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MANAGEMENT AND PROSPECTS OF THE CROATIAN SHORT SEA SHIPPING DEVELOPMENT

ABSTRACT

Quite a number of scientific and technical papers have been written about the elements and the factors of the port system operation in the developed maritime countries. The study of a port system may be based on the research of the traffic, commercial and industrial role separately, or in an integrated approach of the technical, technological, organisational, economic, ecological and legal elements. The drawbacks of both approaches come to the fore if one studies the competitiveness of the port system as the end goal of the port functioning which also determines the operation of the port system subjects. A comprehensive study of the competitiveness of the Croatian port system must combine the study and research of the possibilities of short sea shipping integration in the European maritime countries, especially regarding the Croatian integration into the European Union. From the Croatian aspect, the term as accepted by the Ministry of the Sea, Tourism, Transportation and Development, "meduobalno prometno povezivanje" (English: short sea shipping) has multiple meaning, and this is primarily the traffic connection of the Croatian and Italian coasts, redirection of a part of cargo transported from the European Union to the countries of the South-eastern Balkan, via Croatia, reduction of harmful emissions in traffic and increase of traffic in domestic ports. "Meduobalna plovidba" (Eng. intercoastal navigation) refers to the movement of goods and passengers by sea between the ports located in Europe or between these ports and those outside Europe having the sea border with Europe. The goal of introducing short sea shipping is to alleviate the burden on the European road routes and to redirect the transport of part of the cargo and passengers to sea transport; and furthermore, the improvement of the traffic connections between Croatia and the European Union and connecting of the Danube and the Adriatic.

KEY WORDS

SSS, transport development strategy, port management, port system competitiveness

1. INTRODUCTION

In the European countries the intercoastal navigation started to be more intensively planned and organized in 1996. Intercoastal navigation effected very good results, both in economic and ecological justification. The last reports, namely, of the European organization of the maritime ports have been more than positive. Some of them had been mentioned earlier, but it should be emphasised that currently the European maritime ports and services closely connected to their activities produce some twenty billion euro, which means that in the final calculation the European maritime industry produces at least a hundred and eleven billion euro annually.

Besides, about three hundred and fifty thousand people all over Europe are employed in the ports and port services, which means that the European maritime industry employs about two and a half million people. Average port costs vary between five and ten per cent of the total door-to-door transport costs in the export of goods from Europe by sea. [1]

In Croatia, more intensive considerations about the introduction of intercoastal navigation started several years ago. A significant step was undertaken in Rijeka on 12 July 2005 when the Short Sea Shipping Promotion Centre was founded on the initiative of the Ministry of the Sea, Tourism, Transportation and Development, and one of the most important objectives was defined as the promotion of short sea shipping of the Italian and Croatian coast. Ravenna and Bakar, Ancona, Zadar and Ploče were mentioned as the key destinations for the promotion of short sea shipping. Intercoastal navigation is the field of interest of the Croatian port authorities, ports, shippers, agencies, forwarders and carriers, and everything in the interest of increasing the national gross revenue.

The purpose of research in this work is to consider the complexity of the system of ports and berths on maritime navigable routes, their elements and action of the subsystem from the aspect of technology and traffic organization, with the aim of establishing the concept of intercoastal navigation development which will provide an affordable price of service to all the users not disrupting the legal and ecological standards. In compliance with the existing facts and results of the previous studies of the transport systems, the characteristics of the ports will be studied and the possibility of their reorganization into the intercoastal navigation centres i. e. interfaces of the maritime and land transport. Based on the developed predispositions, preconditions and possibilities, the presented study initiates an overview of the administrative, organizational and information levels with exact specification of the measures and strategic decisions forming a model that provides all the port system subjects with information on how to establish the intercoastal navigation in the Republic of Croatia and what are the advantages of such an established system.

