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CURRENT CONDITION OF VESSELS ON INLAND WATERWAYS IN CROATIA

ABSTRACT

According to the criteria of reliability, cost-efficiency and environmental friendliness the traffic on inland waterways in the Republic of Croatia has not been fully used. The study analyzes the current condition of vessels on inland waterways in the Republic of Croatia. Also, statistical method and methods of analysis and comparison were used to research the current and pre-war condition from the aspect of type and number of vessels, and their capacity and engine power. The trend of the development of vessels in the Republic of Croatia has been compared in relation to the European countries with developed inland navigation. The current trend in the Republic of Croatia is the stagnation of the number of self-propelled vessels, and the reduction in the number of vessels intended for the transport of goods, then the reduction of total capacity and the engine power of all the vessels, as well as changes in the relation between the pushing and towing technologies in favour of the pushing technologies, in compliance with the trends in the world. The methods of compilation and comparison were used to research the preconditions of improving the condition of vessels, in compliance with the status and development in the countries of the Danube corridor VII.

KEY WORDS

inland waterways, Republic of Croatia, vessels, current situation

1. INTRODUCTION

The development of vessels for inland waterways has continuously followed the development of traffic on inland waterways, and first the towing technology was developed in the world, to be followed by the development of the pushing technology and self-propelled ships in the recent years.

The advantages of traffic on inland waterways compared to road and railway traffic are: less expensive transport and maintenance, lower necessary traction force, lower consumption of energy sources, lower share of labour, better environmental protection, greater safety.

The biggest disadvantages of traffic on inland waterways are: low vessel movement speed (8-10 times lower speed compared to the speeds in railway and road traffic), dependence of navigation on climatic and natural conditions.

At the end of the last century, global increase in temperature of the earth atmosphere was defined (about 0.6^0C during 20^{th} century)[1], caused by anthropogenic release of carbon dioxide (and other "greenhouse" gases) into the atmosphere. Traffic is also a significant anthropogenic atmospheric polluter by carbon dioxide. According to data from various sources the traffic participates in the total anthropogenic emission of carbon dioxide with a share of 20-25%. Therefore, the influence on the global warming is also one of the major factors for the selection of the cargo transportation branch. Also, within every traffic branch it is necessary to select such transport means and technology that will have least impact on the global warming through the emission of carbon dioxide into the atmosphere.

2. CURRENT CONDITION OF TRAFFIC ON INLAND WATERWAYS OF THE REPUBLIC OF CROATIA

The Republic of Croatia owns natural inland waterway network which consists of navigable rivers the Sava, Drava, Danube and Kupa (the Neretva is also navigable and it belongs to the Adriatic basin). These four rivers flow in the west-east direction and belong to the Black Sea basin, and follow Corridors X and VII the Danube corridor, and by opening the Rhein-Main-Danube Canal in 1992, the Croatian rivers have acquired access to the North Sea as well.

On the VB branch of the European traffic corridor (transport route north-south) the connection of the Danube and the Adriatic is possible and desirable using river-railway connection, since this would be the fastest way for Croatia to capitalize its favourable geo-traffic condition, thus creating the preconditions for successful competitive performance on the international traffic transit market. However, in order to realize this connection, relatively high financial investments are necessary. The several times announced construction of the multipurpose Danube-Sava Canal hasn't still been started yet. The construction of the low-land double-track railway line Rijeka – Botovo on the traffic corridor VB via Zagreb has been announced for 2007 with planned completion in 2010 at the earliest, and the dilemma regarding the construction of the river port in Zagreb (Rugvica) or in Sisak is still present. The more probable option is the construction of a river port in Sisak due to the started construction of the motorway A11 from Zagreb to Sisak in April 2006.

The combined transport river-railway connection on the branch VC of the European traffic corridor by connecting the Danube basin with the port of Ploče on the Adriatic, via Bosnia and Herzegovina (via Sarajevo and Mostar) will be realized more slowly due to the limited financial possibilities of the neighbouring country.

The natural disadvantage of our river traffic because of the lack of connection between the flows of the Sava, Drava and the Danube within the Republic of Croatia will be eliminated by the construction of the multipurpose navigable Danube-Sava Canal from Vukovar to Šamac which will connect the rivers Sava and Danube, and via the Danube with the Drava as well.

