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NECESSARY INFRASTRUCTURE CHANGES FOR DEVELOPMENT OF FLAVIA CORRIDOR

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Katedra technologie a řízení dopravy
Katedra dopravního managementu, marketingu a logistiky

1. Introduction

All projects in Central Europe which are oriented on trade transport and logistics have something in common. They want to improve some part of a supply chain. The improvement can be in greener logistics, lower transport costs, higher energy utilization and many others. FLAVIA benefits will be in better information of carriers how to make their business more efficient. Report of sub-action 4.2.1 concerns Action plan for infrastructure, how to proceed with removing of bottlenecks. The fulfilments of the Action plan will have positive effects on the reliability of a logistic chain. Except market players it's about infrastructure, terminal development and legislation. Those three types of bottlenecks must be removed along the FLAVIA Corridor as well. That will have a positive effect on market players. Prepared Action Plan will be an instruction, how to implement changes in conditions along the FLAVIA Corridor. Actions Plans are core output for the FLAVIA project.

Programme Central Europe cooperating for success has four priorities: Innovation, Accessibility, Environment and Competitiveness. This research belongs to the chapter accessibility which is precondition for a free market access and the interoperability of the rail market. All three chapters are communicating vessels and it should be considered together.

In previous actions of the project FLAVIA some bottlenecks were discovered on infrastructure, in terminal development as well in legislation. The most important passage of each sub-action is an “Action Plan”, how to remove those bottlenecks along the corridor in cooperation of the FLAVIA countries. That will have a synergic and multiplier effect on transport market and logistics chains. The conclusions of all three sub-actions will be in accordance with the goals of the Central Europe Programme.

2. Methodology

University of Pardubice was a partner responsible for the report (action plan) about necessary infrastructure changes. The following step-by-step methodology has been developed to elaborate the action plans.

Step 1: Data collection

Main basis for the action plans were previous reports of the FLAVIA project. Infrastructure relevant data from the previous reports were transformed in a bottleneck table (one per country). Involved partners inserted results in a table. Additionally, they marked all bottlenecks on the country map of their country by using the caption BR1, BR2, etc.

Table 1: Identified major bottlenecks of the transport infrastructure, country XY

Nr.	Improvement fields	Bottlenecks
1	Rail infrastructure	BR1: text, text BR2 : text, text
2	Inland waterway infrastructure	BW1: text, text
3	(Only) Highway infrastructure necessary to foster intermodal rail and inland waterway transport	BH1: text, text …

Source: *FLAVIA* Report no. 4.2.1

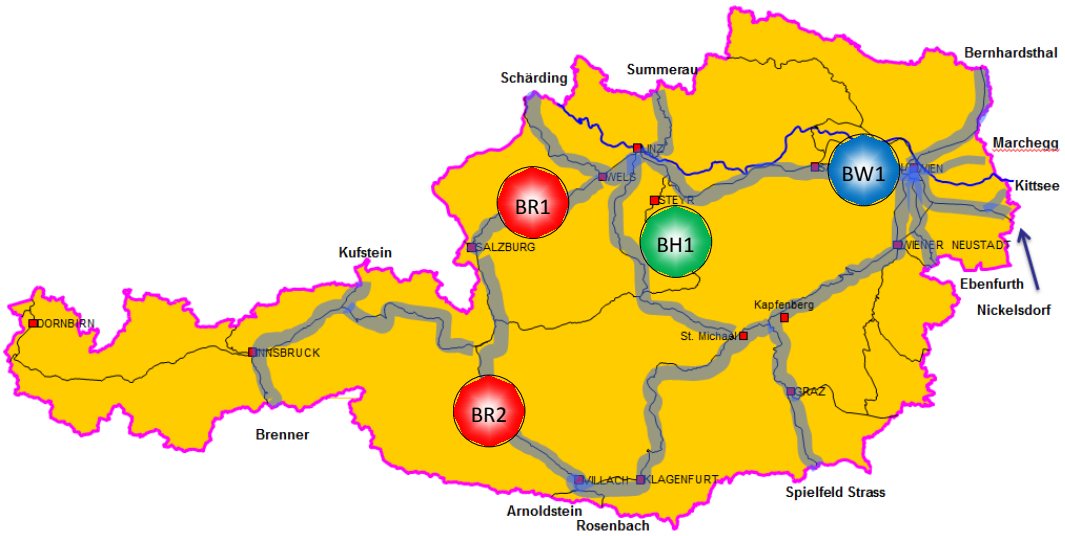

Figure 1: Map of the bottlenecks – Example Austria

Each of the identified bottlenecks of table 1 has been described shortly in textual form.

