURES REQUIRED FOR IMPLEMENTATION OF EUROPEAN TRANSPORT POLICY IN CROATIAN TRANSPORT SYSTEM

In order for the guidelines of European transport policy to be successfully implemented in the Croatian transport system it is required to adjust the common rules which apply to the international transportation from or to the territory of the member countries, i.e. the transport over the area of one or more member countries. It is necessary to establish conditions under which transportation operators which do not have headquarters or residence in one of the member countries can perform transportation services, and to adopt measures for the improvement of transportation safety and all the other relevant provisions.

Investments in construction of new transport infrastructure are one of the prerequisites for continuous sustainable development. Plans for the development of the transport infrastructure are based on the analysis of the nature of the demand for transport services. Within the process of planning, the present and the future relations of the transport demand are analysed. The process consists of a series of reviews of the obtained results on different levels of decision making. Long-term plans have to be in accordance with the aims of transport policy, economical growth, social policy and environmental protection.

The Republic of Croatia lays basis of its transport system development in the Spatial Planning Strategy adopted by the Croatian Parliament in 1997 and in Croatia's Transport Development Strategy adopted by the Croatian Parliament in 1999.

Configuration of the Republic of Croatia and its territorial connection, with the north lowland transport routes on one hand, and the Adriatic coastline on the other, clearly indicate the vital importance of the development of transport infrastructure, as well as the need for mutual inland and maritime connection between the countries of European southeast and central Europe across the Croatian territory. New demands refer to the necessity for transport connections and territorial

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[2] Zelenika, R: Prometni sustavi, opt.cit., p 155-159

integration of the Republic of Croatia by means of modern and safe infrastructures, and to the necessity for connecting the Croatian transport systems with the transport systems of our neighbouring countries and especially the EU member countries.
Croatia is a transit territory especially in terms of transportation, which is proven by the fact that three Pan-European corridors (V, VII and X) that run across the Republic of Croatia. In that way, the transport as a whole represents not only the internal demand of the Republic of Croatia, but also one of its possible competitive advantages. The selection of multi-modal Pan-European corridors across the Croatian territory indicate, not only that the territorial location of the Republic of Croatia is an advantage, but also an obligation toward itself and Europe.
Redirection from road to railway cannot be imposed by the EU nor can it be implemented by the government prescription. The best way to do it is by means of incentives, such as targeted investments in other forms of transport, which could deal with excess, and prices which reflect the real expense of road utilisation and encourage "natural" migration from roads to alternative means of transport. The aim is to have the reduced amount of passengers or goods that travel by road on far distances, and increased amount of those who take the railway, and to replace some of the short passenger flights with railway travels.
The aim of the European transport policy remains the creation of sustainable transport systems which can meet the needs of society both economical and social, as well as ecological in the period of quick changes and ever growing demands.
In addition to the existing RO-RO lines that connect Croatian and Italian ports, not even one new MoS service has started in Croatia. So far, research and analysis of potential Croatian ports have been implemented only within East Mediterranean MoS Master Plan4 which analysed ports of Rijeka, Zadar, Split and Ploče but dealt with partially available data. Based on the results of that project, MoS potential scenarios were identified under which the Croatian ports are represented in all three corridors.

- MoS potential corridor 3 (Ionian Sea/ West Greece ports cluster & the eastern segment of the North Adriatic ports cluster)
- MoS potential corridor 5 (The eastern segment of the North Adriatic ports cluster & the western segment of the North Adriatic ports cluster)
- MoS potential corridor 7 (The eastern segment of the Norh Adriatic ports cluster &the central segment of the North Adriatic ports cluster & the northern segment of the South Adriatic - Balkan ports cluster)

6. CONCLUSION

The development of the "motorways of the sea" undoubtedly represents the basis for the future development of the transport network of the United Europe. This "door to door" system of transportation deals with numerous transportation issues, among which we can emphasize: unburdening of road transport, reduction of pollution and decrease in total expenses for freight transportation. The system of the "motorways of the sea" increases the transport reliability, because late deliveries due to the traffic jams are avoided by the employment of maritime transportation routes.
Guidelines of Trans-European Transport Networks have already determined the corridors for the "motorways of the sea" in Europe, and the member countries are responsible for the implementation of their transport systems into these corridors. The Republic of Croatia ought to reach for its opportunity to participate in TEN-T network. A valuable opportunity is the intensification of the development cycle in marine transport, with modernisation of ports and provision of good quality inland freight distribution within the Adriatic MoS project.
In other words, the Adriatic MoS project represents an opportunity for reinforced integration of the Republic of Croatia into a unique transport market of the EU that would multiply numerous positive effects both on transportation and on economic system of the country.
Looking from the point of view of the transport geography and anticipated market expansion to wider area due to the enlargement of the EU and the industrial growth in transitional countries of central Europe and due to the intensified foreign trade relations, Croatia has got good predispositions for attracting international transport routes.

Apart from being the shortest connection between the countries of the West Europe and the Middle East, the location of Croatia in terms of transport geography is the strongpoint for the development of numerous initiatives of regional progerss, the most important of which are the Adriatic-Ionian initiative, initiative for transport connection between the Baltic and the Adriatic, and between the Danube region and the Adriatic.
In accordance with the guidelines of the common transport policy of the European Union, the main goals of the complementary transport policy include – environmental protection, increase in transport safety and increase in efficiency of transport system.
The development of the transport system of Croatia must be adjusted to the strategic guidelines of the common transport policy of the United Europe.
4 TEN-T project: 2005-GR-90701-S East Mediterranean Motorways of the Sea Master Plan, +http://www.eastmed-mos.eu/

REFERENCES

[1]B. HLAČA: Politika europske unije i morske luke Pomorstvo, god. 21, br. 1 (2007)

[2]T. Poletan Jugović, M. Dujmović Cerovac: VREDNOVANJE UČINAKA PROVEDBE PROJEKTA "MORSKIH AUTOCESTA" U REPUBLICI HRVATSKOJ, 74 POMORSTVO, Scientific Journal of Maritime Research, 26.1.2012. str. 63-79

[3]http://www.entereurope.hr/page.aspx?PageID=94 [Accessed 7 Jan 2013]

[4]http://www.entereurope.hr/cpage.aspx?page=clanci.aspx&pageID=13&clanakID=3470 [Accessed 10 Jan 2013]

[5]http://www.delhrv.ec.europa.eu [Accessed 25 Jan 2013]

[6]http://www.mppi.hr/UserDocsImages/II%20065-STRATESKI%20PLAN%20MPPI%20%202012-2014%203_12. [Accessed 22 Jan 2013]

[7]http://www.bib.irb.hr/datoteka/537760.CRO_trans_prilagodba.doc [Accessed 15 Jan 2013]

[8]http://www.mppi.hr/default.aspx?id=44 [Accessed 28 Jan 2013]

[9]Čedomir Dundović, Alen Jugović, Dražen Žgaljić ANALYSIS OF CROATIAN PORTS IN RESPECT TO MOTORWAYS OF THE SEA IMPLEMENTATION

IMSC Split 2012. 4th INTERNATIONAL MARITIME SCIENCE CONFERENCE 36June 16th-17th, 2012, Split, Croatia

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TECHNICAL AND TECHNOLOGICAL CHARACTERISTICS OF RO-RO TERMINALS IN HARBOURS OF THE REPUBLIC OF CROATIA TOWARDS MOS PROJECT IMPLEMENTATION

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ABSTRACT

Adriatic Motorway of the Sea (AdriaticMoS) is a project based on the idea and strategy of connecting Europe with south-eastern coast of European Union, Cyprus and neighbouring areas by means of trans-European multimodal system of transport. This provides an opportunity for the development of the coastal navigation and intermodality in the entire region, having regard to the guidelines of European transport policy which, within the affirmation of the sustainable and more efficient transport, demonstrate preference for redirecting the road haulage to alternative systems. This redirection requires having or constructing Ro-Ro passenger terminals. Therefore, this paper will carry out the analysis and validation of the existing conditions of the port infrastructure in the Republic of Croatia, i.e. the Ro-Ro terminals, with the aim of obtaining information about necessary modernisation of the Ro-Ro terminals. The construction of the port infrastructure will be based on the market demand and defined criteria, on the qualitative and technological modernisation, on the transport connection with the main road and railway corridors for establishing better integration with the economical hinterland so as to create prerequisites for the development of intermodal transport. Special emphasis in the study will be placed upon the analysis and validation of the conditions of the technical and technological characteristics of the Ro-Ro terminals in the harbours of the Republic of Croatia as an essential infrastructure for the development of the Adriatic MoS project.

Keywords
Adriatic Motorway of the Sea (AdriaticMoS) project, technical and technological characteristics of Ro-Ro terminals in harbours of the Republic of Croatia

1. INTRODUCTION

This scientific paper deals with Ro-Ro terminals with the purpose of the MoS (Motorways of the Sea) project implementation.
Roll on – Roll off (abb. RO-RO) vessel is a specific transportation technology characterised by horizontal loading and unloading of road vehicles especially the freight carriers. This transportation technology is very simple. Cargo is loaded on board on its own wheels across a loading ramp that connects the shore with the hold, and it is unloaded after maritime transportation, on the its own wheels, also across the unloading ramp that connects the hold and the shore.

RO-RO terminals are, by their substantial concept and infrastructural equipment, one of the simplest and least demanding terminals. RO-RO technology brought many advantages to ports, because it increased traffic without the need for any additional investments or for new harbour mechanisation. To accept the RO-RO technology ports must only ensure the safe berthing to a vessel and provide vehicle reception on sufficiently large parking area in the port, which means that the expenses of port infrastructure are considerably lower in comparison to other transport systems.
When defining technical and technological concept of terminals, it is necessary to take into account type of RO-RO vessels that are to berth at the terminal. RO-RO vessels can be divided according to a few criteria[1]:
- size, or draught of vessel,
- type of cargo she is designed to carry, and
- length of her route.

Main tasks of the RO-RO transportation are[1]:
- Connecting road and maritime traffic by ensuring quick, safe and rational transportation service without handling the cargo from road haulage vehicles to vessels and vice-versa.
- Efficiency optimisation of transport infrastructure and transport superstructure, especially of maritime and road transport.
- Solving issues of harbour congestions and maximal turn-round of RO-RO vessels, and by means of that acceleration of the outflow of goods on roads.
- Providing solutions for road congestions, especially through cities and industrial centres and ensuring the increase in turn-round of road vehicles, and by means of that reducing the period of cargo transportation from manufacturer or vendor to consumer. RO-RO transport is especially used in trades shorter than 2 000 miles, therefore it is particularly developed in enclosed seas, and not only in freight, but also in passenger transport. Today there are more than thousand RO-RO ships of different sizes plying in world seas.

In 2007 the European Commission published Freight Transport Action Plan and proposed series of measures with aims of promoting transport logistics, encouraging competitiveness of intermodal transport system, creating frames to ensure modernisation of European ports and attracting investors, increasing the level of competitiveness of maritime transport and analysing the progress in the development of sustainable mobility.
Modernised RO-RO terminals of high quality are a prerequisite for developing the general idea, i.e. traffic shift from overloaded roads to sea.
Due to the identification of the bottlenecks in regional intermodal transportation system, in 2006 the European Commission started a project (DGTREN/G/FK D(2006) 227499) whose main objective is to identify and to reduce obstructions which impede unobstructed flow of cargo and passengers in Europe. Within this so-called Bottleneck Exercise, the users of intermodal transportation systems had to deliver information on bottlenecks which impede their operation or progress in general.[2] The Bottleneck Exercise project is currently implemented separately within national frames by responsible Short Sea Shipping promotion centres in each country. The European Commission recommends initiating the implementation of this project on regional basis in order to solve common problems. In the Adriatic region, the project is carried out only by Croatia and Italy. By now, there have been registered 200 bottlenecks in the whole Europe, and only about 40 of them, which are related to cross-border transportation, remained pending.

2. MAIN FEATURES OF ADRIATIC MOS PROJECT

The concept of the Motorways of the Sea – MoS has set as its goal the improvement of the existing or the introduction of new, integrated intermodal chains of logistics which are based on maritime transport, and have high-quality maritime connections with the restricted number of ports

[1] R. Zelenika, G. Nikolić, H. Pavlić *Gospodarska opravdanost izgradnje i eksploatacije RO-RO terminala Bakar*

[2] Bottleneck is any obstruction to free freight or passenger transportation of administrative, operative, legal, local, national, regional or any other nature alike.

selected by their respective strategic positions on the European coast. These services are commercially more sustainable and more efficient. They provide an alternative to road haulage and, by means of that, ensure a considerable shift of freight transport off the congested roads to alternative transportation systems (maritime transport, railroad and inland waterways).

By stimulating the development and the introduction of the concept Motorways of the Sea the approach to markets all over Europe will be made easier and the overloaded road system in the Adriatic region and the European Union will get unburdened.

The development of five main European corridors within the Motorways of the Sea and their funding is comprised in the latest guidelines of the European Commission for Trans-European Networks (TEN-T). The European Commission has divided the European transportation system into four areas, and for each of them it financed and prepared a Master Plan of the development. Among these, there is also the East Mediterranean MoS Master Plan, which connects the Adriatic Sea with the Ionic Sea and the East Mediterranean (including Cyprus). The area of the eastern Mediterranean has been recognised as the main international transport arena whose "knots" and corridors are of global importance. However, due to the fact that Croatia, Bosnia and Herzegovina, Montenegro and Albania are not member countries of the EU, they have not been actively included in creation of the original MoS Master Plan for the eastern Mediterranean. The proposed project is the extension of that Master Plan, and its wider objective is the development of the MoS Master Plan for the Adriatic transportation system which would make a constituent part of the East Mediterranean MoS Master Plan.

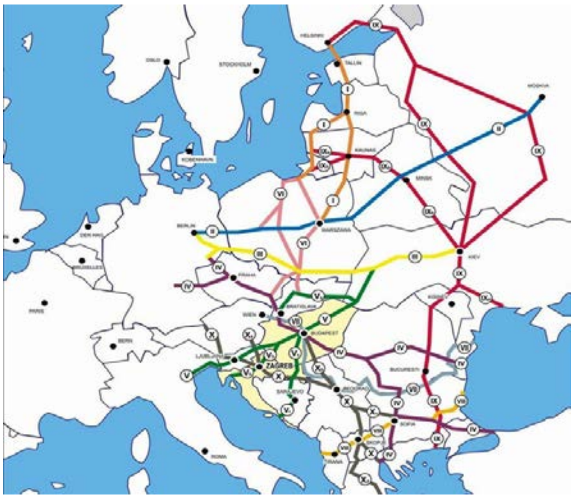

Figure 1: Pan-European transport corridors

3. ANALYSIS OF CONDITIONS OF RO-RO TERMINALS IN PORTS OF CROATIA

The main feature of RO-RO terminals is that a RO-RO terminal does not carry out standard cargo handling in port, but provides services only. Therefore, it can be concluded that RO-RO terminals represent a direct connection between the two transport branches (the maritime and the road transportation).

Very favourable geographical location of Croatia in terms of transit transportation represents a significant potential for the development of intermodal transport. The competitive advantage of the Republic of Croatia is the connection of the Pan-European transport corridors, namely the V, VII and X corridor, with the ports of the Adriatic basin and the inland waterways of Sava and Danube.

The Adriatic is an arm of the Mediterranean sea which is most deeply embedded into the European land. The maritime route to the north Adriatic represents the most economic way of transportation which reduces the expensive road haulage route. It is naturally the shortest and the most economic way by means of which Europe is connected with the Mediterranean and with most countries of Asia, Africa and Australia through the Suez Canal.

3. 1. Port of Rijeka

Harbour area in Rijeka includes:

- Rijeka/Sušak basin – container terminal, passenger terminal, Ro-Ro terminal, general cargo, grain, conditioned cargo and timber,
- Bakar basin – bulk cargo, Ro-Ro terminal,
- Omišalj basin – oil and oil derivatives,
- Raša (Bršica) basin – general cargo, livestock and timber and
- area of Škrljevo.

Rijeka – Budapest is a transversal route which connects the central European area with the Adriatic, and in wider sense with the Mediterranean, which includes the port of Rijeka as the transit waypoint of the corridor, as well as the road and rail communications which connect it to central European transit hinterland. Apart from the roads and railways, the system of oil pipeline that connects refineries in Croatia, Hungary, Austria, Bosnia and Herzegovina, Serbia, Check Republic and Slovak Republic is also of great importance. In the immediate vicinity of the port of Rijeka, on the island of Krk, there is also an international airport.

Container and Ro-Ro terminal (Brajdica) has the sea depth by the quay from 11 to 12 meters, the length of the South quayside is 300 m and there are two STS (Ship-to-Shore) container cranes. Additional 300 m of quayside with related infrastructure and superstructure (the estimated overall capacity of the terminal is 500 000 TEU), as well as the 164 m long West quayside with two STS container cranes are under construction.

Rijeka Gateway Project (RGP I and RGP II) whose total value amounts to 190 mil. EUR is being carried out In Rijeka. This project has modernised the capacities of the port of Rijeka to increase the transit cargo through the port, especially the container and RO-RO transport. By 2009 the passenger terminal with two berthing locations for passenger vessels and ferries, the terminal building for passengers and the new bridge on the breakwater were constructed within the frames of this project.

The second stage of container terminal in Brajdica is under construction. By the completion of this terminal there will be a quayside of 630 m in length and the overall area will spread over 50 000 m². The completion of this project is predicted for 2015. Designs for the new container terminal at Zagreb pier are in their last stage. The terminal is planned to be completed by 2015, and its construction will provide 400 m of new quay and 17 ha of warehouse area. Apart from the modernisation of the harbour area, this project predicts the construction of roads toward the port of Rijeka, and provision of harbour equipment. Rijeka Gateway Project is put into realisation by means of the World Bank loan and by Croatian Government support (190 mil €, 158 mil € of which are provided by the World Bank loan, and 32 mil € from the national budget of the Republic of Croatia). In 2011 the port of Rijeka handled 9.4 mil t of cargo and 171 400 passengers on the annual basis.

This development project determines the plan for modernisation and construction of the port of Rijeka, the realisation of which will be done in stages in ten years time. Plans for the development of this basin predict additional restoration of the terminal for the RO-RO vehicle transportation which is now being carried out at an inadequate area in Sušak. With minimal investments in the terminal arrangement and the employment of the existing warehouse areas and the 52 km long railway, which was built exclusively for the needs of the Raša basin, it would be possible to compete with the port of Koper, the port which permanently invests in the increase in capacities for the same purpose.

3. 2. Port of Zadar

The new port of Zadar – Gaženica encompasses the area of 250 000 m² and 12 piers, of which 6 for local traffic, 3 for coastal and international traffic, and 3 for Ro-Ro and cruise ships. The construction of new container terminal is predicted within this project. The project of the passenger port construction is carried out in 3 stages:

- The first stage, which included earthworks (filling and excavations) and construction of the secondary breakwater, was completed in May 2011.
- Work on the second stage (quayside constructions, access roads, basic terminal infrastructure) began in the end of 2010, and its completion is predicted by the spring of 2013.
- The third stage of the construction which refers to the terminal building should start in spring 2012 (the international tender is in process).

The completion of the overall construction of the ferry terminal is predicted by the December 2013.

The new passenger port will bring to unburdening of the city port from the vehicle traffic and make space for the high-speed lines toward islands, and for the smaller cruise vessels, yachts, tourist boats. The implementation of the whole port project is directly connected with the new motorway. The value of the complete project is 236 mil Euro, and it is provided by the European Investment Bank loan (100 million Euro) and the German development bank KfW (120 million Euro), whereas the rest of about 16 million is ensured by the Port Authority of Zadar from the national budget funds.

3. 3. Port of Šibenik

The port of Šibenik is connected by roads to other parts of the coastline, by motorway to the continental Croatia and Europe, and by railway to hinterland.

The port of Šibenik hasn't got a good-quality solution for the maritime transport of passengers. Most of the passenger transportation toward islands is carried out through the pier Krka, located in the centre of Šibenik, and ferry traffic through the pier Vrulje. The existing capacities in port do not provide berthing locations for vessels of greater size or cruise ships, therefore the port of Šibenik does not require the development of the new Ro-Ro terminal.

The new passenger terminal at quayside Vrulje, whose value is estimated at 12 mil Euro, is currently under construction. In 2010 the contract between the Port Authority of Šibenik and EBRD was signed. The complete implementation of the project is expected by the end of 2013. The value of the future passenger terminal is estimated at 25 million Euro, and it will be constructed under the concession tender.

3. 4. Port of Split

By the highway Zagreb – Split and railway infrastructure, the port of Split is connected to the hinterland, which makes it a point of contact between several important transport corridors connecting the entire Mediterranean. It stretches over 18.1 km^2 with the maximum draught of 10 m.

The project of reconstruction and construction of the pier Sv. Duje in the City Port was completed in 2010. This resulted in bigger number of berth locations (2 berths for vessels in the international trade and cruise vessels) in the city port, and in the additional 150 m of quayside. It also provided cruise ship traffic. This project is 28 million Kuna worth. In 2011 the project documentation was prepared for the construction of external berths at the city port breakwater, for the reconstruction of the main harbour road in Sjeverna luka Split, for the improvement and reconstruction of railroad turnouts and tracks, for the reconstruction of the berths 26 and 27 in the Split City Port, as well as for the technical documentation for the construction of international maritime terminal for passengers. The realisation of these activities is predicted for the period between 2012 and 2014. The annual turnover of cargo is 3 000 000 tons, and about 4 100 000 of passengers and 700 000 of vehicles.

3. 5. Port of Ploče

Port of Ploče is located on the branch Vc of the Pan-European corridor, by means of which it is directly connected to the European road and railway network.

In 2005 the activities on the project of trade and transport integration started on the basis of the agreement between the Government of the Republic of Croatia, World Bank and European Bank for Reconstruction and Development whose objective was to increase capacity, efficiency and service quality in the southern part of the Vc corridor, with the emphasis on the port of Ploče as its outset. The project comes as a response to the development trends in economy of the gravitational area of the port of Ploče. It is a result of the fact that the big multinational cooperations became part of the ownership structure of important harbour users in the area of metallurgy in Bosnia and Herzegovina and the amounts of the goods that pass through the port increased considerably exceeding the existing capacities.

Infrastructural development of the port of Ploče includes:

- the (re)construction of road/railway/energy infrastructure in the harbour area. The main harbour road from the main entrance to the container terminal has been built. There are plans for commencement of work on the entrance complex, the realisation of which is planned by the end of 2013.

- container / multipurpose terminal, the first stage of which was completed in 2010. The 280 m long and 27 m wide quayside with a Ro-Ro ramp and a warehouse of 60 000 TEU was constructed. The concession agreement which was signed on 18th January 2010 by the concession provider – Port Authority and the concessionaire – "The Port of Ploče" d. d. defined the liabilities of the container terminal extension and development, so that in its final stage, the terminal would stretch over 23 ha with and a capacity of approximately 500 000 TEU per year.
- Terminal for bulk cargo will be built at the south-east part of the port on the right side of the Vlaška channel. The construction of the terminal started in 2012 and it will last for about 26 months. The entire terminal will be built in two stages and will have the capacity of 6.5 million tons per year. The first stage of the terminal will be built with the reduced cargo handling gear and the capacity of 4.6 million of tons per year. The quay will be 350m long with the berth accommodation for vessels of up to 180 000 DWT. It will be possible to use the terminal in direct and indirect turn-round, with the possibility of operating on two vessels simultaneously. This will ensure significant competitiveness for the Port of Ploče in this segment of transport.
- The annual turnover in the port of Ploče is 3 600 000 tons of cargo and 110 000 passengers.

3.6. Port of Dubrovnik

Dubrovnik is a prestigious Mediterranean destination for the reception of transit passengers on cruise journeys.

The shore infrastructure in the Port of Dubrovnik within the bay of Gruž is completely constructed. The project realisation resulted in the new 900 m long quayside and the new area of 15 400 m² (the possibility to accommodate up to 3 cruise ships, and turn-round of 10 000 passengers at the same time). The value of the project amounts to 26.2 million €.

The realisation of the Project for construction of the port infrastructure started in January 2011 on the location of berth 17 (Batahovine). The project is financed by the funds from the EBRD loan (the amendment to the original agreement with the EBRD). The new quayside is intended for the passenger liners and ferry transportation. The value of the project is estimated at 8 million €. The annual turnover of the Port of Dubrovnik is 20 000 tons of cargo and 1 300 000 passengers. The completion of the infrastructural projects ensured the basis for the investments in port superstructure as it was planned in the overall project for the development of the modern port in Dubrovnik.

4. CONDITION ASSESSMENT AND PROPOSAL OF MEASURES FOR DEVELOPMENT OF RO-RO TERMINALS IN CROATIA AND REALISATION OF MOS PROJECT

When making plans for the area required for a RO-RO terminal, it must be taken into consideration that the plan for a modern RO-RO terminal requires greater area than a container terminal, in case of the same amount of the cargo, due to the fact that the cargo cannot be stacked. The main prerequisite for the successful operation of a RO-RO system is the speed of turn-round operations, and for this reason it is necessary for the terminal area to accept the complete cargo from the ship in few hours time. At the same time, it is necessary to have an area which will accept the cargo, and to have another area for the cargo ready to be loaded immediately after the previous unloading.

In case that the added areas of a RO-RO terminal are located beyond the close area of the port (e.g. warehouse area), it is necessary to have an operating area large enough to avoid congestions and delivery delays. The UNCTAD recommends one RO-RO berth to have at least 10 ha of parking area.

When making plans for the area required for a RO-RO terminal, ramps are one of the most important superstructure objects and for that reason a lot of attention is paid to their construction. Implementation of mobile bridge ramp can increase the berth capacity very quickly without the expensive investments in berth enlargement. The advantage of mobile bridge ramps is that, in case of the traffic reduction, the ramp can easily be moved to another part of the port with greater traffic.

Apart from the ramp construction, it is also important to make close plans of other factors important for the successful operation of the terminals:

- size of parking and warehouse area,
- selection of means of transportation and cargo handling gear,
- good connection between the terminal and road network, and
- construction features of dock.

The length of a dock depends on the length of the vessels which will berth at the terminal. Since the greatest number of RO-RO vessels which berth at terminal are provided with the stern axial ramp, the length of the dock is not of crucial importance. The length of the dock is important in case that the terminal accommodates container/RO-RO ships (of CONT type or HYBR RO-RO vessels). The length of the dock, in that case, should be about 260 m.

The existing transportation system of the Republic of Croatia is not adapted for the employment of intermodal transport. The difficulties are multiple, and are evident through administrative, organisational and technical and technological obstacles and infrastructural and personnel inadequacy. The results are evident through the expensive and inefficient transportation, high expenses. All of this adds to a burden of our economy and makes the Republic of Croatia uninteresting for significant investments.

Organisational problems are numerous and have, along with the poor transport connections, big responsibility for the inefficient transportation system. The most important organisational problems are: poor organisation of the operators – freight forwarders and hauliers, their fragmentation and surplus, maladjusted organisation of custom and inspection services (services of surveillance and control), insufficient number of information centres for cargo monitoring and neglected role of professional organisation of transport in places where a transport unit is formed or used (wholesale and sale distribution and production).

Technical and technological problems are represented by incomplete and maladjusted systems of transportation, turn-round and cargo handling in the intermodal transport. Transport systems for Ro-Ro, Ro-La and piggy back technologies are incomplete (there is lack of wagons, and road transport units for transportation of containers and swap bodies). Cargo transfer locations, terminals, cargo-transport centres, industrial terminals (places where transport units emerge) and marts are not equipped nor are they adjusted for the mentioned transport technologies. Insufficiency of the corresponding transport capacities significantly complicates further development of the intermodal transport.

Systems for transportation monitoring (the information systems) are neither installed nor mutually connected. This disables the creation and utilisation of data base and the access to information by users, service providers and other related services which take part in the process of transportation.

The state of transport infrastructure does not serve the development of intermodal transport. Problems and weaknesses are evident in plans for the construction and mutual connection of roads and terminals into unique transport system of intermodal transportation on frequent corridors, written in accordance with the postulates of European Union (White Paper).

The routes remained unconnected, both within each transport branch, as well as within the combination of more branches of transportation, e.g. roads – railways – sea and terminals. At the same time, they do not have equalised passing capacities. Terminal network was proposed, but not verified, and standards for construction and equipment not been defined.

In terms of construction guidelines, geodesic experts should be engaged, projects and other construction works professionally designed, answers and solutions provided for all construction problems regarding infrastructural objects on RO-RO terminals, including the issues of the construction of the access road infrastructure and parking place capacities.

In terms of transportation guidelines it is necessary to make a responsible and expert analysis of all the technical and technological prerequisites of construction and exploitation of RO-RO terminals, access roads, parking area, logistical operations such as forwarding, agency, custom and other services, maritime transport regulation, road transport regulation, road transport regulation of arrivals and departures in RO-RO terminals.

During exploitation of RO-RO terminals it is necessary to respect all prescribed and usual ecological standards in order to protect in an adequate manner flora and fauna, environment, people and all other participants in maritime and road transportation.

Since a large number of trucks, drivers and other employees will be circulating at RO-RO terminals each day, they should be provided with adequate accommodation and other catering services. The associated infrastructure would experience considerable progress, and a number of people would get employed.

5. CONCLUSION

Transport is one of the development generators of both global and regional economy. The development strategy of the Republic of Croatia requires quick and efficient integration into European transport network by developing transport system compatible with the European transport system in accordance with the requirements of economic growth. Such strategy for the transport system development is primarily oriented toward the application of new technologies and the construction of terminal network, which is especially important for making connections between the Croatian and European harbour system. Technical basis for designing RO-RO terminals, intended for modern transportation technologies, includes numerous measures that precede the terminal construction with the aim of determining and adjusting technical, technological and information possibilities of all parties in the transport chain.

Contemporary transport system in the Republic of Croatia is developed by single activities of certain ports and hauliers with separate strategies for individual development. Regarding its potential, such a system is insufficiently developed.

Due to its favourable location in terms of transport geography, the Republic of Croatia could have by far greater and more important role in transportation of goods. Apart from agriculture and tourism, providing transport services is for Croatia maybe one of the most significant sources of newly created values, and it requires the construction of intermodal infrastructural network with terminals of intermodal transport, i.e. elimination of bottlenecks on transport networks and terminals, and adjustments with the European transport network and integration in its system.

Beside making records of the present state in the Adriatic ports (Rijeka, Zadar, Split, Šibenik, Ploče, Dubrovnik and other), solutions should be provided for the problem of selecting ports which are to be improved and modernised for accepting certain types of cargo with regard to the natural privileges, location and transport connection with the hinterland. The standard for the equipment and the capacities of efficient operation, especially of the RO-RO and container transportation, should be accordingly anticipated.

The answer should be provided to the question why, with all the favourable natural conditions we have at our disposition, the Adriatic ports still have insignificant role in the amount of transported of goods, and what is to be done (in organisation, construction and equipment) in order for them to become a doorway to Europe. This relates especially to the Port of Rijeka which has a favourable geostrategic location and possibility to accept vessels of big deadweight tonnage. The modernisation of ports in Zadar, Šibenik and Split is also necessary to enable them for their role in the further development in the system of the Adriatic ports as the “Adriatic Doorway to Europe”.

It can be concluded that the construction and modernisation of the existing RO-RO terminals and the establishment of a good-quality intermodal route between the Adriatic sea and central Europe have reasonable grounds, however it is necessary to deal with the issues mentioned in this paper, such as: administrational, organisational and technical and technological problems and infrastructural and personnel inadequacy, maladjusted system of transportation, cargo handling in intermodal transport, problems for providing sufficient area for new RO-RO terminals and their good connection to other inland transportation branches without any bottlenecks.

REFERENCES

[1]A. Jugović, D. Žgaljić, T. Poletan Jugović: MODEL POTICAJA RAZVOJA INTERMODALNOG PRIJEVOZA JADRANSKE REGIJE U FUNKCIJI ODRŽIVOG RAZVOJA POMORSTVO • Scientific Journal of Maritime Research • 24/2(2010) • str./pp. 129-146

[2]Poletan Jugović, T., Prilog definiranju kvalitete transportno-logističke usluge na prometnom pravcu, Pomorstvo, 21 (2007), 2, str. 95-108.

[3]Poletan, T., A. Perić, A. Jugović, Quality of transport-logistic service as prerequisite for competitiveness on european transport market, Proceedings ISEP 2004., 7-8. oktober, Ljubljana, 2004., str. 35-39.

[4]Ratko ZELENIKA, Gordana NIKOLIĆ, Helga PAVLIĆ: Gospodarska opravdanost izgradnje i eksploatacije RO-RO terminala Bakar, Pomorski zbornik, Rijeka, 2003. Str.319-335.

[5]http://ec.europa.eu/transport/strategies/2001_white_paper_en.htm, 3.5.2010. [Accessed 7 Feb 2013]

[6]http://unfccc.int/resource/docs/convkp/kpeng.html, 4.5.2010. [Accessed 15 Feb 2013]

[7]http://www.hit.certh.gr/imonode/project.php, 7.5.2010. [Accessed 15 Feb 2013]

[8]http://www.google.hr/#hl=hr&gs_rn=2&gs_ri=hp&cp=42&gs_id=7&xhr=t&q=PRIJEDLOG+MJERA+ZA+RAZVOJ+RO-RO+TERMINALA [Accessed 25 Feb 2013]

[9]http://www.fpz.hr/zims/adriatic/index.php?page=index, 14.4.2010. [Accessed 10 Feb 2013]

[10]Quality Indicators for transport Systems - QUITS, European Commission Transport RTD Programme,

[11]http://www.cordis.lu/transport, 12.5.2010. [Accessed 7 Feb 2013]

[12]http://www.shortsea.hr/sites/kip.prospekt-solutions.com/files/upload/brosura_KIP_hr_za_web.pdf [Accessed 18 Feb 2013]

[13]http://www.ipcdj.hr/dokument/01_PROGRAM%20RAZVOJA%20INTERMODALNOG%20PRIJEVOZA.pdf [Accessed 21 Feb 2013]

[14]http://www.pfri.uniri.hr/~ajugovic/download/lucko_poslovanje/predavanja/Studija_Rasa_natjecaj_final.pdf [Accessed 10 Feb 2013]

[15]http://www.pfst.hr/old/data/materijali/LASH-Ro-RO-studenti.pdf [Accessed 19 Feb 2013]

[16]http://www.mppi.hr/UserDocsImages/II%20065-STRATESKI%20PLAN%20MPPI%20%202012-2014%203_12.pdf [Accessed 8 Feb 2013]

BIOGRAPHIES

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APPLICATION OF FUZZY LOGIC IN THE REGULATION OF THE AUTOMATIC HEELING SYSTEM FOR SHIPS

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ABSTRACT

Automatic anti-heeling pumps, commonly applied in merchant fleet, are used to maintain the vessel in upright position during the process of loading or discharging. Installing the on-board equipment fitted with automatic system for controlling the ship heel is a significant factor that contributes to the speed and safety of fast cargo operations. It is difficult to achieve the continuous control of heel during transhipment operations as the existing systems compensate the heel when the vessel is already listed. This paper discusses an automatic anti-heeling system based on fuzzy logic. The results have been obtained using the Matlab-Simulink software by defining the input and output variables and by structuring the knowledge base. Proposed simulation of the automatic heeling system for ships additionally increases the safety of vessels during loading or discharging operations in the port.

