Chemical Logistics Cooperation in Central and Eastern Europe

Feasibility Study

Improvement of Conditions for the River Transport in Central Europe (Mainly on the Elbe River)

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(Mainly on the Elbe River)“

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THE CONTENT

1 CHARACTERISTICS OF THE INTENT AND THE FEASIBILITY STUDY

1.1 THE FOCUS OF THE STUDY

The feasibility study is focused on measures developed to improve the situation in the logistics of chemicals (raw materials, products and semi-products) by means of river transportation in Central and Eastern Europe. The feasibility study was elaborated as one of the outputs of the ChemLog project. The aim of the study was to evaluate the reasons preventing the higher usage of the water transport route and to propose measures for improvements. Particular attention was paid to the part of the Elbe river waterway leading through the territory of the Czech Republic, with respect to increasing transport safety, reinforcing precautions to protect the environment and increasing competitiveness of the chemical industry in Central and Eastern Europe.

1.2 BASIC APPROACHES AND SOURCE MATERIALS

In the study, the processor used the experience and knowledge from the field of commodity flow on the Elbe waterway. To identify and quantify the flow, the data from Czech as well as European statistics were gathered and the prognosis of commodity flow in the Elbe corridor was elaborated (in all three transport modes – roads, railways, rivers) in the period up to 2050. Both risks associated with transportation of chemicals, as well as economic aspects of transport on the Elbe river were taken into account.

The study is focused on the issue of transporting chemicals in the Czech Republic and in Germany (as the route of the Elbe river passes through the territory of both countries). Furthermore, it was necessary to include the world´s major seaports in the Netherlands and Szczecin-Swinoujscie port in Poland. The Dutch ports are connected with the Elbe route through a series of canals through Elbe-Seitenkanal, Mittelland Kanal, Dortmund-Ems Kanal, Wesel-Datteln Kanal (or Thein-Herne Kanal) and the Rhein river, while the port in Szczecin can be reached through Elbe-Havel Kanal, Havel-Kanal, Hohensaaten-Friedrichtshaler Wasserstrasse a Westoder. The commodity flow to and from the ports of Hamburg, Bremenhaven, Amsterdam, Rotterdam and Szczecin were studied.

2 ANALYSIS OF THE CURRENT STATE

2.1 GENERAL SITUATION

Inland waterway transport is an important transport mode, which allows improving and ensuring sustainable European transportation system. Due to growing volumes of transported commodities, the land traffic routes (roads, railways) are facing increased congestions associated with time losses and resulting in environmental issues. There are 35.000 km of inland waterways in the European Union and the network is densest in Western Europe.

Thanks to the possibility to transport oversized items, to the high safety level (the lowest accident rate), to low transport costs and to environmental friendly operation, the river transport is a strong competitor to road and railway transport. In addition, inland water transport offers the possibility to serve as a valuable part of the combined transportation and the logistic chain. The main commodities currently transported by inland waterways are mainly bulk materials, animal feeds, fertilizers, grain, ore and scrap metal, solid and liquid fuels and container transportation is on the rise as well.

The foreseen trend for the inland waterway transport shows constant growth. According to the study TEN-STAC, increase in transported volumes will be by 2,5 % in national and 3,4 % in international transport until the year 2020. The report on European waterway transport 2002 predicts rise in performance (tons-km) by 2 % per year until 2015.

2.2 THE ELBE WATERWAY

The Elbe is one of the largest rivers in Europe. It rises in the Czech Republic, flows through Germany and empties into the North Sea. The total length of the Elbe river route is 1.154 km with a river-basin area of 144.055 km^2. The Elbe waterway offers great potential for transportation under the condition of the whole year economical operation of cruises. The Elbe waterway is a part of the IV. Trans-European multimodal corridor and is marked as waterway E20 by the AGN agreement (European Agreement on Main Inland Waterways of International Importance), which defines the European waterway network of international importance and the commitment to abide by given parameters in the development of waterways. The AGN Agreement was approved in Geneva on 19th January 1996, became effective by its article 8, paragraph 2, on 26th July 1999. The AGN Agreement provides following characteristics and criteria of waterways and of international ports:

Technical characteristics of waterways within the category E:

Evaluation of individual waterways distinguishes categories IV – VII with various characteristics according to the following principles:

(i) The waterway category is defined by horizontal dimensions of motor vessels, tow-vessels and groups of vessels, and specifically by the main standardized dimension – their maximum width.

(ii) Waterways are categorized as E waterways only if they meet requirements of at least category IV waterways (minimum dimensions of the vessel must be 80 m x 9,5 m). Draft limit (less than 2,50 m) and minimum under-bridge height (less than 5,25 m) may be accepted only on already existing waterways and only as an exception.

(iii) In case of modernization of the category IV waterways (as well as smaller regional waterways), it is recommended to fulfill at least the parameters of the category Va waterways.

(iv) The construction of new category E waterways should at least meet the requirements of category Vb waterways and it is necessary to ensure a minimum draft of 2,80 m.

(v) The modernization and/or construction of new waterways should always take into account vessels and groups of vessels of large proportions.

(vi) In order to efficiently transport containers, it is necessary to ensure the highest possible construction of bridges (see Table 1 – 5,25 m for transportation of containers in two layers, 7,00 m for transportation of containers in three layers, 9,10 m for transportation of containers in four layers) [1]

(vii) Inland waterways used for transportation of high volumes of containers and for transportation of freight vehicles by vessels should meet at least requirements of the category Vb waterways.

(viii) On waterways with the changing water level, the minimum recommended draft limit should correspond with the average water level reached within 240 days in a year or more (or within 60 % of the navigability period). The recommended height under bridges (5,25 m, 7,00 m or 9,10 m) should be ensured wherever it is possible and economically profitable.

[1] The imprescriptible rule used in Western Europe states, that the waterway container transportation is competitive for three layer containers.

(ix) The entire waterway or at least the most of its length should be constructed according to the unified category of requirements with consistent draft and bridge heights.

(x) Parameters of adjacent inland waterways should be preferably identical or similar, if possible.

(xi) The limits of maximum draft (4,50 m) and minimum bridge height (9,10 m) should be ensured for all network sections directly connected to sea routes.

(xii) The minimum bridge height 7,00 m should be ensured on waterways connecting major seaports with surrounding areas, which are suitable for efficient transportation of containers and for sea-river transport.

(xiii) The sea-river routes listed in the Annex 1 of the Agreement should provide the integrity of the category E waterway network across Europe and they are intended for sea-river vessels with dimensions accordingly. The dimensions of these vessels should, where possible and economically profitable, correspond with the requirements for motor vessels suitable for inland navigation on waterways category Va and VIb.

Following minimum requirements are considered essential in terms of providing container waterway transportation:

- an inland vessel (width 11,4 m, approx. length 110 m) should be able to transport containers in three layers; otherwise, a group of vessels with minimum allowed length 185 m capable of transporting containers in two layers must be provided.

Operational criteria of the category E waterways:

In order to provide reliable international transport, the category E waterways should satisfy following essential criteria:

(i) During the navigability period, continuous transportation should be ensured with the exception of the interruptions listed below.

(ii) The period of navigability may be less than 365 days per year only in regions with adverse weather conditions, where frozen waterways prevent from navigation and therefore a winter interruption is inevitable. In such cases, the closing and opening dates should be strictly given. The length of the interruption caused by natural

phenomena, such as ice, floods etc., should be minimized by appropriate technical and organizational measures.

(iii) Suspension of operation on waterways during the period of navigability caused by regular maintenance of locks and other hydraulic equipment should be as short as possible. Users of waterways under maintenance should be consistently informed about the dates and duration of such interruption. In case of failure of locks, other hydraulic equipment or in case of other unpredictable events, it is necessary to utilize the maximum available resources to reach recovery as soon as possible.

(iv) Suspension of operation should not occur during periods of low water levels. On waterways with changing water levels, conditions for operation of vessels with a draft at least 1,20 m should be secured for at least 240 days per year. In areas mentioned in paragraph (ii), conditions for operation of vessels with a minimum draft of 1,20 should be ensured at 60 % of the navigability period.

(v) If economically profitable, the operating time of locks, movable bridges and other facilities should be adapted to 24-hour vessel traffic during working days. For organizational and/or technical reasons, an exception may be granted. An appropriate operating period should be ensured during weekends and national holidays as well.

Technical and operational characteristics of the category E waterway ports:

The network of category E waterways should be supplemented by a system of inland ports of international importance. Each port should meet following technical and operational criteria:

(i) A port should be located on a category E waterway.

(ii) It should have sufficient capacity to accept vessels or group of vessels operated on the relevant category E waterway in the same class.

(iii) It should be connected with the main roads and railway lines (if possible belonging to a network of international roads and railway lines established by the European Agreement on Main International Traffic Arteries (AGR), European Agreement on Main International Railway Lines (AGC) and the European Agreement on Important International Combined Transport Lines (AGTC).

(iv) The total port capacity for load handling should be at least 0,5 million tons per year.

(v) A port should provide appropriate conditions for the development of the affiliated industrial zone.

(vi) It should offer the possibility to operate standard-sized containers (with the exception of ports operating high-volume loads).

(vii) All facilities necessary for standard operation of international traffic should be available.

(viii) With respect to the environmental protection, ports of international importance should be equipped with facilities for reception and disposal of waste generated by operating vessels.

The waterway classification was adopted in 1992 by both the United Nations Economic Commission for Europe and The European Conference of Ministers of Transport (now the International Transport Forum).

The classification categories of internationally important waterways are presented in the picture below.

Picture 1 - Waterways with relevant classification categories.

Source: http:/www.inlandnavigation.org/documents/Facts%20Figures/Network/Map_Waterways_Europe.jpg

Based on this classification, the Elbe waterway has the following designation and corresponding parameters:

- The medium section from Přelouč to Mělník - category IV
- The section from Mělník to Wittenberge – category Va
- The section from Wittenberge to the North Sea estuary – category VIb
- Important connecting waterways in Germany

- Mittellandkanal – category IV, Vb
- Elbe-Seitenkanal – category Vb

- Weser – category IV, VI
- Saale – category IV
- Elbe-Havel Kanal – category IV
- Dortmund-Ems-Kanal – category IV
- Wesel-Datteln Kanal - category V
- Rhein-Herne Kanal – category IV, V
- Elbe-Lübeck-Kanal – category IV
- Nord-Ostsee-Kanal – category VIb[2]

Classification of waterways in the Czech Republic is stated in legislation by the ordinance no. 222/1995 Coll., as amended, which implements the law no. 114/1995 Coll. on inland navigation, as amended.

The basic parameters of waterways stated in the ordinance are following:

The fairway

(1) Dimensions of a waterway are

a) the minimum width of a direct fairway in the draft corresponding with the draft of a design vessel

1. in a river

10 m for the category 0.;

20 m for the category I.;

50 m for the category IV., Va., Vb.

2. in a channel

6 m for the category 0.;

40 m for the category IV., Va., Vb.

[2] Nord-Ostsee-kanal, or the Kiel Canal is a sea channel, which deviates from the classification of inland waterways. It allows to vessels with the maximum parameters of 250x38 m and the draft of 10 m. During the World War I and World War II, German battle vessels were cruising through this channel (e.g. Bismark).

b) the minimum fairway draft is a sum of the allowed vessel draft and the safety distance above the waterway bottom. For new and newly adjusted waterways the value is 1,20 + 0,30 m for category 0.; 2,20 + 0,50 m for category I. and 2,80 + 0,50 m for categories IV., Va., Vb.

The safety distance from the bottom of a waterway to the bottom of a vessel (margin) is

1. in a river

at least 0,30 m, for new and newly adjusted waterways at least 0,50 m;

2. in a channel

at least 0,30 m for category 0.,

at least 1,00 m for categories IV., Va., Vb.,

c) the minimum curve radius of a fairway

400 m for category I., 650 m for categories IV., Va., 800 m Vb.

(2) The fairway is wider in the curve depending on the length of the design formation and the curve radius.

The lock chamber

(1) For newly reconstructed lock chambers, there are

a) the minimum width

5,3 m	for category 0.;
6,0 m	for category I.;
12,0 m	for categories IV., Va., Vb.

b) the minimum length

38,4 m	for category 0.;
45 m	for category I.;
85 m	for category IV.;
115 m	for category Va.;
190 m	for category Vb.

c) the minimum draft above the nipper

1,5 m	for category 0.;

3,0 m for category I.;

3,5 m for category IV.;

4,0 m for categories Va., Vb.

The waterway classification defines individual waterways according to the maximum proportions of vessel, for which the conditions allow safe and smooth operation. These proportions are listed in the chart below.