Step 2: Identification of measures

After this, proper measures to overcome the bottlenecks were compiled.

Table 2: Measures to overcome major bottlenecks, country XY

Nr.	Improvement field	Bottleneck	Measures
1	Rail infrastructure	BR1	Notation of measure, what and where (1) e.g. Add second track for rail section XY (1) Notation of measure, what and where (2)
		BR2	Notation of measure, what and where (1)
		BR1	Notation of measure, what and where (1) Notation of measure, what and where (2) Notation of measure, what and where (3)
2	Inland waterway infra-structure	BW1	Notation of measure, what and where (1) Notation of measure, what and where (2)
		BW2	Notation of measure, what and where (1)
		BW1	Notation of measure, what and where (1)

Nr.	Improvement field	Bottleneck	Measures
3	(Only) Highway infra-structure necessary to foster intermodal rail and inland waterway transport	BH1	Notation of measure, what and where (1) Notation of measure, what and where (2)
		BH2	Notation of measure, what and where (1)
		BH1	Notation of measure, what and where (1)

Step 3: Ranking of the proposed measures

Data from table 1 were transformed into the graph of Figure 2. Each proposed measure represents one bubble with a colour according to Table 1. The caption of the bubbles has the following code: BR1 (3) means bottleneck rail 1 (according to the table), measure 3.

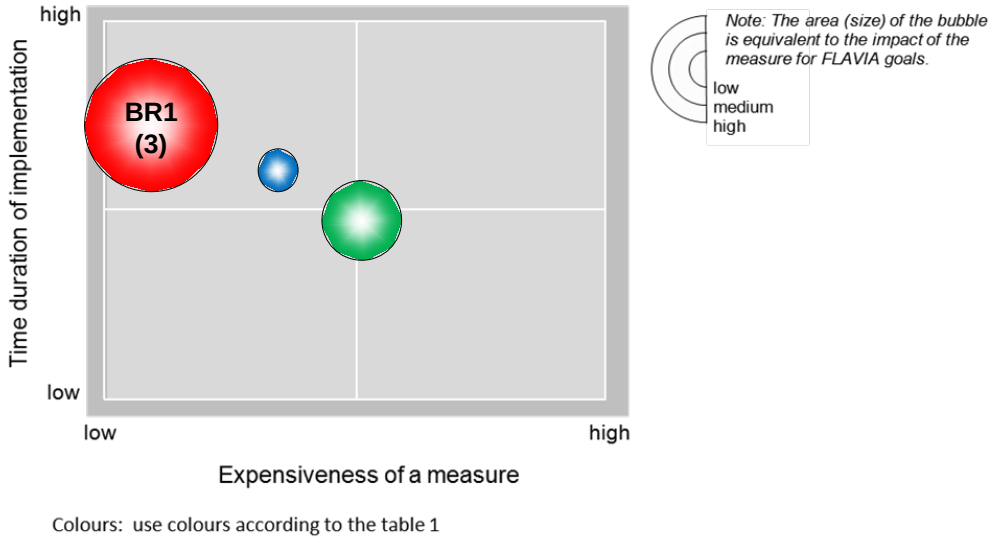

Figure 2: Visualization of the measure main dimensions

Step 4: Introduction of TOP 5 measures per country

Table 3: Description of measure 1, country XY

Policy field	Measure name and code, e.g.: **WR1 (3) Add second track for rail section XY**
STARTING POINT	What are the problems?
ANALYSIS	Facts and figures about the problem
ACTION and AP-PROACH	a.) What should be done? Refer here also on the next line (STA-TUS...).

