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THE DEVELOPMENT OF CONTAINERISATION IN CROATIA AND STRATEGIC LONG-TERM DEVELOPMENT FOR A HARMONIOUS DEVELOPMENT OF ALL THE TRAFFIC BRANCHES

SUMMARY

The geo-traffic advantages of the Republic of Croatia have not yet been evaluated as a whole. The traffic-maritime valorisation is included in the strategy of long-term development of Croatia. This particularly implies the construction and modernisation of the sophisticated railway and road traffic routes connecting the Danube region and the Adriatic, especially along the transversal corridor the Danube region - Zagreb - Rijeka - maritime markets, and then towards other maritime and river ports. At the same time, the application of these technologies should be reconstructed longitudinally from the West to the East. The container and piggyback terminals and cargo transport centres (RTC) should be primarily constructed, regular container and piggyback trains established and connected, by sea ports and shipping, first of all through the port of Rijeka, with various maritime markets.

In this way, higher rationalisation would be achieved, first of all in traffic, then in economy and the community as a whole, with a far greater traffic safety, environmental protection, major foreign exchange inflow, etc.

1. INTRODUCTION

The container transportation system (i.e. containerisation) is a very complex, sophisticated and economical method of freight transportation - from door to door - thus considered a turning point in the transport of cargo.

In order to correctly analyse the container transportation system, it is necessary to define the container as the basic and starting assumption of containerisation. Considering numerous international organisations and conventions, containers are defined as special devices, portable tanks of specific standards and structure.

The container transportation system includes land, river and maritime capacities for the transport of containers, containers and special equipment, as well as land and port container terminals, which are a necessary component of the successful and complete containerisation.

Feeder-service, in the function of the container transportation system, contributes to the rationalisation of the overall container transportation of big container ships, connects successfully major and minor container port services.

Container cargo transportation started to develop in the world in the mid 60s, and in our country, Central and Eastern Europe, only at the beginning of 80s. Therefore, more intensive investments are needed in the modern transportation systems, especially in containerisation, in order to catch up with the level of development of these systems in Europe as a whole.

2. ADVANTAGES OF CONTAINERISATION

Advantages of containerisation, most concisely put, consist in the following:

- container, as a transportation unit is easily transferred from one mode of transportation to another, i.e. from one means of transportation to another;
- freight is handled practically only twice, at the beginning (loading) and at the end of the transportation process (unloading). This provides higher safety in handling: breaking and damaging are reduced. This means that no freight vans are needed in railway transportation, and the containers are transported by flat wagons instead, which is less expensive;

- the initial-final expenses are reduced, and the expenses of single packaging, especially for use of pallets are significantly reduced;
- the railway cars are better exploited. First, a container train does not need to enter the shunting yard, since it is possible to form direct trains on the principle of travelling directions instead. In this way the wagons have relatively longer runs during one cycle.
- better effects are achieved in production, transportation and trade.

In a good structure, the application of container transportation system is especially significant, combined and supplemented by pallet system. The structure is established by placing the pallet units into the containers, thus forming container units. After arriving at the destination, the container is transported to the receiver. The mentioned advantages for the railway refer to other transport branches as well.

Transport connections between road and railway traffic are very functional, efficient, rational and economical in the technological and integral sense. This has already been proved by thousands of examples in the technically developed countries, and partly in our country as well. It is precisely at the road-railway junctions that there exist preconditions which would allow technological linking of the road and railway traffic, with the aim of introducing the piggyback transport, following the construction of freight transportation centres (RTC) with further connections to container (Lo-Lo) and Ro-Ro ships in Rijeka and Ploče, towards various world markets and vice versa. This has been quite well developed in our sea shipping and at sea ports, whereas on land, the contemporary railway and road infrastructure is rather lagging behind, especially in the construction of freight transportation centres, that technologically connect traffic branches into integral transportation systems.

Starting from the analysis of the modern transportation systems development in the world and in our country, the fundamentals have been established for a general vision of the development and methodological procedures of optimising the transportation system development programme in our country. This has to be developed particularly in the main traffic corridors, sea and river ports, and primarily in the Zagreb - Rijeka corridor. The development of the container traffic in Croatia can be seen in the following section.