Chart 1 - The classification categories of waterways and vessel proportions

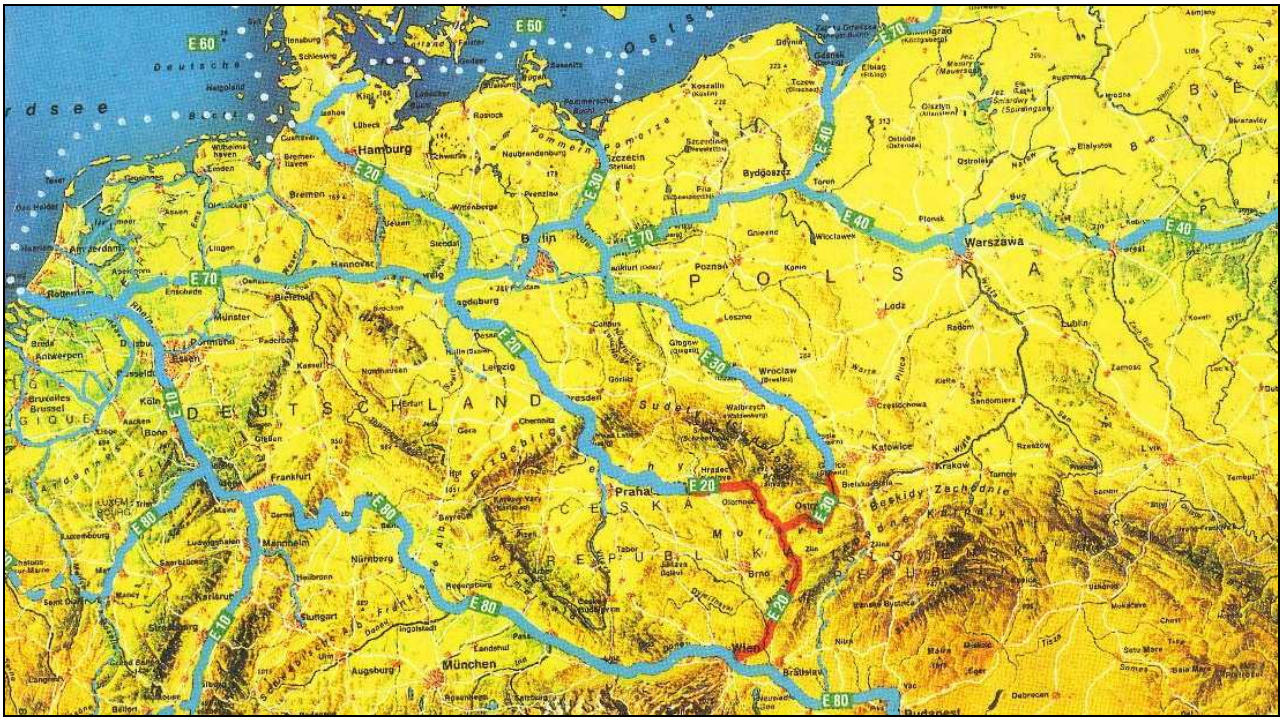
Category	Motor cargo ship					Pusher assembly					Underpass height H (m)
	Model ship	Lenght L (m)	Width B (m)	Draft d (m)	Load T (tons)	Model ship	Lenght L (m)	Width B (m)	Draft d (m)	Load T (tons)	
IV	Johan Welker	80 - 85	9,5	2,5	1000 - 1500	small tug boat	85	9,5	2,5 - 2,8	1250 - 1450	5,25 or 7
Va	Big Rhein vessels	95 - 110	11,4	2,5 - 2,8	1500 - 2000	standard tug boat Evropa II	95 - 110	11,4	2,5 - 4,5	1600 - 3000	5,25 or 7 or 9,10
Vb						set up 2 boats in a row	172 - 185	11,4	2,5 - 4,5	3200 - 6000	
VIa						set with 2 boats side by side	95 - 110	22,8	2,5 - 4,5	3200 - 6000	7 or 9,10
VIb		140	15	3,9		kit with 4 boats 2x2	185 - 195	22,8	2,5 - 4,5	6400 - 12000	
VIc						kit with 6 boats 3x2	270 - 280	22,8	2,5 - 4,5	9600 - 18000	9,1
						kit with 6 boats 2x3	195 - 200	33 - 34,2	2,5 - 4,5	9600 - 18000	
VII						kit with 9 boats 3x3	285	33 - 34,2	2,5 - 4,5		

Source: http://www.wikipedia.cz/

2.2.1 The Czech Republic

The Czech Republic signed the AGN Agreement in Helsinki in June 1997, the Agreement entered into force on 26th July 1999. The Elbe river is the only waterway of international importance in the Czech Republic (E20). In a longer perspective, there is a possibility of connecting Elbe waterway to another important waterway Danube (E80), by building channels between Danube, Oder and Elbe. The territorial protection of the Danube-Oder-Elbe channel connections is included in the concept of the Spatial Development Policy of the Czech Republic.

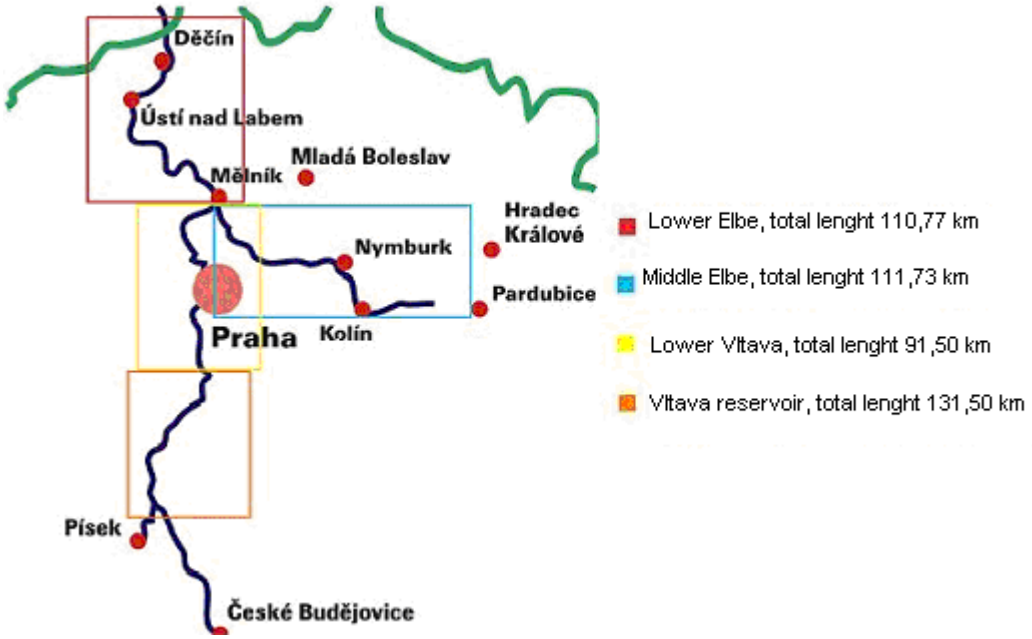
Picture 2 - European waterways and the planned Danube-Oder-Elbe channel connections.



Source: the magazine Waterways and Navigation (Vodní cesty a plavba), 4/2002

Within the admission of the Czech Republic to the European Union, the Elbe river (in the section between Pardubice and the border with Germany) and the Vltava river (in the section between Třebenice and the confluence with Elbe) were included into the Trans-European transport network TEN-T (the resolution no. 884/2004/ES redefining the TEN-T network in the extended EU25). Furthermore, the Elbe-Vltava waterway is a part of the "former" 4th Multimodal Helsinki Corridor (Helsinki multimodal corridors are still partially operating and are undoubtedly important for the non-member countries of the EU; among the member countries, there is still ongoing cooperation based on non-binding memoranda).

Picture 3 - Waterways in the Czech Republic



Source: http://www.lavdis.cz/

The planned development of the Czech waterways in the coming years is defined by a schedule approved by the Government resolution no. 1064 from 19th September 2007 about the Schedule of the Transport Infrastructure Construction between 2008 - 2013. The schedule is presented in the chart below, including the duration of individual projects and costs for implementation (the investor of all projects is the Waterway Headquarters of the Czech Republic).

Chart 2 - The schedule of the transport infrastructure construction between 2008 - 2013 (water transport)

	Name	[thousands CZK	from	to
N	VD Lobkovice, chamber equipment modernization	11000	05/08	12/09
FS	Road bridge across the Elbe in Poděbrady	71352	12/06	08/08
F6	2nd chamber in Brandýs nad Labem	777508	01/11	12/13
G	Waterway development incl. the conn. of Břeclav on the Danube	19000	01/06	12/09
F6	A waterway guide	48707	01/08	12/10
N	Lighting, bridge nav. signs reconstruction	8000	03/07	12/08
N	2nd stage of waterfront wall in Mělník port – flood protection	76850	01/08	12/08
N	Anchor stand Holešovická tržnice	12800	03/08	10/08
N	Passenger ships dock Větruše	7946	03/08	10/08
N	Automatic control and navigation-level supply in Baťův channel	8422	06/07	12/08
N	Sports port Bílé Břehy	32000	01/08	12/08
N	Lock chamber Bělov	183915	01/08	12/10
F6	Děčín Port, transship point Staré Loubí-Dock wall prolongation	51338	01/08	12/08
F6	strait adjustment Chvatěruby	204350	05/08	11/09
F6	Ústí n.L. – Vaňov, dock wall&waiting stand	60000	10/08	12/08
F6	VD Kostomlátky	49160	01/08	12/08
F6	VD Nymburk	49160	01/08	12/08
F6	Public port Nymburk	41650	10/09	12/10
N	Building, reconstruction a modernization-will be specified se	10200	01/08	12/09
F6	Nav. conditions improvement on the Elbe Ústí n.L.- nat.bor. nav. lock Děčín	3932695	10/08	05/12
N	Increase reliability. LVVC- prep. of buildings	36000	03/98	12/09
F6	Bridge height securing 5,25 - port Pardubice (bridge Poděbrady)	330106	10/06	12/09
N	Navigability prolongation VC Otrokovice - Rohatec	122944	01/08	12/09
N	Praha – anchor stand embankment of E. Beneš	100140	06/07	12/08
F6	VD Hradišťko lock chamber wall reconstruction	37320	05/06	12/08
N	waterway České Budějovice – Hluboká n/Vlt.	309270	01/08	12/10
N	waterway Hluboká n/Vlt. – VD Hněvkovice	145770	05/08	12/11
N	waterway Hněvkovice - Týn n. Vlt.	248557	09/08	10/13
	total	**6986160**		

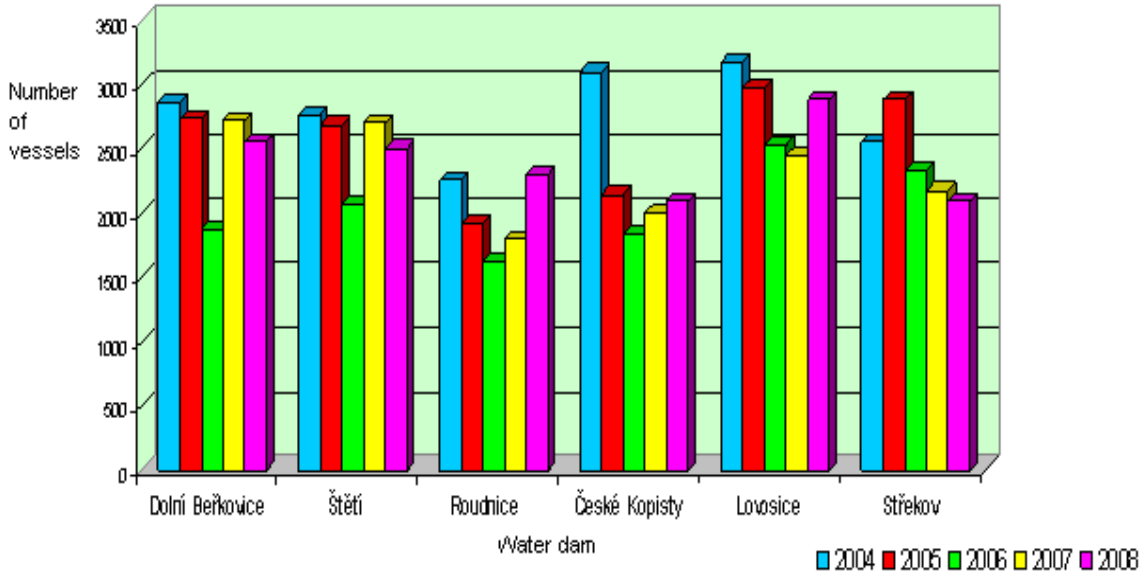
Glossary: G - globals, N – national enterprise, F6 – priority 6 (VC)

Source: MD ČR, adjusted by CityPlan, spol. s r.o.