Policy field	Measure name and code, e.g.: **WR1 (3) Add second track for rail section XY**
	b.) How it should be done?
STATUS OF IMPLEMENTATION	What is already there/existent to support the implementation of the measure? What is in planning and can be considered as future basis?
IMPACT	What kind of improvements can be gained from the proper implementation of the measure (facts and figures, not only global achievements)?
Priority	Low, Medium, High
Timeframe	number of years
Financing	Sources to finance the measure from bottom up (don't start always with EU money)
Coordination/ Participants	Who is responsible for the implementation of the measure (be as concrete as possible)? Who should be involved additionally?
Required future studies / investigations	

Step 5: Harmonisation of the measures for the FLAVIA corridor

In this final step all TOP5 measures from all countries have been evaluated together regarding their corridor impact and regarding their impacts on other FLAVIA countries. This table - especially the FLAVIA ranking have been approved by all partners and is the basis for the discussion with the national stakeholders. Each partner had to report the results of the discussions in form of a short resume.

Table 4: Patern of measure codification, country XY

No.	Measure name and code	From	Corridor impact	DE	AT	PL	CZ	SK	HU	RO	*FLAVIA* Rank
				Benefiting countries							
1	WR1 (3) Add second track for rail section XY	DE	What are the effects along the corridor, if any? • Bullet points	X	X	X	-	-	-	-	1
2											
3											
4											
5											
6											

The most effective measures were stated separately according to the allocation in step 5 and deriving of conclusions.

3. Results for Czech Republic

The Czech Republic is located in the centre of Europe and this fact determines requirements on transport infrastructure. This location is able to be seen as an advantage from the point of view of transport routing. On the other hand, Czech railway infrastructure is in standard condition, but for attraction of more customers there must be serious attempt to reach high quality of these services (else the operators will routed their trains over German and Austria area, where is ensured high quality of services). High rate of capacity usage is seen as the main problem of the Czech railway network. In the case of inland waterway transport the Czech Republic suffers by its location on the watershed. The rivers have got springs on the area of the Czech Rep. and "upper" parts of rivers usually has not suitable conditions to be a waterway. In spite of this a project how to connect Elbe, Oder and Danube is discussed.

3.1 Identification of measures

It is able to be mentioned that the bottlenecks in the Czech Republic are connected with high usage of capacity of railway lines, these bottlenecks are able to be seen as "linear" bottlenecks. In general point of view the solution is not able to be seen in reconstruction of the lines, because most of them was been reconstructed in last years (in the frame of creating of so called corridors). Some constructions are not able to be changed, because it has been financed by support of the European Union and there is a time period in what it is not possible to change reconstructed constructions. The solution is seen in the application of modern train controlling systems (ETCS) and in fulfilling of technical specifications of interoperability (TSI).

Second possible group of bottlenecks is connected to different way and rules of railway operation in the Czech Republic and in neighbouring states, especially in Austria and Germany. Some problems are also able to be occurred in the field of using of different electric power-supply systems.

In the field of inland water transport the bottlenecks are related especially to the geographical position of the Czech Republic in the central part of Europe and on the watershed between Danube, Oder and Elbe rivers. These problems are not able to be solved without high investments into artificial waterway transport infrastructure.

A list of identified bottlenecks in the Czech Republic is mentioned in the table below

Table 5: List of bottlenecks – Czech Republic

Nr.	Improvement fields	Bottlenecks
1	Rail infrastructure	BR1: Line Bad Schandau (DE) – Děčín – Lanžhot – Kúty (SK); (high capacity usage) BR2: Line Zebrzydowice (PL) – Bohumín – Břeclav - Hohenau (AT); (high capacity usage) BR3: Line Havlíčkův Brod – Jihlava – Č. Budějovice – Summerau (AT); (high capacity usage) BR4: Border Crossings to Germany and Austria (different transport

Nr.	Improvement fields	Bottlenecks
		rules on both sides of border); BR5a: Border Crossings to Germany and Austria (different power-supply system); BR5b: Beroun, Benešov u Prahy, Svitavy, (Kadaň-Prunéřov, Nezamyslice) – different electric power-supply systems in the Czech Republic
2	Inland waterway infra-structure	BW1: River Elbe surroundings of Ústí nad Labem (bad natural conditions for navigation); BW2: Location of the Czech Republic on the watershed between Elbe, Oder, Danube (still missing interconnection of these rivers)
3	(Only) Highway infra-structure necessary to foster intermodal rail and inland waterway transport	BH1: high capacity usage of the highway D1 between Prague and Brno (possible road-based connection of Danube, Oder and Elbe waterways); about 35,000 vehicles/24hours in the middle section (by Jihlava)

Source: website of Railway Infrastructure Administration, state organisation www.szdc.cz
Ředitelství vodních cest ČR http://www.rvccr.cz/uvod; Ředitelství silnic a dálnic www.rsd.cz
Reached results of the Flavia project (part 3.5).