The existing status of traffic on inland waterways of the Republic of Croatia can be considered by segments, and it is also a consequence of several influencing factors. The traffic on inland waterways in the Republic of Croatia has been stagnating for quite some time now, which is among others also a consequence of the recent great war destruction and occupation of a part of the territory, then many years of belonging to Yugoslavia, where the development priorities were intentionally focused on the then Republic of Serbia, as well as the lack of competitiveness of this traffic branch due to the absence of major investments after the end of the war.

3. CONDITION OF GOODS TRANSPORT IN RIVER TRAFFIC AND TRAFFIC AT THE CROATIAN PORTS

Still, more recently there are indicators that show that the trend is stopping and there are possible changes. According to the data of the State Bureau of Statistics, during 2005, about 1,750,000 tonnes of cargo were transloaded at the ports of inland waterways of the Republic of Croatia, which is an increase of 30.3% compared to the previous year. However, a disastrous fact is that during 2005 not one transloading manipulation with containers was recorded. The transport of goods in ports on inland waterways in 2005, according to the data of the State Bureau of Statistics amounted to 1,644,000 tonnes, out of which 24% of the total amount was the share of transport of goods realized in domestic traffic, and 76% in international traffic. Data on cargo transloading for 2005 are not identical to the data on the transport of goods in the ports for two reasons:

1. The data of the State Bureau of Statistics do not include the data on transloading cargo performed by legal entities involved in cargo handling activities for their own purposes.
2. The statistics of cargo handling of the State Bureau of Statistics does not include the cases when a part of legal entities performs transloading outside the ports, and when cargo handling is done by legal entities that are not registered for transloading activities.

For the goods transport segment in the ports, the data for the years before 2005 cannot be compared to the year 2005 since there was an interruption of the time series. It is, namely because of the international comparativeness (according to Guideline of the Council of the European Commission 80/1119/EC), that gravel and sand were excluded from the data on traffic in ports.

Table 1 - Transport of goods (in 10^3 tonnes) and realized tonne-kilometres (in 106 tkm) in river traffic of the Republic of Croatia, from 1995 to 2004

year	RIVER TRAFFIC			
	transport of goods		realized tonne kilometres	
	10^3 tonnes	% in relation to 2004	10^6 tkm	% in relation to 2004
1995	776	86.5	33	16.6
1996	1,161	129.4	22	11.1
1997	971	108.2	22	11.1
1998	1,206	134.4	53	26.6
1999	833	92.9	52	26.1
2000	1,045	116.5	63	31.7
2001	1,123	125.2	78	39.2
2002	739	82.4	90	45.2
2003	706	78.7	84	42.2
2004	897	100.0	199	100.0

Source: Processed data from the State Bureau of Statistics

The analysis of data from Table 1 can lead to the conclusion that the total quantity of the transported cargo in river traffic in the Republic of Croatia stagnated from 1995 to 2004 with maximal deviation of up to 34.4%. One can also notice a fall in the amount of transported goods over the recent years in relation to the status in 2000 and 2001. Regarding the transported tonne kilometres of goods there is obvious continuous growth with minor anomalies for the entire considered period from 1995 to 2004. The data for 2005 cannot be compared with the data before 2005 because since 2005 the transport among foreign ports was not included, and in realized tonne-kilometres the distance from point of loading to point of unloading is considered.

Table 2 - Transport of goods (in 10^3 tonnes) and the realized tonne kilometres (in 10^6 tkm) in river traffic of the Republic of Croatia from 1984 to 1990 (excluding gravel and sand)

year	RIVER TRAFFIC			
	transport of goods		realized tonne kilometres	
	10^3 tonne	% in relation to 1984	10^6 tkm	% in relation to 1984
1984	4,339	100	652	100
1985	3,929	91	556	85
1986	3,939	91	635	97
1987	4,098	94	738	113
1988	3,622	83	504	77
1989	3,674	85	557	85
1990	2,713	63	527	81

Source: processed data of the Chamber of Commerce of the Republic of Croatia

Table 2 shows a fall in the total volume of the transported goods by 37% and tonne kilometres by 19% in river traffic of the Republic of Croatia in the pre-war years (1984 to 1990).