2. DEVELOPMENT OF INTERCOASTAL NAVIGATION IN EUROPE AND IN THE REPUBLIC OF CROATIA

Short-sea Shipping has been around for a very long time: there are thousands of wrecked vessels around the Mediterranean dating back to Roman times. Short-sea Shipping carries 41% of goods traffic within the Community. [2]

The European maritime corridors, the so-called "Motorways of the Sea", represent a new concept in the European traffic system. They are based on short-sea shipping with a volume increased by 32 per cent, between 1995 and 2004, the same as with road transport. Short-sea shipping on the European maritime corridors should improve the European transport system in releasing road transport from its domination. The European transport corridors represent the main possibility of the European Union for the following planning periods of several years. Still, possible problems are of financial nature, both in the public and private sector.

Besides, the following should be done: [3]

- the existing infrastructure should be adapted in the ports and their hinterland,
- logistic activities should be stabilized and with the application of newer technologies it should yield very good results. The investment funds should be available within the "Marco Polo" project, investments from private sectors or/and from the European Investment Bank or from the Union member as independent investment source.

High quality of the transport service available on the European maritime corridors requires continuous investments and quality monitoring which initiates certain changes. The changes should be studied and they should include all the relevant participants. Master plans of the defined two maritime corridors recognize various characteristics and should help in forecasting the potential cargo flow as the basis for the needs of this political decision of each of them separately. They should help in the preparation of the participants in the public and private sectors for financing methods, insurance of knowledge on the characteristics of transport flows and the new market. The objective is to study and combine different national economies, environments and social factors, connect the ports and make them mutually open and transparent.

The establishment of the Short Sea Shipping Promotion Centre. The Centre was established on July 12, 2005 by the Ministry of the Sea, forwarding agents, port authorities, Croatian Railways, Croatian Association of Road Hauliers, and shipping agents. It is expected that the Centre will join to the European Network for the Promotion of Short Sea Shipping in October 2005. The objective of the Centre is to encourage evaluation of the advantages of short sea shipping on the trans-European and pan-European level. [4]

3. PROTECTION OF THE ENVIRONMENT AND INTERCOASTAL NAVIGATION

One of the basic guidelines of further development of the European Union transport system is the preservation of the environment, sustaining of the current situation in the environment and reduction of the existing level of traffic-generated environmental pollution. In this respect, arguments are in favour of the initiative to develop SSS since it is in compliance with the ecological development and environmental protection requirements. For every operation or construction of port traffic infrastructure facilities it is necessary to consider the legal requirements which regulate the sea and environmental pollution. Pollution by harmful materials and fuels differs due to different laws and regulations related to a certain type of pollution.

4. SSS INTEGRATION INTO INTERMODAL TRANSPORT CHAIN

Promotion of the balance among transport modes means consideration of the drawbacks of every individual mode and insurance of mutual advantages and interaction and integrated functioning. The link which is missing most is the lack of close connections between the sea, inland waterways and railway. For cen-

turies already has the transport by seas and rivers dominated the cargo transport in Europe. The major cities were built on rivers or on the river mouths and major trade fairs in the Middle Ages had always been held in river or sea ports. However, today, in spite of mild revival, transport on inland waterways is in the poorest relationship towards other transport branches, although it is a type of transport that is not expensive and harms the environment less than road transport.

Maritime transport and transport on inland waterways within the Union are the two key parts of intermodality that has to provide a method of solving the issues of increasing congestion on the roads and railway infrastructure as well as reducing air pollution. Until now, these two types of transport had been insufficiently used, although the Union has a huge potential, i. e. 35,000 kilometres of coast and hundreds of sea and river ports, and literally infinite transport capacities.

In order to form the trans-European transport network, it is necessary to give priority, at the national level, to ports that are well connected with the mainland network, especially along the coast of the Atlantic Ocean and the Mediterranean, and which could form a part of the authentic logistic chain.