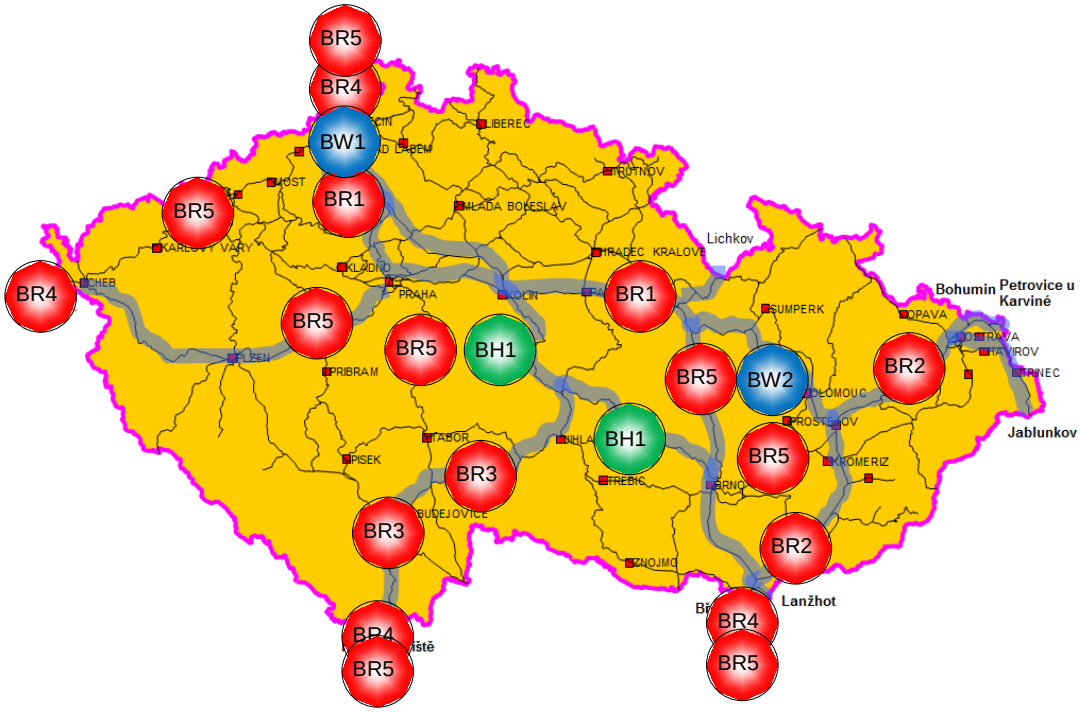

Figure 3: Map of the bottlenecks – Czech Republic

Mentioned bottlenecks are graphically represented by the map above with this explanation due to limited space by individual points.

BR1: capacity usage over 90 % (more concrete information was not available from the Railway Infrastructure Administration, state organisation. Mentioned railway line form Děčín to Břeclav is after reconstruction and it can be not presupposed that the capacity will be increased in the way of reconstructions or similar construction works in short time horizon (with exception of ETCS application).

BR2: capacity usage over 90 % (more concrete information was not available from the Railway Infrastructure Administration, state organisation (see part 3 of the FLAVIA project). Mentioned railway line form Bohumín (PL border) to Břeclav is after reconstruction and it can be not presupposed that the capacity will be increased in the way of reconstructions or similar construction works in short time horizon (with exception of ETCS and remote control application – in progress).

BR3: capacity usage over 90 % (more concrete information was not available from the Railway Infrastructure Administration, state organisation (see part 3 of the FLAVIA project). Mentioned railway line is located in complicated terrain it is not possible to presuppose that a serious modernization can be realized there. For that reason, utilizing of substituting line Praha – Veselí nad Lužnicí is proposed next to application of the ETCS L2 safety system.

BW1: problematic state of water levels causing limitation of cruises on the river Elbe in the area between cities of Děčín and Ústí nad Labem near German border.

BW2: Location of the Czech Republic on the watershed between Elbe, Oder and Danube is causing not so suitable natural conditions for inland waterway transport. These rivers are not connected together in spite of the fact, that an artificial waterway is planned there for a long time.

