

# The importance of the port of Rijeka within the Pan-European corridor V

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## TABLE OF CONTENTS

### **DEVELOPMENT OF FRANCO-LATVIAN CHILDREN'S BILINGUALISM IN LATVIA. DOES THE LANGUAGE OF SCHOOLING MATTER?**

Jonathan Durandin 5

### **ENHANCING THE WRITING SKILLS OF B1 LEVEL PRIMARY SCHOOL STUDENTS IN THE FOREIGN LANGUAGE USING WEB 2.0 TOOLS**

Antonia Loutsi  
Makrina Zafiri 15

### **REGULATING TELEVISION VIEWING AMONGST TEENAGERS CAN CURB SCHOOLS' UNREST**

Mary Njeri Kamaku  
Helen Mberia  
Kyalo Wa Ngula 24

### **ANALYSIS OF AGRICULTURAL SECTOR IN V4 COUNTRIES**

Dominika Varga Oravcová 32

### **SPACE DEBRIS AND SECURITY IN SPACE**

Andras Edl 38

### **CREATIVITY IN SOLVING LIBRARY PROBLEMS AND FINDING USER-ORIENTED SOLUTIONS - ANALYSIS OF EXAMPLES FROM THE WORLD**

Weronika Kortas 44

### **THE CONTEMPORARY ROLE OF LIBRARIES AS HUBS OF INNOVATION, CREATIVITY AND KNOWLEDGE IN THE SERVICE OF LOCAL COMMUNITIES. THE EXAMPLE OF THE FUTURE LIBRARY NETWORK**

Eleni Alexandri  
Antonia Tzanavara 49

### **THE DETERMINANTS OF FIRM INVESTMENTS IN RESEARCH AND DEVELOPMENT**

Alberto Costantiello  
Lucio Laureti  
Angelo Leogrande 55

### **THE IMPORTANCE OF THE PORT OF RIJEKA WITHIN THE PAN-EUROPEAN CORRIDOR V**

Lorena Bogović  
Marija Jović  
Edvard Tijan  
Ana Perić Hadžić 69

### **ELECTRONIC TRANSPORTATION MANAGEMENT SYSTEM DEVELOPMENT IN THE PORT OF RIJEKA**

Edvard Tijan  
Marija Jović  
Saša Aksentijević  
Dražen Žgaljić 75

**THE ROLE OF PORT AUTHORITY IN SEAPORT GOVERNANCE**

Ana Panjako

Marija Jović

Edvard Tijan

Alen Jugović

80

**INTENSIVE CARE UNIT NURSE'S WORKLOAD AND QUANTITATIVE DETERMINATION OF PATIENT CARE CLASSES**

Diana Platace

Svetlana Kulesova

86

# The importance of the port of Rijeka within the Pan-European corridor V

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## Abstract

In this paper, the role of seaports in the transport system was explained, as the hubs which connect various transport modes (road, rail, sea) for both cargo and passengers. The Pan-European Corridor V was analyzed, as a part of the Pan European Transport Network, consisting of seaports, roads and railroads, established in order to facilitate the European and Pan European traffic. The statistical data for port of Rijeka, the largest Croatian cargo seaport was compiled, emphasizing the importance within the Croatian seaport system, and within the Pan-European Corridor V. The Port of Rijeka was compared with the Ports of Venice, Trieste and Koper, which also lie at the Pan-European Corridor V. Finally, the analysis of the Corridor V branches B (Port of Rijeka) and C (Port of Ploče) was conducted.

*Keywords:* Maritime transport, Pan-European Transport Network, Corridor V, seaports, Port of Rijeka

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## 1. Introduction

The term transport refers to the movement of cargo from initial to end point, more specifically from the point of production, to the consignee of the cargo. It is necessary to form a balance between transport activities to achieve the lowest costs, but by fulfilling the required conditions. To achieve that, it is required to form a transport chain which will transport the goods in the fastest, safest and the most economical way.

The Geo-traffic position of Croatia is considered to be the key factor for its traffic valorization. Besides the position at the intersection of some important traffic corridors, Croatia is located on the Adriatic coast, deeply into the European mainland. This fact proves that the North Adriatic transport route is the shortest route connecting Europe to Mediterranean and to most Asian countries via Suez Canal (Dundović, Vilke, & Šantić, 2010). Central European Transport Corridor, which connects Northern Europe (Baltic) to the Southern Europe through Central Europe, is important for the Adriatic ports and their traffic. Adriatic ports are also located on the South European Transport Corridor, which provides connections for Mediterranean (Dundović et al., 2010).

