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Intermodal Transport
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AN INTERMODAL TRANSPORT ROUTE WITHIN THE HINTERLAND OF THE BAKAR RO-RO TERMINAL

ABSTRACT

The geographical/traffic position of the Port of Rijeka is an important factor in its integration into the European traffic system. In this respect, Bakar emerges as an important point, which, unfortunately, has not been sufficiently valorised and therefore holds much unused potential (especially in the former coke plant area). The existing infrastructure facilities and their technical and traffic elements synthesize the aim for a well-balanced maritime, road and/or railway traffic. The road freight transport routes correspond to the distant traffic itineraries towards Bakar, i.e. the Rijeka Traffic Junction, and further towards the Italian Port of Chioggia. These are the routes from the continental hinterland, i.e. Central and Eastern Europe, which primarily exist as two access routes from Zagreb and Ljubljana and, secondarily from Dalmatia and Istria. In the future, the Rijeka Traffic Junction access road together with the motorway links will be integrated into the Rijeka by-pass Road. A possibility of introducing intermodal railway alternative should be considered as well as the "piggyback" system. The assumptions for the justification of such operations should be examined in a special research taking into consideration similar, already well-established intermodal services in Europe. The set-up of the existing Rijeka Traffic Junction infrastructure and suprastructure allows for an uninhibited start of an extremely positive initiative. However, an efficient intermodal route between the countries of Central and Eastern Europe and Northern Italian ports is possible only with an integrated logistic support.

KEY WORDS

Port of Rijeka (Bakar), Ro-Ro terminal, logistics, intermodal transport

1. INTRODUCTION

When introducing a new intermodal traffic route, all the relevant port traffic and road transport interface parameters should be investigated. For the balancing of capacity to be successful, it should not be studied within only one traffic branch but within a traffic route as a whole. It is precisely the balancing of various traffic branches that creates a more realistic picture of an integrated traffic route's capacity, i. e. the time parameter within which a specified cargo volume

or a number of transport units can pass along a particular route. This also extends to transport costs, as well as safety and reliability in relation to a particular itinerary.

2. EVALUATION OF THE CONDITION OF ROAD INFRASTRUCTURE IN THE RIJEKA TRAFFIC JUNCTION

The geo-traffic position of the port of Rijeka is an important factor in its integration into the European Traffic System. In this respect, Bakar emerges as an important location, which, unfortunately, has not been sufficiently valorized and therefore holds much unused potential (particularly in the area of the former coke plant). The existing infrastructure, technical and traffic elements synthesize the aim for a well-balanced sea, road and/or railway traffic.

The road cargo transport routes correspond to the distant traffic itineraries towards Bakar, i. e. the Rijeka Traffic Junction. These are the routes from the continental hinterland, i. e. Central and Eastern Europe, which primarily exist as two access routes from Zagreb and Ljubljana and, secondarily, from Dalmatia and Istria. In the future, the Rijeka Traffic Junction access roads, together with the motorway links, will be integrated into the Rijeka By-pass Road. The



Figure 1 - Road Traffic Routes in the Rijeka Traffic Junction

basic concept of connecting the Bakar Basin with access trunk roads and county roads is based on the tangential access in relation to the Rijeka city centre. The reason for this was, until recently, the limited capacity of D8 road and the old industrial road through the Kukuljanovo industrial zone. As a result, cargo traffic was undermining all the advantages of a balanced crossroads and access roads capacity in the so-called eastern approach area.

Assuming that the introduction of an intermodal service results in the traffic load of 2x150 vehicles per day, the future traffic load projection may be calculated in the following way:

$$Q = 11280 \text{ vehicles/day (current traffic flow)}$$

$$\Delta q = \text{vehicles/day (increase in traffic)} = 150 \times 2 = 300 \times 3 = 900 \text{ assumed vehicles}$$

$$p\% = Q + \Delta q / Q = 11280 + 900 / 11280 = 1.08$$

Note: The increase in traffic flow of 8% in case of 150x2 daily truck arrivals at the Bakar Ro-ro terminal by route D8 and the decrease in the service level (for instance C>D).

As consequence of the anticipated increase in traffic due to ever increasing inflow into the Bakar Ro-Ro terminal, the situation could get worse during rush hours. The only way this problem could be solved is by implementing sophisticated methods of fleet management, i. e. distance management from a distribution centre within the Ro-Ro terminal itself.

3. ROLE OF TRUNK ROAD D40

The introduction of a new intermodal truck traffic route from the countries in the Southeast of Europe to the Bakar terminal including onward transport by sea creates a new challenge and a test for the existing land

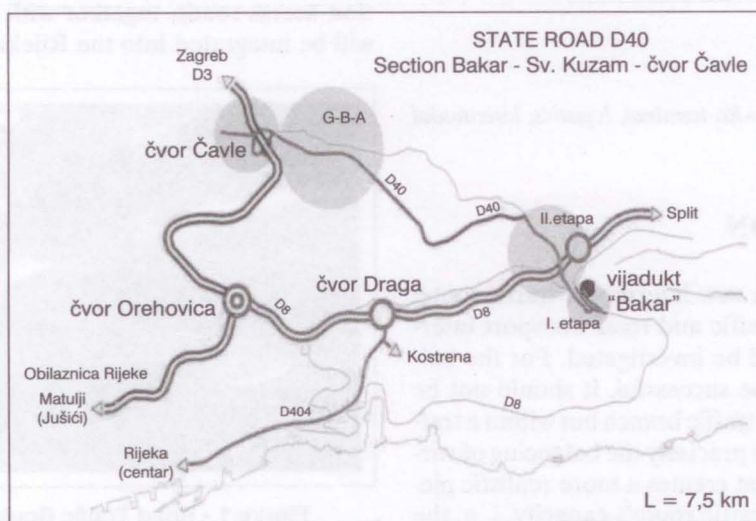
infrastructure and superstructure, and especially for the road network.