To make full use of Short Sea Shipping in Europe, it needs to be seamlessly integrated into logistics chains and offer door-to-door solutions to customers. Such logistics chains should be managed and commercialised by one-stop shops offering the customers a single contact point that takes responsibility for the whole intermodal chain. Further, the notion of competition between modes should be replaced by complementarity because co-operation between modes is vital in door-to-door chains involving more than one mode. This requires efforts from all parties but it is a clear win-win situation. [5]

5. THE BASIC MODEL

Defining the basic model of supply chain and the company positioning within the chain, e. g. ports, represents the precondition of identifying the need to introduce SSS.

According to the author S. S. Merchan [6] a supply basic-chain of a company consists of distributing a homogeneous product to several consumers from factory, distributed uniformly in a region and it is also considered that the product value is not high. According to this the company has basically distribution strategies of the product, as shown in Figure 1:

a) one-to-many. Each customer receives directly the product from the factory. When a particular schedule is not imposed and the value of the product is not high it is possible that all trucks are filled and serve several customers in one trip, in order to

reduce the total logistic cost as shown in case A, Figure 1.

b) one-to-many transshipment. There is a terminal that receives the trucks from the factory and sends other truck to the costumers. A few trucks of great capacity can supply the terminal every day and from it several vans whose capacity could be half of the first one for instance, can supply the customers, implying a reduction of the transport cost. The final customer receives the same quality services as the first strategy, with lower transport costs, but the holding and the handling cost of the terminal increase. This strategy could be cheaper than the first one depending on several factors, such as the distance between origin and destination or the demand.

It can be assumed that there is no any problem to consider that each van departs full from the terminal and serves several customers, as it is shown in case B in Figure 1. This consideration is valid particularly if a long distance is assumed from the terminal to the final customer. In this context, it is logical that the company analyses another way to transport its product, using SSS. As first approximation, when the most economical supply chain of a company uses a consolidation terminal, under the terms exposed in Figure 2, the part of the maritime transport, particularly port B, could be viewed in the supply chain in the same role the terminal had when all transport was done only by road transport, as it presented schematically in Figure 2. Focusing on costs, the SSS alternative could be better than only road transport depending basically on maritime cost and port costs, both of which are essentially due to economies of scale in ships and maritime time and operational cost and port productivity respectively. [7]

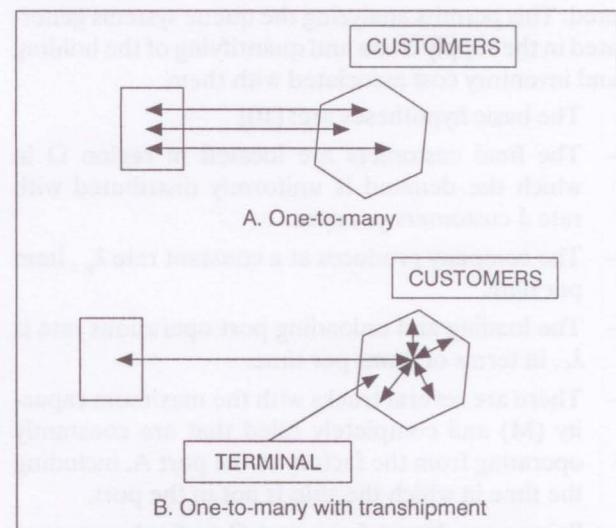


Figure 1 – Strategies to distribute a product

Source: S. S. Marchan: An Analysis of the Potential of the Short Sea Shipping due to its Cost Structure, Maritime Transport III, Department of Nautical Sciences and Engineering, Technical University of Catalonia, Barcelona, 2006, p. 609.

