



## Integrated and Sustainable Transport in Efficient Network - ISTEN

<b>DT1.1.9 – Local context analysis for Serbia (with focus on Belgrade area)</b>
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## Document information

### Abstract

Comparing to other cases of partnership regarding Local context analysis, the case of Serbia is specific. Serbia is landlocked country and not directly connected to Ionian nor Adriatic Sea. On the other side, analysis of whole territory of the Country, with about 50.000 km of roads and almost 5.000 of railway tracks and 1.000 km of river paths through 198 municipalities and 29 counties is too ambitious for limited resources of this project.

The Local context analysis is conducted focusing on capitol city of Belgrade and its attraction area.

Through basic remarks on geographic and infrastructural specifics of Serbia, analysis of five main groups of bottlenecks and factors of influence (market, infrastructure, operation, institutional and innovation, by applying recommended methodology, three scenarios of mid-term development are presented.

### Keywords

Local context analysis, port-hinterland, bottlenecks, scenarios

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\* Abbreviations of editor/contributor name

## Table of contents

1	INTRODUCTION.....	5
2	CHARACTERISTICS OF THE LOCAL ENVIRONMENT .....	7
2.1	Port-hinterland chain overview.....	7
2.2	Port-hinterland chain operations .....	12
2.3	Port-hinterland chain governance.....	15
3	BOTTLENECKS TOWARDS BECOMING AN INTEGRATED HUB.....	16
3.1	Market bottlenecks .....	16
3.1.1	Market bottlenecks identified.....	16
3.1.2	Impacts of market bottlenecks.....	16
3.2	Infrastructural bottlenecks.....	16
3.2.1	Infrastructural bottlenecks identified .....	16
3.2.2	Impacts of Infrastructural bottlenecks.....	18
3.3	Operational bottlenecks.....	18
3.3.1	Operational bottlenecks identified .....	18
3.3.2	Impacts of operational bottlenecks.....	18
3.4	Institutional bottlenecks.....	18
3.4.1	Institutional bottlenecks identified .....	18
3.4.2	Impacts of institutional bottlenecks.....	19
3.5	Innovation bottlenecks.....	19
3.5.1	Innovation bottlenecks identified .....	19
3.5.2	Impacts of innovation bottlenecks.....	19
4	MEDIUM-TERM SCENARIOS .....	20
4.1	Main factors to influence future development.....	20
4.2	Scenarios' formulation .....	22

## List of figures

<i>Picture 1 – Involvement of Serbia in Macro-regional strategies and initiatives (EUSDR, EUSAIR, WB6) .....</i>	<i>7</i>
<i>Picture 2 – Indicative extension of TEN-T network to Western Balkan .....</i>	<i>8</i>
<i>Picture 3 - Indicative extension of TEN-T network to WB6 with existing and planned connections to main transport nodes.....</i>	<i>8</i>
<i>Picture 4 – Top ten exporters to Serbia (tons).....</i>	<i>9</i>
<i>Picture 5 - Top ten importers from Serbia (tons), source CCIS.....</i>	<i>9</i>
<i>Picture 6 – Sea ports used for containers in intermodal transport to Serbia .....</i>	<i>10</i>

<i>Picture 7 – Core and Comprehensive regional road network within indicative TEN-T extension</i>	12
<i>Picture 8 – Core and comprehensive rail network within indicative TEN-T extension</i>	12
<i>Picture 9 – Serbian Railway network</i>	13
<i>Picture 10 – IWT network in Serbia</i>	13
<i>Picture 11 – Location of main logistics facilities in Serbia</i>	14

## List of tables

<i>Table 1 – Morphological table of factors enabling Serbia (Belgrade) role in port-hinterland system of Adrion ports</i>	21
<i>Table 2 – Plausible Scenarios formulated for Belgrade area</i>	23

## List of abbreviations and definitions

CCIS – Chamber of Commerce and Industry of Serbia  
A.D – abbreviation of Serbian expression for a Joint-Stock Company  
d.o.o – abbreviation of Serbian expression for a Limited liability company  
SEETO – South-East Europe Transport Observatory  
FMCG – Fast Moving Consumer Goods  
FCA – Fiat Chrysler Automobiles  
WB6 – Western Balkan 6 initiative under Berlin process  
EUSDR – European Union Strategy for Danube Region  
EUSAIR – European Union Strategy for Adriatic-Ionian Region

# 1 INTRODUCTION

- Aim of the Deliverable

Aim of this deliverable is to show main characteristics, issues and bottlenecks as well as possible scenarios of intermodal transport development in Serbia and capitol city of Belgrade as far hinterland of Adriatic-Ionian ports, in next 5-year period.

- Structure of the report

Aiming not to repeat the content in details, the structure of this document was followed by idea to present the current situation and level of development, to identify main bottlenecks and obstacles which could prevent a Belgrade area to become an integrated part of port-hinterland system of Adrion ports and finally to draft development scenarios based on main influencing factors of development in mid-term period, using methodology of morphologic analysis (simplified to certain level due to limitations occurred).