The port of Rijeka is located on the intersection of important European corridors, both road and rail corridors, which makes it the optimal port in Croatia for receiving the goods and their further transportation to Central and Eastern Europe. The port of Rijeka is an important part of most transport chains which begin in the Middle East and end in Eastern and Central Europe, even in Northern Europe. The reason for that is the excellent position of the port of Rijeka at the top of the Kvarner Bay, where the Adriatic Sea is the deepest into the European mainland. The other reason is Rijeka being the capital and the largest city of the Primorje-Gorski Kotar County.

Due to the aforementioned characteristics, the topic of this paper is the importance of the port of Rijeka in the transport chain within the Pan-European corridor V and its advantages in relation to the other ports, such as Venice, Trieste, Koper and Ploče.

## 2. The role of seaports in the transport system

The transport sector, as a part of international trade, can be viewed as a part of the public infrastructure, a supply chain, a service provision or a business. The transport sector is handling both passenger and freight transport (Westerheim, 2014). Transportation represents the largest share of total logistics costs, and involves numerous stakeholders (Jović, Tijan, Karanikić, & Perić Hadžić, 2020). The development of transport services and an adequate transport and communication infrastructure are increasingly becoming important in achieving the competitive edge and decidedly influence the position of a country in international trade (Pavlović & Radoš, 2016).

Maritime transport involves a large number of stakeholders as well such as ship owners, insurance companies, agents, etc., and numerous business procedures and interests (Marx, Gebhard, Jović, & Tijan, 2019). Seaports are main links in the international maritime transport, offering various services and connecting many stakeholders (Agatić & Kolanović, 2020). A seaport may also be defined as a logistic and industrial node accommodating seagoing vessels and characterized by a functional and spatial clustering of cargo transport, storage, and transformation processes linked to global supply chains (Notteboom, Lugt, Saase, Sel, & Neyens, 2020). Seaports must adapt constantly to contemporary business conditions in order to remain competitive in the global market (Tijan, Jović, Jardas, & Gulić, 2019). In this respect, seaports should conduct their operations according to principles or aspects of sustainability: the economic principle (providing seaport services efficiently), the environmental

principle (efficient use of natural resources, decreased emission of pollutants, etc.), and the social principle (well-being of seaport employees and stakeholders) (Tijan, Agatić, Jović, & Aksentijević, 2019).

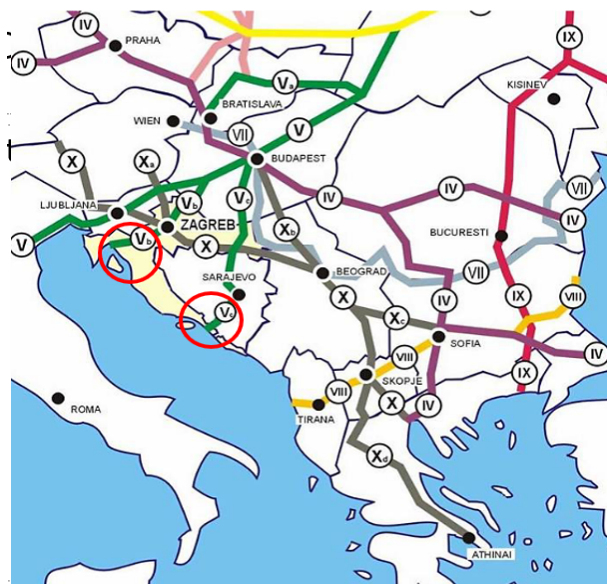
One of the main roles of seaports is providing the services for passengers, cargo and ships. In the distribution process, the seaport is not the initial or the end point of the transport chain. In the seaports, the cargo is reloaded from the ships to the other means of transport. Also, the cargo which is loaded on the ships has arrived at the seaport by the other types of inland transport. According to that, an important role of seaports is connecting different transport modes in the transport of the cargo and passengers, since the seaports are initial and end points of maritime routes and rail and road corridors (Poletan Jugović, 2014).

