

Analysis of the potential of Serbia to transport containers on Danube

Nenad Zrnić

Professor
University of Belgrade
Faculty of Mechanical Engineering

Sanja Bojić

Associate Professor
University of Novi Sad
Faculty of Technical Sciences

Milosav Georgijević

Professor
University of Novi Sad
Faculty of Technical Sciences

Marko Urošević

Research Assistant
University of Belgrade
Faculty of Mechanical Engineering

This paper deals with problems and possible solutions for the improvement of container transport of Serbia by using Danube as a waterway. Given the geographical position in relation to the Danube, Serbia has a sufficient number of ports on this river, which could be an element of further development of the economy and therefore can be considered as a great potential. An analysis of import and export of container that was done in this paper indicates that Serbia has substantial potential to transport containers on Danube. Consequently, there are sufficient justifications for the design and construction of a modern container terminal on the Danube which will connected Serbia with main European ports and which will contribute to the further progress of the Serbian economy.

Keywords: containers, Danube, ports, logistics

1. INTRODUCTION

As the Danube has only a great potential for transporting goods, transitional economies are only a major contributor to the European economy. Because of the low productivity, the annual increase of GDP (small value of a few percent) remains low. Only an annual increase over a long period of over 10% can give hope to stabilize economy and this would in itself bring more containers in the Danube countries. First of all, a critical mass of the containers has to be created, which would impose all benefits of the water transport on Danube, and annul the shortcomings of liner shipping, out of which the greatest are the navigability the transport time. Safety navigation on the Danube for at least 300 days a year requires large investments and the inclusion of all countries around the Danube, under the auspices of the EU, and there are indications of when will be the increase of containers on the Danube.

The import and export data show that in value terms, the majority of imports comes from Germany and China, and about 30% of exports go to Germany and Romania, therefore to countries that are on the Danube or the EU's waterway RMD with the largest share of containerized goods.

Regardless of the fact that geographical aspects explicitly indicate that transport of goods from the Far East to Central Europe favor the Rhine - Main - Danube and Danube waterways as a water highway, logistical aspects are still an obstacle for the regular navigation and the daily existence of containers on ships on the Danube.

The EU SEE project DaHar deals with analysis of the logistic potentials of the Danube region, what is presented in Figures 1 - 3 (Dahar PP port labels are not relevant for analysis) [1].



Figure 1. Logistics Potential in the Danube Region - Overview on DaHaR ports

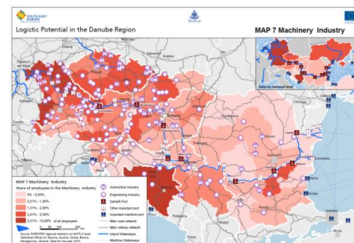


Figure 2. Logistics Potential in the Danube Region - Machinery industry

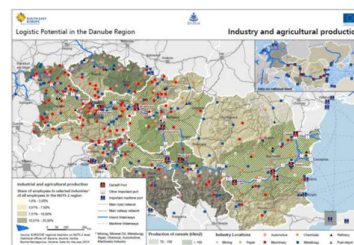


Figure 3. Logistics Potential in the Danube Region - Industry and agricultural production

- Previous pictures (Figure 1 - 3) indicate that Serbia:
- Has enough ports on the Danube which could, with their potentials, be an element of further development of the economy, with modernization and transformation into logistics centers,
 - Has no significant resources from the Machinery Industry, which is a prerequisite for production, workplaces and development, and hence the number of containers at a given level,

Correspondence to: Dr. Nenad Zrnić, Professor
University of Belgrade,
Faculty of Mechanical Engineering,
Kraljice Marije 16, 11120 Belgrade 35, Serbia
E-mail: nznric@mas.bg.ac.rs

- Besides a significant area for agriculture and production, there are no significant industrial - type resources, what are the prerequisites for the development strategies of the economy.

The largest part of Serbia, geographically and economically, is directly connected to the Danube, which is an advantage, which is not used, and therefore can be considered as a great potential.

More than 5 million inhabitants live in the Danube region in Serbia and the region has the most important economic and human resources (Universities in Belgrade, Novi Sad, etc.)

2. CONTAINER FLOWS IN SERBIA

Regarding the available data for Serbia, obtained by interviewing leading containers forwarding companies operating in Serbia, container throughput is around 75,000 containers: 45,000 containers - import / 30,000 containers - export.