The keystone for the development and reliability of inland navigation in the Czech Republic is realization of the "Děčín navigation degree" project, i.e. construction of a dam by the Děčín city, which is an essential step to ensure the navigation draft of 1,40 m 345 days per year (20 days are calculated for freezing and floods) in the critical forty-kilometer long section of the Elbe river between Ústí nad Labem and the state border with Germany. The project represents a compromise to reach whole-year navigability on the Elbe river. Technical navigation studies proved that conditions for navigation on the lower part of the Elbe river can only be improved by constructing navigation degrees. Navigation degrees were proposed for Malé Březno and Dolní Žleb. Disapproval of the authorities for environmental protection and the environmental activists led to a change of a solution resulting in a proposal for a single navigation degree by the Děčín city. Its technical concept follows parameters of the waterway on the German territory (after completing the planned adjustments until the year 2010, according to the German Ministry of Transport, the

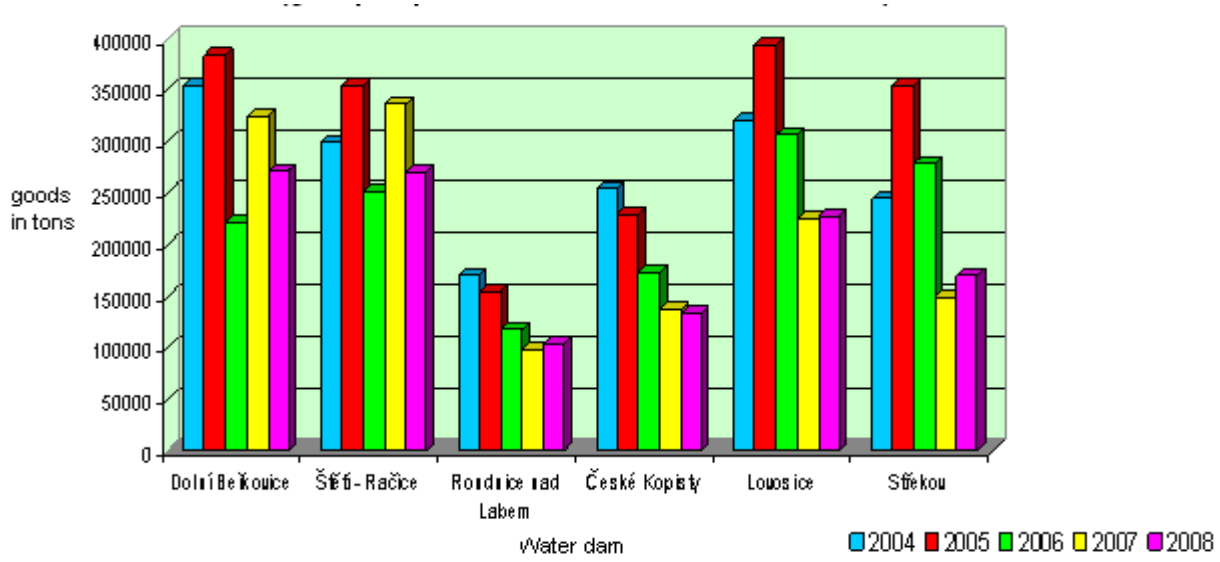
Elbe river should be navigable throughout the whole route, i.e. the minimum navigation draft 1,60 m 345 days per year should be ensured). The project to improve navigation conditions on the regulated section of the Elbe route appears in the aforementioned schedule (it is apparent, that neither the construction deadline, nor the planned expenses will be met) and it is also listed among the priority infrastructure projects for water transport in the “Operational Transport Program” (OPD). The decreasing volume of transported commodities is apparent from the following graphs, as well as the importance of waterway navigation for transportation of chemical products, which constituted 33 % to 45 % of the total volume of transported commodities by the chamber locks in Lovosice and in Střekov in 2008.

Graph 1 - The number of vessels passing through the chamber locks in the lower section of the Elbe river in years 2004 – 2008.



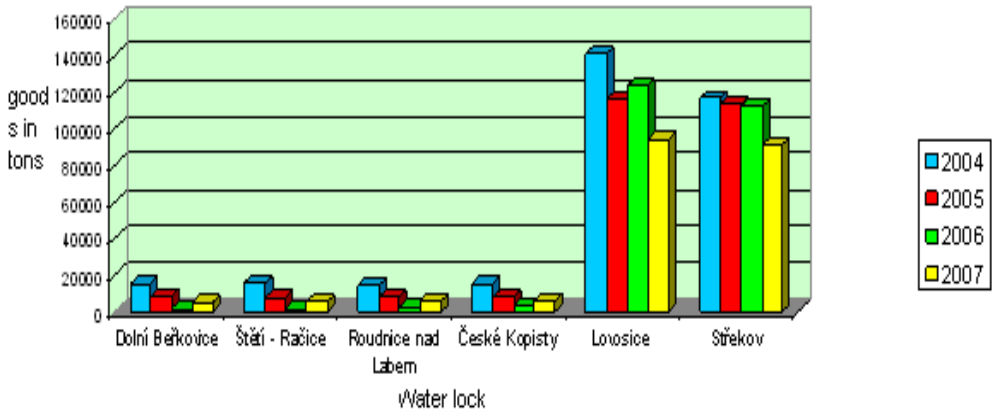
Source: Povodí Labe, a state enterprise

Graph 2 - The total volume of commodities transported through the chamber locks in the lower section of the Elbe river in years 2004 – 2008.



Source: Povodí Labe, a state enterprise

Graph 3 - The amount of chemicals transported through the locks in the lower course of the Elbe through the years 2004 - 2007



Source: Povodí Labe, a state enterprise

Chart 3 - The number of passages through the chamber locks on the lower section of the Elbe river, according to the commodity type, in 2008

Water lock	Number of vessels	Kind of goods in tons											
		Chemicla products	Raw food	Feed	Gravel	Aggregates	Wood	Petroleum products	Ore	Piece goods	Construction waste	Other	Total
Dolní Beřkovice	2558	1631	5135	11377	198401	10538	0	0	501	23985	9586	10902	272056
Štětí - Račice	2500	846	9025	7880	205266	1579	3737	0	327	33767	1637	6719	270783
Roudnice nad Labem	2297	1025	11855	2847	35788	11613	4334	0	14047	22727	0	944	105180
České Kopisty	2294	1103	9344	7388	62950	5334	4470	0	0	31143	5792	6730	134254
Lovosice	2886	75100	7534	14804	57102	24153	4302	0	3175	21078	14916	5433	227597
Střekov	2091	76773	4977	39573	890	1592	3062	0	7208	29238	6504	0	169817

Source: Povodí Labe, a state enterprise

Completion of the navigability of the medium course of the Elbe river up to Pardubice also belongs among the priority projects OPD. According to the original plans, the construction of a 3.150 m long channel on the Elbe river between Přelouč and Pardubice was supposed to be finished in 2011, which would extend the Elbe waterway from Hamburg to approx. 870 km and connect Pardubice to European inland waterways.

Both these projects are at hold awaiting approval from the Czech Ministry of Environment and the environmental associations obstructing the realization of such plans.

Among other future goals, OPD proposed elimination of narrow sections and normalization of parameters of the existing Elbe-Vltava waterway, completion of navigability of the Vltava river between Třebenice and České Budějovice and investments into port infrastructure, telematics and vessel modernization.

2.2.2 Germany

There are 7 300 km of inland waterways in Germany from which 75% are rivers and 25% are channels. The primary network (category IV waterways and higher) covers 5 100 km and it consists of the Rhein river (and its tributaries the Neckar, the Main, the Mosel, the Saar rivers), the Danube, the Wesser, the Elbe river and a network of channels connecting these rivers with the Oder river. This system belongs in the TEN-T network.

Picture 4 - German inland waterways

Source: http://www.wsw.de/, adjusted by CityPlan, Ltd. for the project needs

Chart 4 - Characteristics of German main inland waterways

Main inland waterways	Lenght (km)	Navigable sections (km)	Channelled sections (km)	Number of locks
Berlin-Spandauer Schifffahrtskanal	12		12	1
Dahme-Wasserstraße	26	26		1
Dattel-Hamm-Kanal	47		47	2
Donau	203	133		6
Dortmund-Ems-Kanal	223	49	162	15
Elbe	607	33		1
Elbe-Havel-Kanal (incl. Niegripper Altkanal)	58		58	4
Elbe-Lübeck-Kanal and Kanaltrave	68		62	7
Elbe-Seitenkanal	115		115	2
Havelkanal	35		35	1
Havel-Oder-Wasserstraße incl. Hohensaaten-Friedrichsthaler Wasserstraße and Westoder	150	39	97	5
Küstenkanal	69		67	2
Main	387	385		34
Main-Donau-Kanal	171	51	120	16
Mittellandkanal incl. connecting channels	388	5	383	13
Mosel	242	240		12
Neckar	203	199		27
Oder	162			
Peene	96			
Rhein	695	121		2
Rhein-Herne-Kanal	46		46	5
Ruhr	12	10		2
Saale	124	105		12
Saar	105	105		8
Spree-Oder-Wasserstraße	125	65	60	7
Teltowkanal	36		36	1
Untere Havel-Wasserstraße	148	110	18	6
Wesel-Datteln-Kanal	60		60	6
Weser	346	142		8

Source: http://www.wsw.de/, adjusted by CityPlan, Ltd. for the project needs

The Transport operation program for the years 2007 - 2013 of the German Ministry of Transport contains, among others, plans development and maintenance of waterways. Within the Priority 3, federal waterways determines following three general objectives:

- Eliminating narrow profiles in navigation lock chambers and lifts;
- Constructing waterways;
- Managing transport and information systems.

German inland waterways show large capacity reserves both at present state and in the perspective for the year 2015. The study “Verkehrswirtschaftlicher und ökologischer Vergleich der Verkehrsträger Straße, Bahn und Wasserstraße“ (PLANCO Consulting GmbH, November

2007) examined 21 navigation gates and their capacity reserves are presented in the following chart.

Chart 5 - German navigation gates and their capacity reserves

waterway	navig. chamber	2005 volume in millions of tons	practical capacity in 2015 (mil.	2015 reserve in regard to yr. 2005 (mil. t)
WDK	Friedrichsfeld	10,3	17,7	7,4
RHK	Oberhausen	8,5	35,9	27,4
DEK	Münster	5,9	22,5	16,6
DHK	Hamm	0,6	5,3	4,7
MLK	Anderten	7,1	17,2	10,1
Weser	Minden	1,3	8,5	7,2
KüKa	Dörpen	2,4	6,1	3,7
ESK	Lüneburg	6	13,6	7,6
ELK	Lauenburg	0,5	3,1	2,6
Main	Kostheim	12,4	27,1	14,6
Main	Obernau	4,7	14,9	10,2
MDK	Kelheim	3,4	11,5	8,1
Donau	Jochenstein	4	12,9	8,9
Neckar	Feudenheim	5,6	22,4	16,8
Mosel	Koblenz	8,9	29,2	20,3
Elbe	Geesthacht	6,6	17,0	10,4
EHK	Hohenwarthe	1,9	17,3	15,4
UHW	Brandenburg	2,2	33,8	31,6
SOW	Charlottenburg	0,5	6,1	5,6
TeK	Kleinmachnow	0,6	8,9	8,3
HOW	Spandau	1,6	8,3	6,7

By the end of the year 2010, according to the German Ministry of Transport, the Elbe river should be navigable on the whole part leading through the German territory. This means ensuring the minimum navigation draft 1,60 m for 345 days per year, while smooth operation of cargo vessels is guaranteed with a draft of 1,40 m.

2.2.3 The Elbe waterway capacity

There are no navigation lock chambers, lifting bridges or other restrictive obstructions on the Elbe waterway in the section between Děčín and Hamburg. If the vessels navigate with one-hour intervals and the daily cruise time is 15 – 16 hours (current practice), then the daily capacity of sixteen vessels in one direction will be reached. This model is valid under the circumstance that the allowed draft is set to at least 1,40 m. The average navigation draft, and thus the vessel draft, differs during the year. The capacity of the future chamber lock Děčín will be at least twice as high compared to the open-river section (this applies to all existing locks between Střekov and Mělník). All the following data are related to the maximum capacity of the waterway, rather than to the expected real transport volume. Three possible future states will be considered.