The comparison of data from Table 2 with Table 1 shows that in the years following the Croatian War of Independence caused by Serbian aggression on the Republic of Croatia, the inland navigation has been drastically reduced and that even the least favourable pre-war year has not been reached yet, neither regarding goods transport criteria, nor regarding the realized tonne kilometres. The most important, but not the only cause of such a condition is the almost complete break in the transport on inland waterways in the period of 5 years and the establishment of competitive traffic corridors that used to bypass the Republic of Croatia during the years of the Croatian War of Independence[2].

4. CURRENT CONDITION OF VESSELS ON INLAND WATERWAYS OF THE REPUBLIC OF CROATIA

The current condition of vessels on inland waterways of the Republic of Croatia has to be considered through several factors that are connected by cause--effect relationship.

The basic and the biggest problem is that our rivers have not been prepared for navigation, except for the Danube, which provides navigation in both directions according to the European standards along the entire length of the navigable path. The lengths of waterways according to classes are presented in Table 3. For the river Sava, this data is valid only for about half a year. Due to low water level, namely, the river Sava is navigable only for about 6 months a year. The rivers Danube and Drava are navigable along their whole navigable flow, and crude oil is transported along the river Sava from Slavonski Brod to Sisak. On the remaining navigable section the waterway is partly used as long as the water level allows it.

Table 3 - Inland waterways of the Republic of Croatia according to classes

navigable river	lengths of waterways (km) per classes			
	I	II	III	IV
Danube (in RH)	-	-	-	137.5
Drava	198.6	151	22	14
Sava	-	446	276	-
Kupa	136	5	5	-
Neretva	-	-	-	20

Source: Master's *thesis:* N. Đaković: Višenamjenski kanal „Dunav-Sava" u funkciji povezivanja Podunavlja s Mediteranom, Pomorski fakultet, Rijeka, 1996

About 50% of registered vessels in the Republic of Croatia are more than 30+ years old. [3] The stagnation and decrease of the goods transport on inland waterways have influenced also the decrease in the total number of vessels, and their capacity and power. Table 4 shows the comparison of the number and engine power of the river self-propelled vessels in the Republic of Croatia for the period from 1990 to 2005. The individual shares of engine power of pushboats, tugboats and self-propelled ships in the total engine power of all vessels are presented for clearer overview in Figure 1, and the individual numbers of pushboats, tugboats and self-propelled ships in the total number of self-propelled vessels in Figure 2. For comparison with trends in the world Table 4 analyzes the tugboats/pushboats relation over the years of the observed period.

Table 5 presents the comparison of the number and capacity of non-propelled river vessels (barges

and pushed boats) of the Republic of Croatia for the period from 1990 to 2005.

Table 6 shows the comparison of the number and the capacity of all the river vessels meant for the transport of goods of the Republic of Croatia for the period from 1990 to 2005. The capacity of barges, pushed boats and self-propelled boats, and the total capacity are presented for clearer overview in Figure 3.

Table 4 - Comparison of the number and power of self-propelled river vessels of the Republic of Croatia for the years 1990, 1997, 2000, 2003 and 2005 (data collected from legal entities registered in the transportation activities on inland waterways and legal entities involved in transport of goods on inland waterways)

self-propelled vessels	year				
	1990	1997	2000	2003	2005
tugboats	number	23	19	24	17	16
	% out of total number	71.9	67.9	68.6	56.7	51.6
	engine power, kW	8,957	7,272	6,821	5,042	5,246
	% out of total power	56.7	53.6	51.3	42.8	42.0
pushboats	number	8	6	8	8	9
	% out of total number	25.0	21.4	22.8	26.7	29.0
	engine power, kW	6,034	4,529	4,694	4,694	5,069
	% out of total power	38.2	33.4	35.3	39.8	40.7
self-propelled motor freighters and tankers	number	1	3	3	5	6
	% out of total number	3.1	10.7	8.6	16.6	19.4
	engine power, kW	810	1,777	1,777	2,045	2,155
	% out of total power	5.1	13.0	13.4	17.4	17.3
	capacity, t	1,102	1,899	1,899	2,251	2,218
OVERALL	Σ number	32	28	35	30	31
	% in relation to 1990 god.	100.0	87.5	109.4	93.8	96.9
	Σ engine power, kW	15,801	13,578	13,292	11,781	12,470
	% in relation to 1990 god.	100.0	85.9	84.1	74.6	78.9
Relation tugboats/pushboats	per number of vessels	2.88	3.17	3.00	2.13	1.77
	per vessel engine power	1.48	1.61	1.45	1.07	1.03