The connection between the outer-city and inner-city network is to be located in the so-called contact area of the Ro-Ro terminal parking lots and trunk roads D8 and D40.

At the immediate entrance to the Ro-Ro terminal or within the terminal itself, there should be a parking lot for the accommodation of heavy vehicles, trucks, trailers, semi-trailers and trailer trucks. The parking lot should have sufficient capacity to accommodate all vehicles that might, in the worst case scenario, simultaneously be waiting to embark/disembark onto the Ro-Ro vessels.

While designing the junction, the possibility of substantial increase in truck traffic has not been considered because of the central role of the railway for low-tariff bulk cargoes from the Bakar Basin. Otherwise, an optimistic outlook as a result of the new initiatives, such as the idea of introducing a new intermodal route, would certainly affect the change of parameters relevant to the position, number and type of the terminal road links to the D8 road.

More precisely, the new leg of the road link in question might have been built with a non-levelled crossroads, which would have fulfilled the basic principle in the design of the outer-city and inner-city road network, i. e. the continuity of traffic flows for the benefit of both networks. The current traffic solution is inadequate for outflow due to the road link lower priority rank, which results in unnecessary resistance in the network when joining road D8. Still, the overall result is the improvement in the quality of distant traffic by road D40, which meets the requirements of the new intermodal route from/to the Bakar terminal. Only 7.5 km of the three-lane road, with a lane for slow vehicles, rise from the port to the level of Čavle Road Traf-



Map 1 - Outline of the leg 'Bakar - Sv. Kuzam - Čavle'

fic Junction and directly to the trunk road B3 towards Zagreb.

The secondary route towards Split (the 'old' Adriatic trunk road) plays a complementary role in the service of the hinterland. By continuing to build the eastern leg of the Rijeka By-pass Road, i. e. the initial leg of the Adriatic motorway stretching over the coastal area Rupa-Rijeka-Žuta Lokva, a long-term perspective could be created for a better service of the Bakar Ro-Ro terminal.

4. CONCLUSION

Although distance, time and cost of transport are mutually intertwined components influencing extensive exploitation of the Bakar Ro-Ro terminal, the fact is that each component has its own significance. Once a new traffic route has been introduced, a record should be kept of technological, transportation and exploitation indicators, and even partial studies should be carried out for particular segments of the whole system. The necessary tools for this approach should be the simulations which would enable testing of particular sub-systems, such as interactive information support service, telematic fleet management, etc.

Due to changes in input regarding the increase/decrease in the number of freight vehicles and changes in transport locations in particular countries and in customs policy, as well as other parameters with notable dynamic and stochastic features, there will be some necessary changes in the logistic model of the considered traffic route.

The set-up of the existing infrastructure and superstructure in Bakar, Rijeka, County of Rijeka and Croatia as a whole allows for an uninhibited start of an extremely positive initiative. However, an efficient intermodal route between the countries of Central and Eastern Europe, Bakar and the port of Chioggia is possible only by way of an integrated logistic support.

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SAŽETAK

INTERMODALNI PROMETNI PRAVAC U GRAVITACIJSKOM PODRUČJU RO-RO TERMINALA LUKE BAKAR

Prometno-zemljopisni položaj riječkog lučkog kompleksa značajan je čimbenik za njegovu brže uključivanje u europski

prometni sustav. Luka Bakar pri tom zauzima vrlo istaknuto mjesto koje na žalost nije dovoljno valorizirano te predstavlja veliki neiskorišteni potencijal (poglavito na području bivše koksare). Objekti prateće infrastrukture svojim postojanjem i prometno-tehničkim elementima sintetiziraju težnju za harmoničnim djelovanjem pomorskog i cestovnog i/ili željezničkog prometa. Prometni putovi teretnog cestovnog prometa korrespondiraju itinerarima daljinskog prometa usmjerenih prema Bakru, odnosno tzv. Riječkom prometnom čvoru (RPČ), i nastavno prema talijanskoj luci Chioggia. Primarno, to su putovi iz kontinentalnog zaleđa tj. srednje i istočne Europe, koji egzistiraju kao dva prilazna pravca iz Zagreba i Ljubljane, te sekundarno iz Dalmacije i Istre. U perspektivi će navedeni prilazi RPČ-u s elementima autoceste biti integrirani u Riječku zaobilaznicu. Osnovna koncepcija povezivanja bakarskog bazena sa pristupnim državnim i županijskim prometnicama temelji se na tangencijalnom prilazu u odnosu na urbano središte grada Rijeke. Također valja razmotriti mogućnost uvođenja alternative intermodalnog željezničkog prometa kao i "huckepack" sustava. Pretpostavke za opravdanost ovog zahvata treba istražiti u posebnoj studiji na tragu već uhodanih, sličnih intermodalnih servisa u Europi. Konstelacija postojeće infrastrukture i suprastrukture u RPČ-u omogućava nespuntani začetak jedne izuzetno pozitivne inicijative. Ipak, djelotvornu harmonizaciju budućeg intermodalnog pravca između država srednje i istočne Europe i sjevernih talijanskih luka moguće je ostvariti samo cjelovitom logističkom podrškom.

KLJUČNE RIJEČI

luka Rijeka (Bakar), Ro-Ro terminal, logistika, intermodalni transport

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