- Identified stakeholders and their contribution to the report

Identified stakeholders are competent authorities, private and public companies, University and international institution dedicated to coordination of transport development in South-East Europe (Western Balkan) countries, respectively, by name:

- Ministry of Construction, Transport and Infrastructure of Republic of Serbia
- Transport Secretariat of City of Belgrade
- Faculty of Transport and Traffic Engineering, University of Belgrade
- South East Europe Transport Observatory - SEETO, Belgrade
- Public Company - National Railway operator "Serbia Cargo" A.D, Belgrade
- Free zone - Stock company, "Free Zone Pirot" A.D, Pirot
- Private Company "Milšped" d.o.o, Belgrade, 3PL provider
- Private Company "Nelt Co." d.o.o, Belgrade, 3PL provider + Intermodal terminal
- Private Company "European Contract Logistics Serbia" d.o.o, Belgrade, Shipping and Freight forwarding
- Private Company "RALU" d.o.o, Belgrade, Road transport operator
- Public company "Jugoslovensko rečno brodarstvo" A.D, Belgrade – river transport operator

All of above mentioned stakeholders including some experts in this field, were interviewed live or through electronic survey we translated and modified specially for this occasion and purpose of gathering bottleneck information and determine possible scenarios of development and future impacts (<https://goo.gl/forms/Qa3RcdwX2rqTnRxq1> ).

Regarding the contribution level from listed stakeholders, the fact is that some of them didn't fully recognized the importance of the survey and its results aiming to define and develop local context analysis as an important part of the project. On the other hand, it was somewhat expected, regarding several facts:

- Intermodal freight transport is the field of transport with high potential of development, but without any progress on national level for decades,
- Some of recognized stakeholders didn't delegated personnel with sufficient experience,
- The survey was conducted during summer vacation season, preventing availability of decision makers.

Despite these obstacles, we managed to organize bilateral meetings with some of key players and ensure data and opinions collection from most of stakeholders.

Additionally, we succeed to interview several experts from Institute of Faculty of Transport and Traffic Engineering of University of Belgrade as well as associations of transport and logistics operators and association of managers.

Regarding the scope, level and quality of stakeholder's contribution, it was on to an expected high level, ensuring the valid information and data as well as precise overview not only of current situation but impacts of future development and scenarios.

At this point it is important to highlight specific position and role of Serbia as a landlocked country, where during preparation for Local Context analysis development several key stakeholders insisted that survey has to be changed and adapted to specific position of Serbia comparing with most of other partners who are representative of sea ports or closely connected to port activities and interests.

As it was agreed with stakeholders and partnership, this document aiming to show local context analysis from the aspect of far hinterland of Adriatic-Ionian seas, focusing on City of Belgrade and its attraction area, as most developed in terms of logistics as well as free zone of city of Pirot on the south-east part of Serbia.

## 2 CHARACTERISTICS OF THE LOCAL ENVIRONMENT

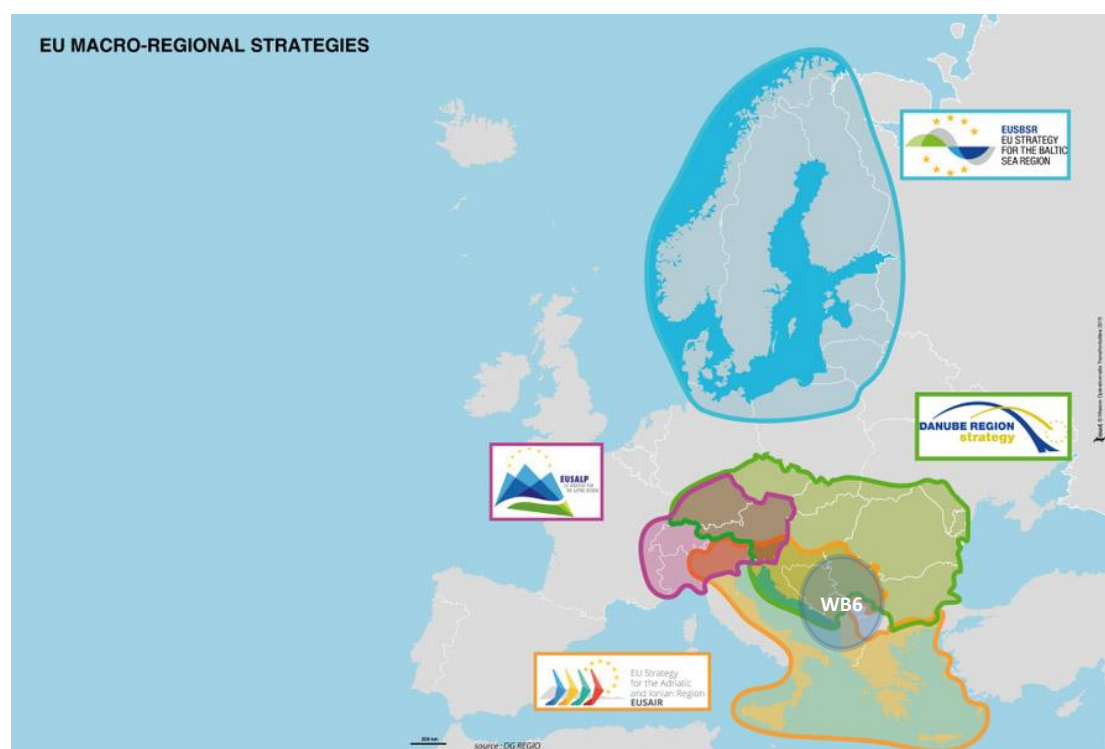
### 2.1 Port-hinterland chain overview

- Geography

Located at the crossroads between Central and Southern Europe, Serbia is found in the Balkan Peninsula and the Pannonian Plain. Serbia lies between latitudes 41° and 47° N, and longitudes 18° and 23° E. Serbia is landlocked country.

Neighboring countries are Hungary, Romania, Bulgaria, FYR Macedonia, \*Kosovo, Montenegro, Bosnia and Herzegovina and Croatia.

Political and strategic areas and regions of EU and other initiatives could have very positive impact to transport infrastructure development. Serbia is in the middle of three geo-political entities: Danube macro-region, Adriatic-Ionian macro-region and Western Balkan 6 initiative.