Source: Processed data of the State Bureau of Statistics

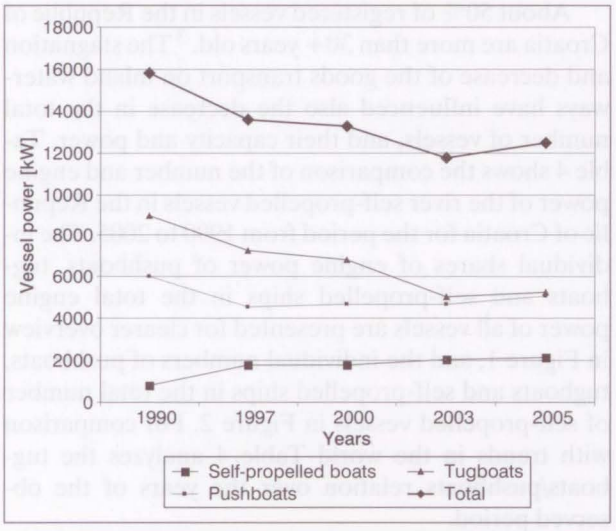

Figure 1 - Self-propelled vessel engine power for years 1990, 1997, 2000, 2003 and 2005

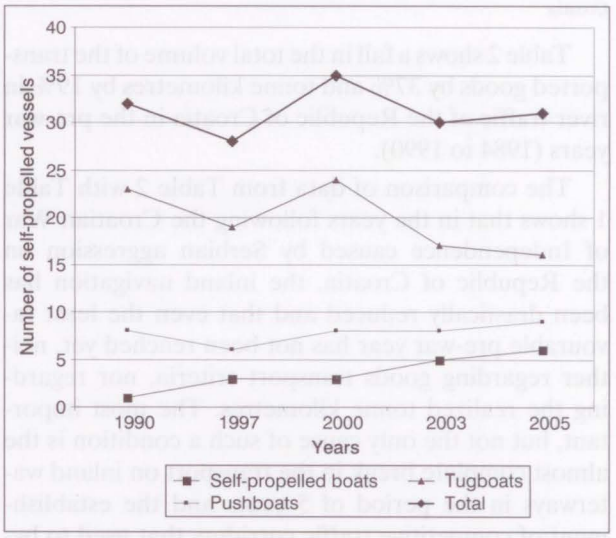

Figure 2 - Number of self-propelled vessels for the years 1990, 1997, 2000, 2003 and 2005

Table 5 - Comparison of number and capacity of non-propelled river vessels of the Republic of Croatia for the years 1990, 1997, 2000, 2003 and 2005 (data collected from legal entities registered in the transportation activities on inland waterways and legal entities involved in transport of goods on inland waterways)

non-propelled vessels		year				
		1990	1997	2000	2003	2005
tank barges	number	43	27	26	23	18
	capacity, t	42,500	27,015	25,977	22,805	18,567
barge	number	43	41	43	16	20
	capacity, t	27,536	24,356	21,102	7,333	7,956
TOTAL barges	number	86	68	69	39	38
	% out of total number	69.4	67.3	69.0	56.5	56.7
	capacity, t	70,036	51,371	47,079	30,138	26,523
	% out of total capacity	64.5	60.3	65.8	57.00	48.2
tank pushed boats	number	2	2	1	1	1
	capacity, t	3,400	3,400	1,700	1,700	1,700
other pushed boats	number	36	31	30	29	28
	capacity, t	35,138	30,480	21,060	21,060	26,790
TOTAL pushed boats	number	38	33	31	30	29
	% out of total number	30.6	32.7	31.0	43.5	43.3
	capacity, t	38,538	33,880	24,460	22,760	28,490
	% out of total capacity	35.5	39.7	34.2	43.00	51.8
OVERALL	Σ number	124	101	100	69	67
	% in relation to 1990	100.0	81.5	80.6	55.6	54.0
	Σ capacity, t	108,574	85,251	71,539	52,899	55,013
	% in relation to 1990	100.0	78.5	65.9	48.7	50.7
Towed/pushed relation	per number of vessels	2.27	2.06	2.23	1.3	1.3
	per capacity of vessels	1.82	1.52	1.92	1.33	0.93

Source: Processed data of the State Bureau of Statistics

Table 6 and Figure 3 show that the overall capacity of the vessels intended for the transport of goods in the period between 1990 and 2005 was continuously falling to 52.2% in relation to available capacity in the year 1990, as well as their number which fell to 58.4% in relation to the available number in 1990.