BH1: The main Czech highway D1 from Prague to Brno is highly utilized from the capacity point of view. The traffic intensity is about 35,000 vehicles/24 hours in the middle part of highway (near city of Jihlava).

Second parallel motorway connection between Prague and northern Moravia by highway No. D11 and motorway No. R35 is still not completed. These connections are important for possible interconnection of Danube, Oder and Elbe by road transport.

– source: ŘSD http://scitani2010.rsd.cz/content/doc/pentlogram_A3.jpg

3.2 Characteristics of measures

Measures to overcome the bottlenecks:

Table 6: Measures to overcome major bottlenecks, Czech Republic

Nr.	Improvement field	Bottleneck	Measures
1	Rail infrastructure	BR1	Application of the ETCS – L2 system. Application of the modern safety systems is seen as an essential support for effective using of railway line capacity. On the other hand, effects leading to improving capacity are not so important. [Source1]. There is at disposal another parallel double-tracked and

Nr.	Improvement field	Bottleneck	Measures
			electrified line from Děčín to Brno (86.7 % of total length of estimated line) over Mělník, Nymburk, Kolín, Havlíčkův Brod and Žďár nad Sázavou. This line has capacity usage between 75 and 90 %, but in comparison to estimated main line (over 90 %), a little reserve is able to be found there.
		BR2	Application of the ETCS – L2 system. Application of the modern safety systems is seen as an essential support for effective using of railway line capacity. On the other hand, effects leading to improving capacity are not so important. [Source1]. There is also a possibility to use another line connecting Brno and Přerov over Vyškov na Moravě. This is seen as possible after planned reconstruction and modernization (construction of 2nd track), when is able to invite, that passenger trains will be routed by this line (over Brno). On the other hand, the measurement is able to be used of 52.1 % of length of estimated line and the parallel route will be in Brno connected to the line Děčín – Břeclav (bottleneck 1). For these reasons, the effect will be marginal, but positive.
		BR3	application of ETCS – L2, modernization and higher utilization of "substituting" corridor line Praha – Tábor – Č. Budějovice - Summerau" (reconstruction in progress).
2	Inland waterway infrastructure	BW1	Bettering of navigation conditions (e.g. construction of weir and lock in Děčín) in this segment of river Elbe.
		BW2	Construction of artificial waterways (interconnection Elbe, Danube and Oder), planned from the year 1901.
3	(Only) Highway infrastructure necessary to foster intermodal rail and inland waterway	BH1	Reconstruction and modernization of the highway No. D1 between Prague and Brno. Construction of the northern highway connection Praha – Hradec Králové – Olomouc by combination of highway D11 and motorway R35.

Source: Global Perspectives for ERTMS, ETCS and GSM-R [online]. Paris: UIC - ETF, 2007, 88 s. ISBN 2-7461-1360-0, available at: <http://www.uic.org/html/ertms-conference2007/conferences/2007/docs/Global-Perspectives-ERTMS.pdf>

3.3 Ranking of proposed measures

Relations between there features by each individual measures are represented by following figure. Impact of the most of measures for FLAVIA project is considered as medium, because it is usually not about allowing some new possibilities, but about ensuring of some things in easier way. High impact is seen by application of unified system of train controlling.

In the case of waterway transport removing of both measures will importantly increase utiliability of inland waterway transport in the Czech Republic.

