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TRANS TRITIA

TAKING COOPERATION FORWARD

Concept of the development of multimodal freight transport in the Trans Tritia area

Strategy and action plans for the Polish-Czech-Slovak cross-border area

Editoři:
Katarzyna Dohn, Lilla Knop, Marzena Kramarz,
Edyta Przybylska, Zbigniew Żebrucki

Gliwice 2020


GAPR
Upper Silesian
Agency
for Entrepreneurship
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SDRUŽENÍ PRO ROZVOJ ®
MORAVSKOSLEZSKÉHO KRAJE


Výskumný ústav dopravný


Dopravní
projektování
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ŽILINSKÁ UNIVERZITA
UNIVERSITAS SOLNENSIS
VYSOKÁ ŠKOLA DOPRAVY A SPOJOV ŽILINA

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1 Introduction

The project TRANS TRITIA – Improving coordination and planning of freight transport on Trans Tritia project territory was implemented in the territory of 3 countries and 4 regions in Central Europe: Śląskie Voivodeship, Opolskie Voivodeship (Poland), Moravian-Silesian Region (Czech Republic) and Žilina Self-Governing Region (Slovak Republic). The project territory is spread over 34 thousand km^2 and includes over 7 million inhabitants. Key roads and rail transport corridors, including the Baltic-Adriatic Transport Corridor, pass through the project area.

Fig. 1.1. Project area on Interreg Central Europe territory

Due to its location, high population density as well as a high level of economic development, an efficient and effective transport system is of significant importance all over the project territory and the adjacent areas, especially taking into consideration its cross-border nature and its challenges. So far the experience of the regions shows the necessity of improvement in the field of cross-border flow of information and integration in freight transport planning process.

The project area is closely connected with the territory of European Grouping of Territorial Cooperation TRITIA (EGTC), which has been established to facilitate and spread the cross-border transnational and interregional cooperation of its members with the objective to strengthen economic and social cohesion, particularly through implementation of territorial cooperation projects. Specific objectives of the EGTC Tritia and

its establishment are closely related to the objectives of Interreg Central Europe Programme in the field of cooperation beyond borders in Central Europe, to make the cities and regions better places to live and work, including the freight transport system with its multimodal and environmentally-friendly solutions.

Such territorial challenges are the basis the idea of the Trans Tritia project came from. The project is implemented in an international partnership composed of:

1. Górnośląska Agencja Przedsiębiorczości i Rozwoju Sp. z o.o. (Upper Silesian Agency for Entrepreneurship and Development Ltd.) Gliwice, Poland – as a Lead Partner,
2. Sdružení pro rozvoj Moravskoslezského kraje z.s. (Union for Development of the Moravian-Silesian Region) Ostrava, Czech Republic,
3. Výskumný ústav dopravný, a.s. (Transport Research Institute Jsc.) Žilina, Slovakia
4. Dopravní projektování,. s r. o. (Transport Designing Ltd.) Ostrava, Czech Republic,
5. Žilinská univerzita v Žiline (University of Žilina) Žilina, Slovakia,

The main project idea is focused on the transfer of information among the key actors of freight transport system in the project territory, including regional and national public authorities, stakeholders and transport service providers. The crucial aspect is not only the interregional exchange of knowledge and information but especially its cross-border nature, including integration of crossborder investment operations and plans.

At the same time, the project is aimed at the optimisation of economic efficiency and increase of use of environmentally friendly means of transport. The project's field of interest is focused on the intermodal character of the freight transport system. That leads to a shift from overcrowded roads to alternative transport modes, including inland waterways or railways, with the development of intermodal terminals and logistic centres.

To do so, the project consortium, in close cooperation with key freight transport Stakeholders, worked hand in hand on analyses of status quo in the project regions, identifying the needs, barriers and bottlenecks and searching for the potential of the regions as well as for the best solutions and recommendations in the field of freight transport in the project territory.

Such cooperation on the project implementation resulted in preparation of a set of strategic documents, including:

- Regional Multimodal Freight Transport Strategy,
- 3 Multimodal Freight Transport Cross-border Action Plans for each project border-lines (PL/CZ, PL/SK, CZ/SK),
- 3 Action Plans in the field of inland waterways, railways, intermodal logistic centres/terminals,
- Tritia Transport Model.

The documents present the recommendations for the project regions, which are ready for implementation within the time horizon to the year 2030. All the solutions created in response for the identified challenges and needs, show the essential projects and investments which are necessary for the best cross-border transport system development and for the most effective shift of transport from roads to railways and inland waterways. Except for the investment recommended within the time frame of 2030, the documents additionally present important investments for further implementation.

The unique and innovative character of the project approach is the Tritia transport model and the way of data collection, which was based on the project's own traffic survey. Its elaboration is based on 2 kinds of traffic surveys:

- questionnaire traffic survey on border crossings,
- profile traffic survey.

Such a research-based approach ensured the most appropriate and updated data gathered and results subsequently achieved. In effect, the most relevant transport model for the whole project regions was elaborated with prognosis up to 2030.

Owing to the project implementation and recommended solutions, the project territory would be better communicated, cross-border transport system would be unified and integrated and the European recommendation of the White Paper on Transport in the field of alternative freight transport modes could be met.

Acknowledgements

This final publication comes as a result of over three years of intensive work and fruitful collaboration among the 5 project Partners and key Stakeholders of the freight transport system within the Partners' countries, including EGTC Tritia as well as national and regional authorities.

We would like to thank all the Partners and Stakeholders involved in project implementation for excellent cooperation and their commitment, as well as the Joint Secretariat in Vienna and the national institutions for all the support we received.

We hope that the project deliverables, the lessons learnt as well as the excellent collaboration will become permanent and the presented recommendations will lead to sustainable development in the field of freight transport system.

The publication contains the main results of the project implementation. Full versions of all the documents elaborated within the project are available on the project webpage.

We hope you will find the publication interesting and inspiring.

Aleksandra Krawucka
Trans Tritia Project Manager
Upper Silesian Agency for Entrepreneurship
and Development Ltd. in Gliwice

2 Executive Summary

As the freight transport development was considered to be one of the main elements of regional development, first the Project had to collect the necessary data, carry out an analysis and propose an adequate solution to eliminate the barriers to the development of multimodal transport in the TRANS TRITIA cross-border area.

1. Data collecting was based on the agreed methodology during the initial phase of the Project by the whole team of the partners' experts.
2. After collecting data based on the strategy building methodology, a number of analyzes were conducted, including PEST analysis, resource analysis, stakeholder analysis, SWOT analysis and a strategic scorecard. The SWOT analysis was an important link between the results of the PEST analysis and the resource analysis. The results obtained jointly for all countries of the TRANS TRITIA region indicate that the key threats to the development of multimodal transport in this region are **legislative difficulties and unequal transport policies between countries, while the quality of transport infrastructure is definitely a weakness.** In the conducted analysis, some of the opportunities, strengths, weaknesses and threats are the same in all the three countries, but there are also factors that are specific only to one country or two.

Fig. 2.1. Based on such a comprehensive analysis the following vision and strategic goals were developed:

Vision
CREATING THE ECOSYSTEM FOR MULTIMODAL FREIGHT TRANSPORT IN THE TRITIA AREA

Mission
SUSTAINABLE DEVELOPMENT OF MULTIMODAL FREIGHT TRANSPORT IN THE BORDER AREA, BASED ON A SUPPORT SYSTEM FOR TRITIA TERRITORY, TO IMPROVE THE FUNCTIONALITY, EFFECTIVENESS, COMPLEMENTARITY, COOPERATION AND REGULATION OF MULTIMODAL FREIGHT TRANSPORT

Strategic goals for the development of multimodal freight transport
Growth of multimodal freight transport in the TRITIA area Supporting initiatives aimed at increasing the competitiveness of multimodal transport in the TRITIA cross--border area.
Promoting multimodal transport as an environmentally friendly solution with a positive impact on the standard of living of the citizens and the competitiveness of the economies of the TRITIA area.
Taking initiatives and actions to develop markets in the area of multimodal transport and create fair competition conditions in these markets. Undertaking and supporting initiatives to increase the number of specialists in the multimodal transport market.

All the above conclusion are presented in detail in Chapter 3; the strategic goals are also presented as follows:

Key projects for the development of multimodal transport in TRANS TRITIA area
→ **Observatory of multimodal transport in the TRITIA cross-border area (acronym: Observatory)**
→ **Coordinator of the multimodal transport network (acronym: Coordinator)**
→ **Competence center for sustainable freight flows in the TRITIA cross-border area (acronym: Competence center).**

All the details of the strategic projects can be found at the end of Chapter 3

3. Based on the above mentioned strategy (see Chapter 3) and the transport model (see Chapter 5), specific action plans were developed. The proposed action plans cover both the transport modes and the cross-border transport issues.
4. In Chapter 4, the three separate action plans ("branches") are discussed and presented as follows:

   4.1. **Inland waterway Action Plan** the main objective of this AP is to establish coordination procedures to address congested road freight transport in order to improve access of TRANS TRITIA to waterway areas and thus to shift a part of the transport of goods from road and rail to waterways. As a result, the following priorities were established:

   - → modernization and completion of the Oder water corridor up to Ostrava
   - → construction of the Silesian Canal,
   - → modernization of the Gliwice Canal,

- construction of a waterway in the Ostrava-Mošnov section,
- construction on of the Váh waterway to Žilina.

4.2. **Railways Action Plan** The basic objective of the action plan was to assess whether the existing railway infrastructure of the TRANS TRITIA area, including the planned construction projects, will have sufficient capacity for the transfer of transport set out in the "EU White Paper" by 2030. The Project recommendations were the following:

- to meet all the planned deadlines according to the completion dates for infrastructure projects;
- to accelerate the work on sections of the railway system in the TRANS TRITIA region, at least in the following sections:
  - Přerov – Ostrava (CZ),
  - Vrútky – Diviaky (SK),
  - Opole – Katowice – Krakow (PL),
  - Katowice (PL) – Ostrava (CZ).

4.3. **Intermodal Logistics / centers / terminals Action Plan** – as the Intermodal logistics centers and terminals are fundamental components of the intermodal transport system, it is recommended in the projects to arrange the regional TRANS TRITIA cooperation system based on the following intermodal hubs:

- Gliwice (Silesian Logistics Centre), Śląskie Voivodeship (PL),
- Kędzierzyn-Koźle (KKT), Opolskie Voivodeship (PL),
- Ostrava (Mariánské Hory), Moravian-Silesian Region (CZ),
- Sławków (EUROTERMINAL), Śląskie Voivodeship (PL) ,
- Žilina (SK), Žilina Self-Governing Region.

5. Due to the needs of all the analytical activities, a transport model had to be developed within the Project . The purpose of the transport model was to identify the potential transfer of long-distance road traffic over 300 km to alternative modes of transport in the 2030 timeframe. The results of the zero scenario, as well as those of the alternative scenarios, are that out of the entire potential transfer volume identified in road transport, it is possible to transfer about 40%-50% to rail and 2%-4% to inland waterways. The reported values indicate the possibility that by the year 2030, more than 30% of road transport over 300 km can be moved. It would mean that the objectives stated in the White Paper Roadmap to a Single European Transport Area Creating a competitive transport system resources, could be met. If the objectives of the White Paper could be met, at the same time it is possible to support the EU low carbon economy (Roadmap for moving to a competitive low carbon economy in 2050). When analyzing and assessing the transport infrastructure within the TRANS TRITIA territory, the planned projects were taken into account.

The calculated results of the TRANS TRITIA transport model have confirmed the validity of all the infrastructure investments planned for implementation (in due time horizon). In addition to the planned measures, other projects (mainly concerning railway infrastructure) have been identified which, based on the assumptions set out in the transport model, should be included among the other necessary projects to ensure sufficient capacity of related railway infrastructure. The projects were prioritized according to the severity of the respective capacity problem and were assessed in terms of pessimistic and optimistic economic development, which also confirmed that these points on railway infrastructure are bottlenecks in the case of pessimistic development.

6. Chapter 6 – TRANS Tritia cross-border Action Plans – all the actions indicated in the Action Plans were concerning the development of infrastructure. The cross-border action Plans analyzed the cross-border approach to the implemented projects, identifying the similarities and differences in the approaches of the particular countries and defining those areas that must be given high priority due to the key role for the development of multimodal transport in the TRANS TRITIA area.

Fig. 2.2. The infrastructure projects on the Polish – Czech border as a crucial part of this Action Plan were presented as follows:

	Short-term	Mid-term	Long-term
Inland waterways projects	No24 – Moderniz. of Odra dams (step I)	No24 – Moderniz. of Odra dams (step II) No26 – Construction of a weir flap (Mouth Nysa)	No23 – Gliwice Canal No25 – Moderniz. of locks and draft No27 – Odra-Danube (Kędzierzyn-Koźle – Ostrava section) No28 – Silesian Canal
Road transport projects	No36 – Expressway S1 (Pyrzowice – Bielsko) (section 1) No40 – Northern bypass of Kędzierzyn-Koźle	No 37 – Expressway S1 (Pyrzowice – Bielsko) (section 2 and 3)	No42 – Constr. Of the Euroterminal Sławków connector with S1
	No 29 – D48 Frýdek-Místek, bypass No 32 – I/58 Pribor – Skotnice No 33 – D48 Rybi – Rychaltice No 35 – I/57 Krnov – north-west bypass No 36 – Highway A1 (section E) No 39 – S11 Kępno – A1 node Piekary Śl. (section 3)	No 30 – D56 Frýdek-Místek, connection to D48 No 31 – I/67 Karvina, bypass No 34 – I/11 Opava, western part of the northern bypass (step I) No39 – S11 Kępno – A1 node Piekary Śl. (section 4)	No 33 – I/11 Opava, western part of the northern bypass (step II) No 38 – Beskidzka Integration Road S52 No 39 – S11 Kępno – A1 node Piekary Śl. (section 1 and 2)
Railway transport projects	No 3 – Recons. of station Petrovice u Karviné No 4 – Line Dětmarovice – Petrovice No 7 – Constr. of siding in Mošnov No 11 – Line 287 (Nysa – Opole) No 13 – Lines 140 and 158 (Rybnik – Chałupki) No 14 – Lines 140, 148, 157, 159, 173 (Chybie – Żory – Rybnik) No 16 – Line 93 (Trzebinia – Czechowice-Dziedzice) No 41 – Information technologies	No 5 – Line Bohumín – Chalupki No 6 – Connection lines 305B i 306A No 12 – Line E65/E30 No 15 – Line Ce 65 (Chorzów Batory – Maksymilianowo) No 22 – Line Ostrava – Kunčice – Ostrava-Svinov/ Polanka nad Odrou	No 1 – Line Ostrava – Prerov – Katowice No 2 – Recons. of junction Ostrava No 8 – Recons. of stations on RFC5 No 19 – Line E59 (Kędzierzyn-Koźle – Chałupki) No 20 – Line 190 Zebrzydowice – Cieszyn No 21 – Line 131
	No18 – Line E30 (Kędzierzyn-Koźle – Opole Zachodnie)	No 9 – Line Ostrava – Frýdek-Místek No 17 – Line 143 (Kalety – Kluczbork)	No 10 – Linka Frýdek-Místek – Frenštát pod Radhoštěm

High priority Medium priority

Fig. 2.3. Below are the infrastructure projects as a crucial part of this Action Plan on the Polish – Slovak border

	Short-term	Mid-term	Long-term
Inland waterways projects			
Road transport projects	No 15 – Project D1 Hubová – Ivachnová No 16 – Project D1 Hričovské Podhradie – Lietavská Lúčka No 18 – Project D1 Feeder Lietavská Lúčka	No 11 – Bypass of Węgierska Górka No 12 – Project R3 Tvrdošín – Nižná nad Oravu No 17 – Project D1 Lietavská Lúčka – Dubná Skala	No 13 – Project R3 Nižná nad Oravou – Dlhá nad Oravou No 14 – Project R3 Dlhá nad Oravou – Sedliacka Dubová No 19 – Project D1 Turany – Hubová No 20 – Project D3 Žilina, Brodno – Kysucké Nové Mesto No 21 – Project D3 Kysucké Nové Mesto – Oščadnica No 22– Project D3 Oščadnica – Čadca Bukov
Railway transport projects	No 25 – Information technologies	No 2 – Project Poprad – Východná No 4 – Project Liptovský Hrádok – Liptovský Mikuláš No 5 – Project Liptovský Mikuláš – Ružomberok No 7 – Project Turany – Vrútky No 9 – Project Node Žilina No 10 – Project Krásno nad Kysucou – Čadca	No 1 – Line 139 Czechowice-Dziedzice – Zwardoń No 3 – Project Východná – Liptovský Hrádok No 6 – Project Ružomberok – Turany No 8 – Project Vrútky – Varín No 23 – Čadca – Skalité No 24 – Vrútky – Diviaky

High priority Medium priority

Fig. 2.4. Below are the infrastructure projects as a crucial part of this Action Plan on the Czech – Slovak border

	Short-term	Mid-term	Long-term
Inland waterways projects			
Road transport projects	No 9 – D48 Frýdek-Místek, bypass No 10 – I/68 Třanovice-Nebory		No 6 – Project D3 Žilina, Brodno – Kysucke Nove Mesto No 7 – Project D3 Kysucke Nove Mesto – Oscadnica No 8 – Project D3 Oscadnica – Cadca Bukov
Railway transport projects	No 3 – ETCS – Mosty u Jablunkova – Dětmarovice No 11 – Information technologies	No 1 – Project Node Žilina No 2 – Project Krásno nad Kysucou – Cadca No 5 – Line Cesky Tesin - Albrechtice u Ceskeho Tesina	No 4 – Reconstr. Of stations on RFC5

High priority Medium priority

6.4. All of the presented solutions (presented in the specific action plans, both cross-border and branch-specific ones) are based on organizational solutions, the pillars of which are the results of the three proposed strategic projects:

1. Observatory of multimodal transport in the TRITIA cross-border area (acronym: Observatory).
2. Coordinator of the multimodal transport network (acronym: Coordinator).
3. Competence centre for sustainable freight flows in the TRITIA cross-border area (acronym: Competence centre).

The Observatory and the Coordinator are the key undertakings for the implementation of the entire strategy. Both the Observatory and the Coordinator are included in the monitoring processes in individual action plans, but they are also organizations necessary for the synchronization of flows, unification of the multimodal transport system in the cross-border area and the initiation of future projects aimed at the development of multimodal transport. Support should be provided by the Competence Center, which is focused on research and development of alternative sources of propulsion and designing a network of innovative centers to deliver alternative propulsion sources.


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3 Strategy of multimodal freight transport development in the TRANS TRITIA area

3.1. Strategic assumptions for the development of multimodal transport in TRANS TRITIA area

The model for designing a multimodal freight transport development strategy in the TRANS TRITIA area, developed by a team of experts, included three basic components: strategic analysis; strategy design; and implementation (Figure 3.1).

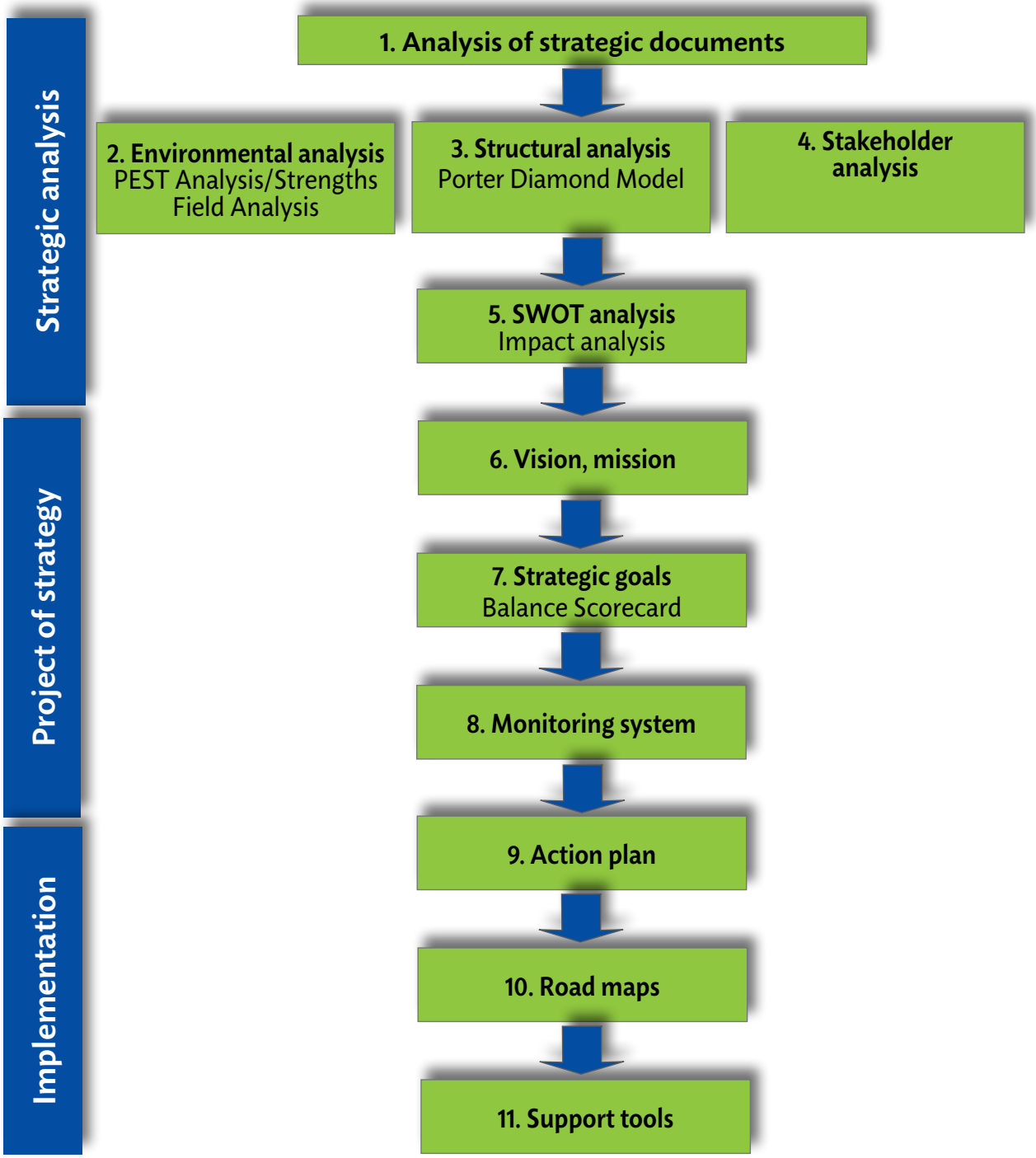
In the areas of strategic analysis and strategy design, the following analysis tools were used:

- Analysis of strategic documents: the aim of this stage is to identify the key documents addressing the development of freight transport in the area of the TRITIA agreement.
- PEST Analysis: PEST is **P**olitical, **E**conomic, **S**ocial and **T**echnological factors. This analysis is used to assess these four external factors in relation to the project. Basically, a PEST analysis will be helpful to determine how these factors will affect the performance and activities of freight transport development in the long term (in the TRANS TRITIA area).
- Strength Field Analysis: Strength Field Analysis is a tool that will be used to synthetically identify and analyze the forces (factors) that support or hinder the development of freight transport in the TRANS TRITIA area.
- Structural analysis/The Porter Diamond Model: The assessment of TRANS TRITIA's potential in the area of supply and demand side evaluation is assumed. In addition, companies operating in this area, their activities and supporting entities will be assessed.
- Stakeholder analysis: the Stakeholder Analysis based on identification of main stakeholders. The next step is to work out their respective power, influence and interest. The third step is to develop the expectations and goals of stakeholders. Stakeholder analysis in the context of the implemented project (for each country).
- SWOT Analysis/Impact Analysis: S.W.O.T. is an acronym that stands for Strengths, Weaknesses, Opportunities, and Threats. Strengths and weaknesses are internal to the

freight transport development in TRANS TRITIA. Opportunities and threats are external to this problem. The analysis is based on previously identified factors and analyses.

- Vision, mission, key values: the vision of the development of freight transport for the TRANS TRITIA area will be based on the creation of a freight transport ecosystem. A vision statement focuses on tomorrow and what EGTC TRITIA wants to ultimately become. A mission statement focuses on today and what EGTC TRITIA does to achieve it.

Fig. 3.1. Methodology of preparation of a multimodal freight transport strategy in the TRANS TRITIA area



- Strategic goals: the strategy map is a useful technique for structuring the strategy. It allows to determine if there are links between the targets set for each of the defined strategic map perspectives. Thanks to this, it clearly shows how the implementation of one goal (cause) affects the achievement of another goal (effect). The information collected at this point on the strategic objectives, such as measure, effects, data and monitoring frequency will help to develop a system for monitoring implementation of the strategy based on the Balanced Scorecard.

In the area of implementation, a monitoring system for the implementation of the strategy and action plans were developed (for rail transport, inland navigation and intermodal terminals, as well as cross-border: for PL/CZ, PL/SK and CZ/SK borders). Roadmaps were used to determine the timetable for the implementation of cross-border projects.

3.2. Strategic challenges for the development of multimodal transport in the TRANS TRITIA area

The main requirements for the development of transport in the EU transpire from the provisions of the transport policy included in the White Paper (2011) on Transport and in the strategic documents of individual countries (Poland, Czech Republic, Slovakia). The White Paper emphasizes that transport is the foundation of the European economy and society, and the mobility of goods and people is extremely important. Therefore, it should be possible to increase transport and support mobility, while striving to reduce emissions by up to 60%. To this end, it is necessary to create a new transport pattern that allows transport to take place by the most efficient means or a combination of such means. Further development of transport in the EU is based on three basic assumptions:

- increasing the energy efficiency of vehicles,
- optimization of multimodal logistics chains,
- greater involvement of traffic and information management systems.

In addition, one of the objectives set by the EU on the road map for transport by 2050 is to transfer 30% of road haulage over 300 km to rail or sea by 2030, and increase this ratio to 50% by 2050. It is assumed that on such sections, rail or water transport is an attractive, cost-efficient and environmental alternative to road transport.

As a result, policy makers intend to reduce road transport in order to reduce carbon emissions and encourage more sustainable transport solutions. Local authorities have an important role to play in ongoing transformations by using proactive planning policies and establishing cooperation with the various parties involved (freight transport initiators, freight forwarders, rail operators, landowners and the general public).

Detailed strategic goals included in the White Paper are presented in Table 3.1.

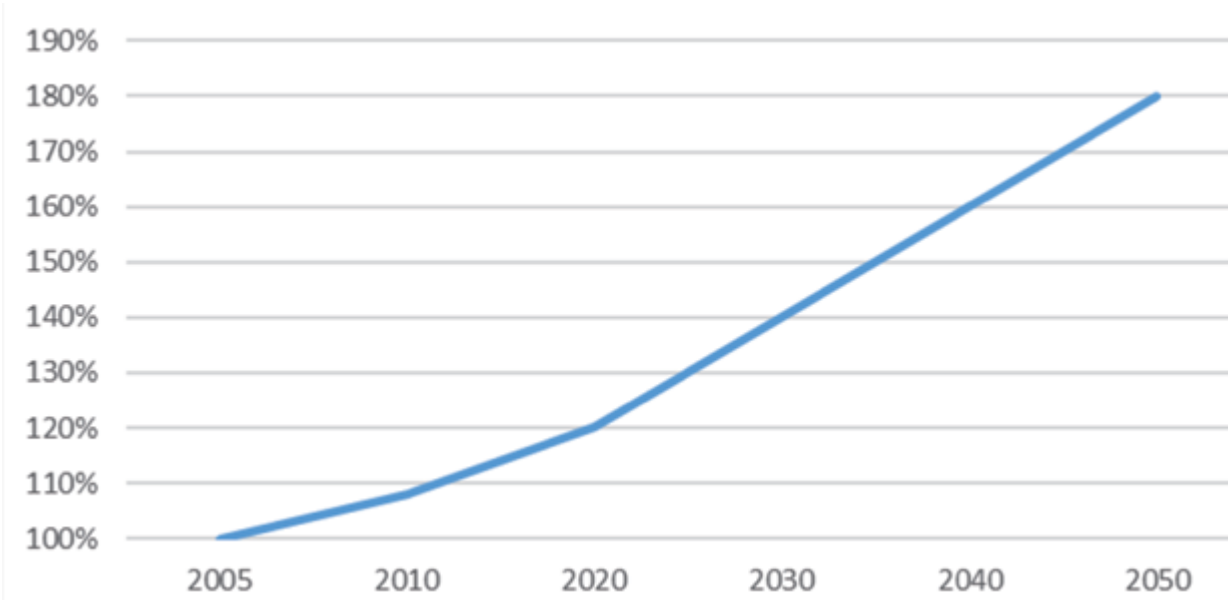
Tab. 3.1. Specific objectives of the White Paper on Transport

Lp.	Specific objectives of the White Paper from 2011
1.	Reduce by half the number of conventional cars in urban transport by 2030. (by 2050, their complete elimination from cities).
2.	The use of low-emission fuels in air transport (reaching a level of 40%, with the possibility of increasing to 50% by 2050).
3.	Branch transfers in general transport over a distance of over 300 km (by 2030, 30% share from road to rail or water transport, while by 2050 it should be 50%).
4.	Completion of the fast European rail network program until 2050, as well as maintaining the appropriate density of the rail network per 100 km^2 in each member country.
5.	Established by 2030, a multimodal and fully functional TEN-T core network, by 2050 ensuring its highest level of functionality as well as the implication of relevant IT services.
6.	Connection of all airports and ports with the core network until 2050; At the same time, each airport is expected to be connected by a fast rail network and seaports by efficient rail corridors and, as far as possible, to the inland waterway network.
7.	Introduction of advanced transport management systems by 2020 in all branches of transport (SESAR, ITS, SSN, LRIT, RIS, ERTMS), as well as the Galileo system.
8.	A framework established by 2020 for the European management system, payments and information for multimodal transport.
9.	Achievement by 2050 of almost zero deaths in road transport accidents.
10.	Implementation of the 'user and polluter pays' principles and broader cooperation with the private sector to eliminate distortions that arise and to finance future transport investments.

The most fundamental goal of the transport policy is to reduce road transport towards less polluting and more energy-efficient modes of transport. This is a big challenge for the countries of the TRANS TRITIA area, in which the share of road transport in cargo transport is dominant, and this results in generating significant external costs of transport.

The need to change the branch structure of the transported loads is particularly important due to the forecasts that provide for an approximate 60% increase in freight transport in the EU between 2020 and 2050. The cargo growth trend will also apply to TRANS TRITIA countries.

Fig. 3.2. Dynamics of the increase in demand for freight transport in EU countries (2005 = 100)



Source: K. Wojewódzka-Król, E. Załoga (pod red.), Transport Nowe wyzwania, PWN, Warszawa 2016, s. 412

National and regional challenges for TRANS TRITIA

The challenges for freight transport development will focus on several areas:

National (Poland, Czech Republic, Slovakia) and regional (TRITIA) policies

Transport accessibility in the individual countries located in the TRANS TRITIA area should be considered not only in the European and global dimensions, but also in the regional dimension. It should be emphasized that stimulation of economic and social development can be ensured by commonly available high-quality transport services, while modern and efficient infrastructure will be one of the main conditions for the provision of these services. One of the basic challenges for the development of transport in the TRANS TRITIA cross-border area is the improvement of the integrated cross-border transport system, which requires prioritization in the implementation of investment and modernization works. In the first place, investment efforts should focus on: catching up with infrastructure backlogs in increasing transport accessibility in the TRANS TRITIA cross-border area (roads, railways, inland waterways, inland ports, intermodal terminals) and on organizing the basic infrastructure of an integrated transport system, including the implementation of cross-border multimodal transport.