If in Table 4 and Figure 2, during the same period, the share of individual technologies is considered in the total number of self-propelled vessels one can see an increase in the share of the number of self-propelled boats which compensates for the fall in the share of the number of tugboats, and together with the stagnation in the share of the number of pushboats contributes to the stagnation of the total number of self-propelled vessels. However, it is indicative that in the same period, along with the stagnation of the total number of self-propelled vessels, there was a continuous fall in the available engine power of these to 78.9% in 2005 in relation to the year 1990. This means that in practice the self-propelled vessels with stronger engines are replacing the vessels with weaker engines.

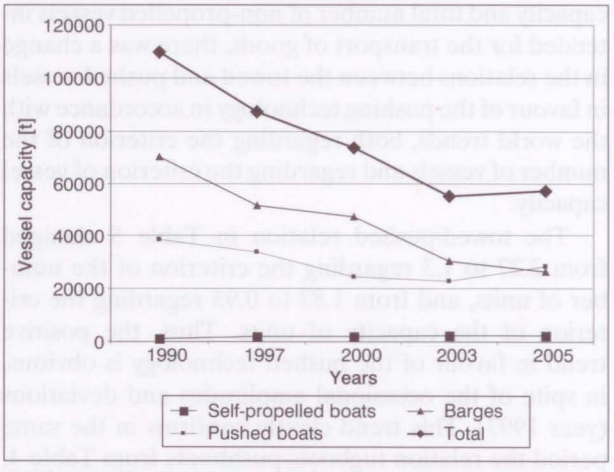

Figure 3 - Capacity of vessels on inland waterways for the years 1990, 1997, 2000, 2003 and 2005

Table 6 - Comparison of the capacity of the vessels on inland waterways of the Republic of Croatia for the years 1990, 1997, 2000, 2003 and 2005

vessels for the transport of goods		years				
		1990	1997	2000	2003	2005
total barges	number	86	68	69	39	38
	% out of total number	68.8	65.4	67.0	52.7	52.1
	capacity, t	70,036	51,371	47,079	30,138	26,523
	% out of total capacity	63.9	58.9	64.1	54.6	46.3
total pushed boats	number	38	33	31	30	29
	% out of total number	30.4	31.7	30.0	40.5	39.7
	capacity, t	38,538	33,880	24,460	22,760	28,490
	% out of total capacity	35.1	38.9	33.3	41.3	49.8
OVERALL non-propelled vessels	number	124	101	100	69	67
	% out of total number	99.2	97.1	97.0	93.2	91.8
	capacity, t	108,574	85,251	71,539	52,898	55,013
	% out of total capacity	99.0	97.8	97.4	95.9	96.1
self-propelled motor freighters and tankers	number	1	3	3	5	6
	% out of total number	0.8	2.9	3.0	6.8	8.2
	capacity, t	1,102	1,899	1,899	2,251	2,218
	% out of total capacity	1.0	2.2	2.6	4.1	3.9
OVERALL	Σ number	125	104	103	74	73
	% in relation to 1990	100.0	83.2	82.4	59.2	58.4
	Σ capacity, t	109,676	87,150	73,438	55,149	57,231
	% in relation to 1990	100.0	79.5	67.0	50.3	52.2

Source: Processed data of the State Bureau of Statistics

If one considers only the non-propelled vessels intended for the transport of goods, Table 5 shows a fall in 2005 to 54% in relation to total available number of units in the year 1990. There is also a fall in their capacity in 2005 to 50.7% in relation to total capacity for 1990. Table 5 shows that in spite of the fall in the total capacity and total number of non-propelled vessels intended for the transport of goods, there was a change in the relations between the towed and pushed vessels in favour of the pushing technology in accordance with the world trends, both regarding the criterion of the number of vessels and regarding the criterion of vessel capacity.