2.2.3.1 The navigation degree Děčín will not be constructed

The navigation period will shorten to only 203 days (calculated as a difference 345-142 days per year with insufficient permitted draft). Due to fluctuations in water levels (water flow), only the average load of 800 tons per vessel can be taken into account. The maximum transport volume is therefore 2.600 thousand tons in one direction. Utilization of water transport for only 203 days of unwarranted navigation, i.e. unwarranted delivery dates, causes lower interest of transporters. As a result, the real capacity usage is only 535.500 tons and 669 vessels in both directions per year. The daily average is 3 vessels in both directions during the navigation period.

2.2.3.2 The navigation degree Děčín will be constructed

Navigation will be possible 345 days per year at least from the port Děčín Rozběsy and in combination with river upheaving, to all ports on the Elbe and Vltava rivers. During the remaining 122 days, capacity will be lowered due to insufficient capacity of the Děčín port and the related routes to 6 vessels per day. This corresponds with the possible maximum of 8.600 vessels per year in both directions. Regarding the greater vessel loads, the maximum transported volume will be 8.014 thousand tons in both directions.

2.2.3.3 The navigation degree Děčín will be constructed and the conditions for navigation between Boletice and Střekov will be solved

In this case, fulltime navigation will be ensured 345 days per year. This means 345*16 = 5.520 per year in one direction. Calculating the average load 600 tons for 142 days per year and 1.000 tons for 203 days per year, the maximum transport volume will be following:

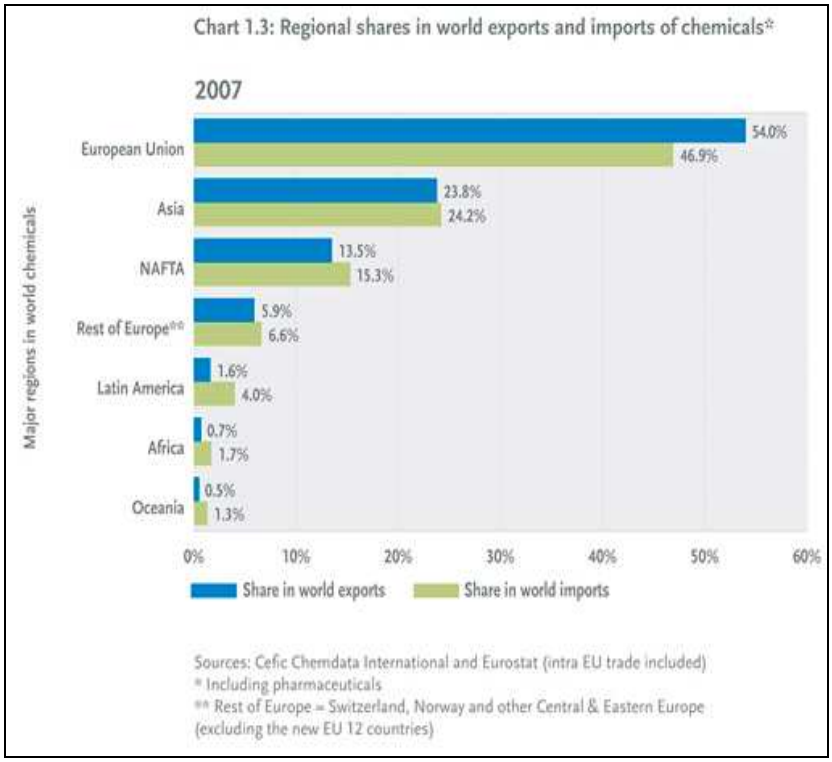
203*16*1000 + 142*16*600 = 4.611.200 tons in one direction, or 9.222.400 tons in both directions.

2.3 CHEMICAL INDUSTRY PRODUCTION

2.3.1 The European Union

Chemical industry, plastic and rubber production belong among the largest and the most dynamic industries in the EU. Together, they produce approximately 3,2 million of working places in more than 60.000 companies. In 2007, sales of chemicals reached in EU the total amount of 537 billion EUR. The EU is among the world's largest producers of chemicals. Statistical data show constant growth of chemical production volumes during the past years. In the EU 15, the total chemical production grew by 22 % between the years 1996 - 2007. Production of toxic chemicals grew by 18 % between 1996 - 2005, only the slight decrease by 3 % appeared in 2006/2007. The main consumers of chemicals are metallurgy, machine-building, electrical and electronic industry, textile, clothing, car, paper and printing industries.

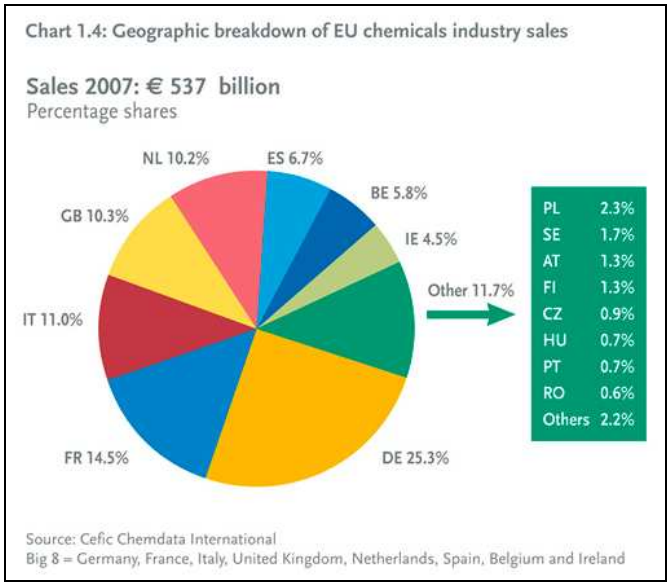
Graph 4 - Exports and imports of chemicals by regions in 2007



Source: http://www.cefic.org/

Germany is the largest producer of chemicals in Europe (more than 25 % in 2007), followed by France (14,5 %), Italy (11 %), United Kingdom (10,3 %) and the Netherlands (10,2 %).

Graph 5 - Chemical production in the European countries in 2007



Source: http://www.cefic.org/

Chart 6 - Foreign trade with chemicals (SITC5[3] – chemicals and related products) - export

EXPORTS IN 1000 MILLION OF ECU/EURO									
	2000	2001	2002	2003	2004	2005	2006	2007	2008
European Union (27 countries)	118.91	130.19	141.13	141.1	152.62	164.85	184.57	197.9	198.82
European Union (25 countries)	119.73	131.32	142.57	142.56	154.35	166.87	187.51	201.48	203.04
European Union (15 countries)	129.61	142.44	154.64	154.85	166.92	181.22	204.74	221.27	224.32
Belgium	41.35	44.71	61.71	61.86	68.6	77.15	83.04	91.02	90.22
Bulgaria	0.53	0.52	0.47	0.5	0.52	0.72	0.76	1.03	1.21
Czech Republic	2.24	2.4	2.42	2.53	3.1	3.77	4.38	4.98	5.98
Denmark	6.05	6.77	7.35	7.73	8.14	9.21	9.14	9.9	10.27
Germany (including ex-GDR from 1991)	75.28	81.68	79.31	84.8	96.78	105.43	121.38	134.8	140.85
Estonia	0.14	0.17	0.18	0.22	0.26	0.32	0.39	0.45	0.53
Ireland	27.46	32.4	39.14	35.79	37.5	40.36	39.77	43.18	44.1
Greece	1.03	1.15	1.08	1.47	1.64	2.03	2.18	2.36	2.28
Spain	11.88	13.15	14.39	15.2	16.02	18.57	20.38	23.14	24.66
France	49.01	51.69	53.31	53.62	56.78	60.42	66.09	69.71	73.37
Italy	24.56	26.44	27.86	27.13	29.03	32.18	34.98	37.24	36.81
Cyprus	0.07	0.09	0.1	0.09	0.11	0.13	0.14	0.16	0.19
Latvia	0.13	0.14	0.14	0.16	0.2	0.26	0.39	0.51	0.63
Lithuania	0.35	0.34	0.4	0.46	0.6	0.82	1.03	1.68	2.2
Luxembourg (Grand-Duché)	0.56	0.58	0.63	0.67	0.75	0.69	0.75	0.87	0.8
Hungary	1.99	2.21	2.42	2.64	3.34	3.69	4.9	5.58	6.12
Malta	0.04	0.05	0.04	0.04	0.05	0.1	0.14	0.2	0.21
Netherlands	33.88	35.22	38.08	38.97	45.27	49.92	55.7	62.34	60.46
Austria	6.65	7.36	8.15	8.22	8.36	9.54	11.26	12.33	13.12
Poland	2.34	2.54	2.76	3.1	3.89	4.88	6.31	7.51	9.11
Portugal	1.49	1.47	1.6	1.73	1.94	2.11	2.34	2.71	2.73
Romania	0.66	0.66	0.69	0.74	1.04	1.28	1.47	1.7	2.04
Slovenia	1.05	1.18	1.34	1.53	1.72	1.92	2.37	2.79	3.12
Slovakia	0.98	0.99	1.01	1	1.18	1.47	1.82	2.09	2.3
Finland	2.95	3.05	3.31	3.33	2.27	3	3.55	3.76	4.01
Sweden	8.48	8.87	9.2	10.35	11.03	11.76	13.53	13.63	13.62
United Kingdom	40.91	43.94	45.02	45.26	47.22	48.82	54.88	56.92	54.88
Iceland	0.03	0.06	0.09	0.08	0.12	0.09	0.08	0.08	:
Norway	1.69	1.82	1.94	1.87	2	2.23	2.32	2.87	3
Switzerland	24.13	28.58	31.48	30.62	33.1	36.47	41.27	43.3	46.85

:=Not available

Source: Eurostat

Note: The chart above was taken over from Eurostat. There is an obvious mistake in the chart; it is not possible that the EU 15 trade is higher than the EU 25 trade, respectively EU 27 trade. Probably, the processor switched the two lines in the chart in either names or in values of EU 27 and EU 15.

Despite the mentioned mistake, the Eurostat chart shows constant growth in exports of chemicals, both across the EU partner countries and the ChemLog project partners.

[3] SITC (Standard International Trade Classification) – a classification dividing the trade commodities into ten categories:

0 – Food and live animals, 1 – Beverages and tobacco, 2 – Raw materials (except fuels), 3 – Mineral fuels and lubricants, 4 - Oils, fats and waxes, 5 - Chemicals, 6 - Manufactured goods classified by type of material, 7 - Machinery and transport equipment, 8 - Miscellaneous manufactured articles, 9 - Other.

Chart 7 - Foreign trade with chemicals (SITC5[4] – chemicals and related products) - import

IMPORTS IN 1000 MILLION OF ECU/EURO									
	2000	2001	2002	2003	2004	2005	2006	2007	2008
European Union (27 countries)	70.5	76.9	80.76	80.51	88.53	96.44	109.22	120.63	124.35
European Union (25 countries)	70.58	76.89	80.65	80.37	88.26	96.03	108.68	120.1	123.7
European Union (15 countries)	71.37	77.54	81.16	80.76	89	98.3	112.01	124.34	128.19
Belgium	31.4	35.59	50.08	49.63	55.23	64.46	68.45	72.7	71.53
Bulgaria	0.66	0.82	0.86	0.96	1.2	1.39	1.63	1.92	2.2
Czech Republic	3.9	4.43	4.82	5.21	6.06	6.69	7.69	8.89	9.92
Denmark	4.87	5.18	5.66	5.61	6.06	6.71	7.47	7.79	8.28
Germany (including ex-GDR from 1991)	51.64	57.69	57.72	58.79	66.41	75.97	88.34	98.73	102.62
Estonia	0.4	0.43	0.49	0.54	0.64	0.76	0.97	1.06	1.13
Ireland	6.09	6.35	7	6.89	7.07	7.38	7.94	8.09	8.28
Greece	4.21	4.55	3.65	5.02	5.72	6.36	6.92	7.75	8.26
Spain	18.03	19.8	22	23.38	24.89	26.9	29	31.65	34.15
France	40.87	42.15	42.44	44.12	46.8	51.16	53.99	59.63	61.64
Italy	31.48	32.39	33.73	34.37	38.06	40.82	45	48	46.95
Cyprus	0.34	0.38	0.41	0.41	0.44	0.46	0.51	0.57	0.64
Latvia	0.43	0.49	0.54	0.57	0.65	0.75	0.98	1.14	1.3
Lithuania	0.67	0.81	0.92	0.98	1.16	1.41	1.79	2.28	2.43
Luxembourg (Grand-Duché)	1.12	1.25	1.19	1.22	1.32	1.42	1.53	1.68	1.69
Hungary	3.08	3.38	3.69	4.09	4.63	4.99	5.89	6.44	7.29
Malta	0.23	0.22	0.23	0.24	0.26	0.27	0.29	0.33	0.32
Netherlands	25.04	26.09	28.06	27.67	31.14	35.15	38.85	44.48	44.7
Austria	7.8	8.52	8.92	9.28	9.59	10.8	12.14	13.04	13.65
Poland	7.46	8.18	8.69	8.91	10.2	11.64	13.64	15.7	18.51
Portugal	4.07	4.39	4.64	4.75	5.05	5.39	5.96	6.35	6.66
Romania	1.42	1.72	2.03	2.18	2.72	3.31	4.3	5.26	6.15
Slovenia	1.36	1.44	1.55	1.63	1.85	2.04	2.25	2.64	2.79
Slovakia	1.51	1.7	1.87	1.95	2.33	2.7	3.19	3.87	4.33
Finland	3.88	3.96	4.18	4.34	4.55	5.13	5.84	5.82	6.13
Sweden	7.15	7.32	7.34	7.87	8.67	9.59	10.61	11.92	12.73
United Kingdom	34.74	37.24	39.13	38.73	42.26	43.94	47.77	51.97	48.58
Iceland	0.2	0.24	0.25	0.26	0.28	0.31	0.33	0.36	:
Norway	3.24	3.4	3.5	3.44	3.62	4.18	4.66	5.03	5.69
Switzerland	14.86	18.06	19.36	18.81	20.01	22.11	23.83	26.33	25.46

:=Not available

Source: Eurostat

Note: The chart above was taken over from Eurostat. There is an obvious mistake in the chart; it is not possible that the EU 15 trade is higher than the EU 25 trade, respectively EU 27 trade. Probably, the processor switched the two lines in the chart in either names or in values of EU 27 and EU 15.