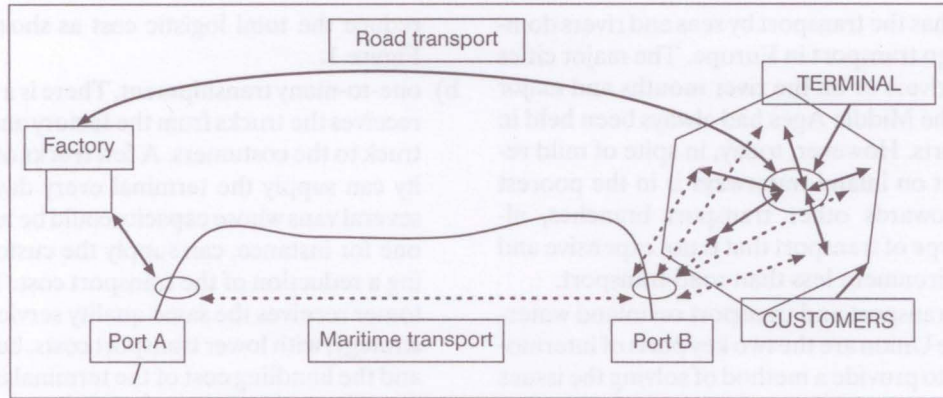


Figure 2 - The implementation of SSS compared with road transport

Source: S. S. Marchan: An Analysis of the Potential of the Short Sea Shipping due to its Cost Structure, Maritime Transport III, Department of Nautical Sciences and Engineering, Technical University of Catalonia, Barcelona, 2006, p. 610.

6. MATHEMATICAL MODEL

Short Sea Shipping is a successful mode of transport in Europe. For instance, in the 1990s it was the only mode that was able to keep pace with the growth of road transport. It started in fact to outpace road transport. Short Sea Shipping is also an obvious choice to play a key role in reaching the objectives of the European Transport Policy. It can help curb the forecast substantial increase in heavy goods vehicle traffic, rebalance the modal shares, bypass land bottlenecks, and it is safe and sustainable. [8]

The model of a supply chain shown in Figure 2 can be divided into three basic parts (factory to access port A, port A and B and maritime transport and access of port B to final customers), all of which are studied separately. To calculate the total logistics cost per item a curve between numbers of items versus time is considered. This permits analyzing the queue systems generated in the supply chain and quantifying of the holding and inventory cost associated with them.

The basic hypotheses are: [10]

- The final customers are located in region Ω in which the demand is uniformly distributed with rate δ customers per area.
- The company produces at a constant rate λ_p , item per time.
- The loading and unloading port operations rate is λ_l , in terms of items per time.
- There are several trucks with the maximum capacity (M) and completely filled that are constantly operating from the factory to the port A, including the time in which the ship is not in the port.
- Some vans depart from port B to final customer, each serving a particular sub region of demand (Ω_i , where $\sum \Omega_i = \Omega$). All vans are full and with a capacity (λ_{max}) sufficient to serve all customers located in Ω_i .

- The ship only serving the same company and its capacity (C) is one that all the items accumulated when the ship is outside of port A. For this, it is also necessary to suppose that $\lambda_l > \lambda_p$. The ship sails from port A, arrives at port B and returns to port A to carry on new products.
- In order to make calculations easier, it is supposed that $c_{/M} \approx \delta$ and $c_{/v_{max}} \approx \eta$ where δ and η are input numbers. Thus, the relation $\eta \approx \delta M/v_{max}$ can be automatically obtained.

In these conditions, the total logistic cost per item due to the transport from the origin to port A access (z_{OA}) is the sum of the fixed inventory time and transport cost per dispatch, that is:

$$z_{OA} = \alpha_0 + \frac{\alpha_1}{M} = c_i \left(\frac{r_{OA}}{s} + \frac{M}{2\lambda_p} \right) + \frac{2r_{OA}c_d}{M}$$

Where:

- α_0 – fixed inventory cost, due to transport and queuing in the factory.
- α_1 – transport cost per dispatch.
- C_i – inventory cost per item-day.
- r_{OA} – road distance from factory to the port of access.
- c_d – transport cost per vehicle-mile.

Additionally, the total logistic cost per item generated from the port A access to the port B exit (z_{AB}) is basically due to unloading and loading port operations (other type of port costs like taxes are included in this concept), inventory cost and maritime transport cost.