The towed/pushed relation in Table 5 changed from 2.27 to 1.3 regarding the criterion of the number of units, and from 1.82 to 0.93 regarding the criterion of the capacity of units. Thus, the positive trend in favour of the pushed technology is obvious, in spite of the occasional amplitudes and deviations (year 1997). This trend clearly confirms in the same period the relation tugboats/pushboats from Table 4, regarding the criteria of the number of vessels and the engine power of the vessels. The trend is positive in favour of the pushboats, without any amplitudes or deviations.

Since greater investments in the development of traffic on inland waterways are expected in the future, after some time the capacity and engine power and the number of vessels will increase as well. Therefore, no linear or some other approximations have been done, which would certainly show mostly a negative trend in the capacity, engine power and number of vessels in the future.

5. NECESSARY PRECONDITIONS FOR POSSIBLE IMPROVEMENTS

The solution of the problems of traffic means on inland waterways in the Republic of Croatia is part of a larger and complex problem. The basic preconditions for the changes in the structure of vessels and stopping of the stagnation trend and the fall in the number, power and capacity of traffic means on inland waterways include:

1. Targeted investment into infrastructure, i. e. waterways, with the recently greatly intensified construction of the multi-purpose Danube-Sava Canal as one of the major preconditions for future intermodal or combined transport through the river ports, and further through traffic corridors VC. and VB. The start of its construction has been announced several times although the construction has not started yet.
2. Along with the construction of the canal the rivers Sava and Drava also need to be reconstructed in order to upgrade the category of navigability. If financial possibilities do not allow complete reconstruction planned by the projects, it needs to be approached partially, section by section, but in compliance with the priorities defined by the entire traffic strategy.
3. Also, it is necessary to introduce advanced transport technologies on inland waterways of the Republic of Croatia regarding synchronised development of vessels, berths, terminals and ports as important preconditions for the future traffic demand. Only the introduction of advanced transport technologies guarantees future revenues from international transit traffic.
4. The Republic of Croatia plans and stimulates the shift of a part of transport from roads and railways to inland waterways. This requires clear transport strategy at the level of the Republic of Croatia since synchronization of all the transport branches is essential for the economic moment. The inland waterways of the Republic of Croatia need to be really and not just declaratively included in the integrated international transport chains.
5. Due to favourable geo-traffic position of the Republic of Croatia the river port terminals should be designed for a wider catchment area and for the future traffic demand according to the level of economically more developed countries in our neighbourhood. However, due to international competitiveness and additional possibilities of reducing the costs of transportation, manipulation and warehousing of goods, it would be desirable, in major river ports of the Republic of Croatia, that are connected or that could be well connected with at least two other traffic branches, to design and build logistic and distribution centres. In the logistic and distribution centres, the additional excess value will be created by the production of the logistic services.

After all the above listed preconditions, and in accordance with the experiences and trends in the countries that have well-developed traffic on inland waterways (the Netherlands, Germany, Belgium) it is important to decide on a homogeneous concept of purchasing more efficient vessels. The same needs to be done after detailed analysis of the quantity and type of goods that are to be transported in the future on the inland waterways of the Republic of Croatia, in order to achieve sustainable and economically acceptable traffic on inland waterways. The efficiency of vessels on inland waterways does not depend only on their capacity and speed, and the purchase of vessels in the future depends mostly on the following parameters:

1. planned category of waterways,
2. planned possibility of transloading and warehousing at ports and terminals,
3. planned type and quantity of cargo,
4. financial possibilities.

The pushed technology and self-propelled boats in the world are replacing the towed technology, for which there are several reasons that need to be taken into consideration in purchasing the vessels.

The pushed technology is considered more efficient than the towed one because: [4]

1. The drag of the pushed composition is by 20 to 25% lower than the drag of the towed composition.
2. The required engine power of the pushing vessel in relation to the required power of the tugboat with the same displacement is by 25-30% lower.
3. The investment costs of the construction of pushed boats are 20-35% lower in relation to the costs of constructing tugboats of the same capacity.
4. Manoeuvring of the pushed composition is easier and requires even up to 35% smaller crew than for the towed compositions.
5. The pushed compositions partly alleviate the greatest drawback of the traffic on inland waterways: low vessel speed. Because of the lower navigation drag, namely, the pushed compositions are also faster than the towed ones by 5-20 %.

In relation to the pushed compositions the self-propelled boats are faster, have better manoeuvring capabilities and they need an even smaller number of crew members (2-3 members per boat).