Despite the mentioned mistake, the Eurostat chart shows constant growth in imports of chemicals, both across the EU partner countries and the ChemLog project partners (the only exception with slight decrease in 2008 is Italy).

[4] SITC (Standard International Trade Classification) – a classification dividing the trade commodities into ten categories:

0 – Food and live animals, 1 – Beverages and tobacco, 2 – Crude materials (without fuels), 3 – Mineral fuels and lubricants, 4 - Animal and vegetable oils, fats and waxes, 5 - Chemicals, 6 - Manufactured goods classified chiefly by material, 7 - Machinery and transport equipment, 8 - Miscellaneous manufactured articles, 9 - Commodities and transactions not classified elsewhere in the SITC.

2.3.2 The Czech Republic

The Czech Republic exports most of the chemicals (the SITC 5 category) into Germany (more than 20 % of the total volume of exported chemicals), Slovakia (more than 14 %) and Poland (approx. 11 %). As for the import of chemicals, more than 30 % of the total volume of imports originates in Germany, approx. 7 % in France and more than 5 % in Italy, Poland, Belgium and the Netherlands.

Chart 8 – The SITC5 Imports of the Czech Republic in 2007 and 2008 (in monetary units)

A year 2007 - import (%)	
Germany	31,94
France	7,07
Italy	5,53
Belgium	5,49
Holand	5,42
Poland	5,30
Slovakia	4,66
Britain, Ireland	4,55
Austria	4,12
Switzerland	3,45

A year 2008 - import (%)	
Germany	31,33
France	6,80
Poland	5,58
Italy	5,48
Belgium	5,26
Holand	5,24
Slovakia	5,00
Britain, Ireland	4,52
Austria	4,29
Switzerland	3,35

Source: A foreign-trade yearbook 2008 (The Ministry of Industry and Trade, The Czech Statistical Office)

Chart 9 – The SITC5 exports of the Czech Republic in 2007 and 2008 (in monetary units)

A year 2007 - export (%)	
Germany	21,36
Slovakia	14,11
Poland	10,99
Hungary	6,38
Italy	4,94
Russia	4,22
Austria	3,65
France	2,65
USA	2,52
Belgium	2,50

A year 2008 - export (%)	
Germany	21,34
Slovakia	14,74
Poland	11,89
Hungary	5,59
Italy	4,27
Russia	4,00
Austria	3,94
France	2,64
USA	2,57
Belgium	2,44

Source: A foreign-trade yearbook 2008

The domestic national transport of chemicals in the Czech Republic showed significant decrease in 2008 compared to the previous four years. The decrease was by about a half compared to the year 2007.

Chart 10 - The national domestic transportation of goods in the Czech Republic by individual commodities in total (thousands of tons)

	2000	2004	2005	2006	2007	2008
Total	***428 961***	***468 642***	***463 790***	***444 350***	***455 330***	***426 957***
Agriculture, hunting and forestry products; fish and other fishing products	23 692	22 112	25 707	21 910	21 182	43 703
Black coal and lignit; crude oil, natural gas	33 618	30 423	29 643	34 592	31 147	30 928
Metal ore, mining products, modification of other minerals, peat; uranium and thorium	151 779	194 667	195 808	172 526	187 034	153 016
food, beverages, tobacco	36 460	34 924	34 603	35 828	33 244	24 484
Textile, textile products; leather, leather products	6 385	5 781	7 081	9 411	6 786	1 325
Wood, wooden and cork products (no furniture); wickerwork, straw,wood-pulp, paper paper products; printing products, recorded media	19 810	20 789	17 171	22 850	24 088	18 195
Coke, refined crude-oil products	8 304	7 804	9 369	9 021	8 626	11 251
Chemicals and chemical products, synthetic fibres; rubber and plastic products; atomic fuel	18 128	17 341	13 013	14 690	16 080	8 231
Other non-metal anorganic products	62 045	67 184	66 238	63 056	64 424	47 936
Metals; m.constructions, m. products, apart from machinery and mechanisms	18 113	16 036	19 590	16 062	14 578	18 278
Other machines and mechanisms; office machines, computers;electric appliances and others radio, TV, telecommunication installations and machines, hospital, precise,optical machines watches, clocks	0	0	0	0	0	7 576
Means of transport,installations	7 702	8 887	10 548	10 554	14 211	6 529
Furniture; other industrial products	0	0	0	0	0	989
Secondary raw materials; waste	0	0	0	0	0	33 366
Shipments	0	0	0	0	0	4 577
Installations, transport material	0	0	0	0	0	6 000
Articles transported while moving households and offices; luggage transported separately from passengers;vehicles transp. to be repaired; umarketable goods mentioned nowhere else	0	0	0	0	0	72
Group articles: sort combinations transported together	0	0	0	0	0	5 492
For whatever reason unidentified articles that can not be included in groups 1-16	0	0	0	0	0	3 252
Other articles	42 926	42 694	35 019	33 849	33 931	1 758

Note: In accordance with the new EU legislation, reclassification of transported goods was made in 2008. To maintain comparability of time lines, reverse calculation was performed.

Source: The transportation yearbook 2008

The comparison of statistical data on exports of chemicals (see the table below) shows growth in the year 2008 by approx. 20 % compared to the year 2007. Apparent oscillation appears between the years 2004 – 2007, slight decrease occurs in 2005, the following year slight increase and then decrease again by approx. 8 % in 2007.

Out of the total volume of export, the export of chemicals and chemical products covered approx. 5,2 – 6,4 % between the years 2004 – 2008.

Chart 11 - Total export of the Czech Republic by individual commodities (thousands of tons)

	2000	2004	2005	2006	2007	2008
Celkem	***43 550***	***39 692***	***38 723***	***42 827***	***42 014***	***41 079***
Agriculture, hunting and forestry products; fish and other fishing products	1 925	906	2 454	1 880	1 835	2 875
Black coal and lignit; crude oil, natural gas	10 358	7 806	7 590	9 023	8 707	7 546
Metal ore, minig productsmodification of other minerals, peat; unraium and thorium	2 549	2 225	3 532	3 777	3 932	1 355
Food, beverages, tobacco	1 247	1 499	1 530	2 067	1 716	2 047
Textile, textile products; leather, leather products	965	603	1 224	1 276	960	489
Wood, wooden and cork products (no furniture); wickerwork, straw,wood-pulp, paper paper products; priniting products, recorded media	4 143	4 768	4 010	4 609	4 679	3 360
Coke, refined crude-oil products	568	970	1 142	1 091	1 235	2 318
Chemicals and chemical products, synthetic fibres; rubber and plastic products; atomic fuel	2 586	2 541	2 185	2 368	2 190	2 612
Other non-etal anorganic products	3 488	2 935	2 564	3 049	2 558	2 244
Metals, m.constructions,m.products, apart from machinery and mechanisms	6 364	6 940	5 687	6 316	6 452	5 865
Other machines and mechanisms; office machines, computers;electric appliances and others radio, TV, telecommunication installations and machines, hospital, precise,optical machines watches, clocks	0	0	0	0	0	1 831
Means of transport,installations	1 117	2 575	2 676	2 811	2 961	1 820
Furniture; other industrial products	0	0	0	0	0	274
Secondary raw materials, waste	0	0	0	0	0	2 071
Shipments	0	0	0	0	0	154
Installation, transport material	0	0	0	0	0	671
Articles transported while movind households and offices; luggage transported separately from passengers;vehicle transp.to be repaired; unmarketable goods mentioned nowhere else	0	0	0	0	0	0
Group articles; sort combinations transported together	0	0	0	0	0	656
For whatever reason unidentified articles that can not be included in groups 1-16 zařazeny do skupin 01 – 16	0	0	0	0	0	2 428
Other articles	8 241	5 926	4 128	4 561	4 788	464

Note: In accordance with the new EU legislation, reclassification of transported goods was made in 2008. To maintain comparability of time lines, reverse calculation was performed.

Source: The transportation yearbook 2008

Statistics on waterway export indicates that the export of chemicals between the years 2006 – 2008 constitutes approximately a fifth of the total export volume transported by waterways (see the chart below).

Chart 12 - The waterway export of the Czech Republic (thousands of tons)

	2000	2004	2005	2006	2007	2008
Total	622	253	546	378	256	182
Chemical substances, prepararions, products and synthetic fibres; rubber and plastic products; atomic fuel	155	81	88	90	55	35

Source: The transportation yearbook 2008

Statistical data on imports show slight yet constant increase between the years 2005 and 2008. Imports increased by approximately 16 % between 2007 and 2008.

The volume of the chemicals and chemical products from the total volume of imported goods was approx. 6,6 - 7,4 % between the years 2004 and 2008.

Chart 13 - Import of goods into the Czech Republic by individual commodities (thousands of tons)

	2000	2004	2005	2006	2007	2008
Total	***33 731***	***37 189***	***33 328***	***39 414***	***39 659***	***39 936***
Agriculture, hunting and forestry products; fish and other fishing products	1 045	1 104	932	1 396	1 176	1 682
Black coal and lignit; crude oil, natural gas	1 681	1 975	1 633	2 643	3 536	2 935
Metal ore, mining products, modification of other minerals, peat; uranium and thorium	8 285	10 032	9 464	11 719	10 438	9 938
Food, beverages, tobacco	1 804	1 759	1 532	1 710	1 572	1 775
Textile, textile products; leather, leather products	437	601	820	1 353	1 128	558
Wood, wooden and cork products (no furniture); wickerwork, straw,wood-pulp, paper, paper products; printing products, recorded media	2 320	2 355	2 017	1 632	1 955	2 200
Coke, refined crude-oil products	693	1 905	2 158	1 827	2 101	1 704
Chemicals and chemical products, synthetic fibres; rubber and plastic products; atomic fuel	2 661	2 572	2 390	2 548	2 625	3 044
Other non-metal anorganic products	2 405	2 650	2 319	2 913	2 821	2 354
Metals; m.constructions, m.products, apart from machinery and mechanisms	4 749	4 989	4 034	5 069	5 433	5 646
Other machines and mechanisms; office machines, cmputers;electric appliances and others radio, TV, telecommunication installations and machines, hospital, precise,optical machines watches, clocks	0	0	0	0	0	1 095
Means of transport,installations	928	1 779	1 349	1 610	1 604	1 041
Furniture; other industrial products	0	0	0	0	0	140
Secondary raw materials; waste	0	0	0	0	0	479
Shipments	0	0	0	0	0	93
Installations, transport material	0	0	0	0	0	1 096
Articles transported while moving households and offices; luggage transported separately from passengers;vehicles transp. to be repaired; unmarketable goods mentioned nowhere else neuvedené	0	0	0	0	0	0
Group articles; sort combinations transported together	0	0	0	0	0	667
For whatever reason unidentified articles that can not be included in groups 1-16 zařazeny do skupin 01 – 16	0	0	0	0	0	3 179
Other articles	6 722	5 470	4 680	4 993	5 271	311

Note: In accordance with the new EU legislation, reclassification of transported goods was made in 2008. To maintain comparability of time lines, reverse calculation was performed.