Main ports for Serbian container export/import are:

- Rijeka, Croatia: (40,000 containers),
- Bar, Montenegro: (20,000 containers),
- Koper, Slovenia: (10,000 containers),
- Piraeus, Greece: (3,000 containers),
- Thessaloniki, Greek/North EU ports (Rotterdam, Hamburg, Antwerp): (2,000 containers).

Container carriers - Serbian market share:

- MAERSK LINE: (33,000 containers),
- COSCO: (15,000 containers),
- MSC: (13,000 containers),
- EVERGREEN: (7,000 containers),
- CMA - CGM: (4,000 containers),
- HAPPAG LLOYD: (3,000 containers).

The data obtained from the Customs Service refer to the total number of containers in the customs offices without their categorization of a 20" (TEU), 40" (FEU) or larger containers. In order to express the total volume of container traffic in the TEU, the transformation of data obtained from the customs offices was used. The following relationship: 27% are 20" containers and 73% are 40" containers [2].

Obtained values (expressed in TEU) were used in all analysis that follows.

The total export of containers in TEU for 2015, 2016 and 2017 is given in the Table 1 and shown in the Figure 4.

Table 1. The total export of containers in TEU for 2015, 2016 and 2017

Year	2015	2016	2017
Export of containers (TEU)	31,515	34,936	41,961

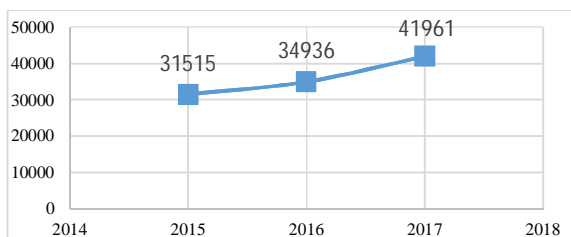


Figure 4. The total export of containers in the TEU for 2015, 2016 and 2017

Analysis of the accompanying data shows an increase of container exports of 10.86% in the period 2015 - 2016, i.e. 20.11% in the period 2016 - 2017.

The graph of total exports from the customs offices of the Danube region is shown on the diagram (Figure 5) in TEU, for 2015, 2016 and 2017:

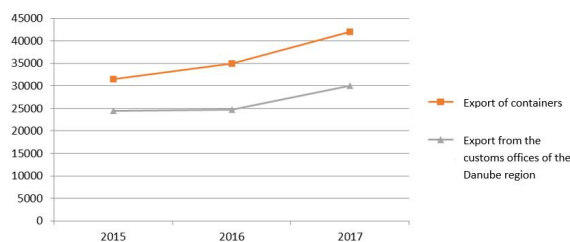


Figure 5. Total exports from the customs offices of the Danube region

Export by customs offices in the TEU is given in the Table 2 and shown on the chart, Figure 6.

Table 2. Export by customs offices in the TEU

Customs office	Year		
	2015	2016	2017
Customs office Belgrade	12,958	12,475	15,207
Customs office Dimitrovgrad	99	33	66
Customs office Kladovo	168	382	965
Customs office Novi Sad	2,834	3,841	4,034
Customs office Sombor	42	88	24
Customs office Subotica	801	1,100	1,083
Customs office Šabac	4,467	3,415	4,367
Customs office Vršac	144	38	54
Customs office Zrenjanin	396	754	855
Customs office Niš	1,493	2,479	3,024
Customs office Kragujevac	2,962	3,171	4,323
Customs office Kraljevo	2,126	2,865	3,282
Customs office Kruševac	2,107	2,981	3,424
Customs office Užice	920	1,313	1,254

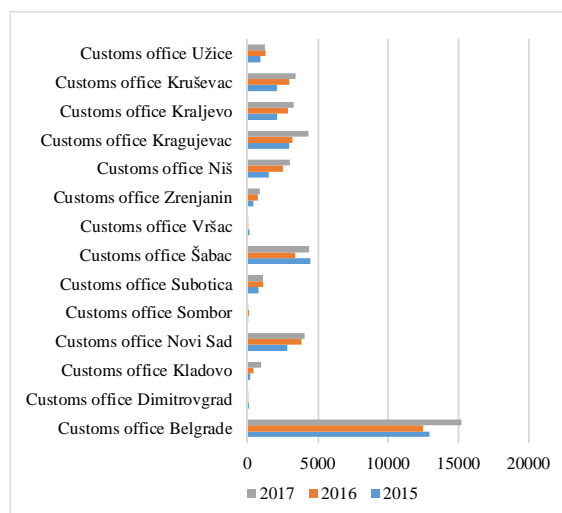


Figure 6. Export by customs offices in the TEU

The data for export by statistical regions in the TEU are given in the Table 3 and shown in the chart, Figure 7.

