

ANTUN STIPETIĆ, D.Sc.
E-mail: antun.stipetic@fpz.hr
University of Zagreb,
Faculty of Transport and Traffic Sciences
Vukelićeva 4, HR-10000 Zagreb, Republic of Croatia
ŽELJKO BAGIĆ, B.Eng.
Berečka 6, HR-10000 Zagreb, Republic of Croatia
MARTIN STARČEVIĆ, B.Eng.
E-mail: martin0@net.hr
University of Zagreb,
Faculty of Transport and Traffic Sciences
Vukelićeva 4, HR-10000 Zagreb, Republic of Croatia

Traffic and Transportation Science

Review

Accepted: Nov. 11, 2005

Approved: Oct. 16, 2006

INFLUENCE OF RAILWAY ON THE DEVELOPMENT OF THE PORT OF PLOČE

ABSTRACT

The role of the railway in the development of every cargo port is huge, since the railway enables mass transport of goods. Therefore the influence of the railway on the development of the Port of Ploče is significant, especially in the context of connecting the port with the Pan-European Corridor Vc. The paper studies the possibilities of improving the transport of goods from the Port of Ploče by rail and the influence of this type of carriage on the development of the port.

KEY WORDS

port of Ploče, railways, connecting

1. INTRODUCTION

Already at the end of the nineteenth century, during the Austrian-Hungarian government, the necessity to construct railway lines in order to establish a connection with the Adriatic ports was recognized. The construction of the railway line Metković – Sarajevo (completed in 1891) with the capacity of 600,000 tons annually, represented the start of connecting the South-Adriatic ports (mainly the port of Metković) to the interior of Bosnia and Herzegovina.

The ports at that time in Metković and Dubrovnik were too small for the needs of the economy in their hinterland. Therefore, after much consideration, in 1936 the decision was made on the construction of a sea port at the mouth of the Neretva. The most suitable site was Ploče (at that time Aleksandrovo). Since a port without high-quality railway connections has no possibility of development, a railway line started to be built in 1937 (which was completed in the mid-1942). After the end of the war, the port of Ploče was completed and started to operate, including the railway line (15 July 1945).

The fight for the railway line starts again after the Second World War, but this time for a line of normal track instead of the existing narrow gauge tracks. The construction of the Sarajevo-Ploče railway line started in 1958 and was completed in 1966.

Today, the port of Ploče is the second largest Croatian seaport whose basic activity is cargo traffic. Due to its location on the south part of the Adriatic coast, it is of special significance for the Republic of Croatia, as well as for the economy of numerous subjects in the region (especially in Bosnia and Herzegovina).

As one of the most modern ports in its environment the port has a tendency of continuous development. The organization of the traffic infrastructure on the Corridor Vc through Croatia and Bosnia and Herzegovina has big chances of becoming one of the largest ports on the Adriatic, and one of the most significant ports on the Mediterranean.

The attraction of the port of Ploče is based among other things, on its geo-traffic position compared to the potential market. The constructed infrastructure in the area of the port, the presence of labour, and the legislative benefits, provide for additional attractiveness of the port.

2. INFRASTRUCTURE OF THE PORT OF PLOČE

The port of Ploče features extraordinary traffic connections. The geographic location of the port allows good maritime connections along the coasts of the Adriatic and the Mediterranean, as well as with all the ports around the world. Apart from maritime connections, the port is well connected by road routes towards Rijeka and Trieste, and by road and railway connections on the Pan-European Corridor Vc towards Sarajevo, Osijek, and Budapest.

The port gives incentive to the founding of numerous economic, service, and tourist enterprises and represents an important factor in the development not only of the town of Ploče but also of the entire Neretva valley.