The implementation of development plans in the field of transport infrastructure must be based on several fundamental principles:

- development and implementation of future National Multimodal Transport Development Programs,
- development and implementation of the Multimodal Transport Development Program for the TRANS TRITIA area,
- scheduling new infrastructure investments in the light of the existing financial conditions at the level of each TRANS TRITIA cross-border country and region;
- striving for maximum efficiency and usefulness of investments carried out with the support of European Union funds, which can be used for activities provided for in the Transport Development Strategies at the level of individual countries and regions of the TRANS TRITIA area, developing an optimal financial model taking into account funds from private investors (e.g. Investments in construction of trimodal reloading terminals),
- further elimination of barriers to and delaying the implementation of investment projects, including harmonization of the cross-border rail services.

Line and point infrastructure

The maturity of the cross-border transport infrastructure system in the TRANS TRITIA area, which enables the implementation of sustainable freight flows, is expressed in a multimodal network of connections using rail transport and inland waterways as a basis, as well as road transport. In addition, maturity will be determined by the existence of a network of charging / refueling points for low-emission vehicles and by the openness of stakeholders to innovative solutions in the broadly understood transport infrastructure.

Therefore, access to multimodal transport infrastructure, as well as its technical parameters, constitute the basic challenge in the cross-border area in question. This requires all the three countries to create a coherent network of line infrastructure with appropriate quality parameters. A particular challenge in this respect is the improvement of the quality of railways, which will allow for an increase in the operational and commercial speed of freight transport. A very big challenge for the entire TRANS TRITIA area is the adaptation of waterways to classes that allow a much higher level of use of inland waterways in international cargo flows. This requires not only the modernization of waterways, but also the construction of new roads that will connect the regions of the Czech Republic, Poland and Slovakia. It is also necessary to improve the parameters of motor roads in order to ensure their greater capacity, safety and adaptation to the increased load, especially in the context of their role of delivery and delivery to /

from reloading terminals. A separate challenge is to create a network of multimodal transhipment terminals in the cross-border area. In this regard, it is also pointed out that the trimodality of some terminals is aimed at, but to a large extent this type of challenge goes beyond the year 2030. Apart from access to terminals, their parameters are also important issues, here we are talking about serviced intermodal units (ITU), length of transhipment tracks, equipment appropriate reloading infrastructure or increasing their innovativeness through the implementation of modern reloading systems. The last challenge concerns the information flows accompanying the transport of goods. Due to the role they play, it is necessary to provide infrastructure in the form of an efficient and coherent information system that will support the coordination of flows in the cross-border area, in an inter-sectoral system.

Social and economic effects

The most important social and economic challenge in the cross-border freight transport network is the reduction of external transport costs, the amount of which varies between the particular modes of transport, and their internalisation through full implementation of the "polluter pays" principle. External costs of transport are costs directly related to the negative effects of transport activities, both on human lives and the natural environment, they include costs related to: traffic noise; air pollution; climate change; transport accidents; a threat to the environment; transport congestion; land occupancy.

The internalisation of costs will make it possible to obtain funds for eliminating the effects of transport, i.e. treatment of road accident victims, limiting the effects of air pollution, excessive noise, etc. It will also make it possible to achieve such a relation between the prices of the transport service between different means of transport that would reflect the proportions of the total costs of services.

In the social area, another significant challenge is to improve the image of multimodal transport by conducting a broad information campaign and promoting its development, with particular emphasis on social benefits (in relation to the indicated external costs).

The development of the transport market also requires an appropriate number of employees. The shortage of operational staff (drivers, train drivers, etc.) with skills at a level expected by the industry causes a risk of not having fully staffed the rolling stock owned by carriers. The imbalance of supply and demand for labor in freight transport, as well as an increase in the financial expectations of employees in the industry, will also translate into higher costs.

From the economic point of view, the most important challenges for multimodal cross-border transport are the following:

- financial support from public funds for investments in the development of rail transport and inland waterways infrastructure as well as multimodal terminals and logistic centers, as well as facilitating access to the use of EU funds in this area,

- creation of the Multimodal Transport Fund to support the development of this transport system;
- introducing incentives, financial allowances for investors and guaranteeing low-interest loans;
- introducing incentives or exempting road hauliers operating in the multimodal chain from fixed road tolls, from tax on means of transport; preserving and increasing the multimodal concession, reducing handling charges (for the use of infrastructure and transhipment terminals).

Key players' activities

The multimodal freight transport system involves many stakeholders who have a strong influence on the development of transport, and who are also affected by it. Given the perspective of a cross-border freight transport network, the group of stakeholders is even broader, and it should be seen as internal and external stakeholders group. Internal stakeholders should include all the participants involved in the flows of goods between countries, both regionally and in terms of individual countries. Among the external stakeholders, the decisive role is played by the EU, international and national institutions and bodies (in countries outside the TRANS TRITIA region), committees, associations and various forms of agreements. External stakeholders include the Transport, Telecommunications and Energy Council (European Union), the Visegrad Group, the International Commission for the Protection of the Oder River against Pollution (ICPO), etc. In the group of internal stakeholders, they should be indicated on the side of each country of the cross-border area.

The main problem that poses a major challenge in the cross-border freight transport network is the lack of coordination of flows. The specified actors in individual regions making up the TRANS TRITIA cross-border area cooperate to a moderate or low degree, and do not undertake joint initiatives. Definitely poor cooperation can be noticed between the stakeholders from different countries. Thus, building a structure and coordination mechanisms in the cross-border freight transport network in the TRANS TRITIA cross-border area is a fundamental challenge in the development of cross-border freight transport. This challenge is related to the problem of information flow and knowledge sharing between individual internal stakeholders. The reluctance of network actors to share their knowledge and experience makes it difficult to undertake such initiatives that would enable sustainable development of the freight transport system in cross-border areas. Therefore, the second challenge in the area of stakeholders in cross-border freight transport is to build a system for collecting, processing and sharing knowledge, which is necessary for the effective coordination of flows in the cross-border freight transport network.

At the same time, it should be emphasized that the development of cross-border freight transport depends on a number of EU institutions and bodies, as well as structures created outside the cross-border area itself. Thus, the coordination system created for the freight transport network in the TRANS TRITIA cross-border area should take into account the communication between the TRANS TRITIA freight transport network and external stakeholders, both at the level of monitoring, obtaining information on policies, strategies and operational activities, and on the other hand, in terms of informing about strategic and operational activities in the TRANS TRITIA area. This scope of cooperation between the stakeholders of internal freight transport networks in the TRANS TRITIA area with external interlayers is particularly important in the area of harmonizing legal aspects and focusing on sustainable development by increasing the share of intermodal and multi-modal transport in the overall structure of freight flows. The internal to external stakeholders communication system can be considered the third challenge posed at the level of stakeholders in the area of freight transport development in the TRANS TRITIA cross-border area.

3.3. Strengths and weaknesses, opportunities and threats of multimodal transport in TRANS TRITIA area

The SWOT analysis was based on previous analyses: PEST analysis (opportunities and threats) and structural analysis (strengths and weaknesses). The table below outlines the common areas and differences in individual countries.

Tab. 3.2. SWOT analysis for the TRANS TRITIA area in the field of multimodal transport development

SWOT	Common conditions / features	Differences
1	2	3
Opportunities	→ Economic growth (GDP growth) (CZ/PL/SK) → High fuel price (increasing road freight transport costs, opportunities for more ecologic modes of transport – water, rail) (CZ/PL/SK) → Strategic transport position (new investors and investments) (CZ/PL/SK) → Taxes and fees (for roads and HGVs) (CZ/PL/SK) → Stability of the EU politics (security, duty-free union) (CZ/PL/SK) → Intensification of cooperation of entities in the TRANS TRITIA cross-border area (CZ/PL/SK) → Transit of international corridors (fees) (CZ/PL/SK)	→ Manpower from abroad (SK) → Modernization of railway lines (SK) → Interest of new investors (due to more transport options) (SK) → Increasing cooperation of enterprises with the R&D sphere enabling the transfer of knowledge (CZ/PL)

Cont. tab. 3.2. SWOT analysis for the TRANS TRITIA area in the field of multimodal transport development

1	2	3
Opportunities	→ Taking into account ecological aspects in the policy of sustainable transport development (CZ/PL/SK) → The development of multimodal transport as a solution supporting the reduction of external transport costs (CZ/PL/SK) → An integrated transport policy of the European Union that includes multimodal transport (CZ/PL/SK) → Development of transport infrastructure in various modes of transport (CZ/PL/SK) → Strong development of containerization and other reloading technologies and their standardization (CZ/PL/SK) technological development and evolution of modern technologies including information and telematics technologies (CZ/PL/SK – beginning)	
Threats	→ Lack of employees (CZ/PL/SK); → High labor costs (CZ/PL/SK); → Financial risk with long-term projects (the risk of exceeding the project budget) (CZ/PL/SK) → Lack of political transparency (CZ/PL/SK) → Increase of motorisation rate (CZ/PL/SK) → Some institutions opposing the implemented solutions and investments in the area of transport (e.g. road blocks) (CZ/PL/SK) → Insufficient infrastructure (poor quality, low capacity, delays in the construction and modernization of infrastructure) (CZ/PL/SK) → Lack of money for transport in the national budget (CZ/PL/SK) → Legislative restrictions and high bureaucratic duties (CZ/PL/SK) → Rapid and unregulated growth of passenger transport (insufficient capacity) (CZ/PL/SK) → Low increase in commercial speed in the field of rail freight transport (CZ/PL/SK) → Legislative and political delays (CZ/PL/SK)	→ Poor planning, low drawdown of EU funds (CZ) → Political instability (new priorities) (SK) → Lack of supporting instruments for the implementation of an environment-friendly transport system (incentives, penalties) (PL/SK) → Low level of lobbying in multimodal transport (PL) → Omission of the Polish water transport routes in the European TEN-T transport network (CZ/PL) → Lack of coherent regional policy in the field of freight transport (PL) → Lack of proportionality in the implementation of ecological solutions in particular branches of transport (PL) → Diversity of the geographical environment problems with the construction and modernization of infrastructure (PL/SK)

Cont. tab. 3.2. SWOT analysis for the TRANS TRITIA area in the field of multimodal transport development

1	2	3
Strengths	→ Current and potential labour market (potential supply of employees) (CZ/PL/SK) → Physical resources – number and location of re-loading terminals, logistics and distribution centres, available storage, logistic operators, number of transportation companies (CZ/PL/SK) → Sufficient number of multimodal operators (CZ/PL/SK) → Number of trucks, trailers and semi-trailers (CZ/PL/SK) → Availability of inland waterway infrastructure (CZ/PL/SK) → Knowledge resources: high numbers of colleges and universities; high level of education (CZ/PL/SK) → Demand for transport and logistics services (CZ/PL/SK) → The level of market saturation (CZ/PL/SK) → Market dynamics and new investments (CZ/PL/SK) → High barriers of entry (CZ/PL/SK) → Low barriers of exit (CZ/PL/SK) → Middle level of cooperation (CZ/PL/SK) → High competition in freight transport and logistics (CZ/PL/SK)	→ Road infrastructure (PL) → Cluster cooperation network (SK/CZ/PL) → Low industry risk (CZ/SK) → Technological requirements – new, modern and fuel saving vehicles provide advantage over the competition (CZ/SK) → Strong support from business environment institutions (CZ/SK) → Development of information and telematics technologies (CZ)
Weaknesses	→ Number of employed persons (CZ/PL/SK) → Low salaries for specialists (CZ/PL/SK) → High fluctuation of employees (CZ/PL/SK) → Number of fleet of barges, towing barges (CZ/PL/SK) → Low quality of roads, waterways and railways (CZ/PL/SK) → Insufficient level of investment in the development of freight transport (CZ/PL/SK) → Support from finance institutions, government institutions (CZ/PL/SK)	→ Low level of innovation implementation (PL/SK)

3.4. Mission, vision, strategic goals of multimodal transport development in the TRANS TRITIA area

Vision
CREATING THE ECOSYSTEM FOR MULTIMODAL FREIGHT TRANSPORT IN THE TRITIA AREA

Mission
SUSTAINABLE DEVELOPMENT OF MULTIMODAL FREIGHT TRANSPORT IN THE BORDER AREA, BASED ON SUPPORT SYSTEM FOR TRITIA TERRITORY, TO IMPROVE THE FUNCTIONALITY, EFFECTIVENESS, COMPLIMENTARITY, COOPERATION AND REGULATION OF MULTIMODAL FREIGHT TRANSPORT

Strategic goals for development of multimodal freight transport

Strategic goals are the deliverables of analyses of the environment, the potential of regions and countries operating in the TRITIA area as well as broad consultations with stakeholders. The strategy responds to the challenges of regional development and goals defined in the strategies Europe 2020 or White Paper – Roadmap to a Single European Transport Area. We include the following main goals:

- Growth of multimodal freight transport in the TRANS TRITIA area.
- Supporting initiatives aimed at increasing the competitiveness of multimodal transport in the TRANS TRITIA cross-border area.
- Promoting multimodal transport as an environmentally friendly solution with a positive impact on the standard of living of citizens and the competitiveness of the economies of the TRANS TRITIA area.
- Taking initiatives and actions to develop the markets in the area of multimodal transport and create conditions of fair competition in these markets.
- Undertaking and supporting initiatives to increase the number of specialists in the multimodal transport market.

Balanced Scorecard (BSC) for development of multimodal freight transport

The standard Balanced Scorecard (BSC) consists of four basic perspectives: financial, customer, processes, and development. Each of them measures various aspects of its activity and each of them provides different information, which together form the image

of the strategy implementation process, which is why these perspectives cannot be treated separately[1, 2, 3, 4]. However, these perspectives should be treated as a pattern and not as a rigid framework. The model perspectives must be however viewed as a template, not as rigid frameworks. The specifics concerning the approach to creating the region strategy is based on the location-based approach and the resource-based theory of strategy and requires consideration of additional perspectives or a change of their order[5, 6, 7]. The classical Balanced Scorecard, due to its sectoral presentation, impact of multimodal transport development on the surroundings and impact of the surroundings on the freight transport development as well as the stakeholders of the multimodal transport development, was modified.

In the project, the perspectives were selected taking into account the specifics of this project, as well as its stakeholders; the order of these perspectives was also changed. The perspectives set on the map of freight transport development strategies in the TRANS TRITIA cross-border area are the following:

- development,
- infrastructure,
- process,
- security and sustainable development,
- financial,
- stakeholders.

A strategy map is a visual representation of the overall objectives and how they relate to one another. The map is created during the strategic planning process and is used as a primary reference material during periodic strategy check-in and review meetings.

[1] Brzóska J., Karbownik A., Kruczek M., Szmal A., Żebrucki Z.: *Strategiczna karta wyników w teorii i praktyce*. Wydawnictwo Politechniki Śląskiej, Gliwice, 2012.

[2] Kaplan R.S., Norton D.P.: *Strategiczna karta wyników, Praktyka*. CIM, Warszawa, 2001.

[3] Kaplan R.S., Norton D.P.: *Strategiczna karta wyników. Jak przełożyć strategię na działanie.* PWN, Warszawa, 2002.

[4] Niven P.R., *Balanced Scorecard Diagnostics, Maintaining Maxiumum Performace*. Wiley, John Wiley & Sons INC., New Jersey, 2005.

[5] Rajesh R., Pugazhendhi S., Ganesh K., Ducq Y., Leny Kohe S.C.(2012), *Generic balanced scorecard framework for third party logistics service provider*. International Journal of Production Economics, Volume 140, Issue 1.

[6] Devendra Kumar Pathak, Lakshman S. Thakur & Shams Rahman (2019), *Performance evaluation framework for sustainable freight transportation systems*, International Journal of Production Research, Volume 57, Issue 19.

[7] Ramfou I., Sambracos E., (2013), *Freight Transport Time Savings and Organizational Performance: A Systemic Approach*, International Journal of Economic Sciences and Applied Research, Volum VI/2013, Issue 1.

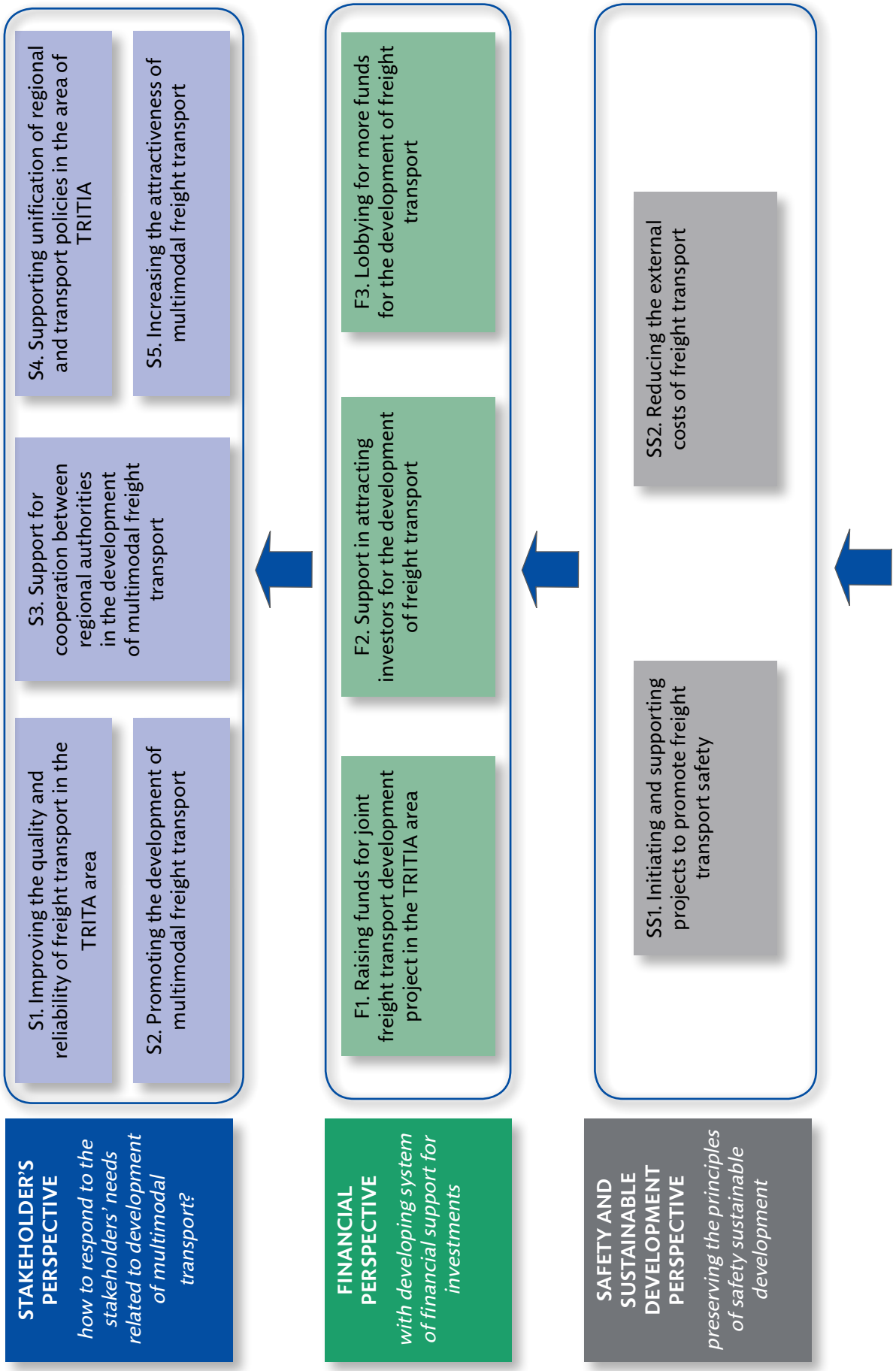
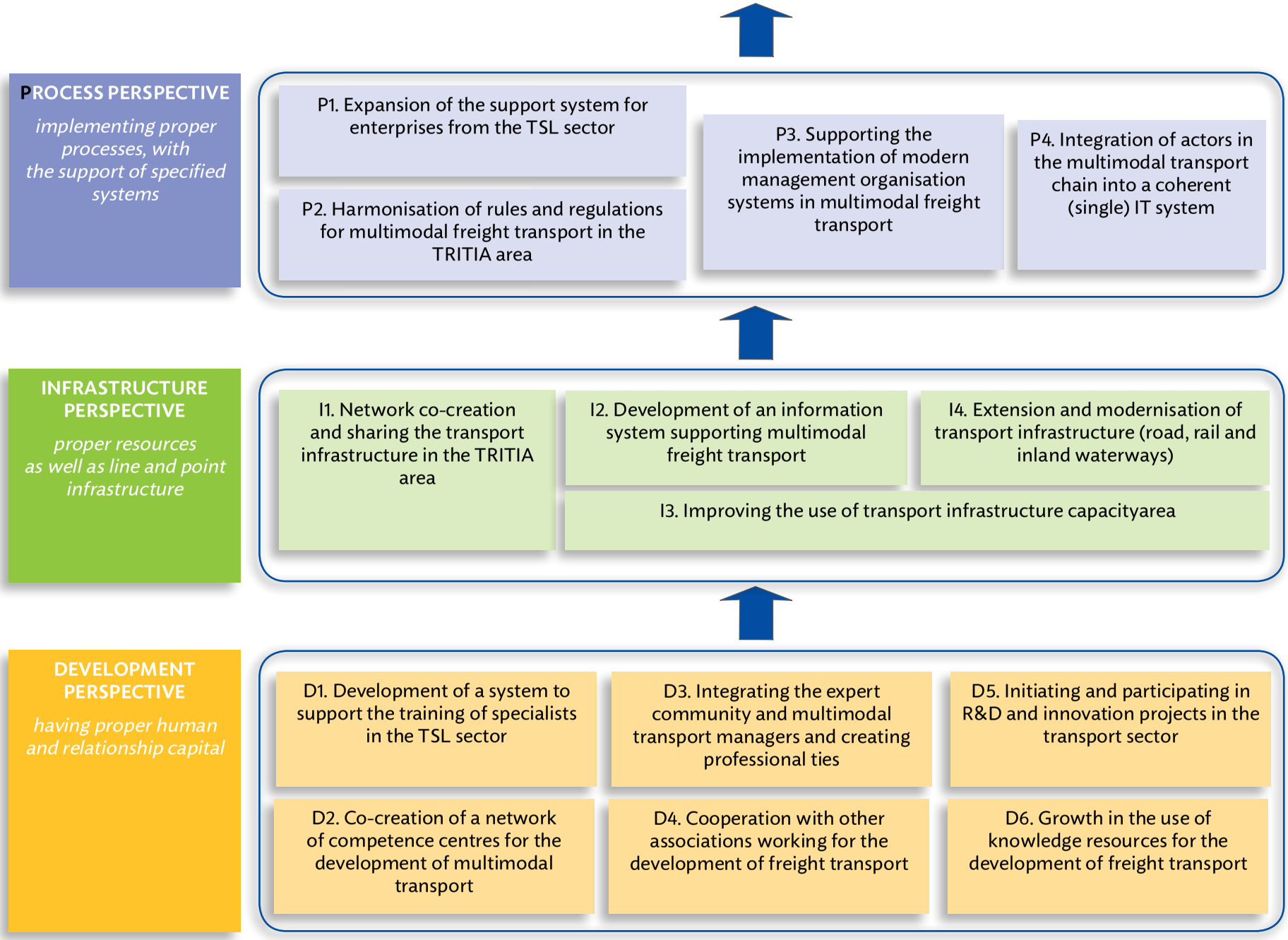


Fig. 3.3. Strategy map


PROCESS PERSPECTIVE
implementing proper processes, with the support of specified systems
P1. Expansion of the support system for enterprises from the TSL sector
P2. Harmonisation of rules and regulations for multimodal freight transport in the TRITIA area
P3. Supporting the implementation of modern management organisation systems in multimodal freight transport
P4. Integration of actors in the multimodal transport chain into a coherent (single) IT system
INFRASTRUCTURE PERSPECTIVE
proper resources as well as line and point infrastructure
I1. Network co-creation and sharing the transport infrastructure in the TRITIA area
I2. Development of an information system supporting multimodal freight transport
I4. Extension and modernisation of transport infrastructure (road, rail and inland waterways)
I3. Improving the use of transport infrastructure capacityarea
DEVELOPMENT PERSPECTIVE
having proper human and relationship capital
D1. Development of a system to support the training of specialists in the TSL sector
D3. Integrating the expert community and multimodal transport managers and creating professional ties
D5. Initiating and participating in R&D and innovation projects in the transport sector
D2. Co-creation of a network of competence centres for the development of multimodal transport
D4. Cooperation with other associations working for the development of freight transport
D6. Growth in the use of knowledge resources for the development of freight transport

3.5. Key projects for the development of multimodal transport in the TRANS TRITIA area

As a result of consultation with the socio-economic environment, three key strategic projects were identified and refined:

1. Observatory of multimodal transport in the TRITIA cross-border area (acronym: Observatory).
2. Coordinator of the multimodal transport network (acronym: Coordinator).
3. Competence centre for sustainable freight flows in the TRITIA cross-border area (acronym: Competence centre).

Other organizational projects were included in the proposed strategic projects. Infrastructure projects are presented in chapters 4 and 6. Table 3.3 presents the characteristics of the identified strategic projects.

Tab. 3.3. Characteristics of strategic projects

Project	Project 1: Observatory of multimodal transport in the TRITIA cross-border area (acronym: Observatory)	Project 2: Coordinator of the multimodal transport network (acronym: Coordinator)	Project 3: Competence centre for sustainable freight flows in the TRITIA cross-border area (acronym: Competence centre)
	1	2	3
Project aim:	The goal of the project is to launch a specialized observatory that will be responsible for observing technological and market trends in the development of intermodal transport in the cross-border area TRANS TRITIA. The observatory will respond to the specific needs of the actors of the intermodal transport ecosystem of the Śląskie Voivodship, Opolskie Voivodship, the Local Government of the Žilina Region and the Moravian-Silesian Region in the scope of supporting and tracking the development of intermodal transport, positioning its key technological areas and assessing the effectiveness of its development activities.	The aim of the project will be to develop a model of multimodal transport network coordination for the TRANS TRITIA area. The subject matter of the project will be strongly in line with the guidelines of modern transport policy, emphasizing the need to build an integrated and sustainable multi-branch transport system.	Designing innovative service centres in the TRANS TRITIA area enabling the implementation of sustainable freight flows using vehicles with alternative propulsion sources. The project is part of the requirements of the transport policy of the European Union countries and the guidelines related to the need to develop electromobility and alternative fuels. The scope of the project covers freight transport previously omitted in projects related to electromobility.
Included projects:	1. Oder Commission 2. The concept of determining the external costs of freight transport 3. Analysis of disruptions in freight transport that are the result of infrastructure sharing 4. System of data collection in freight transport 5. Monitoring of the development of the TEN-T network - including roads, railways, inland waterways in the TRANS TRITIA area 6. Monitoring of the development of roads, railways, inland waterways networks and point infrastructure 7. Monitoring of Intelligent Transport Systems further deployment	1. Modelling of logistics centres networks and multimodal terminals 2. Alternative scenario of multimodal freight transport development	1. Modelling of the network of innovative freight transport service centres in the TRITA area, including in their infrastructure power stations into alternative propulsion sources 2. Designing innovative solutions for alternative vehicle power sources 3. Forecasting freight flow streams taking into account the environmental impact of alternative propulsion sources used in TRANS TRITIA

Cont. tab. 3.3. Characteristics of strategic projects

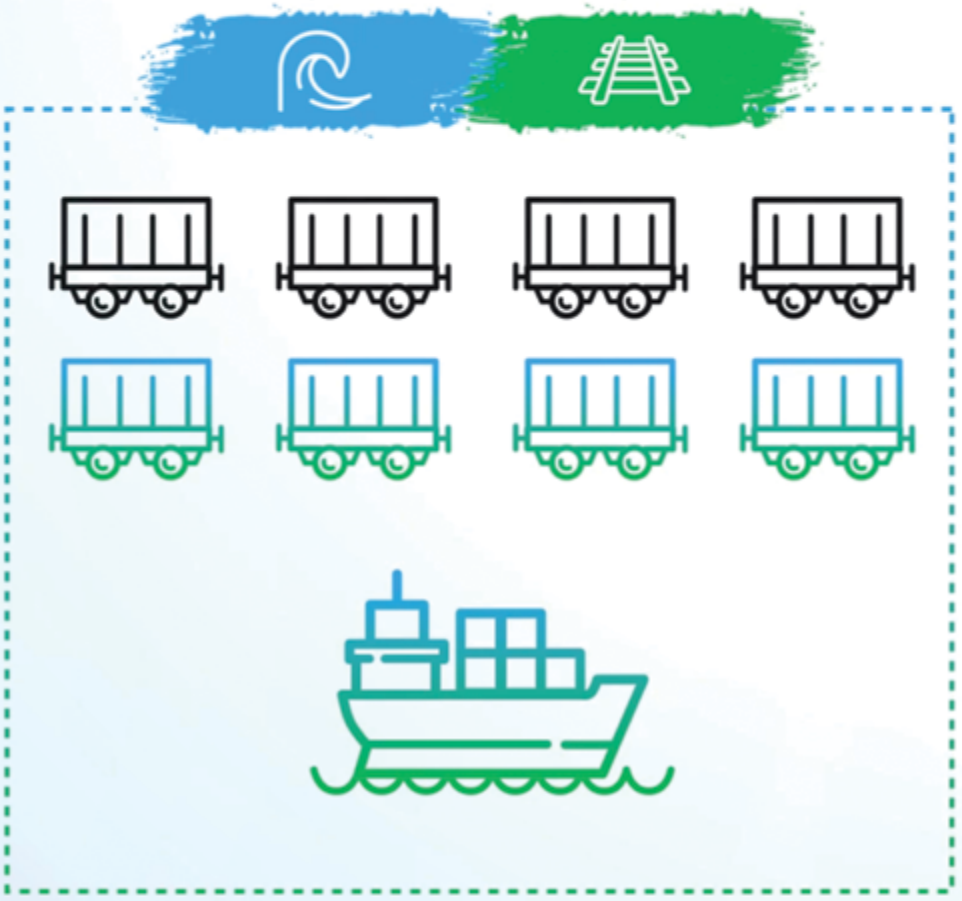
	1	2	3
The scope of the project:	The activities of the observatory will include the collection and processing of specialized knowledge about technological and infrastructural areas, monitoring the implementation of multimodal transport development strategies; technological trends and infrastructure development, and an assessment of the endogenous potential of the TRANS TRITIA region in the development of intermodal transport. The scope of the project will include the following tasks: → mapping of the multimodal transport system in the TRANS TRITIA area → mapping relations in the multimodal transport network of the TRANS TRITIA area → the assessment of transport and logistics potential → cooperation for the development of the transport and logistics in the TRANS TRITIA area → monitoring of the development of the TEN –T network and infrastructure (roads, railways, inland waterways networks and point) → lobbying to establish an intergovernmental organisation that guarantees freedom of navigation and equal treatment for all banners on the Oder → comparison of application of externalities in freight transport, incl. charges for the use of transport infrastructure; elaborating maps of pilot projects before and after the full application of externalities (within the TRANS TRITIA area);	→ selection of the method and mechanisms of coordination of the multimodal transport network in the TRANS TRITIA area. → design of innovative transport traffic management systems contributing to the reduction of environmental pressures generated by road transport → developing cooperation platform including an information system for multimodal transport networks. → based on data obtained from the Observatory, creating alternative scenarios for the development of multimodal transport in the TRANS TRITIA area. The coordination model will take into account the available logistics infrastructure and its changes, network actors, as well as current and forecast freight flows in the network under study. → initiating network cooperation at the level of supply chains, logistics organizations and other multimodal transport stakeholders → lobbying for support for the development of multimodal transport, → including harmonization of regulations	→ research on current and emerging technologies for alternative propulsion sources; → analysis of global trends in the context of the development of electromobility in combination with multimodal transport, → preparation of innovative projects, → acquiring and developing competences and searching for talents in the studied area → mapping the type and size of freight streams in the TRANS TRITIA area; → analysis of the structure of transported loads, taking into account various modes of transport; → analysis of organizational and legal possibilities and restrictions in the scope of designing innovative centres for realization of balanced goods flows; → analysis of the possibilities and restrictions of using vehicles with alternative propulsion sources in the TRITIA area. Both freight-based (last mile) and heavy goods vehicles will be included here → mapping the existing supply network of commercial vehicles and trucks to alternative power sources → configuration of the network of innovative freight transport service centres in the TRITA area, including in their infrastructure power stations into alternative propulsion sources → analysis of environmental benefits resulting from the increased share of electric vehicles or vehicles with alternative drives to achieve freight flows (comparison of external transport costs)