3. CONTAINERISATION IN CROATIA FROM 1980 TO 1995

The three tables show that the container sea (port) transportation saw the highest increase over the period from 1985 to 1990, and that it stagnated following

the year 1990, which is understandable considering the condition in which Croatia found itself between 1991 and 1995. However, in spite of that, the Croatian ship operators have most increased the container transportation, both in TEU units and in tons of goods, precisely in the period between 1990 and 1995. This best describes the resourcefulness and capabilities of the Croatian ship operators to operate successfully in spite of the great competition in the world maritime market.

The first precondition for the development of container transport - as the basics for the multimodal transport development in Croatia - is certainly the constructed network of the container terminals and the cargo transport centres. Until today, there has been no adequate network of container terminals in Croatia, although the cargo transport centres do exist - which was mentioned earlier. According to the Resolution about determining the basic network of the cargo transport centres of Yugoslavia, there were 47 cargo transport centres in former SFRJ and only 11 in Croatia, and they were: Rijeka, Ploče, Karlovac, Osijek, Split, Slavonski Brod, Šibenik, Varaždin, Vukovar, Zadar and Zagreb. This means, 5 in ports (by the sea) and 6 inland.

For Croatia and her international maritime transport, the port container terminal in Rijeka is of special significance. Among the inland container terminals special significance belongs to the container terminal in Zagreb (at the so-called East Railway Station) which is temporary, since the construction of a bigger, modern container terminal has been already planned on the location Zagreb - Žitnjak, the developed industrial zone. The terminal is provided with the modern cargo handling equipment: container lifter "Luna", which is suitable both for handling truck semi-trailers (technique "B" of PIGGYBACK) and the exchangeable vehicle cases (technique "C" of PIGGYBACK), and for stacking containers at three levels, with lifting capacity of 40 t, the 12 ton freight lifter "Litostroj" for handling of empty containers, lift truck of 40 t lifting capacity, six spreaders of 20 and 40 ft.

This terminal has had a capacity of 15,000 TEU annually, whereas the terminal at Žitnjak will have a capacity of over 30,000 TEU annually. The structure of the containers handled at this terminal from 1985 to 1995 was: 60% for overseas, 35% for continental and 5% for national continental transport, proving the international orientation (abroad) of the terminal. According to the data of ŽTP Zagreb, the goods transported in containers were mainly final products of the wooden, metal-working and food industries. This means that the export of goods to foreign markets participated with 95%, whereas the share of containerisation of goods in import (arrival) was negligible. It needs to be pointed out that the cargo transport centre

“Robni terminali” Zagreb, was the biggest in SFRJ and Croatia (13 ha) among the so-called continental terminals. The Zagreb East Railway Station is connected by direct fast cargo trains with Rijeka, Split, and Vinkovci, and indirectly with the other centres. The container service organises the operation at the

terminal, and is also engaged in acquisition, contracting and organisation of the transport. For the combined and multimodal transportation, the container transport is significant in the regime of international society “Intercontainer” which participates in the overall handling of the terminal with 35 - 40%. The ba-

Table 1 - Container traffic in sea ports of Croatia and its share, 1980-1995

Port/type of transport	1980	share %	1985	share %	1990	share %	1995	share %
1. Rijeka total TEU*	17,177	98	29,984	94	53,445	85	42,980	77
– export TEU	7,527	43	13,844	43	22,385	36	17,324	31
– import TEU	7,447	43	13,092	41	23,233	37	19,458	35
– transit TEU	2,203	13	3,008	10	7,827	12	6,198	11
2. Ploče total TEU	350	2	1,976	6	9,497	15	12,550	23
– export TEU	350	2	1,658	5	5,325	8	4,285	8
– import TEU	–	–	318	1	4,172	7	5,280	10
– transit TEU	–	–	–	–	–	–	2,985	5
3. Other ports in Croatia	–	–	–	–	–	–	–	–

Table 2 - Container port traffic in Croatia from 1980 to 1995 and its structure

Year	Total transport		Share in % of goods	Export of goods		Share in % of goods	Import of goods		Share in % of goods	Transit		Share in % of goods
	TEU unit	Goods 000 t		TEU unit	Goods 000 t		TEU unit	Goods 000 t		TEU unit	Goods 000 t	
1980	17,527	137	100	7,877	60	44	7,447	59	43	2,203	18	13
1985	31,960	286	100	15,502	139	49	13,410	120	42	3,048	27	9
1990	62,942	567	100	27,710	274	48	27,405	271	48	7,827	71	14
1995	55,530	611	100	21,609	238	40	24,738	223	36	9,183	83	14