KEYWORDS
Automatic Heeling System, Fuzzy Logic, Simulation.

1. INTRODUCTION

The turn-round time of merchant ships is getting shorter. The development of port facilities and technologies has enabled a faster loading and discharging process. Ships need to respond to the rapid technological development of ports and terminals. Enhanced cargo handling systems have to be fitted and upgraded in order to keep ships competitive on the market. The increase in ship and port size has led to the improvements in cargo operation facilities in order to handle faster loading and unloading operations. On-board installation of the systems for rapid regulation of cargo loading and discharge presents an important factor contributing to the speed of shipping. One of these systems is the automatic heeling system which employs the automatic pump for the regulation of the ship's heeling. The existing system regulates the ship heel when the latter reaches certain degree. This paper proposes the application of fuzzy logic with the purpose of enhancing the system through the continuous regulation of the ship list with regard to the existing system.

2. SHIP HEELING CONTROL SYSTEM

The heeling control system has been designed for maintaining the vessel in upright position during the process of loading or discharging. The system rebalances the vessel when the heeling angle limit exceeds the set values (in the observed case, the set limits range from -1.8° to +1.8°). Problems arise during fast operations when the system should start the pump before the heeling angle exceeds the limit. For that reason, the paper proposes the rules that are defined by fuzzy logic, ensuring a continuous control of the ship heel. The upright position of the vessel, i.e. zero heeling value allows for faster loading or discharging.

2.1. Model presenting the ship heeling control system

The ship heeling control system consists of two units [4]:

- Starter Unit
- Control Unit.

The starter unit is placed directly in the system's line, actuating the pump and making it rotate in both directions. The system operates automatically and is started by the control unit or the terminal operator. The control unit is shown in Figure 1.

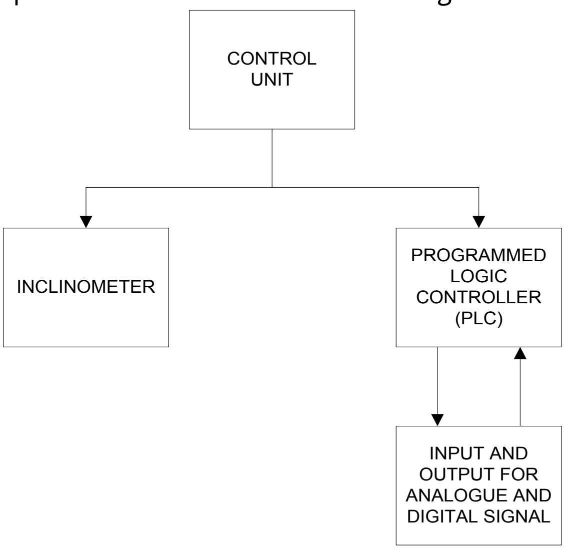

Figure 1. Model presenting the system's Control Unit

2.2. Elements of the heeling control system

The relevant elements involved in the control system of the ship's heeling are shown in Figure 2.

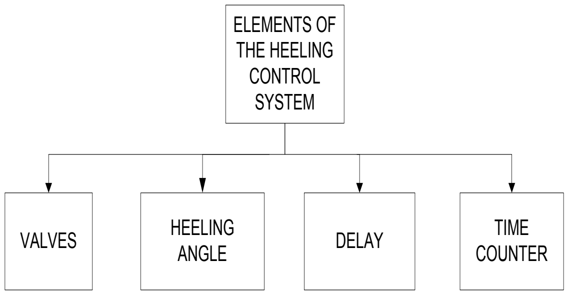

Figure 2. Elements of the ship heeling control

To achieve better results and to adapt the system to various installations, input parameters have been defined and adjusted [4]:

- Time alarm for opening and closing of valves (Ta);
- Critical heeling point (Ch);
- Inclinometer direction (Id);
- Calibration of heeling indication (Cin);
- Interval between valve opening and pump starting; and
- Date and time accurately set.

3. APPLICATION OF FUZZY LOGIC IN THE REGULATION OF SHIP HEELING

The fuzzy expert system is defined as a system which makes decisions on the basis of fuzzy logic. This definition results in the conclusion that the fuzzy expert system is a set of corresponding functions and conclusion rules.

The following input and output variables have been defined in the expert system for the ship heeling control:

- Input variable: X→crane position with regard to the ship heel (p);
- Input variable: Y→ship heel measured by the inclinometer (h); and
- Output variable: Z→valve opening regulator (z).

The input variable X (crane position p) is defined:

- P (crane discharging to port, from
- -15m to -5m),
- C (crane discharge amidships, from -5m to +5m),

- S (crane discharge to starboard, from +5m to +15m).

The input variable Y (ship heel h) is defined as follows:
- -1.8° to -0.9° large heel to port,
- -0.9° to -0.4° medium heel to port,
- -0.4° to 0.0° small heel to port,
- 0°,
- 0° to +0.4° small heel to starboard,
- +0.4° to +0.9° medium heel to starboard,
- +0.9° to +1.8° large heel to starboard.

The output variable Z (valve opening regulator r) is defined by seven linguistic terms:
- HN (large negative flow, from
- -100% to -60%),
- MN (medium negative flow, from
- -60% to -40%),
- SN (small negative flow, from -40% to -10%),
- N (neutral position, from -10% to +10%),
- SP (small positive flow, from +10% to +40%),
- MP (medium positive flow, from +40% to +60%),
- LP (large positive flow, from +60% to +100%).

The flow rate of water between anti-heeling tanks will depend on the valve opening percentage.

3.1. Rules regarding the selection of the regulator's position in heeling control

Rules that are related to the selection of the regulator's position are determined in order to transfer the linguistic knowledge of the process into the fuzzy controller. The decision-making rules are structured on the basis of the real-life example of discharging a container ship. The simulation of the system's enhanced operation has been achieved through the Matlab software support. The rule base is shown with the
aid of Boolean n-sets :

$$X:\{X\,|\,-15m \le X \le +15m\}\ [\mathrm{m}] \qquad (1)$$

$$Y:\{Y\,|\,-1.8° \le Y \le +1.8°\}\ [°] \qquad (2)$$

$$Z:\{Z\,|\,-100\% \le Z \le +100\%\}\ [\mathrm{m^3/hr}] \quad (3)$$

3.2. Defining fuzzy sets

Starting data for defining the fuzzy set include the ship's beam (30m), inclination angle (-1.8° to +1.8°) measured by the inclinometer and the position of the valve regulator that has been defined by the expert using the heeling control system. The defined inclination angle is the extreme low/high point at which the heeling regulation system should be activated. The starting data are shown as n-sets A, B and C:

A_1: crane to port (-15m to -5m),
A_2: crane amidships (-5m to +5m),
A_3: crane to starboard (+5m to +15m),
B_1: heel, large, to port (-1.8°to -0.9°),
B_2: heel, medium, to port (-0.9° to -0.4°),
B_3: heel, small, to port (-0.4° to 0°),
B_4: no heel (0°),
B_5: heel, small, to starboard (0° to +0.4°),
B_6: heel, medium, to starboard (+0.4°to +0.9°),
B_7: heel, large, to starboard (+0.9° to +1.8°)
C_1: regulator in position HN,
C_2: regulator in position MN,
C_3: regulator in position SN,
C_4: regulator in position N,
C_5: regulator in position SP,
C_6: regulator in position MP,
C_7: regulator in position HP.

3.3. Graphic display of the n-sets with the aid of Matlab program

The graphic display of the n-set for the crane position is shown with the aid of Matlab software in Figure 3.

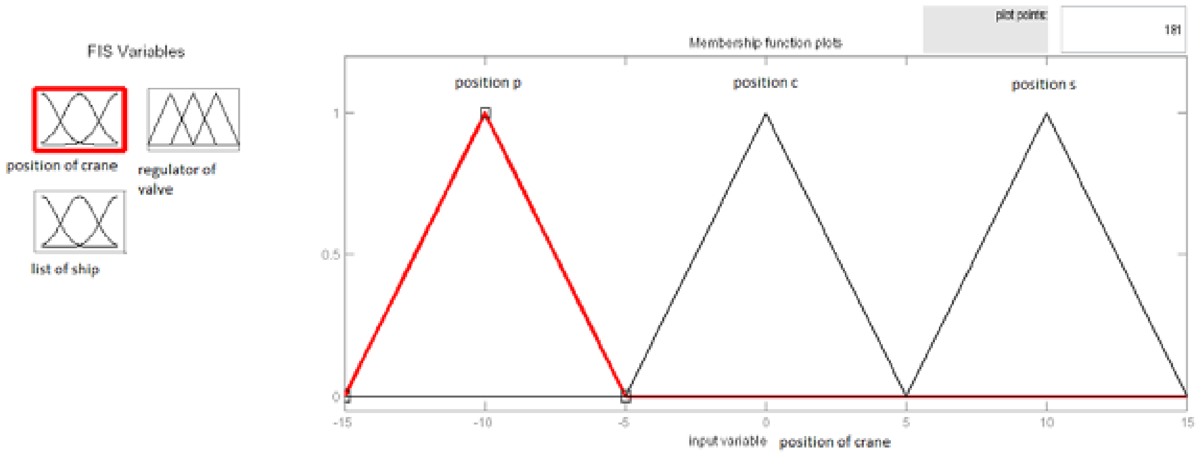

Figure3. Input elements for the crane position

By using Matlab program the n-set for the ship heel is graphical shown in Figure 4.

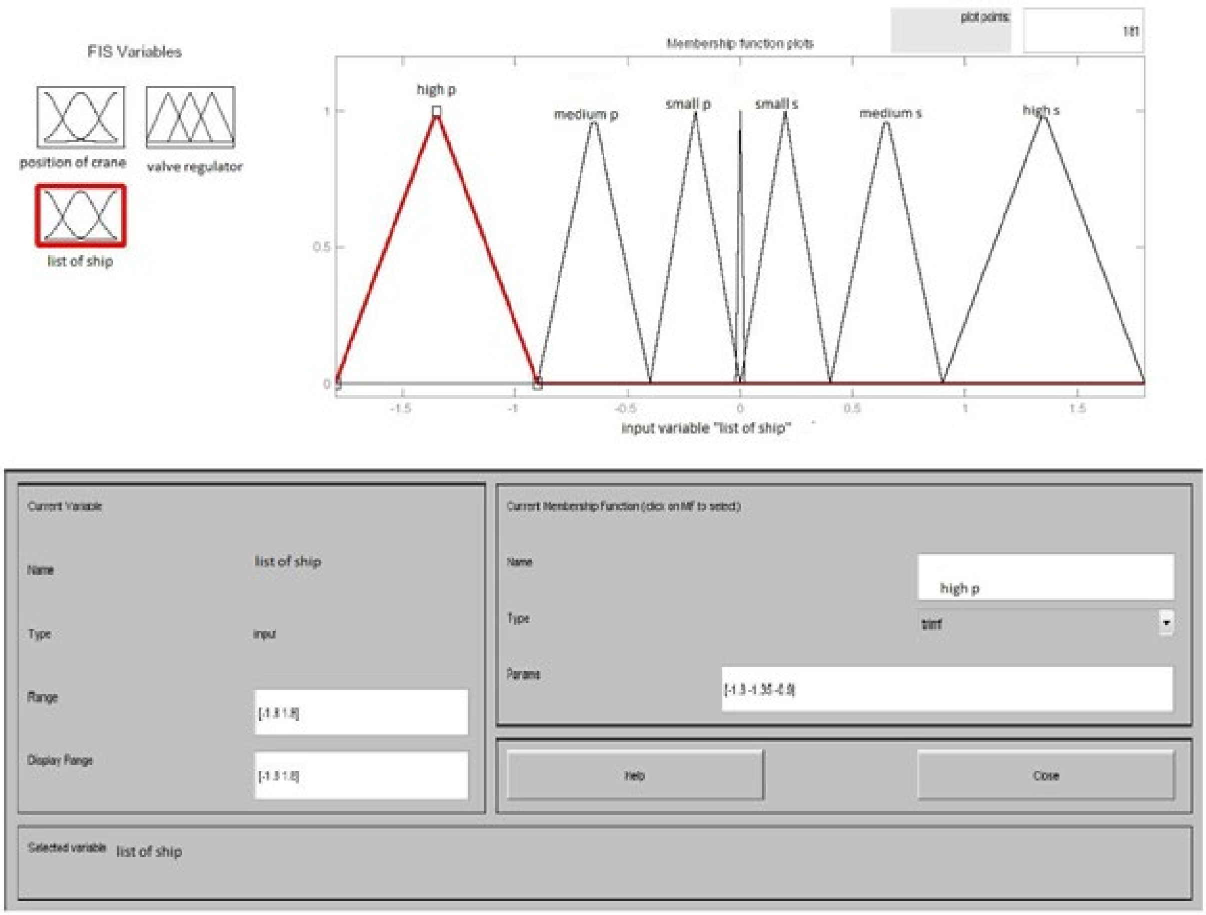

Figure 4. Input elements for the ship heel

The graphic display of the n-set for the position regulator is shown with the aid of program ž (figure5).

Figure 5. Output elements for the ship heel

3.4. Knowledge base

In expert systems, the knowledge bases relying on fuzzy rules, present a display of the operation environment within which certain problems are to be solved. For the case observed in this paper, the knowledge base involves 21 rules, as follows:

- If X is A3 and Y is B1 then Z is C7
- If X is A3 and Y is B2 then Z is C7
- If X is A3 and Y is B3 then Z is C6
- If X is A3 and Y is B4 then Z is C5
- If X is A3 and Y is B5 then Z is C4
- If X is A3 and Y is B2 then Z is C7
- If X is A3 and Y is B7 then Z is C2
- If X is A1 and Y is B7 then Z is C1
- If X is A1 and Y is B6 then Z is C1
- If X is A1 and Y is B5 then Z is C2
- If X is A1 and Y is B4 then Z is C3
- If X is A1 and Y is B3 then Z is C4
- If X is A1 and Y is B2 then Z is C5
- If X is A1 and Y is B2 then Z is C6
- If X is A2 and Y is B1 then Z is C6
- If X is A2 and Y is B2 then Z is C5
- If X is A2 and Y is B3 then Z is C4
- If X is A2 and Y is B4 then Z is C4
- If X is A2 and Y is B5 then Z is C4

- If X is A2 and Y is B6 then Z is C3
- If X is A2 and Y is B7 then Z is C2

The knowledge base as a set of rules is shown in Table 1.

Table 1. Display of the knowledge base rules

Y / X	B_1	B_2	B_3	B_4	B_5	B_6	B_7
A_1	C_6	C_5	C_4	C_3	C_2	C_1	C_1
A_2	C_6	C_5	C_4	C_4	C_4	C_3	C_2
A_3	C_7	C_7	C_6	C_5	C_4	C_3	C_2

3.5. Graphic display of the solutions

Defuzzification is the process opposite to fuzzification and is also known as the decoding process. The defuzzification process converts the result of aggregation, representing a section of surface, into the signal which can be recognised by the process. The output signal features a real value which is commonly represented by a real number. Due to a number of results obtained through Matlab, it is common to show only the results referring to the starting conditions and to the final values, i.e. the results defining the range within which the heeling control system operates. The obtained results are presented, in numeric and graphic ways, for the regulator's state representing the end result of the achieved program simulation. Various results can be achieved by moving the red lines using the cursor. The results that are produced match the ones that have been expected.

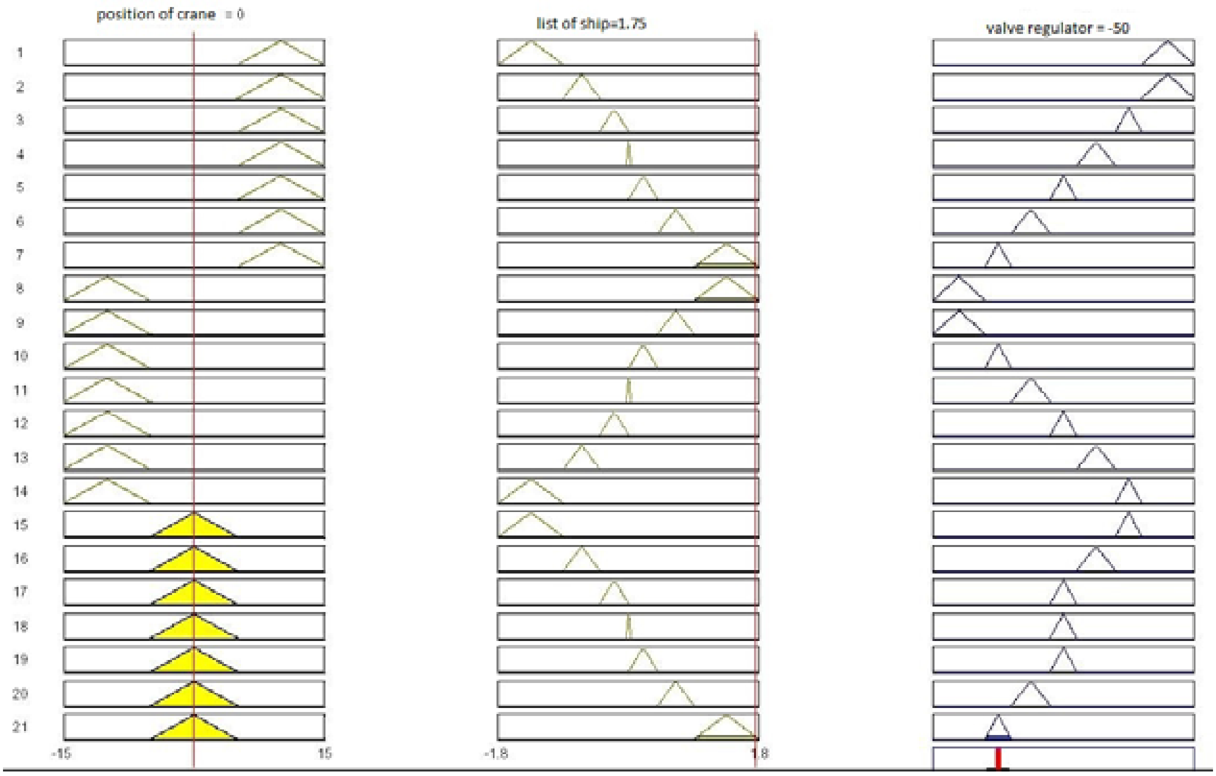

Figure 6. Regulator's position for the crane position 0 and ship heel +1.75° to starboard

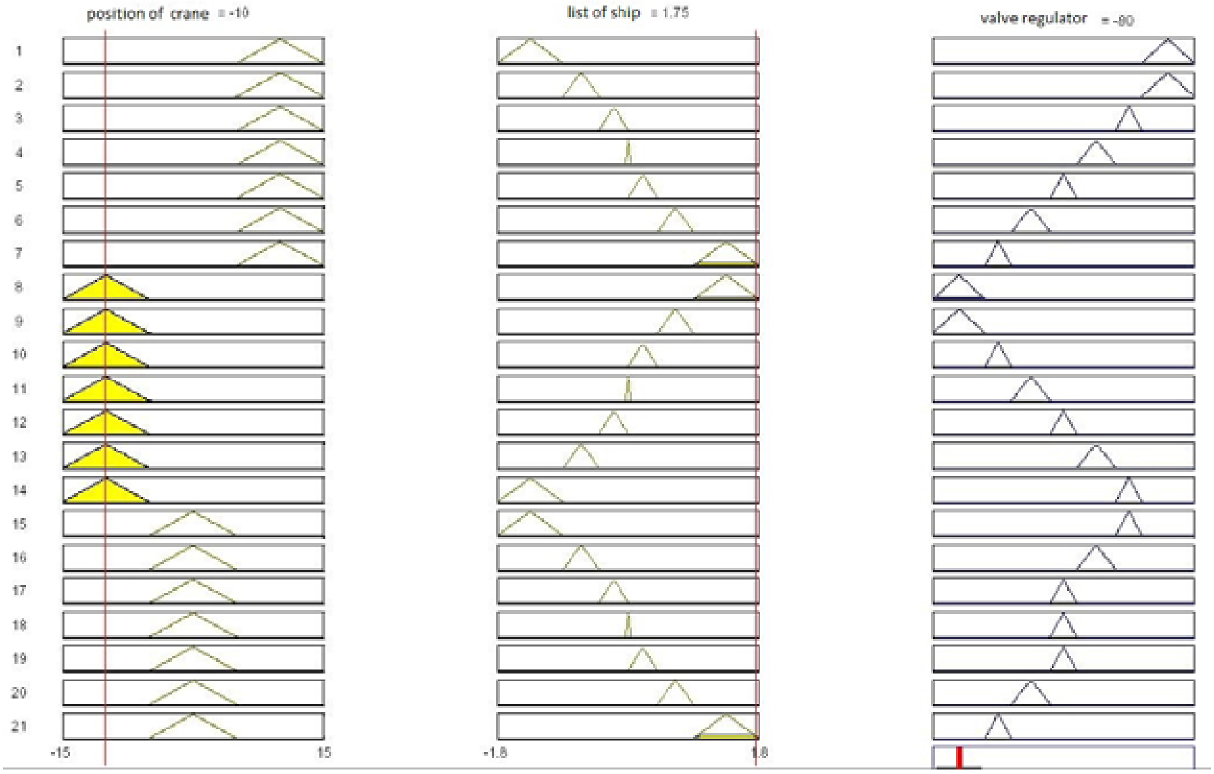

Figure 7. Regulator's position for the crane position -10m and ship heel +1.75° to starboard

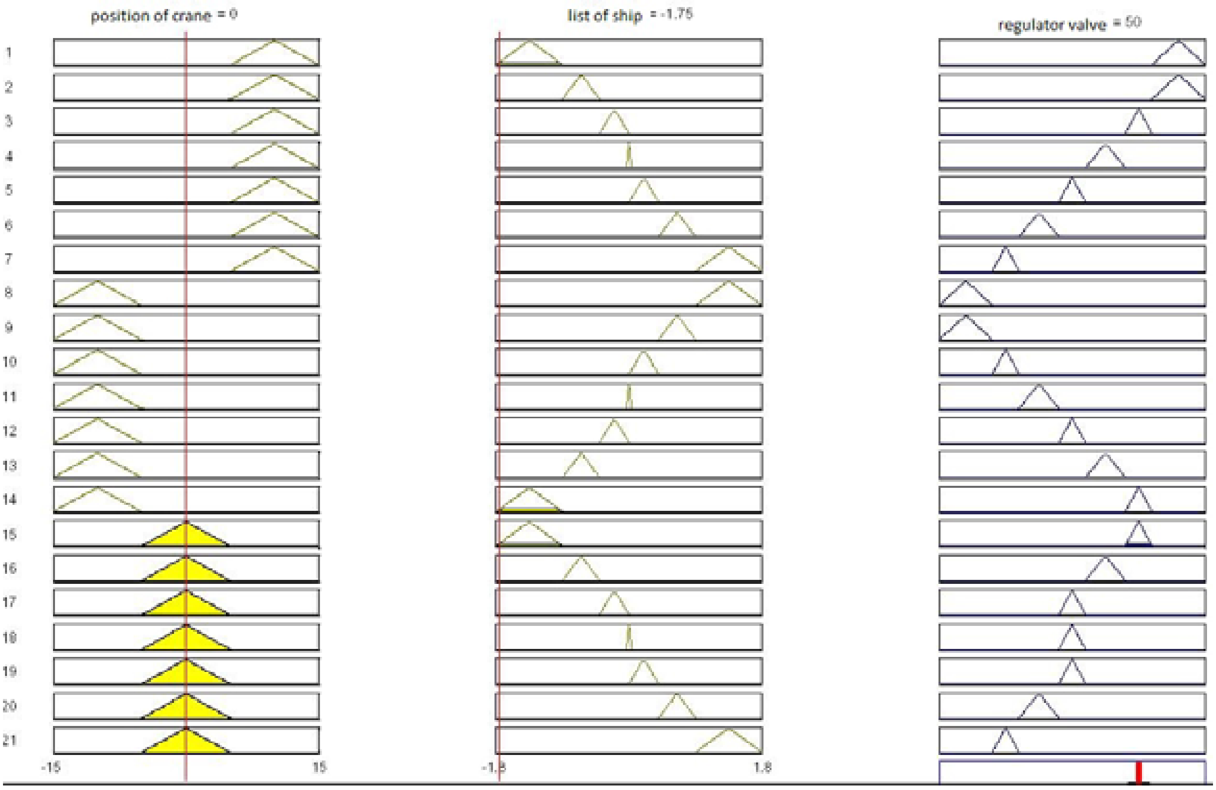

Figure 8. Regulator's position for the crane position 0m and ship heel -1.75° to port

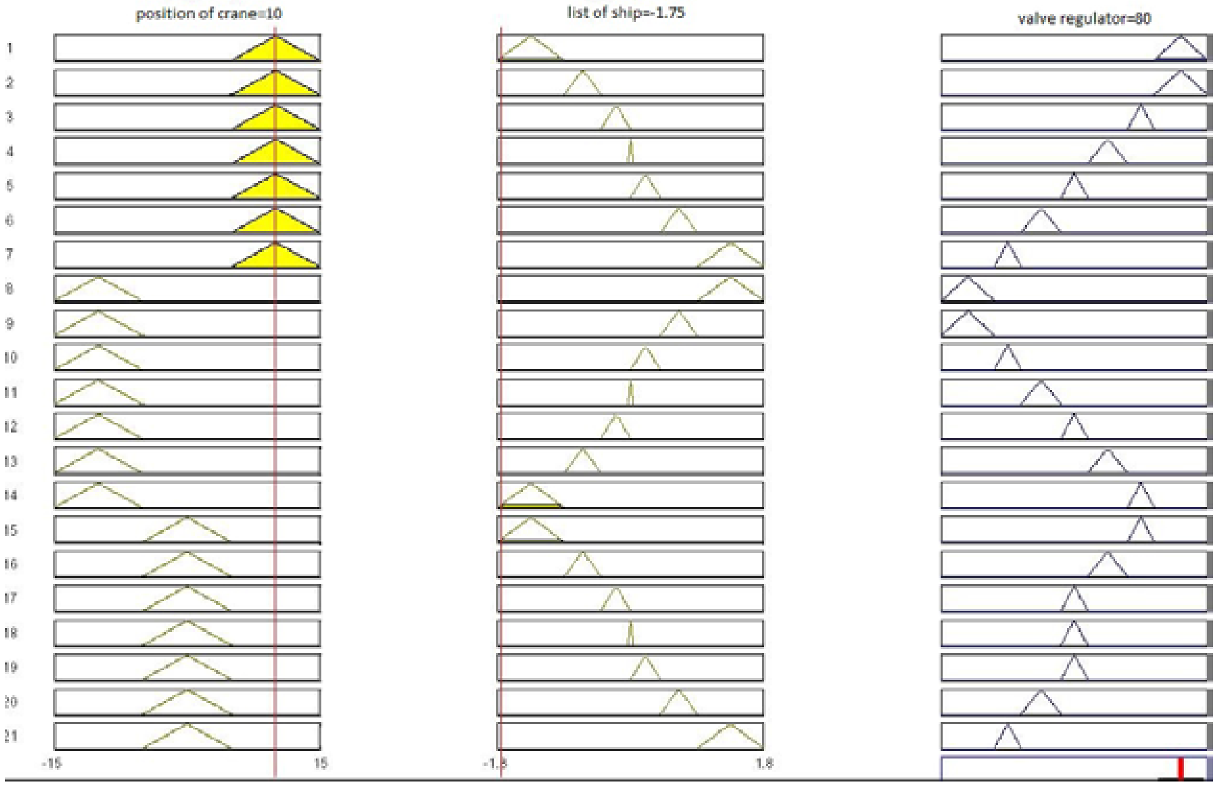

Figure 9. Regulator's position for the crane position +10m and ship list -1.75° to port

The presented simulation applies to the situation when cargo is being discharged. In case of cargo loading, the simulation would have the reverse sequence. Figure 6 shows the state of the input-output parameter of the heeling control system when the input parameter is the crane position amidships (within the interval from -5m to +5m) and the heeling angle +1.75° to starboard. The output parameter presents the state of the regulator when it is in position -50%. This means that the water flow is directed to the port side (the water flow between the connected anti-heeling tanks is medium negative) rebalancing the ship at the appropriate rate to port up to the reference zero. The presented simulation corresponds to the rules given for various ship heel values and crane positions (21 rules).

Figure 7 shows the state of the input-output parameter of the heeling control system when the input parameter of the crane position is at the extreme port position (distance of -15m to port from the ship's centre line) and the heeling angle is +1.75° to starboard. The output parameter presents the state of the regulator when it is in position -80%. This means that the water flows to port (the water flow between the connected anti-heeling tanks is large negative), balancing the ship at the appropriate rate to port up to the reference zero. The presented simulation corresponds to the rules given for various ship heel values and crane positions (21 rules).

Figure 8 shows the state of the input-output parameter of the heeling control system when the input parameter of the crane position is amidships (within the interval from -5m to +5m) and the heeling angle is -1.75° to port. The output parameter presents the state of the regulator when it is in position +50%. This means that the water flows to starboard (the water flow between the connected anti-heeling tanks is medium positive), balancing the ship at the appropriate rate to starboard up to the reference zero. The presented simulation corresponds to the rules given for various ship heel values and crane positions (21 rules).

Figure 9 shows the state of the input-output parameter of the heeling control system when the input parameter of the crane position is at the extreme starboard position (within the interval of +15m to starboard) and the heeling angle is -

1.75° to port. The output parameter presents the state of the regulator when it is in position +80%. This means that the water flows to starboard (the water flow between the connected anti-heeling tanks is large positive), balancing the ship at the appropriate rate to starboard from the reference zero. The presented simulation corresponds to the rules given for various ship heel values and crane positions (21 rules).

4. CONCLUSION

Recently, an increasing number of ships have been fitted with automated systems for the ship heeling control. In order to enable the automated anti-heeling systems to operate in various operation modes, it is necessary to introduce intelligent program modules. This paper proposes an expert system for controlling the ship heel continuously during transhipment. The existing systems regulate the ship heel only when the ship reaches certain heeling angle. Such systems are considered as insufficiently safe as it may occur that due to rapid cargo operations the system does not respond timely; hence it is not enough fast and reliable. It is exactly for that reason that the continuous monitoring of the heeling, as obtained by Matlab simulation, is suggested. The application and development of on-board expert systems for heeling regulation represents a sound long-term investment in the ship's automated system.

The introduction of the proposed expert system into the ship heeling control increases the level of safety. Consequently, the improved safety of cargo operations increases the safety of people, ship and cargo.

REFERENCES

1.Siler, W., Fuzzy Expert System and Fuzzy Reasoning, Wiley-Interscience, 2004.

2.Giarratano, J. C., Riley, G. D., Expert Systems, Principles and Programs, Thomson Learning, Inc., USA, 2004.

3.Cox, E. The Fuzzy Systems Handbook, AP Professional 1994.

4.Operation manual "Antiheeling Control System", Framo, 2000.

5.Framo, Antiheeling System, AG Mohn. [http://www.framo.com/default.aspx?pageid=37]

6.Bauk S., "Fazi pristup problemu višeekspertnog-višekriterijumskog odlučivanja" in: 29. SYM-OP-IS,Tara, pp. 45-49, 2002.

7.Bauk S., "Kompozicija fazi skupa i fazi relacije u izboru preferentnog pravca plovljenja", in: Vodni saobraćaj u 21. veku, Beograd, pp. 203-209, 2002.

8.Bezdek J., Dubois D., Prade H., Fuzzy Sets in Approximate Reasoning and Information Systems, Kluwer Academic Publisher, 1999.

9.Ćalasan L., Petkovska M., Matlab i dodatni moduli Control System Toolbox i SIMULINK, Mikro knjiga, Beograd, 1996.

10.Carlsson C., "Approximate Reasoning Through Fuzzy MCDM-Models", in: Operation Research 87, Amsterdam, pp. 817-828, 1988.

11.Chanas S., et al., "A Fuzzy Approach to the Transportation Problem", in: Fuzzy Sets and Systems, vol. 13, pp. 211-221, 1984.

12.Gupta M. M., Yamakawa T., Fuzzy Logic in Knowledge-Based Systems, Decision and Control, Amsterdam, New York, 1988.

BIOGRAPHIES

Rino Bošnjak was born on 16th October 1975 in Imotski, Croatia, where he completed his primary and high school education. He moved to Split in 1995 and graduated in Nautical studies at the University of Split – Faculty of Maritime Studies in 2000. From 2001-2011 he was sailing onboard ships of various types and sizes as chief officer. He has been holding the Master mariner license for ships over 3000 GT since 2007. He is an assistant in various courses, including Electronic navigation, Safety at sea, Navigational integrated system, Cargo handling, etc at Faculty of Maritime Studies in Split. Presently he attends doctoral studies at Faculty of Transport and Traffic Sciences in Zagreb.

Sanja Bauk, was born in Kotor, Montenegro, in 1972. She received the PhD degree in Traffic and Transportation Engineering at the University of Belgrade in 2005. Since 1998 she has been employed at the University of Montenegro. She is an assistant professor and vice-dean for education.

Currently she is also performing a post-doctorate research at the University of Graz. Her multiple fields of interest include operations research, information systems and technologies, e-learning, human dimension of technological development, etc.

Zvonko Kavran, graduated in electrical engineering and holds a PhD in traffic and transport technology. Current fields of interest include transport planning & simulation and ICT technologies in transport. He has published over 50 articles in scientific and professional issues and conferences and participated in EU projects NELI and ADRIATIC3S, national project INTERMODARH and bilateral project HR-CG "ICT and e-learning in intermodal transport".

LIABILITY FOR DAMAGE (PROFESSIONAL RESPONSIBILITY) OF THE CREW MEMBERS IN COMPLIANCE WITH CIVIL OBLIGATIONS ACT

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ABSTRACT

Compared with all other legal institutions liability for the damage of those who are engaged in any activity as professionals (and crew members certainly are), by a number of criteria, among the most important ones is precisely this institute (by the criterion of the value of the property in question, the number of court proceedings, the effect on the quality of work performance, conflicts of potentially relevant rights ....). At the same time, those that are directly related to – crew members, are very little informed on this issue. Therefore it is important to thoroughly investigate how and under what conditions these responsibilities of an individual may occur, including how and in what way liability could be excluded or at least reduced.

Keywords
liability for damage, professional liability, crew members, reduction or exclusion of liability

1. INTRODUCTION

There is a trend in at levels, national and international, to encourage professional responsibility of all those who are professionally engaged in any activity. Initially emerging in the US and most developed countries, the trend has spread globally. Until 1991, Croatia had difficulties in introducing the trend as the social system was not market-oriented and did not encourage ownership and entrepreneurship, but these difficulties disappeared when Croatia became a sovereign state. Maritime affairs[1], by their nature, easily cross state boundaries, and this fact has facilitated the introduction of trends and standards that have been in effect in the states having developed legal systems for a long time.