Picture 1 – Involvement of Serbia in Macro-regional strategies and initiatives (EUSDR, EUSAIR, WB6)

Regarding transport issues, geography of Serbia is suitable for transport and logistics development - Serbia has a strategic transportation location since the country's backbone, Morava Valley, represents by far the easiest route of land travel from continental Europe to Asia Minor and the Near East.

There are two main transport corridors recognized as Pan-European Corridors X and VII (River of Danube).

According to European Union TEN-T classification and latest indicative extension of TEN-T network to Western Balkan, former Pan-European corridors are replaced by branches of Orient/East-Med Corridor and Mediterranean corridor as shown at following pictures.





Picture 2 – Indicative extension of TEN-T network to Western Balkan



Picture 3 - Indicative extension of TEN-T network to WB6 with existing and planned connections to main transport nodes (source: SEETO)



- Main markets served

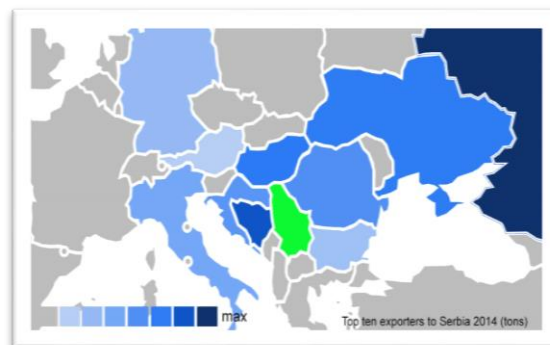
As a Landlocked country situated on one of the oldest historical paths connecting the West and East, Serbia has a big portion of transit movements of goods coming from Greece, Turkey, Macedonia, Montenegro and Bulgaria to western part of Europe, as well as in opposite way from Germany, Italy, Poland, Austria, Hungary and others going to Greece, near and even far East.

Lately, the significant part of transit operations are generated by trade of Central European and SEE countries with China, where goods are coming or transiting over Serbia from port of Piraeus and Thessaloniki in Greece, port of Bar and port of Rijeka and Koper at Adriatic Sea.

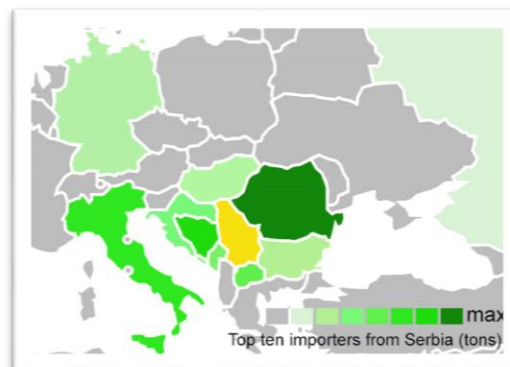
Regarding the trade of Serbia, main partner is European Union, then China and Russian Federation. By EU member states, Germany and Italy are leading markets by trade value.

On the other hand, when it's about logistics and transportation market, higher trade in cargo volume of FMCG is between Serbia and Romania and Bosnia and Herzegovina. Having this fact in mind, recognized infrastructural bottlenecks are connections with these two countries. This issue will be more discussed in later chapters.

Looking at Belgrade as a most attractive point of trade, production and logistics and transportation activities as well as geographical node and crossroad of roads, railways and river of Danube and Sava, the Belgrade have a highest potential for intermodal transport development aiming to become an integrated hub for all transportation modes.

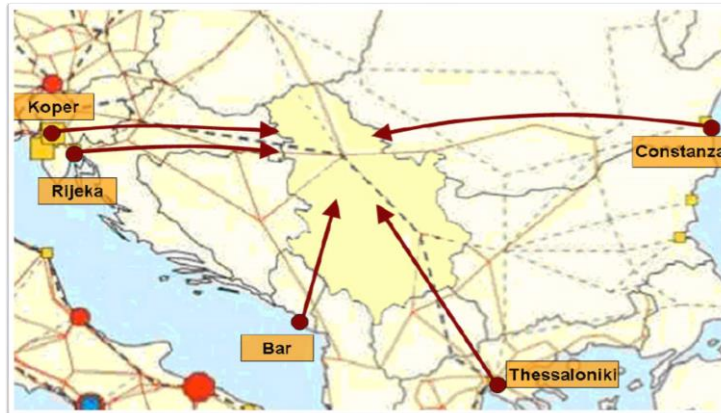


Picture 4 – Top ten exporters to Serbia (tons)



Picture 5 - Top ten importers from Serbia (tons)

When it is on intermodal transport market and connections to sea ports, most of containers are transported by road from ports of Koper and Rijeka. Significant number of TEU coming from Piraeus and Thessaloniki and smaller part coming from port of Bar and port of Constanza. Port of Constanza is recognized as a gate for bulk cargo mostly.



Picture 6 – Sea ports used for containers in intermodal transport to Serbia (source: IMOD-X project)

The number of TEU circulating through Serbia was for a long period at the level of 50.000-60.000 TEU annually, but by establishing of regular railway service from port of Piraeus and Thessaloniki this number is increased for about 8.000 TEU and now is estimated to 70.000 TEU annually.

- Main actors involved (private and public)

When we analyze who are the main actors involved in port-hinterland operations, usually we think on the port authority, port operators and intermodal or conventional transport operators, support (or not) by competent authorities as main actors in chain operations. But we often forgetting where are the sources and destinations of supply chain or trade activities.

In case of Serbia, as a whole country and Belgrade as a Capitol City where is majority of economic activities are based and in the same time a far hinterland of Adriatic-Ionian Sea ports (as a final destination or dry port for further operations or clean transit), aiming to clearly define main actors and their actual and possible influence on further development – actors are divided into the two main groups – demand side and supply side.