Source: The transportation yearbook 2008

Statistics on imported goods by waterway transport indicates, that the volume of chemicals from the total volume of imported goods is significantly lower than volume of exports and it is very unstable – approx. 3,5 % in 2006, 1,6 % in 2007 and 6,4 % in 2008.

Chart 14 - Waterway import of the Czech Republic (thousands of tons)

	2000	2004	2005	2006	2007	2008
Total	482	299	364	336	248	173
Chemical substances, preparations, products and synthetic fibre; rubber and plastic products; atomic fuel	44	66	46	12	4	11

Source: The transportation yearbook 2008

The problem of transport yearbooks is that data are gathered only on domestic transporters and only on public ports. The corporation port Lovochemie (the largest producer of fertilizers in the CR) in Lovosice is managed by German vessel operators to a high degree. Therefore in average, there are approx. 3.000 tons of imports and 65.000 tons of exports missing in the Transportation yearbook data (for the Lovosice port statistics, Inc. see the chapter 2.5.1.2)[5].

If the volumes of the foreign vessel operators are calculated, the output changes considerably:

Export of chemicals: approx. 105 thousands tons → 36 % of the total transported volume of all vessel operators in all commodities.

Import of chemicals: approx. 14 thousands tons → 5 % of the total transported volume of all vessel operators in all commodities.

The transported volumes of a single chemical factory are significant. If the accessibility (especially in terms of time) of other chemical industries improved, it is assumed that the volume of chemicals transported by waterways would rapidly grow.

2.3.3 Germany

The role of the chemical industry is crucial in German economy. In 2008, the German chemical industry ranked fourth in the list of worldwide production of chemicals and first in Europe focusing its production on basic and consumption products. The major produced commodities are plastics, synthetic fibers and varnish for industrial commodities, consumption products including pharmaceuticals, cosmetics and cleaning products for end-consumers.

[5] CityPlan findings

Chart 15 – Production of the chemical-pharmaceutical industry

2005 = 100, Originalwert

VCI-Abgrenzung

	Chemisch-pharmazeutische Industrie		Chemische Industrie		Anorganische Grund-chemikalien		Petro-chemikalien und Derivate	
1996	80,6	+ 3,6	81,4	+ 3,8	75,4	- 1,0	81,9	+ 14,6
1997	84,3	+ 4,6	87,2	+ 7,0	78,4	+ 4,0	88,8	+ 8,4
1998	84,6	+ 0,4	87,4	+ 0,3	78,6	+ 0,2	88,0	- 0,9
1999	87,8	+ 3,8	91,3	+ 4,4	77,0	- 2,1	93,8	+ 6,6
2000	89,9	+ 2,3	94,4	+ 3,5	82,1	+ 6,7	92,7	- 1,2
2001	88,3	- 1,7	90,5	- 4,2	81,4	- 0,9	89,0	- 4,0
2002	91,5	+ 3,6	94,3	+ 4,2	84,7	+ 4,1	98,3	+ 10,5
2003	92,0	+ 0,5	93,4	- 0,9	87,3	+ 3,1	94,6	- 3,8
2004	95,0	+ 3,3	97,3	+ 4,2	92,3	+ 5,6	97,6	+ 3,1
2005	100,0	+ 5,2	100,0	+ 2,7	100,0	+ 8,4	100,0	+ 2,5
2006	104,0	+ 4,0	103,7	+ 3,7	107,8	+ 7,8	102,7	+ 2,7
2007	109,0	+ 4,8	105,6	+ 1,8	106,1	- 1,6	103,5	+ 0,8
2008	107,3	- 1,5	101,6	- 3,8	98,5	- 7,2	98,9	- 4,5

	Polymere		Fein- und Spezial-chemikalien		Wasch- und Körperpflege-mittel		Pharmazeutika	
1996	77,8	+ 4,6	81,8	+ 0,2	97,3	- 4,4	78,5	+ 3,2
1997	86,2	+ 10,7	86,8	+ 6,1	96,6	- 0,7	77,6	- 1,2
1998	89,0	+ 3,3	87,1	+ 0,4	93,9	- 2,7	78,1	+ 0,7
1999	96,4	+ 8,4	88,7	+ 1,8	96,2	+ 2,4	79,8	+ 2,1
2000	101,2	+ 5,0	94,4	+ 6,4	94,3	- 1,9	79,1	- 0,8
2001	94,8	- 6,4	92,0	- 2,5	91,1	- 3,4	83,1	+ 5,1
2002	95,6	+ 0,9	93,3	+ 1,5	98,1	+ 7,6	84,9	+ 2,1
2003	90,9	- 4,9	94,8	+ 1,6	103,1	+ 5,2	88,6	+ 4,4
2004	94,6	+ 4,1	99,3	+ 4,7	105,0	+ 1,8	89,6	+ 1,1
2005	100,0	+ 5,7	100,0	+ 0,7	100,0	- 4,7	100,0	+ 11,6
2006	102,1	+ 2,0	105,3	+ 5,2	103,2	+ 3,2	104,7	+ 4,7
2007	101,7	- 0,4	110,1	+ 4,6	109,3	+ 5,9	117,0	+ 11,7
2008	99,3	- 2,3	105,4	- 4,3	106,5	- 2,5	120,8	+ 3,3

Source: Chemiewirtschaft in Zahlen 2009

The Federal Republic of Germany exports the most of the chemical-pharmaceutical products into the following EU countries: Belgium (more than 20 %), the Netherlands and France (both approx. 12 %). The first fifteen states of EU 27 importing German chemical products include following ChemLog partners: Italy (4th place), Poland (6th), Austria (8th), the Czech Republic (9th) and Hungary (13th).

Chart 16 – Export of chemical-pharmaceutical products by countries

	Land	2005	2006	2007	2008[1]	i.v.H
EU 27		67 602,7	75 398,8	83 523,9	86 456,3	62,7
	Belgien	14 188,3	16 180,6	17 257,2	17 832,9	12,9
	Niederlande	7 604,0	8 688,3	10 590,0	11 132,9	8,1
	Frankreich	9 284,0	9 710,3	10 397,0	11 096,2	8,0
	Italien	7 753,1	8 399,3	9 108,5	8 850,1	6,4
	Großbritannien	6 309,1	6 710,1	7 411,2	7 449,3	5,4
	Spanien	4 204,5	4 518,8	5 051,4	4 858,5	3,5
	Polen	2 930,4	3 574,2	4 139,0	4 674,8	3,4
	Österreich	3 884,2	4 193,8	4 531,9	4 649,1	3,4
	Tschechische Republik	1 716,8	2 082,4	2 436,7	2 525,0	1,8
	Dänemark	1 294,5	1 390,8	1 760,3	2 117,1	1,5
	Schweden	1 744,4	1 826,8	1 977,2	2 023,4	1,5
	Griechenland	1 087,6	1 090,7	1 296,7	1 396,0	1,0
	Ungarn	963,5	1 235,0	1 346,9	1 369,2	1,0
	Finnland	967,4	1 229,2	1 304,0	1 289,1	0,9
	Portugal	751,8	797,9	836,7	880,3	0,6
	Irland	637,1	916,9	834,3	876,2	0,6
	Rumänien	467,1	628,2	751,0	825,1	0,6
	Slowakei	446,7	543,5	635,1	663,9	0,5
	Slowenien	394,3	456,1	550,3	575,1	0,4
	Luxemburg	314,6	406,0	423,1	412,7	0,3
	Litauen	215,9	244,1	283,5	308,7	0,2
	Bulgarien	198,1	242,2	243,2	266,1	0,2
	Estland	100,5	156,4	171,3	181,6	0,1
	Lettland	78,8	109,0	112,8	119,5	0,1
	Zypern	42,5	41,8	48,7	55,8	0,0
	Malta	23,5	26,3	26,1	27,8	0,0
Sonst. europ. Länder		10 743,9	12 860,6	14 183,2	14 763,1	10,7

Source: Chemiewirtschaft in Zahlen 2009

Germany imports most of the chemical-pharmaceutical products from the following EU 27 countries: the Netherlands and Ireland (both approx. 17 %) and Belgium (15 %). The first fifteen states of EU 27 exporting chemical products into German include following ChemLog partners: Italy (6th), Austria (8th), Poland (10th), the CR (11th) and Hungary (14th).

Chart 17 – Import of chemical-pharmaceutical products by countries

	Land	2005	2006	2007	2008[1]	i.v.H
EU 27		52 404,3	58 995,1	63 335,9	63 312,6	66,8
	Niederlande	8 354,5	9 797,5	10 841,6	10 585,1	11,2
	Irland	9 568,7	10 034,1	10 476,0	10 430,0	11,0
	Belgien	7 763,9	8 762,1	9 787,6	9 764,0	10,3
	Frankreich	7 153,1	7 836,2	8 139,1	8 221,7	8,7
	Großbritannien	7 017,0	7 826,7	7 892,9	7 362,9	7,8
	Italien	3 547,7	4 102,2	4 084,6	4 245,2	4,5
	Spanien	2 036,1	2 317,7	2 606,0	2 669,2	2,8
	Österreich	1 648,2	1 967,9	2 198,1	2 117,3	2,2
	Schweden	1 459,4	1 653,2	1 688,0	1 673,4	1,8
	Polen	654,5	989,0	1 177,8	1 442,9	1,5
	Tschechische Republik	834,5	944,3	1 006,7	968,5	1,0
	Dänemark	643,1	644,0	873,8	942,7	1,0
	Finnland	366,8	450,3	498,8	511,2	0,5
	Ungarn	258,3	343,2	400,4	454,4	0,5
	Portugal	199,4	254,7	325,2	408,4	0,4
	Griechenland	189,0	219,1	261,2	298,3	0,3
	Luxemburg	212,3	240,2	251,5	291,4	0,3
	Litauen	63,1	82,5	213,0	290,0	0,3
	Slowakei	205,7	226,5	249,4	263,3	0,3
	Slowenien	115,2	132,6	132,8	133,9	0,1
	Rumänien	39,0	53,6	101,9	104,2	0,1
	Bulgarien	12,9	44,7	45,1	40,7	0,0
	Zypern	35,7	42,3	34,6	32,3	0,0
	Estland	9,3	10,1	18,5	28,4	0,0
	Malta	8,5	11,0	20,0	20,1	0,0
	Lettland	8,2	9,4	11,1	12,8	0,0
Sonst. europ. Länder		6 124,0	7 107,9	9 343,4	9 627,8	10,2

Source: Chemiewirtschaft in Zahlen 2009

Chart 18 – Transported volumes – railway transport (thousands of tons)

Eisenbahnverkehr

	Transportaufkommen gesamt		Chemisch-pharmazeutische Erzeugnisse		Anteil an Gesamt
1998	308 704	- 4,0	29 426	+ 2,3	9,5
1999	290 700	- 5,8	28 299	- 3,8	9,7
2000	293 800	+ 1,1	29 098	+ 2,8	9,9
2001	291 100	- 0,9	28 276	- 2,8	9,7
2002	289 205	- 0,7	29 997	+ 6,1	10,4
2003	303 757	+ 5,0	30 644	+ 2,2	10,1
2004	310 261	+ 2,1	33 284	+ 8,6	10,7
2005[1]	317 294	.	33 398	.	10,5
2006	346 118	+ 9,1	32 654	- 2,2	9,4
2007	361 116	+ 4,3	34 636	+ 6,1	9,6
2008	371 298	+ 2,8	33 792	- 2,4	9,1

Source: Chemiewirtschaft in Zahlen 2009

Chart 19 – Transported volumes – inland road transport (thousands of tons)

Straßenverkehr inländischer Lastkraftwagen					
	Transportaufkommen gesamt		Chemisch-pharmazeutische Erzeugnisse		Anteil an Gesamt
1998	2 968 023	- 0,4	235 011	+ 1,1	7,9
1999	3 181 363	+ 7,2	249 437	+ 6,1	7,8
2000	3 005 104	- 5,5	247 129	- 0,9	8,2
2001	2 884 479	- 4,0	229 831	- 7,0	8,0
2002	2 720 163	- 5,7	218 089	- 5,1	8,0
2003	2 743 858	+ 0,9	232 119	+ 6,4	8,5
2004	2 767 167	+ 0,8	235 577	+ 1,5	8,5
2005	2 764 983	- 0,1	234 790	- 0,3	8,5
2006	2 919 325	+ 5,6	249 394	+ 6,2	8,5
2007	3 027 941	+ 3,7	263 442	+ 5,6	8,7
2008	3 077 845	+ 1,6	289 716	+ 10,0	9,4