In mathematical terms it means:

$$z_{AB} = \alpha_3 + 2\alpha_4 C + \alpha_5 + \alpha_6 C = \left(2t_m + \frac{C}{\lambda_l} \right) - \frac{M(\delta - 1)}{2\lambda_p} + \frac{\eta v_{max}}{\lambda_l} - \frac{v_{max}^2 \eta (\eta - 1)}{2} C \lambda_l + 2c_o C + c_{sf} + c_{sv} t_m$$

where:

- α_3 – inventory cost when the freight is in ports in €/day-item.
- α_4 – unloading / loading port cost in €/item.
- α_5 – shipping fixed cost per item, in terms of €/item.
- α_6 – variable shipping cost per item, in terms of €/item-day.
- c_0 – port operational cost, in €/item.
- c_{sf} – fixed shipping cost, in €.
- c_{sv} – variable shipping cost, in terms of €/item-navigational day.
- t_m – time in ship.
- v_{max} – delivery lot size to a customer that is equivalent to the vehicle capacity (in terms of numbers of items).

The inventory cost due to the port time in both ports is calculated considering the queue systems created in ports and estimating the average time of item in the system dividing the total area defined by the queue system and the total items in this system.

Finally, to obtain the total logistic cost per item, the supply chain cost (z_{BF}) from the port B to the final customer should be characterized. In this part of the trip there is only one origin (port B) and several consumers that are uniformly distributed in region Ω . We have several vans, each of them serving a particular sub region (Ω_i) in this way: it departs from port B and goes full to its region stopping at each customer. The total demand of the customers of each sub region is equivalent to the van capacity.

In Daganzo [9] the logistic cost per item for this particular case is studied, using the continuous approximation method. The cost function per item of each van which serves a sub region Ω_i is:

$$z_{BF} = \alpha_7 + \frac{\alpha_8}{n_s v_{max}} + \frac{\alpha_9}{v_{max}} + a_{10} n_s = \frac{c_i r_{AF}}{s} + \frac{2r_{BF} c_d}{n_s v_{max}} + \frac{c_d k \delta^{-0.5}}{v_{max}} + \frac{c_i k \delta^{-0.5}}{2s_{BF}} n_s$$

where:

- α_7 – fixed pipeline inventory cost generated by the trip between port B and the customers.
- α_8 – transport cost per dispatch.
- α_9 – transport cost added by customer detour.
- α_{10} – pipeline inventory cost added per item caused by a customer detour.
- n_s – number of stops per tour.
- r_{BF} – average distance from port B to the points in the delivery region Ω_i .
- s_{BF} – representative vehicle speed from B to region Ω_i .
- k – dimensionless factor for VRP local distance.
- δ – customer/area.

According to Daganzo, the total logistic cost per item (z_{OF}) when the SSS is used can be modelled by the sum of the three last terms of cost:

$$z_{OF} = z_{OA} + z_{AB} + z_{BF}$$

Using this expression it is possible to analyze the influence of the economies of scale in ships, and unloading and loading port productivity in the total logistic cost per item, which permits evaluating the role of these two factors in competition of SSS in respect to road transport. A valid way to do so is by obtaining the variation of the total logistic cost per item when the port operational productivity (λ_1) and the representative variables of ship's economies of scale (c_{sf} and C) change. Considering a particular trip, the average shipping transport cost, in €/item, is the ratio between the total shipping cost (the sum of fixed, CT_{sf} , and variable costs, CT_{sv}) and the total transported items (the ship capacity in studied case). In case of increasing ship capacity (C), the average cost will be reduced basically due to the importance of CT_{sf} in front of CT_{sv} , so that the ship's economies of scale are essentially represented by the variations of the value of fixed shipping cost per item (c_{sf}) and ship capacity (C). It should be noted that in a competitive situation the growth of productivity implies a reduction of cost production. Consequently, in this analysis the port operational cost (c_0) is considered constant, independent of port productivity increase.