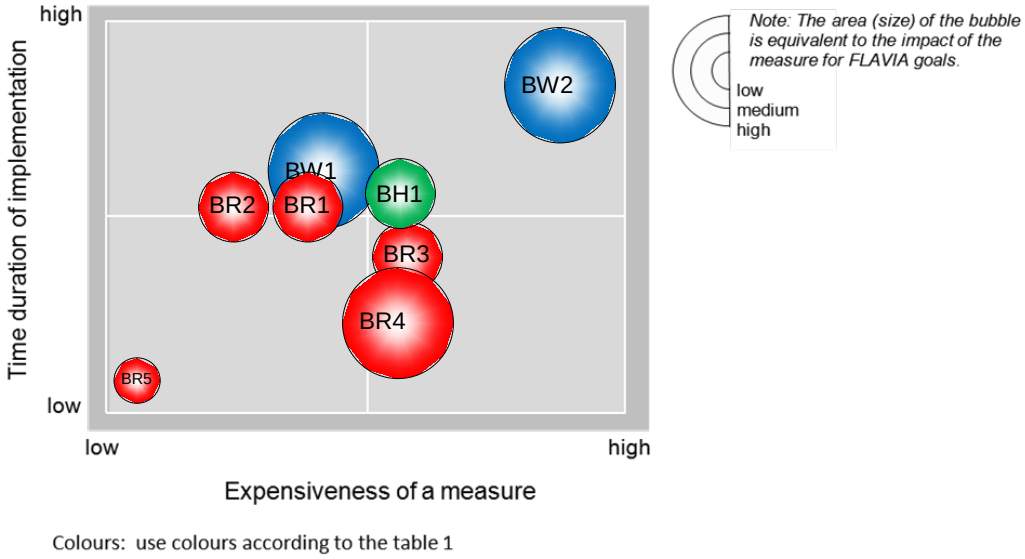

Figure 4: Visualization of the measure main dimensions – Czech Republic

3.4 Example of TOP 5 measures

In accordance to the bubble analysis the five most effective measures to remove the weaknesses of the transport infrastructure system or the strength intermodal transport in the future are derived and described in deeper detail using the following table with one example.

Table 7: Description of measure 5, Czech Republic

Policy field	**BH1 Improving of highway connection East – West in the Czech Republic**
STARTING POINT	There is a possibility to connect the rivers Elbe, Danube and Oder by road or railway transport in spite of an artificial inland waterway construction. This is also able to be realized in shorter time than construction of artificial inland waterway transport infrastructure.
ANALYSIS	There is existing only one highway connection from east to west of the Czech Republic (highway No. D1). Capacity usage of this highway is high (about 35,000 vehicles/24 hours). Planned northern connection from Prague to Olomouc over Hradec Králové based in combination of highway D11 and motorway R35 is still missing.
ACTION and APPROACH	a.) What should be done? Complete preparation, (re)construction. b.) How it should be done? Reconstruction of the highway D1, its modernization and improving of capacity.

Policy field	**BH1 Improving of highway connection East – West in the Czech Republic**
	Construction of motorway No. R35 between Hradec Králové and Olomouc (highway No. D11 Praha – Hradec Králové already exists).
STATUS OF IMPLEMENTATION	Reconstruction of highway D1 is prepared and will be started in short time horizon. Construction of R35 motorway is discussed, projected and planned.
IMPACT	Creation of infrastructure for possible substituting of missing artificial inland waterway (channel) between Elbe, Oder and Danube (Morava).
Priority	Middle
Timeframe	Unknown (short long time horizon)
Financing	Czech Republic – state, EU funds
Coordination/ Participants	Czech Republic – state, Road and Motorway Directorate of the Czech Republic
Required future studies / investigations	all preparation and construction.

4. Executive Summary

The main goal of this research was to identify measures to remove infrastructure bottlenecks on FLAVIA corridor. In the first step the bottlenecks for railway, water and route transport in each country were identified and described. All bottlenecks were also marked in country charts. After this the proper measures to overcome the bottlenecks were compiled and evaluated. The partners from all FLAVIA countries also express in graphic form the expensiveness and time duration of measure implementation. From all measures per country the TOP 5 measures were chosen. For each from these TOP 5 measures the deeper details were specified. The TOP 5 measures from all countries were summarized in one table and evaluated and ranked.

Measures that are related to TEN-T network in railway transport were identified as the most important measures for bottlenecks removing. In Austria it is extension of track to two between Linz and Summerau with connection to Czech Republic. Both countries put this track to TOP 5 measures. In Czech Republic the parallel tracks has been evaluated as most important in railway transport. These tracks are parallel to railway connection from German border (Děčín) to Austria and Slovakia borders (Břeclav). In Germany are the construction of a second track Bremen – Solta – Uelzen – Salzwedel – Stendal and the electrification Reichenbach-Regensburg (freight bypass to the South) the most significant measures. It can increase the seaport hinterland access and thus