Source: Chemiewirtschaft in Zahlen 2009

Chart 20 –Transported volumes - inland waterway transport (thousands of tons)

Binnenschifffahrt					
	Transportaufkommen gesamt		Chemisch-pharmazeutische Erzeugnisse		Anteil an Gesamt
1998	236 365	+ 1,2	24 434	+ 3,3	10,3
1999	229 136	- 3,1	25 882	+ 5,9	11,3
2000	242 223	+ 5,7	27 305	+ 5,5	11,3
2001	236 101	- 2,5	24 390	- 10,7	10,3
2002	231 746	- 1,8	24 564	+ 0,7	10,6
2003	219 999	- 5,1	23 455	- 4,5	10,7
2004	235 861	+ 7,2	25 556	+ 9,0	10,8
2005	236 765	+ 0,4	26 098	+ 2,1	11,0
2006	243 495	+ 2,8	25 856	- 0,9	10,6
2007	248 974	+ 2,3	27 647	+ 6,9	11,1
2008	245 662	- 1,3	26 923	- 2,6	11,0

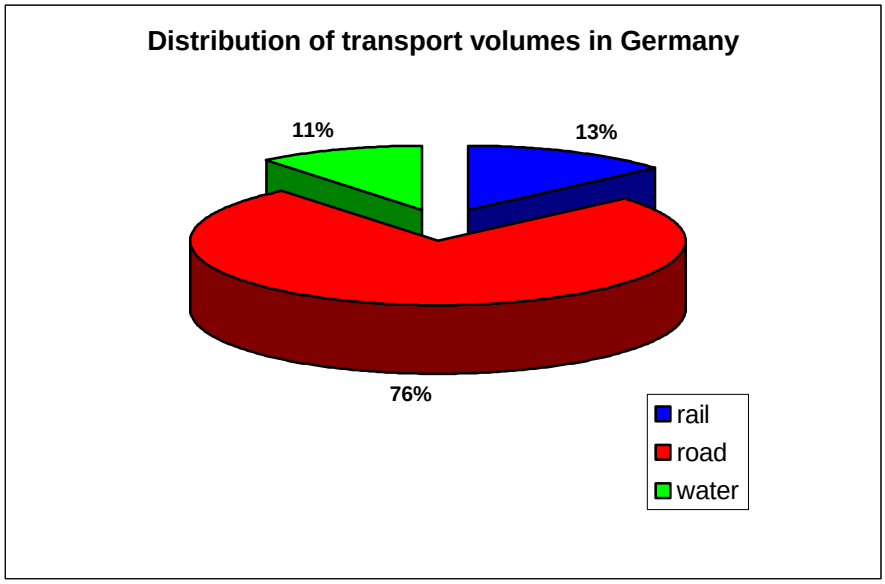
Source: Chemiewirtschaft in Zahlen 2009

Chart 21 – Transported volumes – sea transport (thousands of tons)

Seeverkehr						
	Transportaufkommen gesamt[1]		Chemisch-pharmazeutische Erzeugnisse		Anteil an Gesamt
1998	214 045	+ 2,1	20 477	- 0,4	9,6
1999	217 063	+ 1,4	19 701	- 3,8	9,1
2000	238 254	+ 9,8	20 359	+ 3,3	8,5
2001	242 156	+ 1,6	20 497	+ 0,7	8,5
2002	242 546	+ 0,2	21 228	+ 3,6	8,8
2003	251 300	+ 3,6	22 281	+ 5,0	8,9
2004	268 205	+ 6,7	23 078	+ 3,6	8,6
2005	280 972	+ 4,8	25 765	+ 11,6	9,2
2006	299 215	+ 6,5	26 699	+ 3,6	8,9
2007	310 948	+ 3,9	27 596	+ 3,4	8,9
2008	316 651	+ 1,8	28 441	+ 3,1	9,0

Source: Chemiewirtschaft in Zahlen 2009

Graph 6 – Distribution of transport volumes in Germany



Source: charts 17,18 and 19

Compared to the Czech Republic, the utilization of waterways is higher. The reason is that the waterway network is longer and denser and also highly reliable, unrestricted by low water levels.

2.4 TRANSPORT OF CHEMICALS

The transport of chemicals involves all modes of transportation. Regardless how the “chemical law” classifies the safety hazard of individual chemical substances and products, it is advisable to follow valid national and European (global) regulations during the transportation. If a product is

classified as hazardous according to the regulations, these regulations must be followed. Otherwise, if the chemicals are not classified as hazardous, it is handled as any other commodity according to the valid regulations on road, railway and inland water transport.

Hazardous materials can be characterized as substances with one or more dangerous qualities classified by law. Hazardous materials occur in areas of production, processing, storing and transporting. Accident involving hazardous materials is an exceptional event when the material gets out of control (leaking from containers or equipment) in amount causing threat to population, animals and the environment and requiring rescue and liquidation works.

Characteristic features of an accident involving leak of hazardous materials are:

- the transporting vehicle or container is labeled by warning plates, orange reflective plates, safety signs and handling marks;
- color of vegetation changes or decays, small animals in a close proximity are dying;
- unusual phenomena during burning and fire formation (unusual color of the flame and smoke, smell, explosions, fervent flames and spontaneous combustion, rapid spread of fire even on non-flammable materials);
- mist, quivering air, hissing of gas, cracking structures;
- unusual wrappings, glass containers, pressure cylinders, thick insulations on containers.

Road transportation of hazardous materials follows **the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR)**, the railroad transportation is regulated by **the Regulations concerning the International Carriage of Dangerous Goods by Rail (RID),** and the inland waterway navigation by **the European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterway (ADN)**.

These regulations harmonize the transporting conditions, including the compulsory labeling, in order to minimize risks, which may occur during accidents or extreme situations.

Such regulations defines material and its level of dangerousness. The classification of materials contains five elements: class, classification code, wrapping cluster, the UN number and the official label.

Chart 22 – Classification of hazards

CLASS	CLASS LABEL
1	explosives
2	gases
3	inflammable liquids (combustible liquids)
4.1	inflammable solids, spontaneously decomposing materials, inert solid explosives
4.2	pyrophoric materials
4.3	materials emitting inflammable gasses in contact with water
5.1	combustion-facilitating materials
5.2	organic peroxides
6.1	toxic materials
6.2	infectious substances
7	radioactive materials
8	corrosives
9	other hazardous materials and objects

Chart 23 – Meaning of letters used for classification codes

	MEANING OF LETTERS USED FOR CLASSIFICATION CODES
A	asphyxiant
F	flammable
D	explosives, desensitized
SR	self-reducing materials
S	self-igniting materials
W	materials emitting inflammable gasses in contact with water
O	combustion-facilitating

P	organic peroxide
T	toxic
I	infectious
C	corrosive
M	materials that may generate hazard during transportation (do not qualify for any of the categories 1-8)

Chart 24 - Wrapping clusters

WRAPPING CLUSTER	WRAPPING LABEL	WRAPPING USAGE
I	X	high-hazard materials
II	Y	medium-hazard materials
III	Z	low-hazard materials

UN - number – identification number of the material, a four-digit code uniquely identifying a substance.

To mark the tankers, the tank containers and loosely-lodged loads, hazard identifying number is used (the Kemler code) – two or three-digit combination complemented with the X-sign. The first digit indicates primary hazard, the second / third digit identifies secondary hazard. If the digits are doubled, the hazard is greater.

1 – explosives

2 – release of gasses under-pressure or by chemical reaction

3 – flammability of liquids and gas vapors

4 – flammability of solid materials

5 – oxidizing effects (facilitates burning)

6 – toxicity

7 – radioactivity

8 – corrosiveness

9 – danger of violent spontaneous reaction (spontaneous decomposition or polymerization)

0 – additional numerical order

Double digits indicates increased corresponding hazard. The letter X at the front of a digit means, that the material reacts dangerously with water.

The ADR, RID and ADN agreements also determine adjustments and equipment of vehicles transporting hazardous-materials (section 9 in the ADR and ADN Agreement, section 6 in the RID Agreement; detailed description exceeds the scope of this project). Companies involving road, railway or inland water transport of hazardous materials or associated wrapping, loading, tanking or unloading of such materials, must appoint one or more safety advisors responsible for help with risk prevention avoiding damage to people, property and the environment.

2.4.1 Road transport

The European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR)

The ADR Agreement was sealed in Geneva in 1957. Until today, it is ratified by 46 countries (also non-European countries) including all partners of the ChemLog project. Apart from the above-mentioned requirements of the ADR, RID and ADN regulations stated in the chapter “Land transport of chemicals”, the ADR requires additional features.

According to the ADR agreement, the transported is bound to:

- use only vehicles intended for transportation of chemicals
- ensure that the driver has the obligatory equipment, including orange warning plates or safety signs
- ensure the presence of an assistant driver in the vehicle, if required
- ensure that only trained drivers manage the transportation
- provide training for other individuals contributing to the transportation
- ensure that during transportation, the driver carries the necessary documents and can present them upon request of authorized personnel, as well as functional fire extinguishers and the obligatory equipment of the vehicle; that the driver does not accept damaged or leaking goods; that the driver is capable of performing corrective actions described in written instructions in case of an accident or an extreme situation; that the driver follows regulations for loading, unloading and manipulation with goods, if carried out by himself
- appoint a safety advisor for transportation of hazardous materials

The accompanying documents – apart from the documents required by other regulations, a transporting unit must be provided with following documents:

- transportation documents for all transported hazardous materials and certification of container loading in case the road transport continues by sea transport
- written instructions referring to all transported hazardous materials

- identity cards with a photograph of all members of the transporting crew

If determined by the ADR, the transport unit must be further equipped by following documents:

- certificates of approval for each transport unit or vehicle of such transport unit
- a driver´s training certificate
- a copy of approval by competent authority, if required

2.4.2 Railway transport

The Regulations concerning the International Carriage of Dangerous Goods by Rail (RID)

The RID Agreement is a part of the International Convention on the International Railroad Transportation (Convention Internationale sur le transport international ferroviaireje - COTIF) sealed in Vilnius in June 1999 (Attachment C in the Convention). Until January 1, 2009, it was ratified by 43 states including all partners of the ChemLog project.

Apart from the common requirements of the ADR, RID and ADN Agreements mentioned in the chapter “Land transport of chemicals”, the RID further requires additional features.

The transporter accepting hazardous materials in the initial location should execute random cross-section checks, namely:

- to make sure that the hazardous materials allowed for transportation according to the RID
- to make sure that the obligatory documents are attached to the transportation documents
- to make a visual control that there are no apparent defects, leaks or cracks, the compulsory equipment is not missing, etc.
- to make sure that the certification of the tank wagons, battery wagons, detachable tanks, transferable tanks, tank containers and ***MEGC*** (Multiple-Element Gas Container) are not expired
- to make sure that the wagons are not overloaded
- to make sure that the wagons are equipped with safety signs and labels

If appropriate, all the above-stated must be conducted based on transportation documents and accompanying documents, visual control of vehicles or containers and of the load. If the transporter detects violation with the RID regulations, the consignment cannot be delivered unless the defects are removed. In case a defect threatening safe transportation occurs during the trip, the consignment must be withheld as soon as possible with regard to operation safety, safe stabling of the load and public safety. Transportation may be resumed only after the load fulfills valid regulations. The responsible authority may issue a permit for the rest of the trip.

If the required regulations cannot be met and no permit for resumption of the trip was issued, the transporter must be granted the necessary administrative support by the corresponding

authority. The same applies when the transporter informs the authority about not being acquainted with the hazardous nature of the transported materials by the originator and therefore wishes to unload, dissolve or annihilate the load in accordance with the valid regulations.

Accompanying documents – the carriage document

2.4.3 Waterway transport

The European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterway

The ADN Agreement became effective in 2008 after being ratified by a required number of seven states. Until today it was ratified by 12 countries – Russia, the Netherlands, Hungary, Austria, Bulgaria, Luxemburg, Germany, Moldavia, France, Romania, Croatia and Slovakia. The Czech Republic should ratify the Agreement in 2010 but its requirements have already been adopted (transport of hazardous materials is assessed according to the ADN by the State navigation office). The ADN Agreement cannot be interchanged with the ADN-R or ADN-D Agreements which also concern inland waterway transport of hazardous commodities but they are issued by the Central Committee for the Rhein and Danube navigation. Although these two agreements are almost identical with the ADN Agreement and the differences are insignificant, the degree of consistency is not absolute.

Apart from the above-mentioned requirements of the ADR, RID and ADN regulations stated in the chapter “Land transport of chemicals”, the ADN requires other obligations.