A vessel is a complex working environment, typically employing a number of persons with various personal and professional profiles. On board a cruiser there may be several thousand passengers and over thousand crew members. All of them need

[1] The shipper is a physical person or corporation that is, as the vessel's owner, the provider of the maritime adventure; unless proven otherwise, it is assumed that the shipper is the person who is entered into the register of shipping as the vessel's owner. *Carrier* may be the vessel's owner, the shipper or the person contracting an agreement with the charterer – Article 5, paragraph 1, al. 32 and 40 of the Maritime Code.

to carry out their task in a professional and coordinated manner. In case of emergency, it is essential to clearly define how a crew member acted and how he/she should have acted. In other words, it is necessary to determine whether a crew member failed to act according to duty's requirements and thereby made himself / herself or the employer liable for the damage. Generally speaking, Croatian seafarers experience blows from all sides. Firstly, the market is not stable and the market oscillations affect the steadiness of their jobs, salaries and other rights. On the other hand, the employers often tend to solve their business difficulties by burdening their personnel. Thirdly, perpetrators of a crime, pirates in particular, attack vessels and put the property, life and health of all the persons onboard, including crew members, at risk.

This paper deals with the seaman's liability for damage in Croatian legislation, taking into consideration all the events where the occurred damage can be settled by Croatian law, i.e. Civil Obligations Act. Although there have been accidents at seas, rivers and lakes since the dawn of man, the issue has become particularly brought into focus by the COSTA CONCORDIA cruiser accident, a large-scope disaster that took place on 13th January 2012, resulting in huge material damage, and 32 persons reported dead or missing. The accident was clearly caused by human negligence (with or without the contribution of the so-called objective factors). In such events it is essential, within the context, to define how the crew members should act in order to avoid liability for damage. Each individual case has its specific features, but general provisions are applicable to each vessel and each crew member. Even though a large portion of issues have been settled by Maritime Code, and other issues are governed by the application of the international treaties, this paper also refers to Civil Obligations Act, directly or indirectly, as certain legal sources may implicitly refer to Civil Obligations Act, given the fact the Act is an essential tool regarding the essential issues such as form of culpability, forethought etc., and particularly regarding the standards of the so-called professional responsibility.

This paper's basic hypothesis is that, in Croatian law, the area of indemnification liability of the crew members depends exclusively on general provisions on liability (except for the master of the vessel) which do not specifically refer to crew members and maritime affairs in general, which consequently implies that the specific features regarding the crew members and maritime affairs have not been recognised. Until these provisions are amended, their flaws can be rectified only by judicial practice. As regards the services provided by the crew members, which may result in indemnification liability, they represent a legal area which has been rapidly expanding. Not so long ago, these services used to be largely considered as non-independent and non-essential economic categories on the national and international markets, irrespective of the goods involved. Such views were dominant in the times of Adam Smith who considered services as economic processes which produced services incorporated in the product (1776) and John Stuart Mill who believed that the implementation of services was conditioned by and dependent on things, i.e. goods (1848). In 1930s Colin Clark started a systematic research but concluded that services were "secondary goods", used only once the primary needs (for goods) were satisfied.[2]

2. LEGAL SOURCES

The essential legal source with regard to any legal issue, including this paper's matter, is the Constitution of the Republic of Croatia[3]. As this paper's issue involves the liability and professional responsibility of crew members, the legal sources

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[2] See in: Deša Mlikotin Tomić, Dominik Vuletić, *Prvi model Zakona ugovora o uslugama u Načelima europskog ugovornog prava* (First model of the Law on service contracts in Principles of European Contract Law), in: Pravo i porezi, No. 12/10, p. 78.

[3] Ustav Republike Hrvatske (The Constitution of the Republic of Croatia), Narodne novine (Official Gazette of the Republic of Croatia – hereinafter Official Gazette) No. 56/90, 135/97, 8/98 - consolidated text, 113/00, 124/00 – consolidated text, 28/01, 41/01 - consolidated text, 55/01, 76/10 – Revision of the Constitution - hereinafter: The Constitution.

also include the Maritime Code4 and the Civil Obligations Act5, as well as any other legal code at law or sub-law level governing this issue.6 Given the possibility of international legal actions, the legal sources include the Act concerning the resolution of conflicts of laws with the provisions of other countries in certain matters7.

According to the Constitution8, international treaties are, with regard to legal power, above law.9

Judicial practice and administrative practice, together with legal science, represent legal sources sui generis.

The Republic of Croatia has not yet become a member of the European Union; however, the EU guidelines and various acts representing the European community acquis or acquis communautaire have been adopted and make an important part of the Croatian legal practice. In this regard, the role of The Constitutional Court of the Republic of Croatia is of paramount importance as it adopts and implements various standards from the acquis communautaire, including the standards and views of the European Court of Human Rights.

As we focus on the liability and indemnification matter, hence on the contractual law to a large extent, specific legal sources sui generis include the so-called Lando Principles10 or the PECL initiative (Principles of European Contract Law), aimed at designing a law model for service contracts under the title PEL SC (Principles of European Law; Service Contracts). These sources are specific because the Republic of Croatia is still not a member state and also owing to the fact that, for the EU member states, this is a source which is certainly not a legal source in its classical sense.

3. ANALYSIS

3.1. GENERAL ASSUMPTIONS

The matter regarding vessels and crew members is very complex as the vessel and its crew at sea is rightfully regarded as its own little world. On the other hand, seamen's life is hard – they perform exceptionally difficult tasks that are seemingly well paid. However, their salaries (which may be higher in gross figures than salaries for their jobs) are considerably lower if all working conditions are taken into account.11 In spite of these facts, any

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4 Pomorski zakonik (Maritime Code), Official Gazette 181/04, 76/07, 146/08, 61/11.

5 Zakon o obveznim odnosima (Civil Obligations Act), Official Gazette 35/905, 41/08.

6 Although Maritime Code is a comprehensive act, which may serve as an example according to the criteria of quantity, a large portion of the issues are settled by sub-law regulations whose procedures of designing and coming into effect inherently lack transparency, so that the latter is insufficient to guarantee the quality of the text and legal safety.

7 Zakon o sukobu zakona s propisima drugih zemalja (Act concerning the resolution of conflicts of laws with the provisions of other countries in certain matters), NN 53/91 (Official Gazette, No. 53/91).

8 Article 140 of the Constitution states: International Treaties which are made and confirmed in accordance with the Constitution and which are published and in force, make part of the internal rule of law of the Republic of Croatia and are, with regard to legal power, above law. Their provisions can be altered or cancelled only in line with requirements and procedures stipulated in these Treaties or in compliance with general rules of the international law.

9 The importance of international treaties is not limited only to the cases where these treaties are applied. Namely, both the text and the practice performed on the basis of a certain text, affect the practice in general, as the issues are not only similar or the same, but they are related to maritime affairs, i.e. the matter which is entirely globalised. Here we should point out the importance of the Convention on Limitation of Liability for Maritime Claims and its 1996 Protocol. According to these sources, there is a limitation of liability under certain conditions (this primarily refers to personal liability) and this right is granted to the crew members even though they are considered liable. Otherwise this right is not effective in the event of that a personal liability exists.

10 See more in: Selma Sakić, *Landovi principi kao oblik harmonizacije komunitarnog prava*, master thesis, Sarajevo, March 2009, (unpublished); Deša Mikotin Tomić, Dominik Vuletić, op. cit.

11 The specific working conditions of seafarers include separation from their families, daily

activity aiming to improve the status of seafarers is, as a rule, followed by lack of understanding both in public and authorities who consider such activities as requests for privileges for the ones whose quality of life is significantly better even without further privileges, if compared with other people.

According to the scope of the legal tools applicable to the matter, this paper deals with a narrow but exceptional aspect of seafaring which refers to the indemnification liability of the crew members – seafarers, in compliance with Civil Obligations Act12. If their activities do not result in damage (which is the conditio sine qua non), there is no liability. However, if there is damage of any kind, the issue is governed by the laws and regulations this text is dealing with.

As it was stated, Civil Obligations Act represents the essential legal source (sedes materiae) defining the liability of professionals and on-professionals under Croatian law. Typically, lawful regulations are general to the extent that they often allow various interpretations13. It is therefore necessary to amend these regulations both with interpretation procedure and the real-life content. In this particulate matter, the regulations should refer specifically to each crew member, i.e. to the entire crew from the cleaner to the master. Civil Obligations Act is a regulation that may be derogated only in two cases. The first case is the existence of another legal source of higher legal power, regulating the concrete issue. As it is only theoretically conceivable that the Constitution (as the highest legal act) might settle the issue of liability, this leaves us with the second possibility – an international treaty which, with regard to legal power, is above law, according to the Constitution and its Article 141.14 The second case implies a special regulation that would settle the issue in a different way with regard to Civil Obligations Act (e.g. the provisions of the Maritime Code regarding the master and other crew members in certain situations15). In case that an international element is part of the issue, there is also the third possibility – that another state's law prevails over Croatian law, in compliance with the Act Concerning the Resolution of Conflicts of Laws with the Provisions of Other Countries in Certain Matters. Of course, there is always the possibility of making a contractual agreement based on another country's law, which would represent the fourth case where the Civil Obligations Act would be derogated.

It should be noted that the Civil Obligations Act was acquired from the former Yugoslav legislation;16 it came into force in 1978 and was generally regarded as a high-quality act by experts. It was logical to expect a good act arising from good foundations and, indeed, after almost eight years of its implementation it can be confirmed so. Within the act, special attention is paid to the issues regarding indemnification liability. This part,

threats to their health and life, inability to serve onboard over the entire work life, which implies looking for shore-based job by the end of their professional career which particularly affects low-ranked and less paid seafarers who form the majority of the seafaring population.

[12] Which, of course, is applicable only in cases where Civil Obligations Act is applied.

[13] This does not mean that we contradict the provider of the lawful code. In principle the procedure is acceptable, but such a procedure is often abused in practice (but, in this case, this is the responsibility of the interpreter, not the provider).

[14] Article 140 of the Constitution states: International Treaties which are made and confirmed in accordance with the Constitution and which are published and in force, make part of the internal rule of law of the Republic of Croatia and are, with regard to legal power, above law. Their provisions can be altered or cancelled only in line with requirements and procedures stipulated in these Treaties or in compliance with general rules of the international law.

[15] According to Article 550 of the Maritime Code, the carrier is liable for the actions and defaults of the vessel's master, other crew members and other persons working for the carrier, within the performance of their duties, as if these were the carrier's own actions and defaults. The same article their liability is annulled with regard to damaged, missing or lost cargo, or with regard to failing to deliver cargo on time.

[16] Civil Obligations Act, *Službeni list* (Official Gazette of the Socialist Federal Republic of Yugoslavia) 29/78, 39/85, 46/85 and 57/89, *Narodne novine* (Official Gazette of the Republic of Croatia) 53/91, 73/91, 111/93, 3/94, 7/96, 91/96, 112/99 and 88/01.

especially the articles dealing with non-material damage, has experienced most amendments with regard to the original act.

The Civil Obligations Act[17] clearly and precisely defines the term damage[18] so that the legal definition includes not only the damage occurring during and following the harmful event (actual damage), but it also includes all damage that is yet to occur in the future due to the harmful event (slipped profit). Thereby the indemnification liability shall depend on the cumulative presence of the following elements:

1. damage (actual damage, slipped profit, non-material damage or infringement of personal rights), 2. harmful action (may be active, passive, or failure to act), 3. cause-effect nexus or relationship, 4. guilt[19] (intention or negligence), 5. unlawfulness[20].

Likewise, the Civil Obligations Act clearly and precisely defines the so-called professional responsibility[21], by using legal standards "...increased awareness, in line with the rules of the trade and customs (a good professional's awareness)..." which ensure the long-term legal solution (which is good as it increases legal safety) but, on the other hand, these standards require the expertise of the interpreter when interpreting the legal standards. In case that the interpreter lacks expertise or fails to act according to his/her best knowledge and abilities, the interpretation may result in jeopardising legal safety.

The awareness of a good professional is a standard that is, to a greater or lesser extent, included in all developed legal systems. The essential difference in legal solutions is whether they refer to an average or an above-average professional. Croatian law includes the standard of a good professional which is interpreted by Croatian judicial practice as an awareness of an average professional. This standard is, by all means, above any awareness that may be required from a non-professional. In other words, those who can not meet the standard should change their profession or else live in permanent fear whether or not the damage may occur, as the presence or absence of damage remains the only parameter for defining whether such persons shall be found liable or not. On the other hand, the average and above-average professionals can keep on working (naturally, in a professional and attentive way), without fear regarding whether or not their awareness is sufficient. This applies to the members of the crew. Actually, they largely benefit from the Civil Obligations Act provision according to which the employer is held responsible for their defaults, with potential reimbursement in case of the damaged that occurred intentionally or through great carelessness.

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[17] More about damage in all its aspects: Hrvoje Kačer, Ante Perkušić, in: Zlatko Ćesić, Vilim Gorenc, Hrvoje Kačer, Hrvoje Momčinović, Drago Pavić, Ante Perkušić, Andrea Pešutić, Zvonimir Slakoper, Ante Vidović, Branko Vukmir, *Komentar Zakona o obveznim odnosima* (*Comments on Civil Obligations Act*), RRIF plus d.o.o., Zagreb, 2005, (group of authors divided according to the Act's articles), pp. 1604-1739; Aldo Radolović u: Hrvoje Kačer, Aldo Radolović, Zvonimir Slakoper, *Zakon o obveznim odnosima s komentarom* (*Civil Obligations Act with Comments*), Poslovni zbornik, Zagreb, February 2006, pp. 914-963; Petar Klarić, Martin Vedriš, *Građansko pravo* (*Civil right*), Narodne novine (Official Gazette), Zagreb, 2006, pp. 583- 643.

[18] Civil Obligations Act, Article 1046: *Damage* is the reduction of someone's property (common damage), the prevention of its increase (slipped profit), and the infringement of personal rights (non-material damage).

[19] Only exceptionally, in case of the objective liability (liability without guilt or responsibility according to the criterion of *causae*), the guilt is not the requirement for liability, but this is an exception which enters into effect only in case of dangerous substances and dangerous activities, or when this is specifically requested by the law.

[20] On very rare occasions, exceptionally, the unlawfulness is not the requirement for indemnification liability.

[21] Civil Obligations Act, Article 10: A participant in the mandatory relationship is obliged to fulfil his/her professional duties with increased awareness, according to the rules of the trade and customs (a good professional's awareness).

3.2. PRECISE RESPONSIBILITIES OF THE CREW MEMBERS

The vessel's crew consists of the master and other persons engaged in onboard tasks and entered in the list of crew[22].

For the optimisation purposes, the crew can be divided into two categories: the officers (mates and engineers) and other personnel. The latter category includes a number of various positions, from cleaners to surgeons. All of them perform their tasks professionally and are subject to the application of regulations on professional responsibility. Naturally, each person and each position have their specific features and differences worth to be pointed out. It should also be noted that each individual is obliged to improve his/her knowledge and skills on a daily basis, in line with the Life Long Learning (LLL) principle. In addition to formal learning, the LLL principle implies the use of media (where information is available easily, instantly, to everyone) and the observation of the events occurring worldwide, so that seafarers could learn from other persons' defaults and failures and, in doing so, to improve their own work skills and reduce their own errors. One of the textbook examples is the globally known disaster of the Costa Concordia cruiser. The well-known and widespread custom enabled the master to take the vessel close to the shoreline when passing by his place of birth and to use sound and light signals, in spite of the dangers associated with deviation from the safe course. After the Costa Concordia disaster, the custom was bound to change and it can be ascertained that "it will never be the same".

Officers are highly-educated individuals who ex lege have, i.e. should have all necessary qualifications for performing their tasks (both certificates and experience). The very existence of these qualifications increases the standard of awareness they have to render at all times and at all places where their tasks are carried out. The Civil Obligations Act sets "a good professional's awareness" standard which is not defined at legal level and, in judicial practice, is interpreted as the awareness of an average professional having adequate qualifications. This is, by all means, the above-average awareness if compared with an obligatory awareness of a non-professional[23]. However, there is an absolute need for exploring the situation where an above-average individual acts far below his/her abilities as if he/she was an average professional. In case of damage, it should be examined whether that professional engaged his/her necessary awareness and attention or not. It is assumed that the logic of the entire law system, including the system of responsibility, requires the liability of that professional, at least in principle, taking into consideration the principle of neminem laedere – the general principle on prohibition of causing damage[24], as the above mentioned professional undoubtedly violated the general principles of the obligations law. It is possible that someone might find it unfair, as the same performance at the same place does not imply the identical result with regard to responsibility or irresponsibility. However, we assume that this is rather a superficial, simplified and wrong view. Although there may be arguments for and against the described solution, it remains essential to provide the users with the high-quality services. If we accept this as the essential ratio, then everyone has to do their best at all times and, if they fail to do so, they are held responsible for the potential damage. They, of course, may use all the available arguments to limit their liability. This, however, does not means that an above-average professional is free to act below his/her best abilities (in a conscious and justified way) and be out of liability. For instance, a master who successfully sailed the seas around the world and received numerous awards at all levels for having successfully completed his tasks, can not be exempt from liability for stranding in a port, arguing that

[22] Article 125, par. 1 of the Maritime Code.

[23] There are various solutions in the comparative law – see more in: Hrvoje Kačer, *Obvezna osiguranja profesionalne odgovornosti u hrvatskom pravu*, in: *Ugovor o osiguranju prema novom ZOO*, Inženjerski biro, Zagreb, October 2005, p. 92-131, and the local and foreign sources listed there. "If such a person acts without increased awareness, i.e. without a good professional's awareness, this is common negligence. If the person does not act as any average professional would act, this an act of serious negligence" – Petar Klarić, Martin Vedriš, op. cit., p. 599.

[24] Petar Klarić, Martin Vedriš, op. cit., p. 607.

this was his first approach to that port. He should have been informed better, he might have required the presence of someone who was familiar with the conditions or who had entered the port before... The conclusion is even clearer and more convincing if the master happens to be a doctor or a person having a medical high-school leaving certificate. In a medical emergency, that person will always be more responsible than the master who holds only the mandatory advanced medical care certificate. In addition, it is not possible to accept the argument[25] that certain training was conducted formally and superficially, as an excuse of a crew member for not having acquired necessary knowledge and skills. The strongest argument, again, is the interest of the third party, i.e. the interest of all users of the services that are rendered by the crew members headed by the master.

Among non-officers, there are crew members who are not officers now, but are going to be in the near future (cadets and assistants in the broadest sense of the word) and crew members who will never become officers. The latter group include crew members whose professions are not "maritime" in the strict sense of the word (cooks, surgeons...) as well as standard crew members (deckhands, oilers, etc.). In principle, each case is specific, but one must have in mind that signing in implies "accepting the ship rules". This means that someone's lack of factual or formal competence is not regarded the same on the first voyage and on the tenth voyage, as it is not regarded as the same feature on the first day of navigation and a hundred days later. To put it simply, every crew member has to make progress every day and in any possible way. In that case, he or she has nothing to fear of regarding his/her responsibility or liability. Once again, it should be pointed out that it is important to remain updated and informed about actual events. Ignorance can not be justified. The whole world talks about criminal activities regarding the horse-meat which was sold as beef in the EU[26] – maybe someone really did not know anything, but he should have known – which, as to legal consequences, is the same. The same goes for the news about the poor reliability of a certain device produced by a certain manufacturer or about a sports event which has not been officially announced although the media are reporting about it, and the like.

At the end, a provision contained in the Article 1107 of the Civil Obligations Act is worth noting.[27] It assumes the joint liability of two or more persons, which may be exceptionally important as to the responsibility of the crew members. It often happens that a number of persons have been involved in the event resulting in damage and it is not possible to ascertain who among them has caused the damage or who has contributed to the damage most.[28] Here it is necessary to emphasise the existence of legal codes which are, by themselves, absolutely clear but inapplicable under certain circumstances (which are not rare). A good example is Article 149 of the Maritime Code, stating that it may occur that a master has to steer the vessel personally, practically over an unlimited period during a voyage, as if there was no one to replace him, even if such persons had the same competencies[29].

[25] Although, unfortunately, the argument is not always untrue from the factual point of view.

[26] It is clear that the motive was the great difference in market prices.

[27] (1) For the damaged caused by a number of persons, all the participants are jointly liable. (2) The abettor and the assistant, as well as the one who obstructed the identification of the responsible persons, are jointly liable together with such persons. (3) The persons who caused the damage, by acting independently one from another, are jointly and equally liable for the damage if their individual shares in the damage can not be ascertained. (4) If it has been undoubtedly ascertained that the damage was caused by one of the persons who are mutually related, and if it not possible to ascertain who among them caused the damage, all these persons are found jointly liable.

[28] Partly because it is often impossible to establish all relevant facts during navigation, and because the specialists for establishing the facts – inspectors, police, insurers – arrive on board after a time delay, which makes their work difficult.

[29] (1) The master of the vessel, or the officer of the watch who is in charge of controlling the vessel, is obliged to take all measures that are necessary for the safety of the vessel and navigation. (2) The master of the vessel is obliged to control the vessel personally whenever the vessel's safety

4. CONCLUSION

Despite the fact that provisions contained in Article 1061 of the Civil Obligations Act30, applicable to crew members or any employees, regardless of the place and type of work, is absolutely in favorem for the employee, this does not necessarily mean that the employees are allowed to neglect the aspect of their responsibility. The employer may or may not apply the right for compensation (which is limited to the cases of deliberate acting and serious negligence), but it is much more than that: if there is any form of fault (even the minor one, which does not invoke the request for compensation), the situation is likely to affect the trust of both the existing and the future employers. As far as the property is concerned, the issue can be prevented or mitigated by an insurer; nevertheless the situation is not identical to the situation where no damage has ever occurred. The same goes for the limitation regarding the extent of the damage. This means that each crew member, from the top (the master) to the bottom (the lowest-ranked staff) has to continuously upgrade his or her education, skills and the level of performance. Although this applies to all professions and all jobs, onboard service is much more sensitive in this regard as the risk and the potential damage are, as a rule, greater and harder to settle, compared with other professions (e.g. oil tanker accidents and pollution). This might be the right moment to apply good solutions from the Civil Obligations Act to the Maritime Code and, even further, to the international law. On the other hand, it would also be beneficial to allow good solutions from other legal sources to be introduced into the Civil Obligations Act. The old but the always actual saying Navigare necesse est, vivere non est could be fine-tuned to modern era in the way that the first part (navigare necesse est) is amended by the need for best legal regulations.

This paper deals with one aspect of a complex matter, and there are many legal issues that also deserve to be in the focus of the professional and scientific research. In the area of indemnification liability there are particularly interesting issues (to be dealt with in our future research), such as the type of fault, premeditated fault and various forms of compensation for the damage, in particular the non-material damage, all related to crew members, shippers and maritime affairs in general.

requires so, in particular when the vessel is approaching or leaving the port, canal, river or fairway, and in poor visibility. (3) The presence of the pilot on board does not exempt the master from the responsibility of controlling the vessel.

30 (1) If an employee, through work or activities associated with work, causes damage to the third party, the liability is imputed to the employer, unless it can be proved that there were reasons for excluding the responsibility of the employee. (2) The aggrieved party is entitled to claim indemnification for the damage directly from the employee if the damage was done deliberately. (3) The employer who indemnified the damage to the aggrieved party is entitled to request the compensation for the expenses from the employee, if the latter caused the damage deliberately or due to utmost negligence. (4) The right described in Paragraph 3 of this Article becomes void six months after the damage was indemnified.

REFERENCES

1.Kačer Hrvoje, Perkušić Ante, in: Zlatko Ćesić, Vilim Gorenc, Hrvoje Kačer, Hrvoje Momčinović, Drago Pavić, Ante Perkušić, Andrea Pešutić, Zvonimir Slakoper, Ante Vidović, Branko Vukmir, Komentar Zakona o obveznim odnosima (Comments on Civil Obligations Act), RRIF plus d.o.o., Zagreb, 2005.

2.Kačer Hrvoje, "Obvezna osiguranja profesionalne odgovornosti u hrvatskom pravu", in: Ugovor o osiguranju prema novom ZOO, Inženjerski biro, Zagreb, 2005, pp. 92-131.

3.Klarić Petar, Vedriš Martin, Građansko pravo (Civil right), Narodne novine (Official Gazette of the Republic of Croatia), 2006, pp. 583-643.

4.Mlikotin Tomić Deša, Vuletić Dominik, "Prvi model Zakona ugovora o uslugama u Načelima europskog ugovornog prava", in: Pravo i porezi, No. 12/10, p. 78.

5.Sakić Selma, Landovi principi kao oblik harmonizacije komunitarnog prava (master thesis), Sarajevo, March 2009 (unpublished).

6.Radolović Aldo, in: Hrvoje Kačer, Aldo Radolović, Zvonimir Slakoper, "Zakon o obveznim odnosima s komentarom" (Civil Obligations Act with Comments), in: Poslovni zbornik, Zagreb, February 2006, pp. 914-963.

7.Ustav Republike Hrvatske (The Constitution of the Republic of Croatia), Narodne novine (Official Gazette of the Republic of Croatia) No. 56/90, 135/97, 8/98 - consolidated text, 113/00, 124/00 – consolidated text, 28/01, 41/01 - consolidated text, 55/01, 76/10 – Revision of the Constitution - 85/10.

8.Zakon o obveznim odnosima (Civil Obligations Act), Official Gazette 35/905, 41/08.

9.Zakon o obveznim odnosima (Civil Obligations Act), Službeni list (Official Gazette of the SFRY) 29/78, 39/85 and 57/89, Narodne novine (Official Gazette of the Republic of Croatia) 53/91, 73/91, 111/93, 3/94, 7/96, 91/96, 112/99 and 88/01.

10.Pomorski zakonik (Maritime Code), Official Gazette 181/04, 76/07, 146/08, 61/11.

11.Zakon o sukobu zakona s propisima drugih zemalja (Act concerning the resolution of conflicts of laws with the provisions of other countries in certain matters), Official Gazette of the SFRY 43/82, 72/82, Official Gazette of the Republic of Croatia 53/91.

BIOGRAPHIES

Blanka Ivančić-Kačer was born at 15. of July 1979. in Split, married and mother of two children. She enrolled at The Faculty of Law in Split in the academic year 1998/1999., and has graduated at 28. February 2002., namely before the term. She has received for the academic year 2000./2001. a reward from the Dean and from the Head Provost, and as a best student of the 4. year she has received a reward Konstruktor- engineering d.d. Split.
After graduation she entered the Post-graduate scientific study from the Civil legal sciences in Zagreb at which she has passed all exams, after she was approved a theme of the Doctoral Dissertation "Civil legal aspects of the transplantation parts of the human body" and for mentor has been chosen dr. sc. Petar Klarić. She had trainee internship at the Country Court in Split (2003-2005) and 05. of January 2005. she passed Judicial exam.
She is a member of the three juristic professional associations (Croatian society for civil legal sciences and practice, Croatian society for copyright law and Croatia society for sport law).
So far she has published many professional and scientific papers and she has participated as the author at several international symposia abroad, and she has held lectures in English and in German languages and also she has participated in the roundtable in the Croatian Academy of Arts and Science on the subject "Medicine and the law".
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NEW APPROACHES TO CREATING SAFETY LEARNING MATERIAL

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ABSTRACT

This article describes the model of safety learning process used in the "Competitive Advantage by Safety (CAFE)" project. The model is compared to the DIKW-pyramid and to the perspectives of holistic education. CAFE safety learning material, which is under construction, will be based on the model and will encourage seafarers to share information and knowledge to promote the implementation of onboard safety solutions, motivate seafarers to use safe practices onboard and enhance their know-how in operational safety decision making.

For the first time in Finland, there will be emergency cartoons in sea safety handbooks. Seabook-cartoons of an unlucky Able Seaman will enhance students' and other readers' self-esteem as good seafarers and question the unsafe attitudes and crazy, even macabre, decisions made by the goofy character. During emergency situations, people often underuse their cognitive skills. It can be assumed that by using funny emergency cartoons to raise strong emotions during the learning and reading period it can also be possible to create a link from emotions to the rational know-how demanded in the real rescue operations.

KEY WORDS

Maritime safety, emergency, learning, comic strips

1. INTRODUCTION

Prevailing attitudes and practices have a high potential to improve safety at sea, but the mere reading of the International Safety Management Code or compilation of the data into a reporting system will not improve safety. Information has to be disseminated, and recommendations and various knowledge have to be implemented into everyday operations.

The focus of this preliminary communication article will be on these issues: how information and knowledge can be used to strengthen the implementation of safety onboard, and how seafarers' motivation and know-how can be added to make them even more committed to the safety of practices in routine and emergency operations.

2. METHODS

The methods employed in this article are mostly descriptive, i.e. the model of the safety learning process developed on the basis of previous studies in "Competitive Advantage by Safety (CAFE)" project and used now as a pedagogical manuscript of the new kind of safety learning material, is introduced.

The fundamental basis of the safety learning and the material's design process will be analyzed using the so called DIKW-pyramid, sometimes attributed in origin to the geographer Yi-Fu Tuan. DIKW-pyramid includes in levels for Data, Information, Knowledge and Wisdom. (Ackoff, 1989)

Figure 1. When DIKW-pyramid is adapted to the safety learning, wisdom is the desirable result of the holistic process.

The safety learning process and also the structure of the CAFE safety learning material will be compared with the perspectives of holistic education. In the holistic education approach learning is based on every person's intellectual, emotional, social, physical, artistic, creative and spiritual potential. (Forbes, 2003)

3. SAFETY LEARNING PROCESS

Even when the structural conditions for the safety system are in good order, there can still be problems which, in many cases, are connected to humans and their behavior.

Figure 2. Seabook-characters: Is new technology enough for safety?

Onboard there can always be individuals, who oppose the system for some reason or people who just do not want to admit they have made mistakes, or there can be interpersonal problems among the crew which are reflected in daily operations. Sometimes even intentionally violated procedures and regulations may contribute to unsafe acts.

3.1. Motivating to safe approaches

The normal solution to solve problems of this kind has quite often been to add company rules and tight safety management systems.

Figure 3. Seabook-characters: What kind of carriers is needed to go over the gap between office and ships?

However, as Knudsen (2009) has found, the demand for written procedures is perceived by many seafarers as "counteracting" and the use of common sense, experience, and professional knowledge is epitomized in the concept of seamanship. In the CAFE learning material, safety management rules and procedures will concretely be linked to onboard practices and vice versa. When defining and refining connections between management tools and simple working methods, students and other readers will enhance their know-how and hopefully also be more motivated to adopt safe practices.

3.2. Learning from unsafe acts and sharing best practices

Researchers suggest that a safety information system that collects, analyses, and disseminates information from incidents and near-misses is an important tool to improve the intelligence and readiness of the crew. (Lappalainen et.al., 2011)
Lee (2005) has studied the effects of safety information on decision making and his findings also suggest that students who periodically review safety information acquire a beneficial effect on their decisions in critical safety situations.

Figure 4. Seabook-characters: What really is the purpose of the safety and near miss reporting system?

CAFE learning material includes many examples from maritime accidents. In Finland the Safety Investigation Authority investigates all major accidents regardless of their nature as well as all aviation, maritime and rail accidents and incidents. All accident and incident descriptions will be taken from these investigation reports because the near-miss reporting databases owned by Finnish ship owners are not public.
In an accident investigation, a change analysis technique is often used to examine an accident by analyzing the specific differences between the accident–free situation and the accident scenario. These differences are evaluated to determine whether the differences caused or contributed to the accident. (Sklet, 2002)
In previous articles published by the CAFE project, it has been determined that safety knowledge and skills are part of intellectual capital necessary for all shipping companies. More specifically, safety capital consists of, for example, safety management practices which need to be used in everyday life and be continuously under development. (Seppänen & Salokorpi, 2012)

Figure 5. Seabook-characters: What can I do to motivate others in safety?

The learning material also presents descriptions of normal accident-free procedures and best onboard safety practices challenging students and other readers to compare differences and to use their cognitive skills to solve problems and gain their safety capital. Also, if the focus is only on unsafe acts, the picture of mariners' safety attitudes might become twisted and negatively affect the students' self-efficacy.

3.3. Enhancing self-respect through emotions

The use of comic strips in education is based on the concept of creating engagement and motivation for students and other readers. In addition, when reading comic strips such as Donald Duck, people usually feel very relieved to be at least a little luckier than Donald.

The essential part of the CAFE learning material is the Seabook cartoon manuscripted by Teemu Leppälä and illustrated by Anni Sinersaari. The material includes several strips of an unlucky Able Seaman with the purpose of enhancing students' and readers' self-respect as good seafarers and to question the unsafe attitude and crazy, even macabre, decisions made by the goofy character.

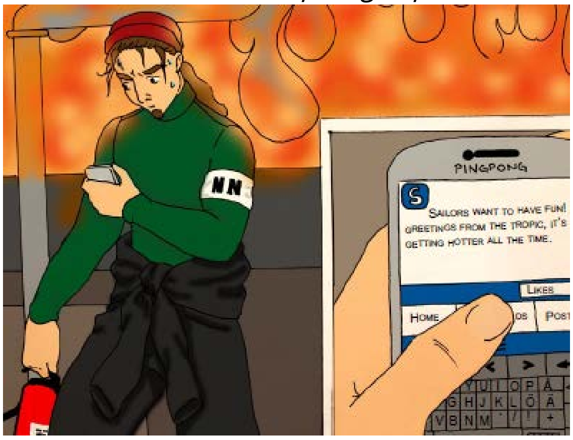

Figure 6. Seabook-characters: Can all problems be solved using Facebook?

According to the theories of naturalistic decision making (Klein, 2008), decisions made in real life vary in the degree to which they rely on intuitive and analytical processes. Heuristic cutoff paths may also exist.

During emergency situations, people often underuse their cognitive skills: when raising strong emotions via funny emergency cartoons in the learning material it may also be possible to create a link from emotions to the rational know-how also described in the material and demanded in the real rescue operation.

4. CONCLUSIONS

When analyzing the structure of the safety learning process using DIKW-pyramid (Figure 7), the starting point comprises on the one hand, the available data, i.e. presumptions decreed in the International standard for the safe management and operation of ships and for pollution prevention (the ISM Code), and the procedures based on the safety management systems (SMS) of the shipping companies, and on the other hand, the mental metadata, i.e. individual and organizational commitment to the safe practices and the concept of safety per se.

Information includes descriptions of previous studies in connection to the ISM Code, ship-owners' SMS or operational onboard safety.

Knowledge refers to the understanding of how safety related systems and routines function, i.e. what are the best practices and what can be learned from failures.

Wisdom, the final result, will be the ability to make independent decisions regarding safety and use safe practices on the basis of SMS principles, available information, experience and knowledge.