If $z_{OF}(C, c_{sf})$ and $z_{OF}(\lambda_1)$ represent the total logistic cost per item when only the ship's economies of scale and port operational productivity change respectively, the following elasticities are defined to study the influence of two factors in the logistic total cost:

$$\varepsilon_C^Z = \frac{z_{OF}(C, c_{sf}) - z_{OF}^*}{\Delta C} \frac{C^*}{z_{OF}^*}$$

and

$$\varepsilon_{\lambda}^Z = \frac{z_{OF}(\lambda_1) - z_{OF}^*}{\Delta \lambda_1} \frac{\lambda_1^*}{z_{OF}^*}$$

where: z_{OF}^* is the logistic total cost per item in the initially considered value of variables.

7. PROSPECTS OF SSS IN DEVELOPMENT OF CROATIA

Maritime transport regarding the scope of operation, diversity of transport of goods, vehicles and people, and the possible influence on the world and national economy, and the foreign trade exchange represents the economic activity which has to be considered with special attention by the government.

Presented basic conceptual and mathematical model prove the economic justification of introducing

SSS in the Republic of Croatia. The basic document issued by the Ministry of the Sea, Tourism, Transportation and Development which defines the frame of affirmation and development of short sea shipping in the Republic of Croatia is the Pre-Accession Maritime Strategy of the Republic of Croatia. It defines the importance of the SSS development and the future financial support to the development.

Reinforcement of administrative measures in order to accomplish eligibility to participate in the projects Promoting short sea shipping within the programme of Croatia's participation in the EU Marco Polo programme is needed. Using financial assistance from the PHARE Programme for the year 2005, the Ministry of the Sea, Tourism, Transportation and Development is to join the Marco Polo Programme in 2006. This will provide the Croatian carriers with the possibility of access to financial support from the above Programme in conducting specific projects designed to reduce the heavily loaded road routes. The Republic of Croatia is expected to take part in the Marco Polo II Programme, starting in the year 2007. [11]

The Croatian port system has to be reorganized, modernized, redefined and restructured. In the future, the ports of Rijeka and Ploče can be developed as cargo ports, and the ports Rijeka, Zadar, Split and Dubrovnik should become macrologistic centres in maritime passenger transport.

The port policy measures with the aim of well-thought profiling of the Croatian ports have to define, concretize and simplify:

- the financing methods and investment amounts into port infrastructure;
- construction of land traffic routes towards the hinterland;
- management in ports of special importance for the Republic of Croatia i. e. county and local ports.

Investments into establishing and maintaining of SSS would mean significant benefits because multiplicative factors on the entire national economy would be multiple. Correct implementation of the set goals with consistent compliance to the proposed measures is impossible without educated personnel. Well-thought development of the lagging-behind maritime system of a rich maritime country has to be carried out by recognizing the national, economic, legal and political resources, but starting from the starting premise that the world sea is one and that the world maritime market is unique.

8. CONCLUSION

Regular service operates with freightliners and in ocean navigation today has a share of approximately

90 per cent of the entire world line tonnage. Regarding such a high percentage, it is important to insure the necessary safety level at ports, possibility of synchronized action of the traffic subsystems, and the level of participants' information required to satisfy their needs.

Maritime ports are the key subsystem of the maritime system and a factor in the transport flows and the development of numerous economic activities of a country. The tendency of seaport development in the world is directed towards: concentration of traffic to a fewer number of major ports, concentration of different economic functions in the same port, tendency to higher added value (improvement of goods and "lohn" activities), modern traffic connections with the hinterland, greater autonomy of port management.