The port of Ploče covers an area of 230ha divided into:

- dry cargo covering an area of 9.35ha,
- general and bulk cargo covering an area of 11.42ha,
- liquid cargo covering an area of 17.68ha,
- special cargo covering an area of 20.00ha,
- lumber warehousing covering an area of 8.64ha,
- refrigeration plants covering an area of 0.20ha,
- maintenance and servicing – area of 2.24ha,
- garages for machinery – area of 2.96ha,
- passenger terminal – 1.50ha,
- constructed areas out of service – 7.29ha,
- areas for the port development - of 147.58ha.

The development of industrial potentials in the port hinterland is setting daily increasing demands on the port capacities.

Today, the terminal for dry cargo can store over 300,000 tons of cargo with daily transshipment of up to 10,000 tons of cargo, whereas even 300 tons of goods can be handled per hour in the cereal warehouses of 35,000 tons capacity. The terminal for general cargo, intended for the warehousing of high-tariff goods has a capacity of 10,000 tons. The terminal for alumina of 20,000 tons capacity, can handle 800 tons of goods in one hour using the automated procedure. The terminal for liquid cargo has the capacity of warehousing 20,000m³ of masut and 60,000m³ of petrol.

According to the long-term development plan brought by the Croatian Parliament a construction of two capital facilities is planned in the port of Ploče:

- container terminal,
- terminal for bulk cargo.

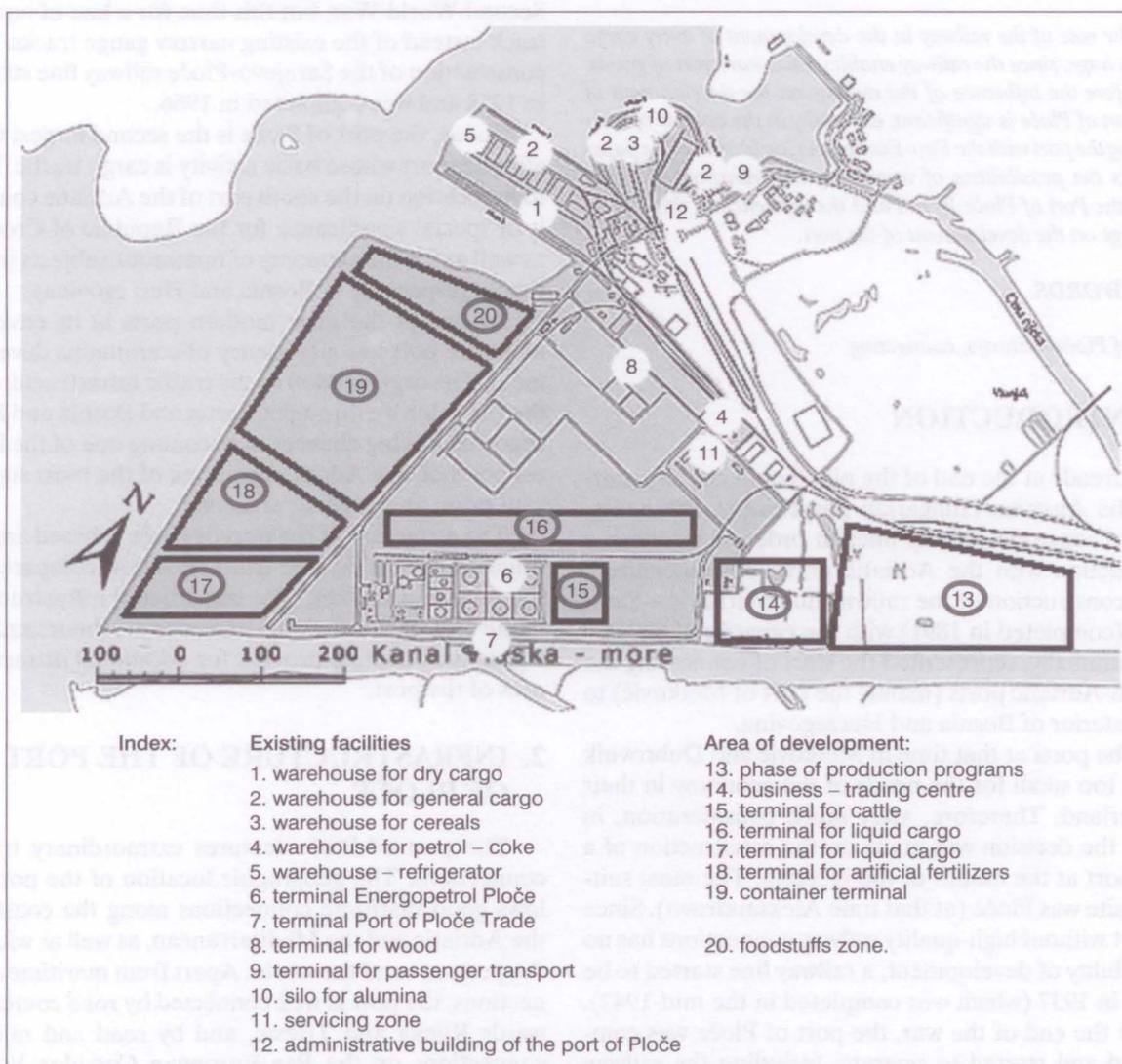
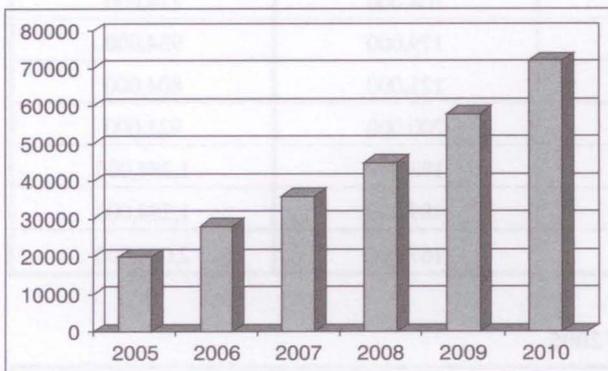