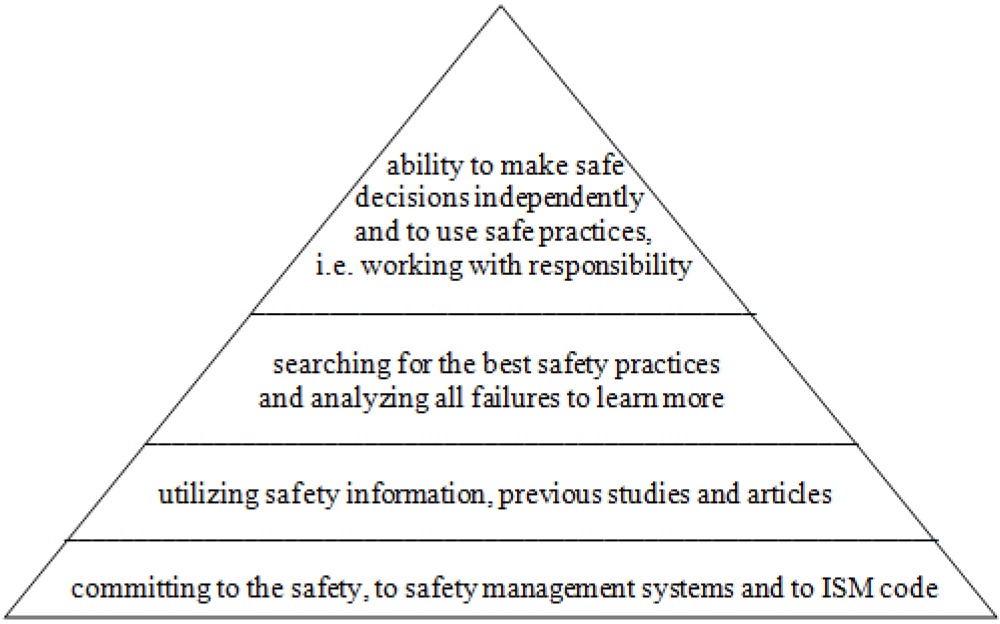

Figure 7. Safety-learning pyramid, applied from DIKW-pyramid. Sound safety attitudes and Just culture are indispensables when rising stairs to the top.

4.1. Safety learning as a holistic process

CAFE safety learning material will cover at least five of the dimensions of holistic education: intellectual content will be very strong starting from the ISM Code and ending with academic studies, emotional and artistic stimulus will arise from comic strips while social and ethical contemplation will be included with the aim of eliciting discussion and social interaction.

Figure 8. Seabook-characters: What kind of holistic readiness is needed in real emergency?

In addition, the material seeks to engage students and seafarers in the learning process and encourage in them personal and collective responsibility.

When talking about safety, discourses usually indicate only the positive strengths existing in the safety culture and the opportunities to make things even safer. (Seppänen, 2012) When approaching safety holistically, with sound safety attitudes and in the Just culture, also threats and weaknesses of all kind would be easier to bring up.

4.2. Other discussion

Compared with previous materials used in Finland, the new approach will offer a much wider perspective and new ways to learn collective and individual safety skills and safety management expertise in Finnish maritime industry.

After this preliminary communication article, further studies e.g. by the Kotka Maritime Research Centre will be carried out to find how much the material will be used, how useful it will be from the students' and other readers' point of view and what the influence of the material will be on the safety attitudes and culture onboard Finnish commercial vessels.

Acknowledgments
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REFERENCES

1.Ackoff, R.L. (1989) From data to Wisdom. Journal of Applied Systems Analysis, 16:3–9.

2.Competitive Advantage by Safety (CAFE) project. http://www.merikotka.fi/cafe/

3.Forbes, S.H. (2003) Holistic education: An Analysis of Its Ideas and Nature. The Foundations of Holistic Education Series, V. 8. Foundation for Educational Renewal, Brandon, VT.

4.Klein, G. (2008) Naturalistic Decision Making. HUMAN FACTORS, Vol. 50, No. 3, 456–460.

5.Knudsen, F. (2009) Paperwork at the service of safety? Workers’ reluctance against written procedures exemplified by the concept of ‘seamanship’. Safety Science, 47, 295–303.

6.Lappalainen, J. & Vepsäläinen, A. & Salmi, K. & Tapaninen, U. (2011) Incident reporting in Finnish shipping companies. WMU Journal of Maritime Affairs. October 2011, Volume 10, Issue 2, 167-181.

7.Lee, J.R. (2005) The effects of safety information on flight students' aeronautical decision making. Diss. Purdue University, USA.

8.Safety Investigation Authority in Finland. http://www.turvallisuustutkinta.fi/en/Etusivu

9.Seppänen, J. (2012) Talking about safety - A content analysis of Finnish seafarers' magazines. The Nordic Logistics Research Network, June 2012. NOFOMA 2012, Book of Abstracts, 137-138.

10.Seppänen, J. & Salokorpi, M. (2012) EU-project develops skills and increases safety capital of maritime domain. Baltic Rim Economies, Issue No. 5, 14 Dec. 2012.

11.Sklet, Snorre (2002). Methods for accident investigation. Reliability, Safety, and Security Studies at Norwegian University of Science and Technology, ROSS (NTNU) 200208, Trondheim, Norge.

BIOGRAPHIES

Jukka Seppänen is a 45-year-old project manager and a researcher, doctoral student and M.Sc. & M.Th. Previously, he has worked as a military chaplain, a counselor in crisis and a teacher of military leadership in the Army Academy of Finland. He has also served in highly practical positions e.g. in emergency response centers and volunteered as a coxwein and SAR trainer in Finnish Lifeboat Institution. Seppänen is the author of "Sotilaan pyhät hetket" (Holy moments - handbook for soldiers to live and cope) and he has published several scientific articles. Seppänen has four children and his wife Päivimaria is the leader of the art workshop for alienated adolescents.

Jouni Lappalainen is a 51-year-old researcher in the Centre for Maritime Studies, University of Turku, Finland. He has a Master’s degree in Agriculture and Forestry from the University of Helsinki, Finland. He has worked over 20 years as a sales manager, consultant and quality manager for several companies. Since 2007 he has participated in EU-funded research projects and in consulting projects at the Centre for Maritime Studies. Lappalainen is preparing his doctoral dissertation about maritime safety management.

Teemu Leppälä is a 40-year-old Master of Marine Science and has worked as a pilot the last six years living with his wife and three children in Helsinki, Finland. He has 20 years of seafaring experience on numerous different types of vessels and companies. As a success oriented person, he enjoys adopting new technologies and participating in different creative projects. Leppälä owns a production company which makes documentary films on various topics. Storywriting is one of his favourite hobbies.

Anni Sinersaari is a 20-year-old second year graphic design student in Kymenlaakso University of Applied Sciences on Kasarminmäki Campus, Kouvola. Before starting her university studies, she graduated from Anjalankoski Upper Secondary School in 2011. Sinersaari has written articles for Insider, the student magazine of her university, and is currently working in the CAFE project creating cartoons focused on maritime safety. As a graphic design student, she is naturally interested in arts, particularly in music, literature and drawing; her main hobbies being choir singing for the past 12 years, drawing and occasionally writing poems and short stories.

CURRENT INFECTIOUS RISKS IN INTERNATIONAL MARITIME TRAFFIC

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ABSTRACT

This paper examines the significance of current infectious risks in international maritime traffic. Maritime traffic differs from other types of transport by its speed, so some diseases with short incubation may manifest on the ship, which requires an intervention of the second mate in cases of commercial navy ships on which there are no doctors. In addition to infectious risks, this paper also considers preventive measures that need to be implemented. The frameworks for the implementation of preventive measures in maritime transport are the International Health Regulations (IHR 2005) and the Guide to Ship Sanitation (WHO). Unlike the recent past and the time of quarantine diseases such as smallpox, cholera, epidemic typhus and haemorrhagic fever, today these diseases no longer present a public health concern. In the authors' opinion, one of potentially larger issues among seafarers is protection from malaria and sexually transmitted diseases, including AIDS. Some research show that the number of seafarers infected with imported malaria is declining in Croatia. The issue related to malaria chemoprophylaxis is the need for long-term use of antimalarials, which is the reason why seafarers avoid it. Infectious diseases that may occur on cruisers are not considered because the population on cruisers has its own specificities that may affect the incidence of communicable diseases and, in addition to that, these ships are obliged to have a doctor on-board.

KEY WORDS

Maritime traffic, infectious risk, Croatia.

1. INTRODUCTION

It is estimated that 1.2 million seafarers are employed on ships around the world, of which 30,000 are seafarers from Croatia. From the public health point of view, seafarers represent a possible entrance way for infectious diseases into a population, particularly the domicile one – that from which they come and to which they return from their travels.

Ships can transport infected cargo, humans and other vectors, such as mosquitoes and rats, between ports and can therefore act as a means of national and international dissemination of disease and disease agents.

Naval ships, cargo ships, ferries and cruise ships can all be affected, often with serious operational and financial consequences. Communicable diseases in seafaring are a world health issue and an occupational problem with specific work-related risks.

In the last 30 years the meaning of infectious diseases in international traffic has not changed, but the spectrum of disease agents has.

In relation to "classic" quarantine infectious diseases that were once significant in international

traffic, there have been no smallpox cases in the world since 1978, cholera is under control, there is an efficient vaccine against yellow fever, and haemorrhagic fevers surface periodically, but not in maritime traffic. Epidemic typhus and relapsing fever (febris reccurens) are ancient history in most parts of the world.
Of the old threats that do not require quarantine, malaria is still equally present with an increasing problem of resistance to antimalarials.
In recent years, SARS, bird and swine influenza were responsible for the activities and continuous "stand by" arrangement of the public health service. As there is no sufficiently safe and efficient vaccine against them, these diseases are currently the ones threatening the developed world.
In terms of international traffic, however, and in addition to the abovementioned, many other infectious diseases are important. Neither HIV/AIDS nor hepatitis B should not be ignored. On the other hand, in the developed part of the world where one of the predominant transmission routes for hepatitis B is sexual intercourse, this disease should no longer be an issue due to the application of a safe and efficient vaccine; and Croatia is one of such countries.
In relation to other types of transport, maritime traffic has no special characteristics with regard to the risk of contracting infectious diseases. Ships on international voyages usually dock in international ports, and these are places that have to meet certain hygienic standards, meaning that the risk should be smaller. A specificity of maritime traffic compared to other types of transport is that it is slower, so in case of diseases with short incubation on long-route ships, a disease may manifest itself on-board and jeopardize other crew members. From the aspect of health, all types of international transport, including maritime, are regulated by the International Health Regulations adopted in 2005 (IHR 2005). Before that, the International Health Regulations (IHR) adopted in 1969 were in force. The IHR 2005 apply to world traffic: ships, aircraft, other conveyances, travellers and cargoes. Ships are discussed specifically in the Guide to ship sanitation (WHO, 2009). These regulations enable the implementation of health controls and preventive measures without disrupting the flow (traffic) of people and goods (cargo).

According to official documents of the Centers for Disease Control (CDC) and World Health Organization (WHO), Croatia is a country with no risks in international traffic. It owes this status to long-term preventive activities on the suppression and control of infectious diseases and to the implementation of the Mandatory Vaccination Program. Its objective is to maintain that situation and the most prominent role in that, in addition to the International Health Regulations, is held by the Croatian public health system with associated legal regulations. Health checks and implementation of preventive measures for seafarers are only a segment of that task.

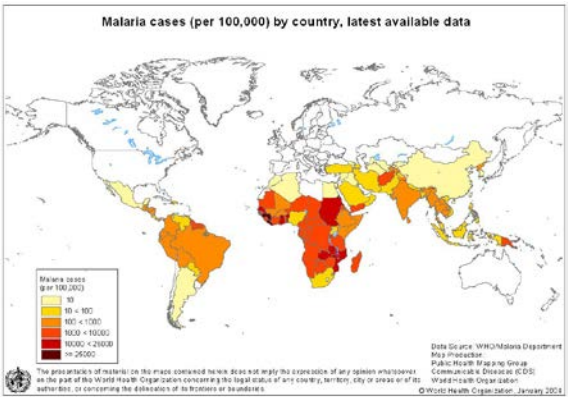
2. CURRENT INFECTIOUS RISKS IN MARITIME TRAFFIC

2.1. Malaria

The World Health Organization estimates that 216 million cases of malaria occurred in 2010 worldwide, of which 655,000 were fatal, most of which (91%) in the African region. This disease, caused by different types of parasites, is serious and sometimes fatal. It should not be overlooked that the clinical picture of malaria is similar to influenza (high temperature, bone and muscle aches) and very important epidemiological information is that about time spent in or traveling through endemic areas. The most severe clinical picture with a very high mortality rate is presented in cases of malaria caused by Plasmodium falciparum. This type of malaria is predominant on the western coast of Africa – Map 1.

Map 1. WORLDWIDE MALARIA CASES

Malaria morbidity expressed as the number of infected persons per 100,000 inhabitants



Malaria has been an important health problem for seafarers and the risk of infection varies according to the epidemiological situation in the port areas.

Malaria infections among seafarers have been regularly reported from many seafarers' countries in which malaria was eradicated. There are annually eight to ten cases of imported malaria in Croatia. Croatian seafarers are not sufficiently informed about the risks of malaria and methods of protection, they often do not take chemoprophylaxis or take it irregularly. Considering that Croatian seafarers travel on ships from all world countries and to all world countries, including malaria-endemic areas, more attention should be given to educating seafarers and raising their awareness of the risks of getting infected. Special attention should be given to seafarers who will travel by sea along the coast of western Africa. The scope of preventive measures varies from location to location in endemic areas, but, in addition to chemoprophylaxis, it generally boils down to:

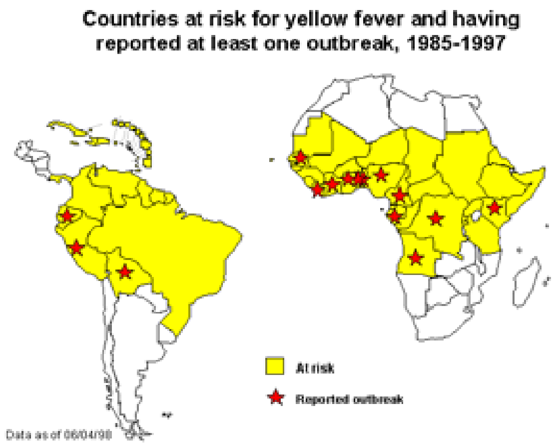
- preventing mosquito bites by staying indoors between dusk and dawn;
- wearing a long-sleeved shirt, long trousers and a hat;
- wearing bright-colour clothes;
- applying insect repellent to exposed skin;
- using an insecticide-treated (permethrin) bed net for sleeping.

In a few words, protection against malaria among seafarers may be put into three messages:
definitely taking chemoprophylaxis if travelling in a high risk zone (western Africa!)
prevent mosquito bites
in case there is reason to believe that a crew member has malaria, immediately contact Radio Medical Advice (professional medical care)

2.2. Yellow fever

Yellow fever is a serious disease caused by the yellow fever virus and transmitted by infected mosquitoes. There is a very efficient vaccine and vaccination is mandatory for seafarers. After vaccination, this information is registered in the "yellow book". The vaccine provides protection for ten years, after which revaccination is required. The disease occurs in some African and South American countries. Forty-five endemic countries in Africa and Latin America, with a combined population of over 900 million, are at risk. In Africa, an estimated 508 million people live in 32 countries at risk. The remaining population at risk is in 13 countries in Latin America, with Bolivia, Brazil, Colombia, Ecuador and Peru at greatest risk – Map 2.

Map 2:



Yellow fever is difficult to diagnose, especially during the early stages. It can be confused with severe malaria, dengue haemorrhagic fever, leptospirosis, viral hepatitis (especially the fulminating forms of hepatitis B and D), other haemorrhagic fevers (Bolivian, Argentinean, Venezuelan haemorrhagic fevers and other flaviviruses such as west Nile, Zika virus, etc.) and other diseases, as well as poisoning. There is practically no possibility that a crew member becomes infected with yellow fever because vaccination is mandatory and a seafarer may not board the ship without proof of vaccination. Only stowaways or travellers on passenger ships or cruisers may be infected if they are not vaccinated. However, even in the situation when there is a person on-board infected with yellow fever (or suspected of being infected), there is no danger for the vaccinated crew and the ship should be treated as having a patient suffering from a quarantine disease.

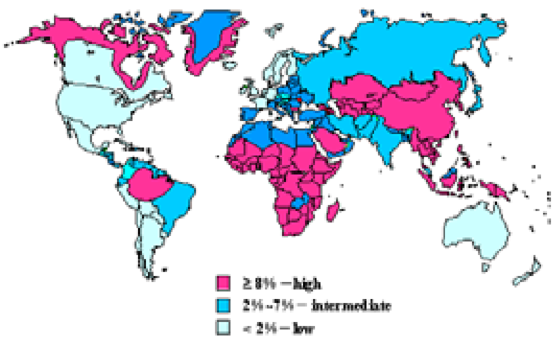
2.3. Hepatitis B

The high prevalence of hepatitis B viral (HBV) infection, and therefore the risk of transmission, is present mostly in African and Asian countries – Map 3.

In recent years the predominant way of transmission in Croatia was sexual, and the incidence declined due to introducing mandatory vaccination, so Croatia belongs to the group of low-risk countries.

Vaccination for seafarers is not mandatory, but it is recommended. Seafarers traveling to high-prevalence countries are advised to avoid medical and dental interventions, tattoos, piercings and unprotected sexual relations.

Map 3. PREVALENCE OF HEPATITIS B INFECTION IN THE WORLD



It should be mentioned that the vaccine is effective and provides protection only if the person is fully vaccinated, which includes a three dose series (0 day, one month after and six months after the date of initial vaccination).

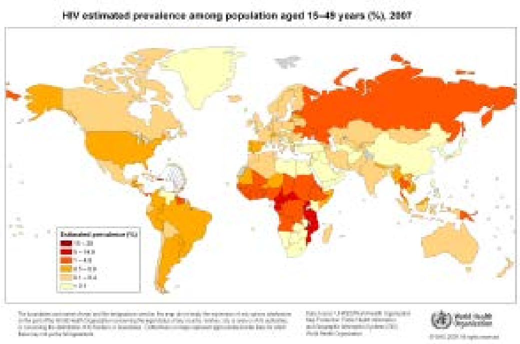
2.4. Sexually transmitted diseases

World Health Organization estimates that 340 million episodes of curable sexually transmitted infections (chlamydial infections, gonorrhoea, syphilis, trichomoniasis) occur throughout the world every year.

Seafarers have been identified as a group at risk for HIV infection and other sexually transmitted diseases. Sexual infections are transmitted during unprotected sexual intercourse (heterosexual and homosexual – anal, vaginal or oral). There is no risk of acquiring any sexually transmitted infection from casual day-to-day contact on-board, at work or socially. The most important sexually transmitted infections and infectious agents are: HIV/AIDS infection, hepatitis B, gonorrhoea, syphilis, chlamydial infections, trichomoniasis, chancroid, genital herpes and genital warts caused by human papilloma viruses. Sexually transmitted infections increase the risk of contracting or transmitting HIV infection.

Same as other migrant workers, due to long-term separation from family and stable sexual partners, seafarers are exposed to risky behaviour and a higher risk of contracting sexually transmitted infections. It has been proven that seafarers are at greater risk of being infected with HIV/AIDS than the general population. The distribution of AIDS/HIV infection prevalence is well known and highest in the countries of Sub-Saharan Africa – Map 4.

Map 4. HIV estimated prevalence among population aged 15 – 49 years



3. CONCLUSION

Infectious risks in international traffic are constantly present, only the spectrum of disease agents and diseases is changing. In order to protect seafarers as well as the general population of seafaring countries, preventive measures prescribed by international conventions, the International Health Regulations (IHR 2005) and

the Guide to Ship Sanitation are regularly implemented. The listed documents were prepared by the World Health Organization and are internationally accepted. With the support of WHO, the 194 States Parties to the International Health Regulations (IHR) have been implementing these global rules to enhance national, regional and global public health security.
Regarding mandatory vaccinations for seafarers, in practice only vaccination against yellow fever is mandatory and it is repeated every ten years. As far as other vaccines are concerned, vaccine against influenza (every year) and vaccine against hepatitis B are recommended.
Malaria chemoprophylaxis is mandatory if traveling in malaria-endemic areas.
The use of safe food and water, and the disposal of waste substances in line with the Marpol Convention and the IHR 2005 is imperative, as well as the maintenance of general and personal hygiene on the ship. The IHR 2005 requires each ship operator to ensure that no sources of infection and contamination are found on-board, including in the water system. The IHR 2005 states that the competent authority in each State Party is responsible for the supervised removal and safe disposal of any contaminated water or food, human or animal dejecta, wastewater and any other contaminated matter from a conveyance.
Advice to seafarers is that if food is consumed outside the ship, the rule "boil it, cook it, peel it or forget it" should be observed.
In countries with high hepatitis B and HIV prevalence, medical injections, dental care and piercing and tattooing using unsterilized needles or blades are also possible sources of infection and should be avoided.

REFERENCES

1. World Health Organization, Guide to Ship Sanitation, (Geneva 2011), pp 2-10.

2. International Medical Guide for Ships. 3rd edition. WHO, Geneva 2007, pp 195-207.

3. Travellers' Health. Vaccinations. Available at: http://wwwnc.cdc.gov/travel/page/vaccinations.htm. Access date: February 21, 2013

4. International Health Regulations. WHO, Geneva, 2005.

BIOGRAPHIES

Iris Jerončić, was born in Split, Croatia, in 1966. She graduated in the University of Zagreb, School of medicine. 2010 she received her Master of Science degree in basic and clinical medical sciences (in the field of clinical medicine). Since 2009 she is employer in the Department of Public Health, University of Split, School of Medicine. Since 2009 she has been worked as assistant in the Maritime Medicine in the Faculty of Maritime.

Luka Mudronja was born 1985. in Dubrovnik. He graduated for mag. ing. of naval architecture on Faculty of engineering and naval architecture in Zagreb. He has been employed as assistant on Faculty of maritime studies in Split, department of nautical engineering, since 2012. He is Ph D student on Faculty of engineering and naval architecture in Zagreb.

Rosanda Mulić MD, PhD was born in Split, Croatia, 1954. She graduated in the Faculty of Medicine in Sarajevo in 1978. She has 34 years of working experience in public health including maritime medicine. Since 2005 she has worked at the Faculty of Maritime Studies in Split, where she is currently holding a position of a full professor. She also included in School of Medicine Split University as a Head of Public Health Department and she is full professor also. She was Vice Dean for teaching and students from 2009 to 2011. In 2011 she was appointed as a Dean Faculty of Maritime Studies in Split.

PROPOSAL FOR NEW METHODS OF ENVIRONMENTAL PROTECTION OF THE ADRIATIC SEA

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ABSTRACT

Due to diverse natural features of the Croatian coastline and islands, nautical tourism has become a recognisable Croatian "tourism product". Its most important and valuable segment refers to natural coastal and island areas. Any further unconsidered and uncontrolled development of any segment of these areas may threaten the long-term preservation of the quality and attractiveness, as well as the desired and possible overall economic valorisation. Reduced sojourn costs make this form of tourism even more attractive. However, most frequently, anchoring in deserted coves and bays lacks any supervision. Owing to the heavy traffic of recreational boats, the Republic of Croatia does not have enough resources for monitoring all vessels and protected areas in order to prevent activities that are likely to become harmful to the environment. This paper presents the authors' proposal for new methods of protecting marine environment and monitoring in nautical tourism.

KEY WORDS
Nautical tourism. Environment protection, AIS, Boats engaged in nautical tourism.

1. INTRODUCTION

Croatia's coast is exceptionally suitable for the development of nautical tourism due to the indented coastline and preserved nature diversity. The sea is unspoiled, pine forests are common sights along the shore. Further development of the coastal area must be sustainable in the long term as the preserved environment is the most important resource. The sustainable development implies the development which allows the possibility of resource exploitation in the future, meeting the needs of the generations to come. In the context of nautical tourism, sustainability implies the balance between the reduction of possibilities of the economic growth and the acceptable reduction of the quality of the coastal eco-system (Figure 1).

Nautical tourism is a cluster of relationships and phenomena arising from sailing and onboard sojourn of guests-boaters, as well as staying in the ports of nautical tourism for the purpose of leisure and recreation. According to the size of vessels, nautical tourism may be categorised as follows [17]:

Large vessels nautical tourism: including cruise ships, passenger vessels, mega-yachts (larger than 24 m in length), hydrofoil craft and catamarans (vessels intended for fast transport of passengers)

Small vessels nautical tourism (yachts > 12 m), including sailing boats, skimming boats, power boats, scooters, kayaks, rafts, and the like).

Figure 1. Quality of the sea for swimming in the Croatian Adriatic (Blue = excellent; Green = good; Yellow = satisfactory; Red = poor)

2. STATISTICAL ANALYSES OF NAUTICAL TOURISM IN THE REPUBLIC OF CROATIA

The development of nautical tourism in the Republic of Croatia is determined by [17]:

- Sustainability of natural resources
- Traffic connection with the nautical emitive markets
- Design of the "nautical product"
- Human resources
- Ports of nautical tourism
- Number of berths for boaters
- Boat charter fleet
- Boatyards for nautical fleet
- Business policy of the nautical tourism companies, and
- Gross domestic product

From the environmental point of view, the nautical tourism development should imply that:

- Sewage and run-off must not threaten the ports or beaches
- Layout of the port environment must be in line with the effective spatial planning
- Local community must have ready emergency plans in case of pollution
- Sea water must not contain visible signs of pollution by solid or liquid waste, fuels, lubricants, oils, and the like (Figure 1)
- Quality of the sea water for swimming must be in compliance with the EU regulations [13]

According to the statistics1, on 31st December 2007 there were 14.099 vessels in permanent berths in ports of nautical tourism (Tables 1 and 2). 86.6% of vessels were moored in sea berths, whereas dry berths were used by 13.4% of vessels. According to the type of vessels, the vessels using permanent sea berth included 45.1% of power yachts, 49.8% of sailing boats, and 5.1% of other craft. At the same time, there were 220,875 craft in transit in the ports of nautical tourism. According to the type of transient vessels using sea berths, 29.4% of them were power yachts, 68.0% of them were sailboats, whereas 2.6% belonged to other categories. A total of 54,864 navigation permits and extended navigation permits were granted for sailing within internal waters and the territorial sea of the Republic of Croatia. 22.7% of the permits were granted to vessels arriving by sea, 60.8% to those arriving by land, while 16.5% of the permits were granted to the craft staying in Croatia over winter. As for boaters, there were overall 811,000 arrivals, including 91.9% foreign and 8.1% domestic arrivals; there were 1,210,000 recorded overnights of 93.6% foreign and 6.4% domestic boaters. Given the recorded figures referring to the arrival and stay of nautical guests in the ports of nautical tourism, it is obvious that nautical tourism is becoming an increasingly important segment of the overall tourism industry in Croatia.

Table 1. Capacity of berths in ports of nautical tourism and dry berths according to the spatial plans of Croatia's counties

L(m) of vessels	Number of berths			
	1980.	1990.	2000.	2010.
< 6m	516	1371	2010	1239
6-8m	549	1794	2111	2097
8-10m	523	2235	2697	3542
10-15m	386	3254	5088	7842
>15m	157	216	957	2193
TOTAL	2131	8870	12863	16913
L(m) of vessels	Structure (%)			
	1980.	1990.	2000.	2010.

[1] Croatian Bureau of Statistics / Hrvatski državni zavod za statistiku, available at: http://www.dzs.hr/

< 6m	24,2	15,4	15,6	7,3
6-8m	25,8	20,2	16,4	12,4
8-10m	24,5	25,2	21,0	20,9
10-15m	18,1	36,7	39,6	46,4
>15m	7,4	2,4	7,4	13,0
TOTAL	100	100	100	100

Table 2. Capacity of Croatia's marinas

Capacity of marinas		
	2010.	2011.
Number of marinas	54	54
Nautical ports (anchorages, moorings, land marinas)	44	44
Water surface area (m2)	3.313.110	3.293.891
Number of moorings in sea	16.913	11.828
Length of shoreline equipped for moorings (m)	64.715	64.345
Total surface area on land (m2)	756.538	772.338

In 2011 there were 98 ports of nautical tourism along the Croatia's coastline, including 61 marinas (out of which 11 land marinas) and 37 other ports of nautical tourism. Their overall sea surface amounts to 3,295,891 m2, and the total number of berths is 17,059 [6]. The marina and ports are usually constructed in the vicinity of well-known tourist destinations. The Strategy of the development of ports of nautical tourism from 2009 to 2019 [19] anticipates extending the existing marinas and ports and building new ones.
In 2007 there was a total of 928 charter businesses (companies and craft businesses) registered for renting vessels with 3,463 renting vessels altogether, which means that each business managed an average of 3,73 vessels. Out of 928 businesses, no more than 78 or 8.4% of them had more than 10 vessels (51 companies had a charter fleet ranging from 10 to 25 vessels, 27 companies had more than 25 vessels, out of which only 2 had more than 100 vessels).
The total of 3,056 vessels included only 241 power yachts up to 20 metres in length, whereas only one of them was longer than 30 metres. Therefore, the large power yacht charter service has not been sufficiently developed and there are practically no luxury mega-yachts available in charter service.

3. ADVERSE DEVELOPMENT FACTORS OF NAUTICAL TOURISM IN THE REPUBLIC OF CROATIA

The implementing regulations oblige the ports of nautical tourism to implement the system of retaining facilities for collecting waste form vessels (sewage, oils, garbage, etc.). In addition to meeting global ecological standards, such systems contribute to the environmental preservation effectively.
In order to develop nautical tourism in the Republic of Croatia in a sustainable way, it is essential to preserve the natural beauty that attracts boaters in these waters. Moreover, it is necessary to enhance the quality of vessel accommodation services, particularly in nautical ports. With regard to the space usage, nautical tourism may be developed taking on of two crucial directions. The basic priority is to protect the exceptionally valuable areas (uninhabited, non-urbanised stretches of the coastline, islands, islets, bays and coves), which strongly encourage the arrival of the local and foreign nautical population, and to plan the construction of new nautical tourism ports that meet the highest environmental standards, in less valuable areas. When planning the construction of new ports of nautical tourism, it is necessary to carry out a thorough evaluation and apply a number of criteria. One of the most important is, undoubtedly, the criterion for selecting the construction sites. The areas included in the construction planning should primarily include devastated areas, in particular the ones going through the recovery programs (quarries, abandoned military ports and industrial facilities).
Compared to other Mediterranean seas, the Adriatic is a shallow sea featuring a relatively large number of species of flora and fauna, most of which are endemic. The most serious threats to the endangered and protected species result from loss of habitat, introduction of alien species, ballast waters and other perils. Habitats are destroyed mainly due to construction activities in towns and ports, and due to tourism activities. Invasive alien species are another cause of endangered biodiversity; they may also adversely affect the quality of life and health in human population and cause considerable economic damage. Two invasive sorts of green algae, Caulerpa taxifolia and Caulerpa racemosa, have appeared in the Croatian part of the Adriatic Sea (Figure 2). They represent the most serious threat to the authentic biodiversity and may cause considerable damage to

fishery and tourism in the long run. Caulerpa taxifolia (Figure 3) disseminates as it is carried on anchors and in fishing nets. Its spreading across the seabed can be prevented only by physically removing it and by forbidding anchoring and fishing within the affected areas. Originally from the Indian Ocean, the alga has a stem spreading horizontally above the seabed, producing vertical ferns whose leaves are flat and needle-like, resembling the leaves of the yew tree. Taxus is a genus of yews, hence the name "taxifolia". The alga produces large amounts of toxic chemical substance that is harmful to fish and other predators, unlike other plants which produce harmful substances to a lesser extent.

Figure 2. Distribution of the invasive algae[8]

Figure 3. Sea bottom fouled with Caulerpa taxifolia[8]

It is one of the two algae that are among the world's 100 worst invasive species listed by International Union for Conservation of Nature - IUCN. It is also called the killer-alga as it turns the place where it is attached into a dense assemblage. The Caulerpa's features differ in the Mediterranean and in the tropics: in the Mediterranean Sea it survives at temperatures as low as 7°C, grows up to 15 cm, it is more toxic, etc. The poisonous matter it exudes is lethal to other algae and smaller marine organisms. Since it is lethal to the algae which are low down on the food chain, other creatures within the food chain are consequently jeopardised. Caulerpa is disseminated by anchors, anchor chains and fishing nets, and is therefore necessary to prevent anchoring and fishing at sites where it grows.

Ballast waters pose another serious threat as they are the major means of invasive alien species and bacteria (e.g. Vibrio Cholerae and others).

Protection of valuable and sensitive areas of the Adriatic Sea is the essential measure for preserving the diversity of the marine life and the aquatic landscape. These areas constitute the core of the overall environmental protection as they are the key nodes of the ecological network representing the havens and reservoirs of biodiversity. They are protected in various ways and at various levels but their overall surface is less than 1%. Endangered and protected species are also under special protection. Potential uncontrolled increase in visitors and boating activities represents a serious threat to environment preservation, particularly to biodiversity in protected areas and, above all, the most visited areas such as national parks and nature parks. The Republic of Croatia strives to inhibit the dissemination of the invasive algae. Anchoring is usually forbidden in areas where these algae grow. However, insufficient monitoring of vessels in the existing ports and marinas, and insufficient monitoring of the very ports and marinas, as well as remote coves, bays and anchorages, make it possible for vessels to pollute Croatian waters of the Adriatic Sea without any constraint.

Some countries, for instance New Zealand and Australia, prohibit the discharge of faecal waters in the areas that are closer than 500 meters from the shore. They also prohibit discharging of faecal waters at sea depths less than 5 meters and in the areas that are closer than 100 meters from fish farms [9]. Great Britain and Sweden also have strict regulations governing the discharge of faecal waters. It is easy to notice that none of the above mentioned countries lies at a confined sea as does the Republic of Croatia. Therefore it can be concluded that the Republic of Croatia should issue even stricter regulations applying to boating and yachting, because the Adriatic is a semi-enclosed sea.

According to the Maritime Code, a sports and recreational vessel is defined as any waterborne craft more than 12 meters in length, carrying fewer than 12 passengers not including the crew, which is intended for extended seagoing navigation and can be employed either for private or commercial purposes.[2]

Pollution from yachts and boats implies human-induced release of matter or energy into the marine environment, directly or indirectly, which has or may have lethal impact on the marine life both in the water column and the seabed. The pollution may threaten marine life conditions and human health, impede maritime activities, decrease the quality of the sea water and reduce the attractiveness of the marine environment. Due to the serious risks of pollution, a relatively high number of national and international regulations have been issued. The International Maritime Organization – IMO has had a crucial role in the process of international standardisation.[3]

When examining the consequences of the nautical tourism (Table 3.) development it becomes obvious that a major issue is that many marinas lack facilities or adequate equipment for taking sewage from vessels. Another problem is the contamination caused by servicing marine engines and releasing oily matter into the sea after service and maintenance activities.

According to the available data[4], 180 tons of various lubricants and engine lube oil are replaced in the Croatian part of the Adriatic per year. Such waste represents a considerable threat unless it is stored and treated adequately. The third form of contamination that harmfully affects the environment is the use of anti-fouling paints applied to the vessel's hull. These paints are harmful to marine life and, through the food chain, to humans. It is essential to monitor and control systematically and, if need be, sanction the above described sources of pollution, according to the effective regulations of the Republic of Croatia.