Potential for short sea shipping is reflected in the following: short sea shipping includes national and international maritime transport, including secondary services, along the coast, to and from islands, rivers and lakes; the short sea shipping notion also increases the maritime transport among EU member states with the countries of the Baltic Sea, the Black Sea and the Mediterranean; short sea shipping offers the characteristics such as reliability, regularity, frequency, and safety of cargo on a higher level at a low price. Complete integration of short sea shipping, realization of door-to-door transport and intermodal transport leads to the network creation and contributes to the increase in the cargo at the port and development of cooperation with other modes and parts of supply chain and promotion, stimulation, and enabling of the development of short sea shipping as an economically more cost-efficient and environmentally friendly alternative to land transport and of intermodal transport of goods that will allow effective and cost-efficient usage of user-oriented transport system, free of influences on the competition among the industrial subjects.

The European Commission has adopted the orientation of the transport policy for the future. The mobility is of crucial importance for the European development and for the free movement of people. The negative impact of mobility has to be reduced regarding energy and environment quality. Apart the actions planned in the 2001 White Paper, the required additional instruments are the logistic transport action plan and intelligent transport systems in order to render mobility, which is competitive, reliable, safe, and environment-friendly, "greener" and more efficient.

Therefore, the study of development, management and prospects of SSS in the Republic of Croatia are starting to be of national importance, financially supported at the national level and at the level of the European Union.

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SAŽETAK

MENADŽMENT I PERSPEKTIVE RAZVOJA MEĐU- OBALNE PLOVIDBE RH

O elementima i čimbenicima djelovanja lučkog sustava u razvijenim pomorskim državama postoji priličan broj napisanih znanstvenih i stručnih djela. Promatranje lučkog sustava može se zasnivati na istraživanju prometne, trgovačke i industrijske uloge zasebno ili na integriranom pristupu tehničkih, tehnoloških, organizacijskih, ekonomskih, ekoloških i pravnih elemenata. Nedostaci oba pristupa dolaze do izražaja ukoliko se promatra konkurentnost lučkog sustava kao krajnji cilj kojem funkcioniranje luke teži i čime je djelovanje subjekata lučkog sustava determinirano. Sveobuhvatno istraživanje konkurentnosti lučkog sustava Republike Hrvatske mora objediniti proučavanje i istraživanje mogućnosti međuobalnog prometnog povezivanja s europskim pomorskim zemljama, posebno u svijetlu integriranja Hrvatske u Europsku uniju. Međuobalno prometno povezivanje s aspekta Republike Hrvatske (naziv preveden i prihvaćen od strane MMTPR, a u izvornom engleskom Short Sea Shipping) ima višestruko značenje, a to je prvenstveno međuobalno prometno povezivanje hrvatske i talijanske obale, preusmjeravanje dijela tereta koji se iz Europske unije prevozi u zemlje jugoistočnog Balkana, preko Hrvatske, smanjenje emisije štetnih plinova u prometu i povećanje prometa u domaćim lukama. Međuobalna plovidba odnosi se na kretanje roba i putnika morskim putem između luka smještenih u Europi ili između tih luka i luka izvan Europe koje morem graniče s Europom. Cilj uvođenja međuobalne plovidbe je rasterećenje europskih cestovnih pravaca i preusmjerenje prijevoza dijela tereta i putnika na pomorski prijevoz. Nadalje, poboljšanje prometne povezanosti Hrvatske i Europske unije i povezivanje Dunava i Jadrana.

KLJUČNE RIJEČI

SSS, strategija razvoja prometa, menadžment luke, konkurentnost lučkog sustava.