Table 3. Export by Serbian regions in the TEU

Region	2015	2016	2017
Belgrade	11,107	10,290	13,478
South and East Serbia	1,759	2,894	4,055
Šumadija and West Serbia	8,115	10,330	12,283
Vojvodina	10,534	11,421	12,145

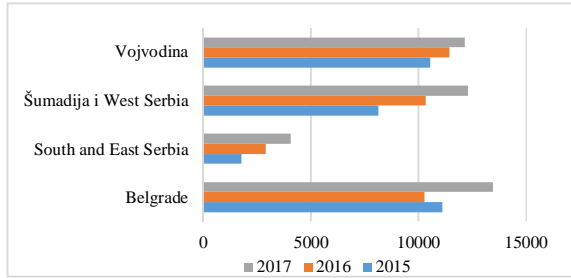


Figure 7. Export by Serbian regions in the TEU

Exports from the customs offices that gravitate to the Danube [TEU] are shown on the chart, Figure 8.

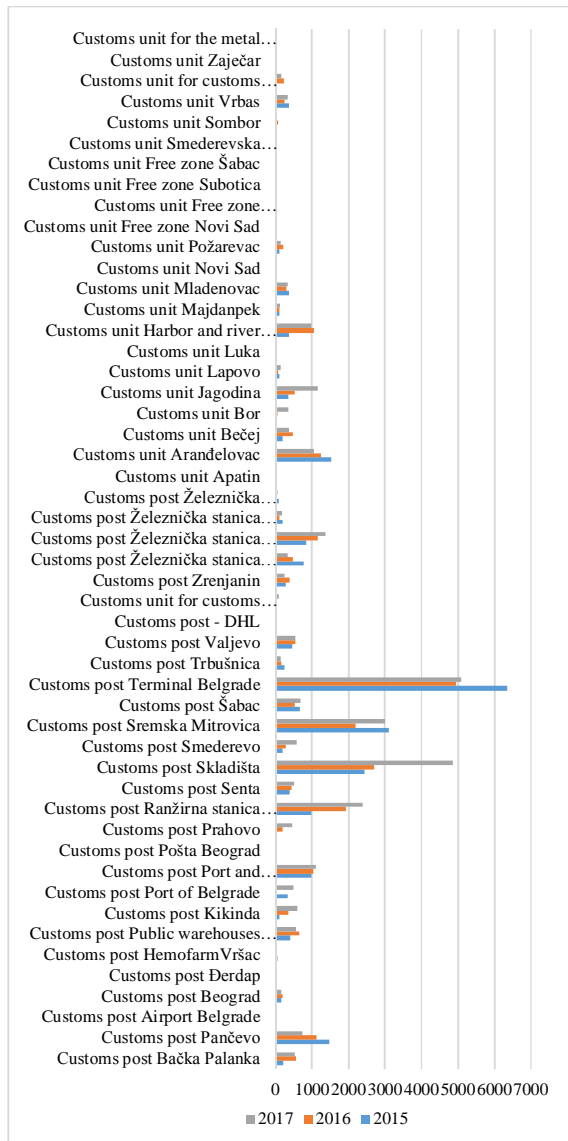


Figure 8. Exports from the customs offices that gravitate to the Danube in the TEU

The total import in the TEU is given in the Table 4 and shown in the chart, Figure 9.

Table 4. Total import of container in the TEU

Year	2015	2016	2017
Import of container [TEU]	70,285	79,163	89,226

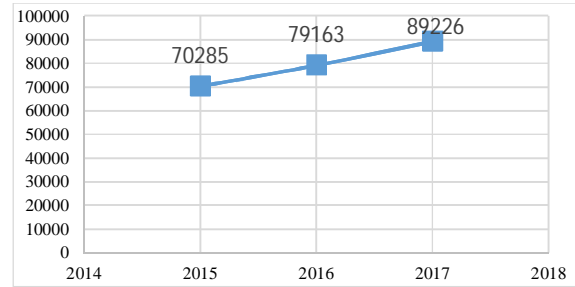


Figure 9. Total import of containers

It can be noticed that the increase of imports in the period 2015 - 2016 amounted to 12.63%, and in the period 2016 - 2017 12.72%.