Impairing the environmental quality is one of the possible disadvantages of the (excessive) development of nautical tourism, because:

- marinas are built in inadequate sites with regard to the natural features of the landscape (marinas Žut and Piškera within the Kornati archipelago – because this is a national park; Marina Šimuni – pollution of the bay due to poor sea water circulation; Marina Punat – due to overcapacity and confined bay; Marina Palmižana – due to deterioration of the natural environment, etc.);
- excessive anchorage moorings in the bays with poor water circulation (Telašćica – due to excessive anchorage areas, too many buoys at anchorages and too many vessels throughout the season, etc.);
- pollution of the sea and coastline because of excessive boating in particular sea areas (waste, bilge and faecal waters).[5]

It is presumed that an increase in the boating capacity would result in additional pollution in the areas where boating activities are concentrated. The existing marinas have the entire infrastructure that ensures operational functioning and pollution prevention in line with the highest international standards. However, the issue is that there are many vessels built before 2000, as well as many newer vessels, whose sewage system is arranged in the way that faecal waters are discharged directly into the sea.

4. SURVEILLANCE OF THE AREAS OF THE REPUBLIC OF CROATIA WHICH ARE ENVIRONMENTALLY SENSITIVE DUE TO BOATING BY USING ICT

[2] Article 5, par. 1, alinea 20 of the Maritime Code

[3] See the contents of the Convention in: Official Gazette of the Republic of Croatia – International treaties (Narodne novine – Međunarodni ugovori), No. 9/2000. The Convention came into force in 1994, and was amended by Agreement on the application of Part XI of The United Nations Convention on Law of the Sea. See the text of the 1994 Agreement in: International Legal Materials, 1994, vol. 34, No. 6, p. 1301.

[4] provided by ACI company

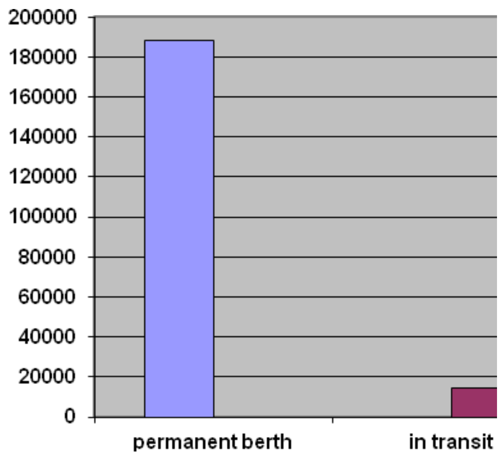
[5] http://www.hhi.hr/uploads/materials/SRNTH.pdf

Due to dense traffic of recreational boats, the Republic of Croatia does not have enough resources for monitoring all boats and protected areas with the purpose of preventing potential unwanted activities that are harmful to the environment (Graph 1). Other agents participate in the navigation safety system, including the coast guard, maritime police, Croatian Register of Shipping, Hydrographic Institute of the Republic of Croatia, and Plovput plc. The National Headquarter for Search and Rescue at Sea, comprising the Maritime Rescue Coordination Centre (MRCC) in Rijeka and the sub-centres (harbour master's offices and their branch offices) along the coast have been established for managing the system of ensuring the safety of navigation and coordinating search and rescue operations. Together with the coastal radio stations in Rijeka, Split and Dubrovnik, these offices maintain radio watch-keeping at internationally determined frequencies and channels dedicated for mayday, pan-pan and sécurité messages.

Table 3. SWOT analyses of nautical tourism in Republic Croatia

	Strengths	Weakness	Opportunity	Threats
	natural beauty, clean sea, indented coastline, numerous islands, favourable climate features, natural attractions (national and nature parks) biodiversity, preserved marine environment and seabed, non-urbanisation of coastal areas	confined sea, defective spatial plans, insufficient surveillance of environmental protection	sustainable development of nautical tourism, increase in the quality of service, possibility of enhancing the monitoring	unplanned development due to defective spatial plans, pollution of the sea, coastal areas and sea bottom
Coastal area of the Republic of Croatia	personal safety and safety of navigation, geographic position (vicinity of emitive markets), traffic connections / availability, associated tourism infrastructure (service industry), tradition of tourism industry, hospitality, skilled human resources, nautical infrastructure (ports of nautical tourism)	the Schengen regime towards the neighbouring EU countries, lack of berths, poor railway infrastructure, insufficient capacity of nautical ports (insufficient berths), lack of berths for larger yachts, services available in marinas, quality of basic and technical services in marinas, seasonal quality of the demand, inadequate waste management	accession to the EU, entering the unique market, increasing demand in tourism services - including nautical tourism services - across the world (increasing berth demand), trends in tourism (safe, nearby and easily accessed destinations, preserved nature, high health care standards), Croatia becomes an increasingly popular tourism destination, creating new markets, further improvement of traffic accessibility (building traffic infrastructure, low budget airliners, etc.)	uncontrolled development of nautical tourism resulting in losing the appeal of the tourism product, conflicts with other resource users (e.g. other forms of tourism, mariculture, fairways, etc.), pollution of the environment, overdeveloped coast, insufficient awareness of the need of preserving the environment and biodiversity, inadequate legislative, planning and other frameworks, political instability in the region, terrorism (in the surrounding regions), occurrence of new contagious diseases
	maritime tradition, higher maritime and tourism education, possibility to extend the existing large and small ports, spatial capacity for	insufficient education and lack of educational / professional institutions, discrepancies in regulations, administrative obstacles, inadequate	development of domestic boatbuilding, development of eco-tourism, increase in quality	disturbances in emitive markets, inappropriate privatisation

	constructing new nautical ports	categorisation of ports of nautical tourism, lack of cohesion among the elements of the system		



Graph 1. Ratio of total number of vessels at permanent berth to vessels in transit in the Republic of Croatia in 2011[9]

The yachts built after 1st January 2006 featuring heads with direct sewage discharge into the sea must be equipped with a tank for holding sewage waters and a discharge connector.
Pristine, "wild" coves and bays represent appealing brands of nautical tourism. Anchoring in pristine coves is, most often, free of charge. Therefore, reduced sojourn costs make this form of tourism even more attractive. However, most frequently, anchoring in deserted coves and bays lacks any supervision. The major problems stated in reports on inspection of the marine environment condition include garbage and sewage pollution, treating the issues associated with nautical tourism as less relevant.
The authors of this paper suggest that recreational and sports vessels should keep the ballast book, oil record book and waste management book so that the surveillance of sewage and waste waters can be more effective. Keeping such books would reduce the possibility of discharging harmful substances into the marine and aquatic systems.
Furtheromore, monitoring of the coastal area in the Republic of Croatia is considered insufficient, with regard to available resources and the indented coastline. Therefore, the Republic of Croatia should urgently impose regulations requiring all vessels that are registered for nautical tourism activities to install Automatic Identification System - AIS. Considering the price and features of these devices, it is suggested that the installation of the AIS Class B system, designed for smaller craft, would be an appropriate solution. The AIS Class B system does not provide a detailed insight into the vessel's features and navigation parameters as does the AIS Class A system, but it nevertheless provides enough information for monitoring purposes. The most relevant data include the name of the vessel (or its registration number), the size of the vessel and its position. The system allows data networking, thus increasing the possibilities of the monitoring which can be performed remotely. AIS monitoring is especially necessary in the areas affected by invasive algae, where anchoring is not allowed. Violation of anchoring restriction is a common phenomenon and the patrol boats of the Croatian coast guard are often not close enough to monitor all maritime violations.
The possible application of AIS technology in nautical tourism would not imply a significant increase in costs. The systems for ship monitoring (Vessel Tracing System - VTS) have already been using the same technology (Figure 4). Installing the device into a boat would cost no more than 1,000 USD per piece. Expectedly, the boat owners may oppose the introduction of the proposed device on account of their right to privacy. However, it should be pointed out that such systems have already been used onboard ships and, besides, privacy has been restricted in other aspects of life for quite a while, e.g. by installing video surveillance systems along the roads, in museums, shopping centres, airports, etc.

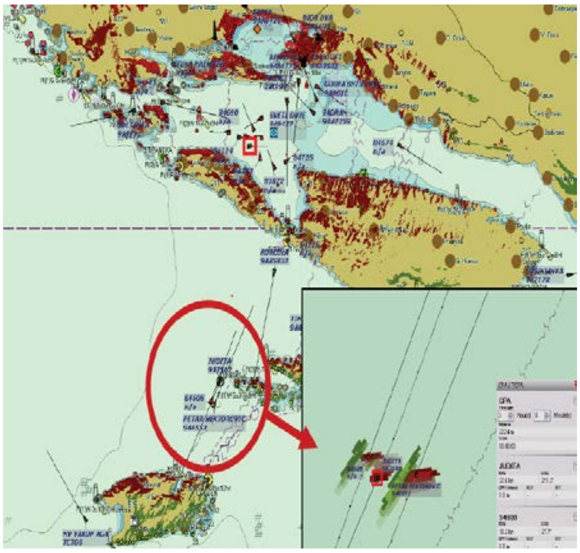


Figure 4. AIS operation within the VTS centre[12]

5. CONCLUSION

Croatian coast is suitable for the development of nautical tourism. Boaters visit Croatia because of its appealing coastline, numerous islands and preserved, non-urbanised bays and coves. It is necessary to protect the beauty of the nature that attracts the boaters and to enhance the quality of the vessel accommodation services, particularly in the ports of nautical tourism. Owing to the heavy traffic of recreational boats, the Republic of Croatia does not have enough resources for monitoring all vessels and protected areas in order to prevent activities that are likely to become harmful to the environment.

Therefore the Republic of Croatia should impose stricter regulations in line with the MARPOL convention, primarily the provisions applying to sports and recreational boats. By implementing a part of the MARPOL convention requirements on sports and recreational boats, the latter would be obliged to keep the ballast book, oil record book and waste management book. In addition, the authors of this paper suggest the introduction of the AIS technology onboard these vessels for the purpose of easier monitoring.

REFERENCES

1.http://bs.wikipedia.org/w/index.php?title=Datoteka:CaulerpaTaxifolia.jpg&filetimestamp=20060220204018

2.http://web.efzg.hr/dok/TUR/Web_Nautički%20turizam.pdf

3.http://www.antea.hr/pdf/usisne_stanice_za_crpljenje_kaljuznih_i_fekalnih_voda_sa_b.pdf

4.http://www.boatersland.com/rarpurasan.html

5.http://www.crs.hr/Portals/0/docs/hrv/brodice_jahte/Pravila%20za%20teh.%20nadzor%20brodica%20i%20jahti,%20dj.%202.pdf

6.http://www.dzs.hr/Hrv_Eng/publication/2011/04-04-05_01_2011.htm

7.http://www.hhi.hr/uploads/materials/SRNTH.pdf

8.http://www.mfe.govt.nz/publications/water/sewage-systems-for-boats-nov99.pdf

9.Narodne novine – Međunarodni ugovori (Official Gazette – International Treaties), 9/2000

10.http://www.izor.hr/kakvoca/kakvoca.html

11.www.aci-club.hr/

12.www.mmpi.hr

13.R. Zelenika, V. Vidučić: "Model razvitka nautičkog turizma u Republici Hrvatskoj do godine 2015" / "Model for development of nautical tourism in the Republic of Croatia by year 2015", in: Ekonomski pregled, 58 (9-10), pp. 522-544 (2007)

14.http://www.mppi.hr/default.aspx?id=9015

15.http://www.mppi.hr/UserDocsImages/ADRIA%20VTS.pdf

16.http://www.mppi.hr/UserDocsImages/STRATEGIJA%20%20BW%20HRVATSKE-final.pdf

17.Hydrographic Institute of the Republic of Croatia – HHI, Studija razvoja nautičkog turizma Republike Hrvatske (The study of the development of nautical tourism in the Republic of Croatia), Split, 2006, Croatia

BIOGRAPHIES

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INCREASING CONTAINER TRANSPORT CAPACITY AT THE PORT OF KOPER

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ABSTRACT

The Port of Koper, Slovenia's only port, contributes significantly to Slovenian economic health, and all the more so given the known multiplier effect of maritime businesses. The state of Slovenia is the largest shareholder and the future development of the port depends on decisions made by the Ministry of Infrastructure. The increase in container throughput in the Port of Koper requires absolutely a reconstruction and extension of the current container terminal. Regarding economic sustainability the extension must be in line with the estimated growth of traffic as well as with the exploitation of present and future terminal capacities. Expansion projects must fulfil environmental and safety requirements. Here special consideration of potential bottom wash activity will be further explained.

KEY WORDS
Shipping, NAPA, Port of Koper, Container vessels and terminals, Bottom wash, Simulation, Ship handling

1. INTRODUCTION

The ports of Koper, Trieste, Venice, Ravenna and Rijeka (NAPA – North Adriatic Ports Association) are located in the northern part of the Adriatic Sea, which penetrates deep into the middle of the European continent, providing the cheapest maritime route from the Far East, via Suez, to Europe. More than 100 million tonnes of water-borne cargo are handled in the NAPA seaports every year. Due to the tremendous variety of logistics services and the extensive traffic network, NAPA forms a perfect multimodal gateway to the key European markets. The near-by fifth Pan-European transport corridor provides a quick link to 500 million European consumers. Large commercial and industrial hubs like Vienna, Munich and Milan are just few hours drive away. The five entities combine their strengths in order to promote the northern Adriatic route and present themselves as an alternative to the northern European ports. In addition, the association anticipates cooperation in the development of maritime and hinterland connections, visits from cruise lines, environmental protection, safety and information technology. Perhaps the most phenomenal change has been the rapid increase in container traffic, which has increased almost exponentially in the northern Adriatic ports, on average 7% per year, though the rate has varied among ports [1].
The fastest growth of container traffic (Figure 1) was recorded at the Port of Koper, at an average of 14% per year; in Venice the growth was constant, while at Ravenna the traffic barely increased at all.

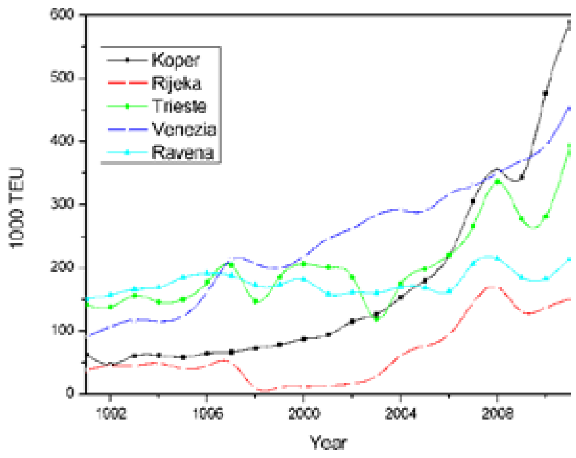

Figure 1. The evaluation of container throughput in NAPA ports during 1991-2011 (1000 TEUs)

The minimum throughput was and remains at the Port of Rijeka, which lost a great deal of traffic due to the state of war in Croatia; since about 2003 the increase in Rijeka's container throughput has been more in line with that of Koper, Trieste, and Venice. 2008 and 2009 – the worst years of the global economic and financial crisis – offer some interesting results. In Venice during this period, throughput kept steadily increasing by 5% per year; the other four ports experienced a decrease averaging 15%. The largest drop in traffic was recorded in Trieste, a decrease of more than 58,000 TEUs (17.5%), though by percentage Rijeka fared worse, declining at the rate of 22.5% (38,000 TEUs less). We performed the shift-share analysis proposed by Notteboom [2]. In this analysis we include absolute growth of container traffic ABSGR and the share effect among ports. The calculation is based on the following formulas

$$ABSGR_k = TEU_{k1} - TEU_{k0} \qquad (1)$$

$$SHARE_k = \left(\frac{\sum_i TEU_{i1}}{\sum_i TEU_{i0}}\right) \qquad (2)$$

Results of the calculation are displayed in Figure 2, which shows that the port of Koper has by far experienced the largest absolute growth and shift in the region. All other ports have oscillations. The most unpleasant situation is at the port of Ravenna.

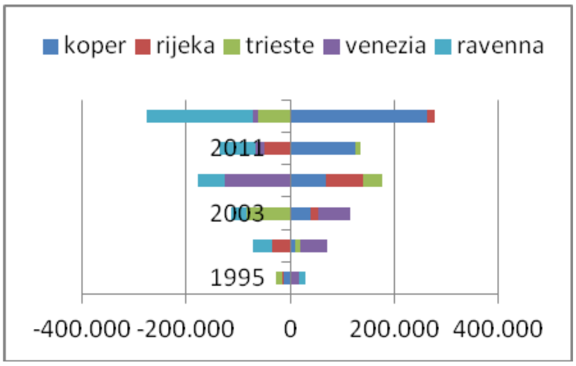

Figure2. The evaluation of the shift shares in NAPA ports (1991-2011)

Although the total container traffic in the northern Adriatic ports increased in recent years it still represents a negligible proportion in total throughput of the European ports. The data indicate that container traffic in northern Adriatic ports in the European Common throughput shows a slight increase – in 2008 it was 1.6 percent and it amounted to almost 2 percent in 2011. In the proportion - the throughput of all North Adriatic ports present just 15.2 percent of the throughput, which has created Europe's largest port Port of Rotterdam in 2011.

2. MEANS FOR INCREASING CAPACITY

The trend in the shipping market is an increase in orders of ships of over 7500 TEUs, which is why the Port of Koper began to further develop the infrastructure in its container terminal. Significant financial investments in the extension of the container shore, expansion of storing space and the purchase of specialized transport equipment paid off during the increase in transport (despite the global crisis) in the year 2010. The quantity of transported containers has reaching enviable numbers. This very success though, has at the same time created a problem. The growth of container throughput in the Port of Koper is at the limit of the capacity for the existing container terminal. Therefore, it is necessary to start construction on a new container terminal and reconstruction and extension of the current container terminal. The extension is in line with the estimated growth of traffic as well as with the exploitation of present and future terminal capacities. New projects and potential investments are important steps for the development of the Port of Koper, enhancing its performance and increasing its market share. The figure below (Figure 3) shows large container vessel berthed at the container terminal (berth 7C). Because of limited channel depth the maximum draft for such vessels is 11.6 m. alongside the existing terminal.

Figure 4 shows the traffic density in the area of the Port of Koper. AIS based tracks clearly identify anchorage positions, where characteristic ellipses show movement of the ships as affected by tides.

Figure 3. Container vessel on limited draft alongside the existing terminal

3. BOTTOM WASH

Among the many environmental issues concerning transport, one that seems to be largely overlooked is that of re-sedimentation, the effect of maritime vessels on the sea bottom - particularly, of course, in and near ports. The Gulf of Trieste is a semi-enclosed gulf in the north-eastern part of the Adriatic Sea, a shallow water area with an average depth of 16 m and a maximum depth of 25 m. This shallow area is subject to special pollution consideration related to bottom wash phenomena. There is a high mercury concentration in the subaqueous sediment which rises into the sea column while ships are manoeuvring.

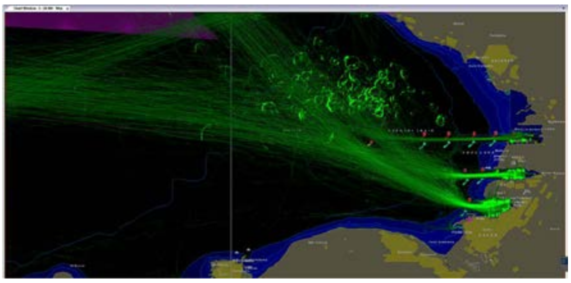

Figure 4: Traffic density (01-03 2011)

This sediment cloud (smaller particles) is then moved by currents for several hours before re-sedimenting, which has a nefarious effect on the aquatic food chain. The process of bottom wash is basically a function of the size, type and speed of propeller, vessel speed, sub-propeller clearance sediment conditions. It is obvious that the process is dynamic; continuously changing vessel position results in variable bathymetry and vessel/tug propulsion. This process can be simulated and compared with actual manoeuvring results where telegraph recording data is collected together with vessel dynamics.

3.1. Model and some results

As a vessel moves, the propeller produces an underwater jet of water. This turbulent jet is known as propeller wash, or bottom wash (or propwash). If this jet reaches the bottom, it can contribute to re-suspension or movement of bottom particles. Velocity distribution behind the propeller is, for fully developed turbulent flow, given by Albertson et al., 1950 [3]:

$$\frac{v_x}{v_0} = \frac{1}{2\xi} exp\left(1 - \frac{\rho^2}{2\xi^2}\right) \quad \left(\xi > \frac{1}{2}\right) \qquad (3)$$

where

$$\xi \equiv \frac{C_1 X}{D_0} \quad \rho \equiv \frac{r}{D_0} \quad (r^r = z^2 + y^2) \qquad (4)$$

and v0 is initial velocity, D0 propeller diameter, C1 empirical constant and x, y, z are coordinates. The maximal velocity at a given ρ is obtained from the condition

$$\frac{d}{d\xi}\left(\frac{v_x}{v_0}\right) = -\frac{\xi^2 - \rho^2}{2\xi^2} exp\left(-\frac{\rho^2}{2\xi^2}\right) = 0 \qquad (5)$$

so

$$\xi = \rho$$

and maximal velocity is

$$\frac{v_{x,max}}{v_0} = \frac{1}{2\rho} exp\left(-\frac{1}{2}\right) \qquad (6)$$

At the bottom we have $\rho = \frac{h}{D_0}$ therefore

$$\frac{v_{b,max}}{v_0} = \frac{e^{-1/2}}{2h/D_0} \approx \frac{0.303}{h/D_0} \qquad (7)$$

In Propeller Wash Study (Moffatt & Nichol, 2005) [4] the maximal bottom velocity is given by

$$\frac{v_{b,max}}{v_0} = \frac{\alpha}{h/D_0} \qquad (8)$$

Where α is 0.22 for open propellers and 0.3 for ducted propellers.
To simulate the berthing procedure we used an advanced ship handling simulator [5], [6], obtaining the data/parametrs described by equation 7.

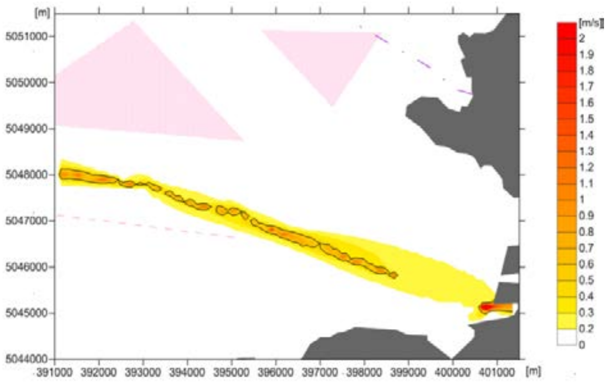

Figure 5. Bottom velocity streams

Ship position, dynamics and tug forces were recorded with a time resolution of one secon. Data were stored and used for the bottom wash model where velocity streams are calculated for the sea bottom level. Figure 5 shows propeller jet streams at the sea bottom for the approaching manoeuvre of the existing container carrier vessel calling at the container terminal. Wherever bottom velocity streams exceed 0.5 m/s some re-sedimentation is expected. Further modelling must be done to calculate the total amount of sediment transport divided further into bed-load, suspended-load and wash load, analysed separately for approaching and departure manoeuvres.

At any rate the next two figures demonstrate that there will be no major increase of re-sedimentation for large container vessels calling at the Port of Koper. Installation power of main engine will increase by 10%, but when analysing bottom wash at zero speed (when the vessel is on stop and start to accelerate, maximum wash is expected) with telegraph command ordered to "Slow Ahead" propulsion power is equal 2.803 kW for larger container carrier compared with 2.545 kW for existing vessel. The main hull and propulsion particulars are described with table 1.

Table 1. Main particulars of planed and existing container vessels calling Port of Koper

Displacement	132.540 t	120.000 t (estimated)
Engine power	60.950 kW	54.853 kW
Service speed	22.8 knt	25.0 knt
Length o.a.	346.98 m	318.20 m
Breadth m.	42.80 m	42.80 m
Draft	14.00	14.00 m (limited to 11,6 m)

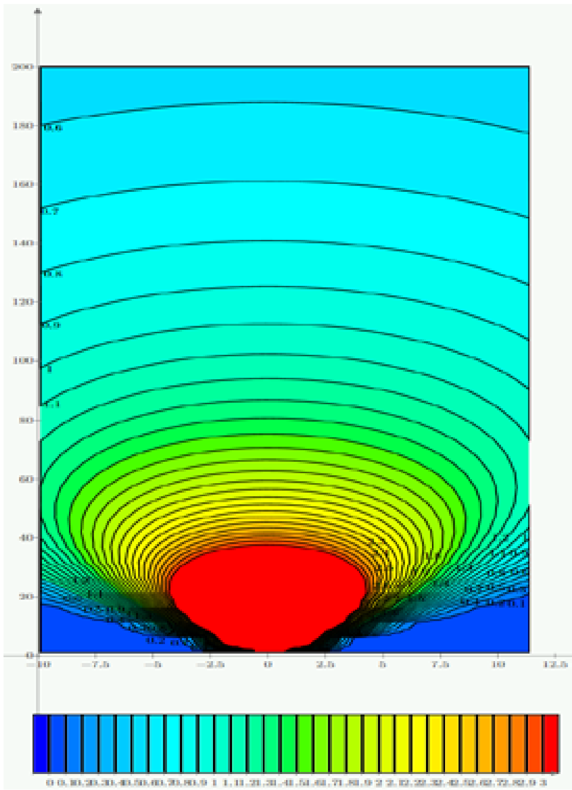

Figure 6. Velocity streams for planed container carriers

Figure 6 shows the axial and vertical velocity streams, where the left edge of the image represents the water surface, while the right edge is the sea bottom margin. The image shows the velocity streams of the studied vessel where the shaft line is -9.9 m under the sea surface and 11.4 m above the sea bottom while the existing vessel has 2.4 meters smaller draft (limited vessel draft of 11.6 m comparing to 14 m draft after the dredging). The studied sea depth is 21.3 m. Figure 7a and 7b show the bottom velocity streams in the axial direction. The main difference in bottom velocity streams between existing (figure 7b) and larger container carriers (figure 7a) is mostly due to the increase of the vessel draft. Again such increase is minor; maximum speed at bottom will increase only by approximately 0.2 m/s.

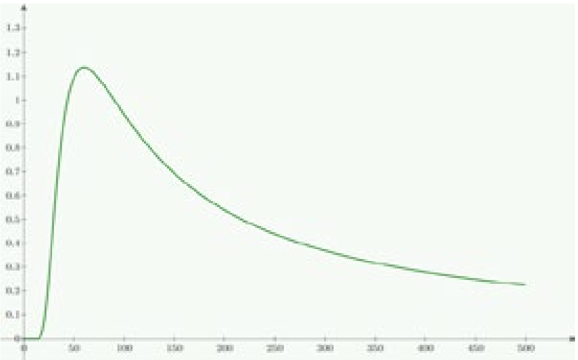

Figure 7a. Bottom velocity streams for planned container carriers

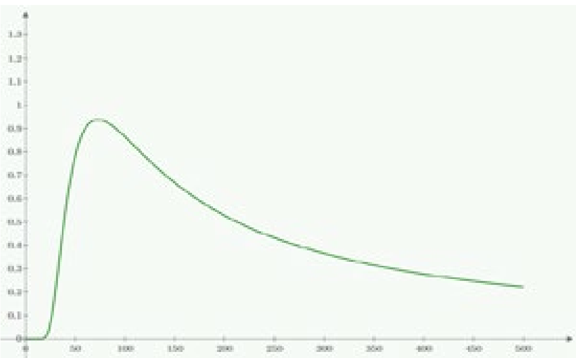

Figure 7b. Bottom velocity streams for existing container carriers

4. CONCLUSIONS

The Port of Koper intends to increase their cargo operations from the current 16-18 million tons to 30-40 million tons in five to ten years, doubling the cargo capacity, so more or less doubling the potential number of vessels calling. Containers continue to increase their share of shipping visits; Ro-Ro's, another intrusive vessel type, continues to accommodate an increasing traffic in automobiles; and passenger vessels are growing in size while ports strive to expand to accommodate this increase. For each alteration at the precise point where the land meets the sea at a port, a number of considerations are likely to arise. Concern is expressed here regarding potential environmental harm. Not for the first time, we demonstrated that ship handling simulators can help reconstruct real domain thrust conditions in a variety of circumstances. The environmental factor is one that does not seem to attract much research as of yet – the effect of vessel manoeuvres in and near ports in regard to bottom wash and re-sedimentation. The effects of current shipping trends on the sea bed must be understood with a long term view to eliminating environmental damage, in this case particularly as it may affect cross-border sedimentation.

ACKNOWLEDGMENTS

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REFERENCES

1.North Adriatic Ports Association, http://www.portsofnapa.com/about-napa

2.Notteboom, T., "Concentration and load centre development in the European container port system" Journal of Transport Geography, Vol 5, (1997), pp. 99-115

3.Albertson, N., Dal Y., Jensen, R., Rouse, H.. Diffusion of Submerged Jets ASCE Paper No. 2409, (1950).

4.Moffatt & Nichols. Propeller Wash Study. Kitimat LNG Import Terminal, MN Project No. 5499, (2005).

5.NTPro 5000 technical manual, NTPRO – Navigational simulator, Transas ltd http://www.transas.com/products/simulators/sim_products/navigational/

6.Marko Perkovic, Milan Batista, Vlado Malacic, Dusan Zagar, Stefan Jankowski, Lucjan Gucma, Maciej Gucma, Dmitry Rostopshin, "Bottom Wash Assessment Using a Full Mission Ship Handling Simulator", MARSIM 2012 Proceeding, Singapore, May 2012, pp. 10.

MARINE DIESEL ENGINES AND TURBOCHARGERS DIAGNOSTICS

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ABSTRACT

Diagnostic and tuning methods which could be used on marine diesel engines and their turbochargers are presented in this paper. Vibro-acoustic signals generated by fuel injectors, valve gear mechanisms and rotors of turbochargers together with special signal processing are also described in the paper. Conventional diagnostic methods for engine fuel injection system and valve gear mechanism depends on injection timing checks and injectors technical condition assessment, on valve clearance checks and valve timing diagram checks on crankshaft flywheel. Conventional maintenance methods for engine turbochargers depend on bearings clearances checks. Some parts of turbochargers have to be checked on special stands or by using endoscopic methods. The presented methods are based on vibration signals analysing in crankshaft revolution angle domain or in frequency and time domain. Using this methods checking angle of fuel injection, timing in valve gear mechanism or technical condition of turbocharger without stopping the engine and dismantling it is possible.

KEY WORDS
Marine diesel engine, diagnostics, tuning, fuel injector, valve gear, turbocharger.

1. INTRODUCTION

Marine high-speed diesel engines type A which were built on former SULZER (now Wärtsilä) license are very popular units in European fleets as an auxiliary on big ships and as main engines on smaller vessels. Checking and tuning of the fuel injection valve timing and exhaust or inlet valve clearance is a common practice in these and similar marine diesel engines. From small engines up to the largest 2-stroke units some regulations and tunings are necessary after repair works, and in normal use, after period of time given by the manufacturer. Such maintenance works are time consuming and sometimes extort partial engine dismantling. In a marine practice are known situations when technical condition of maintained mechanism is worse than before overhaul. Cost lowering tendency in engine maintenance schedules and unmanned vessel's propulsion plants require new approach to these outdated and "reliable" procedures. One of the ways to solve these problems could be using vibro-acoustic diagnostic methods.

The presented diagnostic methods were implemented on high-speed marine diesel engines SULZER type A25/30 and type A20/24 in the Polish Navy. The diagnostic methods use for fuel and valve gear mechanisms are based on the envelope of vibration acceleration signals analysis in crank angle domain. The conventional maintenance methods for valve gear mechanism of

the engine depend on valve clearances checks between valve stem and rocker arm and valve timing diagram checks on crankshaft flywheel. For many years technical condition assessment of ship diesel engine and its turbocharger has been done by engine compartment crew. At present, ship-owners most frequent outsources it in specialized companies. It is due to lack of proper qualification among crewmembers, sometimes due to ship-owner strategy focused on ship maintenance costs cutting. In some newest types of engines and turbochargers it is impossible to repair them on board the ship as it was in the past. In this paper complex engine and turbocharger diagnostic method which is used in Polish Navy is presented. The method based on wide range of different type diagnostic technics which are not always common especially as it is concern to use vibration signals for diagnosing.
Since the technical condition of the turbocharger is strictly dependent on the engine condition, one should first make sure of the correct operation of an engine as whole system and each engine cylinder systems separately. The best diagnostic method in this field is combustion processes evaluation under inside-cylinder pressure waveforms. Turbocharger rotor and bearing system technical condition assessment based on vibration signal parameters analysis and finally verified by turbocharger flow channels endoscopic examination. The paper presents the chosen technical diagnostic results of two diesel engines SULZER family A (Table 1) with turbochargers type PDH-35 installed on main propulsion engines and two turbochargers type C–045/C installed on auxiliary engines onboard navy vessel during sea trials.

2. OBJECTS OF THE RESEARCH

This paper presents chosen results of tests carried out on SULZER 8AL25/30 type main engines with the PBS Turbo type PDH-35 turbocharger installed and on SULZER auxiliary engines type 6AL20/24 with NAPIER C-045/C type turbochargers installed. Engines basic technical data are shown in Table No. 1. The test apparatus used in the tests consisted of an engine analyzer built in Polish Naval Academy [3,4,5,6,7,8,9,10]. Turbochargers vibration parameters were acquired using SVAN 946A vibration analyzer. Endoscopic examinations of turbochargers were made by using a set of OLYMPUS fiberscopes and bore scopes.
Both tested engines types were high-speed marine diesel engine in line form, 4-stroke turbocharged with direct fuel injection. Fresh water in closed circuits is used in engine cooling systems. Fresh water itself, lubricating oil coolers and air coolers are cooled by sea water.