REFERENCE NOTES

- [1] ESPO-UDRUŽENJE EUROPSKIH MORSKIH LUKA, *Politika Europske unije u vezi morskih luka, praktične upute za subjekte odlučivanja u Europskoj uniji*, 2004, p. 2.
- [2] *White Paper - European Transport Policy for 2010: Time to decide*, European Commission, 2001, p. 41
- [3] *Conclusions of the Ministerial Conference on the Motorways of the Sea*, Ljubljana, Slovenia, 24 January 2006
- [4] *Pre-Accession Maritime Strategy of the Republic of Croatia*, Ministry of Sea, Tourism, Transportation and Development, 2005, p. 23
- [5] http://ec.europa.eu/transport/maritime/sss/index_en.htm
- [6] S. S. Marchan: *An Analysis of the Potential of the Short Sea Shipping due to its Cost Structure*, Maritime Transport III, Department of Nautical Sciences and Engineering, Technical University of Catalonia, Barcelona, 2006, p. 608
- [7] Ibidem
- [8] *White Paper - European Transport Policy for 2010: Time to decide*, European Commission, 2001
- [9] S. S. Marchan: *An Analysis of the Potential of the Short Sea Shipping due to its Cost Structure*, Maritime Transport III, Department of Nautical Sciences and Engineering, Technical University of Catalonia, Barcelona, 2006, p. 610
- [10] Daganzo, C. F.: *Logistics System Analysis*, Springer, Berlin, 1996
- [11] *Pre-Accession Maritime Strategy of the Republic of Croatia*, Ministry of Sea, Tourism, Transportation and Development, 2005, p. 23.

LITERATURE

- [1] ESPO-UDRUŽENJE EUROPSKIH MORSKIH LUKA, *Politika Europske unije u vezi morskih luka, praktične upute za subjekte odlučivanja u Europskoj uniji*, 2004 White Paper - European Transport Policy for 2010: Time to decide, European Commission, 2001
- [2] *Conclusions of the Ministerial Conference on the Motorways of the Sea*, Ljubljana, Slovenia, 24 January 2006
- [3] *Pre-Accession Maritime Strategy of the Republic of Croatia*, Ministry of the Sea, Tourism, Transportation and Development, 2005
- [4] http://ec.europa.eu/transport/maritime/sss/index_en.htm
- [5] S. S. Marchan: *An Analysis of the Potential of the Short Sea Shipping due to its Cost Structure*, Maritime Transport III, Department of Nautical Sciences and Engineering, Technical University of Catalonia, Barcelona, 2006
- [6] *White Paper - European Transport Policy for 2010: Time to decide*, European Commission, 2001
- [7] Daganzo, C. F.: *Logistics System Analysis*, Springer, Berlin, 1996
- [8] *Pre-Accession Maritime Strategy of the Republic of Croatia*, Ministry of the Sea, Tourism, Transportation and Development, 2005
- [9] *Intermodalni prijevoz u jugoistočnoj Europi, Jadranske luke - Jadranska vrata Europe*, IPC, Opatija, Croatia, 24-25 Nov. 2005
- [10] *Ekonomski leksikon*, Leksikografski zavod Miroslav Krleža i Masmedia, Zagreb, 1995
- [11] I. Miloš: *Mogući model pretvorbe i privatizacije u lukama Republike Hrvatske s kritičnim osvrtom*, *Suvremeni promet*, Zagreb, No. 14, 1999

- [12] Č. Dundović: *Koncipiranje lučke politike-temeljna pretpostavka hrvatskoga lučkog sustava*, Pomorstvo, God. 15, 2001
- [13] T. Poletan Jugović: *Integriranost RH u paneuropsku mrežu prometnih koridora*, Pomorstvo, Vol. 20, No. 1, Pomorski fakultet u Rijeci, Rijeka, 2006
- [14] M. Bukljaš: *Model luke i pristaništa na unutarnjim plovnim putovima*, Znanstveni magistarski rad, Fakultet prometnih znanosti, Zagreb, 2004
- [15] N. Jolić: *Funkcionalni i simulacijski model inteligentnih transportnih sustava u lukama*, doktorska disertacija, Fakultet prometnih znanosti, Zagreb, 2004
- [16] Parantainen, J., Merilainen, A.: *The Baltic Sea Motorway - Recent development and outlook for the future*, Ministry of Transport and Communications, Finland, Maritime Transport III
- [17] N. Jolić: *Luke i ITS*, Fakultet prometnih znanosti, Zagreb, 2005
- [18] European Commission, *Motorways of the Sea*, Article 12a of the TEN-T Guidelines, Brussels, 2004