

## KEY INFLUENTIAL FACTORS FOR ESTABLISHING AND DEVELOPING INTERMODALITY IN BALTIC ADRIATIC CORRIDOR

### Abstract

The zones along the Baltic and the Adriatic have substantial geographical, economic and transport similarities. The strengthening of economic growth and the dynamics of the flow of goods has provided intermodality the utmost importance. The development of multimodal transport network and its connection with the TEN-T1 corridors represents a precondition for strengthening national economies. Baltic-Adriatic corridor connects the north and the south of Europe, with a more progressive intensification of the economic growth of Baltic and Central European countries. The intermodal transport system in the corridor has the ability to generate and intensify the economically sustainable growth. Without doubt, there is a true need for economic growth and transport system within which intermodal transport would have particular significance as a strategic program. Strategic planning of transport development must be in the service for the overall economic growth and it should be dynamically adjusted to the objective investment possibilities in the field of intermodality.

### INTRODUCTION

In today's modern era the freight transport is of immense importance. The transport volumes are ever growing and the issue to accommodate them in an optimal and sustainable way is of utmost importance. Due to this criticality it is often impossible to arrange just one modality for freight transport, making two or even three modalities necessary (intermodal freight transport)[1]. This article highlights the key factor which influence the establishment and development of intermodality, in Baltic Adriatic Corridor. The Baltic Adriatic corridor is 2400 km long corridor connecting the Baltic ports in Poland with the ports of the Adriatic Sea. It starts at the ports of Gdansk and Gdynia, connecting via strong economic centers like Warsaw, Vienna and Venice to Trieste and Ravenna. The corridor has some branches from Szczecin to Katowice, from Graz via Udine to Trieste as well as via Ljubljana to Trieste/Koper. The corridor provides better access to Baltic and Adriatic seaports for the economic centers in Poland, the Czech Republic, Slovakia and Austria [2].

The article begins with the thorough analysis of the various factors (general and specific) making an impact on the flow of goods in the corridor, therefore urging the need for intermodality. The later part highlights SWOT/TOWS analysis and related recommendations to establish and develop intermodality in Baltic Adriatic corridor.

### 1. FACTORS CATALYZING INTERMODALITY IN BALTIC ADRIATIC CORRIDOR

This section provides an insight into the factors, which catalyze the establishment and development of the intermodal platform. The factors are divided into general and specific to highlight the importance.

The general environment for the network of multimodal platforms is related to the transport infrastructure in the considered area. For purpose of this article, the multimodal network is created by road, rail, air transport and inland waterways network. The overview of general environment of the network of multimodal nodes situated on the Baltic-Adriatic Corridor starts with identification, analysis and impact of various logistics corridors and logistics axes on volume of goods in Adriatic-Baltic corridor.

The specific environment analysis moves the issues of business and infrastructure surrounding of the network of intermodal nodes. It is found that all the nodes in BAC are in the phase of more or less rapid development. Key success factor is reasonable planning process. In the case of railway transportation, in most of the discussed node investments are needed to be adopted in order to fulfil future demand and eventual shifts of freight volumes from road to rail.

#### 1.1. Factors – General Environment

As stated previously, the main factor under general environment is directly associated with the impact of corridors on the freight flow. The figure 1 below shows the updated list of the core network corridors.



Fig. 1 Core Network Corridors [3]

The impact of selected core network corridors on the goods flows in the Baltic Adriatic corridor is highlighting in the upcoming section.

**Midlands core corridor**

This particular corridor extends from Warsaw – Poznań – Frankfurt/Oder – Berlin – Hannover – Osnabruck – Enschede – Utrecht – Amsterdam/Rotterdam – Felixstowe – Birmingham/Manchester – Liverpool. The impact of corridor on Baltic Adriatic corridor is shown in table 1.