The graph of the total import of containers into the Republic of Serbia and import through the customs offices which gravitate the Danube region is shown in the following figure (Figure 10).

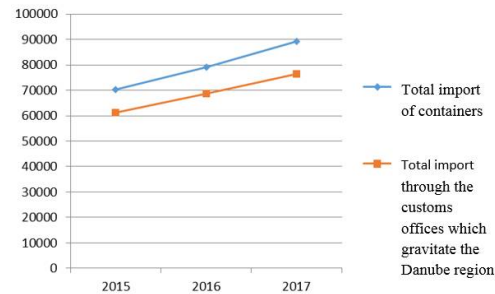


Figure 10. Total import of containers into the Republic of Serbia and import through the customs offices which gravitate the Danube region

The total import by customs offices in the TEUs is given in the Table 5 and shown in the graph, Figure 11.

Table 5. Total import by customs offices in the TEU

Customs offices	2015	2016	2017
Customs office Belgrade	42,503	48,513	49,563
Customs office Dimitrovgrad	90	76	180
Customs office Kladovo	3,389	3,477	9,174
Customs office Kragujevac	2,855	3,292	2,432
Customs office Kraljevo	2,609	2,725	2,614
Customs office Kruševac	1,026	1,362	1,986
Customs office Niš	1,422	1,898	4,533
Customs office Novi Sad	9,076	10,390	10,330
Customs office Sombor	40	69	52
Customs office Subotica	3,183	2,547	3,412
Customs office Šabac	2,406	3,258	3,384
Customs office Užice	1,159	1,007	1,152
Customs office Vršac	185	189	218
Customs office Zrenjanin	343	362	197

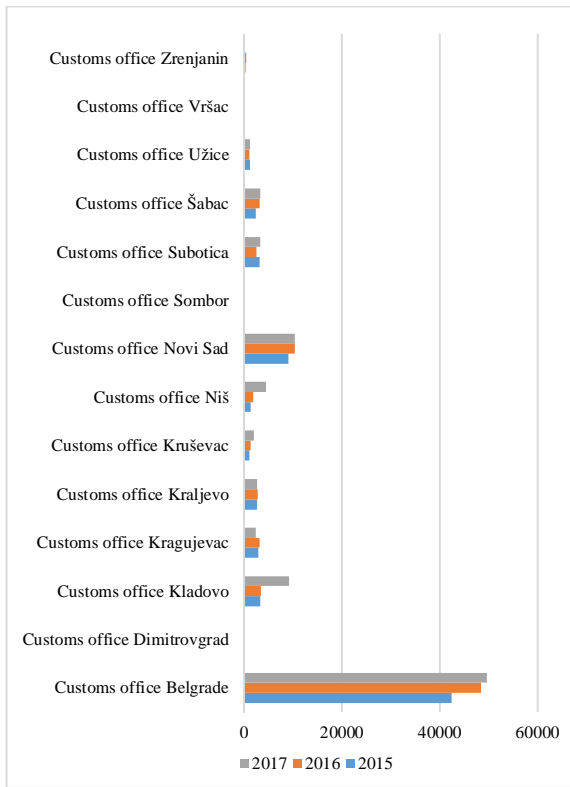


Figure 11. Total import by customs offices in the TEU

The total import by region is shown in the Table 6 in the TEU and on the chart (Figure 12):

Table 6. Total import by region in the TEU

Region	2015	2016	2017
Belgrade	42,337	48,315	48,582
South and East Serbia	4,901	5,451	13,887
Šumadija and West Serbia	7,648	8,385	8,185
Vojvodina	15,399	17,011	18,573

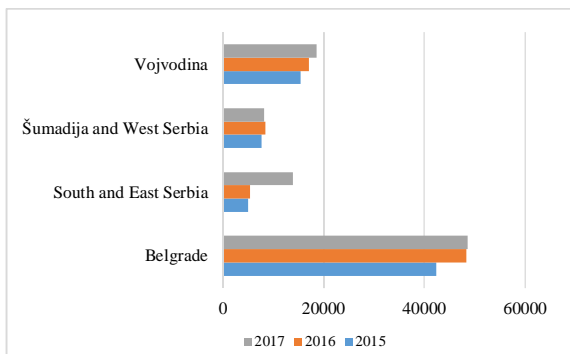


Figure 12. Total import by region in the TEU

The total import of customs offices that gravitate to the Danube Region is shown in the Table 7 and on the diagram, Figure 13, respectively amounts to a total of 206,258 TEUs in the three years considered:

Table 7. Total import of customs offices that gravitate to the Danube Region

Year	2015	2016	2017
Import of customs office	61,124	68,804	76,329

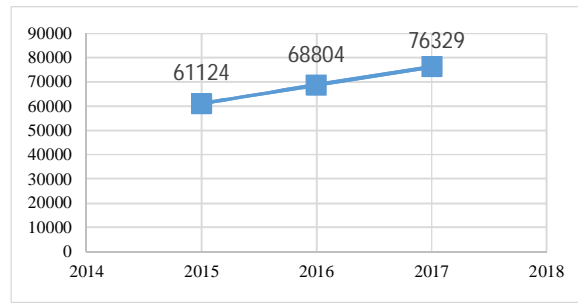


Figure 13. Total import of customs offices that gravitate to the Danube region

Import into the customs offices that gravitate to the Danube is shown on the chart, Figure 14.

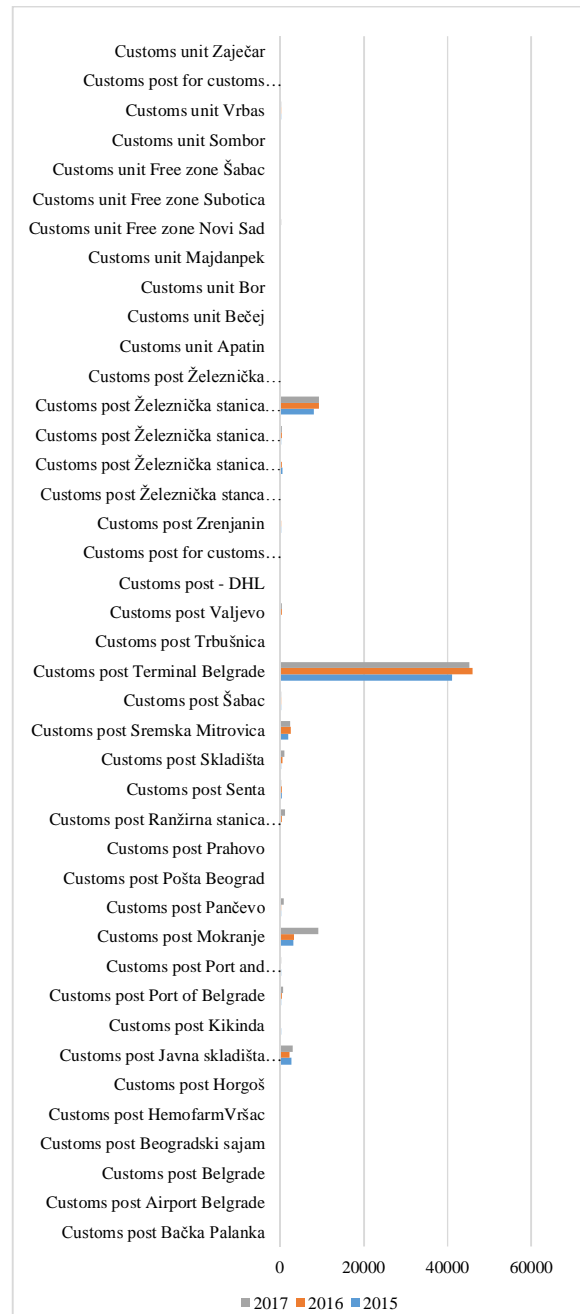


Figure 14. Import into the customs offices that gravitate to the Danube

Finally, the total export and import of containers in the TEUs and in the reviewed period from 2015 - 2017 (Figure 15), based on data received from the Customs Administration, is presented in the Table 8 and the appropriate diagram (Figure 16).