Table 3 - Container traffic by ships of Croatian ship operators 1980 - 1995

Year	Total number of containers with goods		Export of goods		Import of goods		Transit		Transport between for.ports	
	in TEU unit	in %	in TEU unit	in %	in TEU unit	in %	in TEU unit	in %	in TEU unit	in %
1980	74,085	100	11,162	15	6,918	9	4,115	6	51,890	70
1985	118,112	100	16,153	14	9,568	8	8,284	7	84,107	71
1990	131,097	100	22,915	17	9,979	8	9,915	8	88,288	67
1995	174,382	100	31,450	18	16,455	9	16,754	7	109,723	63

Source for all the three tables: “Poslovanje trgovačke mornarice...”, PZPBJ and “Analiza poslovanja i ekonomski položaj lučkih RO” for the period from 1980 to 1990, and for the period from 1991 to 1995, the data were obtained from the Croatian shipping companies (Croatia Line, Jadroslobodna, and Lošinjpliv), Croatian port companies (Luka Rijeka, Luka Ploče...), as well as from the Statistical Yearbook of the Republic of Croatia.

Table 4 - Container traffic by ships, of the Croatian ship operators, 1980 - 1995

Ord. No.	Company (name)	Containers in TEU				Average growth rate		
		1980	1985	1990	1995	80-85	90-95	80-95
1.	“Croatia line” Rijeka /ex (“Jugolinija”)	48,372	86,484	124,348	156,428	12.3%	4.7%	8.1%
2.	“Jadroslobodna” Split	14,208	19,454	25,985	32,455	6.5%	4.6%	5.6%
3.	“Lošinjska plovidba” - Mali Lošinj - Rijeka	11,505	12,174	14,288	19,945	1.1%	7.0%	3.7%
4.	Croatian shipping - total	74,085	118,112	164,621	208,828	12.1%	4.9%	7.2%

Source: 1. “Poslovanje trgovačke mornarice”, PZPBJ for 1980 and 1985; 2. Data obtained by Croatian shipping companies and statistical data 1990-1995

Table 5 - Goods transported in containers in the international transport between Croatia and countries abroad, by Croatian ship operators, 1980 - 1995

Ord. No.	Type of intern. transport	1980	in %	1985	in %	1990	in %	1995	in %
1.	Export in 000 t	245	12	265	13	275	15	71	4
2.	Import in 000 t	175	9	192	9	134	7	62	3
3.	Transit in 000 t	135	7	129	6	117	7	80	4
4.	Transport between ports abroad	1,455	72	1,545	72	1,266	71	1,694	89
5.	Total transport	2,010	100	2,131	100	1,792	100	1,907	100

Source: 1. Data of the ship operators of the Croatian companies and cit. "Poslovanje trg. morn."; 2. For the period between 1990 and 1995, the data from the Croatian Statistical Yearbooks

Table 6 - Number and structure of the arrived and dispatched containers in TEU in the region of ŽTP Zagreb (railway transportation company), Croatia, 1980 - 1995

Ord. No.	Type of container transport (description)	1980	in %	1985	in %	1990	in %	1995	in %
1.	Arrived containers	3,664	53	5,549	50	7,925	51	9,985	51
2.	Dispatched containers	3,492	47	5,493	50	7,474	49	9,692	49
3.	Total transportation of containers	7,156	100	11,042	100	15,399	100	19,677	100
4.	Average growth rates in the overall transport in five-year periods	9.1		6.8		5.1		-	

Source: Calculation done by the author based on the data of ŽTP Zagreb and HŽ Zagreb

Table 7 - Container transportation in the network of ŽTP Zagreb in transit, 1980-1995

Year	Type of container transport (description)	Year	Container transport in transit ŽTP Zagreb	Indexes - basic	Realisation - chain
1980	8,428 TEU	1990		100	100
1985	7,424 TEU	1995		88	88