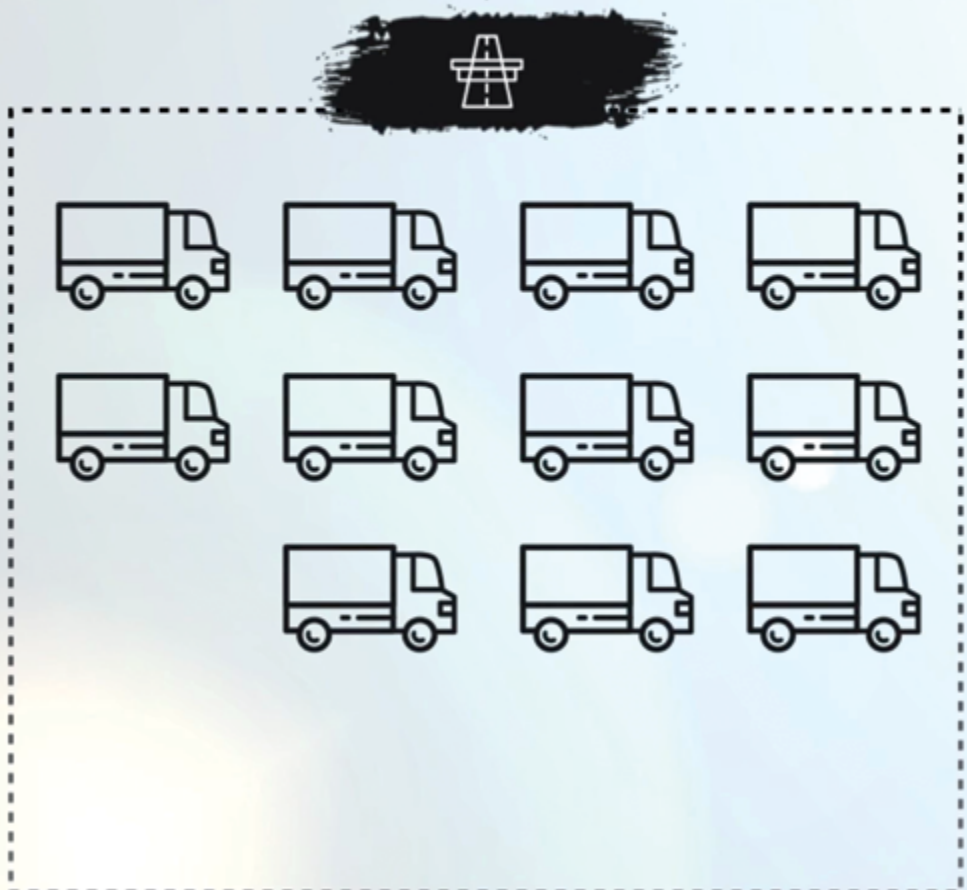
Cont. tab. 3.3. Characteristics of strategic projects

	1	2	3
Relation to strategic goals	S2, F2, SS1, SS2, P3, I2, I3, I4, D1, D4, D6	S1, S3, S4, S5, F1, F2, F3, SS1, SS2, P1, P2, P3, P4, I1, I3, I4, D2, D4, D5, D6	S1, S5, F1, F2, SS2, I1, I2, I4, D4, D5
Level of importance	High	High	High
Project Leader:	Upper Silesian Agency for Entrepreneurship and Development Ltd., Silesian University of Technology, EGTC TRITIA, R&D Institutes from Czech Republic, Poland, Slovakia	Upper Silesian Agency for Entrepreneurship and Development Ltd., Silesian University of Technology, EGTC TRITIA, R&D Institutes from Czech Republic, Poland, Slovakia	Silesian University of Technology, Upper Silesian Agency for Entrepreneurship and Development Ltd., EGTC TRITIA, R&D Institutes from Czech Republic, Poland, Slovakia
Source of funding:	Interreg EUROPE, Interreg Central Europe, Interreg CZ-PL incl. SK, etc.	Interreg EUROPE, Interreg Central Europe, Interreg CZ-PL incl. SK, etc.	Horizon EUROPE The next EU Research & Innovation Programme 2021-2027
Term (period) of implementation (plan)	2020-2025	2020-2030	2021-2027

2030

+30%





4 Multimodal freight transport across the TRANS TRITIA area till 2030

Increasing freight transport is a problem and at the same time a challenge for the society. More than 70% of land transport services are road freight transport; it is therefore one of the most important factors in transport for the sustainable development of society, especially in the field of environmental protection. One solution to this situation is to look for ways to shift part of the freight traffic from roads to rail and/or waterways. This solution is fully in line with the objectives of the European Union's transport strategy, the so-called EU Transport White Paper of 2011, which states that by 2030, 30% of transport will be transferred from road to more than 300 km to rail and waterways[8]. Due to the fact that there is no connection of more modes of transport to all the source and destination localities, it is necessary to make maximum use of multimodal and intermodal solutions.

The publication presents the options of moving a part of road freight transport to waterways and railways in the TRANS TRITIA area. This was also related to the task of dealing with locations used for transshipment of goods between individual modes, on two levels the modification of existing logistics centers and the location of new logistic centers with access not only to road and rail infrastructure, but especially to waterways.

A summary of proposals to ensure the fulfillment of the defined goal was prepared by the transnational team in the form of three separate action plans for inland waterways, for railways and for logistics centres/terminals.

4.1. Inland waterway on the TRANS TRITIA area

4.1.1. Waterway system

Within the territory of TRANS TRITIA, waterways are in fact only used in Poland the Oder Waterway with the Harbor of Kędzierzyn-Koźle and its branches the Gliwicki Canal and the Kędzierzyński Canal). The Oder waterway (length 690 km) can reach not only the nearest Baltic seaport Szczecin-Świnoujście, but also the system of waterways in Western Europe, ie ocean ports such as Hamburg or Rotterdam. However, this waterway does not currently meet the criteria for shipping class IV, i.e. international.

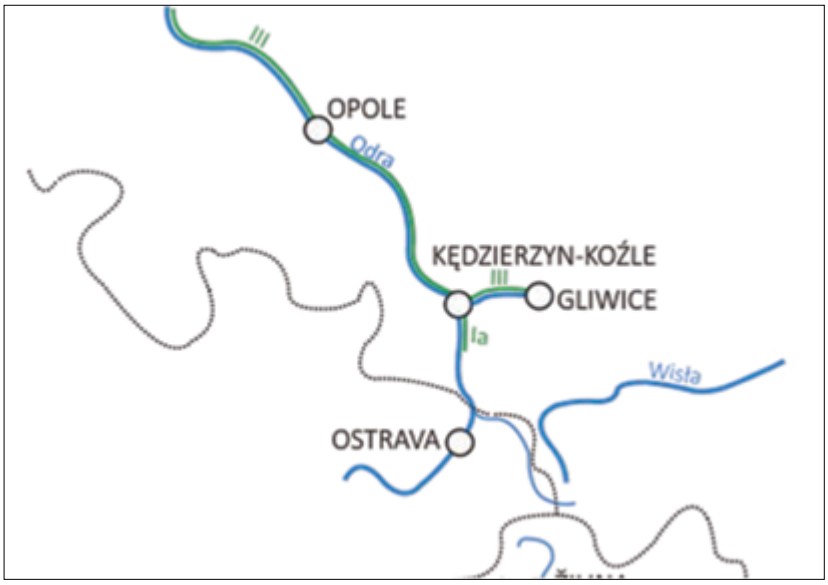
[8] *Sprawozdanie z funkcjonowanie rynku transportu kolejowego w 2018 r.*, Urząd Transportu Kolejowego, Warszawa, 2018, https://utk.gov.pl/download/1/50399/SPRAWOZDANIE2018ver2print.pdf, 2020.

Tab. 4.1. Characteristics of strategic projects

Oder waterway section	Navigation classes
Brzeg-Opole-Kędzierzyn-Koźle	III
Kędzierzyn-Koźle – Racibórz	Ia
Gliwicki Canal	III
Kędzierzyński Canal	II

Unfortunately, the rest of the territory of TRANS TRITIA does not have direct access to the waterway. The Slovak part of the TRANS TRITIA area can be viewed optimistically, where in the 1980s the construction of the Váh waterway began with the aim of navigating from the Danube to Žilina. However, almost the entire inland waterway requires appropriate measures to navigate it.

Fig. 4.1. Scheme of waterways in the territory of TRITIA



Two basic documents need to be emphasized in the context of building the Single European Economic Area and the related high-quality transport infrastructure. These are the **European Agreement on Main Inland Waterways of International Importance** (Geneva, 1996, further as the "AGN Agreement") and the **Regulation of the European Parliament and of the Council on Union guidelines for the development of the trans-European transport network** (No 1315/2013; further as the „Regulation").

The AGN Agreement (1996) creates a legal framework to facilitate the coordination of development of inland waterway transport of international importance and defines a network of waterways covering the Atlantic-Urals Region, thus connecting European countries, including the Czech Republic, Poland and Slovakia. This agreement defined the links of the Danube-Oder-Elbe waterways, the Danube-Oder branch of which passes through the territory of the TRANS TRITIA.

The Regulation sets out the main principles for the development of transport infrastructure, including measures to provide quality services. The regulation defines two periods for its implementation the global network should be completed by 2050 and its subset, the main network by 2030. The current version of the regulation includes the Váh waterway, but does not include the Oder waterway.

Fig. 4.2. Condition of waterways according to the AGN Agreement

Source: www.wikipedia.com

Fig. 4.3. Waterway network according to the Regulation

Source: www.eur-lex.europa.eu

4.1.2. Transfer of traffic from roads to waterways

The basic factors for the use of a given mode of transport (road, rail, water) include the following: transport cost; speed; environmental impact; security; operating conditions.

Comparison of tables 4.2.-4.4. says why, even within the territory of TRITIA, transport should be oriented towards a greater distribution of the movement of goods between individual modes of transport. The use of inland waterway transport has a high potential in the territory of TRANS TRITIA, as transport of oversized and heavy products has a huge potential in this cross-border area, as does transport over short distances. Inland waterway vessels have a carrying capacity equivalent to dozens of lorries and the associated savings, emission reductions and reductions in road traffic flows. Inland waterway transport is also very safe.

Tab. 4.2. Comparison of costs in road, rail and water transport

	Containers TEU 20t		bulks		tanks		heavy and oversized	
	€/1000tkm	% of the highest price	€/1000tkm	% of the highest price	€/1000tkm	% of the highest price	€/1000tkm	% of the highest price
road	82,2	100,00%	47,3	59,60%	89,4	94,30%	393,8	100,00%
rail	46	56,00%	79,4	100,00%	94,8	100,00%	no data	no data
water	33,6	40,90%	29,7	37,40%	34	35,90%	78,6	20,00%

Data collection according to Feasibility Study of the Danube-Oder-Elbe Water Corridor, Ministry of Transport, 2018

Tab. 4.3a. External costs – current status

Comparison of the external costs of different modes of freight transport €/1 000 tkm – currently status									
Current status	road			railway			inland waterway		
	Vito	EC	PLANCO	Vito	EC	PLANCO	Vito	EC	PLANCO
accident	22,8	5,4	37,8	1,6	1,5	2,3	0,1	0,0	0,3
noise	4,4	2,1	7,4	2,8	3,5	12,7	>0,1	0,0	0,0
air pollution	9,1	8,7	29,1	0,4-9,46	4,3	3,5	5,4	3,0	4,2
congestion	5,4	5,5	1,2		0,2	0,0			0,0
necessary areas	1,9	2,5	0,0	0,2	2,9	0,0	0,7	1,0	0,0
other			1,3			0,4			0,0
water and soil pollution			8,6			0,0			0,0
TOTAL	43,6	24,2	85,4	2,3	12,4	18,9	6,2	4,0	4,5
AVERAGE	51,07			11,21			4,89		
Climate Impact by *Inland Navigation Flanders*	0,79			0,3			0,5		
TOTAL	51,86			11,51			5,39		

Tab. 4.3b. External costs – future expected status

Comparison of the external costs of different modes of freight transport €/1 000 tkm – expected status									
Current status	road			railway			Inland waterway		
	Vito	EC	PLANCO	Vito	EC	PLANCO	Vito	EC	PLANCO
accident	22,8	5,4	37,8	1,6	1,5	2,3	0,1	0,0	0,3
noise	3,1	1,5	5,1	1,4	1,7	6,3	>0,1	0,0	0,0
air pollution	8,8	1,5	26,0	0,2-4,73	2,2	1,8	3,8	2,1	2,9
congestion	5,4	5,5	1,2		0,2	0,0			0,0
necessary areas	1,9	2,5	0,0	0,2	2,9	0,0	0,7	1,0	0,0
other			1,3			0,4			0,0
water and soil pollution			8,6			0,0			0,0
TOTAL	42,0	23,4	54,0	1,4	8,5	10,8	4,6	3,1	3,2
AVERAGE	39,80			6,89			3,63		
Climate Impact by *Inland Navigation Flanders*	0,65			0,2			0,4		
TOTAL	40,45			7,09			4,03		

Source: Socio-economic Impact of the Development of the lower Vistula on the basis of the documents: VITO-Flemish Institute for Technological Research, Belgium; EC-European Commission, Brussels; PLANCO-Planco Consulting; Inland Navigation (climate)

The transported commodities are mainly gravel, stone, chemicals, fertilizers, agricultural products, ore or coal. Commodities with a low price per kilogram, low handling requirements and regular deliveries require cheap transportation routes with the ability to deliver on a quality waterway. Modern shipping, thanks to trained crews and modern ship equipment, offers transportation in accordance with accurate timetables. Water transport is as reliable as rail transport and, unlike road transport, is less dependent on the current traffic situation and weather. In addition, continuous research and innovation are taking place in all transport sectors, so that vessels are already running on natural gas (LNG), electricity or hydrogen. And these trends will undoubtedly increase.

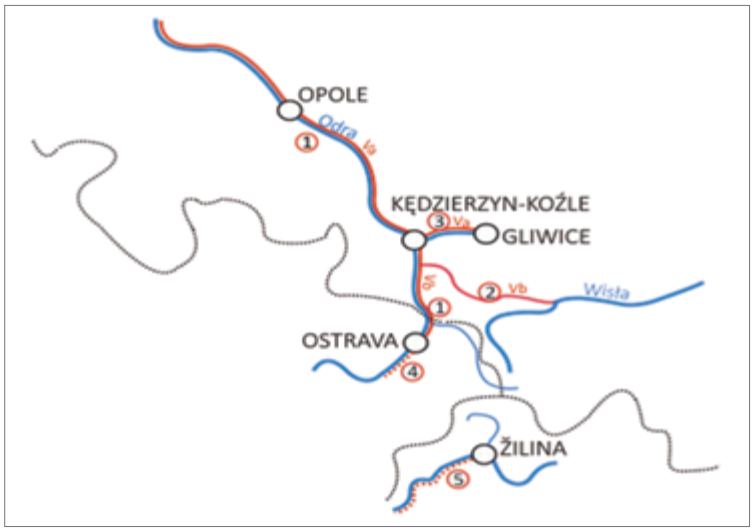
4.1.3 Action plan

The main objective of the Waterways Action Plan is to establish coordination procedures to address congested road freight transport in order to improve access for TRANS TRITIA to waterway areas and thus to shift part of the transport of goods from road and rail to the waterways. A necessary condition is to have an adequate capacity of waterways.

The action plan also aimed to exchange available information and joint debate on the facts and current conditions for possible implementation of the shift of freight transport to waterways with a view to 2030 in the cross-border context of the 3 states. The result is the agreement on the following priorities:

1) modernization and completion of the Oder water corridor up to Ostrava,
2) construction of the Silesian Canal,
3) modernization on the Gliwice Canal,
4) construction of a waterway in the Ostrava-Mošnov section[9],
5) construction of the Váh waterway to Žilina.

Fig. 4.4. Priorities of waterway projects on the TRITIA area



[9] The implementation of priorities 4 and 5 is sheduled after 2030.

Tab. 4.4. Modernization and completion of the Oder water corridor up to Ostrava (CZ)

Section	Activity	Period	Estimated costs (€ mld)
Opole – Kędzierzyn-Koźle	Modernization	2020-2025	0,39
Kędzierzyn-Koźle Waterway Node	Documentation and procedure	2020-2025	0,49
	Construction	2025-2030	
Waterway Node – Lock Buków (incl. reservoir Racibórz Dolny)	Documentation and procedure	2020-2025	0,14
	Construction	2025-2030	
Lock Buków – cross-border PL/CZ	Documentation and procedure	2020-2025	
	Construction	2025-2030	0,23
Cross-border CZ/PL (Starý Bohumín) – Port of Ostrava	Plan documentation and procedure	2020-2024	0,51
	Construction	2025-2030	

Tab. 4.5. Construction of the Silesian Canal

Section	Activity	Period	Estimated costs (€ mld)
Kędzierzyn-Koźle Waterway Node	Modernization / Projects	2020-2030	0,47
Resevoir of Kotlarnia	Documentation and procedure	2020-2025	0,02
	Construction	2025-2030	
Reservoir of Kotlarnia – Reservoir of Rybnik (lateral canal)	Documentation and procedure	2020-2025	0,42
	Construction	2025-2030	
Rybnik – Oświęcim (lateral canal)	Documentation and procedure	2020-2025	1,52
	Construction	2025-2030	

Tab. 4.6. Modernization of Gliwicki Canal

Section	Activity	Period	Estimated costs (€ mld)
Kędzierzyn-Koźle – Gliwice	Modernization to the parameters of class Va	2020-2030	0,60

Inland waterways, i.e. the Váh waterway and the Oder waterway with the Silesian Canal and the cross-border section Kędzierzyn-Koźle Ostrava are among the projects with significant potential for the future. In order to prepare them and for the purposes of the expected implementation, the project team recommends taking the necessary steps at the European and bilateral level (Table 4.7. and 4.8.).

The necessary materials for negotiations are of a different nature: from technical (e.g. feasibility studies) to government decisions (relevant government resolutions) as well as intergovernmental agreements and conventions. This involves the inclusion of inland waterways in European and national programs. The main objectives for the European Transport Policy (TEN-T) are in particular:

- reintegration of the Oder waterway, incl. Silesian Canal to the TEN-T network,
- maintenance of the Váh waterway in the TEN-T network up to Žilina, i.e. maintenance of the current state.

The Odra waterway, is currently not covered by the European network TEN-T. Since 2017, the Republic of Poland and the Czech Republic have expressly supported the coordination with efforts to include the D-O-L water corridor in to the TEN-T network. For the Polish part of TRITIA, there is also a significant inclusion of the Śląski Channel in to the TEN-T; it also has cross-border synergies with both the Czech Republic (Danube connection) and the Slovak Republic (better access to water transport from the Žilina Region to the north direction), i.e. benefits for the entire TRITIA area.

Tab. 4.7. Principles of the Action Plan for development of the waterways – European level

Level of negotiation	Negotiating documents	Target status
European Council	Feasibility Study of the Oder Waterway (PL) Feasibility Study of the Silesian Canal (PL) Feasibility Study of the Danube-Oder-Elbe (CZ)	Inclusion of the Oder Inland Waterway incl. Silesian Canal into the TEN-T
EU Commissioner for Transport		
DG MOVE		
DG ENVI		
Members of the European Parliament (especially CZ/PL/SK)	Agreement between the Czech Republic and the Republic of Poland on the border point and the common interest in the construction of of Oder Inland Waterway.	
	Appropriate government decisions in Poland.	

4.2. Railways in the TRANS TRITIA area

4.2.1 Increasing the capacity of railway connections

The subject of this part is the description of the railway infrastructure of the TRITIA region, including the specification of the planned investment measures until 2030. The discussion covers the specific investment measures enabling the increase of the existing capacity on the basis of:

- elimination of slow rides,
- increase in the number of tracks,

- increase in useful track lengths,
- conversion of power supply from 3 kV DC to 25 kV-50 Hz AC,
- European train protection and traffic information system.

4.2.2 Road to Rail shift of transport flows

This section describes the potential modes of transport that can be preferably shifted to rail. The legislative and technical conditions that need to be created in order for the transfer of transport of goods to take place are described.

One of the key issues was to assess how many lorries have to be shifted in order to meet the key condition for the required 30% shift from road to rail for transport distances over 300 km by 2030. It is therefore based on the European Union White Papers entitled: "Roadmap to a Single European Transport Area Towards a competitive and resource efficient transport system '(COM (2011) 144 final)".

Based on the questionnaire surveys elaborated within the Transport Model (chapter 5), a table was prepared, showing the proportions of trucks with a route over 300 km. These are vehicles that can be the equivalent of a 40´ container. According to the "EU White Paper", these vehicles are the subject of the transfer of traffic from the road to other modes. It was found that they represent 62% of all trucks on average.

Tab. 4.8. Proportions of trucks with a route over 300 km

Border crossing	Trucks total	Trucks with routes over 300km	Percentage over 300 km
SK/PL Trstená	1134	565	49,84%
SK/PL Skalité	959	770	80,28%
SK/CZ Mosty	3316	2471	74,50%
SK/CZ Bílá	1273	874	68,72%
CZ/PL Chotěbuz	3512	2144	61,03%
CZ/PL Antošovice	6754	3683	54,53%
CZ/PL Bartultovice	919	555	60,39%
Total	17 867	11 062	**61,91%**

The next step was to find out how many new freight trains on key transport routes will be added by 2030, if, according to the "EU White Paper", 30% of lorries with a route over 300 km are converted to rail transport. The source of the number of lorries on individual routes are regular, periodically recurring additions, taking into account the data from the counters installed within the Transport Model. The growth coefficient for 2030 is an averaged estimate of the processor from various statistical data.

Tab. 4.9. Increase in the number of trains on the railway infrastructure for the transfer between modes of transport for 2030

Line	Section	Source table from D.T3.1.3	Average trucks per day 2020 in both directions	Growth coefficient 2030/2020	Average day trucks 2030	Share of trucks with a route over 300 km	Shift of 30% trucks over 300 km (White Paper EU, paragraph 2.5 (3)	Number of 40´ per train	Number of new freight trains in 2030
A	B	C	D	E	F	F	F	F	G
				note 2	DxE		Ex0,3xI		F/G
Jihozápad (South-west) – Ostravsko	Studénka – Ostrava	68	5511	1,37	7550	62%	1402	40	35
	Dětřichov – Krnov – Frýdek-Místek	70	2302	1,37	3154	62%	586	40	15
	Dětřichov – Krnov	74	852	1,37	1167	62%	217	40	5
Total for line section	Suchdol nad Odrou – Ostrava								55
Bohumín – hranice Česko/Slovensko	Jablunkov – Mosty	69	2983	1,37	4087	62%	759	40	19
Border of CZ/SK Žilina	Čadca – Krásno nad Kysucou	151	3880	1,37	5316	62%	987	40	25
	Dolný Kubín – Tvrdošin	154	1181	1,37	1618	62%	301	40	8
Total for line section	Žilina – Čadca								33
Žilina – západ (West)	Žilina – Bytča	153	6231	1,37	8536	62%	1585	40	40
Žilina – jihovýchod (South-West)	Strečno – Dubná Skala	152	4962	1,37	6798	62%	1263	40	32
	Rajec – Fačkov	155	232	1,37	318	62%	59	40	1
Total for line section	Žilina – Vrútky								33
	Ivachnová – Liptovský Mikuláš	152	3688	1,37	5053	62%	938	40	23
Bohumín – Katowice	Bohumín – Mszana	106	4681	1,37	6413	62%	1191	40	30
	Tychy – Pszczyna	110	5553	1,37	7608	62%	1413	40	35
	Żory – Skoczów	117	1910	1,37	2617	62%	486	40	12
Total for line section	Tychy – Katowice								77
Cieszyn – Bielsko-Biała	Cieszyn – Bielsko-Biała	108	3411	1,37	4673	62%	868	40	22
Total for line section	Dětmarovice – Czechowice-Dziedzice								99
Bohumín Opole	Racibórz – Krapkowice	111	905	1,37	1240	62%	230	40	6
Opole Katowice	Gliwice – Katowice	105	21915	1,37	30024	62%	5576	40	139
	Opole – Gliwice	105	13486	1,37	18476	62%	3432	40	86
Katowice sever	Siewierz – Częstochowa or Chorzów –Kłobuck	110	7389	1,37	10123	62%	1880	40	47

Transferring of goods to rail – obstacles and restrictions compared to road transport

Tab. 4.10. Railway barriers and restrictions compared to road transport

Problem areas	Railway transport	Road transport
Transit across borders	one driver is not authorized to drive a traction vehicle in other countries (unknown routes), language barrier, delays due to train inspections and handovers	smooth transit (within the EU no border delays, outside the EU customs checks)
Introducing new international lines	more complicated (cooperation of more carriers, e.g. KD operators and freight forwarders in different countries)	easier just arrange 2 freight forwarding companies in different countries to ensure transport across several countries
Types of cars, types of goods	problematic (on certain substrates there are special wagons that cannot be loaded with another kind of goods at the foreign station than at the destination station)	it is possible to transport different kinds of goods (e.g. on pallets), there are also special refrigerators, tanks for food or chemicals (they also have restrictions they are intended only for certain goods)
Transport price (transport charges), back load	paid for transport route on all lines, no backloading is problematic (the customer pays for both directions of transport)	only for motorways (or first-class roads), trucks also travel on lower-category roads to reduce the price or to embrace the bottlenecks, usually trucks are back-loaded
Infrastructure network scope, traffic management	lower network density, interstate freight transport is carried out mainly on interstate railway corridors (double-track electrified corridor lines), security equipment (signaling regulations) slightly differs in each country	has a higher network density, in the case of accidents theoretically there are greater possibilities to avoid the accident site (on the other hand, in the case of a highway accident it is usually associated with a delay in delivery) traffic control signs are almost the same in all countries
Infrastructure power systems, track gauge	incompatible power supply systems to the electrification lines in different states (direct or alternating current), different gauge of railways in some countries e.g. Ukraine, Russia, Spain	roads in all states and intersections are designed to similar standards
Communication and information transfer	more complicated insufficient application of EU directives for telematics in freight transport problematic obtaining information about train locations abroad (in relation to railway infrastructure of certain countries Poland), necessity of equipping ETCS traction vehicles	simpler (by phone, email), trucks must be equipped with on-board units for data transmission in the toll system
Speed of transport, time of transport	trains run late (downtime due to insufficient throughput and waiting at railway stations due to the priority of passenger transport)	trucks are much faster, more reliable in terms of delivery time (Just in time deliveries)
Reliability, safety, accidents, goods damage	is not reliable (delays due to track reconstruction, other operational problems, it is safer in terms of accidents	it is more reliable (e.g. fragile, perishable goods it transports food more reliably), occasionally road accidents also occur and goods are damaged
Necessity to reload goods ("last mile")	Customers (manufacturing companies or trading companies) usually do not have a siding connection of their operations (or warehouses) to the railroad (depending on the type of products produced and the volume, if they send goods by rail, they have to transship the goods at the end. increases the cost of transport (extra costs)	most production companies use trucks to import material for production and import of finished products (mostly goods on pallets)

4.2.3 Action Plan

The basic objective of the action plan was to assess whether the existing railway infrastructure of the TRANS TRITIA area, including the planned construction projects, will have sufficient capacity for the transfer of transport set out in the "EU White Paper" by 2030. The data on line capacity from part of the Transport Model were used and the transferred traffic from the above tables was added on the decisive sections. This determined the percentage of utilization of individual sections, with the critical values for line capacity being 80% and higher. Sections have also been added to the list which assess part of the Transport Model as insufficient capacity on the basis of the number of vehicles whose route is always one of the border crossings of the TRANS TRITIA area, while in the Action Plans all lorries are assessed.