Table 8. Total export and import of containers in the TEUs in the period 2015 - 2017

	2015	2016	2017
Export	31,515	34,936	41,961
Import	70,285	79,163	89,226
Total	101,800	114,099	131,187

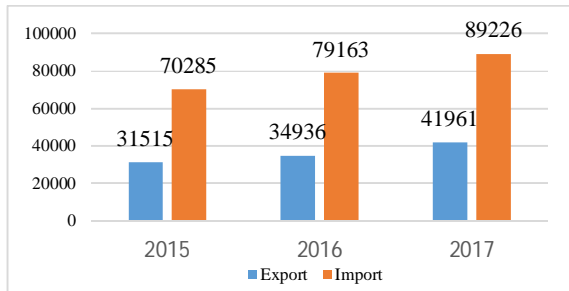


Figure 15. Total export and import of containers in the TEUs in the period 2015 - 2017.

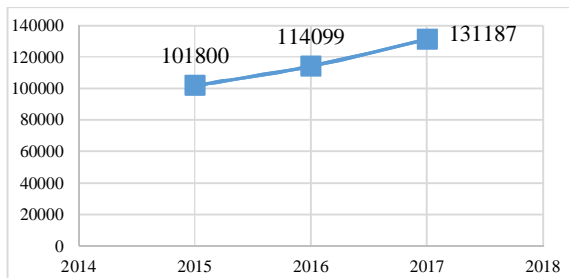


Figure 16. Total export and import of containers

Total imports and exports from the customs offices that gravitate to the Danube Region and in the reviewed period from 2015 - 2017 (Figure 17) are given in Table 9 and on the chart (Figure 18).

Table 9. Total imports and exports from the customs offices that gravitate to the Danube Region in the TEU in the period 2015 - 2017.

	2015	2016	2017
Export	24,470	24,756	30,055
Import	61,124	68,804	76,329
Total	85,594	93,560	106,384

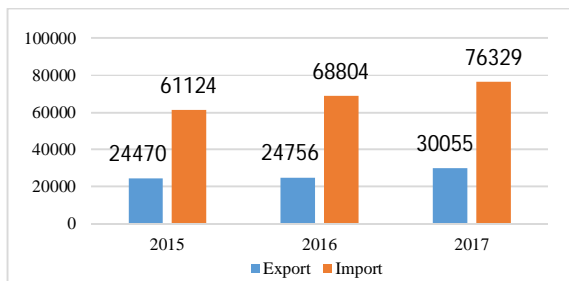


Figure 17. Total imports and exports from the customs offices that gravitate to the Danube region in the period 2015 - 2017.

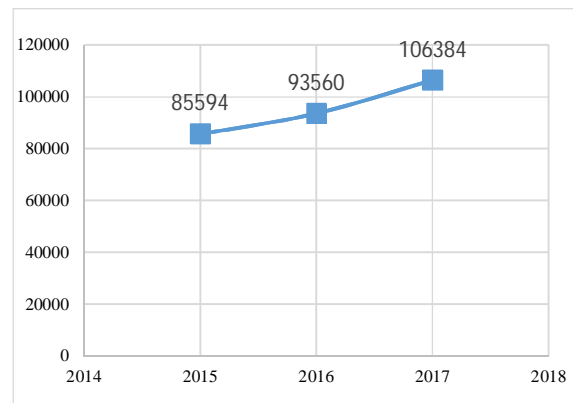


Figure 18. Total imports and exports from the customs offices that gravitate to the Danube region

The overall export and import of containers in the Republic of Serbia, as well as the export and import realized through the customs offices that gravitate to the Danube region, is given in the following chart (Figure 19).

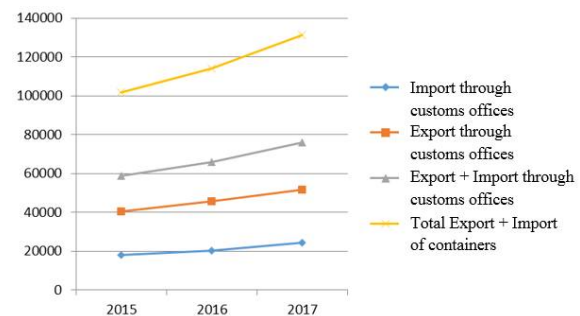


Figure 19. Export, import of containers, export and import realized through the customs offices that gravitate to the Danube region

3. FORECAST FOR FUTURE CONTAINER TRANSPORT IN SERBIA

Previous analyzes provide backgrounds for development assessments. For long - term forecasts of the development of goods flows, and in particular of the goods in Serbia, there are many dilemmas, since Serbia does not have a clear projection - the economic development strategy, which determines which economic branches - the groups will have priority, on the basis of which the expected margins can be projected transport.