#### Demand side

Regarding the scope and basic objectives of ISTEN project, main actors of demand side are exporters and importers based in Serbia.

In order to recognize main import/export players, two criteria are taken:

- Companies with highest values of imported or exported goods (internal actors who generates the flows)
- Partner Countries or regions with highest foreign trade volume

The goal of identifying internal actors – companies was not to present them here, but just to locate them within territory of Serbia. Comparing locations of top 10 exporters and top 10 importing companies, we can conclude that four main areas in Serbia important from aspects of supply chain:

- Belgrade attraction area (100-150 km from the city)
- Central Serbia (Cities Kragujevac and Krusevac)

- East Serbia (Piot)
- West Serbia (Čačak, Prokuplje, Užice)
- North of Serbia (Vršac, Subotica)

As it was capitalized from some previous studies and projects and agreed between stakeholders of this project as well as approved at partnership level, Belgrade area will be the focus of further analysis and conclusions of this deliverable, with minor reference to central and east Serbia as areas of intense industrial production.

Additionally, the big portion of export flows is generated by agriculture, where most of grain are produced in Vojvodina (north Serbia) and fruits from west and central Serbia.

On the other side, main trade partners of Serbia are European Union, Russian Federation, China and Turkey. When we compare value of trade and join together import and export directions as a freight origin/destination points, main partner countries of Serbia from EU are Germany, Italy followed by neighbors Romania, Hungary and Croatia. Outside EU, main O/D countries are China, Russian Federation and Bosnia and Herzegovina, Montenegro and FYR Macedonia as neighboring countries.

Aligning origin/destination directions from/to Serbia with transport network of Serbia and its connectivity, we can conclude that Core network is well utilized in its northern and western parts and that missing or insufficient links are to east and south-west directions. It is important to mention here that transit operations are not involved in this analysis, where south-east direction of main Corridor is playing important role.

Another very important and currently influenced is flow of goods coming from China through north Adriatic ports by Road and Port of Piraeus with complete service by Rail to Serbia, supported by One Road – One belt initiative.

Not to forget, about 15 free zones near cities where a number of foreign companies situated a new factories attracting cargo flows.

### **Supply side**

Main actors involved in Port hinterland chain operations are road transport operators which are responsible for about 65% of all cargo coming from or going to sea ports. Second important mode of transport is railway with modal share of about 25-30% and the last one is Inland Water Transport covering about 5-10% of bulk cargo mostly going through ports of Constanza, Bar and Thessaloniki.

Modal share of Serbian railway operators is significantly higher if transit operations are included, with over 60% share. The use of River of Danube for transit operations is still at the low level during limitations of upper water course in Hungary and Austria as well as at the river dam Djerdap.

At this moment the main actors of cargo operations are:

- Serbia-Cargo A.D, national railway operator
- JRB A.D, biggest river cargo operator (IWT)
- Air Serbia Cargo, national airway company
- Nelt doo, private company, the only functional intermodal terminal in Serbia (modest capacity)
- About 100 private road transport operators who own container dedicated semi-trailers and about 1.500 international road transport operators with conventional equipment
- About 400 freight forwarding companies (private)
- About 25 Logistics providers who offer complete logistics services (3PL – transport, warehousing, distribution, freight forwarding etc.)

Regarding institutions, main actors are competent Ministry of Construction, Transport and Infrastructure at state level, Transport Secretariat at City of Belgrade level, SEETO at regional transnational level.

## 2.2 Port-hinterland chain operations

- Existing infrastructure (relevant for port-hinterland connections)

Main transport infrastructure is relying on main international corridors – Core network (Corridor X, or Orient/East-Med Corridor and Mediterranean corridor, Corridor VII or Danube-Rhine-Main river corridor) and comprehensive network, where Routes 3, 4, 5, 7 and 9 are connecting Serbia with surrounding countries beside Core network.



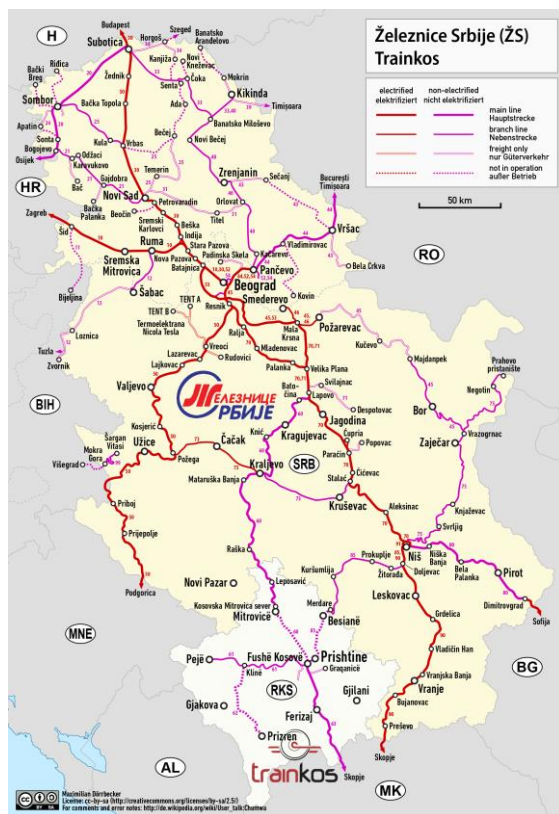
Picture 7 – Core and Comprehensive regional road network within indicative TEN-T extension (source: SEETO)



Picture 8 – Core and comprehensive rail network within indicative TEN-T extension (source: SEETO)

Road network in Serbia has total length of about 45.000 km, where 782 km are highways, 4.487 km of first-level state roads, about 11.000 km of second-level state roads and the rest are local roads.