Tab. 4.11. Sections with insufficient capacity on the railway network in the Moravian-Silesian Region

Sections according to table 10 by D.T3.2.2	Occupation	Solved within construction
CZ/SK border Chotěbuz	80-120%	Conversion of power supply systém from 3 kV dc to 25 kV-50 Hc AC and signaling systém ETCS
Sections according to table 3 by D.T3.2.3 Including an increase to 2030	Occupation	Solved within construction
Polom – Ostrava	130%	High speed line Přerov – Ostrava, Increasing the capacity Přerov – Ostrava
Ostrava – Bohumín	120%	Reconstruction of Ostrava node
Pudlov – Chałupki	125%	Increasing the capacity Pudlov – Chałupki
Ostrava Kunčice – Frýdek-Místek	110%	Electrification and Doubling of tracks Ostrava – Frýdek-Místek
Český Těšín – Ostrava-Kunčice	80%	Conversion of power supply systém from 3 kVdc to 25 kV-50 Hc AC and signaling system ETCS
Ostrava-Vítkovice – Ostrava-Svinov	80%	Increasing the capacity Pudlov – Chałupki

Note: The order of construction projects in the table corresponds to the order of priorities of the solutions for key sections

Tab. 4.12. Sections with insufficient capacity on the railway network in Opolskie and Śląskie Voivodeship

Section according to table 10 by D.T3.2.2	Occupation	Solved within construction
Herby Nowe – Kłobuck	136,8%	Modernization of section Kłobuck – Chorzów
Tychy – Pszczyna	132,9%	Modernization of section Katowice – Zebrzydowice Vysokorychlostní trať Katowice – Ostrava
Katowice Ligota – Mąkołowiec	126%	Modernization of section Katowice – Zebrzydowice
Strzebiń – Kalina	108,4%	Modernization of section Kłobuck – Chorzów
Radzionków – Tarnowskie Góry – Zwierzyniec	100,5% 89,4%	Modernization of section Kłobuck – Chorzów
Chorzów Stary – Bytom Północny	92%	Modernization of section Kłobuck – Chorzów
Section according to table 3 by D.T3.2.3 including an increase to 2030	Occupation	Solved within construction
Opole Groszowice – Kędzierzyn-Koźle – Katowice – Trzebinia	75% 130%	Increasing capacity Opole – Katowice – Kraków
Zebrzydowice – Czechowice-Dziedzice	80%	Modernization of section Katowice – Zebrzydowice Vysokorychlostní trať Katowice – Ostrava

Note: The order of construction projects in the table corresponds to the order of priorities of the solutions for key sections

Tab. 4.13. Sections with insufficient capacity on the railway network in the Žilina Region

Section according to table 10 by D.T3.2.2	Occupation	Solved within construction
Vrútky – Diviaky	135,3%	Increasing capacity Vrútky – Diviaky
Section according to table 3 by D.T3.2.3 including an increase to 2030	Occupation	Solved within construction
Vrútky – Žilina	110%	Modernization of infrastructure, line security and transition to 25kV electrification
Žilina – Bytča	110%	Modernization of infrastructure, line security and transition to 25kV electrification within Žilina node

Based on the information obtained in the project and with regard to the plans for the construction of railway infrastructure of individual states, it is recommended:

- to meet all the planned deadlines according to completion dates for infrastructure projects;

- to accelerate the preparation of sections of the railway system in the TRANS TRITIA region, where in 2030 it is not and will not be fully eligible for the required transfer of traffic according to the EU White Paper at least in the following sections:
  - Přerov – Ostrava (CZ),
  - Vrútky – Diviaky (SK),
  - Opole – Katowice – Kraków (PL),
  - Katowice (PL) – Ostrava (CZ);
- by 2025, to prepare a study that will solve the complicated capacity issues (specifies modifications) of the Czech – Polish – Slovak three-border railway lines by freight trains due to large longitudinal slopes, which currently leads to the bypass of the Žilina (Slovakia) – Czech Republic – Poland, route via the Břeclav route Bohumín and complicates the transfer of traffic in the region of the tri-border;
- to make legislative adjustments by 2025 that will support the transfer of transport in the 2030 horizon;
- to make adjustments to infrastructure charging from 2025 in order to transfer traffic to the 2030 horizon;
- to prepare legislative and pricing policies for the arrival of electric road lorries by 2025, which will reduce the costs of road transport by tens of percent and without a legislative and price reaction will cause freight transport to return from rail to road by 2030, or that transport will not be transferred at all.

4.3. Intermodal logistic centers/terminals in the TRANS TRITIA area

Intermodal logistics centers and terminals are among the basic elements of the intermodal transport system. The project team therefore included this fact in the project and at the same time, together with the previous action plans for waterways and railways, addressed the options and technical requirements for relocating part of freight transport within the terminals already operating in TRANS TRITIA, their possible modernization or expansion. In this context, the team also defined potential sites for location of new intermodal terminals, especially in connection with the planned widening of waterways in TRANS TRITIA in connection with the project plans for navigating the Oder in the section Kędzierzyn-Koźle (PL) – Ostrava (CZ) and Silesian Canal connecting the Oder and the Vistula.

The aim was not only to define the potential location for trimodal centers (connection to road, rail and water infrastructure), but also to discuss their location, especially with local governments, and related spatial planning documentation. Like with the previous two action plans, the reference year for this action plan was 2030.

In defining the necessary steps to create appropriate conditions for intermodal logistics centers, the project team also relied on the requirement for intermodal transport set by the relevant European Union bodies under its subsidy policy, in particular the subsidy conditions for building logistics nodes to ensure public non-discriminatory access to this freight transport service.

4.3.1. Maps of intermodal logistic centers/terminals

The following terminals currently operate in the territory of TRANS TRITIA:

- ARGO Bohemia Kopřivnice (CZ),
- Euroterminal Sławków (PL),
- METRANS Ostrava – Šenov (CZ),
- PCC Gliwice (PL) with Port of Gliwice (SILESIAN LOGISTICS CENTRE JSC),
- PKP CARGO INTERNATIONAL Paskov (CZ),
- METRANS Terminal Dąbrowa Górnicza (PL),
- RCO Žilina (SK),
- Terminal Kontenerowy Gliwice (PL),
- Terminal Ružomberok (SK),
- Terminal Trstená (SK),
- TIP Žilina, Teplička nad Váhom (SK).

4.3.2. Intermodal logistic centers/terminals

The basic aim was to assess the increase in the number of processed intermodal units. For this purpose, the results of questionnaire surveys within the Transport Model were used, where the average proportion of vehicles with a route over 300 km, which are targeted at the TRANS TRITIA area, was found to be 31%. If traffic from these lorries arrives in the region otherwise than by road, there must be a transfer in front of the destination at an intermodal center. All key routes to the individual areas of TRANS TRITIA were assessed.

Tab. 4.14. Daily increase in processed 40´ intermodal units due to traffic transfer to year 2030

Section	Source table from D.T3.1.3	Trucks 2020i n both directions-AADT	Growth coefficient of 2030/2020	Trucks 2030 AADT	Share of vehicles with a route over 300 km	30% transfer of vehicles over 300 km (White Paper EU paragraph 2.5 (3))	Percentage of vehicles targeted in the TRANS TRITIA area	Number of new 40´ intermodal units in 2030
A	B	C	D	E	F	G	H	I
			note 3	C x D	note 1	E x 0,3 x F		G*H
Studénka – Ostrava	Table 68	5511	1,37	7550	62%	1402	31%	430
Jablunkov – Mosty	Table 69	2983	1,37	4087	62%	759	31%	232
Rychaltice – Frýdek-Místek	Table 70	2302	1,37	3154	62%	586	31%	179
Bílá – Frýdek-Místek	Table 72	310	1,37	425	62%	79	31%	24
Dětřichov – Krnov	Table 74	852	1,37	1167	62%	217	31%	66
Kopřivnice – Příbor	Table 77	494	1,37	677	62%	126	31%	39
Total for Moravian-Silesian Regionj								970
Opole – Gliwice	Table 105	13486	1,37	18476	62%	3432	31%	1051
Gliwice – Katowice	Table 105	21915	1,37	30024	62%	5576	31%	1708
Bohumín – Mszana	Table 106	4681	1,37	6413	62%	1191	31%	365
Cieszyn – Bielsko-Biała	Table 108	3411	1,37	4673	62%	868	31%	266
Tychy – Pszczyna	Table 110	5553	1,37	7608	62%	1413	31%	433
Siewierz – Częstochowa	Table 110	7389	1,37	10123	62%	1880	31%	576
Racibórz – Krapkowice	Table 111	905	1,37	1240	62%	230	31%	71
Total for Opolskie and Śląskie Voivodeship								4469
A	B	C	D	E	F	G	H	I
Čadca – Krásno nad Kysucou	Table 151	3880	1,37	5316	62%	987	31%	302
Ružomberok – Ľubochňa	Table 152	2021	1,37	2769	62%	514	31%	158
Žilina – Bytča	Table 153	6231	1,37	8536	62%	1585	31%	486
Dolný Kubín – Tvrdošín	Table 154	1181	1,37	1618	62%	301	31%	92
Rajec – Fačkov	Table 155	232	1,37	318	62%	59	31%	18
Diviaky – Turčianske – Teplice	Table 156	681	1,37	933	62%	173	31%	53
Total for Žilina Region								1109

In terms of annual output, these are increases in intermodal units of size 40´ by regions:

- Moravian-Silesian Region – 354 000 with the current capacity of 300 000
- Opolskie and Śląskie Voivodeship – 1 631 000 with the current capacity of 300 000
- Žilina Region – 405 000 with the current capacity of 200 000

Levels of logistic terminals

In order to properly execute the existing and newly localized logistics terminals on the TRANS TRITIA area according to the European standards, the project team worked with 4 levels (Table 4.15).

Tab. 4.15. Levels of the logistic terminals according to the proposal of the TRANS TRITIA project team

LEVEL	DESCRIPTION & INTENTION	Public access	multi-modal-ity	length of the track	number of tracks	inter-modal units area	swap--bodies area	storage area
1	The purpose is the central collection of goods from a region of 1 - 2 million inhabitants or at the hubs where the European transport networks meet.	yes	yes	740 m	10	2ha	6ha	2ha
2	The terminal does not have to be tied to the size of the area or the number of inhabitants, the decisive factor is the catchment of nearby industrial zones.	optional	optional	740 m	5	1ha	2ha	1ha
3	A terminal that reduces to a minimum the downstream road traffic and will be necessary in the future to meet the stricter requirements for the transfer of goods from road by 50% by 2050 and within the GREEN DEAL policy. *)	yes	no	local conditions	2	0,5ha	0,5ha	–
4**)	The terminal is designed for transshipment for specific large companies doing business in the field of turnover of commodities eligible for water transport. Another potential option is the addition of facilities for the transshipment of extra-cargo costs; currently possible within TRITIA area only in Opole.	yes	yes	–	–	0,5ha	–	–

*) The operation of the terminal is assumed to be automated with one common dispatcher for several stations. The transport and transport of railway wagons would take place by a handling train. The terminal will replace previously decommissioned siding connections and make rail transport available to new entrants for a fraction of the investment in railway sidings. The terminal would only handle:
- manipulator-loadable intermodal units for swap bodies
- intermodal units that can be loaded onto a railway car without the help of handling equipment
- intermodal units for which the carrier has its own handling equipment

**) This example was designed based on idea of one of city's on the Oder Waterway in Poland.

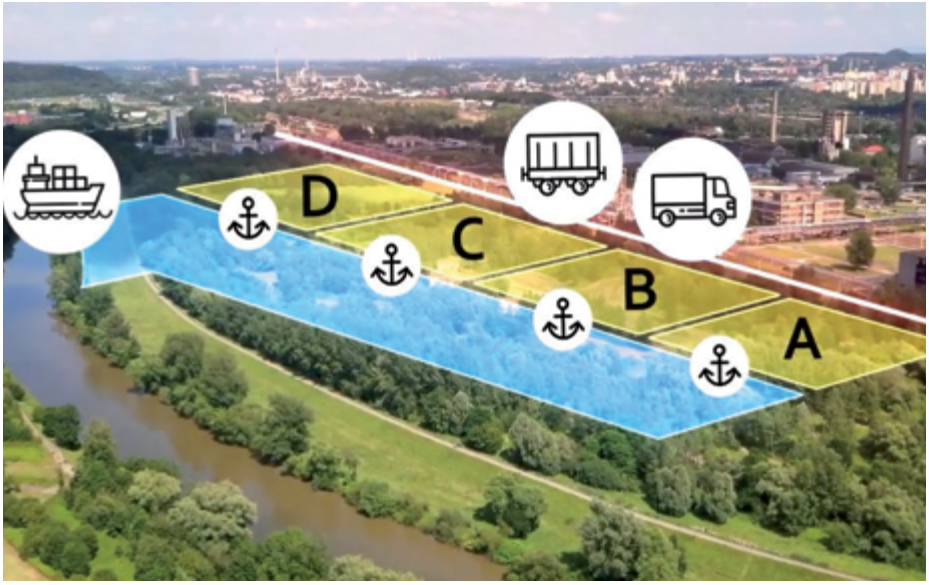
4.3.3. Action Plan

The action plan represents a set of proposals for the necessary projects (see Tables 4.17 4.18), the implementation of which should achieve in 2030 the creation of optimal services for the transhipment of modeled transport volumes of goods in TRANS TRITIA. The basic logistics nodes will be 5 multimodal level 1 terminals in the following locations:

- Gliwice (Silesian Logistics Centre), Śląskie Voivodeship (PL),
- Kędzierzyn-Koźle (KKT), Opolskie Voivodeship (PL),
- Ostrava (Mariánské Hory), Moravian-Silesian Region (CZ),
- Sławków (EUROTERMINAL), Śląskie Voivodeship (PL),
- Žilina, (SK) Žilina Self-Governing Region.

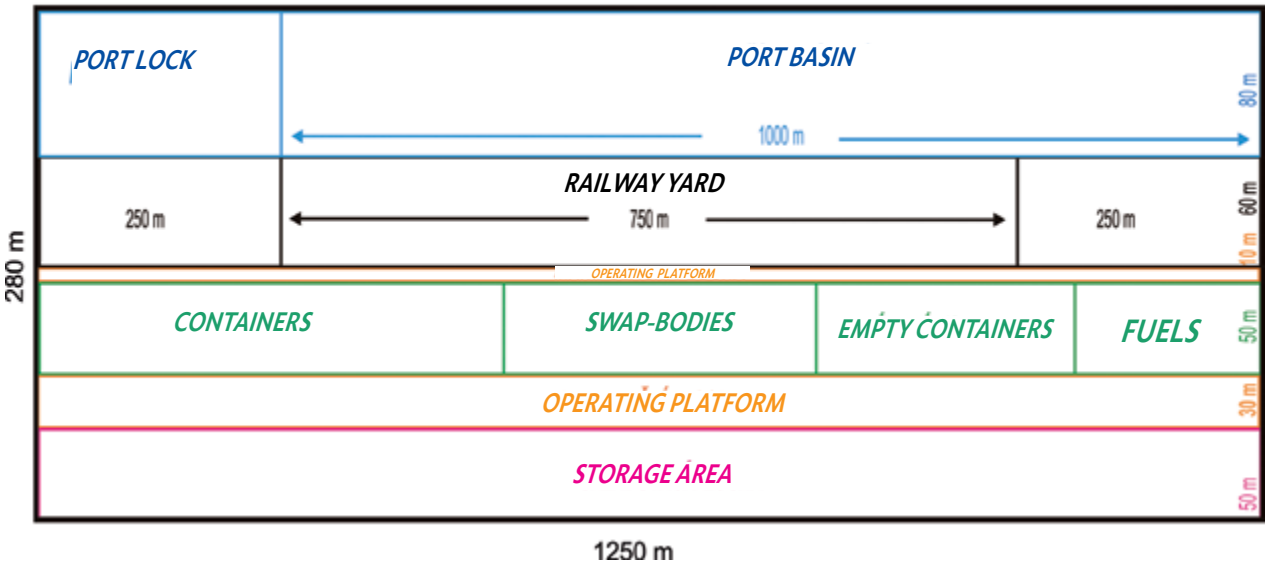
Fig. 4.5. Reconstruction of the terminal Kędzierzyn-Koźle

Fig. 4.6. Planned localization of Terminal of Ostrava



The above presented nodes of level 1 should operate in public access mode. At the same time, they will serve as collection points for the terminals proposed in levels 2 and 3. Terminals in Gliwice, Sławków and Žilina already operate from these locations, and reconstruction has begun in Kędzierzyn-Koźle. The location of the terminal of level 1 in Ostrava is in preparation.

Fig. 4.7. Schematic diagram of a trimodal logistic centre – LEVEL 1



Tab. 4.16. Timetable for projects in the Moravian-Silesian Region (CZ)

Project title	Year of completion
Ostrava trimodal terminal	2030
Road connection to Ostrava trimodal terminal	2030
Rail coupling of Vratimov – Ostrava-Bartovice	2030
Capacity increasing Ostrava-Vítkovice – Ostrava-Svinov	2025
Rail coupling – triangle of Studénka	2025
Upgrade of Paskov terminal	2030
Subsidies for transs hipment equipment	continuously
Setting up station terminals	continuously

Tab. 4.17. Timetable for projects in Opolskie and Śląskie Voivodeship (PL)[10]

Project title	Year of completion
Krzyżanowice transshipment terminal	2030
Racibórz logistic centre	2030
Cointainer terminal Gorzyce-Věřňovice	2030
Rybnik inland port & transhipment terminal	2030
Żory transs hipment terminal	2030
Bieruń transs hipment terminal	2030
AZOTY specialist transs hipment teminal	2030
Kędzierzyn-Koźle container terminal	2030
Silesian Logistics Center JSC	< 2030
Euroterminal Sławków	< 2030

Tab. 4.18. Timetable for projects in the Žilina Region (SK)

Project title	Year of completion
TIP Žilina crossroad and extension of road I/583A with connection to I/18	2030
Expansion of storage capacities of TIP Žilina	2020

Monitoring and action groups

The groups in question were designed in order to monitor whether the implementation of the above mentioned projects is proceeding in accordance with the preset schedule. Therefore, the project implementation team agreed on a recommendation to set up action and monitoring groups at several levels, including their activities or indicators. These proposals are summarized in Tables 4.19. and 4.20.

[10] The locations and timing of projects depend on the implementation of the planned investments on waterways.

Tab. 4.19. Action Groups

Level		Activities	Period
European		Harmonization in terms of charging for transport networks	2021-2023
International	Visegrad Group	Preparation of intention to creating of transport lines incl. the locations of terminals within the Visegrad Group area	2021-2025
	EGTC TRITIA	Coordination of activities within the cross-border region on the self-governing region level	2021-2030

Tab. 4.20. Monitoring groups

Monitoring group	Indicators	Period
EGTC TRITIA Steering Committee for multimodal transport development in the TRANS TRITIA area Observatory of multimodal transport in the cross-border area Coordinator of the multimodal transport network (+representative of freight transport associations and chambers of commerce)	Number of intermodal (tri- and bimodal) and non-intermodal terminals Arrangement of intermodal and non-intermodal terminals, The volume of loads served by intermodal and non-intermodal terminals Number of TEU and FEU units supported Number of innovative applications in the field of transhipment technologies The use of handling devices in terminals	2021-2030

5 Transport Model

5.1. The basics of the model of TRANS TRITIA multimodal potential

The process of traffic modelling plays an important role in the process of strategic planning of transport infrastructure development and investment allocation in the transport sector. The methodological approach in developing a traffic model largely depends on the purpose and aims for which it is developed. At present, most traffic models are focused on passenger transportation demand analysis. The main reason for this approach is the excessive volume of passenger vehicles in agglomerations that needs to be addressed in order to improve traffic flow and population mobility. Freight transport contributes significantly to these transport problems through increased load on transport infrastructure and the resulting negative impacts such as congestions, deterioration of road surface, environmental standards and lower quality of life of the affected population.

The transportation of goods on a macroeconomic scale is a necessary precondition to ensure economic growth on national level and the satisfaction of population in terms of product demand. This function implies a continuous optimization of the transport process pursued by the carriers. It is particularly necessary to tackle this problem at the European macro-region level, which achieves above-average economic growth and is defined by the unfinished infrastructure of higher transport relevance for individual transport modes. The territory of TRANS TRITIA consists of 4 regions from 3 neighbouring EU member states. The TRANS TRITIA region is formed by Moravian-Silesian Region (CZ), Śląskie and Opolskie Voivodeship (PL) and Žilina Region (SK). The total area of the considered region is 34 069 km^2 with roughly 7,8 million residents. The biggest agglomerations of the TRANS TRITIA area are the towns of Katowice and Ostrava, which form important metropolitan areas.

Given the rather complex relationships within the transport process, which are based on the mobility behaviour of the population (passenger transport) and the ensuring of goods supply (freight transport), it is necessary to use transport engineering

tools and procedures which allow for the verification and justification of infrastructure modification and other interventions. This way the modelling of the traffic flow allowed for the identification of infrastructure bottlenecks and the testing of the impact of the proposed alternative measures. In general, the basic purpose of the TRANS TRITIA traffic model has been defined as the quantification of transport relations in the considered area and the review of the changes in transport relations due to the infrastructure development in the region by the year 2030. The role of the traffic model was also to identify the potential for transferring a part of freight transport to more environmental friendly modes of transportation (railway and inland waterways).

The project was focused on the cross-border, transnational and interregional cooperation with the aim of strengthening the economic and social cohesion in order to achieve the objectives defined by the Europe 2020 Strategy as well as the EU White Paper on Transport. The main task of the project was to improve coordination at the level of strategic planning aimed at the development of infrastructure in the regions, which will result in the elimination of bottlenecks on the main transit routes. One of the most important parts of the project was the elaboration of a strategy (implementation action plan) for multimodal freight transport implementation in the concerned regions. The main tool for the verification of proposed measures have been the development of a cross-border multimodal model describing mainly the state and trend in the freight transport development.

The project was principally divided into two main parts:

A. TRANS TRITIA Multimodal freight transport strategy and action plans.

B. Model of the TRANS TRITIA multimodal potential.

The need for development of the traffic model has arisen from the current situation in the regions. The role of the model was to find and test the solutions for cross-border problems of transport modes. The aim of the solutions was to increase transport efficiency and support the development of the concerned regions. The increasing demand for transport shows the infrastructure bottlenecks in individual regions and also in cross-border interconnections. The main goal of the traffic model was to point out the need for the development of transport infrastructure in regions and in cross-border interconnections and to promote the unification of procedures in the concerned countries. For this reason, two main objectives have been defined in the traffic model development:

1) Quantification of the potential for modal shift of traffic from road freight transport to alternative transport modes (railway and inland waterway) in relation to the aims defined in the White Paper (shift of road freight over 300 km to other modes of transportation within the range of more than 30%).

2) Identification of bottlenecks on the transport infrastructure and proposal of typological measures to increase its capacity in order to increase the potential for modal shift to more environmentally friendly modes of transportation.

The aim and purpose of the project was reflected in the TRANS TRITIA traffic model solution and was divided into two sub-models.

- Sub-model that describes intra-zonal and inter-zonal transport relations.
- Sub-model that describes the surrounding territory, including international roads and international transport.

The traffic model has taken into account the infrastructure of road, rail, inland waterway and intermodal transport (intermodal terminals). Air transport was not considered as the TRANS TRITIA region is not large enough for efficient use of aircrafts.

In view of its purpose, the traffic model was designed separately for freight and passenger transport, while passenger transport was calibrated solely in terms of fulfilment of the maximum capacity requirements of the infrastructure.

The model was developed in the VISUM® program, which is a part of the PTV-VISION® traffic planning software package of PTV Karlsruhe.

5.2. Zoning of the modelled area

The primary step in the creation of most traffic studies, including modelling of traffic potential, is the definition of traffic zones of the given area zoning, which represents the division of the analysed area into discrete areas. Generally, there are no clear and universal established rules on which they are constructed and the creation is based on the existing traffic-engineering practice, which is based on the principle of obtaining a zonal division with homogeneous attributes while respecting the administrative boundaries of the area, for which socio-economic data are available for the quantification of the transport demand attractiveness, and transport generation supply.

The territory zoning system was used for the purpose of aggregating individual households and economic operations into units that could be processed by common traffic modelling tools. The main parameters of the zoning system was the number of traffic zones and their range, where there is an interdependence between them. The higher the number of defined zones in the traffic model, the smaller the covered area of individual zone. One of the first tasks in development of the TRANS TRITIA traffic model was the clear identification of the area of interest and its delimitation to its surroundings.

This was the primary aspect considered when defining the zones of the TRANS TRITIA cross-border freight traffic model. It is clear that for the modelling of the freight traffic via the multimodal traffic model, it was necessary to base it on the economic development forecast as there is a very strong correlation. Aiming to quantify the economic development in the given territory, it was necessary to have a set of socio-economic parameters that are statistically expressed for a given structure of territorial units corresponding to the administrative division of the concerned territory.

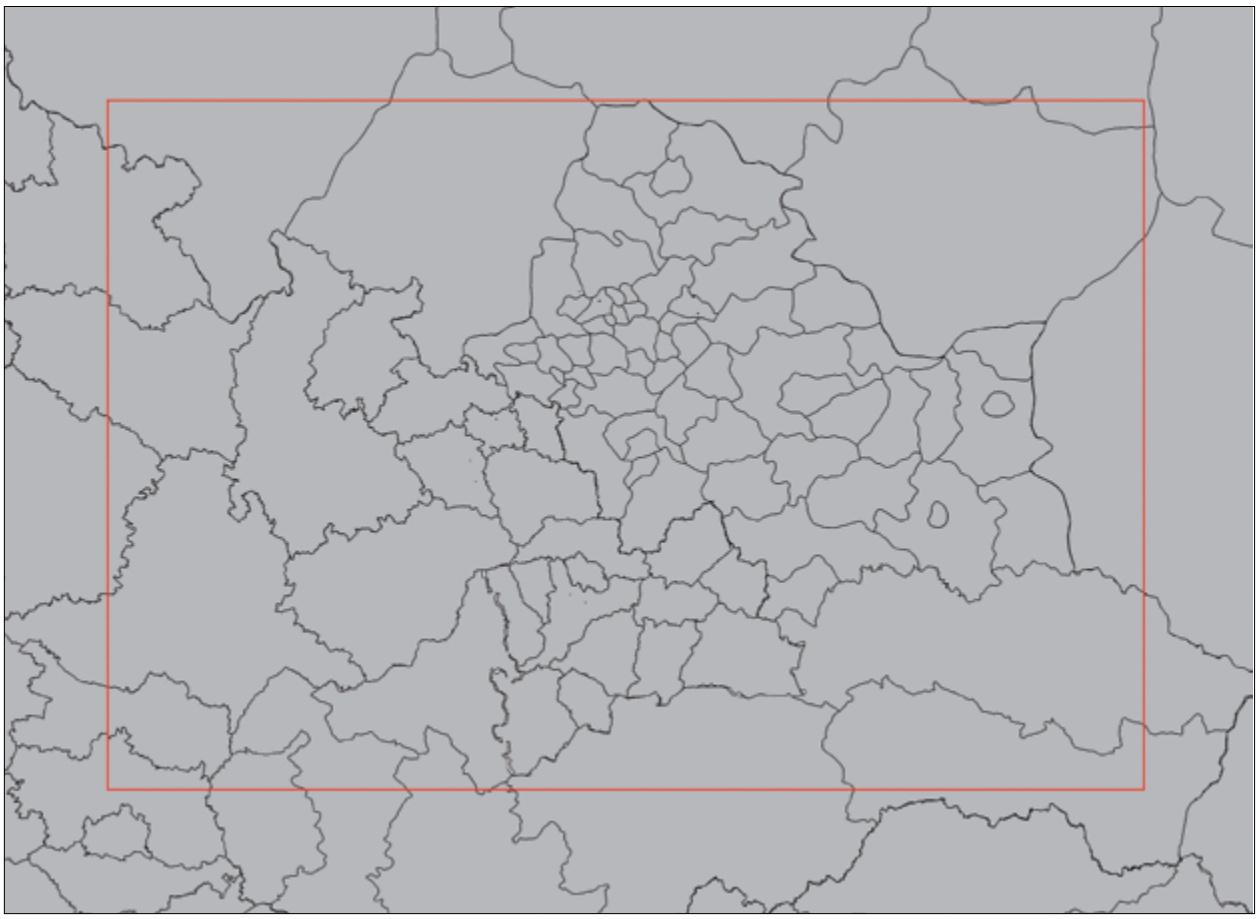
The development of the traffic model was based on the outputs of traffic models processed at the national level which, given their purpose, range of the statistical survey and the nature of the processing, represented a relevant basis for the modelling of the TRANS TRITIA cross-border region. The application of the zonal segmentation based on national traffic models is also justified due to the potential use of the outputs of this project in the framework of updating national models.

5.2.1. Identification of the territory of interest

Within the zoning of the modelled area, it was necessary to proceed in accordance with the requirements for securing outputs with high information value, thanks to which it is possible to develop and to calibrate the traffic model. The primary zoning of the survey area should be identical to the existing zoning that was created for the transport planning tools of higher importance. Subsequently, it is possible to proceed in more detailed area zoning in accordance with the requirements and purpose of the traffic model. Maintaining the primary zoning of the territory is related to the possibility of using the results not only for the assessment of planned measures, but also for updating the data of transport planning tools of higher importance (e.g. national traffic models) through data aggregation.

The concerned territory of the TRANS TRITIA project was defined for the purpose of the traffic model development by the administrative boundary of the territory of the Žilina Self-Governing Region (SK), Moravian-Silesian Region (CZ), Śląskie Voivodeship (PL) and Opolskie Voivodeship (PL). The territory of these top level local government units also constitutes the basis of the transport area of interest. As there is a territorial overlap on the border between the individual cross-border regions of the territory thus defined, it was necessary to extend this basic area of interest. Specifically, it was the north area of the Olomouc Region (CZ), which is bordering Opolskie Voivodeship (PL). This area was included in the area of interest mainly due to the existence of roads of higher transport importance between the Czech Republic (I/44 and I/60) and Poland (DK40 and DW382), where there is a potential for their use by road freight transport. There is also an overlap in the Žilina Self-Governing Region (SK), whose northern border extends to a part of the Lesser Poland Voivodeship (PL), and through this area, there is a major road connection passing through Slovakia via I/59 and DK7 in Poland. By incorporating these overlapping areas into the TRANS TRITIA partner self-governing territories, a compact area of interest has been obtained for the traffic model, in which the transport relations are examined in a more detailed way.

Fig. 5.1. Detailed zonal division of the territory covered by the TRANS TRITIA traffic model



Considering the fact that traffic modelling not only monitors the traffic relations between individual traffic zones within the surveyed area, but also the relationships between external area relations and the surveyed area (origin, destination and transit traffic with respect to the modelled area) it was necessary to define the division of the territory outside the focus area into zones.

The details of the division of this territory depended on the required accuracy of the results and could be done on the basis of the administrative classification according with the nomenclature of territorial statistical units NUTS. In this case, some countries have been merged into one territorial unit based on historical or geographical context. As long as this is consistent with the nature and purpose of the traffic model, the primary zoning respected the boundaries of the existing transport planning tools. Due to the fact that the TRANS TRITIA traffic model is macroscopic, with significant transport relations of a cross-border nature, the surrounding territory is practically extending into the territory of the whole European continent. The wider modelled territory was divided into a total of 139 transport zones, of which 33 are located in the countries of the project consortium.

Fig. 5.2. Zonal division of the extended territory of the TRANS TRITIA traffic model

5.2.2. Structure of the zonal division

The extent of zoning of the TRANS TRITIA multimodal freight traffic model amounts to a total of 229 traffic zones, and covers the territory of virtually the whole European continent.

The area of interest consists of 90 traffic zones, of which 64 are located in Poland, and 13 traffic zones are in Slovakia and the Czech Republic.

The level of traffic zones in the area of interest corresponds to the LAU statistical territorial unit, which represents the administrative segmentation of the area in question based on the district competence.

An exception is represented by some traffic zones within the Polish part of the territory of interest, which are at the NUTS 3 level, which corresponds to the administrative division into regions or voivodships.

The wider territory of the traffic model consisted of a total of 139 traffic zones, of which 33 were additionally sectioned out of the territory of the project consortium countries at NUTS 3 level (Slovakia, Czech Republic) or NUTS 2 in the case of Poland. Foreign transport zones of the extended territory were broken down at NUTS 2 level for countries close to the area of interest up to NUTS 1 level, which according to the nomenclature of statistical territorial units represents macro-regions and states as a whole.