The continuous development of logistics chains and their network system is possible due to the developed node-link system, where the most important nodes are seaports and integrated logistics centres (Montwiłł, 2014). Therefore, seaports have also become key elements of distribution systems in highly urbanized areas focused on the spatial range of services related to the transport, forwarding and logistics to optimize supply, which leads to the reduction in congestion and other external costs of transport (Montwiłł, 2014).

### 3. Corridor V as a part of the Pan-European transport network

Pan-European Network is a road and rail system connecting Europe. It is organized to improve international traffic in Europe and between Europe and Asia. The European Union had a goal to expand Trans-European Network by the development of the Pan-European Network, so the Northern Europe could connect with the Eastern, Southeastern and Central Europe (Poletan Jugović, 2014). Pan-European Network consists of ten corridors. None of them are based in one country only, since there a condition exists that each corridor must be located in at least three countries which are a part of the European Union and each corridor must cross at least two borders (Ministry of Maritime Affairs Transport and Infrastructure, n.d.). Also, each corridor must have at least three types of infrastructure. The corridors were formed at the European Conference of Ministers of Transport in Prague (1991), Crete (1994) and Helsinki (1997) (Dundović & Grubišić, 2013).

Some of the Pan-European corridors are located in the Republic of Croatia (Božičević, Steiner, & Smrečki, 2008) as shown in the Figure 1. One of them is Corridor VII, also known as the Rhine-Danube Corridor. The other one is Corridor X, Branch Xa, which connects Graz, Maribor and Zagreb. The third one is Corridor V, the most important corridor for the port of Rijeka.



**Figure 1.** Pan-European Corridor V

The Corridor V connects Venice, Trieste and Koper, Ljubljana, Budapest, Bratislava, Uzhhorod and Lviv (Prometna zona, n.d.). Besides the main branch, Corridor V has three more branches:

- Corridor Va: Bratislava – Žilina – Košice - Uzhhorod
- Corridor Vb: Rijeka – Zagreb - Budapest
- Corridor Vc: Ploče – Mostar – Sarajevo – Osijek - Budapest

There are two branches located in Croatia, Branch Vb and Branch Vc. For the port of Rijeka, the most important corridor is Corridor Vb since it connects the port of Rijeka to the Pan-European Network. The port of Rijeka is also important for the Corridor Vb since it is the initial and the end point of this branch, and also the only port on the branch. But, the port of Rijeka is not the only port on the Corridor V. There is the port of Ploče (also Croatian port) on the Corridor Vc and Italian ports of Trieste and Venice and Slovenian port of Koper on the main branch of the Corridor V.

#### 4. Port of Rijeka as the key part of Croatian seaport system

Port of Rijeka is the largest cargo port in Croatia. It is located at the northern coast of the Republic of Croatia. Port of Rijeka consists of numerous cargo terminals and a passenger terminal. Besides that, the port provides different types of services to the ships, passengers and cargo and it has an optimal geo-traffic position. All of that makes the port of Rijeka the largest port in Croatia and one of three North Adriatic ports (including the port of Trieste and the port of Venice), which compete with the North Sea ports in maritime transport of the cargo to the Central Europe (Marković, Muić, & Vučić, 2003).

Port of Rijeka is connected to the inland by road and by rail. Corridor Vb, which connects Rijeka, Zagreb and Budapest, has an important role in connecting the port of Rijeka to the inland. Since the port of Rijeka is the only port on the Corridor Vb, it has an important role in diverting the cargo onto the Corridor V. Cargo unloaded in the port of Rijeka is transported to the end points in the inland on the Corridor V and Corridor Vb. Corridor Vb connects Rijeka to Zagreb, the capital city of Croatia, so the transportation of cargo from the port of Rijeka to the end points in Central and Eastern Croatia and in Eastern Europe is directed to the infrastructure of the Corridor Vb, which connects to the main branch of the Corridor V in Budapest.

CEF (Eng. *Connecting Europe Facility*) co-finances projects for infrastructure development in the port of Rijeka, which proves the importance of the port of Rijeka on the Corridor V. The goal is to improve port infrastructure of the port of Rijeka, also the rail infrastructure, port intermodality and other important elements. CEF finances those projects because of the significance of the port of Rijeka is a part of the Pan-European Network via Corridor V. Infrastructure improvement projects in the port of Rijeka are (Port of Rijeka Authority, 2020):

- Development of multimodal platform
- Port Community Information System improvement
- Zagreb Deep Sea Container Terminal
- Rijeka Basin infrastructure improvement
- Bulk cargo terminal Bakar infrastructure improvement
- General cargo terminal infrastructure improvement
- Adriatic Gate Container Terminal dredging

The main goal of those projects is to modernize the infrastructure and terminals for handling different types of cargo. By improving the infrastructure and terminals, the cargo volume on the port of Rijeka's transport routes should grow, as well as on the Corridor V.