Picture 9 – Serbian Railway network (source: Serbian Railways)

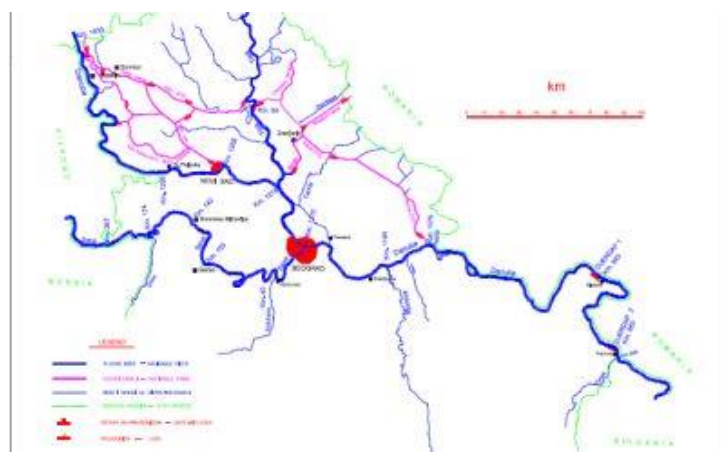
Railway network has about 5.000 km of rail-tracks where only about 20% is electrified and about 10% have double tracks.

Main characteristics of Railway network is poor condition with over 300 spots of slow driving and need for reconstruction. There is an estimation that 4 bln euros is needed for reconstruction. Even Serbia opened railway market recently, there is only two registered private operators but with very limited capacities.

At the moment a huge number of rehabilitation, re-construction and construction works are on-going, slowing

down already slow movement and low level of railway service.

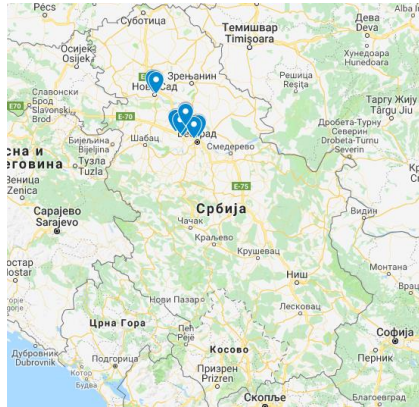
Highest development potential is on river transport (IWT). There is a need for dredging and cleaning main waterways as well as re-construction of lock at the Djerdap river dam on Danube in order to enable bigger ships to pass.



Picture 10 – IWT network in Serbia

Logistics facilities in Serbia existing in terms of warehouse capacities near biggest cities, especially Belgrade, where most of logistics services are concentrated. There is an only one

intermodal terminal (rail-road) held by private company Nelt d.o.o near city of Belgrade. In past, there was an intermodal terminal held by Serbian Railways in the city center, but due to residential area development this terminal is closed. Reopening is expecting at new location on south-west part of the city. Some modest capacity and basic technology intermodal possibilities existing within free zone of Pirot (east Serbia) but only for needs of companies within zone.



Picture 11 – Location of main logistics facilities in Serbia

Regarding Air Cargo operations, there is only two airports – Belgrade (Nikola Tesla) and Niš (Konstantin the Great).

- Cargo served (types, shares, trends)

Detailed research on cargo types and trends on whole network of Serbia is out of scope and resources of this project. In general, all types of cargo are existing on the network. When it is on intermodality, as already was mentioned above, total annual throughput of containers is about 60.000 to 70.000, creating huge potential for intermodal transport development.

Modal share is characterized by road transport domination with about 50% of total freight transport or 60% with transit exempt. Second most used mode is railway transport with share of about 30% or 40% including transit movements. IWT share is estimated at 7%, but generally between 5-10%. Other modes are about 3%.

- Services provided (by each of the main actors involved in relation to port-hinterland connections)

Existing intermodal service based near Belgrade within Nelt doo Company is very simple operation of transferring containers from railway cars to road trailers or semi-trailers and opposite. At the moment there is a possibility to accept a half of train composition simultaneously. Extension for one whole train is planned for 2019-2020. Containers are manipulated by Container Handlers and actual storage capacity is 400 TEU.

Existing port-hinterland operation is new service provided by COSCO Shipping, where containers from-to China are transported by vessels to port of Piraeus and by railway from Greece, over FYR Macedonia to Serbia (to above mentioned terminal) or further to Central Europe. Operations are organized by representatives (dependent companies) of COSCO Shipping in Greece and Serbia, with support of contracted railway transport and freight forwarding services.

Regular railway transport is operating from all borders of Serbia and organized change of locomotive and crew at each border. Railway transport is operated mostly by national railway company Serbia Cargo and few small private operators who operate in domestic transport mostly.

Most developed and dominant transport operations are by road transport, as already mentioned.

Intermodal transport by road-river and railway-river is possible through two ports on river of Danube, but due to small demands and lack of container ships this services are cancelled a decade ago.

## 2.3 Port-hinterland chain governance

- Responsibilities of each port-hinterland actor

There is no specific responsibilities other than those defined by regulations and international transport and trade rules.

In terms of responsibility for port-hinterland operations, the main responsibility is on freight forwarding companies as transport services providers.

In terms of river ports, competent authority is Agency for Ports Management at the state level, but details on river port management is out of scope of this project, regarding that cargo flows to river ports are not the point of interest of Adrion and connectivity of Adrion ports with Serbia as a hinterland.

- Coordination among port-hinterland actors

In general, all coordination is done by freight forwarders in terms of operations. The only coordination visible is on existing services of COSCO Shipping where dependent companies coordinate operations and due to participation of Serbia to China initiative “One road – one belt” the government (competent authorities) are involved in overcoming obstacles and barriers which may occur (e.g. customs, border police and inspection activities).