Table 1. Basic data of SULZER diesel engines type 8AL25/30 and 6AL20/24

Engine type	SULZER 8AL25/30	SULZER 6AL20/24
Turbocharger license/type	PBS Turbo/ PDH-35 type	Napier / C–045/C type
No. of cylinders / Configuration	i=8 / „ L”	i=6 / „ L”
Cylinder nominal output at 750 rpm	Pcn= 140 kW	Pcn= 70 kW
Cylinder bore	D= 250 mm	D= 200 mm
Piston stroke	S= 300 mm	S= 240 mm
Compression ratio	ε= 12,7	ε= 12,7
Total displacement volume	Vss= 117,7 dm3	Vss= 45,2 dm3
Mean piston speed	cśr= 6 m/s	cśr= 6 m/s
Effective specific fuel consumption	ge= 212 g/kWh	ge= 212 g/kWh
Number of valves per cylinder	z= 4	z= 4
Fuel injection pressure	pw= 24,5 MPa	pw= 24,5 MPa

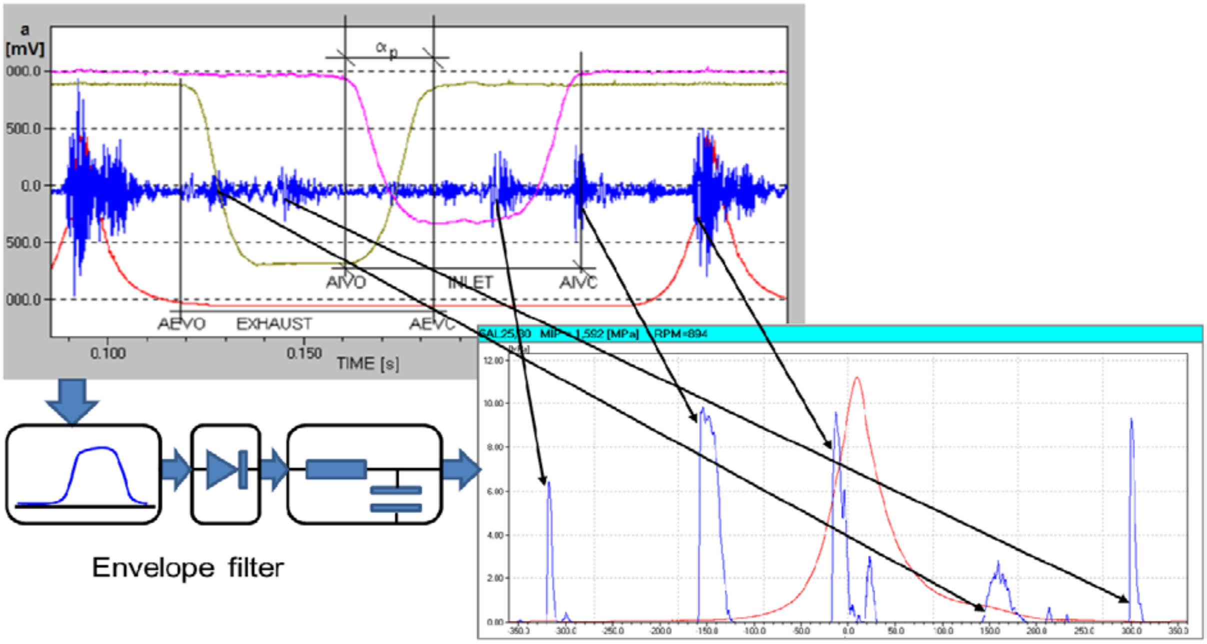

Figure 1. Schematic illustrating how the transposition of the vibration signals in the time domain corresponding to the angular engine cycle[8]
αp - the dynamic angle of valves overlap, AEVO - the dynamic angle of the exhaust valve opening, AEVC - the dynamic angle of the exhaust valves closing, AIVO - the dynamic angle of the intake valve opening, AIVC - the dynamic angle of the intake valve closing

3. FUEL INJECTION VALVE AS A SOURCE OF VIBRATION SIGNAL

Fuel goes through the high-pressure system is a source of noise and vibrations. Moving parts of the high-pressure pumps and fuel valves are source of impacts which may be observed as displacements, velocity and accelerations of the vibrations. Fuel valve needle up and down movements' coincide with sharp impacts on the fuel valve main body and needle seat. To get such signals from working injectors the vibration sensor should be installed directly on the injector or very close to it.
If the whole fuel delivery system works properly two sharp and strong vibrations' signals – picks – created by the fuel valve needle are usually observed in crankshaft angle domain (Figure 1), but when jamming or other malfunction occurs the signal pattern is changed. Information about fuel valve needle moving, period of fuel delivery which correlates with fuel quantity, are especially valuable.

4. VALVE GEAR MECHANISM AS A SOURCE OF VIBRATION SIGNAL

Valves strikes in valve seats during valves closing and rocker arms strikes in valve stems when they are being opened could be observed in time or angle domain. (as it is seen in upper part of figure 1) Observed signals give information about valve gear mechanism timing, technical condition of valve seats, valves' steams, and other elements. In big 2-stroke diesel engines which have one hydraulically open exhaust valve, vibration sensors might be connected to the cylinder heads. Mass of valves in such engines and cylinder head dimensions are big enough to effortless signal selection. It looks quite different in small high-speed engines where more than one or two valves per cylinder are installed. For example, in SULZER type 8AL25/30 and 6AL20/24 engines (at 750 rpm) one cycle (two crankshaft revolutions – 4-stroke engine) takes only 0.16 second. Vibration signal from sensor connected to the cylinder cover

bolt is strongly disturbed by vibration processes in other cylinders and engine mechanisms.
To find out which impact is caused by valve gear mechanism sometimes additional sensors (for example rocker arms lift sensors) are necessary as it is upper part of Fig. 1. For the non-stationary signals generated by the diesel engine the frequency content varies with a time and in this case time-frequency or angle-frequency analysis tools should be used.

5. VIBRATION METHOD USED TO ASSESS TURBOCHARGER TECHNICAL CONDITION

In order to assess technical condition of turbochargers on the basis of engine performance parameters engines are usually introduced in a specific load conditions which are involved by vessel and weather external conditions. Close to the rated load the turbochargers rotors speeds, charging pressures, charge air temperatures and other parameters are read-out and recorded. The values obtained are compared with the values of parameters sets taken from engines acceptance tests. To determine the engines load indicated power are measured using electronic engine analyzer [10] which measuring capabilities presents selected indicator diagrams recorded during the tests and shown in figure number 4 and aggregated engines parameters in table no 2 and in “bar” form in figure no 5.
Vibration parameters were measured on both compressor and turbine sides of turbochargers on main engines and on central bearing housing on auxiliary engines. According to technical specifications of turbocharger manufacturers values of the vibration level on bearing casing are the one of the most important diagnostic parameters.

Figure 2. PBS Turbo PDH-35 type axial-flow turbocharger on SULZER main engine type 8AL25/30

Figure 3. NAPIER C-045/C radial-flow turbocharger on SULZER auxiliary engine type 6AL20/24

6. INVESTIGATIONS AND TESTS RESULTS

Tests results presented in this paper were acquired during 2011 winter vessel tests. Tested vessel has two main engines and two auxiliary engines which are called "high-speed” marine diesel engines in branch literature. The biggest vibration signal observed on the upper part of the figure 1 comes from the combustion process in cylinder on which vibration sensor is mounted. This typical vibration signal has periodical character, which is strongly influenced by vibration source distance to the sensor. Other vibration signals come from the rest of cylinders. To find proper signal one have to use many different signal processing methods such as time selection, synchronous averaging, frequency and spatial selection. Sensor location and sensor fitting methods are important too. The closer to the signal sources the better for signal amplitude and quantity of information carrying by the signal. If it is possible sensors should be mounted directly on cylinder heads or valve housings. Elastic, thin engine and cylinder covers are the places that should be avoided during the sensor montage. Fitting sensors by screw-in bolts or clamp bolts secure high frequency signal components transmission. Magnetic or stick sensor fitting methods give big losses in signal spectrum. Acquired signals might be pass across the frequency window analyzer function to cut out some of the disturbed parts of the signals. For better understanding of the method during the laboratory tests except cylinder pressure and vibration signals additionally valves lift were observed (upper part of Fig.1) on similar engine.

It is not easy to select signals generated by working valves or fuel injectors because they are very short and not as strong as signals generated by combustion processes. Impulses from the other cylinders could be coincident and easy cover weak signals making them almost invisible. Another characteristic symptom of such diagrams is that impulses which accompany the valve closing are a little bit stronger than valve opening signals. When vibration sensors are correctly chosen, when places of their location are proper and if they are sensitive enough one may observe, register and estimate valve gear mechanism timing diagrams. Using proper method of signal filtration one can observe dynamic valve gear mechanism timing diagram. Dynamically estimated angles of intake exhaust valve closing and openings are different to that given in engine manual. These angles are usually determined in static conditions. Because of that special database to prophylactic engine controls has to be created within preliminary tests. Dynamically measured exhaust and inlet valves opening and closing angles are determined by engine speed and rating. Taking into account that maintenance works may be taken in different load conditions; date base should contain broad spectrum of the measured parameters.

- Analyzer built in PNA gives opportunity to measure such engine

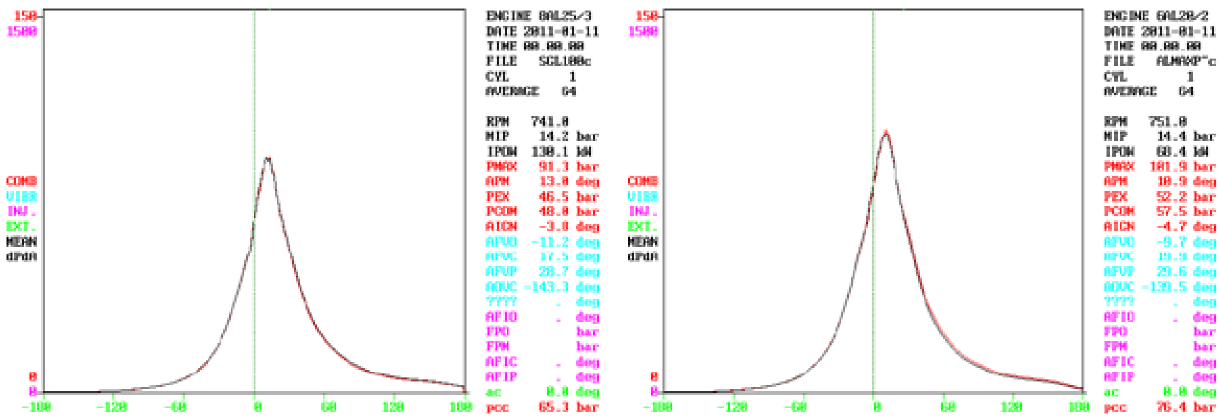

Figure 4. Chosen engine cylinder pressure diagrams with other parameters for close to rated power load – main engine type 8AL25/30 - left, - auxiliary engine type 6AL20/24 - right

Table 2. Walues of measurered and calculated parameters for separate cylinders of marine diesel engine 8AL25/30 – engine load index = 6,8

CYL NO	MIP [bar]	IPOW [kW]	PMAX [bar]	PEX [bar]	PCOM [bar]	AIGN [deg]	AFVO [deg]	AFVC [deg]	AFIP [deg]	AOVC [deg]
Cyl. 1	15.7	144	95.0	50.5	49.3	-3.3	-9.8	18.9	28.7	-148.5
Cyl. 2	15.6	143	94.9	49.8	49.0	-3.2	-11.2	18.2	29.4	-149.8
Cyl. 3	17.3	158	98.5	53.4	48.9	-1.8	-8.9	20.4	29.3	-148.0
Cyl. 4	15.9	146	96.0	50.2	49.0	-3.6	-10.6	17.2	27.8	-145.9
Cyl. 5	15.9	145	90.5	49.8	48.6	-3.0	-9.5	20.5	30.0	-151.2
Cyl. 6	14.6	133	89.8	45.6	47.6	-7.5	-15.4	13.7	29.1	-154.5
Cyl. 7	15.5	142	92.5	49.3	49.3	-3.1	-11.2	18.0	29.2	-147.3
Cyl. 8	15.2	139	95.8	47.2	48.0	-6.4	-14.1	14.9	29.0	-154.4
MEAN	15.7	143	94.1	49.4	48.7	-3.9	-11.3	17.7	29.0	-149.9
D +	1.6	15	4.4	4.0	0.6	2.1	2.4	2.8	1.0	4.0
D –	1.1	10	4.3	3.8	1.1	3.6	4.1	4.0	1.2	4.6

Remark! Commpression pressure (PCOM) determined for angle 7,50 CA (Crank Angle) drgree befor TDC.

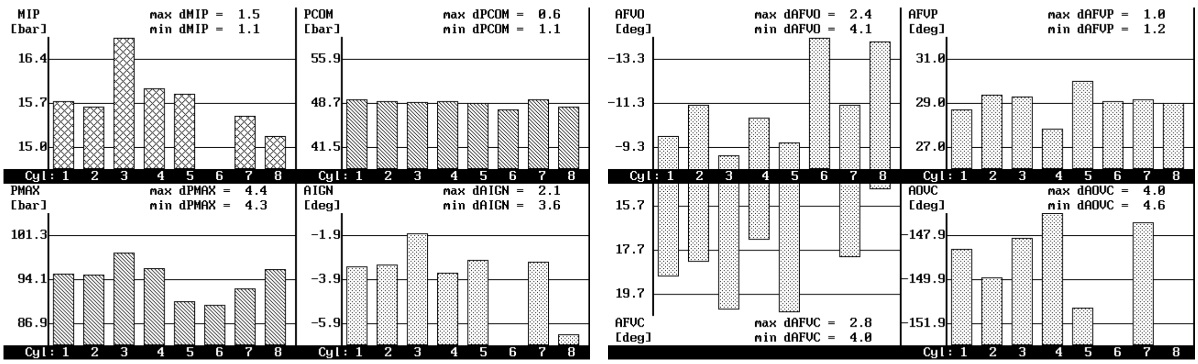

Figure 5. Bar diagrams of chosen measured and calculated parameters walues for separate cylinders – engine load index = 6,8

parameters as mean indicated power (MIP – figure 4 and 5 and table 2), indicated power (IPOW), maximum cylinder pressure (PMAX), pressure of expansion (PEX) 36 degree after TDC, compression pressure (PCOM), angle of ignition (AIGN), angle of fuel valve opening (AFVO) taken from vibrations signal, angle of fuel valve closing (AFVC), angle of fuel injection period (AFIP) and chosen intake and exhaust valves angles. Measurements were made for both main engines and with engines load and turbochargers speeds ranges dependent on vessel operation mode. Engines crankshaft speed have been changed from 400 rpm to 750 rpm and engines load from idling (engine load index = 1,2) to engine load index = 6,3/6,8. Turbochargers speeds varied from about 3300 rpm to about 19600 rpm (Table no 3). Per analogy measurements were made for both auxiliary engines and their turbochargers but with constant speed equal 750 rpm and dependent on vessel electric installation mode.

Table 3. Values of turbochargers chosen vibration parameters – Main Engines – portside/starboard

Engine speed	rpm	400	550	750	750
Engine load index	[-]	1,2/ 1,7	1,5/ 1,9	4,8/ 5,2	6,3/ 6,8
Basic frequency	Hz	63/ 56	91/ 92	236/ 273	315/ 327
Turbocharger speed	rpm	3780/ 3360	5460/ 5520	14160/ 16380	18900/ 19620
Vibration acceleration [I harmonic] compressor side	m/s2	0,10/ 0,32	0,10/ 0,20	1,22/ 0,24	6,53/ 2,69
Vibration acceleration [I harmonic] turbine side	m/s2	0,11/ 0,10	0,12/ 0,16	1,33/ 0,49	6,38/ 6,17
Vibration acceleration [RMS]	m/s2	4,5/ 3,4	12,3/ 10,0	27,9/ 24,8	34,7/ 24,3

For main engines values of vibration acceleration of I-th harmonic on both sides of tested turbochargers are lower than 10 [m/s2] which mean that turbochargers rotors and bearing systems are in good technical conditions (table 3 and 4 and figure 10).

For auxiliary engines vibration parameters were measured in one point on turbocharger bearing casing between compressor and turbine casing. Values of vibration acceleration of I-th harmonic on both tested turbochargers are also lower than 10 [m/s2] which mean that turbochargers rotors and bearing systems are in good technical conditions.

Table 4. Values of turbochargers chosen vibration parameters – Auxiliary Engines – Generator no 1/no 2

Engine speed	rpm	400	750	750
Engine load index	[-]	2,7/ 2,8	4,3/ 4,6	6,0/ 6,3
Basic frequency	Hz	173/ 169	358/ 365	536/ 565
Turbocharger speed	rpm	10380/ 10140	21480/ 21900	32160/ 33900
Vibration acceleration [I harmonic]	m/s2	0,13/ 0,16	0,67/ 0,72	0,76/ 2,43
Vibration acceleration [RMS]	m/s2	2,0/ 2,7	21,9/ 20,2	20,9/ 31,6

For final check of technical conditions of the turbochargers endoscopic examination methods are used which chosen results for main and auxiliary engines' turbochargers are shown in the figure 6 to figure 9.

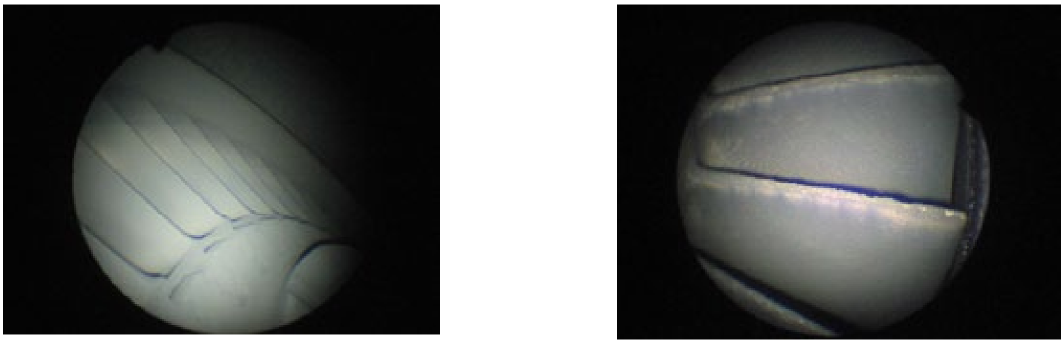

Figure 6. Turbine (left) and compressor (right) wheels - Main Engine – portside

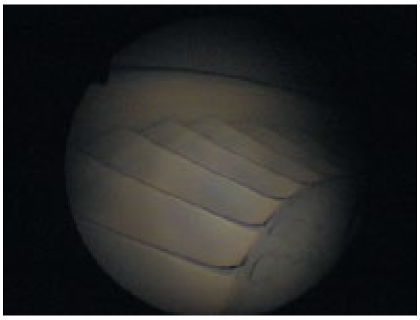 

Figure 7. Turbine (left) and compressor (right) wheels - Main Engine – starboard

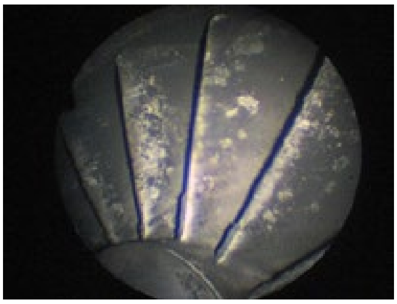 

Figure 8. Turbine (left) and compressor (right) wheels - Diesel Generator No 1

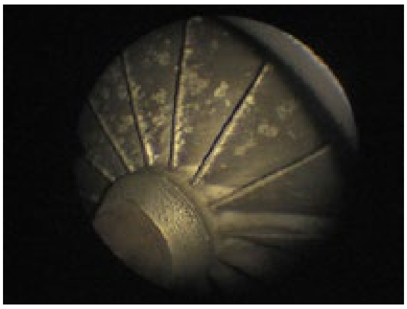 

Figure 9. Turbine (left) and compressor (right) wheels - Diesel Generator No 2

7. CONCLUSIONS

Diesel engines technical condition assessment is a very complex process. Most of the malfunctions and troubleshooting in diesel engine installations are generated by fuel system, valve gear mechanism and turbochargers. There are some tools available in signal analysis which gives opportunity to trace changes in signal patterns in real time online monitoring systems. Vibration signals processing methods seems to be effective in marine diesel engines diagnostics. Presented vibration methods gives opportunity to change the whole engine maintenance philosophy connected with marine diesel engines maintenance process. It is possible using on-line or off-line vibration monitoring systems to go from scheduled to condition based engines maintenance without fear about real operating engine conditions. Due to a new diagnostic methodology developed at the Polish Naval Academy, it is possible to measure and register the vibration parameters generated by a high-speed marine diesel engines and use this information for diagnostic purposes of the fuel injection system, valve gear mechanisms and turbochargers.

So-called "dynamic" tuning parameters of high-speed diesel engine were successfully implemented for SULZER type A engines family. Although there are considerable differences in "static" and "dynamic" engine timing parameters this method could be useful for engine tuning and diagnostic without stopping the vessel. Such non-stop methods when used systematically in year-by-year marine engine inspections could be effective for adapting of cost lowering Condition Based Maintenance [1,2] strategy.

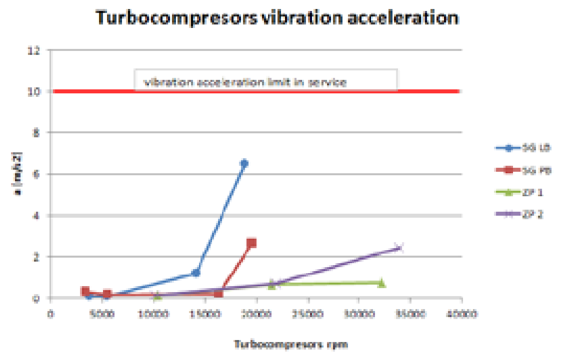

Figure 10. Vibrations acceleration amplitudes measured in service – Ith harmonic measured on turbochargers bearing casing versus turbocharger rpm – SG LB (blue line) – main engine portside, SG PB (red line) main engine starboard, ZP 1 (green line) - Diesel Generator No 1, ZP 2 (violet line) - Diesel Generator No 2

REFERENCES

1.M. Bengtsson., Condition Based Maintenance System Technology – Where is Development Heading?, Euromaintenance 2004 – Proceedings of the 17th European Maintenance Congress, 11th – 13th of May, (2004) AMS (Spanish Maintenance Society), Barcelona, Spain, B-19.580.

2.T. Klockars., A. Eykerman, I. Mayr, Making the most of perfect maintenance timing, indetail, Wärtsilä Technical Journal (01.2010) pp. 57-60, Finland.

3.T. Lus., Vibro-acoustic methods in marine diesel engines diagnostics, Journal of KONES Powertrain and Transport, Vol. 18, no. 3 (2011) 203-210.

4.T. Lus., Tuning method for high-speed marine Diesel engine MB820 type. Journal of KONES POWERTRAIN AND TRANSPORT 2010 Vol.17, No2, 277-284, Warszawa, 2010 ISSN 1231-4005

5.T Lus., Marine high-speed reciprocating internal combustion engines investigations using envelope vibration method, 38th International Scientific Congress on Powertrain and Transport Means European KONES 2012, Journal of KONES POWERTRAIN AND TRANSPORT 20112 Vol.19, No3, 263-269,WARSAW 2012,

6.T. Lus., Vibration signals as a tool for diesel engine diagnostics and tuning. 13th EAEC European Automotive Congress Valencia, 13-16 June 2011 2011, s.8;

7.T. Lus., Marine diesel engines turbochargers diagnostic methods, XI International Technical System Degradation Conference, Liptovsky Mikulas, 11-14.04.2012. PW. CZASOPISMO „Diagnostyka" – Applied Struktural Health, Usage and Condition Monitoring" , 3 (63)/2012, str. 49-54.

8.T. Lus, M. Łutowicz, J. Listkowski., Diagnostic investigations of diesel engine turbochargers during ship see trails, AGRICULTURAL ENGINEERING Research papers 44 (1,2,3) Kaunas, Akademija, 2012, ISSN 1392-1134, pp 24-33

9.T. Lus, M. Łutowicz., Marine diesel engines diagnostics.Research Papers of Lithuanian University of Agriculture 2010 Vol 42, no 2-3, str. 8

10.St. Polanowski, T. Lus., Monitoring and diagnostic systems of marine diesel engines, 9th TC-10 IMECO Conference, Wrocław, (1999) 9pp.

BIOFUELS IN SHIPPING

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ABSTRACT

The dependence of humanity on non-renewable resources, mainly fossil fuels, makes a major problem worldwide. There are global efforts in finding economically acceptable alternative fuel that would greatly reduce the emission of harmful pollutants and GHG into the atmosphere. Ships use low quality fuels with high carbon content producing large amounts of CO2. As an alternative option biofuels can be considered in near future. Biofuels are environmentally friendly and carbon neutral. Bioethanol and biodiesel have taken their positions at the shipping market as a biofuels that can be delivered through the existing infrastructure of conventional fossil fuels and can be used in existing internal combustion engines without major modifications. Biofuels are still in development and in fact, it should be determined all consequences of their use that may have on the global level. In this paper will be presented data mainly provided by marine engine producers, MAN B&W Diesel and Wärtsila, in connection with use of biofuels as potential marine fuel.

KEY WORDS

marine industry, ships, fuel, biofuel.

1. INTRODUCTION

World's petroleum supplies are facing uncertain futures and are becoming constrained. Therefore, attention has been directed to find out alternative sources of fuels. To sustain energy security and renewable source of clean fuel must be sought expeditiously. Biomass sources have attracted much attention as an alternative energy source. They are renewable, non-toxic and can be produced locally from agriculture and plant resources. The prospects for biofuels are very promising in the short term because of their availability and sustainability. As renewable sources of energy they have favorable impact on the environment and they can replace fossil fuels for use in transportation engines.

IMO recognizes the growing importance and need to limit the emission of greenhouse gases that originate from marine engines and it is determined to deal with this problem. In July 2011, MEPC adopted a new chapter of Marpol Annex VI, which includes a suite of mandatory technical and operational measures to reduce greenhouse gas emissions in the maritime transport sector, with the aim of improving the energy efficiency of new ships through improved construction (design) and propulsion technologies, and for all ships (both new and existing) by improving operational measures. It is expected that these measures came into the force on January 1st 2013. Measures could help to reduce CO2 emissions between 45 and 50 million tons by 2020. Biofuels are one of options in reducing GHG in maritime sector [1].

The main drawback of biofuel is the limitation of raw materials and production costs. First of discontent and resentment were directed to the consequence of lack of food, since the production of biofuels use agricultural land and edible plants. In general, the first generation of liquid biofuels (biodiesel, bioethanol, biogas, vegetable oil) is produced from grains (wheat, corn), oil crops (e.g. rapeseed oil, palm oil) and sugar crops (e.g. sugar beets, sugar cane). These resources for production of biofuels are limited. There is a threshold beyond which it could not be produced enough biofuels, thereat not jeopardizing food supplies and biodiversity. Price of biofuels is one of the key factors that limit the widespread use because of the higher cost of production of fossil fuels (with the exception of taxes). For further development of biofuels it is necessary to find a compromise between the energy and nutrition on ownership of arable land. [2].

The world is already working on the development of new technologies, so-called second and third generation of biofuels, from just stated fact that the first-generation of biofuels have certain limitations. Along with the same, should be ensured sufficient quantities of biofuels, which will, at the same time, be fully compatible with fossil fuels? The basic raw material for production of second generation of biofuels is biomass, which consists of remains of non-food parts of crops, such as stems, leaves and husks that are left aside during separation of food part of plants and other crops that are not used for food purposes, such as low vegetation, crops that produce small grains, and industrial waste such as wood chips, bark and pulp from fruit processing and many others. The third generation biofuels covers production from microalgae.

By 2030, Lloyd Register predicts global demand for about 100 million tons of biofuels, thus requiring an additional 400 Handysize tankers for its transport [3].

Since the most biofuels are transported by sea, the industry should take advantage of the experience for further development of safe and effective practice of loading, unloading, handling and storage of it.

2. REGULATIONS FOR TRANSPORT OF BIOFULES BY THE SEA

MEPC issued a code “New Guidelines for Carriage of Bulk Blends of Petroleum Oil and Bio-Fuels" which came into force on September 1st 2011 and contains Annex MEPC.1/Circ.761, by which cease to be in effect temporary solution on the transport fuel blends by sea, from 2006. Under the new rules, transport is based on volume composition of the fuel blend and thus there are the following requirements: [4]

- Blends containing 75% or more of oil are transported under rules of MARPOL Annex I.
- Blends containing more than 1% and less than 75% of the oil are transported under rules of MARPOL Annex II.
- Blends containing 1% or less of oil should be transported under rules of MARPOL Annex II.

Blending of petroleum and biofuels whereby we get one product – blend (blending itself whereby is not used any chemical processes) can be performed only while the ship is in port area. The blending of oil and biofuels is prohibited during sea voyage. This is described in MSC-MEPC.2/Circ.8. MARPOL - Prohibition of Blending Cargoes on Board during the Sea Voyage [5].

Blending the fuel can be made at the refinery, at storage, on vessel supplier and on the ship that receives fuel. Minimal blending of fuel is carried on supplier vessel when are added standard marine fuel additives. Tanks on ship’s supplier must be emptied and cleaned before bunkering of new fuel in them.

Blending of biofuels with marine fuels is performed on several ships. The advantage of fuel blending on board is that biofuels can be stored separately, and thus maintain better properties of fuel. In this way, the blending of biofuels in special tanks with conventional ship fuels in the main engine could provide a temporary reduction in SOx emissions as biofuels do not contain sulfur, and thus prevent charging of penalties in certain geographic areas.

However, the blending of biofuels and fuel on board is not the best solution because it requires knowledge of handling with biofuel tank as well as the additional training and skills of the crew. Also, the owner of the ship must have samples from each tank, and must submit these samples to local authorities if navigating in the area with lower sulfur emission limits for certain fuels.

From the perspective of the ship owner, it will also be an advantage if the fuel was blended earlier in the bunker, in order to simplify the process of fuel bunkering and thus to reduce the need for dedicated biofuel-tanks on board, which would lead to additional costs of administration, and perhaps new hardware costs.

3. BIOFUELS IN SHIPPING

Within the EU there is currently no significant consumption of biofuels in shipping industry and in accordance with obligation of RED (Renewable Energy Directive) on biofuels.
A list of suitable biofuels for marine diesel engines was selected based on the following criteria: [4]

- Availability of biofuels: whether currently or in the short term could be produced in large quantities and whether it would be available in European ports;
- Costs of biofuels: Reduction of fuel costs is a key driver for the ship-owner, production of expensive biofuels should be omitted if there is no clear market potential;
- Maturity of technology: technology development phase will affect the current and future production costs and the availability of biofuels and it is taken into account as a potential risk factor if it is not mature for the stable quality of produced biofuels;
- The first assessment in technical compatibility with marine engines.

Several major companies have already tested biofuels in small and often local levels, in both on cargo and passenger ships. Most projects are performed by commercial parties, such as major shipping companies, and sometimes in cooperation with classification societies. Test results are not always satisfactory, however, since projects are applicable to existing vessels and their engines. Tests were conducted mostly using FAME (biodiesel) and BioLNG [4].
Biofuels require increased maintenance and additional training of personnel.

3.1.Biodiesel / FAME

The implementation of biodiesel as marine fuel was tested in several research programs of various companies. Conducted tests revealed two potential problems: [4]

- Biodiesel acts as a solvent and tends to soften and degrade certain rubber and elastomer compounds that are often used in older engines. Therefore, the rubber hoses and gaskets and other materials used in delivery and transport of fuel blend on board, they must be replaced with a synthetic material resistant to biodiesel.
- Biodiesel can easily remove deposits remained after diesel fuel in the system and thus to clog filters. Therefore filters should be checked and cleaned. Alternatively, the fuel oil tanks should be cleaned prior to loading of biodiesel.

Technical standard ISO 8217 lists some dilemmas about the use of biodiesel, as follows:[4]

- Tendency to oxidation and long-term storage problem;
- Tendency to absorb moisture, and the risk of microbial growth;
- Downgrading of flow properties at low temperatures;
- Biodiesel is deposited on exposed surfaces, including filter parts.

The examination of maritime industry revealed that biodiesel could probably blended with no adjustment up to about 7-10%. IMO's study in 2007 even gave the conclusions that low blend of biodiesel up to 20% (B20) can be used without degradation of the fuel system.
When in question are higher blends, ISO's concerns could be partially real.
Biodiesel will absorb significant amounts of moisture if there is a continuous open connection with the air, and it could easily be avoided if the fuel is completely closed. Oxidation can occur, and storage of biodiesel in the long run should not be a problem if it is used within a few months. Also, the existing oil / water filters could help to reduce the problem of high water content in biodiesel compared to marine fuels.
The application of smaller biodiesel blends at marine fuels distillates could be introduced relatively easily. Fuel supplier may decide to add a small fraction of biodiesel, if it accepts the client. This compound could be prepared at the time of bunkering. If the client accepts the biodiesel blend, regardless of ISO standard, the blending of fuel could be carried in a bunker terminal or even earlier in the supply chain. The application of

higher biodiesel blends requires minor adjustments on board in order to solve problems. This means that it would be needed the lower investment in modernization of hoses and gaskets and that the crew must carry out checking of filter more often. This will be useful only if the ship often uses a higher blend of biofuels.
Tests conducted using biodiesel as marine fuel, pointed out next advantages of biodiesel over fossil fuels: [6]

- Blending can be made up to 100% of biodiesel (RCCL Project Royal Caribbean - Cruises testing on biodiesel);
- Reduction of particle emissions (RCCL Project);
- No adverse effects detected in marine engines, although the number of test hours was such that result is questionable (MAERSK / LR Project);
- Higher cetane number makes it easier to start engine (MAERSK / LR Project)
- Bacterial formations were not detected in tanks of biofuels during storage for more than 6 months (MAERSK / LR Project).

3.2. DME

In the last 20 years, DME (di-methyl ether) was known substitute for diesel oil. It has been tested on smaller engines, but this does not guarantee its suitability for use on larger engines. [7] Based on interviews with people from shipping sector, the following items are of importance for DME as a possible alternative for marine fuels:

- On ships, fuel spills is a greater problem than in road transport, fuel and engine are in enclosed space where the leakage of fuel oil pump could cause an explosion;
- There are safety problems on which should be paid the attention because of high vapor pressure;
- Fuels such as DME, LNG and methanol have a low flash point and require very careful handling and must prove that they are safe to use, therefore they are probably more suited for newly built ships and engines.

In order to introduce on ships DME, there is a lack of adequate infrastructure. Industry proposes production of DME from methanol on board, by means of installation of relatively simple chemicals. Bio-methanol could potentially be produced from various raw materials in large quantities, but the real prospects are very uncertain due to connection between production of bio-methanol and technological developments. Furthermore, the use of chemicals on board, although simple, will require proper operation and trained staff. In order to reduce the workforce on board, this option may not be realistic. [8]

3.3. SVO

Straight vegetable oils, SVO, are suitable as a substitute for other fuels. It is not known whether the vegetable oil was tested for marine use, but there are some testimonials from the mainland where power plant replaced HFO with vegetable oil, for example with engines from MAN B&W and Wärtsilä. MAN B&W states that diesel engines designed for heavy fuel oil can also be used on vegetable oil without any problems, while engines designed for marine diesel oil or gas may have a problem, both because of increased density and viscosity of vegetable oil. Wärtsilä has approved their engines to run on vegetable oil (within certain specification) [9].
It is unlikely that the vegetable oil can be mixed with HFO. This could lead rather to emulsion instead of blend. The emergence of significantly different phases in one fuel is harmful to the engine. Even the use of very fine emulsions can lead to cavitation in the fuel oil system, at the place where the fuel is heated. Instead of vegetable oil could be used as a substitute pure (100% blend) of HFO. In this case, the temperature of biofuel would have to be closely monitored in order to maintain the correct level of viscosity. This ensures adequate circulation, optimum injection of the engine and the efficient distribution and homogeneous combustion. For soybean and canola oil, viscosity is right, but palm oil must be heated before application in order to ensure a lower viscosity [10].
The advantage of using vegetable oil is in the fact that the less energy is needed for preheating of the fuel oil. This results in a net saving of the fuel (on energy level). As already mentioned, the use of vegetable oil does not include adjustments in the ship's fuel system. Therefore, vegetable oil can be applied only to the dedicated ships with a well trained crew and small operational changes.