Figure 1 - Allocation of the areas at the Port of Ploče and layout of railway lines within the port

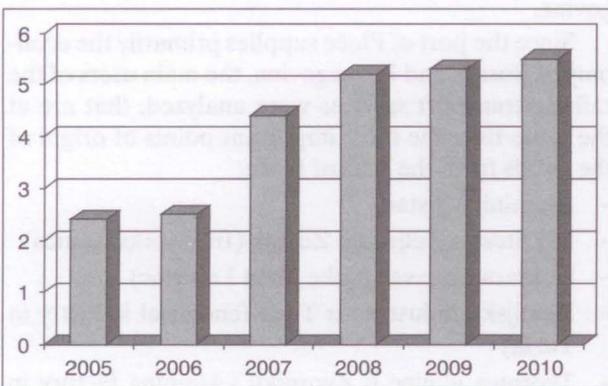
Today container transport is performed by the so-called feeder line with Malta and the port of Gioia Tauro in Italy. This transport is continuously rising which justifies the construction of the container terminal. The economic cost-efficiency of such a facility is annual traffic of 40,000 TEU containers.

The development plan includes the construction of 260 metres of quay with Ro-Ro ramp and the installation of handling equipment for container ships of the third generation. The area of the terminal would amount to about 100,000m². The terminal will include the zone for handling of ships and rail cars, warehousing zone and servicing zone. The plan of TEU container growth until the year 2010 can be seen in Graph 1.



Graph 1 - Plan of TEU container traffic growth in the period from 2005 to 2010

Along the container terminal the development plan foresees the construction of a modern terminal for bulk cargo. According to the development plan the completion of the construction of this terminal is planned by the year 2009. Today the port of Ploče can accommodate ships of up to 70,000 tons capacity. When the terminal is completed it will be able to accept ships twice that size, and the daily unloading capacity will increase from 10,000 tons to 25,000 tons. The plan of the increase in bulk cargo transport for the period until the year 2010 can be seen in Graph 2.