Tab. 5.1. Zonal structure of the TRANS TRITIA traffic model

Model territory	Country	Number of zones	NUTS
concerned	SK	13	LAU 1
	PL	64	LAU 1/NUTS 3
	CZ	13	LAU 1
extended	SK	7	NUTS 3
	PL	13	NUTS 2
	CZ	13	NUTS 3
	outside SK/PL/CZ	106	NUTS 2/NUTS 1
Total		229	-

5.3. Network model of the TRANS TRITIA territory

The design of the transport network of the TRANS TRITIA model was based on the principle that its scope should capture all the significant changes in the traffic flows of the transport modes in question, which may be potentially caused by the implementation of the analysed measures. As a multimodal macroscopic model of freight transport, significant existing infrastructure connections and junctions for road, rail and inland waterway transport have been included in the transport network. The network model was based on the rule that each transport mode within the traffic model is represented by a specific infrastructure network.

The transport network is defined in the traffic model by a set of basic parameters that directly affect the choice of use of the route. Mathematical operations thus simulate the decision-making of drivers, which route will they choose. The following parameters were entered when creating the transport network of the model:

Type of road – in the traffic model, it represents the category of road, for which the standardized parameters of the building structure are further developed in accordance with the existing technical standards.

Capacity – expresses the maximum number of vehicles that will use the road for a given time unit. Traffic capacity depends on weather conditions, technical solution, but also on transport conditions.

Transport system – in the traffic model, it represents vehicles by selected categories for the given transport mode.

Theoretical driving speed – the speed was defined for zero intensity that will gradually decrease as maximum capacity is reached, which has a direct impact on travel/transit time and the attractiveness of the route itself. This speed was defined for individual transport systems based on different assumptions (e.g. maximum permitted speeds).

Length of section – is the distance between two nodes (intersections), or the place where the parameters of the road network change, e.g. speed reduction when entering the city.

Road resistance – (impedance) represents the impact of the road capacity rate. The lower the capacity, the higher the resistance and the drivers simultaneously select a lower resistance route.

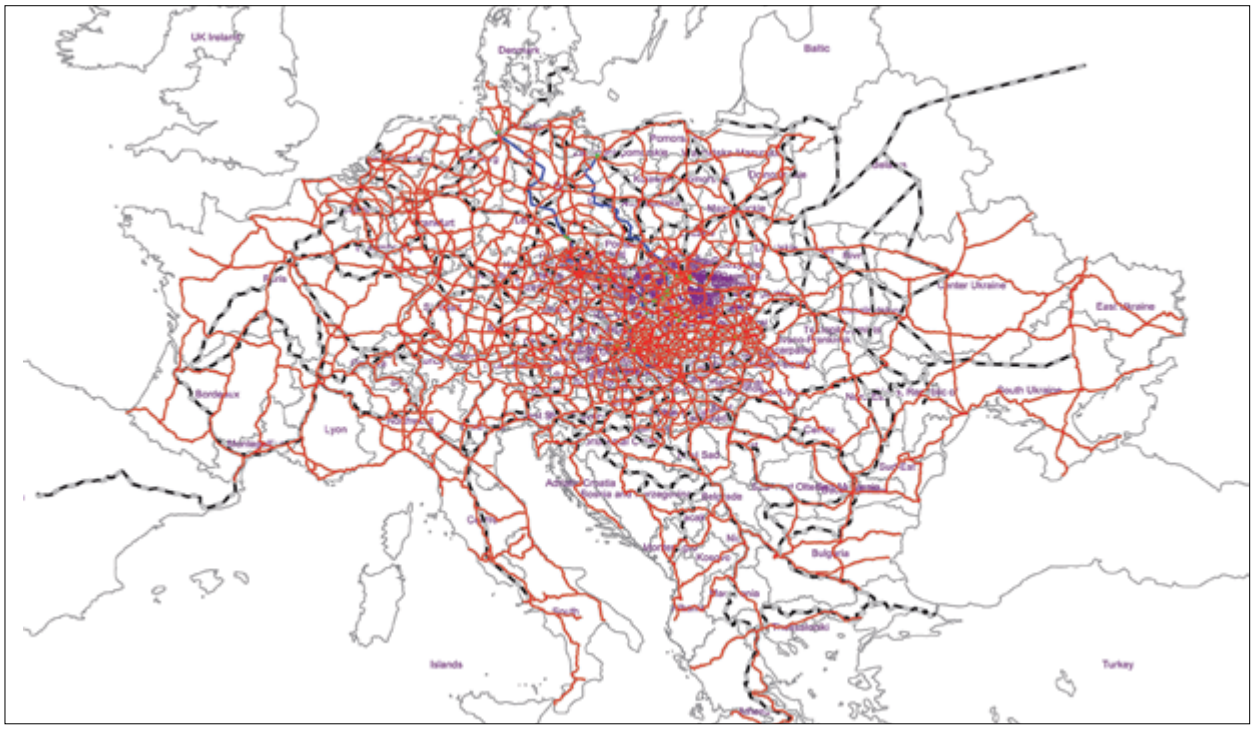
Number of lanes – is the number of lanes in one direction of the road. For each lane, the parameters are the same for the selected road type.

Permitted driving directions – for some sections, the route runs in one direction only and the transport system is then excluded in the opposite direction.

The complete transport infrastructure of the TRANS TRITIA model represents the unification of traffic systems of individual transport modes in the following segmentation:

- road network,
- railway network,
- inland waterway routes,
- intermodal transport terminals.

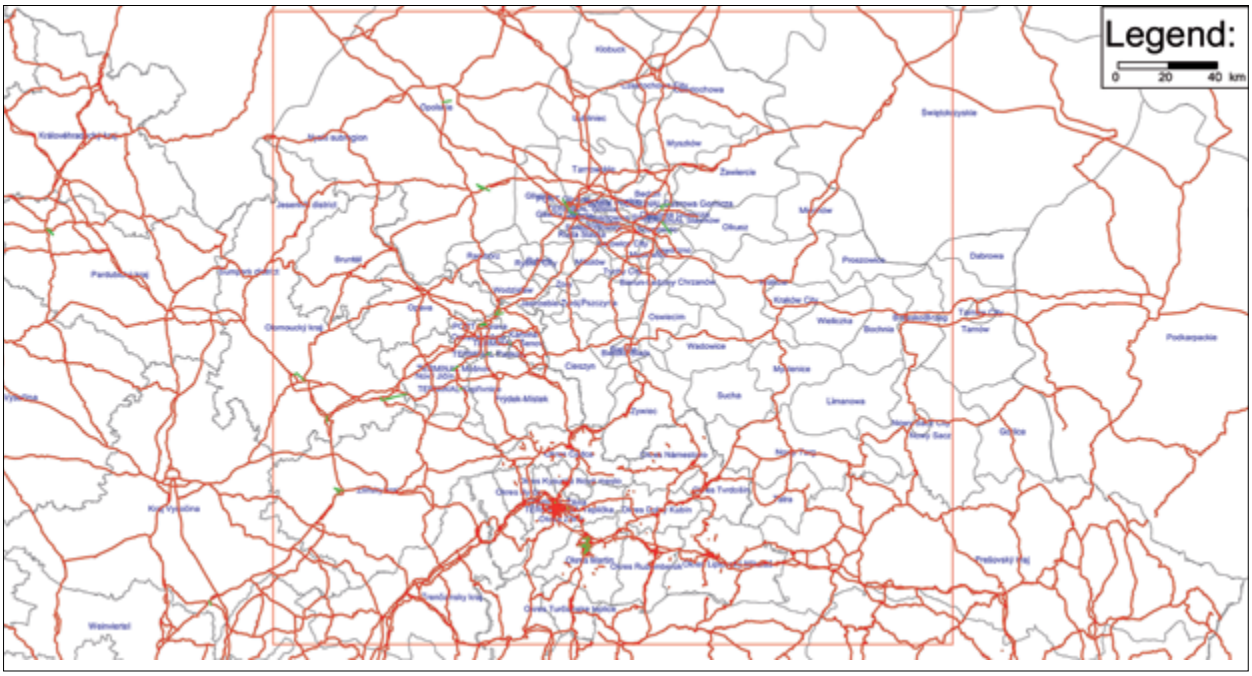
Fig. 5.3. Transport infrastructure of the TRANS TRITIA traffic model



→ *Road transport infrastructure*

The transport network of the TRANS TRITIA model consists of roads of higher traffic importance (motorways, expressways and class I roads), that the transit freight transport usually uses. The TRANS TRITIA territory of interest contains, besides these roads, also some sections of class II and III roads (or local roads), which are relevant for the distribution and routing of the traffic load. Road infrastructure within the distant areas of the extended territory is limited to roads of international and national importance compared to the area of interest. The basis for the creation of the foreign road network was the OpenStreetMap map data.

Fig. 5.4. Road transport infrastructure in the TRANS TRITIA area of interest



→ *Railway transport infrastructure*

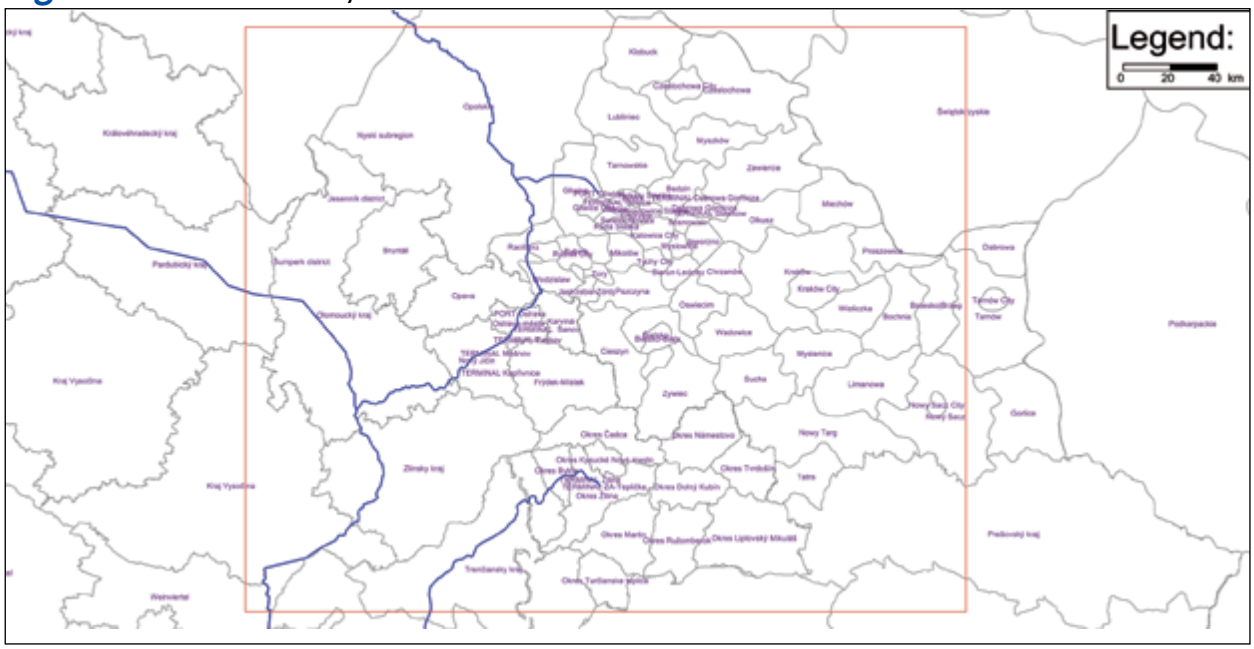
The model network of railway transport includes the complete railway network in the territory of TRANS TRITIA, including operable lines currently not used for passenger transport. The railway network was divided according to the number of tracks and electrification systems. In addition, the maximum line speed was specified for each section. The network also contained all stations and stops, including the name and track number. The input for the creation of the railway network was a list of national points including coordinates and a list of railway sections.

Fig. 5.5. Railway transport infrastructure in the TRANS TRITIA area of interest

→ *Inland waterway infrastructure*

The inland waterway infrastructure of the TRANS TRITIA model is based on the latest revision of major European waterways and their parameters in the 3rd revision of the "Blue Book" issued by the UN Economic Commission for Europe in 2017 as ECE/TRANS/SC.3/144/Rev.3. This updated document presents the technical characteristics of the European Inland Waterways and Ports of International Importance as defined by the AGN and provides a comparison of the minimum standards and parameters foreseen by the AGN.

Fig. 5.6. Inland waterway infrastructure in TRANS TRITIA area of interest



5.4. Development of transport infrastructure by 2030

→ *Road infrastructure projects*

Czech Republic:

The bypasses and new class I roads in this part of Czech Republic are supposed to take transit traffic from Opava and other larger towns and thus relieve mainly the congested urban centres. New bypasses will also improve accessibility of Opava, Krnov and Osoblažsko Regions, which represent the western part of the Moravian-Silesian Region, one of the least accessible areas in the country.

The first class road I/11 forms an important part of the long-distance road system of the Moravian-Silesian Region and connects the eastern and western parts of the region. It is the only link between the northern parts of Moravia and Silesia and Bohemia. The I/11 road is currently passing through villages and is arranged as a two-lane road outside with some section under construction or preparation, as a directionally divided four-lane road as the current state does not fulfill the needs and significance of this road. The prospective traffic makes it impossible to ensure the required level of transport quality on a dual-lane road as the modelled traffic flows correspond to the requirements for a four-lane road. In the long term, the proposed I/11 route will be an important link between the completed D1 (D47) and D48 motorway in the Ostrava-Hrušov (D1) – Havířov (planned I/68), Havířov – Třanovice (I/11) and Třanovice (D48) – Bystřice – Hrádek – Jablunkov – Slovakia. The connection of the Karviná agglomeration to the network of higher importance will be implemented in this extensive infrastructure overhaul.

The D48 motorway is a part of further development of the VI. Trans-European Corridor within the TEN-T (Trans-European Transport Network). In the future, it will replace the existing road I/48, which is an important connection especially for long-distance transport to Poland via the Česky Těšín border crossing. However, in addition to the international aspects of building transport networks as part of the Trans-European Network, there is also a country-specific reason of developing the transport network. The existing road I/48 Bělotín – Frýdek-Místek – Český Těšín – state border with Poland is included in selected road network, along which the European road E462 is running. At the same time it forms an important capacity link of the industrial areas in the foothills of Beskydy Mountains, especially the towns of Nový Jičín, Příbor, Kopřivnice, Frýdek-Místek, Český Těšín and Třinec area.

However, the technical condition and width parameters of the existing I/48 road are no longer suitable for the traffic requirements.

Poland:

The expressway S1 is located on the 4th corridor of the Trans-European Transport Network connecting the countries of the Baltic Sea and the Southern Europe and is included in priority axis TEN-T No. 25 "road axis Gdansk – Brno / Bratislava – Vienna". The extension of the S1 expressway to the south, outside of Poland, is the Slovak motorway D3 between Žilina and Skalité. The completion of investments along this motorway will make the S1 route a safe, comfortable and fast connection from the state border in Zwardoń to the airport in Pyrzowice (Katowice) and the A1 motorway.

The construction of the A1 motorway is an investment of European significance. The need to build it resulted from the need to create a transit road system in the territory of the country.

Slovakia:

The high priority investment is the construction of specific sections of motorways and expressways, the absence of which is negatively reflected in the areas of economy, environment and hindered mobility of the population. The primary objective is to remove key bottlenecks on the TEN-T network, especially in the section Žilina – Liptovský Mikuláš (D1), Žilina – Čadca, state border SK/CZ, PL (D3, R5) and completion of expressways Banská Bystrica – Ružomberok (R1) and Žiar nad Hronom – Martin – Tvrdošín state border (R3).

→ *Railway infrastructure projects*

The purpose of the modernization of railway infrastructure and stations is to eliminate track speed bumps, increase traffic safety, ensure reliable operation, necessary parameters for freight transport, barrier-free access for persons with reduced mobility (stations and stops), improve the technical condition of the tracks, interoperability parameters and ensure compliance with applicable legislation.

Projects in Czech Republic include the redevelopment of the railway substructure, electrification, reconstruction of the railway superstructure, reconstruction of platforms, including island platforms with non-level barrier-free access. Selected existing bridge structures and culverts will be upgraded to the required parameters, railway technological structures, and roofing of platforms will be modernized or newly built. Modernization of security, communication and catenary equipment is proposed.

A very important project in TRANS TRITIA is the planned construction of a high-speed railway line. The objective is to divert long-distance passenger traffic to a new line and thus create new capacity for freight trains on the existing network.

The projects in Poland range from construction of a completely new railway lines to alteration or modernization of existing railway lines, where the aim of the component is to stop the degradation of the railway infrastructure, including transport corridors.

The government's Railway Plus program is to be implemented in 21 towns around the country, where at present there is no railway line or the railway passenger service is suspended. The project involves the implementation of railway connections to towns with more than 10 000 inhabitants, where passenger trains used to stop or where the railway infrastructure has never been constructed.

The project also serves the purpose of improving the railway connections in the EU's Trans-European Transport Network (TEN-T). A total of 178.8 km of lines will be covered by this project in the TEN-T network, including railway line No. 131, which forms a part of the TEN-T core network. Investments in the TEN-T aim to improve the transport infrastructure across Europe, so that passengers and freight can move faster and easier on the European railway network.

In Slovakia, modernization is planned for railway node Žilina, railway lines Žilina – Poprad, Krasno Nad Kysucou – Čadca national border. The transition of electric traction from 3kV DC to 25 kV AC system is planned on sections Púchov – Žilina – Poprad and Žilina – Krásno nad Kysucou – Čadca. The project of the modernization of the Žilina railway node and the adjacent section of the Žilina Varín Strečno railway line is currently in public procurement and the construction should start in the 2020. The Žilina railway node is the junction of two branches of international railway corridors. The project will include replacement of rails and switches, railway bridges, platforms, traction lines, safety equipment, reconstruction of substructure and construction of new infrastructure, where the routing of the new line will differ from old routing. All the level crossing will be decommissioned, disbanded and replaced with grade separated crossing.

→ *Inland waterway infrastructure projects*

In Poland, the Gliwicki Canal project is an important inland waterway which is undergoing comprehensive modernization. Under the implemented project, ports will be renovated, specifically new bridges and water and electricity intake points will be built for vessels using the Gliwice Canal. Control room buildings, both in the underground and above-ground part, as well as mechanical and electrical devices that drive the gate will be upgraded and the engine room will be overhauled. The project also includes new social buildings, roads and pavements on the canal site.

The investment is being implemented in its second stage of project "Modernization of the Oder locks on the section managed by the Regional Water Management Board in Gliwice adaptation to class III of the waterway". In the first stage, the Kłodnica and Rudziniec locks were upgraded, and the renovation of the lock in Łabędy and Dzierżno is planned to be finished in the year 2020. The comprehensive modernization of the six locks of the Gliwice Canal will be completed in the first quarter of 2021, closing the next stage of the project.

→ *Intermodal terminals*

The Moravian-Silesian Region, Ostrava town, the Railway Administration Authority (SŽDC) and Concens Investments and Antwerp Port Authority will cooperate in developing a new container terminal in the strategic industrial zone of Mošov. On September 18, 2019 a Memorandum of Understanding was signed to start this new project, called the Mošnov Multimodal Transport Terminal.

Amongst others, the new terminal will link the Moravian-Silesian Region with one of Europe's largest ports Antwerp and as a result a substantial share of cargo is expected to make the modal shift from road to rail on this relation.

5.5. Traffic model of the zero scenario

The originally proposed process of developing a four-stage model with a given structure of commodity groups for freight transport was modified to a model quantifying the potential for shifting part of the traffic load from road freight transport to other modes due to the absence of relevant data inputs characterizing transport demand. The lack of input data was mainly due to the minimum response from shippers and carriers in the statistical survey of goods flows, as well as incomplete information in relevant specification and detail that would sufficiently characterize the routing and volume of freight carried by railway transport.

As a result, it was not possible to quantify the volume and routing of transport flows for railway and inland waterway transport in the TRANS TRITIA traffic model. The developers thus proceeded to modify the methodological procedure while maintaining the original purpose and objectives of the traffic model in accordance with the available data inputs.

The determination of the modal shift potential was based on the general assumption that long-distance sessions are particularly suitable for railway and inland waterway transport. From this point of view, for the TRANS TRITIA territory, the area of interest for freight transport was defined as the long-distance transit traffic which passes through that territory as well as a destination / origin transport whose beginning or end is located in the TRANS TRITIA region. In this context, the role of traffic modelling was to obtain an output in the form of a calibrated unimodal road traffic model, from which it would be possible to derive precisely these types of journey for the subsequent redistribution of traffic loads to other modes of transport. The relevance of this approach is also proved by the fact that it was also used in other freight traffic models that corresponded to the TRANS TRITIA region in terms of their area of interest. The simplified approach to modelling transport relations within road freight transport through the allocation of traffic to the network was based on the basic assumptions of the modelled relations

in the territory of interest, which allow for the application of this procedure. These are mainly the following common characteristics:

- Suitability for projects where no significant change in traffic flow on the transport network is expected, but only a shift of a part of the traffic from one mode to a parallel mode.
- A basis in analogous approaches, where actual data on traffic and directions are obtained by traffic engineering surveys and by taking outputs from other models.

The direct demand model method aggregates the first three stages of traffic modelling in the form of quantifying the volume of production / attractiveness of a given zone, the distribution of trips between these zones, and the actual allocation of traffic to road infrastructure.

Since the values of the primary demand matrix are based on the recorded road traffic frequency of freight vehicles between the zones of the traffic model, the conversion of the volume of goods into means of transport on individual sessions was not necessarily a part of the network assignment.

Several standardized algorithms ware available for the assignment of traffic on the road network that could been applied on the road transport mode. The most frequently used approaches include:

- "all or nothing",
- gradual (incremental) assignment,
- equilibrium assignment.

The "all or nothing" assignment allocates the entire generated traffic between two zones on one route. The incremental assignment allocates the total load in a given segment of traffic in several steps, looking for the route with the lowest impedance (resistance) for each. Equilibrium assignment allocates routes by multiple iterations so that the impedance on all alternative routes is balanced. This will result in a more credible allocation to all alternative routes, but at the cost of a more demanding and longer-lasting calculation process.

The basis of all algorithms is to find one or more best route options between the origin and destination of the allocated roads. The advantage is assessed on the basis of the calculation of the total impedance (resistance) of the route. Impedance is usually understood as the real time of transit through individual infrastructure sections, including delays due to their capacity.

$$T_{real} = t_0 \times f_{(Sat)} \quad (1)$$

where:

T_{real} real transit time in a given section (turn) with assigned traffic

t_0 basic transit time in a given section (turn) without traffic

$f_{(Sat)}$ resistance function of the so-called limited capacity, which extends transit time depending on the achieved degree of saturation of traffic capacity in a given section (turn)

For practical reasons (a more realistic assignment than the 'all or nothing' method and a shorter calculation time), the incremental allocation method for freight was used in the traffic model, divided into individual iterative steps.

The actual assignment of trucks to the road network of the traffic model was based on the primary demand matrix, while the calculation apparatus took into account the resistance of the route on individual transport relations. This procedure resulted in the resulting load matrix exhibiting some degree of difference from the original demand matrix.

In order to take into account the capacity constraints of the modelled road network, a model of transport relations for individual car transport (passenger vehicles) was developed through conventional traffic modelling procedures. By loading the network with this component of the transport stream, the operational conditions for it were streamlined and the simulation of the reallocation of transport reached a higher level of conformity to the reality.

5.5.1. Quantification of the useable potential for the transfer to rail and inland waterway transport

The application of the forecasted development to the calibrated model of the current state resulted in an output in the form of a heavy-duty road network load for zero scenario in the reference year 2030. This output represents the value of the maximum transfer potential from road freight transport to more environmentally friendly modes of transport (railway and inland waterway transport).

In order to model the transfer of traffic load to other transport modes, the layer of the infrastructure network of railway and inland waterway transport (multimodal transport network) was activated in the PTV VISUM environment. In this context, it was necessary to convert the original outputs in the form of road transport frequencies (heavy goods vehicles) into intermodal transport units (containers), which can be assigned to the entire multimodal network of the TRANS TRITIA model.

The conversion of road transport vehicles to containers was carried out in a 1:1 ratio, as the modelling of road freight transport was developed for heavy vehicles, whose carrying capacity corresponds to the parameters of a 40-foot ISO container.

The subsequent assignment of the traffic load to the multimodal network was carried out by means of a calculation algorithm of the resistance (impedance) function, which was based on the national traffic model of the Czech Republic with updated values of parameters for the TRANS TRITIA region. It is a composite function ($f_{imp} = f_{(t,\ c,\ d)}$), which takes into account the resistance of the multimodal network sections in the following structure:

- $f_{(t)}$ as a function of transit time,
- $f_{(c)}$ as a cost function (infrastructure usage fee and handling costs),
- $f_{(d)}$ as a function of the impact of the saturation of the transport network due to its capacity constraints.

In the TRANS TRITIA model, its impedance was defined for each section of the transport network based on different variables, for which the BPR (Bureau of Public Roads) resistance function was defined. These resistance functions simulated different route conditions, such as congestion and intersection delays. The BPR resistance function was calculated using the formula:

$$t_{cur} = t_0 * \left(1 + a * \left(\frac{q}{q_{max} * c}\right)^b\right) \quad (2)$$

where:

t_{cur} current transit time with network load

t_0 transit time without network load

q traffic volume

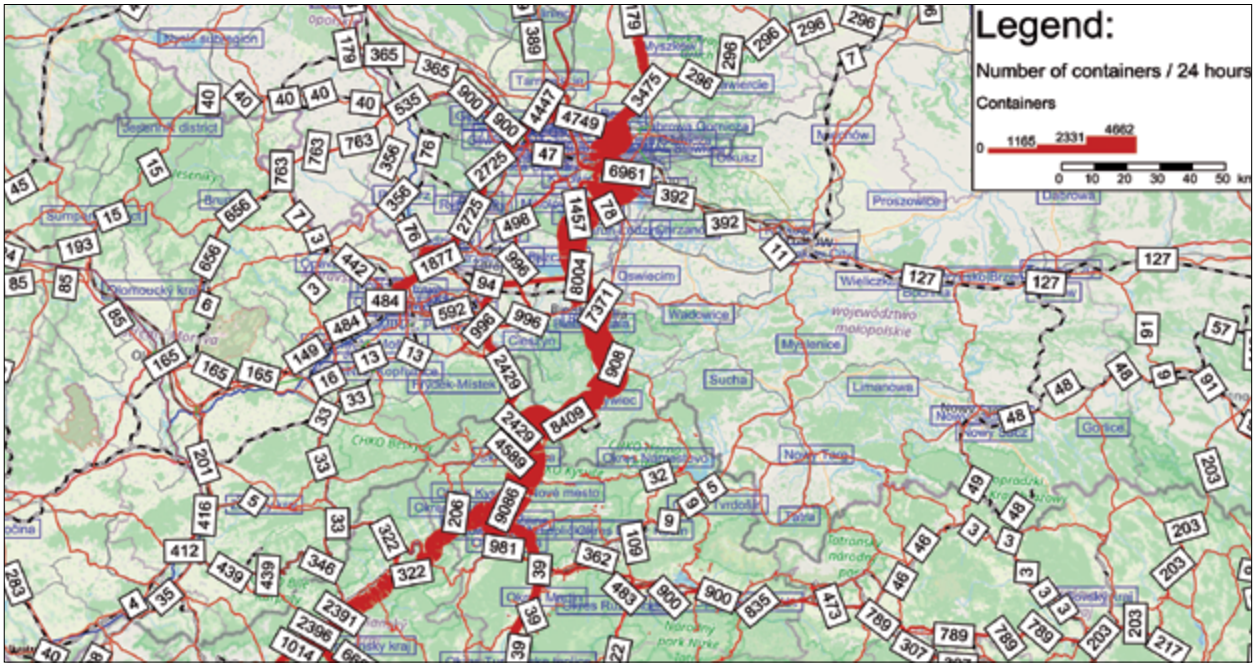
q_{max} infrastructure capacity [vehicle / time]

a, b, c parameters

The total resistance of a given route consists of individual resistances for road, connectors, turns and other parameters of infrastructure. Resistances are largely dependent on road traffic and are expressed in terms of “Volume-delay functions”.

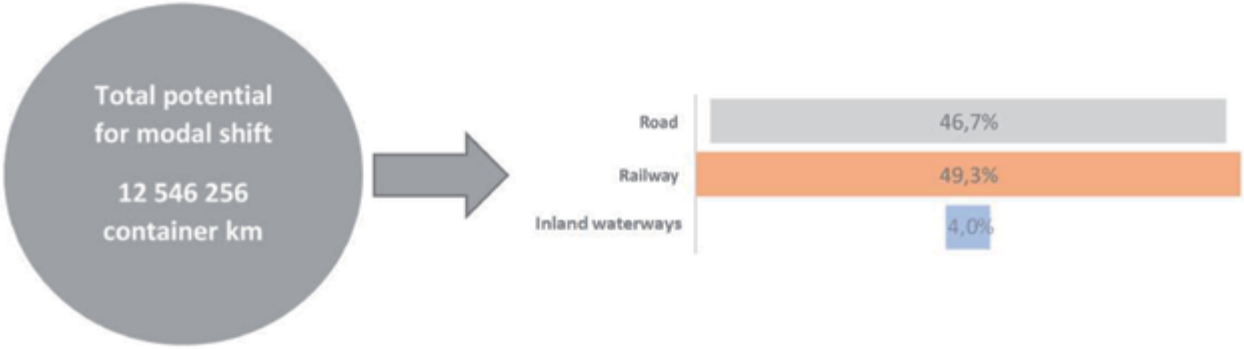
Based on the aforementioned procedures for the assignment of traffic to the TRANS TRITIA multimodal network, the output is a redistribution model for zero scenario (2030), which is shown in the following figure.

Fig. 5.7. Model of redistribution of traffic load to the multimodal transport network of the TRANS TRITIA territory, zero scenario /2030/



The outputs of the TRANS TRITIA multimodal potential model, following the redistribution of traffic load, show that from the total volume of road freight transport of 12,546,256 container-kilometres per year (total potential), almost half of this load shifts towards the railway and around 4% to the inland waterways. In the modelling of the modal shift, capacity constraints have not been taken into account in the case of railway and inland waterway infrastructure. The remaining part of the modelled transport load (46.7%) remains on the road infrastructure, where it is transported by heavy goods vehicles.

Fig. 5.8. Shift of total transport load potential to individual transport modes, zero scenario /2030/



5.6. Alternative scenarios of the TRANS TRITIA model

The zero scenario of the traffic model potential for the use of the transport infrastructure in the TRANS TRITIA region by the year 2030 considered the natural development of the assessed area, which means that an assumption was made that the planned projects defined in the strategic documents will be implemented.

The macroeconomic theory suggests that the natural development of the territory is assessed on the basis of the growth of the country's GDP (region), so it was necessary to estimate GDP development in the TRANS TRITIA model by 2030. Since the economic development estimate for the 10-year period is influenced by a number of factors that are very difficult to predict, an optimistic, pessimistic and realistic scenario was considered. The optimistic scenario was based on the assumption that the economy's growth will be higher than estimated in the underlying realistic assumptions. The pessimistic scenario considered the possibility of a slowdown in economic development and the realistic scenario was estimated to be the most likely development by the year 2030.

The main role in modelling alternative scenarios was to examine the impact of changes in the economy and selected parameters on transport demand in the traffic model. The preparation of modelling alternative scenarios consists of:

- modelling of the development of the economic parameter (GDP) and testing of individual input parameters (prices for the use of transport infrastructure, prices for container handling and their combinations) and their impact on the modal split.