- Networking activities with other ports

There is no specific activities with sea ports in terms of governance.

In terms of economic and market networking with sea ports, Port of Bar and Port of Constanza organizing regular annual or occasional promotional events, mostly in Belgrade, where Serbian importers, exporters, freight forwarders and logistics providers are invited.



## 3 BOTTLENECKS TOWARDS BECOMING AN INTEGRATED HUB

### 3.1 Market bottlenecks

#### 3.1.1 Market bottlenecks identified

Through assessment completed through direct interviews on meetings and online survey some proposed bottlenecks are recognized. At the first place limitations of far markets reachable through ports and limited market of hinterland were recognized by main market bottlenecks. There was also one interesting interpretation on cause of bottlenecks: Lack of knowledge of the hinterland market players and benefits of port-hinterland system.

#### 3.1.2 Impacts of market bottlenecks

The main impact of market bottlenecks has commercial effects. The inability or limited access to certain markets limiting possibilities for new contracts and increasing the business. Widening of catchment area through better infrastructural connectivity as well as knowledge of the new markets is crucial for economic development of service providers and development of new services.

### 3.2 Infrastructural bottlenecks

#### 3.2.1 Infrastructural bottlenecks identified

Infrastructural bottlenecks are identified in several terms. First and most obvious infrastructural bottlenecks are missing links and inadequate transport network.

#### Road network

Road network missing links or insufficient capacity on Core network are:

- Incomplete Belgrade by-pass (works are on-going, but not fast enough)
- Incomplete Route 4 – connection Romania – Belgrade – Montenegro
- Insufficient capacity to Bosnia and Herzegovina and Romania
- Incomplete connection Niš – Dimitrovgrad (to Bulgaria)
- Low condition on highway section to Croatian border

Secondary network is well developed with high density, but high percentage of roads are in bad condition with missing traffic signalization and low maintenance level.

Concerning Belgrade area and freight traffic, main bottleneck identified is incomplete Belgrade by-pass and connection to north Serbia and Vojvodina over the bridge to city of Pancevo.

#### Railway network

Regarding railway network, density is on high level, but generally bad condition of railway tracks and huge number of “slow ride” points creating a significant number of micro-bottlenecks.

Belgrade railway node is particularly complex issue concerning unclear jurisdictions on infrastructure objects due to recent reorganization of national railway company, relations between state and city authorities and recent decision to move certain part of network and shunting and cargo manipulation capacities.

Construction and completion of Belgrade by-pass, especially construction of new bridge over river of Danube on east side of Belgrade enabling moving of railway operations from City zone and connection of central and north-east part of Serbia.

Additional problem is missing or unclear status of industrial tracks as part of network which is out of scope of Network statement and often not in use.

### **IWT network**

Even we define IWT as a subsystem out of scope of this project, from the aspect of further possibilities of connection to Central Europe and Black Sea, it is important to mention that main bottlenecks on River of Danube as main waterway are needs to be upgraded by dredging on certain parts (high level investments) and that locks on river dam of Djerdap needs reconstruction in order to accept bigger ships. Port capacities in terms of intermodal transport are very limited and underequipped. On one part of Danube waterway there is specific need for extraction of sunken fleet from WWII.

### **ITS**

Intelligent Transport System's infrastructure is underdeveloped in Serbia. As a system enabling not only road maintenance and traffic safety information distribution, but also freight transport information services, construction of ITS infrastructure along main freight transport corridors is not only useful, needed and recommended but obligatory for Serbia as a EU candidate country. Most important ITS links need to be installed along Core network and Corridors but also to enable communication between road and railway services enabling more efficient transport operations.

### **Intermodal Transport**

In Serbia, there is actually no intermodal terminal in full meaning of this term. Manipulation of containers is theoretically possible only at river ports, but it's not usually done due to lack of equipment, low demand and lack of connections. Mentioned existing private intermodal terminal "Nelt" is mostly for services provided by Company Nelt doo and Cosco Shipping group, but not for public services available for other operators (or not yet). In the past, there was one intermodal terminal owned by Serbian Railways, but it was dismantled and probably will be installed on new location.

### **Soft infrastructure bottlenecks**

Lack of communication caused by insufficient communication infrastructure is recognized in operations conducted by competent authorities (customs, border police, inspection etc.) and lack of interface and interaction between different systems, where operators cannot get right and timely information, causing additional time waste and costs.

### **Other infrastructure bottlenecks**

Regarding infrastructure bottlenecks recognized out of Serbia at port locations and near port-hinterland areas, stakeholders highlighted inadequate capacity of port handling equipment and inadequate port infrastructure, causing transport operators to wait for loading/unloading and incompatible infrastructure or equipment between port and transport operators, causing the cancelation of operations or applying of inadequate and unsafe measures to overcome such issues.

### 3.2.2 Impacts of Infrastructural bottlenecks

Infrastructure bottlenecks have impacts to all of three aspects of sustainable business – economic, environmental and social.

Highest and most obvious impact is on commercial terms, where insufficient and inadequate infrastructure causing additional costs, decreased competitiveness and lower revenues. It is not rare that due to broken infrastructure some transport operations have to be cancelled or that delivery delays causing extra costs to transport operators.

In terms of environment, increasing of transit time, lower average speed and lower vehicle conditions causing higher carbon footprint and emission of other pollutants. Also, bad condition of railway infrastructure causing low level of railway mode share and slower shift from road to other modes of transport, resulting in higher use of road transport and higher emission.

Lower average speed and high transit time have negative impact to drivers in road transport in terms of fatigue and consequently lower safety, poor working conditions etc. Lack of infrastructure could cause security issues, when trucks or trains have to stop at unsafe spots.