3.4.Bio-Methane

Bio-methane or bioLNG could be an alternative for LNG (liquefied natural gas), which is gaining higher interest in the shipping sector. It can be connected to the existing and upcoming LNG terminals. Bio-methane can be applied in the same manner as bioLNG and therefore will not require additional costs for modification.

In principle, bio-methane can also be used as CNG (compressed natural gas). This application has the following disadvantages: [4]

- High pressure of 200-250 bar in the gas phase;
- Grossly storage;
- Very expensive storage (very sturdy, heavy ship);
- Bunkering at high pressure, heavy and slow;
- Requires bunker station of at least 10 times of storage, in order to avoid large pressure drops.

Use as LNG would entail the following measures:[4]

- Storage is at a very low temperature (- 162 ° C) with elevated pressure;
- In practice, the actual volume of tank for LNG is usually about four times the size of tank for diesel oil and provides an equivalent amount of energy;
- Continued use is necessary because LNG evaporates slowly;
- Implementation can be as dual fuel oil in main engine, or as a mono / dual fuel oil for auxiliary engines.

LNG tankers use loaded LNG as a fuel. LNG is also used on ferries and coastal vessels. Norway is a major innovator in this regard and its 16 ships currently run on natural gas, which is located on the ship as LNG. [7] To switch from LNG on bioLNG, are needed investments in technological development in order to produce the required amount of biogas. Biogas is produced mainly through the use of agricultural residues, but at long term it could be produced from wood waste biomass.

Tests with bioLNG recorded decreased emissions of NOx, while CO_2 by 20% compared to fossil fuels [7].

3.5. Oil obtained by pyrolysis

Oil obtained by pyrolysis is potentially very expensive, because it can be produced from biomass / waste anywhere in the world. Several Wärtsilä engines for heavy fuel run on this oil, with a combined capacity of 680 MW [7]. Pyrolysis oil is of poor quality. It consists of emulsion, with 20-30% of water. The high oxygen content leads to low pH, which makes fuels acidic and corrosive, given the low value of heat and high viscosity. As a result, it is difficult to store and transport and can damage the engine and boilers. It can not be blended with gasoline and there is no auto-ignition in a diesel engine. This oil can upgrade the quality of fossil fuels, but this increases costs. According to all of the aforesaid, pyrolysis oil is not seen as a viable option.

4. CONCLUSION

Biofuels are promising alternative to fossil fuels within the shipping sector. Introduction of biofuels in this sector is still limited to application on several pilot projects and local initiatives.

Partially replacing conventional fuels with biofuels could allow maritime transport to become more carbon-neutral and possibly to reduce ship emissions of gases that affect the local air quality and GHG. Biofuels also reduce the risk of harmful emissions into the water, which can be crucial in the event of maritime accidents.

Market research has given warning of potential hazards or obstacles that may arise during the introduction of biofuels, in order to perform necessary crew training for handling of this type of fuel.

It is likely that biofuels will continue to provide a challenge to all those involved in their production and distribution in the coming years and the knowledge of the unique properties of these products will be very useful for those who want to reduce the risk of facing with unwanted claims.

REFERENCES

1.EXHAUST EMISSIONS FROM MARINE DIESEL ENGINES -IMPORTANCE, FRAMEWORK, WAY OF UPGRADING, Danilo Nikolić, II International Symposium on corrosion, material and environmental protection, Bar, Montenegro, October 2012.

2.CURRENT STATUS OF BIOFUELS MARKET: N. Marstijepović, D. Sekulović, A. Ivanović, D. Nikolic, II International Symposium on corrosion, material and environmental protection, Bar, Montenegro, October 2012.

3.BIOFUELS PRESENT PROBLEMS FOR MARINE TRANSPORT, HANDLING AND STORAGE, Thomas Miller P & I Ltd International House, 26 London Lane Creechurch EC3A 5BA UK.,

4.ZERO 2007, O.A. Opdal and J.F. Hojem, Biofuels in ships - A project report and feasibility study into the use of biofuels in the Norwegian domestic fleet. Zero Emission Resource Organization, Norway, December 2007 Lloyd's Register, "Hull inspection, and repair damage", London, 2007,

5.www.westpandi.com/Publications/News/MARPOL---Blends-of-Petroleum-Oil-and-Bio-Fuels/

6.RCCL, Imperium Renewables (Trond Are Berg, Chief Engineer GTV Jewel of the Seas) Year 2006-2007,

7.Wartsila 2007, Alternative fuels for medium speed diesel engines,

8.Presentation by P.E. Højlund Nielsen Haldor Topsøe from company: Obata: An upgraded for alcohol fuel efficient & clean diesel engine application, Marine Day, Gothenburg, April 5th 2011th.

9.MAN Diesel 2006, quoted by IMO 2007th.

10.ECSA workshop with ship owner associations organized on November 22, 2011.

BIOGRAPHIES

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EFFECT OF LOSS OF CYLINDER PRESSURE INDICATING CHANNEL PATENCY ON PARAMETERS VALUES OBTAINED FROM INDICATING GRAPH

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ABSTRACT

For indicating procedure of large marine and industrial engines special indicating channels with valves in cylinder heads are used. The impact of these channels on the values of the parameters obtained from engine cylinders indicating is significant. Depending on the method use for TDC determining, errors in values of determined parameters, especially the mean indicated pressure value at engine partial load can exceed up to 80% of the measured value. It is assumed that this error is systematic and uniforms on all cylinders of the engine, and even on all of the engines of the same type/family. Therefore these measurements are commonly used but only for comparing tests. As a result of engine operation deposits of coke and soot appear in the indicating channels reducing their patency. This causes deformation of the cylinder pressure curve relative to the real pressure which occurs in the cylinder. Since the channel fouling process is random, measured parameters are also subject to random error. In this study for the SULZER engine type 6AL20/24 loss of patency for cylinder pressure channel was simulated and evaluated its impact on the values of parameters obtained from engine indicating. The findings challenged the sense of engines indicating in service based only on measurements carried out indiscriminately of maximum cylinder pressure.

KEY WORDS
indicating valve, pressure measurement, piston engine, indicating, diagnostics.

1. INTRODUCTION

One of the basic methods use to asses correct operation of the internal combustion engine is measurement of compression pressure value, maximum cylinder pressure and the quality of the combustion process. Evaluation of these parameters is carried out on the basis of an analysis of the cylinder pressure waveform obtained during the engine cylinder indicating. Indicating both large marine and industrial engines is made with using cylinder heads indicating channels with valves. The impact of these channels on the value of the parameters obtained from indicating is significant. Depending on the method use for TDC determining, errors in values of determined parameters, especially the mean indicated pressure value at engine partial load can exceed up to 80% of the measured value. It is assumed that this error is systematic and uniforms on all cylinders of the engine, and even on all of the engines of the same type/family. Therefore, these measurements are used commonly for the individual cylinders comparative tests at the time of engine diagnostic.

In this study some research results are presented which were carried out for many years at the Department of Marine Power Plants of Polish Naval Academy in Gdynia connected with engines equipped with indicating valves. During these research three times indicating channel no patency was found on SULZER engine type 5BAH22, engine type TD48 and once on the low-speed MAN engine running on heavy fuel. Additionally, during indicating of 136 cylinders on engine-compressors units in gas transfer stations, it was found out that 5 of the indicating valves were also choked. The reason of the obstruction was carbon deposits in indicating channels. In total, during the Polish Naval Academy team diagnostic work more than 2000 cylinders were indicated and found only 10 of this type of malfunctions. It should be noted that so far there was not found a total loss of patency of the indicating channel at any SULZER engine type A which is the most popular prime mover in the Polish Navy. So, it can therefore be concluded that it is a marginal phenomenon. However, there is a presumption that the process of succession loss of channel patency is a continuous and the other indicating channels, despite their partial patency came to step-by-step increase in carbon deposits in the indicating duct. So, in such a case during the engine indicating process instead real indicated cylinder pressure only its distorted image is recorded. Pressure waveform distortion phenomenon could not be noticed during indicating, and could significantly affect the results. Because the channel fouling process depends on the combustion in the cylinder, on the intensity of engine cylinders lubrication and on the other parameters it can be treated as a random. Therefore, the measured parameters, contrary to previous assumptions may also be subject to random error, and as such are not suitable even for comparative tests.

In operating especially in SULZER engines family A often takes place the cylinder pressure valve head (mushroom type valve) damage. Broken cone acts as a non-return valve causing significant distortion of the indicator diagram. Cylinder pressure waveform changes are so large that it is possible to determine the type of damage and avoid such measurement error. An example of measurement made on a valve with that type of damage is shown in Figure 1.

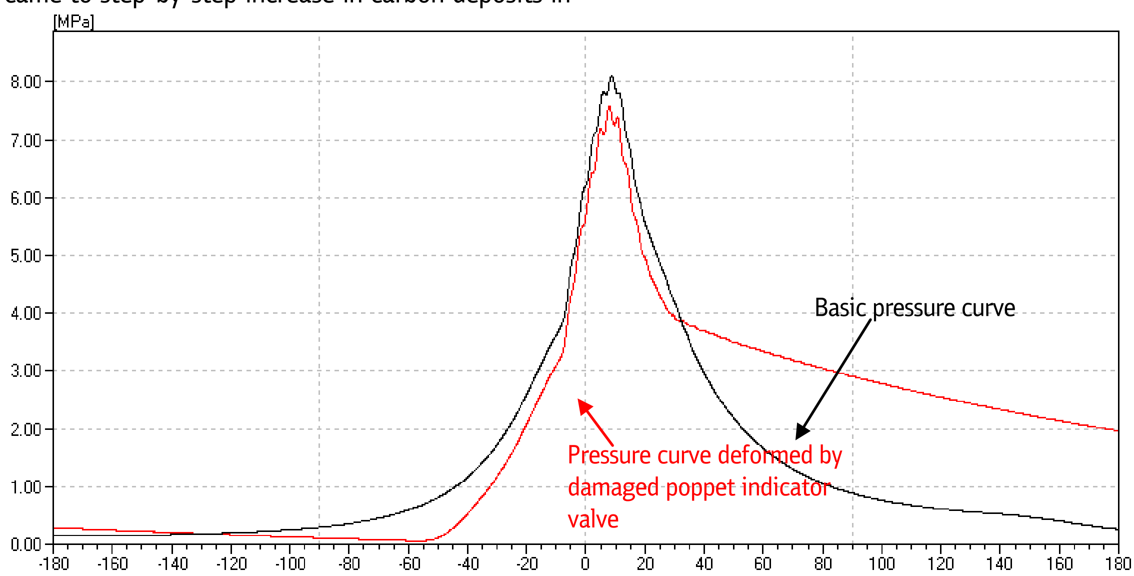

Figure 1. Cylinder pressure indicating diagrams achieved on cylinder with damaged indicator valve and on the cylinder valve in good technical condition

These failures affect the credibility of the measurements taken. In this study it was decided to check if a partial loss of patency of the cylinder pressure channel affects the pressure waveform image and that the deformation will enable evaluation of the cylinder channel condition and possible correction or elimination of measurement error.

In cooperation with industry, it was built and started to operation installation for continuously monitoring GMVH type gas engine-compressors on the one of the gas transfer station.

Figure 2. Examples of fire dampers for the Optrand sensors

In the operation conditions of this monitoring installation high failure rate of high pressure OPRAND sensors mounted in front of engines indicating valves have occurred.

According to the sensors' manufacturer recommendations in front of each mounted sensor forehead engines were equipped in special fire dampers offered by the sensor manufacturer (Figure 2). These fire dampers prevent damage of the pressure sensors, but after a not too long period of operation caused channel pollution by the carbon deposits, causing choking of the channel. Contamination of this filter is much faster than the clean channel overgrowing. Therefore, assessment of cylinder pressure channel condition has become a necessity.

2. RESEARCH STAND

The study was conducted on the SULZER engine type 6AL20/24 laboratory stand in the Polish Naval Academy Department of Marine Power Plants. This engine is equipped with an indicating valve channels, as it is shown in Figure 3.

The SULZER engine type 6AL20/24 indicating channel is a hole in the initial section of 15mm diameter which passes later in the 6mm diameter duct with length of 331mm.

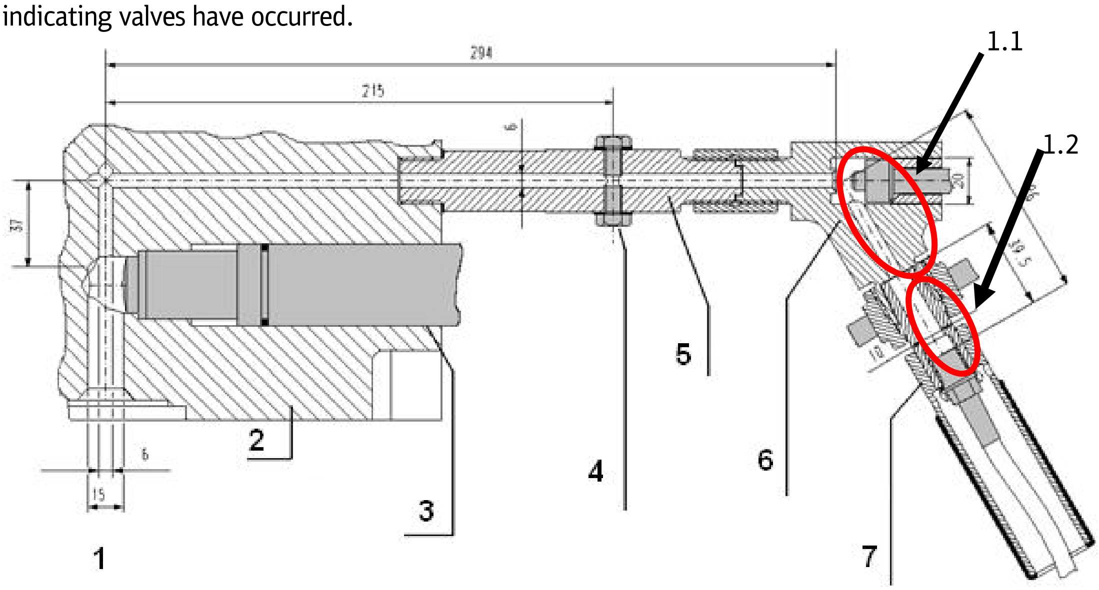

Figure 3. The SULZER diesel engine type 6AL20/24 indicating channel (1- combustion chamber, 2-cylinder head, 3-starting valve channel, 4- screws added to chocking/throttling gas stream during the experiment tests, 5-union piece, 6- indicating valve, 7- Thompson adapter with pressure sensor)

At the end of the duct it is placed the space where the valve disk moves plus the channel connecting the space with a conical connection for the pressure sensors (marked by an ellipse 1.1) with a volume of 4.45 cm3. Inside the fastener of the electronic sensor or inside the mechanical measuring device mounted occurs additional volume as it is marked with an ellipse of 1.2 depending on the type of using sensor. In the case of the 7613 KISTLER sensor mounted in the Thompson adapter, this volume is equal 3.1 cm3. After discussion for the simplicity the channel of 331mm length and 6mm diameter with additional space with the volume which is the sum of the volumes 1.1 and 1.2 was adopted. During engine operation, when conditions for the formation of carbon deposits occurred, open channel section diameter will decrease.

3. INDICATING CYLINDER CHANNEL INFLUENCE ON CYLINDER PRESSURE WAVEFORM

Due to a specific length of the channel some delay has been formed between the pressure in the combustion chamber and the moment in which the pressure pulse reaches the front of the sensor. The size of the delay – τk will depend on momentary value of sound velocity – ax in the channel and from the length of the whole channel – lk, as in formula (1)

$$\tau_k = \frac{l_k}{a_x} = \frac{l_k}{\sqrt{\chi \cdot R \cdot T_x}} [s] \qquad (1)$$

where:
Tx – momentary value of temperature in the channel in [K].
During this time crankshaft will turn around αk° degrees

$$\alpha_k = \frac{n \cdot 360}{60} \cdot \tau_k = \frac{n \cdot 6 \cdot l_k}{\sqrt{\chi \cdot R \cdot T_x}} [°] , \qquad (2)$$

where:
n – crankshaft rotation speed – [rpm].
Putting into equitation lengths of tested channel and mean temperature in the channel estimated as 500 K expected shift values for several different rpm were calculated. Results are presented in the table 1. In channel with constant diameter these shifts would be independent from channel diameter. In a real system during engine operation a gas flow from the combustion chamber through the passage to the volume surrounded the front of pressure sensor occurred caused by pressures difference. The pressures difference is a measurement error and a source of gas flow. Gas flows between the chambers with the velocity close to sound velocity at the narrowest point of the channel.

Table1. Calculated expected values of pressure pulse angle shifts for different engine rpm's

lk / rpm	0.417 m
500	2.90°
550	3.19°
650	3.76°
750	4.34°

In addition, gas flowing out of the channel to a volume with larger cross-sectional area experiences a pressure increase resulting from the conversion of kinetic energy into potential energy of the gas. So for the channels which are extend around the sensor face an appropriate increase in pressure should be considered.
Additional pressure increase occurs after the TDC point when the pressures on both sides of the channel achieved equilibrium, so the cause of gas motion disappears in the channel, but the runaway gas column has more kinetic energy, which will turn into extra pressure potential energy manifested by increased pressure after reaching the maximum pressure value in the cylinder. Proportions of channel diameters, channel length and size of channel extensions are selected so that at engine rated speed these phenomena are compensated. Choking in the channel causes the imbalance of these proportions, leading to deformation of the achieved pressure curves and consequently to reduce in the measured maximum pressure values.

4. TESTS RESULTS

In order to simulate fouling of the channel by carbon deposits coupling between the engine block and indicating valve threaded hole was made perpendicular to the axis of the channel, in which the screws were used for throttle gas flow. In this study surfaces of the gap between bolts were not be measured. Only such the screw bolts position were used that not cut the gas flow after indicating valve opening and not disappeared accompanying

it sound effects. So, this was adjusted to the maximum throttling, which did not give any symptoms possible to determine on the basis of the organoleptic effects associated acoustic measurements.
The tests were performed at a speed of 600rpm and power 210kW and 700rpm and power 315KW. Measurements were made by MA2009 diesel engine electronic analyzer manufactured in the Polish Naval Academy in Gdynia equipped with a KISTLER sensor type 7613. The results of pressure measurements carried out in the case of the effective (clean) channel and with the throttle are shown in Table 2. In addition, the relative decrease in the measured maximum pressure caused by simulated damage was calculated. It was found that the error caused by a leaky connection between indicating valve and Thomson adapter is in the range from 1 to 5.57%. It can be assumed that the described method of introducing leaks in the connections between the valve and sensor was unrepeatable, hence the large spread observed errors.

Table 2. Maximum pressure measurements results for channel in different technical conditions

rpm	Patent/clean channel	Throttling in the channel	
	Pmax [bar]	Pmax [bar]	δPmax [%]
600	79.8	71.2	-10.78
700	97.8	82.3	-15.85

Many time repeated opening and closing of the cylinder pressure valve required each time to set the leaks of indicators. This was done in a unrepeatable way. In the near future we intend to take measurements using a calibrated orifice threaded hole in the modified valve. The present study can be regarded as preliminary. It shows that the error caused by leakage is much lower than originally estimated.

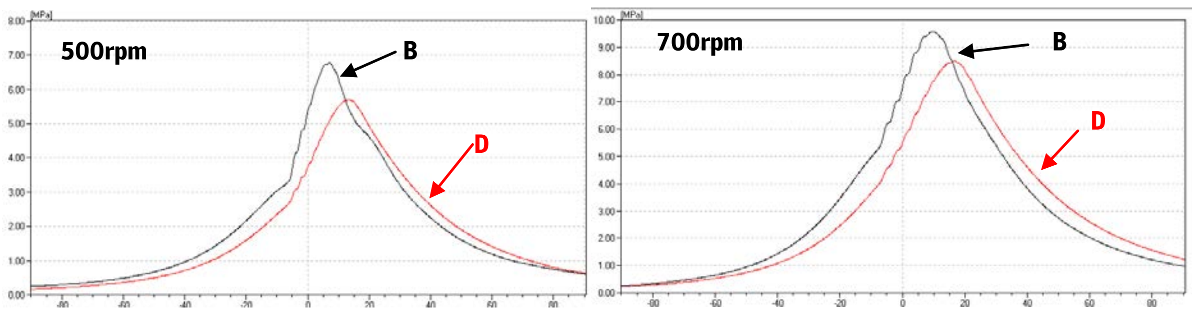

Figure 4. Indicating diagram with and without throttling and TDC setting according to reference pin at 25% and 75% engine load (B- without throttling, D- throttling)

Measurement of throttling effect was performed in a reproducible manner, because the measurement was made with a fixed combination of adjusting screws. During the measurements only engine load has been changed. The reference measurements were performed without throttling, once before setting the throttle for the first engine load and for the second engine load after measurements and removing the throttling screws. Therefore, measurements were limited to only two loading conditions.

Subsequent measurements included the registration of the cylinder pressure waveform. They were limited only to study of the impact of duct throttling. Cylinder pressure waveform measurements obtained during the tests were synchronized by reference pin on the engine crankshaft. This allowed the overlapping pressure curves with choke and no throttle channel at the same engine load conditions. The effect of such imposition is shown in Figure 4 at an engine load of 25% and 75%. It was found that despite the throttling the achieved pressure curve image looks reasonable and without reference to the waveforms without throttling it can be considered valid. It could be argued that the value of the maximum pressure is lower than 16% at 500rpm and less than 11.3% at the speed of 700rpm. There was also a significant increase in the angle of maximum pressure. The increase in the angle caused by throttling of the channel was 6.3o degree at a speed of 500rpm and 5.8o degree at a speed of 700rpm. Cylinder pressure waveform distortion has led to about 43% increase of cylinder indicated power at engine speed 500rpm and about 32% at 700rpm. At higher rotational speed throttling effect was smaller and this is due to higher gas temperature and, consequently, a higher sound velocity. Faster gas flow caused the pressures were faster even and hence less deformation of the pressure curves.

To overcome the delay caused by the throttling in the channel adjustment of the TDC was made by extrapolating of the compression curve. This additionally enabled the compression pressure assessment. The effect of the correction is shown in Figure 5.

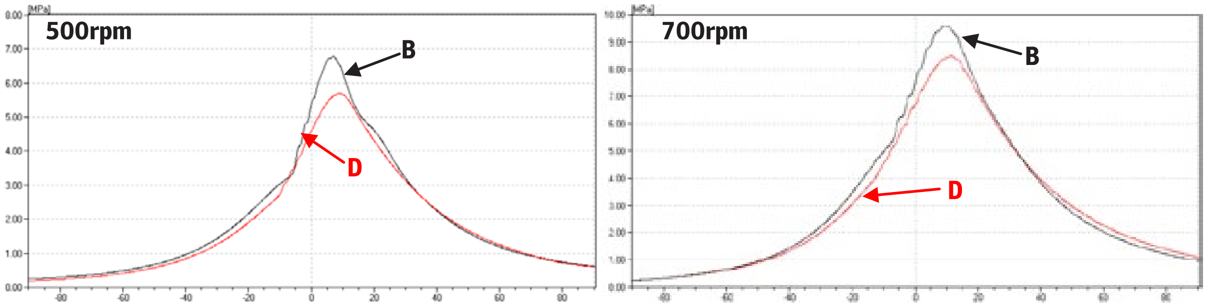

Figure 5. Indicating diagrams with TDC correction at 25% and 75% engine load (B- without throttling, D- throttling)

Cylinder pressure waveforms after adjustments made still look reasonable. Small improvements in the measured mean indicated pressures and in the angle of cylinder maximum pressure have been achieved. Measured compression pressures as a result of channel choking were lower by 10.3% at 500rpm and by 21.3% at 700rpm. Results of mean indicated pressures (MIP), maximum pressure (Pmax), compression pressures (Pcom) and the angles of the maximum pressure (α Pmax) are shown in Table 3.

Table 3. Values of chosen parameters depending on indicating channel technical condition and TDC setting method

Engine rpm/load	Type of measurement	TDC determination method	MIP [MPa]	Pmax [MPa]	Pcom [MPa]	α Pmax [deg]
500rpm/ 105kW	Without throttling	according to reference pin	0.665	6.77	3.50	6.8
	throttling	according to reference pin	0.907	5.69	-----	13.1
		according to extrapolation	0.715	5.69	3.14	8.7
700rpm/ 315kW	Without throttling	according to reference pin	1.238	9.58	5.92	9,8
	throttling	according to reference pin	1.679	8.50	-----	15.6
		according to extrapolation	1.351	8.50	4.66	10.9

It can be concluded that the error of each designated parameter due to the throttling of the indicating channel regardless of the method of the TDC adjustment exceeds the permissible limits of dispersion. In such a situation any adjustment and tuning of the engine can be counterproductive. In the cylinder pressure continuous monitoring system built for engine-compressor type GMVH had to be developed a simple method for checking the status of the indicating channels. Engine-compressor type GMVH on it engine-side are spark-ignition engines fueled by natural gas. They are characterized by unrepeatable ignition and unrepeatable cylinder pressure waveforms during the combustion and expansion processes. The only criterion for evaluation of cylinder pressure channel can therefore be the analysis of the compression curve. Constructed measurement system is synchronized by 1o markers placed on the flywheel and by additional reference marker. As a symptom of indicating channel throttling TDC image shift to the reference TDC image recorded immediately after the machinery repair was decided to use. This analysis could be carried out during normal operation of the machine just catching pressure waveforms in which lack of ignition were determined.

5. THE STUDY OF APPARENT TDC IMAGE SHIFT INDUCED BY THROTTLING

Before the pressure monitoring system was started on the real object its simulation was carried out on SULZER engine type 6AL20/24 in the laboratory. Tests described upper were repeated with cutting off fuel delivering to the tested cylinder. Results of these tests and their parts magnification are presented in the Figure 6.

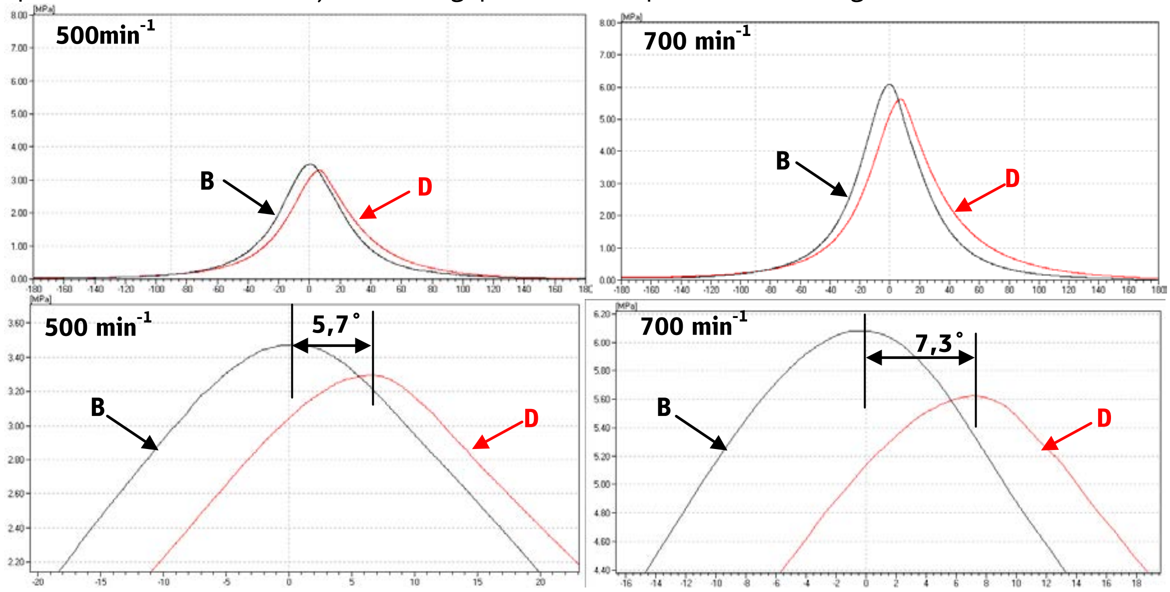

Figure 6. TDC image shift on the indicating graph with throttling together with the graph without throttling at the engine load of 25% and 75% (B-without throttling, D-throttling)

It was found that as a result of indicating channel throttling in addition to the apparent compression pressure reduction TDC image shift by 5.7 to 7.3o occurred. This is a significant and measurable value. Such TDC shift can be caused only by channel throttling. In the case of any other malfunctions, if there is TDC shift, it will have the opposite direction. During the operation of the GMVH type engine-compressors monitoring system on the one of gas transfer station cylinder channel fouling effect caused by carbon deposits has been detected. The pressure waveform on the affected cylinder on the background of the average pressure waveform of the other cylinders is shown in Figure 7 It was found that the fouling process of the duct, if it is launched, it deepens very quickly.

6. CONCLUSIONS

Usually the base to assume that engine indication results are reliable are the certificate, attestation and sensors and analyzers certificates. Contemporary electronic indicators have accuracy class from 0.1 to 0.5 certificated by testing centers by statical checks with use of pressure standards.

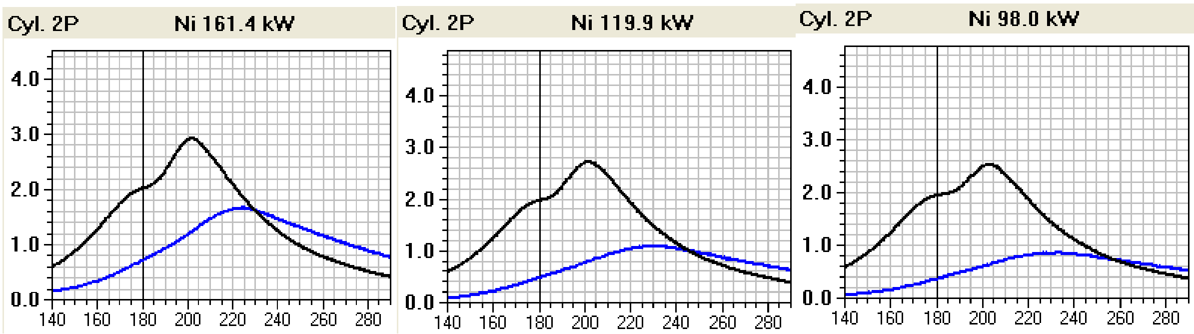

Figure 7. Image of cylinder pressure deformed graph on the cylinder with carbon deposits in the indicating channel on the background of the average pressure graph of remaining cylinders after fault detection (left), after next 24 hours (middle) and after 36 hours (right) of operation

According to contemporary indicating methods it is presumed that measured values of compression and maximum pressures were made according to measurement device accuracy of reading. Untightens in pressure sensor and indicating valve has important influence on pressure measurements results determining their lower value by 1 to 3,9% according to carried out tests. Whereas simulated channel throttling which did not caused observed symptoms of no patency were the reason of 9,64 to 15.85% lower measured value of maximum pressure.

Assertion that these deformations are systematic error and are equal for every engine cylinder is too optimistic.

Without information about the state of the indicating channels and valves measurements results are not suitable even for comparative tests. So before adjusting and tuning the engine one must check the patency of the indicating channels.

When using the device which is synchronized by the reference marker with TDC settings memory during the calibration sufficient symptom is apparent shift of the TDC image versus pressure waveform. In the medium-speed engines with early fuel injection during the test of TDC shift cut-off the fuel supply may be required.

Further research works are needed focused on the work-out of indicating chanel unpatency measure in case of the lack off refference markers. This measure could be helpfull in correction assesment for measured parameters in case of partial channel unpatency determination.

REFERENCES

1.J. Wajand., Pomiary szybkozmiennych ciśnień w maszynach tłokowych. Warszawa: Wydawnictwa Naukowo-Techniczne 1974.

2.S. Kluj., Diagnostyka urządzeń okrętowych. Gdynia: Studium Doskonalenia Kadr S.C. Wyższej Szkoły Morskiej w Gdyni 1992.

3.A. Wimmer, J. Glaser., Indykowanie silnika. AVL List GmbH Przedstawicielstwo w Polsce, Warszawa 2004.

4.M. Łutowicz., Analysis of application of chosen methods for TDC determination in marine diesel engines. Journal of KONES Powertrain and Transport Vol. 16 No. 4, Warszawa 2009.

5.M. Łutowicz., Evaluation of the Condition of Cylinder Systems of the Engine Based Ion an Compression Process Analysis. Polish Journal of Environmental Studies Vol. 18, No. 2A, Olsztyn 2009.

RFID TAG SENSORS INTENDED FOR NUCLEAR CARGO SUPERVISION IN MARITIME TRANSPORT

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ABSTRACT

During past ten years, radio frequent identification (RFID) has drawn much attention in scientific-research and industrial circles with its possibilities. Various industries have recognized RFID technology as possibility for tracking and supervision of their products in real time with great precision and with information concerning current condition of environment surrounding the followed object. Possibility of tracking any object, products in distributive chain that is, has intensified the manufacture of RFID tags. Even though they are consisted of large number of sensors they maintain negligible dimension and weight.
When it comes to nuclear cargo transportation, this technology provokes a special interest in seamanship/maritime/sailing. Due to monitoring of current state of nuclear material in real time, and conditions of its immediate environment: temperature, humidity, container seals, eventual movement of cargo and similar, RFID technology represents great improvement in the sense of providing much safer transport of nuclear material. It will automatically sound of an alarm as well if any parameter 'goes up' of its normal scope, or reach extreme values. Sensors themselves are not sufficient to close this informational circle. System is composed of RFID transmitter, which powers up from a battery (ten years duration), receiver, active sensors, independent memory, software application, data base, internet connection and web portal. Information which receiver gets from transmitter are sent to central data base where they are being kept and only authorized operators have access at any moment.
In this paper, special emphasis will be on sensors within RFID tag, as key components of the tag which contribute most to safer nuclear cargo transportation.

KEY WORDS

RFID, safety, sensors, nuclear cargo, monitoring

1. INTRODUCTION

The RFID system for monitoring nuclear cargo is an integration of multiple cutting-edge technologies, involving radio frequency identification (RFID) in first place, global positioning system (GPS), two-way satellite communication, geographic information system (GIS), secured database and web servers. This system is capable of tracking and supervising route of the ship which is transporting dangerous cargo and monitoring “the state of health,” i.e., seal integrity, shock, temperature, humidity, and radiation of nuclear and radioactive materials packages in transport. When any sensor in the RFID tags exceeds its preset thresholds, an automatic alert/alarm is triggered and the event will be reported immediately via satellites to the command center so that appropriate actions can be taken to manage the situation. All data which are gained from sensors are strictly kept in hidden data bases. Only operator in charge of that specific shipment of the nuclear cargo has access to the data base.