improve connection from North Sea to the FLAVIA hinterland. In Poland the connections from Polish inland (Poznan) to the German border and to the Baltic Sea were evaluated as bottlenecks which need to be eliminated. Removing of bottleneck in east – west direction can increase volume of freight transport between Germany and Poland. In north – south direction is necessary to remove bottlenecks on the connection of Polish inland and also of the Czech Republic to Baltic Sea ports. The most restrictive bottlenecks in Hungary are on railway connection from Germany/Austria through Hungary to Romania. This south railway connection can be parallel to Danube River. For the FLAVIA corridor it is very important to remove bottlenecks along the IVth TEN-T corridor. Slovakia is due to its geographical location tangential to the main flows of the FLAVIA corridor. Nevertheless the bottlenecks in direction to Slovak – Ukraine border should be removed. Also the connection from west part of Slovakia (Zilina region) to Austria (via Bratislava) is very important for rail freight transport. For all countries the implementation of ETCS L2 in railway infrastructure remains very important despite it was not mentioned by partners.

Bottlenecks on inland waterway were mentioned in Austria, Czech Republic, Romania and Slovakia. There is a need of modernization of locks on Danube -Black Sea Channel and Poarta Alba - Midia Navodari Channel in Romania. There is also a problem with the Danube water level in Austria. In Czech Republic the missing navigation step in Decin was mentioned as bottleneck for inland water transport. The clearance of bridges on Danube and Vah River is the bottleneck for quality using of Slovak inland waterways. The table below shows an approach to rank the proposed measures regarding their impact, priority, time frame and connectivity of economic clusters.

Table 8: Evaluation of TOP5 from all countries, sorted by rank and country

No.	Measure name and code	From	Impact	Priority	Timeframe	Economic clusters	*FLAVIA* Rank
6	**BR1, BR2, BR3** Implementation of the ETCS L2 railway safety system	CZ	3	3	2	2	0,91
17	**BR8, BR10, BR11** Maintenance works on Hungarian railway network	HU	3	3	2	2	0,91
2	**BR3 (1)** Extension of track infrastructure in the area of Gänserndorf, Marchegg, Vienna, Bernhardsthal	AT	2	3	2	2	0,82
4	**BW2 (1)** secure adequate fairway conditions at low water levels	AT	3	2	2	2	0,82
12	**BR3 (1)** Electrification of Reichenbach – Regensburg	DE	2	3	2	2	0,82
23	**BR2** Modernisation of the railway line Gdańsk (port) – Zebrzydowice – Petrovice u Karvine	PL	2	3	2	2	0,82
30	**BR3, BR2(1)** Modernization and increasing of the investment for reconstruction	SK	2	3	2	2	0,82
25	**BR1 + BR11** Finishing the works for the segments of the IVth TEN-T corridor	RO	2	3	1	2	0,73
27	**BW1 (1)** Modernization of locks on Danube - Black Sea Channel and Poarta Alba - Midia Navodari Channel	RO	3	3	1	1	0,73

No.	Measure name and code	From	Impact	Priority	Timeframe	Economic clusters	*FLAVIA* Rank
7	**BR1** Utilizing of parallel railway lines	CZ	2	2	2	2	0,73
8	**BW1** Construction of navigation level (step) in Děčín	CZ	2	2	2	2	0,73
10	**BH1** Improving of highway connection East – West in the Czech Republic	CZ	2	2	2	2	0,73
11	**BR5 (1)** Electrification of Ribbeck – Wustermark	DE	2	3	2	1	0,73
15	**BR1 – 4** Add second track for rail sections	HU	2	2	2	2	0,73
16	**BR5** Construction of Budapest Rail Bypass for Freight Trains (V0 project)	HU	3	3	1	1	0,73
18	**BW1** Ensuring of 2.5 m draught and height 9.1 m under bridges	HU	3	2	2	1	0,73
20	**BR5** Electrification of the railway section Horka – Węgliniec	PL	2	3	3	0	0,73
22	**BR1** Modernisation of the railway line Szczecin (port) - Krzyż – Poznań	PL	2	2	3	1	0,73
24	**BR10** Advisory Board for intermodal transport	PL	2	3	3	0	0,73
28	**BW2 (2)** Finishing of the implementation of the RoRIS system, on Romanian Danube and inland waterway	RO	2	3	3	0	0,73
29	**BH1 (1)** Building and reconstruction of the road network	SK	1	3	2	2	0,73
31	**BR1(1)** Modernization of railway corridors in order to increase line speed	SK	2	2	2	2	0,73
5	**BR 4 (1)** Extension of bypass track	AT	2	2	2	1	0,64
13	**BR1 (1) and BR2 (1)** Add second track for rail section Bremen – Solta – Uelzen - Salzwedel – Stendal	DE	2	3	1	1	0,64
14	**BR (6)** Construction of an electronic signal box in Falkenberg	DE	2	2	3	0	0,64
26	**BR12:** interoperability of Romanian railway network	RO	2	3	2	0	0,64
33	**BW2(1)** Increasing of bridges clearance in according to valid international standards	SK	2	2	3	0	0,64
1	**BH2 (1)** Transport solutions to get an adequate modal split for the transalpine freight transport – a shift from truck to train	AT	1	3	2	0	0,55
3	**BR1 (1)** Extensions of tracks to 2 (Linz-Summerau, Bosruck)	AT	2	2	2	0	0,55
9	**BW2** Construction of artificial inland waterway (channel) interconnecting Elbe, Oder and Danube	CZ	2	1	1	2	0,55
19	**BH1** Construction of transversal connections in highway network	HU	3	2	1	0	0,55
21	**BR4** Modernisation of the railway line Frankfurt (Oder) / Rzepin (German-Polish border) - Poznań Małaszewicze / Brest (Polish-Belarus border)	PL	3	1	1	1	0,55
32	**BW1(1)** Innovation or modification of existing vessels	SK	1	2	3	0	0,55