Data provided by the World Bank show projections of an increase in GDP per capita by 2030 between 1.5% and 4%, with a target value of around 3% [3].

Data for Serbia are at the level of 4% for the next year [4] and [5].

For developed countries in the EU, this is significantly less (e.g. about 2%), but their initial position is incomparable with Serbia. For China, the projected growth rate is still around 5% by 2030.

For container transport, the increase in cargo handling in the ports in recent years is at the level of 2 - 6% [6]. The logistics indicator of Serbia is improving and it is on the level of around 2.60 (in 2010 was 2.30 - the scale was from 1 = low - 5 = high).

The Serbian economy, based on foreign investments, without a significant share of its own production, has a 39.6% export of goods from GDP, but that is why 50% of GDP is import of goods.

The increase in the number of containers in the Danube Region is: 9.3% for 2015 - 2016, and 13.7% for 2016 - 2017, and as a basis for the assessment of growth can be taken:

- 10% as the expected annual increase (medium scenario),
- 5% as a pessimistic option (low scenario),
- 15% as an optimistic option (high scenario).

For containers and container transport in the Danube Region, regarding Serbia and from the previous analysis, on the basis of 106,338 TEUs from 2017, follows: The increase in the number of containers, according to data from the Customs of Serbia, can be approximately estimated to 10% per year.

If in Serbia, related to the Danube region, the increase in the number of containers in the next 5 years would be at the level of:

- 0%, this would mean over 60% of TEUs for the next 5 years, which is 171,278 TEUs,
- 5% (pessimistic variant) for the next 5 years would mean about 28% TEUs, which is 136,171 TEUs,
- 15% (optimistic variant), this would mean over 100% TEU for the next 5 years, which is about 212,768 TEUs.

For the next 10 years (until the end of 2027), during which the cost of investing in the container terminal should be demanded, the number of containers in Serbia - the Danube region would be with a factor of annual increase of:

- 10% the number of containers would increase by a factor of 2.6, or around 276,598 TEUs,
- 5% (a pessimistic variant) would for the next 10 years amount to about 63% TEU, which is 173,405 TEU,
- 15% (optimistic variant), the number of containers would increase by factor 4 or about 425,536 TEU (optimistic forecast).

Of the total number of containers in Serbia, it can be taken with great reliability that:

- One third belongs to the region of Vojvodina,
- One third to the region of Belgrade,
- One third in the region of southern Serbia (south of Belgrade).

Customs data of Serbia show that over 80% of the total container transport expressed in TEUs gravitates to the Danube region.

If the base is taken as a rounded figure for 2017 of 105,000 TEUs that is for the increase in the number of containers of 10% per year in the Danube region:

- 169,000 TEU for 5 years,
- 273,000 TEU for 10 years (until the end of 2027).

4. CONCLUSION

Based on the previously presented data there is sufficient justification for the design and construction of a container terminal on the Danube and the expectation that the Danube will be a carrier or at least a significant

factor in container transport. Additionally, it is obvious that there is a need for the creation of a modern container terminal in Serbia connected to some of the existing ports, such as, for instance, can be the Port of Novi Sad.

In real terms, the number of containers that can be transported by the Danube is primarily associated with containers that come from the east and are unloaded in Constanta and a smaller number of containers circulating from and towards central Europe along the Danube. For these analyses, global movements of goods must also be taken into account, since the transport of the containers by the Danube implies liner services from Constance to at least Enns or Regensburg.

If the situation arises that the North Ports are overloaded with containers as it was before 2008, world operators will look for more favorable variants with ports on the Adriatic Sea and with the Constanta port for containers coming from the Far East, which in that period favored the activation of container terminal in Constanta, but also in Koper, Rijeka, etc.

The Danube offers inland navigation, a natural infrastructure with correspondingly low investment costs and no additional land use. If navigation on the Danube would be at least 300 days a year, it would appear that under ideal logistics conditions, if all the containers were transported by the Danube, it could be one to two self-propelled ships daily on the Danube.

The investment costs for road transport are double those of inland navigation and six times higher for rail transport.

In addition to ecology, preliminary analyzes are also significant from the aspect of the capacity of roads, especially railways, as possible modes of transport for the projected number of containers in transport in Serbia.

ACKNOWLEDGMENT

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