**Tab. 1. Impact of corridor on BAC [Own Research]**

No	Origin of goods	Destination	Volume
1	UK, France, Benelux	CEEC via Berlin and Pan-European corridor 2	8,9 million tones
2	Russia	EU via Minsk, Warsaw, Berlin	11,2 million tones
3	Belarus	EU via Warsaw	3,4 million tones

**Mediterranean core corridor**

Mediterranean core corridor has few branches and it stretches from Algeciras – Madrid – Tarragona; Sevilla – Valencia – Tarragona; Tarragona – Barcelona – Perpignan – Lyon – Torino – Milano – Venezia – Ljubljana – Budapest – UA border. The impact of Mediterranean corridor on Baltic Adriatic corridor is shown in table 2.

**Tab. 2. Impact of corridor on BAC [Own Research]**

No	Origin of goods	Destination	Volume
1	Austria, Slovenia, Hungry	Germany	0,42 million tones
2	Germany	Austria, Slovenia, Hungry	0,38 million tones
3	Italy, Slovenia, Austria, Hungry	Ukraine	0,62 million tones
4	Ukraine	Italy, Slovenia, Austria, Hungry	0,21 million tones

**Hamburg – Rostock – Burgas/TR border – Piraeus – Lefkosia core corridor**

This corridor extends from Hamburg / Rostock – Berlin – Praha – Brno – Bratislava – Budapest – Arad – Timisoara – Sofia. At Sofia, it is branched into two more links, Sofia – Burgas/TR border; Sofia – Thessaloniki – Piraeus – Limassol – Lefkosia. The impact of corridor on Baltic Adriatic corridor is shown in table 3.

**Tab. 3. Impact of corridor on BAC [Own Research]**

No	Origin of goods	Destination	Volume
1.	Austria, Slovenia, Hungry	Balkans	0,25 million tones
2.	Balkans	Austria, Slovenia, Hungry	0,18 million tones

**1.1.4 Strasbourg – Danube core corridor**

Strasbourg – Danube core corridor has couple of branches. It stretches from Strasbourg – Stuttgart – München – Wels/Linz; Strasbourg – Mannheim – Frankfurt – Würzburg – Nürnberg – Regensburg – Passau – Wels/Linz; Wels/Linz – Wien – Budapest – Arad – Brasov – București – Constanta – Sulina. The impact of Strasbourg – Danube core corridor on Baltic Adriatic corridor is shown in table 4.

**Tab. 4. Impact of corridor on BAC [Own Research]**

No	Origin of goods	Destination	Volume
1	Austria, Slovenia, Slovakia, Hungry, Czech Republic	Germany	1,1 million tones
2	Germany	Austria, Slovenia, Slovakia, Hungry, Czech Republic	0,6 million tones

**1.2. Factors – Specific Environment**

As a result of the increasing growth of the procurement, markets in the Far East and Middle East changes in the worldwide flow of goods were ascertained. The higher demand for goods from Asia led to a significant rise in the number and volume of trade flows to Europe. This structural change naturally affects the need for reshaping of the European economic area and its infrastructure. Whereas

the northern ports are confronted with capacity bottlenecks through the return to their original transshipment volume, the southern ports are presented with an opportunity to strengthen their market position. For the Adriatic ports individual improvement measures – such as, increased attractiveness of hinterland connections to sales and procurement markets – represent a prerequisite that is decisive in terms of competitiveness. By routing Asian sea freight traffic through the southern ports, not only travel times can be reduced (by up to six days) but a substantial reduction in pollutant emissions can also be achieved. As capacity peaks have not yet been reached at the Adriatic ports, a high degree of flexibility in the provision of services can be ensured.

**2. SWOT/TOWS DIMENSIONS AND SWOT/TOWS ANALYSIS –INTERMODALITY IN BAC**

SWOT/TOWS dimensions are part of the SWOT/TOWS analysis tool used for evaluating an organization and is used for analyzing internal and external factors in order to attain a methodical approach and support for decision making. If it is used correctly, it can provide a good basis for successful strategy formulation [4, pp. 158-169]. It is an assessment technique structured to evaluate internal processes to identify strengths and weakness for improvement [5, pp. 3-47].

This particular section provides the insight into the results which were attained while performing analysis. The section includes, SWOT/TOWS dimensions, SWOT Analysis, TOWS Analysis, Strategy Matrix and profile of various strategies which can be undertaken.