## 3.3 Operational bottlenecks

### 3.3.1 Operational bottlenecks identified

All of general proposed operational bottlenecks are confirmed during assessment, but without any specific highlighted issue on this topic.

- Not aligned operational processes of port-hinterland actors
- Not aligned operational processes between operational & public (e.g. customs) actors
- Limited breadth (or inadequate quality) of services provided by the port and/or the hinterland actors
- Inadequate cross-border coordination of port-hinterland corridor

Stakeholders strongly highlighted issues they suffer as operators and competent authorities in their operations due to organizational issues:

- Additional costs caused by time waste and need for additional workforce
- Additional costs caused by inadequate operational processes and possibility to be fined
- Inability to approach different markets or offer different services (not competitive) due to organizational issues, lack of coordination, limited services provided by port

### 3.3.2 Impacts of operational bottlenecks

The only recognized impacts of organizational bottlenecks are in terms of commercial aspects – increased costs and limited market approach – meaning limited revenue.

## 3.4 Institutional bottlenecks

### 3.4.1 Institutional bottlenecks identified

Fragmented planning at national and regional level are first recognized bottlenecks caused by institutional activities, preventing faster development and possibilities for applying innovative solutions and new services.

Regarding that Serbia and some of surrounding countries are in process of accession to European Union, huge number of regulations are and will be changed, often with incomplete implementation, creating uncertainty and problematic legal and institutional framework, causing that operators are unsecure and having difficulties to cooperate.

Issues on coordination between ports and hinterland corridors are recognized in terms of planning of development as fragmented planning above mentioned.

### **3.4.2 Impacts of institutional bottlenecks**

Impacts are generally identified in commercial terms, where fragmented planning and unclear legal framework causing an uncertainty and inability of private sector to define developing strategies, where as a consequence additional costs and slowed development occur.

## **3.5 Innovation bottlenecks**

### **3.5.1 Innovation bottlenecks identified**

All of proposed bottlenecks are highlighted as issues faced by stakeholders:

- Low innovation content in the services provided
- Not harmonized and missing digital information exchange between port-hinterland actors and between operational and public actors
- Inability to provide seamless port-hinterland cargo visibility to operational actors and shippers

What was identified as a innovation bottleneck is a fact that public actors are actually late in implementation of digital solutions comparing private sector, where investment in educated staff and education of personnel are recognized as a precondition of competitiveness and development.

### **3.5.2 Impacts of innovation bottlenecks**

Impacts are generally identified in commercial and environmental terms, but in social terms as well through education needs.

The highest impact in terms of overcoming identified bottlenecks are economic benefits brought by faster operations, better visibility of cargo, increased efficiency and lower costs of operations, through digitalization, faster information flows, better visibility and transparency, process automation and control.

## 4 MEDIUM-TERM SCENARIOS

### 4.1 Main factors to influence future development

#### Market

In terms of market aspects, main factors recognized as highly influential to future development are global and regional economic development, changing global trade routes and strategic initiatives such as WB6, EUSDR, EUSAIR and China's One Road-One belt initiative, which can bring fresh and new investments in production and infrastructure, stability and increase transport demands in general.

On the other side, political and economic relations are recognized as potential risk or possibility in terms of changes on transport market and changes of trade routes (e.g. EU sanctions to Russian Federation resulted in strong increase of Serbian Transport operations; China investment in Port of Piraeus established regular Railway service to and through Serbia). Modal shift in terms of market changes is recognized by stakeholders but not highly ranked. Changes under pressure for environmentally-friendly modes are possible only through subventions or incentives on use of greener modes of transport, creating economic benefits. Otherwise, it will take a time to create pressure so strong to ignore economic effects and logistics costs of use of environmentally-friendly modes of transport.

#### Infrastructure

Even recognized as most problematic, infrastructure issues are in the same time very simple to solve and most difficult. There is only one word – investments.

Anyhow, most recognized sub-factors which can influence to development are: demand for new types of infrastructure (e.g. LNG), then public investments in hard & soft infrastructure, private investments in railway and intermodal transport industry, and automation in port and hinterland processes, enabling faster, safer, more efficient and costless transport operations. Regarding Belgrade area, construction and completion of Belgrade by-pass and construction of new intermodal terminal projected in Batajnica are two most influenced and foreseen projects in mid-term period.

#### Operations

Regarding that in global supply chain there is a lot of space for improvement in area of transport and logistics and that logistics and transport costs are not small, general demand for competitiveness will continue to push actors to search for new solutions and reach higher efficiency, better quality and new services, for certain. This chain will for sure include the need for integrated transport solutions and decisions on criteria for route/port selection, meaning that importance placed by clients on efficiency is and will be higher and higher.

On the other side, as a field of possibilities and very influenced on future development, alignment of operational processes between operational and public actors was defined as most influenced and corresponding factor to identified operational bottlenecks. The need of improvement of processes in public sector is defined, but it doesn't mean that it will happen.

#### Institutional

Regarding that Serbian stakeholders are representatives of landlocked country and far hinterland of Sea ports, the role of ports and port authorities in terms of institutional factors are not recognized.

What was highlighted are integrated planning and coordination between modes of transport, where different modes shouldn't look each other as competitors but as a partners in same business.

In order to reach that level of integration it is necessary that competent authorities and institutions create and implement environment – legal and strategic framework which will eliminate fragmented interests and enable better cooperation between hinterland actors, ports and inland transport operators.