Graph 2 - Plan of increase in bulk cargo transport (in millions of tons) in the period from 2005 to 2010

3. OPERATION OF THE PORT OF PLOČE

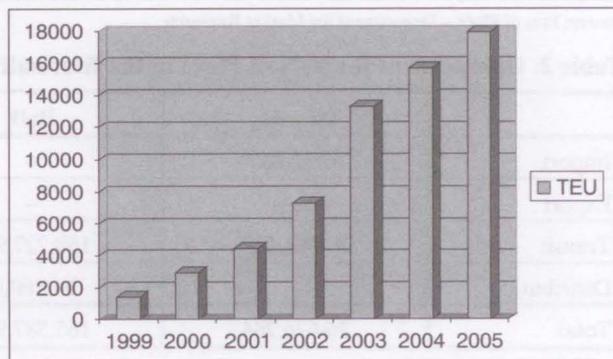
In order to present the operation of the port of Ploče, the physical transport of goods in the period of the past fifteen years has been analysed (Table 1).

The table shows that the port realized the best results in 1989 when the total annual turnover amounted to 4,486,000 tons. The most part was bulk cargo.

In 2004 the port of Ploče reached 46% of pre-war traffic with constantly growing tendency.

The research showed that in the first half of the year 2005 the port realized the maximum transport through the transit of goods for the needs of the economy of Bosnia and Herzegovina (Table 2).

Considering the container traffic growth in the period from 1999 to 2005 (Graph 3) the constant growth of TEU container traffic has been noted. It is assumed that in 2010 it will reach 70,000 TEU annually. Today the containers are on the first place in the item of general cargo, whereas alumina and coal are by far the most cost-efficient goods in the structure of bulk cargo.



Graph 3 - Container traffic at the port of Ploče

The mentioned three components are the basis on which business future of the port of Ploče is constructed.

4. FLOWS OF GOODS

The railway transport is the most important mode of land transport. It depends on the throughput and transport capacity of the railway lines, development level of the railway network, capacities and other infrastructure of the railway companies.

By studying the operation of cargo trains on the railway line Ploče – Mostar – Sarajevo – Zenica – Dobož – Tuzla – Zvornik it has been determined that the maximum load of the railway line is 2050 tons, whereas a limiting section is the railway station at Opuzen.

Table 1 - Transport of goods according to the cargo structure in the period 1989 – 2004 in tons

Year	General	Bulk	Liquid	Total
1989	890,000	3,307,000	289,000	4,486,000
1990	814,000	2,934,000	352,000	4,100,000
1991	521,000	1,356,000	336,000	2,213,000
1992	255,000	490,000	188,000	933,000
1993	180,000	93,000	44,000	317,000
1994	206,000	39,000	23,000	268,000
1995	251,000	78,000	85,000	414,000
1996	316,000	116,000	153,000	585,000
1997	301,000	275,000	137,000	713,000
1998	282,000	324,000	108,000	714,000
1999	414,000	341,000	179,000	934,000
2000	266,000	417,000	121,000	804,000
2001	356,000	365,000	200,000	921,000
2002	396,000	474,000	193,000	1,284,000
2003	420,000	675,000	189,000	1,284,000
2004	346,000	1,518,000	167,000	2,031,000

Source: Port of Ploče – Department for Market Research

Table 2: Operation at the port of Ploče in the first half of 2005

	General	Bulk	Liquid	Total
Import	6,712,067	–	–	6,712,067
Export	–	–	–	–
Transit	29,964,217	150,727,913	16,756,365	197,448,495
Distribution	–	14,860,075	9,956,012	24,816,087
Total	36,676,284	165,587,988	26,712,377	228,976,649

Source: Port of Ploče – Department for Market Research

The maximum allowed speed on the Ploče – Metković section is 80km/h with a tendency of increase after the reconstruction of the line. All the trains that operate are block trains whereas they stop if necessary at Zenica and Lukavac or run to Zvornik.