**2.1. SWOT/TOWS dimensions**

SWOT/TOWS dimensions identifies Strengths and Weakness and examines the Opportunities and Threats for the identity under consideration. The dimensions suggests that the entity that use their internal strengths in exploiting environmental opportunities and neutralizing environmental threats, while avoiding internal weakness, are more likely to gain competitive advantages[6].

**Tab. 5. Opportunities [Own Research]**

	Weight
Regional cooperation programs	25%
Adaptation of best practices to develop multi modal nodes	20%
Ambitious plans to improve transportation conditions	25%
Incentives for environmental awareness	15%
New Technologies for intermodal transfer	15%
<b>Total:</b>	<b>100%</b>

Table 6 highlights the various strengths related to BAC.

**Tab. 6. Strengths [Own Research]**

	Weight
Strong industrial potential of the region	30%
Free movement of persons and goods in Schengen Zone	25%
Strong export based economies	15%
Good transportation conditions in old EU, new members catching up fast	20%
High usage of modern technologies in logistics management	10%
<b>Total:</b>	<b>100%</b>

Table 7 highlights the various Threats related to BAC.

**Tab. 7. Threats [Own Research]**

	Weight
Diversification of the economic growth	20%
Decrease in global trade share	25%
Capacity constraints	20%
Inefficiency leading to increasing lack of interesting intermodal solutions	15%
Incompatible ICT and terminal standards	20%
<b>Total:</b>	<b>100%</b>

Table 8 highlights the various Weaknesses related to BAC.

Tab. 8. Weaknesses [Own Research]

	Weight
Large diversity of countries	25%
Lower quality of network in NE part of BAC	25%
High emission impacts	10%
Administrative barriers	30%
Safety and security in transportation in some countries	10%
<b>Total:</b>	<b>100%</b>

2.2. SWOT weighted analysis

This sub-section highlights the results of the SWOT weighted analysis. SWOT analysis pursues an integrated approach including key and environmental variables [7]. The results obtained after conducting the interactive operations are highlighted in table 9.

Tab. 9. SWOT weighted analysis [Own Research]

Strengths / Opportunities	
Can strengths help to exploit opportunities?	
Interactions number	34
Weighted number of interactions	6.8
Weaknesses / Opportunities	
Can weaknesses reduce ability to exploit the opportunities	
Interactions number	36
Weighted number of interactions	7.65
Strengths / Threats	
Can strengths combat the threats?	
Interactions number	28
Weighted number of interactions	5.65
Weaknesses / Threats	
Can weaknesses reinforce the influence of threats?	
Interactions number	30
Weighted number of interactions	6

2.3. TOWS weighted analysis

This sub-section highlights the results of the TOWS weighted analysis. TOWS matrix helps to systematically identify relationships between threats, opportunities, weaknesses and strengths, and offers a structure for generating strategies on the basis of these relationships [8, pp. 45-66]. The results obtained after conducting the interactive operations are highlighted in table 10.

Tab. 10. TOWS weighted analysis [Own Research]

Strengths / Threats	
Can threats weaken strengths?	
Interactions number	34
Weighted number of interactions	7.05
Strengths / Opportunities	
Can opportunities reinforce strengths?	
Interactions number	46
Weighted number of interactions	9.45
Weaknesses / Threats	
Can threats multiple weaknesses?	
Interactions number	26
Weighted number of interactions	5.15
Weaknesses / Opportunities	
Can opportunities combat weaknesses?	
Interactions number	40
Weighted number of interactions	8.35

2.4. Set of outcomes – Strategy matrix

The strategy matrix which highlights the combined outcome of SWOT and TOWS weighted analysis. It plays an important part in determining the profile of various strategies which can be taken into account to have an efficient outcome. The strategy outcome is shown in table 11.