Source: Statistics of JŽ for 1980 and 1986 and the Statistics of HŽ for 1990 and 1995

Table 8 - Transportation of containers and goods in them in the Croatian public road transport, 1980 - 1995

Year	Container transp. in TEU in JOP of Croatia	Transport of goods in t. in cont. JCP Cro.	Indexes - basic		Realisation - chain	
			Cont.	Goods	Cont	Goods
1980	1,373 TEU	21,689	100	100	100	100
1985	1,796 TEU	28,750	131	133	131	133
1990	8,160 TEU	19,203	594	89	454	67
1995	19,927 TEU	27,875	129	127	138	145

Source: 1. "Informacija o razvoju integralnog transporta", SKSV, Belgrade, 1986; 2. Croatian Statistical Yearbook for 1990 and 1995 (diff. pages)

Note: This includes the so-called big and small containers in national and international transport, with the prevalence of "export" of goods in international transport, forming 10% of the overall container transport, whereas the international transport forms 80% of the transported goods.

sic problem is the insurance of empty containers for loading the cargo and paying the foreign currency freight to "Intercontainer" which is considerably high. Over the recent years, the container railway transportation to Russia has been initiated, exporting electronic investment equipment and various machines. In overseas transport, with the highest share at the terminal, it is the dispatch i.e. export of goods through the ports of Rijeka and Koper. The depot "Croatia line" is

also of great use (at the Eastern Railway Station) for the empty containers, i.e. loading.

Apart from Zagreb, it is necessary to found modern container terminals in Slavonia, Podravina, Posavina and Pokuplje, as well as cargo transport centres. The greatest significance from the point of view of development possibilities of the Republic of Croatia and the evaluation of her interior, belongs to the following three traffic corridors:

- the "posavski" (Sava region) road-railway-river corridor,
- the "podravski" (Drava region) road-railway-river corridor, and
- the "podunavski" (Danube region) road-railway-river corridor.

The "posavski" and "podravski" traffic routes had greater significance in the past. For the future of Croatia, the greatest significance lies in the started construction of the navigable canal Vukovar - Bosanski Šamac, which had been discontinued by the aggression and war, and which has to be realised in the period 1997-98, as well as the construction of Bosut. Thus, the transversal connecting of the Danube region and the Adriatic would bring great traffic and economic advantages to Croatia and her steadier development. For the combined and multimodal transport, (sea - land - interior navigable waterways) this would mean its application throughout the Croatian territory.

Regarding traffic of certain transport branches of Slavonija, it may be claimed that the railway, road and river-canal transportation are quite well developed, although from the economical point of view with variable efficiency and rather uneconomical. Thus, railway transport includes 656 km of tracks, out of which only 28% (184 km) are electrified.

During the period from 1998 to 2003, apart from the construction of the Vukovar - Bosanski Šamac canal, the works on regulating the waterway of the river Sava should be carried out simultaneously. It is absolutely necessary to construct and adapt several river ports, and first of all in Sisak and Zagreb, which would provide greater volume of traffic in the combined transportation of goods on the transit route Adriatic - Danube region. This would result in significant reduction of transport expenses for the transit of goods from the Central European countries. Besides, the completion of the flatland railway line Zagreb-Rijeka and its opening would triple the volume of the multimodal transport the Adriatic - Croatian interior, and primarily of the Adriatic - Central and Eastern Europe. This would also increase the traffic volume of the three Croatian river ports (Osijek, Slavonski Brod and Vukovar) from 4,000,000 tons (cargo handling altogether) in 1985 and 4,400,000 tons of cargo in 1990 to 10-12,000,000 tons of cargo following the year 2000.

In order to develop the multimodal and combined transport in Croatia, it is necessary to modernise the three Slavonian cargo transportation centres (Osijek, S.Brod and Vukovar) and integrate them regarding economy and interests with the cargo transportation centre Zagreb ("Robni terminali Zagreb"), with the port of Rijeka, and the cargo transportation centre Rijeka, as well as with the Dalmatian cargo transportation centres in Zadar, Šibenik, Split and Ploče.