All the running trains usually run directly to the factories that are in fact industrial tracks of the closest stations. Thus, the trains operating for the needs of the factory «Aluminij» run in fact to Bačevići, a place near Mostar, whereas e. g. the train for Zenica runs directly to the Željezara (Ironworks). The furthest section of the gravitation zone of the port of Ploče is Zvornik (460km).

Since from the aspect of the railway the goal is to transport maximum cargo over a maximum distance (regardless of whose authorities), thus realising maximum net-ton kilometres, one should improve the organization of transport uniformity. The transport intensity is rather oscillating (mostly because of the factory requirements) sometimes the entire trains are

dispatched, and sometimes only several wagons. Because of a certain lack of uniformity in utilizing the capacity, the analysis has shown that on the average the trains operate every other day which results from the slow reconstruction of the plants in Bosnia and Herzegovina.

Since the port of Ploče supplies primarily the economy of Bosnia and Herzegovina, the main users of the railway transport services were analyzed, that are at the same time the most important points of origin of the goods from the port of Ploče:

- Aluminij Mostar
- BH Steel – Željezara Zenica (Ironworks Zenica)
- Koksara Lukavac (coke plant Lukavac)
- Kemijska industrija u Tuzli (chemical industry in Tuzla)
- Tvornica glinice u Zvorniku (Alumina factory in Zvornik)
- Rudnici Omarska (Mines Omarska)

The analysis of the cargo flows has shown that the intensity is the highest on the Ploče – Mostar section (100%) which is used for the transport of all the goods on the transport route, whereas the Lukavac – Zvornik section is the least used (28%).



Figure 2 - Analysis of goods flows

The causes for the lack of uniformity in transport are various. The example of the factory "Aluminij" is mentioned, where the transport of raw materials depends exclusively on the ship arrival to the port from where alumina is directly transported into wagons and dispatched to Mostar. The analysis of this transport shows a lot of idle running of the wagons. The most striking is the example of the alumina transport for the factory "Aluminij" Mostar, from which the wagons return empty to the port of Ploče. The reason lies in the fact that only alumina is transported by the wagons of the Uacs series, whereas final aluminium products cannot be transported with the same wagons but wagons of another series have to be used.

The reasons are also of organizational type. The dispatch of coal for the coke plant in Lukavac does not run continuously. If a customs warehouse was constructed in Lukavac (Bosnia and Herzegovina) then no large quantities of coal would have to be stored at the terminal Ploče, since it would be delivered continuously, and not only upon having received and paid the order from Lukavac.

5. IMPACT OF RAILWAY ON THE OPERATION OF THE PORT OF PLOČE

The economy of the surface transport by rail lies in:

- high capacities of the transport means,
- possibility of transport to the user's warehouse (if the user has industry tracks),

- safe transport in adverse weather conditions,
- cost-efficient tariffs compared to the competitors,
- possibilities of connecting with other modes of transport,

The railway transport of goods depends on the throughput and transport capacity of the railway, development level of the railway network, capacities and infrastructure of the railway organizations.

Compared with other traffic branches the railway has a number of advantages regarding energy efficiency, ecological sustainability, and economic cost-efficiency. Besides, the railways enables mass transport of goods and good integration into the railway network of Europe.

The structure of goods that pass through the port of Ploče consists most of the bulk cargo. Since expansion and construction of a new terminal for bulk cargo has been planned, the construction needs to be accompanied also by the construction of infrastructure capacities, mainly railway ones, which means construction of new groups of tracks and the reconstruction of the existing ones. A total of more than 20 km of tracks are planned for construction, with the increase in the loading capacities to 1,000 tons an hour. This will account for the dispatch of 17 trains per day.



Figure 3 - Cargo station at the port of Ploče

With more advanced organization of activities at the port the cargo is increasingly transloaded directly from the ships onto wagons which substantially improves the port operation efficiency.