Tab. 11. Strategy Matrix [Own Research]

	OPPORTUNITIES (O)	THREATS (T)		
STRENGTHS (S)	TOWS		TOWS	
	Interactions number	46.0	Interactions number	34.0
	Weighted number of interactions	9.45	Weighted number of interactions	7.05
	TOWS/SWOT		TOWS/SWOT	
	Interactions number	80.0	Interactions number	62.0
	Weighted interactions	16.25	Weighted interactions	12.7
	SWOT		SWOT	
	Interactions number	34.0	Interactions number	28.0
	Weighted number of interactions	6.80	Weighted number of interactions	5.65
	WEAKNESSES (W)	TOWS		TOWS
Interactions number		40.0	Interactions number	26.0
Weighted number of interactions		8.35	Weighted number of interactions	5.15
TOWS/SWOT		TOWS/SWOT		
Interactions number		76.0	Interactions number	56.0
Weighted interactions		16.0	Weighted interactions	11.15
SWOT		SWOT		
Interactions number		36.0	Interactions number	30.0
Weighted number of interactions		7.65	Weighted number of interactions	6.00

2.5. Profile of available strategies (TOWS/SWOT)

TOWS as the next step of SWOT in developing alternative strategies. TOWS matrix provides means to develop strategies based on logical combinations of factors relate to internal strengths (or weaknesses) with factors related to external opportunities (or threats). TOWS matrix identifies four conceptually distinct strategic groups: Strength- Opportunity (SO), Strength-Threats (ST), Weaknesses-Opportunities (WO), and Weaknesses- Threats (WT), for creating the alternative strategies [9]. As mentioned earlier, the output of strategic matrix is the profile of available strategies. Hence, it is completely based on the number of interaction and weighted interactions obtained during the analysis. The profile of available strategies is shown in table 12.

Tab. 12. Profile of available strategies [Own Research]

.Organization / Environment	OPPORTUNITIES (O)	THREATS (T)
STRENGTHS (S)	<p>Base Strategy (SO):</p> <p>As clear from the analysis SO has got highest number of interactions and Weighted interactions, so main focal strategy revolves around SO. Base strategy highlights the following:</p> <ol style="list-style-type: none"> <li>1.Strong industrial potential will increase the overall goods flow in the region and while maximizing the regional cooperation and improve the intermodal transportation</li> <li>2. New EU members development as strength can directly make an impact in markets by adaptation of the best practices to develop multi modal Empiric Nodes.</li> </ol>	<p>Defense Strategy (ST):</p> <p>Threats can be mitigated by focusing on following strengths:</p> <ol style="list-style-type: none"> <li>1. Strong industrial potential will mitigate threats viz. decrease in global trade and inefficiency</li> <li>2. Free movement of goods overcomes threats viz. Diversification, Capacity constraints and incompatible ICT and terminal standards</li> <li>3. Good transportation condition will eradicate the inefficiency</li> </ol>
WEAKNESSES (W)	<p>Expansion Strategy (WO):</p> <p>Expansion Strategy goes in close view with the Base strategy and has got number of interactions closer to base strategy too. The Opportunities which will encounter weakness are as follows:</p> <ol style="list-style-type: none"> <li>1. Regional cooperation programs will overcome</li> </ol>	<p>Survival Strategy (WT):</p> <p>The major weakness viz. large diversity and lower transport quality will be exploited by the threat viz. inefficiency and incompatibility.</p>



<p>weakness caused due to diversity in regions, lower quality network, administrative barriers, safety and security</p> <p>2. Adaptation and Ambitious plans to improve and develop transportation will have a direct effect on the weakness created by the lower quality network in north eastern part of the BAC</p>
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## CONCLUSIONS

This section is structured according to the analytical themes of logistical structures, pattern of trading relations, scheduling of product and transport flow, and management of transport resources. It highlights the conclusions totally based on the article and will be followed by the recommendation for stakeholders. The conclusions are enlisted below:

- The European transport scene is characterized by a very dense network of road, rail and inland waterway links in the centre of the Union, gradually being less dense as the periphery is approached and population densities become less. Area of important development in terms of infrastructure is the Pentagon that is the area characterized by high GDP, population density and multimodal accessibility.
- The bigger part on B.A.C. good flows is referred to Italy and Austria. In Austria and Hungary, we have a general decrease in good flows. Import quantities are bigger than export
- Considering Eurostat, data it is possible to note that road transport is really the most important modality, gaining the level of about 87% in EU27 and 84% in B.A.C. Comparing these values with the one detected in the partnership studies is possible to note that the role of road transport is reduced.
- Comparing this data with the TENCONNECT scenario it is possible to suppose that the increase of flows divided by modality will not depend only on general flows increase, but also on the development of multimodality in European countries.
- One of the important factors, which can be taken into consideration to elaborate the future transport modality, is Catchment Area development by new modes of transportation involving new additional transport infrastructure evolved in the network.
- All core corridors have a massive impact on BAC network.
- In accordance with the SWOT Analysis of the network, the logistics centres should follow the Base Strategy (SO) and Expansion Strategy (WO). There are certain special needs in the network and their development is of utmost importance.
- Acceleration of the technology shift has been seen in the transport modes.

The recommendations for stakeholders is provided below. There are three key stakeholders considered in this particular case. They are as follows:

- Shippers including Manufacturers, wholesalers and retailers
- Freight carriers including transporters, warehouses and companies
- Administrators including administrators at national, state and city level

Each of the above-specified stakeholders has its own specific objectives, tends to behave in a different manner, and needs to be considered. The origination of the journey is from shippers and to the consumers. Freight carriers and administrators are the media of the delivery tasks. The characteristic of their relationships is that a slight move in one part may affect the whole situation. One of the important recommendations for the stakeholders is to focus on mobility and sustainability. Mobility is ease of movement, which is

the basic requirement for transport of commodities. Goods are supposed to be delivered Just-In-Time. Therefore, the balance between sufficient network capacity and reduced traffic congestion is a main issue. Concerning sustainability, which is more and more important, environmental issues and energy conservation would need to be taken into account. Some of the directed recommendations are as follows:

Shippers and freight carriers:

- Develop regional hubs multi-modal transport nodes and sufficient port and intermodal terminal capacity together with sufficient hinterland network.
- Promote safety standards and measures on roads and railway.
- Accelerate technology shift towards cleaner vehicles including electric vehicles in connection with the replacement of imported carbon fuels by renewable fuels.
- Good relationships with local authorities as well as the representatives of local businesses.
- Investments in ICT systems.
- Harmonization of loading units and packaging sizes.
- Administrators:
- Develop and promote the BAC intermodal network, especially when it goes beyond the TEN-T to obtain funding from the EU Commission, showing the special needs of the region and to also develop further funding in order to secure the fast development of the network

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# KLUCZOWE MIARY ODDZIAŁYWANIA DLA USTANOWIENIA I ROZWOJU INTERMODALNOŚCI W KORYTARZU TRANSPORTOWYM BAŁTYK-ADRIATYK

## *Streszczenie*

*Strefy leżące na obszarze pomiędzy Bałtykiem i Adriatykiem charakteryzują się znaczącymi podobieństwami pod względem geograficznym, ekonomicznym i transportowym. Umacnianie wzrostu ekonomicznego oraz dynamiki przepływu dóbr zapewnia intermodalności najwyższe znaczenie. Rozwój sieci transport multimodalnego i jego połączenie z korytarzami transportowymi TEN-T reprezentuje warunek wstępny dla umacniania narodowych gospodarek. Korytarz Bałtyk-Adriatyk łączy południe i północ Europy, ze zwiększającą się intensyfikacją wzrostu gospodarczego w krajach środkowej Europy oraz krajach bałtyckich. System transportu intermodalnego w korytarzu daje możliwość generowania i nasilania utrzymywanego wzrostu ekonomicznego. Bez wątplenia, istnieje prawdziwa potrzeba wzrostu ekonomicznego oraz tworzenia system transportowego, wewnątrz którego transport intermodalny miałby szczególne znaczenie, jako program strategiczny. Planowanie strategiczne celowane w rozwój transportu musi służyć ogólnemu wzrostowi gospodarczemu i powinno być dynamicznie dostosowane do możliwości inwestowania w obszarze intermodalności.*

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