#### 5. The comparison of the port of Rijeka with ports of Venice, Koper, Trieste and Ploče

Besides the port of Rijeka, there are four more ports on the Corridor V: Trieste, Koper and Venice, which are located on the main part of the Corridor V and the port of Ploče, located on the Corridor Vc.

Port of Ploče is an important Croatian port on Corridor Vc, which connects Ploče, Mostar, Sarajevo, Osijek and Budapest. Port of Ploče is the only port on the Corridor Vc. It is a universal port for handling almost all types of cargo (Port of Ploče Authority, n.d.-b). That is why the port is equipped with equipment and mechanization for docking different types of ships and for loading various types of cargo. The port is located at the southern coast of Croatia, and as such is very important for the economy of Bosnia and Herzegovina, because Corridor V, more specifically Branch Vc connects Ploče to Sarajevo, Osijek and Budapest, where Corridor Vc connects to the main branch of the Corridor V (Port of Ploče Authority, n.d.-a).

Port of Rijeka and port of Ploče are two out of five ports important on the Corridor V. Other ports are Italian ports of Trieste and Venice and Slovenian port of Koper. Port of Venice is the initial point of the main branch of the Corridor V, located in the Northwestern Adriatic. Port of Venice is important for passenger shipping, especially cruising. Furthermore, the port also has terminals for handling different types of cargo, such as general cargo, containers, liquid and bulk cargo (Port of Venice, n.d.). Venice is the westernmost point of the Corridor V and its initial point. Corridor V connects Venice to Trieste and Koper.

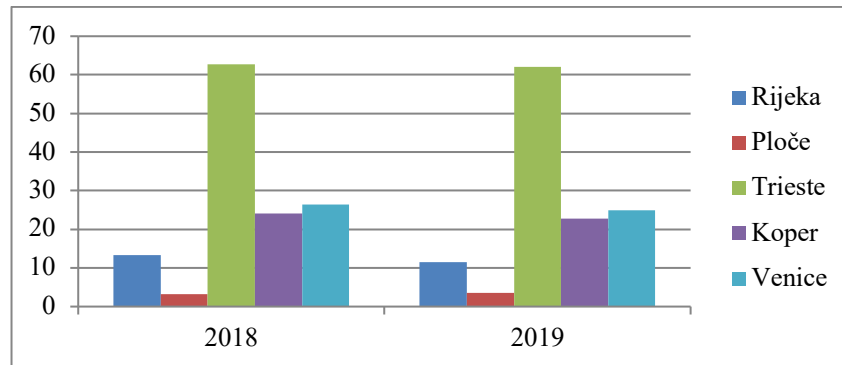
Port of Trieste (Italy) and port of Koper (Slovenia), including the port of Rijeka, are known as North Adriatic ports (Marković et al., 2003). All three ports have similar geo-traffic position and are a part of the Corridor V. Container traffic is important for those ports since they have equipment, mechanization and infrastructure specialized for handling containers. Besides the container traffic, port of Trieste and port of Venice are specialized for handling other types of cargo.

The ports on the Corridor V could be compared based on a few criteria. One of them is their position on the Corridor V. Port of Venice is the westernmost point on the Corridor V. As already mentioned, it is the initial and the end point of the main branch of the Corridor V. Port of Trieste and port of Koper are also located on the main branch of the Corridor V. For those ports, the Corridor V is the direct connection to the Venice. The two ports have similar geo-traffic position since they are positioned very close to each other. Port of Rijeka has a very similar geo-traffic position as the two ports, but unlike them, the port of Rijeka has a different position on the Corridor V. Port of Rijeka is the initial and the end point of the Corridor Vb, and also the only port on this branch. Port of Ploče is the southernmost point on the Corridor V. As the port of Rijeka, the port of Ploče is located on the branch of the Corridor V, which is the Corridor Vc. Port of Ploče is the only port on the Corridor Vc, also its initial and end point.