### Innovations

All of proposed factors which will shape future development of transport and logistics activities in terms of innovations are confirmed as:

- Global pace of digitalizing logistics information streams
- Importance placed by clients on visibility as a port/corridor selection criterion
- Importance and gap of employees' skills in technological innovation
- Maturity of emerging tech solutions
- Autonomous intermodal solutions

In addition, alternative fuels and engines and autonomous vehicles are also recognized as possible highly influent in near future.

This part was most difficult to decide, which is the most influencing factor, regarding that innovations are often interpreted as creativity, but also as digitalization and implementation of new technology-based solutions.

For the need of this project, selected factor was gap of employees' skills in technological innovation, even all of factors could and should be analyzed.

Based on above mentioned, but in certain level limited by mentioned certain prevent or hinder factors of stakeholder's representatives' ability to recognize and express the expected full level of information, from five groups of pre-defined factors, as most influenced factors selected are shown in following table. Selected influencing factors are simplified in certain level and the scope of impact was narrowed only to Belgrade area (not whole Serbia) in relation to ADRION ports only and concerning identified bottlenecks.

*Table 1 – Morphological table of factors enabling Serbia (Belgrade) role in port-hinterland system of Adrion ports*

Market	Infrastructural	Operational	Institutional	Innovation
<b>A) Change of global/regional trade routes - freight flows to or over Belgrade area</b>	<b>B) Road and Railway Belgrade by-pass and intermodal terminal construction and completion</b>	<b>C) Alignment of operational processes between operational and public actors</b>	<b>D) Coordinated planning and legal framework creating</b>	<b>E) Gap of employees' skills in technological innovation</b>
A1 Freight flows to/over Belgrade area will increase	B1 Road and railway by-pass completed	C1 Better alignment of processes - public processes improved	D1 Coordinated planning established and regulations adopted and implemented	E1 Employees' skills in technological innovation increasing to desired level
A2 Freight flows to/over Belgrade area remain unchanged	B2 Intermodal terminal constructed	C2 No changes in alignment of processes	D2 Planning stays fragmented, but legal framework established	E2 Skills in technological innovation will reach desired level through new educated generations of young

A3 Freight flows to/over Belgrade area will decrease	B3 Road and Railway Belgrade by-pass and intermodal terminal constructed and completed	C3 Increase of misalignment - operational actors improve processes while public actor's processes remain unchanged	D3 Even greater fragmentation in planning and adoption of contradictory regulations	E3 Skills in technological innovation will remain at the same level (Gap increased)
	B4 No changes in terms of completion of Road and Railway Belgrade by pass and intermodal terminal construction			E4 Gap of employees' skills in technological innovation will even increase through "brain drain" - leaving of skilled workforce to other more developed countries

## 4.2 Scenarios' formulation

Within the effort to conduct recommended morphological analysis and mentioned limitations in analysis capacity, basic and simplified "problem space" was defined and shown by above table. Second step was to define consistent relations between each pair of states of five influencing factors and finally to formulate scenarios. The main obstacle in completing the tasks was inability to organize joint meeting – a workshop with all of stakeholders and/or low level of interest of some stakeholder's representatives to continue with scenario analysis after identification of bottlenecks.

However, thanks to PP09 partner's project team efforts and comprehensive experience, the task is completed with certain level of aloofness in terms of certainty on accuracy of presented results. Presented results will be re-checked and modified if necessary in further joint work with stakeholders.

In the process of Scenarios' formulation, some pre-assumptions are defined concerning second and third parameters – infrastructural and alignment of processes, where some activities are already on-going and certainty of positive completion is with very high probability.

Regarding completion of infrastructural parameters, Belgrade by-pass is over 50% completed, where some works are on-going. The significant part missing to fully functional by-pass is construction of new bridge over the Danube at the east side of the city of Belgrade enabling connection with city of Pančevo where industrial zone is located (oil refinery and chemistry) and port at the left bank on Danube.

Recognizing the need for public services and increase of intermodal transport volume, Serbia completed project "Enabling intermodal transport in Serbia" where detailed major project for construction of intermodal terminal "Batajnica" (near Belgrade) is completed. Project was completed by support of EU. Still, funding resources for construction are missing.

In terms of alignment of public and operational processes, including legal and strategic development framework, Serbia and City of Belgrade are moving in right direction through process of accession to European Union as well as acceptance of initiatives and influence of foreign investments, where international companies bringing requirements and standards together with know-how and experience which not letting public sector to keep the status quo.



Based on presented assumptions and limited discussions, following scenarios are defined depending on market development options.

*Table 2 – Plausible Scenarios formulated for Belgrade area*

A1	B1	C1	D1	E1
A2	B2	C2	D2	E2
A3	B3	C3	D3	E3
	B4			E4
Scenario 1	Scenario 2		Scenario 3	
<p>Freight flows are increasing Under this pressure, both infrastructural main requirements are completed (by-pass and intermodal terminal) Increased flows pushing operational processes forward but public sector cannot follow – misalignment raise On the other hand, increased flows motivate institutional segment to plan better and create legal framework Need for skilled and creative employees is increasing faster than production of new people</p>	<p>Volume of freight flows remain unchanged, causing loss of interest to invest in intermodal terminal. Only started works on by-pass completed. Public actors have enough space to develop and align processes aiming to attract new flows. At institutional level, planning stays fragmented without efforts to improve legal framework except to fulfil adoption of new regulations as a political tasks related to EU accession. Skills in technological innovation are improving but slowly. There is no strong investments in innovative and creative people.</p>		<p>Due to market changes, freight volume decrease. Consequently, interest for investment (as well as real need) not exist anymore. The supply is higher than demand and need for public actors to improve their processes is not priority. Planning processes and political will to create better legal framework is without significant changes. Due to lower volume of operations, the need for innovations is not highlighted and young, skilled and educated people leaving the country.</p>	

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