6. DEVELOPMENT STRATEGY OF RAILWAY NETWORK IN CROATIA

The strategy of transport development in Croatia that was adopted by the Croatian Parliament in 1999 (NN No. 139) has determined also the main guidelines in the development of railway network in the Republic of Croatia. One of the main strategic guidelines of traffic strategy in Croatia is better connecting of the seaports with the hinterland. Reconstruction and mo-

dernization of the railway line through Lika has been planned (the realization of these works is just before completion) thus substantially improving the connection of the central Dalmatian ports and the hinterland.

In order to supplement the railway network, further construction of railway line along the Adriatic coast from Split towards Dubrovnik is planned. This is also the railway network on the Adriatic-Ionian pan-European traffic route.

The construction of the railway line to Ploče, as a phase in the construction of the Adriatic-Ionian railway line, will realize one more possibility of connecting the port of Ploče with the hinterland and will provide the shortest connection towards Central and Western Europe. By improving the existing railway line on the pan-European Corridor Vc (Ploče-Mostar-Sarajevo-Osijek-Budapest) and the construction of the new railway line to Split, the port of Ploče realizes an even more significant role in the traffic system of the region and its comparative advantages in these conditions come even more to the fore.

7. CONCLUSION

The importance of railways as the main generator in the exchange of goods is enormous. The railway connects all the economic factors, in various regions and allows everyone to fight for their place on the market.

Railway transport as the leading form of land transport is becoming the generator in the development of the port. Therefore it is necessary to continue with the investments in the railway infrastructure and traction means, to improve the traffic organization and agree on the cooperation with the neighbouring railway authorities in order to create the preconditions for seamless traffic operation and to eliminate unnecessary staying of rail cars for customs clearance.

Dr. sc. **ANTUN STIPETIĆ**

E-mail: antun.stipetic@fpz.hr

Sveučilište u Zagrebu, Fakultet prometnih znanosti
Vukelićeva 4, 10000 Zagreb, Republika Hrvatska
ŽELJKO BAGIĆ, dipl. ing.

Berečka 6, 10000 Zagreb, Republika Hrvatska

MARTIN STARČEVIĆ, dipl. ing.

E-mail: martin0@net.hr

Sveučilište u Zagrebu, Fakultet prometnih znanosti
Vukelićeva 4, 10000 Zagreb, Republika Hrvatska

SAŽETAK

ULOGA ŽELJEZNICE U RAZVOJU LUKE PLOČE

Uloga željeznice u razvoju svake teretne luke je velika, jer željeznica omogućava masovni prijevoz roba. Stoga je utjecaj željeznice na razvoj luke Ploče značajan, posebno u kontekstu povezivanja luke s paneuropskim željezničkim koridorom Vc. U radu se istražuju mogućnosti poboljšanja prijevoza roba iz luke Ploče željeznicom i utjecaj tog prijevoza na razvoj luke.

KLJUČNE RIJEČI

luka Ploče, željeznica, povezivanje

LITERATURE

- [1] Stipetić, A., Kreč, S., Haramina, H.: *Modernizacija prometne infrastrukture Hrvatskih željeznica na Vc, Paneuropskom koridoru*, Osijek, 2004, Proceedings, 99 – 108.
- [2] Stipetić, A.: *Razvojna projekcija željezničkog prometa u sklopu koridora Vc*, Sarajevo, 2006, Proceedings,
- [3] *Business report of the port of Ploče 2004/2005*
- [4] *Development plan of the port of Ploče – presentation*, Zagreb, 2005.
- [5] Željeznice Federacije Bosne i Hercegovine, *Strategic plan*, Sarajevo 2003.
- [6] Bosansko Hercegovačka željeznička javna korporacija, *Obnova i razvoj željezničke infrastrukture u Bosni i Hercegovini*, Sarajevo, 2002.
- [7] Hrvatske željeznice, *Izvešće o radovima na modernizaciji Vc koridora*, Zagreb, 2005.
- [8] *Strategija prometnog razvitka Republike Hrvatske* (NN br. 139)