The developed alternative scenarios (to assess the potential shift from road to railway and inland waterway transport) were examined in the TRANS TRITIA traffic model for 2030, in order to verify the impact of changes in the charges for using infrastructure (or a specific service handling) on the reallocation of traffic volumes (represented by a relative unit set as 1 intermodal transport unit ITU 40' ISO 1A container) between the individual modes of transport.

The impact of the change was determined on the basis of the uncertainty in the development of the economy and infrastructure charges, or in the handling of intermodal transport units between individual modes.

The basic parameters entering the testing of the impact of changes on the modal shift were the following:

- change in GDP,
- change in road infrastructure charges (tolls),
- change in railway infrastructure charges,
- change in handling charges.

The first level of alternative scenarios was the economic scenario "S0", which is defined by three variants, where pessimistic GDP growth (+10% increase), realistic GDP growth (+15% increase) and optimistic GDP growth (+20% increase) have been considered. In other alternative scenarios "S1", "S2a / S2b", "S3" and "Combined", a change in the redistribution of the number of intermodal transport units between the different transport modes was identified by simulating the change in the infrastructure and handling charges in individual transport modes, or their combinations. The scenarios "S1", "S2a / S2b" and "S3" are prepared for the realistic development of GDP (growth of 15%), while the change of ± 5%, ± 10%, or ± 20% (water transport) was considered concerning the infrastructure and handling charges. The "Combined" scenario also considered realistic GDP +15%, but it combined various changes in the infrastructure charges, or handling charges as follows: toll +10%, railway +5%, handling +20%.

The following table includes a detailed list of scenarios and their variants that have been tested in the traffic model.

Tab. 5.2. Scenarios and variants considered in the traffic model

Scenario	Variant
S0	GDP growth +10%
	GDP growth +15%
	GDP growth +20%
S1	Charges for road infrastructure (toll) increase by 5%
	Charges for road infrastructure (toll) decrease by 5%
	Charges for road infrastructure (toll) increase by 10%
	Charges for road infrastructure (toll) decrease by 10%
S2a	Railway infrastructure charges + handling charges increase by 5% infrastructure 10% handling
	Railway infrastructure charges + handling charges decrease by 5% infrastructure 10% handling
	Railway infrastructure charges + handling charges increase by 10% infrastructure 20% handling
	Railway infrastructure charges + handling charges decrease by 10% infrastructure 20% handling
S2b	Railway infrastructure charges increase by 5%
	Railway infrastructure charges decrease by 5%
	Railway infrastructure charges increase by 10%
	Railway infrastructure charges decrease by 10%
S3	Charges for handling in inland waterway terminals increased by 10%
	Charges for handling in inland waterway terminals decreased by 10%
	Charges for handling in inland waterway terminals increased by 20%
	Charges for handling in inland waterway terminals decreased by 20%
Combined	Toll +10%, Railway +5%, Handling +20%

Shift in the modal split may create bottlenecks on the existing transport infrastructure. The processed traffic model is able to identify these phenomena, considering and taking into account the defined transport unit (IPJ 40' container), which represents and generalizes the transport of various types of commodities. In the case of requirements for modifying the modal split, it was necessary to verify the suitability of the current infrastructure, its capacity parameters (current and future) in order to assess whether this transport infrastructure will be able to cover the increase of traffic volumes. At present, the transport infrastructure is already fully utilized in many places and congestions arise on a daily basis, therefore it was necessary to identify all the bottlenecks that would affect the overall throughput of the entire transport system in the future.

5.7. Conclusions from the TRANS TRITIA model

The details of the TRANS TRITIA traffic model were described in the reports D.T3.2.2 Report on the zero scenario of TRANS TRITIA traffic model and D.T3.2.3 Report on alternative scenarios of the TRANS TRITIA traffic model.

The purpose of the traffic model was to identify the potential transfer of long-distance road traffic over 300 km to alternative modes of transportation in the 2030 timeframe. The results of the zero scenario as well as alternative scenarios was that of the total transfer potential identified in road transport, there was a possibility of transferring about 40%-50% to railway and 2%-4% to inland waterway transport. The reported values point to the possibility that by the year 2030 the shifting of more than 30% of road transport over 300 km would mean that the objectives stated in the White Paper – "Roadmap to a Single European Transport Area Towards a competitive and resource-efficient transport system", could be met. If the objectives of the White Paper could be met, at the same time it is possible to support the EU low carbon economy (Roadmap for moving to a competitive low carbon economy in 2050).

While analyzing and assessing the transport infrastructure within the territory of TRANS TRITIA, the planned projects were taken into account, which are defined in national and/or regional strategy papers in the time horizon to 2030. The results of the transport model have confirmed their validity, as they are located in sections of infrastructure that are already problematic and managers / owners are working on elimination of specific sections that are bottlenecks. In addition to the planned measures, other sections (mainly on railway infrastructure) have been identified which, based on the assumptions set out in the transport model, should be included among the other necessary projects to ensure sufficient capacity of related railway infrastructure. The projects were prioritized according to the severity of the capacity problem and were assessed in terms of pessimistic and optimistic economic development, which also confirmed that these points on railway infrastructure are bottlenecks in the case of pessimistic development.

The EU seeks to support the development of alternative modes of transport (railway and inland waterways), thereby to reduce the share of road freight transport. Transferring of road freight to railway can cause problems for the railway infrastructure, which in its current state is not sufficiently prepared and capacity restrictions need to be taken into account in long term strategic planning. The TRANS TRITIA traffic model is an infrastructure model for identifying the potential of transferring from road transport to alternative modes of transportation. The results of the model are oriented towards the analysis of infrastructure and/or an assessment of the impact of the price for the use of infrastructure on changing of the shifts between transport modes. In any case, it has been confirmed that within road transport, there is sufficient potential to shift to more ecological means of transportation. If this is not really the case and quality infrastructure is available, it will be necessary to apply systemic organizational measures in individual transport modes, aimed to favour the ecological means of transportation.

Based on the results of the TRANS TRITIA traffic model, an implementation plan was assembled of measures to be solved in the assessed area in the time horizon until the year 2030. The implementation plan takes into account the projects already planned by the year 2030, but also the additional bottlenecks that the traffic model has demonstrated. Annex 9.1. presents the implementation plan for individual TRANS TRITIA regions and schemes of potential shift between modes of transport in TRANS TRITIA area up to 2030.

6 TRANS TRITIA cross-border Action Plans – conclusions

6.1. Main assumptions

The main objective of the cross-border Action Plans is to present infrastructure projects that will allow the implementation of strategic assumptions related to the development of multimodal transport on the Poland – Slovakia (PL/SK), Poland – Czech Republic (PL/CZ), Czech Republic – Slovakia (CZ/SK) borders in relation to the entire TRANS TRITIA area.

The cross-border projects should focus on:

a) reduce lag of remains behind in comparison with the other areas of these countries,

b) increase of the pace of development of mutual economic relations,

c) support for the advantages of European integration for cross-border areas,

d) designing an optimal environmentally friendly transport system,

e) review and completion of TEN-T.

Action plan presents projects with high and medium priority, their budgets as well as owners and entities responsible for their implementation. The organizational projects shown in the strategy for the development of multimodal transport and bottleneck analysis resulting from the model analysis are complementary.

The basis for presenting and prioritizing the projects were the strategic assumptions contained in the White Paper, strategic goals for the development of multimodal transport in the TRANS TRITIA area, the model and scenarios of transport development in the TRANS TRITIA area and action plans in various modes of transport.

The presentation of the projects consisted of several stages:

- Identification of infrastructure projects that have an impact on the development of multimodal transport on the PL/CZ/SK border. The selection of projects was based on a broad analysis of a strategic programme written at the international, national or regional level, with particular emphasis on the development of multimodal transport for the TRANS TRITIA area. It was assumed that the projects may be in progress or are planned for implementation.

- Identification of bottlenecks on the PL/CZ/SK border in relation to the entire TRANS TRITIA area based on the model and workshop.
- Identification of new projects developing multimodal transport on the PL/CZ/SK border, which is a proposal to eliminate bottlenecks and respond to the needs of key stakeholders (at the national and regional level).
- Prioritizing projects according to scale: high priority (the most important from the point of view of the development of multimodal transport on the PL/CZ border), medium priority (medium importance from the point of view of the development of multimodal transport on the PL/CZ border), low priority (low importance from the point of view of the development of multimodal transport on the PL/CZ border).
- Indication of budgets for already planned or implemented projects and a proposal of a budget (investment scale) for new projects with sources of financing.
- Indication of the main stakeholders (owners) of the projects.
- Determining the duration of the project.
- Indication of the project implementation effects.

6.2. Cross-border Projects for implementation: Poland-Czech Republic

This action plan presents primarily the infrastructure projects necessary for the development of multimodal transport on the Poland – Czech Republic border (see fig. 6.1).

Fig. 6.1. Area of the TRANS TRITIA – cross-border Poland – Czech Republic

The roadmap (figure 6.2) includes infrastructure projects that are located on the Polish – Czech border and those which are necessary for the proper flow of goods and the development of multi-modal transport across the border of these two countries, connecting the regions: Śląskie Voivodeship, Opolskie Voivodeship and Moravian--Silesian Region.

The list of projects is divided into rail, road and water transport projects. The proposed projects were evaluated in the context of their strategy implementation importance for the development of multimodal transport in the TRANS TRITIA area, with particular regard to the Poland – Czech Republic border. The project priorities were determined based on a broad discussion with stakeholders, according to the scale: high priority (most important for the development of multimodal transport on the PL/CZ border), medium priority (medium importance from the point of view of the development of multimodal transport on the PL/CZ border), low priority (low importance from the point of view of the development of multimodal transport on the PL/CZ border). Projects developing rail and water transport are considered top priority. However, some road transport projects should be implemented concerning the development of multimodal freight transport. The projects presented in figure 6.2 are in the zero scenario.

In terms of modes of transport, in the cross-border area of PL/CZ, 23 projects were indicated in the field of rail transport, 13 projects were indicated in the field of road projects and 6 projects were indicated in the field of inland waterways, which gives a total of 42 projects. Among the mentioned projects, short-, medium- and long-term ones were listed. In the short-term period (until 2022), 15 projects were selected for implementation. In the medium term (until 2025), 12 projects were planned, while in the long term (until 2030), 15 projects were planned. When prioritizing the projects, the team of experts concluded that:

- all inland waterways projects (6) have a high priority,
- 19 projects have a high priority among railway projects (i.e. about 83% of railway projects),
- among the road projects, 3 projects were given high priority, which constitutes 23.5%.

Investment value

- The total amount of investment costs for high priority projects in Poland is set at more than 34 bn PLN (more than 7.5 bn EUR). To this amount must be added the costs of projects that have not yet been developed in the form of detailed projects (e.g. construction of the Euroterminal Sławków link to S1). Investment costs for rail are comparable to investment costs for inland waterway projects, representing 90% of total costs.

- The total amount of investment costs for high priority projects in the Czech Republic is set at more than 19 394 469 674 CZK (722 380 325 EUR). To this amount must be added the costs of projects that have not yet been developed in the form of detailed projects (e.g.: project of high-speed line Ostrava – Přerov and Feasibility study of high-speed lines Ostrava – Katowice; infrastructure reconstruction of the railway lines Bohumín-Vrbice – Chałupki; railway line Dětmarovice – Petrovice u Karviné – crosssing border). In particular, the amount of costs of the construction of a high-speed line (in design preparation) will be a multiple of the part calculated so far. Approximately 85% of the fixed amount falls on the core construction «Reconstruction of infrastructure of the railway junction Ostrava (RFC5)». The rest is made up of less expensive railway network constructions.
- The total amount of investment costs for medium priority projects in Poland is set at more than 9.5 bn PLN (over 2 bn EUR).
- The total amount of investment costs for medium priority projects in the Czech Republic is set at more than 27 739 010 533 CZK (1 033 187 221 EUR). More than half is made up of investments in the railway network, the remaining part in the road network.

Sources of funding[11]

- Financing in the territory of the Poland is expected in the form of co-financing from EU resources under the: Operational Programme Infrastructure and Environment (2014-2020) and Regional Operational Programme, National Railway Program, National Roads Construction Programme and future Operational Programme for period 2021-2027. The amount of the subsidy is estimated at a maximum of 85% of the total eligible costs.
- Financing in the territory of the Czech Republic is expected in the form of co-financing from EU resources under the Operational Program Transport 2021-2027. The amount of the subsidy is estimated at a maximum of 85% of the total eligible costs.

[11] The source of financing for some projects is not known at these moment.

Fig. 6.2. The roadmap of infrastructure projects on the Polish – Czech border

	Short-term	Mid-term	Long-term
Inland waterways projects	No24 – Moderniz. of Odra dams (step I)	No24 – Moderniz. of Odra dams (step II) No26 – Construction of a weir flap (Mouth Nysa)	No23 – Gliwice Canal No25 – Moderniz. of locks and draft No27 – Odra-Danube (Kędzierzyn-Koźle – Ostrava section) No28 – Silesian Canal
Road transport projects	No36 – Expressway S1 (Pyrzowice – Bielsko) (section 1) No40 – Northern bypass of Kędzierzyn-Koźle No 29 – D48 Frýdek-Místek, bypass No 32 – I/58 Pribor – Skotnice No 33 – D48 Rybi – Rychaltice No 35 – I/57 Krnov – north-west bypass No 36 – Highway A1 (section E) No 39 – S11 Kępno – A1 node Piekary Śl. (section 3)	No 37 – Expressway S1 (Pyrzowice – Bielsko) (section 2 and 3) No 30 – D56 Frýdek-Místek, connection to D48 No 31 – I/67 Karvina, bypass No 34 – I/11 Opava, western part of the northern bypass (step I) No39 – S11 Kępno – A1 node Piekary Śl. (section 4)	No42 – Constr. Of the Euroterminal Sławków connector with S1 No 33 – I/11 Opava, western part of the northern bypass (step II) No 38 – Beskidzka Integration Road S52 No 39 – S11 Kępno – A1 node Piekary Śl. (section 1 and 2)
Railway transport projects	No 3 – Recons. of station Petrovice u Karviné No 4 – Line Dětmarovice – Petrovice No 7 – Constr. of siding in Mošnov No 11 – Line 287 (Nysa – Opole) No 13 – Lines 140 and 158 (Rybnik – Chałupki) No 14 – Lines 140, 148, 157, 159, 173 (Chybie – Żory – Rybnik) No 16 – Line 93 (Trzebinia – Czechowice-Dziedzice) No 41 – Information technologies No18 – Line E30 (Kędzierzyn-Koźle – Opole Zachodnie)	No 5 – Line Bohumín – Chalupki No 6 – Connection lines 305B i 306A No 12 – Line E65/E30 No 15 – Line Ce 65 (Chorzów Batory – Maksymilianowo) No 22 – Line Ostrava – Kunčice – Ostrava-Svinov/ Polanka nad Odrou No 9 – Line Ostrava – Frýdek-Místek No 17 – Line 143 (Kalety – Kluczbork)	No 1 – Line Ostrava – Prerov – Katowice No 2 – Recons. of junction Ostrava No 8 – Recons. of stations on RFC5 No 19 – Line E59 (Kędzierzyn-Koźle – Chałupki) No 20 – Line 190 Zebrzydowice – Cieszyn No 21 – Line 131 No 10 – Linka Frýdek-Místek – Frenštát pod Radhoštěm

High priority Medium priority

6.3. Cross-border Projects for implementation: Poland – Slovakia

This action plan presents primarily the infrastructure projects necessary for the development of multimodal transport on the Poland – Slovakia border (see fig. 6.3).

The roadmap (figure 6.4) includes infrastructure projects that are located on the Polish – Slovak border and those which are necessary for the proper flow of goods and the development of multi-modal transport on the border of these two countries, connecting the regions: Śląskie Voivodeship and Žilina Self-Governing Region.

Fig. 6.3. Area of the TRANS TRITIA – cross-border Poland – Slovakia

The list of projects is divided into rail, road and water transport projects. The proposed projects were evaluated in the context of their strategy implementation importance for the development of multimodal transport in the TRANS TRITIA area, with particular regard to the Poland – Slovakia border. The project priorities were determined based on a broad discussion with stakeholders, according to the scale: high priority (most important for the development of multimodal transport on the PL/SK border), medium priority (medium importance from the point of view of the development of multimodal transport on the PL/SK border), low priority (low importance from the point of view of the development of multimodal transport on the PL/SK border). Projects developing rail and water transport are considered top priority. However, some road transport projects should be implemented concerning the development of multimodal freight transport. The projects presented in figure 6.4 are in the zero scenario.

In terms of modes of transport, in the cross-border area of PL/SK, 13 projects were indicated in the field of rail transport, 12 projects were indicated in the field of road projects, which gives a total of 25 projects; while no inland waterway transport options exist, no projects were identified in this area. Among the mentioned projects, short-, medium- and long-term ones were listed. In the short-term period (until 2022), 4 projects were selected for implementation. In the medium term (until 2025), the implementation of 9 projects was planned, while in the long term (until 2030), 12 projects were planned. When prioritizing the projects, the team of experts concluded that:

- among railway projects, all projects were considered with high priority,
- among road projects, 1 project has a high priority, which constitutes 8.3% of all road projects.

Fig. 6.4. The roadmap of infrastructure projects on the Polish – Slovak border

	Short-term	Mid-term	Long-term
Inland waterways projects			
Road transport projects	No 15 – Project D1 Hubová – Ivachnová No 16 – Project D1 Hričovské Podhradie – Lietavská Lúčka No 18 – Project D1 Feeder Lietavská Lúčka	No 11 – Bypass of Węgierska Górka No 12 – Project R3 Tvrdošín – Nižná nad Oravu No 17 – Project D1 Lietavská Lúčka – Dubná Skala	No 13 – Project R3 Nižná nad Oravou – Dlhá nad Oravou No 14 – Project R3 Dlhá nad Oravou – Sedliacka Dubová No 19 – Project D1 Turany – Hubová No 20 – Project D3 Žilina, Brodno – Kysucké Nové Mesto No 21 – Project D3 Kysucké Nové Mesto – Oščadnica No 22– Project D3 Oščadnica – Čadca Bukov
Railway transport projects	No 25 – Information technologies	No 2 – Project Poprad – Východná No 4 – Project Liptovský Hrádok – Liptovský Mikuláš No 5 – Project Liptovský Mikuláš – Ružomberok No 7 – Project Turany – Vrútky No 9 – Project Node Žilina No 10 – Project Krásno nad Kysucou – Čadca	No 1 – Line 139 Czechowice-Dziedzice – Zwardoń No 3 – Project Východná – Liptovský Hrádok No 6 – Project Ružomberok – Turany No 8 – Project Vrútky – Varín No 23 – Čadca – Skalité No 24 – Vrútky – Diviaky

High priority Medium priority

Investment value

- The total amount of investment costs for high priority projects in the Poland is set about 2 bn PLN (0.43 bn EUR). In particular, the amount of costs for the construction of a part of the S1 expressway is very high.
- The total amount of investment costs for high priority projects in the Slovakia is set at about 2.35 bn EUR. In particular, the amount of costs for the modernization of a railway corridors from Žilina to the east and also from Žilina to the north (CZ and PL borders).
- The total amount of investment costs for medium priority projects in the Slovakia is set at more than 2.992 bn EUR. These costs consist of investments in the development of the road network – missing sections of motorway D1 from West to East Slovakia as part of TEN-T core network, missing section of motorway D3 from Žilina to the North borders as part of TEN-T core network and missing sections of expressway R3 as part of the TEN-T comprehensive network.

Sources of funding[12]

- Financing in the territory of the Poland is expected in the form of co-financing from EU resources under the: National Railway Program, National Roads Construction Programme and future Operational Programme for period 2021-2027. The amount of the subsidy is estimated at a maximum of 85% of the total eligible costs.
- Financing in the territory of the Slovakia is expected in the form of co-financing from EU resources under the: Operational programme Integrated Infrastructure 2014-2020, future Operational Programme for period 2021-2027 and Connecting Europe Facility (CEF). The amount of the subsidy is estimated at a maximum of 85% of the total eligible costs.

6.4. Cross-border Projects for implementation: Czech Republic – Slovakia

This action plan presents primarily the infrastructure projects necessary for the development of multimodal transport on the Czech Republic – Slovakia border (see fig. 6.5).

Fig. 6.5. Area of the TRANS TRITIA – cross-border Czech Republic – Slovakia

[12] The source of financing for some projects is not known at these moment.

The roadmap (figure 6.6) includes infrastructure projects that are located on the Czech – Slovak border and those which are necessary for the proper flow of goods and the development of multi-modal transport on the border of these two countries, connecting the regions: Moravian-Silesian Region and Žilina Self-Governing Region.

The list of projects is divided into rail, road and water transport projects. The proposed projects were evaluated in the context of their strategy implementation importance for the development of multimodal transport in the TRANS TRITIA area, with particular regard to the Czech Republic – Slovakia border. The project priorities were determined based on a broad discussion with stakeholders, according to the scale: high priority (most important for the development of multimodal transport on the CZ/SK border), medium priority (medium importance from the point of view of the development of multimodal transport on the CZ/SK border), low priority (low importance from the point of view of the development of multimodal transport on the CZ/SK border). Projects developing rail and water transport are considered top priority. However, some road transport projects should be implemented concerning the development of multimodal freight transport. The projects presented in figure 6.6 are in the zero scenario.

In terms of modes of transport, in the SK/CZ cross-border area, 6 projects were indicated in the field of rail transport, and in the field of road projects, 5 projects were indicated, which gives a total of 11 projects. Among the mentioned projects, short-, medium- and long-term ones were listed. In the short-term period (until 2022), 4 projects were selected for implementation. In the medium term (until 2025), 3 projects were planned, while in the long term (until 2030), 4 projects were planned. When prioritizing the projects, the team of experts concluded that:

- all of the railway projects have a high priority,
- no high priority projects were identified among road projects.

Investment value

- The total amount of investment costs for high priority projects in the Czech Republic is set at more than 3,76 bn CZK (140 M EUR). To this amount must be added the costs of projects that have not yet been developed in the form of detailed projects (see table above). In particular, the amount of costs of the construction of a high-speed line (in design preparation) will be a multiple of the part calculated so far. Approximately 75% of the fixed amount falls on the core construction "Reconstruction of infrastructure of the railway junction Ostrava (RFC5)". The rest is made up of less expensive railway network constructions.
- The total amount of investment costs for high priority projects in the Slovakia is set at around 680 M EUR. Planned projects represents missing modernization

of railways from Žilina to the North and Žilina node as important railway intersection in the Slovakia.

- The total amount of investment costs for medium priority projects in the Czech Republic is set at more than 6 bn CZK (227 M EUR). These costs consist of investments in the development of the road network.
- The total amount of investment costs for medium priority projects in the Slovakia is set at more than 624 M EUR. These costs consist of investments in the development of the road network (motorway D3).

Sources of funding[13]

- Financing in the territory of the Czech Republic is expected in the form of co-financing from EU resources under the Operational Program Transport 2021-2027. The amount of the subsidy is estimated at a maximum of 85% of the total eligible costs.
- Financing in the territory of the Slovakia is expected in the form of co-financing from EU resources under the: Operational programme Integrated Infrastructure 2014-2020, future Operational Programme for period 2021-2027 and Connecting Europe Facility (CEF). The amount of the subsidy is estimated at a maximum of 85% of the total eligible costs.

Fig. 6.6. The roadmap of infrastructure projects on the Czech – Slovak border

	Short-term	Mid-term	Long-term
Inland waterways projects			
Road transport projects	No 9 – D48 Frýdek-Místek, bypass No 10 – I/68 Třanovice-Nebory		No 6 – Project D3 Žilina, Brodno – Kysucke Nove Mesto No 7 – Project D3 Kysucke Nove Mesto – Oscadnica No 8 – Project D3 Oscadnica – Cadca Bukov
Railway transport projects	No 3 – ETCS – Mosty u Jablunkova – Dětmarovice No 11 – Information technologies	No 1 – Project Node Žilina No 2 – Project Krásno nad Kysucou – Cadca No 5 – Line Cesky Tesin - Albrechtice u Ceskeho Tesina	No 4 – Reconstr. Of stations on RFC5

High priority Medium priority

[13] The source of financing for some projects is not known at these moment.

6.5. Monitoring – TRITIA, national and European level

The implementation of tasks in the area of monitoring and evaluation will be based on the current structure of EGTC TRITIA, supported by the Steering Committee for the development of multimodal transport, as appointed by EGTC TRITA. Monitoring includes the implementation of projects around the Poland – Czech Republic – Slovakia border but in relation to the development of transport across the multimodal TRANS TRITIA area. The EGTC TRITIA is proposed to ensure interconnection between the entities, especially ministries and regional authorities, from the Czech Republic, Poland and Slovakia, in solving problems that require the participation of entities from several countries. At the same time, the implementation of plans for the EGTC TRITIA would be controlled continuously.

Every year, EGTC TRITIA submits a report to the Steering Committee based on annual implementation reports and monitoring indicators. Reports are prepared by the appointed Observatory. The key indicators monitored by the observatory will be at the TRITIA level:

- number and scope of projects,
- completion date,
- the scale of the investment,
- sources of financing,
- the level of demand for multimodal transport,
- level of freight flows on railways and roads,
- the development of the TEN-T network and infrastructure (roads, railways networks, and point),
- comparison of application of externalities in freight transport, including charges for the use of transport infrastructure,
- in addition, an important role, especially in the area of evaluation, will be played by the Coordinator who will support EGTC TRITIA with impact indicators, especially in the long term, on:
  - the need for infrastructure solutions for the development of multimodal transport,
  - linking with other projects developing multi-modal transport.

The key stakeholders of the action plan will be the owners and main investors of the projects, i.e.:

- PKP Polskie Linie Kolejowe (Polish railway infrastructure manager) (PL),
- Ministry of Infrastructure (Ministerstwo Infrastruktury) (PL),
- State Water Holding Polish Waters (Państwowe Gospodarstwo Wodne Wody Polskie) (PL),
- General Director for National Roads and Motorways (Generalna Dyrekcja Dróg Krajowych i Autostrad) (PL),
- National Highway Company (CZ),
- Ředitelství silnic a dálnic ČR (Directorate of Roads and Motorways) (CZ),
- Ministerstvo dopravy ČR (Ministry of Transport of the Czech Republic) (CZ),
- Správa železnic (Railway Administration, s.o.) (CZ),
- Ředitelství vodních cest ČR (Water infrastructure manager) (CZ),
- Ministerstvo Dopravy a Výstavby Slovenskej Republiky (Ministry of Transport and Construction of the Slovak Republic) (SK),
- Železnice Slovenskej republiky (Railways of the Slovak Republic) (SK),
- Národná diaľničná spoločnosť, a.s. (National Motorway Company, JSC) (SK).

In addition to the specified main stakeholders, the following other entities will be informed about the results of the project and at the same time will be an important source of information about the needs and new investments in the development of multimodal transport on the Poland – Czech Republic – Slovakia border:

- Europan level: team of the European Commissioner for Transport and the UIRR (Union internationale des sociétes de transport combiné Rail-Route) and Visegrad Group.
- National level: Ministry of Investment and Development (PL), Ministry of Finance (PL), Ministry of Maritime Economy and Inland Navigation (PL), Ministry of Infrastructure (PL), Ministry of Transport (CZ), Ministry of Transport and Construction of the SR (SK). Due to the fact that freight transport or construction projects on the railway network are not the responsibility of individual regions, the tasks must be pursued by the Ministries of Transport of individual states. The indicated entities may have their representatives on the Steering Committee.
- Regional level: Marshal's Office Śląskie Voivodeship, Śląskie Voivodeship Office (PL), Marshal's Office of Opolskie Voivodeship (PL), Opolskie Voivodeship Office (PL), Moravian-Silesian Region (CZ), Žilina Self-Governing Region (SK).

An important role in the development of multimodal transport is played by specific associations that have a significant impact on the development of multimodal transport. Cooperation with freight transport associations in each country is considered meaningful, as these associations usually have information on real capacity problems, can propose effective solutions and are the target group whose work is to evaluate traffic flows and eliminate bottlenecks. They can thus act both as opponents and as sources of valuable information. If necessary, other entities, such as chambers of commerce, may be invited to cooperate. These associations include, among others:

- The Association of International Road Carriers,
- Polish Chamber of Commerce for Car Transport and Forwarding,
- DGSA – Association of Advisors for the Transport of Dangerous Goods,
- Polish Chamber of Forwarding and Logistics (National member of the International Federation of Freight Forwarders Associations "FIATA" in Zurich),
- Association of Intelligent Transport Systems ITS,
- Association of Polish Regions of the Baltic – Adriatic Transport Corridor,
- Association of Rail Transport Experts and Managers,
- Transport and Logistics Poland (TLP),
- Transport Economics Association (SET),
- Polish Association of Telematics of Transport,
- Polish Transport Union and others,
- SOPK – Slovenská obchodná a priemyselná komora (Slovak Chamber of Commerce And Industry),
- AROS – Asociácia železničných dopravcov Slovenska (Association of Railways Operators of Slovakia),
- ČESMAD Slovakia – Združenie cestných dopravcov Slovenskej republiky (Association of Road Carriers of the Slovak Republic),
- ČESMAD BOHEMIA (CZ),
- ŽESNAD – Sdružení železničních nákladních dopravců České republiky (Association of Railway Freight Carriers of the Czech Republic),
- ČESTAND – České sdružení těžkých a nadrozměrných dopravců (Association represents Czech heavy and oversize transporters).

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7 Conclusions & recommendations

Transport development is considered to be one of the main elements of regional development. With the observation of the growing demand for transport, more and more attention is paid to their quality aspects. These include, among others, efficiency, safety, as well as constant striving to reduce external costs, which are primarily related to the negative impact on the natural environment. Cooperation between border countries and regions is essential for the coherence and continuity of goods flows. The challenges for the development of multimodal transport in the area of TRANS TRITIA indicated in the publication in the field of national (Poland, Czech Republic, Slovakia) and regional (TRANS TRITIA) policies, line and point infrastructure, social and economic effects, key players activities, provided the basis for seeking solutions to eliminate barriers to the development of multimodal transport in the TRITIA cross-border area.

The strategy building methodology used combined a number of analytic tools, including PEST analysis, resource analysis, stakeholder analysis, SWOT analysis and a Balanced Scorecard. The SWOT analysis was an important link between the results of the PEST analysis and the resource analysis. The results obtained jointly for all countries of the TRITIA region indicate that the key threats to the development of multimodal transport in this region are legislative difficulties and diverging transport policies between countries, while the quality of transport infrastructure is definitely a weakness. In the conducted analysis, some of the opportunities, strengths, weaknesses and threats are the same in all three countries, but there are also factors that are specific only to one country or two. As a result, the developed mission, vision and strategic goals are a response to the indicated challenges and the need for a coherent development of multimodal transport, based on cooperation between stakeholders of all countries, as an ecosystem focused on the sustainable development of the TRANS TRITIA region. In this spirit, the goals have been refined in the strategic scorecard perspectives. The projects necessary for its implementation correspond to each goal.