The other basis for comparison is the cargo volume of the ports, with the presumption that a part of the cargo volume is directed to the Corridor V to be transported to the end point of the transport chain. The comparison of the ports on Corridor V based on the cargo volume is shown in the Figure 2 (Autorità di Sistema Portuale del Mare Adriatico Orientale Porti di Trieste



e Monfalcone, n.d.), (North Adriatic Sea Port Authority, n.d.), (Port of Koper, n.d.), (Port of Ploče, n.d.), (PortSEurope, 2019), (Port of Rijeka Authority, n.d.).



**Figure 2.** Total cargo volume in the ports on the Corridor V 2018-2019 [mil t]

Figure 2 shows the total cargo volume in the ports on the Corridor V. Cargo volume is shown in million tons in years 2018 and 2019. In both years, the port of Trieste has had the largest cargo volume, which is about 60 million tons (Autorità di Sistema Portuale del Mare Adriatico Orientale Porti di Trieste e Monfalcone, n.d.). The port of Venice has had a cargo volume of 25 million tons (North Adriatic Sea Port Authority, n.d.). The third port is the port of Koper, with cargo volume around 23 million tons (Port of Koper, n.d.). During this period, port of Rijeka has had a cargo volume of 12 million tons (Port of Rijeka Authority, n.d.). Port of Ploče has had the lowest cargo volume (PortSEurope, 2019). During this period, it was around 3 million tons (Port of Ploče, n.d.).

This information is representative for maritime transport only, since all of the cargo was transported to the ports by ships. In this case, port of Trieste has the largest cargo volume, but that does not mean that the port of Trieste is the most important port for the Corridor V. That is because not all of that cargo is directed to Corridor V to be transported to the inland, a large percentage of the cargo is used locally, due to the intensive industrial sector in the region. Nevertheless, the way the port operates is important for the corridor since the quality of the port services and port profitability lead to larger profitability of the corridor as a whole.

## 6. The importance of the port of Rijeka in comparison to the port of Ploče)

There are two ports in Croatia which are situated on one of the Pan-European corridors: port of Rijeka and port of Ploče. Both of these ports are located on the branches of the Corridor V. The importance of the port of Rijeka and the port of Ploče could be compared based on a few characteristics. In the Croatian seaport system, both port of Rijeka and port of Ploče are ports opened for public traffic of international economic importance (there are six ports of this type in Croatia). The port of Rijeka is the largest and the most important port in Croatia.

Port of Rijeka is (compared to the port of Ploče) more important for Corridor V for several reasons. It is the largest Croatian port, and has got the largest cargo volume in Croatia. For instance, in the year 2019, total cargo volume in the port of Rijeka was 11,49 million tons. On the other hand, in the port of Ploče the total cargo volume was 3,56 million tons. These statistics show that the cargo volume of the port of Rijeka is two times larger than the cargo volume of the port of Ploče.

Containers are one of the most important types of cargo handled at the port of Rijeka. Twenty years ago, the average yearly container volume at the port of Rijeka was 15000 TEU. Currently, the yearly container volume is 300000 TEU, meaning that the volume is growing rapidly. Intensive growth of cargo volume is also expected in the future, especially in the container traffic. Expected container volume in the year 2025 is 600000 TEU (Ministry of Maritime Affairs Transport and Infrastructure, 2017).

The expectation of the cargo volume growth of the port of Rijeka is based on the infrastructure improvement projects. Zagreb Deep Sea Container Terminal project is the most important for the container volume growth. It is a new container terminal at the northern part of the port of Rijeka. The planned capacity of the container terminal is 650000 TEU per year and the sea depth should be 20 meters, which would allow the docking of large container ships (Ministry of Maritime Affairs Transport and Infrastructure, 2017). Zagreb Deep Sea Container Terminal is shown in the Figure 3 (Ministry of Maritime Affairs Transport and Infrastructure, 2017).



**Figure 3.** Zagreb Deep Sea Container Terminal

The two ports could also be compared to each other based on their location. Both of them are located on the branches of the Corridor V. Port of Rijeka is situated on the Corridor Vb, while the port of Ploče is situated on the Corridor Vc. Port of Rijeka and port of Ploče are the only ports on their branches. Corridor Vb is located close to the main branch of the Corridor V. Also, the port of Rijeka is located near the Italian and Slovenian ports on the Corridor V. Unlike the port of Rijeka, the port of Ploče is not located close to the main branch of the Corridor V. It is also the southernmost point of the Corridor V.