The organisation of the integral and "initial" multimodal transportation of goods in Dalmatia is characterised by many drawbacks, such as:

- heterogeneity and division into small sections of the road transport, lacking major integration connections with the railway, maritime, air and pipeline traffic,
- sea transport is, nevertheless, the best developed system of the overall transport in the macroregion, although not connected regarding interests with other systems (branches),
- railway has been especially slow in development up to the present, although there are certain presumptions for a more versatile development of containerisation, PIGGYBACK etc.
- the production and transportation sphere are not mutually connected in an interest integration in production and distribution of goods, but only in the buying and selling of goods.

In order to eliminate the mentioned drawbacks in Dalmatia, first the integration and dependence of ports and ship operators, road and railway networks with the construction and functioning of the cargo transportation centres, container (conventional and multimodal) terminals and free zones need to be realised. The production sphere should not tend to create its own transportation capacities, but to leave this to the modern transportation companies. The function of the physical distribution of goods in industry and agriculture, trade and tourism should be united with the professional transportation carrier companies. The unity would be carried out through the functioning of the combined and multimodal transport in Dalmatia and through connecting with other parts of Croatia and Europe.

Therefore, by the year 2000, as well as later, modern refraction locations need to be constructed, where the transport means of all the transportation systems included in the process of service generation would meet. These include: sea ports (major ones are Split and Ploče, medium-sized Metković, Dubrovnik, Šibenik, Zadar, and the minor ones are starting from Molunt in the south to Starigrad, Novigrad and Obrovac in the north, to mention only those of the busier ports), railway stations, container terminals, public warehouses, river ports, etc. In the so-called economy triangle of Dalmatia, Split - Knin - Zadar, the refraction locations for multimodal transport should be constructed, which would provide incentive to the almost extinct economic and transport condition of the "forgotten Dalmatia". The unique control-information centre of Dalmatia would provide constant direction of cargo and passenger flows on a manager-expert basis.

The construction of the modern cargo transportation centre in Split, with a big container terminal for

multimodal transport, would improve the transportation in Dalmatia. An urban centre with over 300,000 inhabitants has been using this for a long time now, since it happened already in the 70s that the conventional transportation became a bottleneck of cargo transport development. The gravitational area of Split is extremely wide and apart from Dalmatia it includes Herzegovina, Bosnia, Lika and to some extent also Slavonia, Pokuplje ... The whole hinterland can market its goods in Dalmatia or export it (by sea or otherwise) to foreign markets, being their natural route.

Therefore, it is necessary to concentrate the goods by constructing warehouses i.e. collecting-distribution centres, which would be involved in the dispatch of goods using all kinds of transportation means (systems, branches) to manufacturers or consumers. Thus, maximum economic and transportation effects in the distribution of cargo would be achieved, both in the production and in the consumer area of the reproduction cycle.

The construction of cargo transportation centres in Split (near the North Port) and Ploče, would mean a sudden development of the port, sea, railway and road traffic in Dalmatia and the whole Croatia, and it would give incentive to specific forms of cargo production and service generation in the free zones in Split and Ploče. It needs to be pointed out that in Croatia during the 80s (and still true today) Ploče had the biggest area of microlocation of the cargo transportation centre (1,604 ha), although container transportation was quite modest. Croatia should take greater advantages of the sea ports on the river estuaries (Šibenik on the Krka, Metković and Ploče on the Neretva) in the economic and traffic sense. This would also be in accordance with the social and development orientation of the Republic of Croatia, primarily with the Adriatic orientation of the country, and the integration sea - hinterland. Moreover, Metković, Ploče, Zadar, Split, and Šibenik are connected by the railway network with the whole of Croatia, Bosnia and Herzegovina and Southern and Eastern Europe.

The construction of the cargo transportation centres in Croatia and their functioning as logistic centres, from the point of view of the national economy means the following:

- 1) the realisation of the objectives of the transportation policy, reflected in the successful and efficient co-operation of the transportation systems, primarily of railway and road transport, which could provide savings of the transport expenses by as much as 40%,
- 2) the realisation of the objectives of urbanisation and environmental protection,
- 3) the realisation of the objectives of the regional economic development, including the following fields: supply with products of industry, agriculture, as

well as tertiary activities, supply of the inhabitants, export of national goods, transit and import of the foreign goods, improvement and strengthening of the competitive position of the ports within their gravitational regions, creating of preconditions for opening and development of duty free zones, employment of the native people, investment of foreign capital and arrival of foreign experts, activating of the national capital, introduction of the standards in transportation, modernisation of the railway, construction of roads, introduction of "chains"....