There are three possible basic concepts in purchasing vessels:

1. reconstruction of the existing vessels into more efficient ones,
2. construction of new efficient vessels at the domestic river shipyards,
3. purchase of more efficient traffic mean among those offered on the world market,

The selection of one of the concepts of purchasing the vessels in the future should be adapted to the transport of containers and heavy road vehicles, in compliance with the world trends.

The introduction of telematics in the traffic on inland waterways will enable more efficient organization and higher safety on the entire transport route. It will partly compensate for the drawbacks of the inland

navigation and accelerate integration into intermodal transport chains.

6. CONCLUSION

The research of the existing condition shows that the reduction in the total number of vessels, and their capacities and power are in cause-effect relation with stagnation and decrease in the transport of goods on inland waterways. Positive indication to possible stopping of the trend is the increase in cargo handling at ports of the Croatian inland waterways during the year 2005 of 30.3% in relation to the previous year.

However, this is not the consequence of a clear traffic strategy, because of the absence of high investments in the modernization of river ports and investments into the introduction of advanced transport technologies, and therefore cargo handling machinery, except at the port of Vukovar, is not intended for container handling. Consequently, during 2005 not one container handling manipulation has been registered in the Croatian river ports.

Big changes for the better in the near future need not be expected without major investments in the necessary infrastructure facilities. In the European countries with the developed transport on inland waterways, apart from the development and application of increasingly efficient vessels of greater capacity and speed, the tendency is to shift part of the transport from other traffic branches (roads, railways) to inland waterways, and formation of intermodal transport chains, which means high investments into the development and building of infrastructure.

Only after large investments into infrastructure, the last step in increasing the full usage of traffic on inland waterways of the Republic of Croatia is the increase of efficiency of vessels by purchasing faster pushed compositions and/or self-propelled boats of greater capacity, and in compliance with the world trends of replacing the towed technology. This claim is also confirmed by the result of the research dealing with the structure of single technologies in the overall number of vessels.

Although in the Republic of Croatia the towed technology is also being replaced by the pushed compositions and self-propelled boats, the total number of self-propelled vessels is stagnating with continuous fall of their available engine power. Thus, the change of technology only does not and cannot stop the negative trend.

If, among the three previously considered concepts of purchasing vessels, the Republic of Croatia decides to define its traffic strategy for the possible construction or reconstruction of the vessels at the domestic river shipyards, this has to be well planned and strongly stimulated by the Republic of Croatia. The development of domestic production capacities at river shipyards would influence also the economic factor in the issues regarding the maintenance and overhaul of the vessels during exploitation.

Further research should analyze the development of the European traffic on inland waterways and the possibility of implementing the Croatian inland navigation into the intermodal transport chains.

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SAŽETAK

POSTOJEĆE STANJE PLOVNIH SREDSTAVA NA UNUTARNJIM PLOVNIM PUTOVIMA REPUBLIKE HRVATSKE

Prema kriterijima pouzdanosti, isplativosti i ekološke prihvatljivosti promet na unutarnjim plovnim putovima u Republici Hrvatskoj još uvijek nije u potpunosti iskorišten. U radu je analizirano postojeće stanje plovnih sredstava na unutarnjim plovnih putovima u Republici Hrvatskoj. Također, statističkom, te metodama analize i komparacije, istraživano je postojeće i predratno stanje sa stanovišta vrste i broja plovila, te njihove nosivosti i snage motora. Kompariran je trend razvoja plovnih sredstava u Republici Hrvatskoj in relation to europske države s razvijenom unutarnjom plovidbom. Sadašnji trend u Republici Hrvatskoj je stagnacija broja plovila s vlastitim pogonom, te smanjenje broja plovila namijenjenih prijevozu robe, zatim smanjenje ukupne nosivosti i snage motora svih plovila, ali i promjene odnosa potiskivane i teglene tehnologije u korist potiskivane tehnologije, a u skladu sa svjetskim trendovima. Metodama kompilacije i komparacije istraživani su preduvjeti za poboljšanje stanja plovnih sredstava, a u skladu sa stanjem i razvojem u zemljama VII. Dunavskog koridora.

KLJUČNE RIJEČI

unutarnji plovni putovi, Republika Hrvatska, plovna sredstva, postojeće stanje.

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