2. RFID TAG

RFID devices fall into two broad categories: Those with a power supply (a battery) and those without. In dies case an RFID device that actively transmitted to a reader is known as a transponder. Active tags are larger and more expensive than passive tags. The use of a battery places a limit on the life of the device, although with current battery technology this may be as much as 10 years.
To support the operation of a dosimeter in an RFID nuclear cargo tag, the following design requirements are considered:

- Ensure secure mounting and easy removal of the dosimeter module if it is not needed,
- Use existing batteries with low power consumption,
- Use versatile communication protocols and
- Allow room for future expansion of additional sensors.

Figure 1. Inside of RFID tag

Figure 1. [13] shows a prototype of the RFID tag which meets above mentioned conditions. This RFID tag is composed of three main electronic boards: dosimeter carrier board (left), tag controller board (dubbed mother board with antenna, center), and battery supply and management board (right). The dosimeter carrier board can be slid in and out of its compartment and is held securely by two sets of molded alignment tabs. A 20-pin ribbon cable is used for communication with the tag controller board, and a two-pin header connector wire finishes the power from the battery board.
To meet the requirement for low power consumption, the data from the dosimeter are collected by the MCU (Multipoint control unit) on the carrier board. A nonvolatile memory implemented within the MCU allows retention of accumulated dose rate information when the power is off. In the low-power mode of the carrier board, the MCU is programmed to wake up the dosimeter at regular intervals and read the instantaneous dose rate a programmable number of times after each wakeup. The dose rate thus obtained is assumed to stay constant for the entire interval, and the accumulated dose is updated and stored in the nonvolatile memory. With the dosimeter used in this way, the wide dose rate range is extended over an arbitrarily large total dose, because the total dose that can be measured is limited only by the amount of memory allocated to the sum within the MCU program. The data are passed along through the tag to the reader network whenever those values are requested. The requested data are then displayed in the GUI and stored in the database in the control PC and the downstream servers. Alarm events due to the dose rate and the accumulated dose are also stored in the MCU.

3. FREQUENCY RANGES

Frequency allocations are generally managed through legislation and regulation by individual governments. Internationally, there are differences in frequencies allocated for RFID applications although standardization through ISO and similar organizations is assisting in compatibility. For example, Europe uses 868 MHz for UHF and the US uses 915 MHz. Currently very few frequencies are consistently available on a global basis for RFID applications (Table 1.).
In general, low frequency passive tags have an effective range of approximately 30 cm, high-frequency passive tags around 1 m and UHF passive tags from 3 to 5 m. In a situation where greater range is needed, such as in a container tracking

and related applications, active tags can boost the signal to a range of 100 m.

Table1. Frequency bands for RFID tags

Frequency band	Characteristics	Typical applications
Low 100-500 kHz	Short to medium read range, inexpensive, low reading speed	Access control, animal identification, Inventory control, car immobiliser
Intermediate 10-15 MHz	Short to medium read range, potentially inexpensive, medium reading speed	Access control, smart cards, library control
High 850-950 MHz, 2.4-5.8 GHz	Long read range, high reading speed, line of sight required, expensive	Reilway vehicle monitoring, pallet and container tracking, vehicle tracking, ship storage tracking and controling

4. RADIATION SENSORS

With regard to developing the RFID system for nuclear materials management, in past ten years the addition of a radiation sensor to the tag has been considered an important enhancement. A radiation sensor, along with other sensors in the tag, can greatly enhance the overall situational awareness in a facility that has a large number of packages such as ship's storage. Readings from radiation-sensor-enabled tags can be used to construct a scheme of the radiation dose field in the facility on a real-time basis. Any significant perturbation of the field would generate an instant alert/alarm to supplement the existing facility measures for safety, safeguards, and security. As a result of having this real time information on the radiation field in the facility, the need for manned surveillance with handheld devices is greatly reduced, and the universally endorsed principle of protection against radiation (as low as reasonably achievable [ALARA]) is achieved. The knowledge and records on dose and dose rates can also be very useful for process control and aging management for long-term ship storage, down to the item level of the packages.

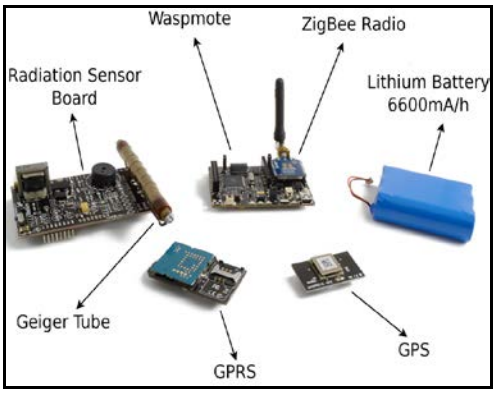

Figure 2. Inside of radiation sensor

An exhaustive search of candidate radiation sensors for tag incorporation was conducted, and a commercially available personnel dosimeter for gamma radiation was selected. The major advantages of a personnel dosimeter over other possible choices are its compactness, reasonable cost, low power consumption, reliability, acceptance by health-physics professionals, and wide dose-rate operating range, matching the range for nuclear materials monitoring. In the incorporation, the dosimeter casing, external display, control buttons, audio/visual alarm provisions, and battery holder were discarded; only the detector components and the electronic core were retained. According to the manufacturer's specifications, the selected dosimeter is sensitive to photonic radiation in an energy range of 50 keV to 6 MeV. The dosimeter also has a wide dynamic measurement range for the dose rate, from ≈10 μR/h to 800 R/h, and a dose from 0.1 mR to 1,000 R.4.

5. SEAL SENSOR

The seal sensors of the tag are custom-designed for packaging so that one or more of their lid bolts can be used for its attachment. Figure 6. [13] shows the sensor for a single-bolt mount. The high sensitivity of the seal sensor to compression makes the seal sensor an effective tamper-indicating device for packages with bolted closures depending on whether the bolt is tightened or loosened.
However, since the tags may stay on the packages for years with the seal sensors in the compressed state, the long-term performance and reliability of

the seal sensors needs to be investigated to determine if the pads stay pliant.

Figure 3. Sensor for a single-bolt mount

In the tests of seal sensor performance conducted to date, the seal sensors are pressed and held by a bolt and a nut with washers that are identical to those used for the actual packages. The seal sensors were compressed during the entire time of the tests, except for the brief moments when the bolt was loosened to obtain the uncompressed resistance readings. As long as the readings from the compressed and uncompressed states are sufficiently separated, the seal sensors are regarded as functional because the difference can be readily detected by the tag electronics for alarm purposes. Results of the test show that all sensors performed as desired and the pads remained pliant after prolonged compression. Equally positive results were obtained from sensors tested at different torque levels. The seal sensor long-term performance testing is continuing.

6. TEMPERATURE SENSOR

One of the applications of RFID temperature measuring sensor system is to monitor the ambient temperature of the package by using the built-in thermostats in the tags (Figure 4) that would trigger an alarm and record the event when the temperature exceeds a preset threshold. To confirm the performance of the thermostats, the tags were placed inside an isothermal chamber along with certified Type K thermocouples. The RF reader is located outside the chamber and records temperature data of the thermostats in case it exceeds anticipated working temperature range of 0–65°C (32–149°F).

Figure 4. Thermostat built in a RFID tag

For all tags calibrated, the difference between the temperatures measured by the tag thermostat and that of the certified thermocouple is well within ±2°C. The thermostats used in the tags are of a commercial grade.

7. CONCEPT OF MONITORING SYSTEM

Sensors alone, as well as readers and tags can not meet the requirements demanded in order to entrust nuclear cargo to such automated system. There are many variables that affect the safety of the cargo and therefore the people responsible for that particular shipment. A key component in managing hazardous cargoes is the software. The software must be simple in handling and reading the important data but at the same time, data security must be at the highest level. Monitoring of cargo from its packaging point, during its shipment and all the way to the place of its disposal must be permanent and with no interference. Information obtained from the sensors during the transport of nuclear cargo are sent via an Ethernet network to the central database. Central base is closely guarded and it can only be accessed by the operator who is responsible for that particular nuclear cargo shipment. All these readings are also stored in the memory unit of the tag, for later comparison of the data obtained on the server.

Figure 5 shows the concept of RFID systems for tracking and monitoring in practice. This monitoring system is still developing. This system is still in its experimenting phase and it is still tested in controled conditions. So far, the tests were successful, and the system gained a quite of attention. The concept of this system is very interesting from the perspective of maritime transport, simply because much of nuclear cargo transport is done by sea.

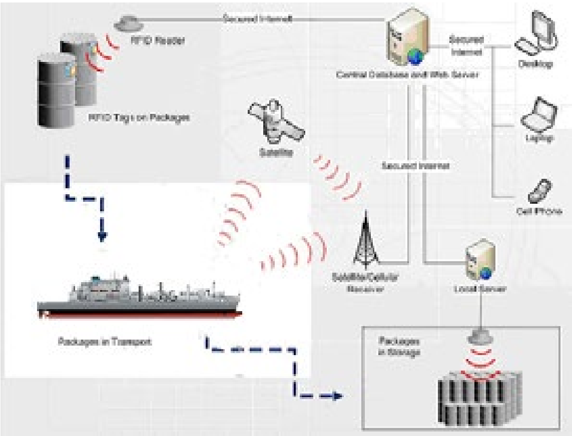

Figure 5. The concept of RFID systems for tracking and monitoring of nuclear cargo during sea transport

As illustrated in Figure 5. [5] gives the information about each package is collected and stored in internal tag memory. Information from the tag are transmitted to the reader via radio waves. The reader is connected to a computer via an Ethernet network within the marine system. The computer can serve as a local server that manages multiple readers, and stores information within the network, or to transmit data to a central database server via satellite or cellular networks.

Central database and a dedicated server are located at a safe location, such as the backup server, which is independent of location. Server is used for database management and routine control of the ship's current position, for better security and data integrity. Backups are periodically kept in the archives on the backup server, to optimize system reliability.

8. THE RFID SOFTWARE

The software plays the most important role in the whole system. The software is installed on the control computer that is placed inside of the storage of the ship and connected to the reader, which allows the reader to gain the data from the tags. An operator can also use the software to remotely control and change settings on the tag.

Figure 6. [1] gives an overview of the screen when the software is running. The circles on the screen are packages (top view) with tags. Tags are programmed to activate the alarm and notify the operator using the software if any value reaches its critical point. The software also verifies the integrity of each tag in exact intervals which are pre-determined. The software automatically saves the readings from the tags in local database of the main computer. Database information can be easily viewed and forwarded further, if necessary.

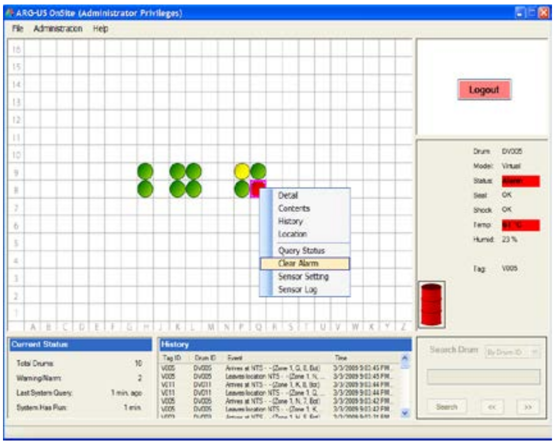

Figure 6. The appearance (Screen) of the software for control and monitoring of nuclear cargo

Apart from reading data from sensors the user can enter data such as the content of the packages in the tag memory unit by using the software. The data stored on the tag are encrypted with 256-bit key (AES-256). User data is also stored in the local database in order to prevent accidental data loss. Software has the ability to send data from a local database to a remote server over the Internet, mobile or satellite network. Server shows all the data associated with each package separately on the secured website. If sensors trigger the alarm, the software sends an email or text message to the operator. The operator using the software can access data where the drum package is located at the time. The software is connected to the GPS system within the tag, and during the accession of the software it uploads the last known position of dangerous goods, i.e. the ship. With the software you can see the status of each drum package separately, in real time. Green colored circles mean that the nuclear material in the package is within normal limits. When the circle is yellow, the nuclear material inside the packaging is beginning to emerge from the limits of normal but not yet reached the critical stage. If the circle is red, then some of the sensors: temperature, shock, humidity, radiation, etc. are activated, and this may mean that changes in the drum package has reached values which are alarming and may affect the security of cargo.

9. ADVANTAGES

The principal advantages of RFID system are non-contact, non-line-of-sight characteristics of the technology. Tag can be read through a variety of visually and environmentally challenging conditions such as snow, ice, fog, paint, grime, inside containers and while in storage.
With a response time of less than 100 ms, an RFID reader can read many (a few hundred) tags virtually instantaneously. Tags coupled with sensors can provide important information on nuclear cargo condition.

10. CONCLUSIONS

Although the RFID system for tracking and monitoring of nuclear cargo is still evolving there is no doubt that it will soon find its application in the maritime industry. This paper presents the principle of its potential for improving safety, safeguards, the reduction of human crews, providing information in real time and its overall efficiency. This type of monitoring is now of more interest and over the next few years it will certainly be adopted as standard for the control of nuclear cargo. In the future review articles on this topic, it is to be paid more attention to each sensor individually, as well as, methods of acquisition and distribution of relevant data with the inclusion of an alarm system.

BIOGRAPHIES

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REFERENCES

1. Chen K., Tsai H., Fabian B., Liu Y., Shuler J.: "A radio frequency identification (RFID) temperature-monitoring system for extended maintenance of nuclear material packaging", Proc. of ASME Pressure Vessels and Piping Division Conference, Prague, Czech Republic, July 2009

2. Chen K., Tsai H., Liu Y.: "Development of the RFID System for Nuclear Material Management", Proc. of the Institute of

Nuclear Materials Management (INMM) 49th Annual Meeting, Nashville, TN, July 2008

3. Constantinon P., Aird C.J., Mellor P.H., Smith D.J., Booker J.D., Flemmitt P.E.J., Truman E.: "An energy supply unit for an autonomous remote sensor system monitoring stored nuclear waste", Sensors and Actuators A: Physics, 166, 2011, pp. 52-65
4. Džankić R., Bauk S., Radulović V.: "RFID Technology Used in Nuclear Cargo Surveillance within Ship's Storage", Proc. of the 4th International Maritime Science Conference - IMSC, 16-17th June, Split, Croatia, 2012 (CD-ROM; ISSN: 1847-1498), pp. 98-104
5. Džankić R., Bauk S., Radulović V.: "Software Solution for RFID Technology in Nuclear Cargo Surveillance within Ship's Storage", Proc. of the 7th International Conference: Ports and Waterways – POWA, Zagreb, Croatia,27th September, 2012 (CD-ROM; ISSN: 1848-252x), pp. 1-8
6. Jassens-Maeuhont G., De Roo F., Jassens W.: "Contributing to shipping container security: can passive sensors bring a solution?", Journal of Environmental Radioactivity, 101, 2010, pp. 95-105
7. Perović S.M., Bauk S.: "Determination of Plutonium Temperature using Special Trans Functions Theory", Nuclear Technology & Radiation Protection, vol. 25, no. 3, December 2010, pp.164-170
8. Roberts C.M.: "Radio frequency identification (RFID) ", Computers and Security, 25, 2006, pp. 18-26
9. Tsai H.,Chen K., Liu Y.: "Applying RFID Technology in Nuclear Materials Management", Packaging, Transpotr, Storage and Security of Radioactive material, vol. 19, no. 1, 2008
10. Wouham J., Davis C.M., Asimakopoulos V.G., Tselentis B.S.: "Marine Transportation of Irradiated Nuclear Fuel, Plutonium, and Radioactive Wastes: the Continuing Debate on Regulatory Measures", Marine Policy, vol. 24, no. 4, July 2000, pp. 287-299
11. Yang H., Yang L., Yang H.: "Hybrid Zigbee RFID sensor network for humanitarian logistics centre management", Journal of Network and Computer Applications, 34, 2011, pp. 938-948
12. Yang H., Yang S.H.: "RFID sensor network – network architectures to integrate RFID, sensor and WSN", Measurement and Control, vol. 40, no. 2, 2007, pp. 56-59
13. Hanchung Tsai and Yung Y. Liu, Argonne National Laboratory "Enhancing ALARA Practice with Dosimeter-Equipped Radio Frequency Identification (RFID) Tags",March 24, 2011
14. Chen K., Tsai H., Fabian B., Liu Y., Shuler J.: "A radio frequency identification (RFID) temperature-monitoring system for extended maintenance of nuclear material packaging", Proc. of ASME Pressure Vessels and Piping Division Conference, Prague, Czech Republic, July 2009
15. www.wipp.ws, What is Plutonium?, 2003
16. www.greenpeace.org, Secret Shipment on Nuclear Bomb Material from Europe to Japan, 1999
17. www.innuserv.com, Transporting Nuclear Material- The Cargo, 2010
18. www.fridjournal.com, Last access: March, 2013
19. www.emc.com/domains/rsa/index.htm, Last access: March, 2013

MILITARY ACTIVITIES IN THE EEZ

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ABSTRACT

The maritime jurisdiction areas are used by all nations according to the international law. While the codification of international law of the sea successfully covers non-military activities at sea, the rules regulating the military use of the seas are somewhat unclear. Thus, in today's world, the usage of maritime jurisdiction areas for military activities is one of the most controversial issues of international law.
When we look from a historical perspective, we see that nowadays the debate for the military use of the sea is mainly concentrated on the use of Exclusive Economic Zone (EEZ). In this paper, our aim is to examine the military use of the EEZ with regard to the rules of international law. First, we will explain the legal background of the research. Then, for a better understanding we will focus on the controversial area of EEZ in Asia-Pasific region as it is a great laboratory for today's military activities. Finally, we will discuss the attempts to resolve the controversies.

KEY WORDS
Law of the sea, Exclusive Economic Zone (EEZ), Peaceful Uses of the Sea, Military Activities.

1. INTRODUCTION

Maritime jurisdiction areas (MJAs) and jurisdictional claims of coastal states on these areas today are among the most controversial issues of international law of the sea (LOS). There are a lot of states that have faced conflicts of interest on MJAs and it is hard to resolve these conflicts with the unsatisfactory regulations of LOS. While most of these conflicts are about the delimitation of MJAs, they are not limited to this after the introduction of the concept of "exclusive economic zone (EEZ)" in 1982, which quickly went from an idea with few supporters to a customary international law. Today, as 17 states claim a 200-mile EEZs like territorial seas (Wilson, 2010, p.421) and UNCLOS is ambiguous about issues regarding military operations in EEZ, it is worth to examine the recent history related to the practices of regarding states.
Military activities in the EEZ have been an important and controversial topic since the drafting process of the United Nations Convention on the Law of the Sea (UNCLOS). There are two sides on this debate. Coastal states tend to increase the control over their maritime zones while maritime states want to enjoy the freedom of navigation and overflight. As a result, different interpretations of UNCLOS have recently leaded to several confrontations between these two group of states. The ambiguity of the issue comes from two main areas: first, the question of whether EEZ limits the freedom of high seas; and, second, the scope of the term "peaceful purposes". Thus, in this paper, we will try to assess the argument from these two aspects.

2. THE LAW

The law of the peacetime uses of the sea is regulated mainly by 1958 and 1982 conventions of United Nations (UN). When it comes to the military activities in EEZ, the only reference to consider is UNCLOS.

According to UNCLOS, EEZ is a maritime zone beyond and adjacent to the territorial sea, extending out to 200 nautical miles from the baselines from which the territorial sea is measured. EEZ is neither national waters nor high seas. EEZ has a special regime in which the rights and jurisdiction of coastal states and the rights and freedoms of other states are set out in articles 55-59. According to these articles, this maritime zone begins where the territorial sea ends and is to extend no more than 200 nm from the baseline. In this zone, the coastal state has sovereign rights for the economic exploitation and exploration of all resources, and jurisdiction over artificial islands and installations, marine scientific research, and the protection and preservation of the marine environment. It is important to note that sovereign rights are not the same as sovereignty which exists on land and in the territorial sea.

After this codification, sovereign rights and jurisdiction of coastal states that extend to international waters started to affect the interests of maritime states operating in these waters. According to article 56, in exercising its rights and performing its duties, the coastal state shall have "due regard" to the rights and duties of other States and shall act in a manner compatible with the provisions of UNCLOS.

Although "due regard" keeps its ambiguity, the scope of this term can be driven from parameters like the content of activities, closeness of coastal state, and the effect of activities to economical potential of maritime zone and the conditions.(Geng, 2012, p.26) This is particularly the case for military activities in the EEZ.

3. MILITARY ACTIVITIES

The military use of the seas involves several activities of naval units. In peacetime, it includes but it is not limited to being the police force in internal waters, exercises to prepare for several operations, gunnery and missile firing trials, intelligence gathering, military surveying, and dealing with issues like piracy and contraband trade (Churchill&Lowe, 1999, p.426).

4. PEACEFUL PURPOSES

The term "Peaceful Purposes" is initially used in 1959 The Atlantic Treaty and then used in the text of many agreements. Finally, it is used in the eight articles of UNCLOS.1 When we examine the text of agreements up to UNCLOS, we see that this term is not defined and even each parties give different meanings to this term. Although UN Sea Bed Committee (1968) worked out to define the term "Peaceful Purposes", those studies were restricted to only sea bed. However, at the end of these studies, the principle of "exclusively peaceful purposes", which may be commented that not every military activity can be forbidden, was accepted. (Traves, p.815-816) Although there were some disputes for defining "peaceful purposes" in UNCLOS, this term was remained "uncertain" and entered to UNCLOS text as it is. The articles which regulate the use of seas for "peaceful purposes" can be summed up to four groups.

- Reservation of the High Seas and EEZ for peaceful purposes, at article 88,
- Use of International Sea Bed for peaceful purposes, at articles 141, 143(1), 147(2)(d), 147(2)(d) and 155(2),
- Maritime Scientific Researches for peaceful purposes, at articles 242(1) and 246(3),
- Use of seas for peaceful purposes, at article 301

Inspite of the fact that there is no clear definition of "peaceful purposes", we can understand the fundamental principles of this term by looking at article 301. In this article, state's military activities for defense in accordance with UNCLOS are named as "peaceful usage". Then, we can conclude that given the principles of UNCLOS and United Nations Treaty2, the term "peaceful usage" do not restrict legal military activities, but threat and use of force. Moreover, most of the experts examining the issue express that article 88 cannot be interpreted as

[1] Article 88, 141, 143(1), 147(2)(d), 155(2), 240(a), 242(1) and 246(3).
[2] Article 2(2) and 2(4).

prohibition of all military activities at high seas, and to support their ideas, they emphasized article 17 and 30 which give the right for all vessels' (without restrictions) innocent and transit passage, article 29-32 which state military vessels should be arranged additionally and article 298 (1)(b) which states there should be special rules for the disagreements over military activities.

After these explanations over "peaceful purposes" term, we want to pass to the analysis of EEZ which is the most controversial MJA in terms of military activities. Today, EEZ includes contagious zone, fishing zone and continental shelf. Besides, approximately %36 of the world seas falls into a 200-mile prospective EEZ and nearly the half of the world's petroleum reserves is under these waters (Wilson, 2010, p.421)

5. MILITARY ACTIVITIES IN THE EEZ

In 1982 UNCLOS, EEZ was a new term and the rights, jurisdiction, and freedom of related states on this zone, especially the status of military activities, were controversial issues during the negations. There is no clear regulation for military activities in EEZ and whether foreign states can practice military activities in EEZ without taking permission from coastal states has always been an unanswered question. From this point of view, controversial article 58 says that all nations have the freedom of navigation and overflight and other internationally lawful uses of the sea in EEZ.

On article 58, nations split into two different sides. Liberal group defends their views with navigation freedom and other internationally lawful uses of the sea and they support the use of EEZ for military activities without coastal state permission. Conservative group says that because of coastal state's national security and economic rights, the use of EEZ for military activities is not acceptable. Main reason for this debate originates from different comments on the articles regarding "peaceful purposes" in UNCLOS. Some nations like Brazil and India declare that according to article 310 other nations have to get permission from coastal state prior to their military activities in EEZ. (Geng, 2012, p.25) For example, Brazil's declaration in 1988 is given below:

"The Brazilian Government understands that the provisions of the Convention do not authorize other States to carry out military exercises or maneuvers, in particular those involving the use of weapons or explosives, in the exclusive economic zone without the consent of the coastal State."

While nations in the conservative group made some declarations, nations in liberal group made some counter declarations, as well. For an instance, Holland's declaration is given below:

"The Convention does not authorize the coastal State to prohibit military exercises in its exclusive economic zone. The rights of the coastal State in its exclusive economic zone are listed in article 56 of the Convention, and no such authority is given to the coastal State. In the exclusive economic zone all States enjoy the freedoms of navigation and overflight, subject to the relevant provisions of the Convention."

While these declarations show the distinct interpretation difference between those nations, the use of EEZ for military activities still maintains its uncertainty and ambiguity.

Because of different interpretations, the political disagreements between liberal and conservative groups caused some concrete conflicts and raised tensions in time. In this context, some countries like Brazil and India promulgated only diplomatic protests against military activities while China, North Korea and Peru physically interfered with research activities. (Pedrozo, 2010, p.13) China is the most claiming nation at South China Sea and tries to restrict or hinder military activities in its claimed EEZ. (Rahman et al, 2010, p.324) On the other hand, U.S. shows its military power via navy globally or regionally throughout the world. Therefore, most of the confrontations in the EEZs occurred between U.S and Chinese Navies. The events happened in the post UNCLOS era are stated below.

5.1. The events between China and U.S.:

The Hindrance of USNS Bowditch (T-AGS 62) Research Ship:

While USNS Bowditch (T-AGS 62) was doing routine hidrographic research in the alleged EEZ of China in Yellow Sea on 23 March 2001, a Jianheu III Class frigate of China hindered the research and wanted from research ship to end the research and to leave the region. Then, UNSN Bowditch which

was an unarmed auxiliary ship left the region as ordered.
After some days U.S. China Ambassador gave a harsh protest to Chinese Minister of Foreign Affairs. Then, USNS Bowditch returned to region with escort of a warship. Chinese goverment spokesman Zhang Qiyue, said that USNS Bowditch (idetified by Pentagon as Ocean Research Ship)'s research activities in EEZ (200 nm) is the violation of international law. On the other hand, Pentagon's spokesman said that Bowditch was a ship which had civilian personnel, was conducting military surveillance activities in ocean and that event in EEZ was a generally accepted implementation of international law. (Pedrozo, 2009)
The EP-3 İntelligence Aircraft's Forced Landing:
While U.S. EP-3E ARIES II Signal Intelligence Aircraft was flying at the point which was 70 nm away from China's Hainan Island and 100 nm away from Military Base at Paracel Island on 01 May 2001, China's 2 J-8II Jet Planes precluded and a collision occured between EP-3E and one jet plane. This event was called as "Hainan Island Event". As a result of the collision, Chinese pilot died and EP-3 Plane's nose and number 1 propeller got injured. And then EP-3 Plane was forced to land on Lingshui Military Airport at Hainan Island. 24 crew were arrested and interrogated by Chinese authorities until U.S. declaration related to accident. Two sides did not increase the tension and China released all of the crew after 11 days under arrest.
The Secretary of the State of that period, Donald Rumsfeld said that surveillance flights were continuous routine that generally accepted by other nations and openly criticized China's interference. Moreover, he said that China could observe their activities but there wasn't any right to interefere with physically. (Wilson, 2010, p.421)
The Harassment of USNS Impeccable (T-AGOS 23):
USNS Impeccable which was an unarmed ocean surveillance ship with civilian crew, was harassed by five Chinese ships at 75 nm south of Hainan Island. One of the ship was intelligence gathering ship, one is patrol boat under the control of Fishing Bureau, and the other one is under the control of State Ocean Administration and the rest were two trawl fishing vessels.
USNS Impeccable's job was defined as mapping the sea bed or listening and monitoring submarines by using Surveillance Towed-Array Sensor System (SURTASS).
Chinese sailors used a long hook and try to reach the cable of sonar array, 2 Chinese Ships approached 15 meters near to Impeccable and wanted from Impeccable to leave the region. Impeccable responded with squeezing water from her fire hose and then 2 Chinese Ships approached to bow of Impeccable and threw billet parts in front of her and finally forced Impeccable to stop.
U.S. goverment declared Chinese activities clumsy, careless and unlawful and protested. USNS Impeccable returned to the region with the escort of USS Chung-Hoon (DDG) in the following day.
Chinese Minister of Foreign Affairs Spokesman said that USNS Impeccable was conducting activities in South China Sea without having permission. In addition to that, one of the Chinese Navy's Political Commissar indicated that they would accept innocent passage of military vessels through their territorial waters or EEZ, but would not give any permission to any military ship activity other than innocent passage. (Geng, 2012, p.23)
The Harassment of USNS Victorious (T-AGOS 19):
A Chinese patrol boat under the control of Fishing Bureau illimunated USNS Victorious (Same as USNS Impeccable) by using high powered projector without any notice at 125 nm away from Chinese coast in Yellow Sea on 04 March 2009. A Chinese Y-12 surveillance aircraft passed 12 times over the ship with low flight in the following day. U.S. National Intelligence Director criticized China's increasing harsh attitude in Yellow Sea in a brifing at Security Committee of Senate. Communist Party newspaper on 19 February 2009 could be shown as an example. In that newspaper it was written that if U.S. Spy Ship had entered to Chinese maritime zone again, China would have sunk the ship. (Rahman, 2010, p.326)

5.2. The event between U.S. and Peru:

Due to not responding orders from Peruvian Air Forces to land, Peruvian Air Forces opened fire to U.S. C-130 aircraft which was 60 nm away from Peru, was making narcotics operation on 24 April 1992. As a result, one personnel died and two personnel injured. The spokesman of Peruvian Air Forces Captain Jorge Barboza said that C-130 had the permission to flight over Huallaga Valley where cocaine's raw material was, but C-130 diverged

300 km west from its original course. And then two fighter plane made notice to C-130 but American pilots did not take that notice into consideration, because of that fact fighter planes opened fire. (Pedrozo, 2010, p.13)

5.3. The Event between China and Vietnam:

One of the warship of Chinese Navy opened fire to Vietnamese fishing vessel on 8 January 2005 and as a result, 9 personnel died and 7 personnel injured. That event occurred at the common fishing region's (between China and Vietnam) 10 nm South in Vietnam territorial waters. According to Chinese defensive declaration Chinese fishing vessels were protected themselves.

5.4. The Event between Japan and North Korea:

During the end of december of 2001, Japan Coast Guard Ships started to follow an unknown flag-100 ton ship from Japan's EEZ to Chinese EEZ and opened fire. The ship was sunk in Chinese EEZ. And then, although Japan declared that the ship was North Korean smuggler ship or intelligence gathering ship, North Korea declared that there wasn't any connection with that ship and attacking and sinking a ship was piracy and that was terrorism. (Valencia, 2002, p.723)

6. TOKYO MEETING

The events happened especially in the EEZs of Asia-Pacific countries and different point of views on practices in the EEZ leaded countries to a deeper analysis about the issue. As a result, between 2002-2005 several dialogue meetings were arranged in Mali, Honolulu, Shanghai, and Tokyo in order to establish a common understanding about the EEZ regime. Experts from Indonesia, South Korea, Japan, USA, Australia, China, India and Russia attended the meetings and they try to clarify the controversial and ambiguous areas.

In the Tokyo meeting in September 2005 the experts and analysts from all countries reached a consensus on some voluntary, non-binding guidelines. (Valencia&Akimoto, 2006, p.704-711) The text of guidelines attempt to balance the interests of coastal states and maritime states and a result of the most comprehensive study on this subject. Even though it is not a global document, it may serve as a framework for such an agreement.

7. CONCLUSION

The text of Tokyo guidelines is an important step in the codification of military uses of the EEZ. However, it is not a widely accepted document and includes the opinions of experts from a small group of countries. Thus, the only legal document regulating the military activities in the EEZ is still UNCLOS.
Given the context above, one can conclude that the discussions about the military use of the EEZ will continue in the following years. According to our analysis, if there is interference in the coastal State's sovereign rights like exploitation of resources, some limitations for foreign states on the freedom of navigation or overflight may be acceptable. Other than that, we conclude that article 58 and 301 was intended to preserve the right to conduct military activities in the EEZ.
In order to prevent future confrontations in EEZs, the scope of military activities and the meaning of the term "due regard" must be clarified. Therefore, it is important to carry on international meetings like Tokyo and develop a global binding agreement on such controversial areas.

REFERENCES

1.Churchill R.R. & Lowe A.V., The Law of the Sea, Third Edition, Manchester University Press, 1999

2.Geng, J., The Legality of Foreign Military Activities in the Exclusive Economic Zone under UNCLOS, Merkourios 2012, Volume 28, Issue 74, Article, p. 22-30.

3.Pedrozo, R., Close Encounters at Sea, Naval War College Review, Summer 2009, Vol 62, No.3.in the EEZ

4.Pedrozo, R., Preserving Navigational Rights and Freedoms: The Right to Conduct Military Activities in China's Exclusive Economic Zone, Chinese Journal of International Law, 2010, p.9-29.

5.Rahman C. & Tsamenyi M., A Strategic Perspective on Security and Naval Issues in the South China Sea, Ocean Development & International Law, vol.41, 2010

6.Treves, T., Military Installations, Structures, and Devices on the Seabed, The American Journal of International Law, Vol. 74, No. 4, 1980

7.UNCLOS

8.Valencia M. & Guoxıng J., The North Korean Ship and U.S. Spy Plane Incidents: Similarities, Differences, and Lessons Learned, Asian Survey, 2002, Vol.42 No.5,

9.Valencia M.J. & Akimoto K., Guidelines for navigation and overflight in the exclusive economic zone, Marine Policy, 2006, p.704-711.

10.Wilson, B., An Avoidable Maritime Conflict: Disputes Regarding Military Activities in the Exclusive Economic Zone, Journal of Maritime Law & Commerce, Vol. 41, No. 3, July, 2010

11.Yee, S., Agora: Military Activities in the EEZ, Chinese Journal of International Law, 2010, p.1-7.

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Education meets the requirements of STCW convention and The Regulation on Requirements for the Award of Ranks and Certification of Seafarers on Board Merchant Ships of the Republic of Croatia.

The Faculty of Maritime Studies is a partner institution of the postgraduate doctoral study "Maritime Affairs" organised by and carried out at the Faculty of Maritime Studies in Rijeka.
The Faculty cooperates with many other faculties of Croatia and Europe as well as many shipping companies and companies involved in sea-related activities. The Faculty of Maritime Studies in Split has founded a professional and scientific journal "Transactions on Maritime Science" - ToMS and International Maritime Science Conference - IMSC.

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Hydrographic Institute of the Republic of Croatia

Organized hydrographic activities in the Adriatic date back to 1860, when Hydrographic Office was established in Trieste. In the years to come, it changed locations a number of times: Pula (1866), Tivat (1922), Dubrovnik (1923), Split (1929), Hvar (1943), Vis (1944), Monopoli (1944), Split (1944). From 1937 the Office continued its activity under the name of the Hydrographic Institute of the Navy.
After the recognition of Croatia as an independent state, Croatian Parliament established the National Hydrographic Institute on 10 April 1992, later renamed the State Hydrographic Institute.
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