Research has shown that initiating activities aimed at the development of multimodal transport in the cross-border area requires the involvement of all the participants in the

process, i.e. all the countries (Poland, the Czech Republic and Slovakia), as well as very different stakeholders. For a further dynamic growth of the importance of multimodal transport in the TRANS TRITIA area, it is necessary to create favorable conditions for cooperation and joint implementation of projects in the area of infrastructure development and organizational support. The challenge for the studied area is, in the first place, to remove the backlog in the expansion, modernization and revitalization of the transport infrastructure and to connect the infrastructure of the most important nodes of the European transport network, including the core TEN-T corridors. A coherent network of high-standard highways, expressways and railways as well as a developed network of inland waterways will allow for the full use of the potential of the economy of the three analyzed countries. It should be remembered that the creation of a coherent multimodal transport ecosystem requires both the dynamic development of the missing elements of the transport infrastructure, as well as the improvement of the quality of infrastructure, its technical standards and the introduction of solutions integrating transport networks.

A transport model was also developed within the project. The purpose of the transport model was to identify the potential transfer of long-distance road traffic over 300 km to alternative modes of transport in the 2030 timeframe. The results of the zero scenario as well as the alternative scenarios are that out of the potential transfer identified in road transport, there is a possibility of transferring about 40%-50% to rail and 2%-4% to inland waterways. The reported values indicate the possibility that by the year 2030, the shift can cover more than 30% of road transport over 300 km. It would mean that the objectives stated in the White Paper – Roadmap to a Single European Transport Area – Creating a competitive transport system resources, could be met. If the objectives of the White Paper could be met, at the same time it is possible to support the EU low carbon economy (Roadmap for moving to a competitive low carbon economy in 2050). When analyzing and assessing the transport infrastructure within the TRANS TRITIA territory, the planned projects to 2030 were taken into account.

The actions indicated in the Action Plans, both in the sector and cross-border area, concern the development of infrastructure. Sector action plans focus on infrastructure by industry, as well as logistics centers and multimodal terminals. In the conducted research, it was essential to identify those areas that require additional investment, so that the infrastructure capacity allows for the transfer of some flows from road transport to rail transport and inland waterways. The cross-border action Plans analyzed the cross-border approach to the implemented projects, identifying the similarities and differences in the approaches of the particular countries and defining those areas that must be given high priority due to their key role in the development of multimodal transport in the TRANS TRITIA area.

All of the presented solutions are based on organizational solutions, the pillars of which are the results of the three proposed strategic projects:

- Observatory of multimodal transport in the TRITIA cross-border area (acronym: Observatory),
- Coordinator of the multimodal transport network (acronym: Coordinator),
- Competence centre for sustainable freight flows in the TRITIA cross-border area (acronym: Competence centre).

The Observatory and the Coordinator are key undertakings for the implementation of the entire strategy. Both the Observatory and the Coordinator are included in the monitoring processes in the individual action plans, but they are also the organizations necessary for the synchronization of flows and the unification of the multimodal transport system in the cross-border area and the initiation of future projects aimed at the development of multimodal transport. Support should be provided by the Competence Center, which is focused on research and development of alternative sources of propulsion and designing a network of innovative centers providing options for alternative propulsion source supply.

The foundation for the development of the ecosystem is the implementation of the specified infrastructural and organizational projects. Additionally, the implementation of infrastructure projects focusing on inland waterways is required. A revolutionary approach to the development of freight transport in the TRANS TRITIA cross-border area is based on the assumption of strong development of water corridors: D-O-L and the Silesian Canal. The Danube-Oder-Elbe water corridor (D-O-L) is one of the largest projects for the development of European transport infrastructure. It is not only the missing link in the interconnected European system of inland waterways, but also a multifunctional water project of great importance for Poland, the Czech Republic and Slovakia as well as for the whole of Europe. The Silesian Canal, on the other hand, as the planned waterway connecting the Oder with the Vistula and the Upper Silesian Industrial District and the Rybnik Coal District with Kraków, should become a critical point in the implementation of infrastructure projects in this scenario. It is to constitute not only an important element of the entire water system in Poland, but also in the future to enable the connection of the Vistula with the Danube.

Further projects related to point infrastructure (in addition to the Silesian Logistics Center and Euroterminal Sławków and the Logistics Center in Ostrava) will be determined by the decisions of stakeholders (including in particular national and local authorities): a trimodal center in Žilina, Krzyżanowice transshipment terminal, Racibórz logistic center, Cointainer terminal Gorzyce – Věřňovice, Rybnik inland port & transshipment terminal, Żory transshipment terminal, Bieruń transshipment terminal, AZOTY specialist

transshipment teminal, Kędzierzyn-Koźle container terminal). Certainly, not all the terminals or logistic centers will be launched in the period 2020-2030, but decisions in this regard should result from joint solutions proposed as part of the activities undertaken by the Observatory and the Coordinator of the multimodal freight transport network in the TRANS TRITIA cross-border area. Joint decisions should concern multimodal transport in its entirety, which means that line infrastructure, especially rail, should be an equally important priority for the future perspective (2030) of multimodal transport in the TRANS TRITIA area.

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4. TRITIA Railway Action Plan
5. TRITIA Intermodal Logistic Centres/Terminals Action Plan
6. TRITIA Transport model

9 Annexes

9.1. TRANS TRITIA traffic model – maps/tables

9.1.1. The implementation plan for individual TRANS TRITIA regions (transport model)

Tab. A.1. Implementation plan – Moravian-Silesian Region

Transport mode	Project Name		Project Type	Planned implementation
Projects from strategic documents				
Road	I/11	Opava – north bypass, west part	New 1st class bypass	2020-2023
Road	I/11	Opava – north bypass, east part	New 1st class bypass	2017-2019
Road	I/11	Ostrava – extended Rudná, bypass	New motorway	2012-2020
Road	I/11	Havířov – Třanovice	New motorway	2028-2032
Road	I/45	Bruntál – east bypass, 1st phase	New 1st class bypass	2022-2026
Road	I/45	Nové Heřminovy – Zátor – bypass, 1st phase	New 1st class bypass	2023-2026
Road	D48	Bělotín – Rybí, highway	Upgrade of existing motorway	2019-2023
Road	D48	Rybí – Rychaltice, highway	Upgrade of existing motorway	2017-2020
Road	D48	Frýdek-Místek, highway bypass	New highway bypass	2018-2022
Road	D56	Frýdek-Místek, connecting to D48	New highway bypass	2018-2022
Road	I/57	Krnov – north east bypass	New 1st class bypass	2017-2021
Road	I/58	Příbor – Skotnice	New 1st class road	2017-2020

Transport mode	Project Name		Project Type	Planned implementation
Road	I/58	Mošnov – bypass	New 1st class bypass	2022-2024
Road	I/58	Frenštát pod Radhoštěm – Vlčovice	New 1st class bypass	2029-2031
Road	I/67	Karviná bypass	New 1st class bypass	2020-2022
Road	I/68	Třanovice – Nebory	New motorway	2019-2022
Railway	305B, 301G	Town Ostrava with surrounding area	Modernization and capacity utilization of the railway junction Ostrava hl.n. and adjacent track sections	2025-2033
Railway	305B	Section Polom – Suchdol nad Odrou	Reconstruction of 12.525 km of track, new railway turning Vražné	2022-2023
Railway	301A, 301B	Section Dětmarovice – Petrovice u Karviné	Reconstruction of 9.8 km of track and railway station Petrovice u Karvine and Dětmarovice, Increase speed to 100 km/h	2020-2022
Railway	301B	Petrovice u Karviné	Track electrification, new safety device, displacement of Dětmarovice head , extension of track for freight trains, new platform	2020-2022
Railway	305B	Section Přerov – Ostrava	Diverting long-distance passenger traffic to a new line and thus creating new capacity for freight trains on an existing network	2025-2030
Railway	301A	Section Český Těšín (outside) – Albrechtice u Českého Těšína (including)	Increase speed from 80 km/h to 100–145 km/h	2022-2023
Railway	305B, 301G, 301D	Section Ostrava-Kunčice – Ostrava-Svinov/ Polanka nad Odrou	Track reconstruction in the section and station Ostrava-Vítkovice, increase speed to 120 km/h	up to 2030
Railway	302A	Section Ostrava-Kunčice – Frýdek-Místek	Double-track (13.797 km) and electrification of existing tracks in the Vratimov – Frýdek-Místek section, extension of rails at freight train stations, increase speed to 120 km/h	2021-2023
Railway	301A, 305B, 305A, 305C	Station Bohumín-Vrbice, Section Bohumín-Vrbice – Chałupki	Track reconstruction in the section Bohumín-Vrbice (outside) – border crossing PR, new railway turning Bohumín-Pudlov	2022

Transport mode	Project Name		Project Type	Planned implementation
Railway	305B, 305A, 305C	Section Bohumín-Vrbice – Chałupki and Bohumín – Chałupki	Track line interconnection with switches, upgrading of the Bohumín – Pudlov railway turning	up to 2030
Railway	305B, 306A	Studénka station, Sedlnice – Bartošovice station	New connecting line (clutch) between line 305B and 306A, Sedlnice-Bartošovice station – new track, Sedlnice station – new track	2020
Road/ Railway	I/58, D48, 305H	Mošnov	New intermodal terminal	up to 2030
Water	Oder, section Ostrava – border crossing CZ/PL		Not in use in the Czech Republic at present, the waterway is in the study phase, its class will be Va. (13 km)	up to 2030
Projects from TRANS TRITIA traffic model				
Railway	301A	Třinec – Český Těšín freight railway station	Capacity increase	up to 2030
Railway	301A	border crossing (SK/CZ) – Mosty u Jablunkova	Capacity increase	up to 2030
Railway	301A	Bystřice nad Olší – Třinec	Capacity increase	up to 2030
Railway	301D	Chotěbuz turning – Albrechtice u Č.Těšína	Capacity increase	up to 2030
Railway	305B	Jistebník – Studénka	Capacity increase	up to 2030

Tab. A.2. Implementation plan – Śląskie and Opolskie Voivodeship

Transport mode	Project Name		Project Type	Planned implementation
Projects from strategic documents				
Road	GP40	Kedzierzyn-Kozle – bypass	New 1st class road	2018-2022
Road	S11	Kępno – A1 – new road	New expressway	2020-2022
Road	GP46	Niemodlin – bypass	New 1st class road	2019-2021
Road	S1	Kosztowy – Bielsko-Biała – new road	New expressway	2019-2023
Road	A1	Częstochowa – Tuszyn – new road	New motorway	2017-2022
Road	S1	Przybędza – Milówka – new road	New expressway	2018-2023
Road	S1	Pyrzowice – Kosztowy – upgrade of existing road to higher class	New expressway	2018-2020
Road	S11	Kępno – bypass	New expressway	2017-2021
Road	GP78	Poręba, Zawiercie – bypass	New 1st class road	2019-2023
Road	S11	Tarnowskie Góry – bypass	New expressway	2019-2024
Road	GP45	Praszka – bypass	New 1st class road	2018-2022
Road	S11	Olesno – bypass	New expressway	2018-2022
Road	GP1	Pszczyna – intersection	Intersection on 1st class road	2017-2019
Road	S11	Opole Voivodeship border – Tarnowskie Góry bypass – new road	New expressway	2019-2024
Road	S1	Pyrzowice – Podwarpie – new road	New expressway	2018-2021
Road	GP39	Brzeg – bypass	New 1st class road	2021-2024
Road	A1	Rząsawa – Blachownia – new road	New motorway	up to 2019
Road	S1	Oświęcim – Dankowice – new road	New expressway	2019-2023
Road	S1	Dankowice – Suchy Potok – new road	New expressway	2019-2023
Road	GP44	Oświęcim – bypass	New 1st class road	2019-2021

Transport mode	Project Name		Project Type	Planned implementation
Railway		Jastrzębie Zdrój Wodzisław Śl.	Modernization of infrastructure	2019-2023
Railway		Gogolin – Krapkowice – Prudnik	Modernization of infrastructure	2019-2023
Railway	171	Katowice Muchowiec – Ruda Kochłowice	Works on the south-eastern GOP beltway along with adjacent sections	2019-2021
Railway	C-E 65	Chorzów Batory – Tarnowskie Góry – Karsznice – Inowrocław – Bydgoszcz – Maksymilianowo	The Operational Programme Infrastructure and Environment 2014-2020 (OPIE 2014–2020)	2018-2022
Railway	694, 157, 190, 191	Bronów – Bieniowiec – Skoczów – Goleszów – Cieszyn / Wisła Głębce	Modernization of infrastructure	2014-2020
Water	Poland	Oder Waterway	Support for the inland waterway development policy in the light of the new Water Law	2018-2021
Water	Poland	Oder Waterway	The research and technical concept for the modernization of selected section of the Oder Waterway to the navigability class Va	2018-2019
Water	Poland	Oder Waterway	The research and technical concept for the modernization of selected section of the Oder Waterway to the navigability class Va	2018-2019
Water	Poland	Opole – Kędzierzyn-Koźle	Modernisation Va	2020-2025
Water	Poland	Kędzierzyn-Koźle – Waterway Node (ODW-DOL)	Construction Va (km 117,000 – km 159,800) 42.8 km	2025-2030
Water	Poland	Waterway Node – Lock Buków (incl. reservoir Racibórz Dolny)	Construction Va (km 103,000 – km 117,000) 14 km	2025-2030
Water	Poland	Lock Buków– cross-border PL/CZ	Construction Va (km 103,000 – km 98,300) 4.7 km	2025-2030
Water	Poland	Kędzierzyn-Koźle – Gliwice	Modernization, Va	2020-2030
Water	Poland	Silesian canal	Construction	2020-2030

Transport mode	Project Name		Project Type	Planned implementation
Projects from TRANS TRITIA traffic model				
Railway	131	Chorzów Stary – Bytom Północny	Capacity increase	up to 2030
Railway	131	Radzionków – Tarnowskie Góry	Capacity increase	up to 2030
Railway	131	Tarnowskie Góry – Zwierzyniec	Capacity increase	up to 2030
Railway	131	Strzebiń – Kalina	Capacity increase	up to 2030
Railway	131	Herby Nowe – Kłobuck	Capacity increase	up to 2030
Railway	139	Katowice Ligota – Mąkołowiec	Capacity increase	up to 2030
Railway	139	Tychy – Pszczyna	Capacity increase	up to 2030

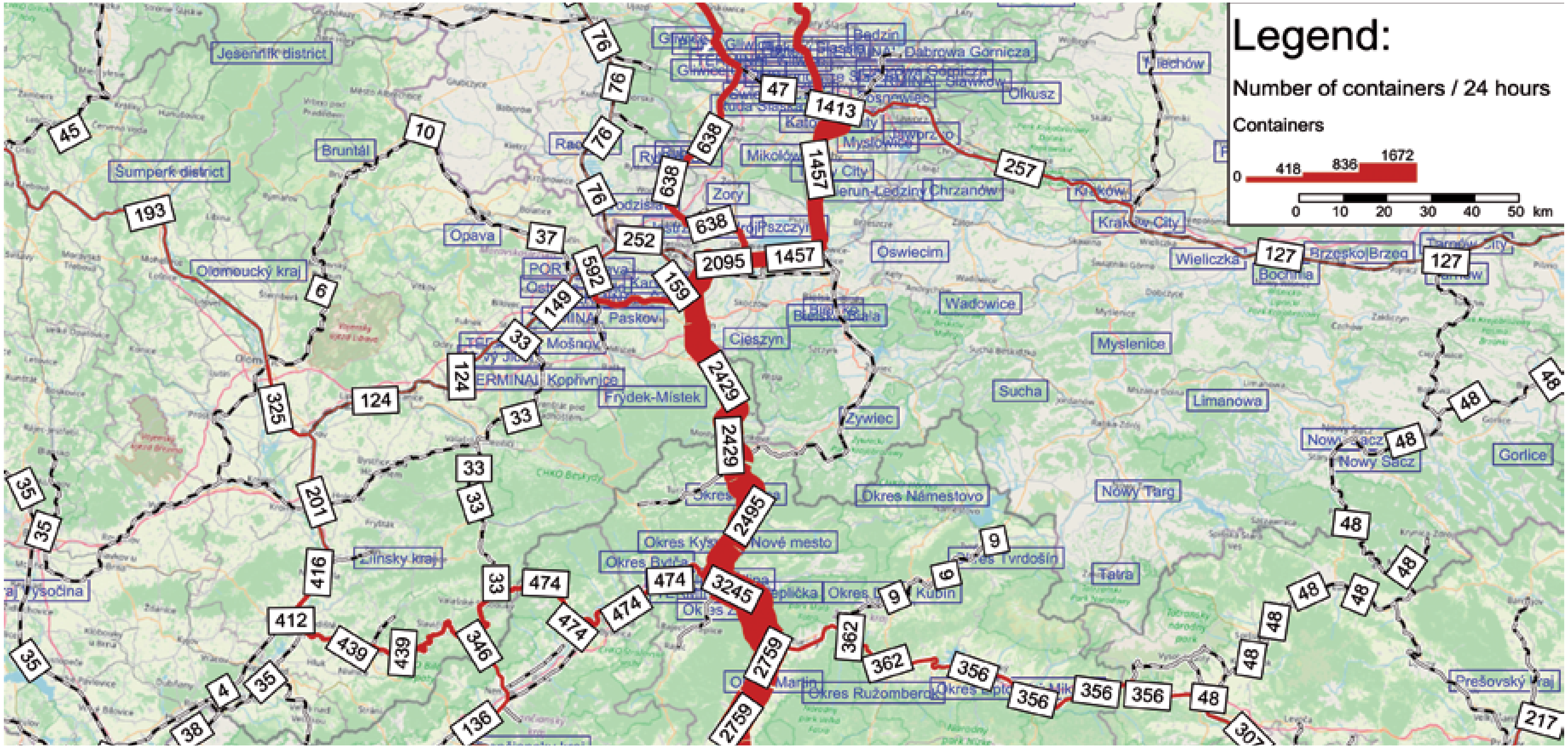
Tab. A.3. Implementation plan – Žilina Region

Transport mode	Project Name		Project Type	Planned implementation
Projects from strategic documents				
Road	R1	Banská Bystrica – Sl. Ľupča	New expressway	up to 2023
Road	R1	Sl. Ľupča – Korytnica	New expressway	up to 2027
Road	R1	Korytnica border of Žilina Region – Litpvská Osada – Ružomberok south	New expressway	up to 2028
Road	R1	Ružomberok I/18 – D1 intersection	New expressway	up to 2026
Road	R3	Tvrdošín – Nižná nad Oravou	New expressway	up to 2021
Road	R3	Nižná nad Oravou – Dlhá nad Oravou	New expressway	up to 2026
Road	R3	Dlhá nad Oravou – Sedliacka Dubová	New expressway	up to 2026
Road	D1	Hubová – Ivachnová	New motorway	up to 2022
Road	D1	Ružomberok south – I/18 intersection	New motorway	up to 2025
Road	D1	Hričovské Podhradie – Lietavská Lúčka	New motorway	up to 2020
Road	D1	Lietavská Lúčka – Dubná Skala	New motorway	up to 2023
Road	D1	Feeder Lietavská Lúčka – Žilina II. phase	New motorway	up to 2020
Road	D1	Turany – Hubová	New motorway	up to 2030
Road	D3	Žilina, Brodno – Kysucké Nové Mesto	New motorway	up to 2030
Road	D3	Kysucké Nové Mesto – Oščadnica	New motorway	up to 2030
Road	D3	Oščadnica – Čadca, Bukov – full profile	New motorway	up to 2030

Transport mode	Project Name		Project Type	Planned implementation
Railway	106A, 106D, 114A	Žilina node	Infrastructural, modernization with new line security (ETCS 2 with GSMR) and transition to 25kV electrification	2019-2021
Railway	106D	Krásno nad Kysucou – Čadca (border), section Čadca – Krásno nad Kysucou	Modernization of infrastructure, line security and transition to 25kV electrification	2022-2025
Railway	105A	Poprad – Východná	Modernization of infrastructure, line security and transition to 25kV electrification	2025-2028
Railway	105A	Východná – Liptovský Hrádok	Modernization of infrastructure, line security and transition to 25kV electrification	2024-2026
Railway	105A	Liptovský Hrádok – Liptovský Mikuláš	Modernization of infrastructure, line security and transition to 25kV electrification	2020-2023
Railway	105A	Liptovský Mikuláš – Ružomberok	Modernization of infrastructure, line security and transition to 25kV electrification	2024-2025
Railway	105A, 106A	Ružomberok – Turany	Modernization of infrastructure, line security and transition to 25kV electrification	2026-2029
Railway	106A	Turany – Vrútky	Modernization of infrastructure, line security and transition to 25kV electrification	2024-2025
Railway	106A	Vrútky – Varín	Modernization of infrastructure, line security and transition to 25kV electrification	2026-2028
Projects from TRANS TRITIA traffic model				
Railway	118A	Diviaky – Vrútky	Capacity increase	up to 2030

9.2.1. T9.1.2. TRANS TRITIA traffic model – schemes of potential shift between modes of transport in TRANS TRITIA year 2030

Fig. A.1. Scheme of potential shift between modes of transport in TRANS TRITIA, year 2030 – railway transport



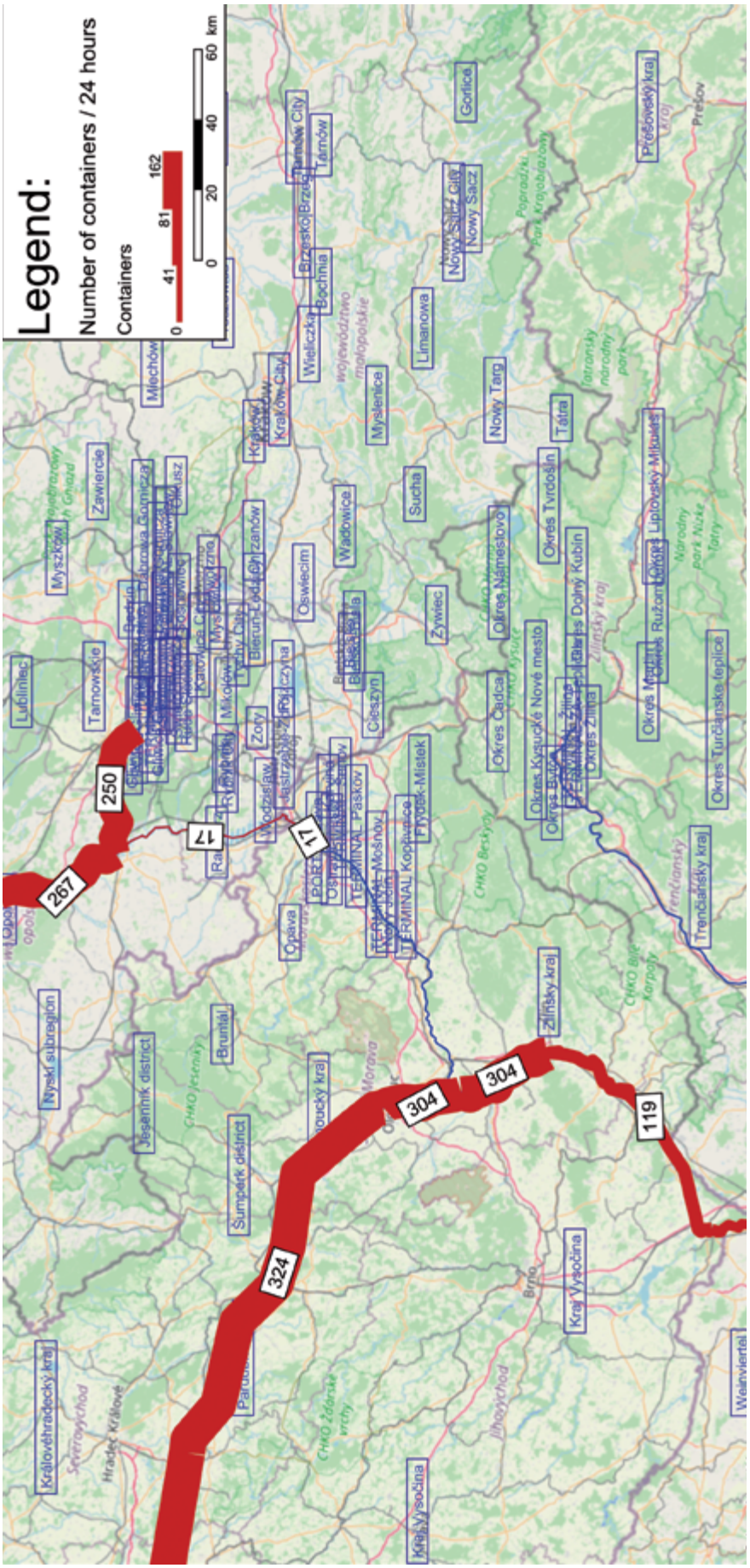


Fig. A.2. Scheme of potential shift between modes of transport in TRANS TRITIA, year 2030 – inland waterway transport

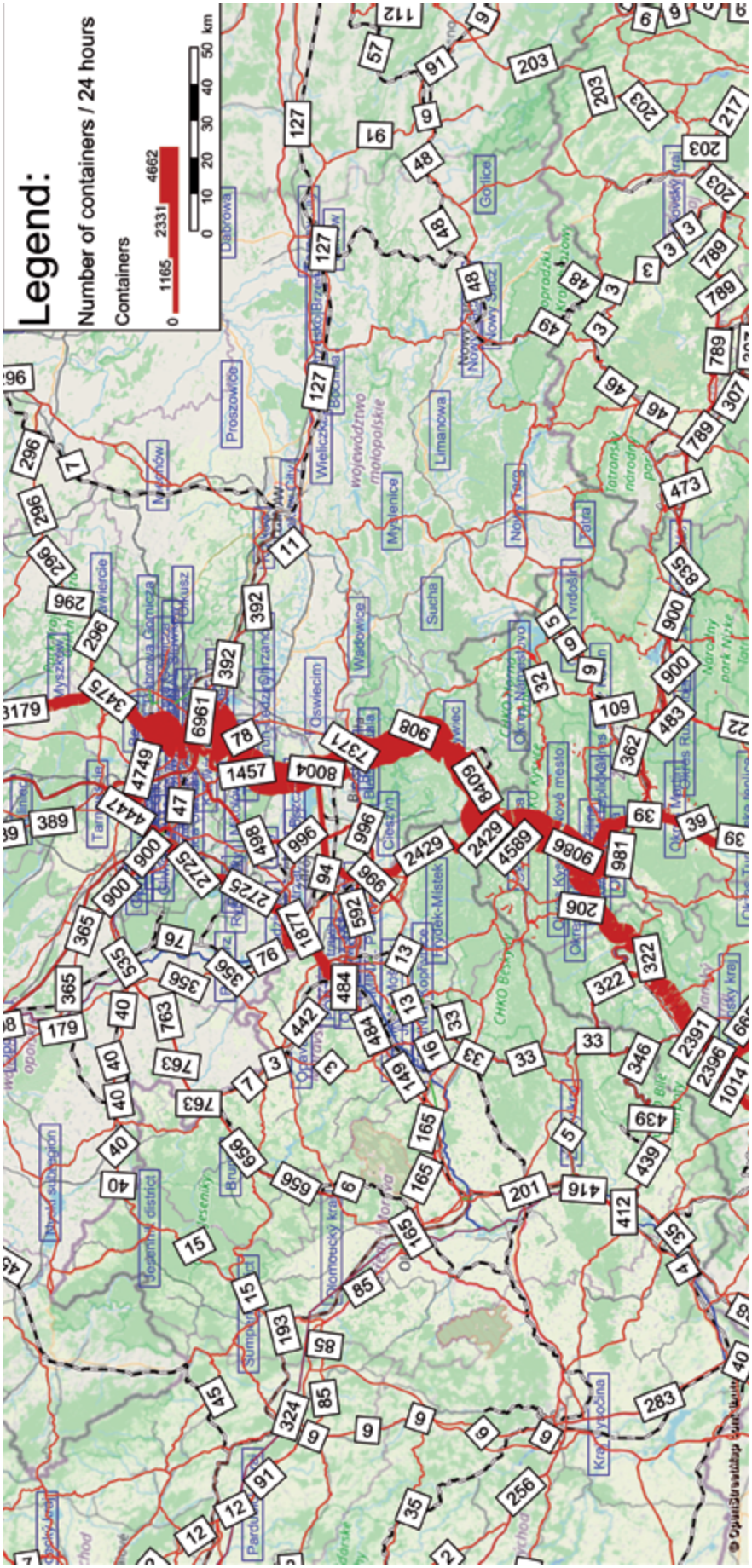


Fig. A.3. Scheme of potential shift between modes of transport in TRANS TRITIA, year 2030 – road transport

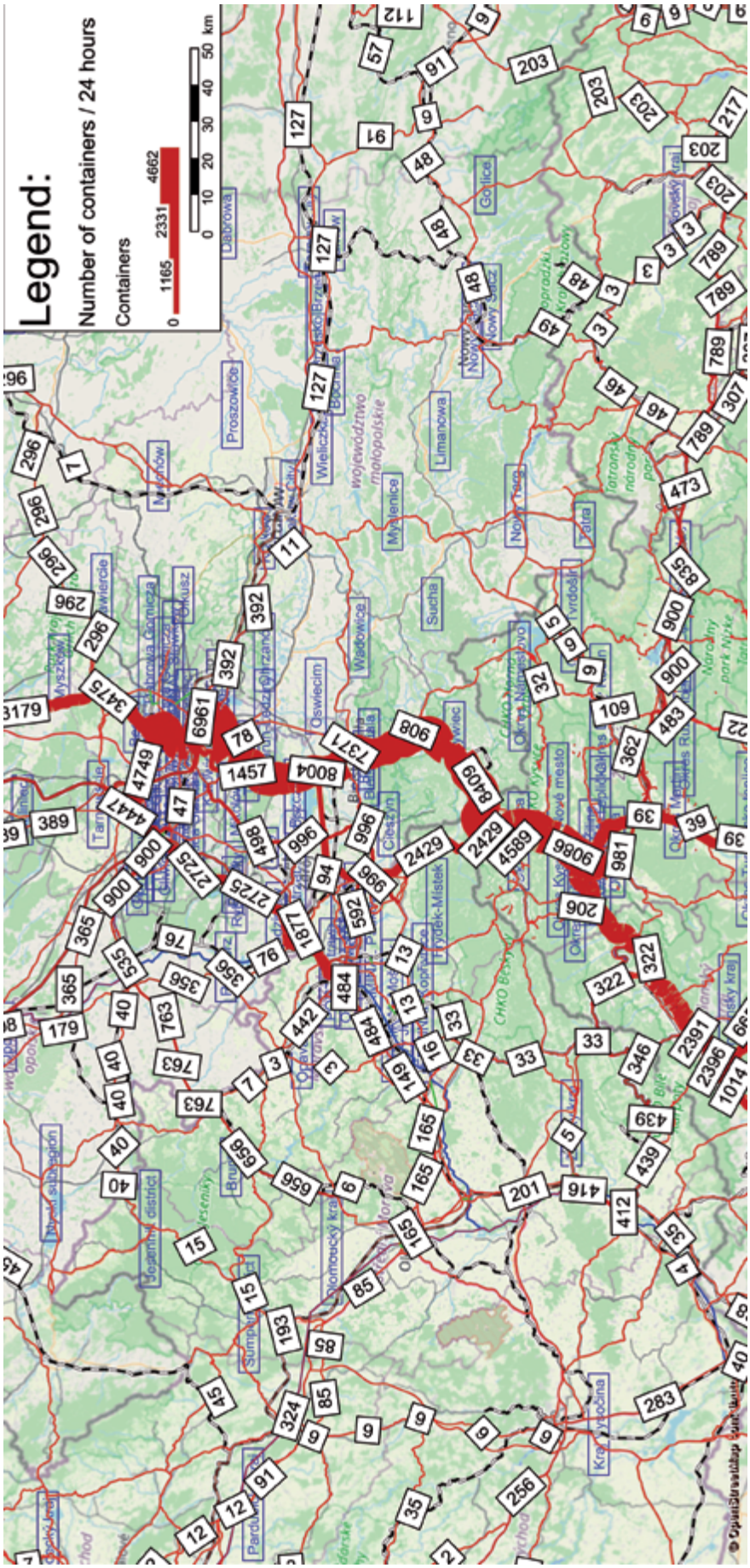


Fig. A.4. Scheme of potential shift between modes of transport in TRANS TRITIA, year 2030 – all transport modes

9.2. Strategic documents

9.2.1. TRITIA Regional Multimodal Freight Transport Strategy
9.2.2. Methodology of preparation of multimodal freight transport strategy for all partners
9.2.3. Strategic assessment of the business environment for TRITIA territory
9.2.4. Definition of strategic objectives of TRITIA territory in terms of freight transport
9.2.5. Strategic projects supporting development of freight transport on TRITIA territory
9.2.6. Organisational framework for implementation of the Strategy
9.2.7. PL – CZ Cross-border Action Plan
9.2.8. PL – SK Cross-border Action Plan
9.2.9. SK – CZ Cross-border Action Plan
9.2.10/11/12. Selection and prioritisation of cross-border projects for implementation
9.2.13/14/15. Budgeting of selected cross-border projects
9.2.16. TRITIA Inland Waterway Action Plan
9.2.17. Inland waterways system at TRITIA area
9.2.18. Road to Inland Waterways. Transfer of Shipments
9.2.19. TRITIA Railway Action Plan
9.2.20. Report on capacity increase of the rail connections at TRITIA area
9.2.21. Road to Rail potential shift of transport flows
9.2.22. TRITIA Intermodal Logistic Centres/Terminals Action Plan
9.2.23. Map of Intermodal Logistic Centres/Terminal at TRITIA area
9.2.24. Intermodal Logistic Centres/Terminal at TRITIA area – Future
9.2.25. Implementation plan for TRITIA region
9.2.26. Methodology of development of traffic surveys
9.2.27. Preparation and performance of annual traffic surveys
9.2.28. Evaluation of traffic surveys
9.2.29. Assessment of rail transport system at TRITIA area
9.2.30. Assessment of inland waterways system at TRITIA area
9.2.31. Report with methodology for TRITIA transport model
9.2.32. Report on the zero scenario of TRITIA transport model
9.2.33. Report on alternative scenarios of TRITIA transport model

Strategic documents in electronic version are available on the pendrive included in the publication.