5. Conclusions

The development of transport in the world is characterized by a maximum effort to increase the speed, reliability and accuracy of delivery of freight, with the help of modern technical equipment. Less transportation work remains on other mode of transport (air, water, and pipeline). In Europe is the combined transport inseparable element of transport policy mainly due to the reduction of negative impacts of road transport on the environment, energy and fuel consumption, maintenance costs of highways and roads on land use and increase road safety.

The development of rail infrastructure must be focused primarily on the modernization of corridors increasing line speed, adjustment stops and stations and upgrading of the track, traction lines and safety equipment.

The investments to modernization and innovation of fleet are necessary, for example construction of vessel and adaptation of standard conditions of rivers. Innovation can take place through the construction of new vessels (long term) and modification of existing vessels (short and medium term). Also the investments to modernization and reconstruction of road infrastructure, using quality materials with connection on ports and intermodal terminals are necessary too. The possibility financing can be through state aid and EU funds. The costs were not considered into evaluation because there are only rough estimates of cost in some cases and in other cases the information about costs are missing.

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Resumé

NUTNÁ INFRASTRUKTURNÍ OPATŘENÍ PRO ROZVOJ KORIDORU FLAVIA

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V Evropě probíhala průběžná modernizace železniční a vodní dopravní infrastruktury. Tyto modernizace probíhaly zejm. v rámci TEN koridorů a jsou dostatečně známé. Nebyla zde ale koncepce, která by zajišťovala vzájemnou propojenost. V průběhu řešení projektu FLAVIA byla vytvořena zpráva, ve které byly představeny opatření na eliminaci úzkých hrdel v relaci Německo – Černé moře. Tento příspěvek obsahuje nejdůležitější informace o těchto výsledcích.

Summary

NECESSARY INFRASTRUCTURE CHANGES FOR DEVELOPMENT OF FLAVIA CORRIDOR

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In Europe, there has been continuous upgrading of rail and water infrastructure. These modernizations are well described in the TEN corridors. However, there isn't a concept that would ensure the continuity of structures and sections. During solving of the project FLAVIA a report has been completed, in which the development of action plans to eliminate bottlenecks in the transport infrastructure in the Germany - the Black Sea is described. This article presents the most important information concerning this action plan.

Zusammenfassung

NOTWENDIGE INFRASTRUKTUR ÄNDERUNGEN FÜR ENTWICKLUNG FÜR FLAVIA CORRIDOR

Pavlína BROŽOVÁ, Roman HRUŠKA, David ŠOUREK

In Europa war die Bemühung zu aktualisieren kontinuierlich Schiene und Wasserstraßen-Infrastruktur. Diese Modernisierung warhauptsächlich in den Fluren durchgeführt und TEN sind bekannt. Aber es gab kein Konzept, Vernetzung bieten würde. Im FLAVIA Projektbericht, in denen die Maßnahmen, um Engpässe zu beseitigen Tagung in Deutschland erstellt. Dieser Beitrag enthält wichtige Informationen über diese Ergebnisse.