For the development of the multimodal transport in Croatia, the cargo transportation centres network should:

- improve the transportation conditions and the quality of the transportation systems network,
- introduce modern transportation technologies, first of all the PIGGYBACK on land (road - railway), Ro-Ro, Lo-Lo, Fo-Fo system ship - road and containerisation,
- improve the quality, quantity and structure of the cargo flows in the country,
- take care of the geo-traffic macro-positioning of the cargo transportation centres in the country, physical distribution regarding the gravitational region, as well as about the micro-location regarding refraction locations in all the transportation branches,
- have the minimal, and gradually also the most up-to-date infrastructure and suprastructure, educated and professionally qualified human (personnel) potential and modern technology, handling-transportation mechanisation, covered and open storage areas, container stacking area, business area for various activities (forwarding, customs, export and import of goods, transport), catering facilities, petrol stations, entertainment, etc.

4. CONCLUSION

1. Since modern infrastructure roads and terminals have not been realised in Croatia up to the present, the container transportation by trains, Ro-Ro and Lo-Lo (container) ships is symbolic as well, with negative effects on the competitiveness of our goods for export, foreign exchange balance, etc.
2. Following the social and economic changes, as well as due to the new environment of the Republic of Croatia, the government orientation regarding modernisation and construction of the modern road and railway corridors, transversal (north-south) first of all, and then longitudinal (west-east), it is necessary to give priority to these railway and road modern routes, terminals and cargo transportation centres. There is a need for gradual

founding of the combined, container, and piggy-back trains (the Danube region - the Adriatic, first of all Zagreb - Rijeka and Hamburg - Jesenice, i.e. Graz - Zagreb - Rijeka or Tovarnik). By modernisation and expansion of the port container terminals (primarily in Rijeka), and then in other sea and river ports as well, and the cargo transportation centres, the technological linking with the modern container and other similar ships that navigate on numerous foreign sea lines and between continents is necessary.

3. For the realisation of this programme, the financial support of the Republic of Croatia is required primarily in the modernisation and gradual construction of the traffic infrastructure, and for the cargo transportation and handling equipment, apart from the financial support by the industrial subjects, using of foreign credit, leasing system, etc. also certain economic government benefits (stimulation) are necessary, such as tax and customs benefits, lower interest rates on the national bank loans, etc.

Only through such comprehensive measures could the development of modern transportation technologies on our transport routes be intensified, thus gradually spanning the "gap" in relation to the Western and Central European countries. This would result in significant increase in the overall transportation of goods (including transit), improvement of tourism, more intense development of numerous other industrial branches, increase in the foreign exchange inflow, etc.

SAŽETAK

DOSADAŠNJI RAZVOJ KONTEJNERIZACIJE U HRVATSKOJ I STRATEGIJSKO DUGOROČNA OPREDJELJENJA RAZVOJA - RADI SKLADNOG RAZVOJA SVIH PROMETNIH GRANA

Geoprometne prednosti Republike Hrvatske još nisu u cjelini vrednovane. Prometno-pomorska valorizacija u strategiji je dugoročnog razvoja Hrvatske. Pod tim se posebice razumijeva gradnja i modernizacija suvremenih željezničkih i cestovnih prometnica na pravcu Podunavlje-Jadran, osobito na transverzalnem koridoru Podunavlje-Zagreb-Rijeka-pomorska tržišta, a zatim prema drugim morskim i riječnim lukama. Usporedno bi se trebala obnoviti primjena tih tehnologija longitudinalno zapad-istok. Na tim pravcima primarno je izgraditi kontejnerske i huckepack terminale i robnotransportne centre (RTC), uspostaviti redovne kontejnerske i huckepack vlakove te ih povezati morskim lukama i brodarstvom, u prvom redu preko Luke Rijeka, s raznim morskim tržištima.

Na taj bi se način postigla veća racionalizacija, ponajprije u prometu, zatim u gospodarstvu i cijelom društvu, uz kudikamo veću sigurnost prometa, očuvanje okoliša, znatniji devizni priljev itd.

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