9.3. Films

9.3.1. Inland Waterway Action Plan

9.3.2. Railway Action Plan

9.3.3. Intermodal logistic centres/terminal Action Plan

Films in electronic version are available on the pendrive included in the publication.

9.4. Maps

9.4.1. Trans Tritia Waterway Map

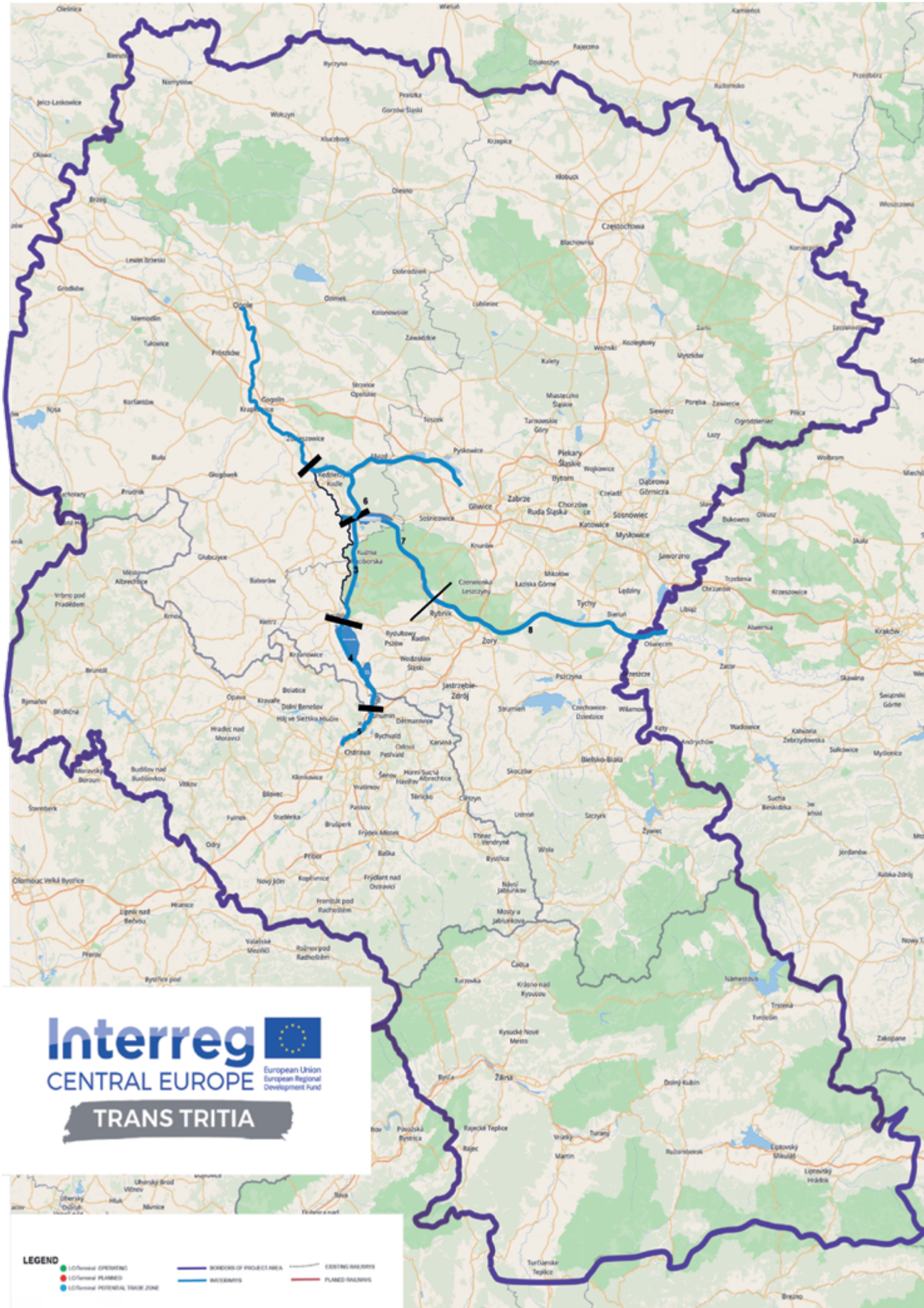
9.4.2. Trans Tritia Rail Map

9.4.3. Trans Tritia Logistic Centers Map

9.4.4. Trans Tritia waterway, railway, logistic centers map

Maps in electronic version are also available on the pendrive included in the publication.

9.4.1. Trans Tritia Waterway Map



CZ No 1a: High speed line Přerov – Ostrava
Proposed by: MDCR
estimated cost € 50 m.

Cz No 1b: Increasing of capacity Prerov – Ostrava
Proposed by: TRANS TRITIA
estimated cost € 500 m.

CZ No 2: Conversion from DC to AC and ETCS Hranice CR/ SR – Chotebuz
Proposed by: MDCR
estimated cost € 200 m.

Cz No 3: Reconstruction of Ostrava node
Proposed by: MDCR
estimated cost € 300 m.

Cz No. 4 Increasing the capacity Pudlov – Chalupki
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estimated cost € 50 m.

Cz No.5 Electrification and doubling of track Ostrava-Frydek-Mistek
Proposed by: MDCR
estimated cost € 200 m.

Cz No. 6 Conversion from DC to AC and ETCS Cesky Tesin – Ostrava – Kuncice
Proposed by: MDCR
estimated cost € 100 m.

CZ No 7a: Increasing capacity switch Odra - Ostrava-Svinov
Proposed by: MDCR
estimated cost € 50 m.

CZ No 7b: Connection Vratimov-Ostrava-Bartovice
Proposed by: TRANS TRITIA
estimated cost € 100 m.

SK No 1: Modernization, ETCS, conversion from DC to AC Vrútky – Diviaky
Proposed by: TRANS TRITIA
estimated cost € 300 m.

SK No 2: Modernization, ETCS, conversion from DC to AC Vrútky – Žilina
Proposed by: MDV SR
estimated cost € 350 m.

SK No 3: Modernization, ETCS, conversion from DC to AC Bytča – Žilina
Proposed by: MDV SR
estimated cost € 300 m.

PL 1: Herby Nowe – Klobuck
estimated cost € 220 m.

PL 2: Opole Groszowice - Kędzierzyn Koźle / Katowice – Trzebinia
Proposed by: TRANS TRITIA
estimated cost € 1 bn.

PL 3a: Tychy – Pszczyna
Proposed by: PKP PLK
estimated cost € 230 m.

PL 3b,8b: High speed line Katowice – Ostrava
Proposed by: TRANS TRITIA
estimated cost € 1bn.

PL 4: Katowice Ligota – Makolowiec
Proposed by: PKP PLK
estimated cost € 115 m.

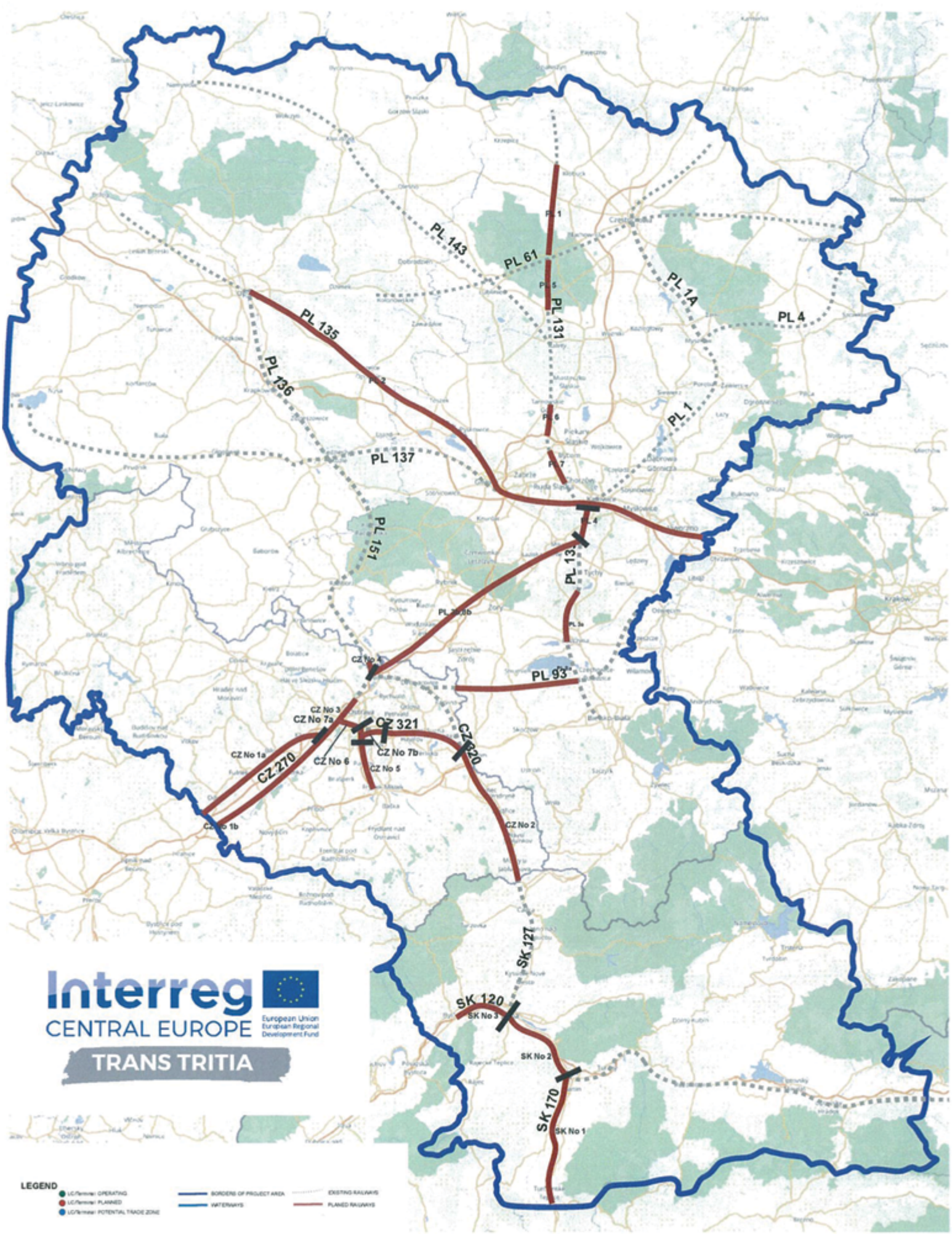
PL 5: Strzebiń – Kalina
Proposed by: PKP PLK
estimated cost € 115 m.

PL 6: Radzionków - Tarnowskie Góry – Zwierzynec
Proposed by: PKP PLK
estimated cost € 120 m.

PL 7: Chorzów Stary - Bytom Północny
Proposed by: PKP PLK
estimated cost € 210 m.

PL 8a: Zabrzydowice - Czechowice – Dziedzice
Proposed by: PKP PLK
estimated cost € 345 m.

9.4.2. Trans Tritia Rail Map



9. **Cointainer terminal Gorzyce – Věřnovice**
   Year of completion: 2030

10. **Racibórz logistic centre:**
    Year of completion: 2030

11. **Krzyżanowice transhipment terminal**
    Year of completion: 2030

12. **Rybnik inland port and transhipment terminal**
    Year of completion: 2030

13. **Żory transhipment terminal**
    Year of completion: 2030

14. **Bieruń transhipment terminal**
    Year of completion: 2030

15. **AZOTY specialist transhipment terminal**
    Year of completion: 2030

16. **Kędzierzyń Koźle container terminal**
    Year of completion: 2030

17. **Silesian Logistics Center JSC**
    Year of completion: <2030

18. **Euroterminal Sławków**
    Year of completion: 2030

19. **Ostrava trimodal terminal**
    Road connection to Ostrava trimodal terminal
    Year of completion: 2030

20. **Rail coupling of Vratimov – Ostrava** Bartovice
    Year of completion: 2030

21. **Capacity increasing**
    Ostrava – Vitkovice – Ostrava – Svinov
    Year of completion: 2025

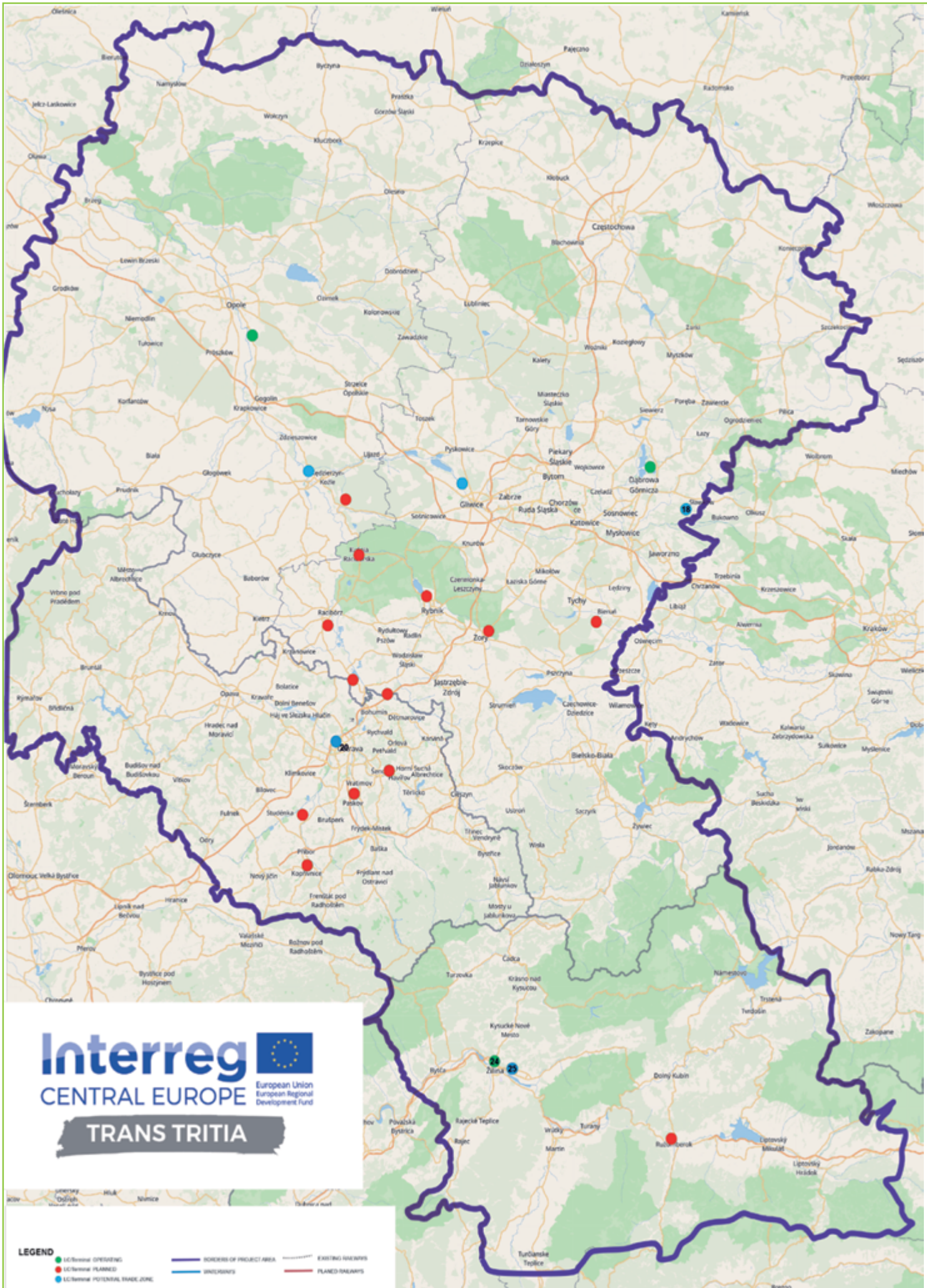
22. **Rail couplin – triangle of Studenka**
    Year of completion: 2025

23. **Upgrade of Paskov terminal**
    Year of completion: 2030

24. **TIP Žilina crossroad and extension**
    of road I/583 to I/18
    Year of completion: 2030

25. **Expansion of storage capacities of TIP Žilina**
    Year of completion: 2030

9.4.3. Trans Tritia Logistic Centers Map



1. **Opole - Kędzierzyn Koźle**
   activity: modernisation
   time period: 2020 – 2025
   estimated cost €: 0.39 bn.

2. **Kędzierzyn-Koźle - Waterway Node (ODW-DOL)**
   Documentation and procedure
   Time period: 2020 - 2025
   Construction
   Time period: 2025 - 2030
   estimated cost € 0,49 bn.

3. **Waterway Node – Lock Buków (in.c l reservoir Racibórz Dolny)**
   Documentation and procedure
   Time period: 2020 - 2025
   Construction
   Time period: 2025 – 2030
   estimated cost € 0.14 bn.

4. **Lock Buków – cross border PL/CZ**
   Documentation and procedure
   Time period: 2020 - 2025
   Construction
   Time period: 2025 - 2030
   estimated cost € 0.23 bn.

5. **Cross border CZ /PL (Starý Bohumin) – Port of Ostrava**
   Documentation and procedure
   Time period: 2020 - 2025
   Construction
   Time period: 2025 - 2030
   estimated cost € 0.51 bn.

6. **Reservoir Kotlarnia**
   Documentation and procedure
   Time period: 2020 - 2025
   Construction
   Time period: 2025 - 2030
   estimated cost € 0.02 bn.

7. **Lateral canal, section Kotralnia Reservoir Rybnik**
   Documentation and procedure
   Time period: 2020 - 2025
   Construction
   Time period: 2025 – 2030
   estimated cost € 0.42 bn.

8. **Lateral canal, section Rybnik – Oświęcim**
   Documentation and procedure
   Time period: 2020 - 2025
   Construction
   Time period: 2025 - 2030
   estimated cost € 1.52 bn.

9. **Cointainer terminal Gorzyce – Věřnovice**
   Year of completion: 2030

10. **Racibórz logistic centre:**
    Year of completion: 2030

11. **Krzyżanowice transhipment terminal**
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15. **AZOTY specialist transhipment terminal**
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    Year of completion: 2025

22. **Rail couplin – triangle of Studenka**
    Year of completion: 2025

23. **Upgrade of Paskov terminal**
    Year of completion: 2030

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    Year of completion: 2030

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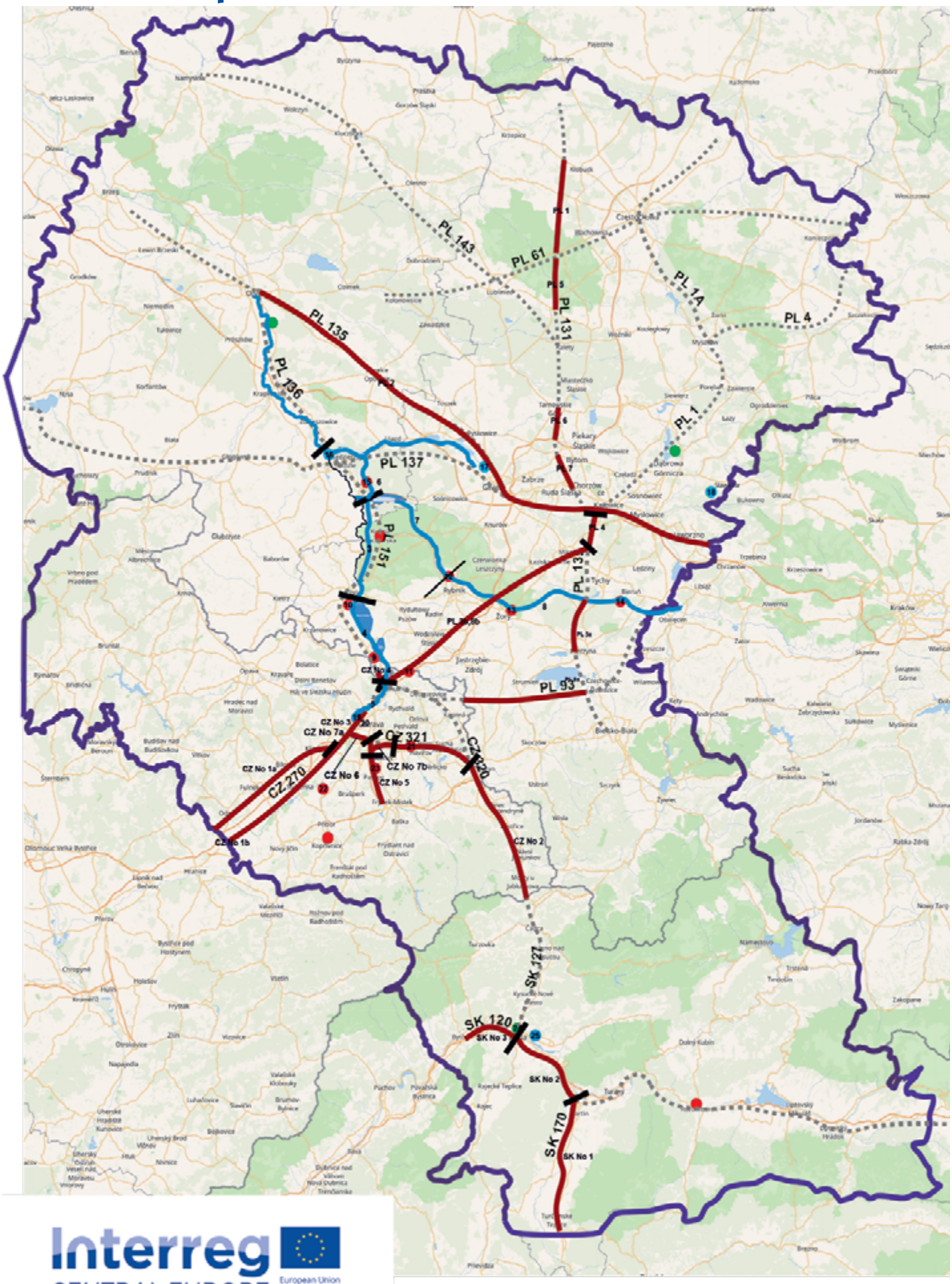
9.4.4. Trans Tritia waterway, railway, logistic centers map



Interreg CENTRAL EUROPE
European Union European Regional Development Fund

TRANS TRITIA

LEGEND

Notebook

10 Description of the Project Partners

Upper Silesian Agency for Entrepreneurship and Development Ltd. (Górnośląska Agencja Przedsiębiorczości i Rozwoju sp. z o.o.) is a dynamically operating Business Environment Institution, which provides services supporting development and entrepreneurship. GAPR Ltd. is a platform for dialogue and cooperation between entrepreneurs, state and local government authorities. It is also an ideal place for people looking for innovative solutions. Cooperation with scientists makes it an excellent partner in the process of commercialization of scientific and technological research results in the economy. GAPR LTD. focuses on (HTS) high technology services, which combined with new communication routes, modern facilities and available land for development, makes the company exceptionally attractive for investors. In addition, the company effectively uses EU funds through the implementation of innovative projects, which have the opportunity to impact on improving the competitiveness of the region and significantly support entrepreneurial attitudes, opening the way to the creation and implementation of innovations. The mission is to provide modern services promoting innovative solutions and involvement in major infrastructure investments. All this influences the development of the region's economy and stimulates the development of entrepreneurship, which consequently leads to a positive change in the image of the entire region.

https://gapr.pl/en/

The Union for the Development of the Moravian-Silesian Region (Sdružení pro rozvoj Moravskoslezského kraje z.s) (...) has been operating in the Moravian-Silesian Region since 1990. At present, it associates 126 members, which are industrial, construction and business enterprises, distribution companies and other business entities, branch clusters, towns and municipalities, consultancy organizations, healthcare organizations, and insurance companies, personnel, education and development agencies. The Union promotes the common interests of its members on a long-term

basis in accordance with the development strategy of the Moravian-Silesian Region and supports the intra-regional debate. The Union also cooperates with other subjects in the region (the Moravian-Silesian Region, the Regional Chamber of Commerce and the MSK Development Association.

http://msunion.cz/

VUD – Transport Research Institute, JSC. (Výskumný ústav dopravný, a. s) (...) is the leading organization of science, research, and development in transport in Slovakia with a long-term tradition. VUD scientific and research activities cover all modes of transport except air transport, particularly in the field of legislation, policy, engineering, technology, operation, economy, management, informatics, automation, ecology, transport infrastructure safety and quality, transport services, statistics, certification and testing and thus ensures complex solutions for different transport issues. This specialization is necessary for an in-depth solutions to those problems, ensuring customer satisfaction, among which include: Ministry of Transport, Construction and Regional Development of the Slovak Republic, Ministry of Interior of the Slovak Republic, Slovak Research and Development Agency, Slovak Road Administration, ZSR (Railways of Slovak Republic), EC, Slovak self-governing regions and a large group of private companies.

http://www.vud.sk/

Transport Designing LTD – (Dopravní projektování) is a design and engineering organization operating on the market since 1997. The main activity of the company is to the design transport structures. They offer design work in the fields of rail and road transport, building constructions, urban and suburban transport, co mmunication and security technology and geodetic activities. It cooperates on transport strategy plans in Moravian-Silesian Region. It is partner in transport and company associations in border region. The main business of the organisation is engaged in designing projects in transport and traffic engineering. Range of work is whole from studios to implementation projects. It designs construction of railways, roads, and buildings.

https://www.dopravniprojektovani.cz/en/

University of Žilina (Žilinská univerzita v Žiline) was established on 1st October 1953 by separation from the Czech Technical University in Prague like the College of Railway. With its more than 50 years of history occupies a forefront place in the Slovak education space. Cooperation with foreign universities allows students and teachers actively participate in international programs LLP/ERASMUS, Leonardo da Vinci, CEEPUS, TEMPUS, COPERNICUS, COST, 5th, 6th, 7th Framework Programme and others. In all forms of study is studying approximately 12 000 students and in university are working 1 500 staff. As a member of the European University Association (EUA) since 2000 University of Žilina in 2002 underwent a comprehensive evaluation of this important association. The Faculty of Civil Engineering and Research centre that will be involved in the project is focused on design of transport infrastructure, maintenance and reconstruction of roads, bridges, railways and tunnels and transport planning. Research activities are concentrated on new types of transport structures, diagnosis and evaluation of existing structures under dynamic loads, pavement and bridge management systems and testing of road construction materials, and planning traffic.

https://www.uniza.sk/

CHAPTERS AUTHORS:

Bado Ján – chapter 5
Danišovič Peter – chapter 5
Dávid Andrej – chapters 4
Dohn Katarzyna – chapters 3, 6, 7
Fišer Vladimír – chapter 4
Forman Petr – chapter 4
Gašparík Jozef – chapter 4
Harant Pavol – chapter 5
Kajánek Pavol – chapter 5
Komínek Radovan – chapter 4
Knop Lilla – chapters 3, 6, 7
Kramarz Marzena – chapters 3, 6, 7
Krawucka Aleksandra – chapter 1
Krupička Jan – kapitola 9.2
Machciník Štefan – chapter 5
Ondrejka Roman – chapter 5
Ondruš Ján – chapters 4
Pitoňák Martin – chapter 5
Przybylska Edyta - chapters 3, 6, 7
Santarius Pavel – chapter 4
Szymborski Andrzej – chapter 2
Trnka Michal – chapter 5
Zuziak Ľuboš – chapter 5
Żebrucki Zbigniew – kapitoly 3, 6, 7

Editorial review of the monograph entitled: "The concept of the development of multimodal freight transport in the Trans Tritia area. Strategy and action plans for the Polish-Czech-Slovak cross-border area" edited by: K. Dohn, L. Knop, M. Kramarz, E. Przybylska, Z. Żebrucki

The reviewed "The concept of the development of multimodal freight transport in the Trans Tritia area. Strategy and action plans for the Polish-Czech-Slovak cross-border area" is an original, creative elaboration and I recommend it for publication. I perceive the book's advantages both in the selection of the scope of the issues, as well as its presentation and proposed solutions constituting the scientific value of the book. Such outstanding work is the result of combining the complementary competencies and knowledge of authors specializing in supply chain management, transport, and logistics services. The book is a study worth publishing, either as a textbook for students and management staff, or as a monograph that scientific effects will be used in research. The book is characterized by the originality of statements with a friendly and logical presentation of the essence of multimodal transport. The book is characterized by the originality of statements, with a friendly and logical presentation of the essence of multimodal transport. The book is thematically coherent, its content fits into the concept of sustainable development of cross-border regions and is a valuable source of knowledge in the development of multimodal freight transport. Moreover, the presented research results fit into the guidelines of current transport policies: regional, national and European.

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