Port of Rijeka and Corridor Vb have different importance for Croatia, compared to the importance of the port of Ploče and Corridor Vc. Corridor Vb is mostly located in Croatia. It connects the port of Rijeka to the capital city of Zagreb, after which it connects Zagreb to Budapest in Hungary. That means that the Corridor Vb is located in Croatia and Hungary, but mainly in Croatia. At the same time, it connects the largest Croatian port to the largest city and capital city of Croatia. On the other hand, Corridor Vc is located in Croatia, Hungary and Bosnia and Herzegovina, but mostly in Bosnia and Herzegovina. The branch connects the port of Ploče to the Croatian city of Osijek, but through the territory of Bosnia and Herzegovina. In Croatia, both port of Rijeka and Corridor Vb are more important than the port of Ploče and Corridor Vc.

Since there is a large connection between the expected growth of the traffic volume in the port of Rijeka and the projects, which are financed because of the port of Rijeka being the initial and the end point of the Corridor Vb, the growth of traffic volume and improvement of the infrastructure should bring the advantages to the port of Rijeka and to the Corridor V too, as it is the most important corridor for directing the cargo from the port of Rijeka to the inland. According to this information, port of Rijeka is the most important Croatian port on the Corridor V. At the same time, Branch Vb is the most important branch of the Corridor V in Croatia.

## 7. Conclusion

Traffic system is a complex system which consists of different transport modes, their elements and connections between them. Transport modes are subsystems of the traffic system. Transport of the cargo often includes various means of different modes of transport. That means that the elements of different transport modes affect each other. Seaports are one of the traffic systems elements. They are places where the cargo is loaded from the ships to the other transport modes. Also, the cargo arriving at the port by the sea is transported to the end point by the other modes of transport, which means that the ports direct the cargo to land corridors for further transport.

Port of Rijeka is the largest Croatian cargo port. It allows the transport of the cargo between Croatia and other countries in the hinterland and oversea destinations. Port of Rijeka is one of the two Croatian ports which are a part of Pan-European Network. It is located on the important transport route, which is the Corridor V, Branch Vb of the Pan-European Network. Port of Rijeka is important for the Corridor V since it is one of the ports on the corridor and the only port on the Corridor Vb. Besides the port of Rijeka, there are ports of Venice, Koper and Trieste on the main branch of the Corridor V and the port of Ploče on the Corridor Vc.

As the initial and the end point of the Corridor Vb, the port of Rijeka allows directing the cargo on the Corridor V. At the port of Rijeka, large amounts of cargo are unloaded from ships (and vice versa) since it is the largest cargo port in Croatia. Corridor V is the most important land corridor for transporting the cargo from the port of Rijeka to the inland. According to all of that, the traffic at the port of Rijeka affects the traffic on the Corridor V, especially on the Corridor Vb.

Cargo volume of the port of Rijeka is expected to grow. For instance, container volume is expected to double itself in the near future. There are also projects planned for the development and modernization of the port infrastructure. The projects should result in the growth of the cargo volume and importance of the port of Rijeka in cargo transport. The connection between the port of Rijeka and the Corridor V is one of the reasons for planning the projects. CEF co-finances the projects for infrastructure improvement at the port of Rijeka since the port of Rijeka is the only port on the Corridor Vb. That means that the projects should bring advantages to both the port of Rijeka and the Corridor V.

The conclusion is based on the projects planned in the port of Rijeka and the importance of the port compared to the other ports on the Corridor V. Great inputs are used for the improvement of the infrastructure at the port of Rijeka, by the projects which should result in cargo volume growth. One of the projects is the construction of the Zagreb Deep Sea Container Terminal with the expected annual capacity of 650000 TEU, which is double compared to the actual annual container turnover at the port

of Rijeka. Comparison of the port of Rijeka to the other ports on the Corridor V shows that the other ports have larger cargo volume than the port of Rijeka. Although the port of Rijeka has smaller cargo volume, the port of Rijeka directs almost all of its cargo on the Corridor Vb. Since the traffic in the port of Rijeka is expected to grow, the traffic on the Corridor V should increase too, since it is the most important corridor connecting the port of Rijeka and its hinterland.

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