According to the ADN, the transporter must:

- make sure that the hazardous materials are allowed to be transported according to the ADN
- make sure that the obligatory documents are on board of the vessel
- make a visual control that there are no apparent defects, leaks or cracks on the vessels and on the load, the compulsory equipment is not missing, etc.
- make sure that the vessel is not overloaded
- make sure that the equipment required in written instructions for the vessel commander is on board of the vessel
- make sure that the vessel is correctly labeled
- make sure that the specific requirements concerning loading, transportation, unloading and handling hazardous materials in cargo areas or cargo tanks were met

Accompanying documents – apart from the documents required by other regulations, the following documents must be present on board of a vessel:

- the vessel certificate

- the shipping documents of all transported hazardous materials and the certificate of a container deposit, if required
- written instructions for all transported hazardous materials
- a valid copy of the ADN Agreement
- a certificate for insulation resistance of electric devices
- a certificate for fire extinguisher and fire hose control
- a book of checks including the required measurement results
- a copy of the specific regulations, if applicable for the transported material
- identity cards with a photograph of all members of the crew
- a list of regular checks or certifications of the results
- in case of transporting frozen materials:
  - o an instruction manual;
  - o a certificate for the cooling system

Apart from these documents, following documents must be present on board of:

▪ a vessel transporting individual pieces and bulk materials:

- a plan of load storage
- a certificate for specific knowledge of the ADN
- for vessels satisfying safety conditions for rescue
  - a safety plan in case of a rescue;
  - data for calculating inviolate stability in case of a rescue as well as all cases of intact stability that serve as a basis for a rescue understandable for the captain of the vessel;
  - a classification certificate

▪ tank vessels:

- a book of loading
- a certificate for specific knowledge of the ADN
- for vessels satisfying safety conditions for rescue
  - a safety plan in case of a rescue;
  - data for calculating inviolate stability in case of a rescue as well as all cases of intact stability that serve as a basis for a rescue understandable for the captain of the vessel.

2.5 PORTS

Ports are the keystone for handling goods and for a possible connection of water transport to road or railway transport. This chapter presents a brief statistical comparison of the volumes of reloaded goods in the important ports on the Elbe river and in the major European sea ports connected with the Elbe waterway.

2.5.1 The Elbe inland ports

There are following major inland ports on the Elbe waterway:

- in the Czech Republic – Mělník, the public port Lovosice, the private port Lovosice, Ústí nad Labem, Děčín

- in Germany – Dresden, Riesa, Torgau, Rosslau, Aken, Magdeburg, Wittenberge

Six of the ports – the public port Lovosice, Děčín, Drážďany, Riesa, Torgau and Rosslau are operated by Česko-saské přístavy přístavy Ltd. (Sächsische Binnenhäfen Oberelbe GmbH – the SBO). The Mělník and Ústí nad Labem ports are operated by České přístavy Inc.

Picture 5 - Ports on the Elbe

Source: http://www.inlandports.be/ – adjusted by the processor

The following sections present statistics on reload in individual ports[6].

2.5.1.1 Mělník

MĚLNÍK			
period	**bulk (tons)**	**lump + IC+NK (tons)**	**chemicals (tons)**
2007	27695	27520	4600
2008	18748	40602	5210
2009	31666	21412	5400
total	**78109**	**89534**	**15210**

2.5.1.2 The public port Lovosice

LOVOSICE - YEAR 2007				
ARTICLE CATEGORY	**Ships**	**Railway**	**Trucks**	**TOTAL**
	tons	**tons**	**tons**	**tons**
Agriculture, forestry	977	0	0	**977**
other food and feed	3 525	0	0	**3 525**
solid mineral fuels	0	0	0	**0**
crude oil, mineral oils	0	0	0	**0**
ore and waste metal	2 314	0	11 998	**14 312**
iron, steel, non-ferrous metal	0	1 520	1 270	**2 790**
stone, soil	16 113	110	51	**16 274**
fertilizers	0	9 727	2 975	**12 702**
chemicals	0	0	0	**0**
containers, other transported goods	2 473	0	25 924	**28 397**
TOTAL	**25 402**	**11 357**	**42 218**	**78 977**

LOVOSICE - YEAR 2008				
ARTICLE CATEGORY	**Ships**	**Railway**	**Trucks**	**TOTAL**
	tons	**tons**	**tons**	**tons**
Agriculture, forestry	2 068	7 336	139 458	**148 862**
other food and feed	0	4 915	0	**4 915**
solid mineral fuels	0	0	0	**0**
crude oil, mineral oils	0	0	0	**0**
ore and waste metal	595	65	12 156	**12 816**
iron, steel, non-ferrous metal	1 118	696	304	**2 118**
stone, soil	37 788	0	26 387	**64 175**
fertiliyers	0	11 355	0	**11 355**
chemicals	0	0	0	**0**
containers, other transported goods	2 065	617	651	**3 333**
TOTAL	**43 634**	**24 984**	**178 956**	**247 574**

6 In connection with the statistics reported in ports of the SBO group, it should be noted, that according to the methodology proposed for adoption by other ports in the Czech Republic, the volume of reloaded goods is presented according to ecological priorities, i.e. with regard to tri-modality of ports - the reload mode vessel-railway/road vehicle/ramp is labeled as vessel reload, the mode road/railway-ramp or vice versa is defined according to the incoming module but the reload mode railway-road is marked as railway transport! In Lovosice, for example, the reload mode railway-road, i.e. without the waterway transport, is relatively frequent. The reason for this is that the port also operates as a common terrestrial terminal.

LOVOSICE - YEAR 2009				
ARTICLE CATEGORY	Ships	Railway	Trucks	TOTAL
	tons	tons	tons	tons
agriculture, forestry	26 291	25 303	91 216	**142 810**
other food and feed	2 568	9 681	270	**12 519**
solid mineral fuels	0	0	0	**0**
crude ooil, mineral oils	0	0	0	**0**
ore and waste metal	0	0	2	**2**
iron, steel, non-ferrous metal	91	0	7	**98**
stone, soil	3 067	21 413	26 079	**50 559**
fertilizers	0	0	0	**0**
chemicals	0	0	27	**27**
containers, other transported goods	28	195	642	**865**
TOTAL	**32 045**	**56 592**	**118 243**	**206 880**

2.5.1.3 The private port Lovochemie (Lovosice)

The company port Lovochemie, Inc. handles only one commodity – fertilizers.

Lovochemie, Inc.			
period	loading (t)	unloading (t)	total (t)
2007	65 949	9 041	74 990
2008	59 062	0	59 062
2009	68 729	0	68 729

2.5.1.4 Ústí nad Labem

ÚSTÍ NAD LABEM			
period	bulk (tons)	lump + IC+NK (tons)	chemicals (tons)
2007	80960	1397	390
2008	65268	6042	38
2009	122995	2749	395
total	**269223**	**10188**	**823**

2.5.1.5 Děčín

DĚČÍN - YEAR 2007				
ARTICLE CATEGORY	Ships	Railway	Trucks	TOTAL
	tons	tons	tons	tons
agriculture, forestry	26 767	0	0	**26 767**
other food and feed	138 135	0	0	**138 135**
solid mineral fuels	0	0	0	**0**
crude oil, mineral oils	0	0	0	**0**
ore, waste metal	0	0	0	**0**
iron, steel, non-ferrous metal	24 463	27 700	6 677	**58 840**
stone, soil	14 507	244	1 961	**16 712**
fertilizers	3 552	0	0	**3 552**
chemicals	134	0	0	**134**
containers, other transported goods	3 519	0	25 354	**28 873**
TOTAL	**211 077**	**27 944**	**33 992**	**273 013**

DĚČÍN - YEAR 2008				
ARTICLE CATEGORY	Ships	Railway	Trucks	TOTAL
	tons	tons	tons	tons
agriculture, forestry	16 474	0	0	**16 474**
other food and feed	90 207	0	310	**90 517**
solid mineral fuels	0	0	0	**0**
crude oil, mineral oils	0	0	0	**0**
ore, waste metal	0	0	953	**953**
iron, steel, non-ferrous metal	36 844	40 787	11 753	**89 384**
stone, soil	14 403	0	4 609	**19 012**
fertilizers	3 046	0	0	**3 046**
chemicals	0	0	0	**0**
containers, other transported goods	1 260	484	29 997	**31 741**
TOTAL	**162 234**	**41 271**	**47 622**	**251 127**

DĚČÍN - YEAR 2009				
ARTICLE CATEGORY	Ships	Railway	Trucks	TOTAL
	tons	tons	tons	tons
agriculture, forestry	94 442	0	237	**94 679**
other food and feed	65 933	0	106	**66 039**
solid mineral fuels	0	0	0	**0**
crude oil, mineral oils	0	0	0	**0**
ore, waste metal	270	0	17	**287**
iron, steel, non-ferrous metal	1 635	7 964	3 178	**12 777**
stone, soil	4 961	196	18 364	**23 521**
fertilizers	1 613	0	1 000	**2 613**
chemicals	450	0	0	**450**
containers, other transported goods	2 103	2 857	22 415	**27 375**
TOTAL	**171 407**	**11 017**	**45 317**	**227 741**

2.5.1.6 Dresden

DRESDEN - YEAR 2007				
ARTICLE CATEGORY	Ships	Railway	Trucks	TOTAL
	tons	tons	tons	tons
agriculture, forestry	0	86	0	**86**
other food and feed	491	0	0	**491**
solid mineral fuels	0	0	225	**225**
crude oil, mineral oils	0	0	0	**0**
ore, w aste metal	17 756	61 217	71 743	**150 716**
iron, steel, non-ferrous metal	3 504	5 925	4 877	**14 306**
stone, soil	23 009	29 135	240 665	**292 809**
fertilizers	425	0	0	**425**
chemicals	0	0	0	**0**
containers, other transported goods	13 370	78 916	168 915	**261 201**
TOTAL	**58 555**	**175 279**	**486 425**	**720 259**

DRESDEN - YEAR 2008				
ARTICLE CATEGORY	Ships	Railway	Trucks	TOTAL
	tons	tons	tons	tons
agriculture, forestry	885	161	0	**1 046**
other food and feed	828	0	0	**828**
solid mineral fuels	0	7 514	8 964	**16 478**
crude oil, mineral oils	0	0	0	**0**
rudy a kovový odpad	6 905	85 296	98 046	**190 247**
iron, steel, non-ferrous metal	240	2 325	2 434	**4 999**
stone, soil	22 626	39 162	252 349	**314 137**
fertilizers	781	0	0	**781**
chemicals	0	0	0	**0**
containers, other transported goods	12 903	87 160	154 789	**254 852**
TOTAL	**45 168**	**221 618**	**516 582**	**783 368**

DRESDEN - YEAR 2009				
ARTICLE CATEGORY	Ships	Railway	Trucks	TOTAL
	tons	tons	tons	tons
agriculture, forestry	3 347	0	0	**3 347**
other food and feed	1 258	0	0	**1 258**
solid mineral fuels	0	2 422	1 924	**4 346**
crude oil, mineral oils	0	0	0	**0**
ore, waste metal	12 374	65 066	79 465	**156 905**
iron, steel, non-ferrous metal	150	661	1 799	**2 610**
stone, soil	26 406	53 992	208 796	**289 194**
fertilizers	0	0	0	**0**
chemicals	0	0	0	**0**
containers, other transported goods	10 649	53 213	190 985	**254 847**
TOTAL	**54 184**	**175 354**	**482 969**	**712 507**

2.5.1.7 Riesa

RIESA - YEAR 2007				
ARTICLE CATEGORY	Ships	Railway	Trucks	TOTAL
	tons	tons	tons	tons
agriculture, forestry	14 441	23 990	101 527	**139 958**
other food and feed	416	0	47 200	**47 616**
solid mineral fuels	1 521	3 666	411	**5 598**
crude oil, mineral oils	0	0	0	**0**
ore, waste metal	279	0	24 556	**24 835**
iron, steel, non-ferrous metal	3 713	534	0	**4 247**
stone, soil	956	7 754	19 054	**27 764**
fertilizers	13 216	31 970	13 301	**58 487**
chemicals	0	0	0	**0**
containers, other transported goods	41 233	284 371	370 435	**696 039**
TOTAL	**75 775**	**352 285**	**576 484**	**1 004 544**

RIESA - YEAR 2008				
ARTICLE CATEGORY	Ships	Railway	Trucks	TOTAL
	tons	tons	tons	tons
agriculture, forestry	18 530	3 646	78 226	**100 402**
other food and feed	184	12 903	21 000	**34 087**
solid mineral fuels	1 077	3 050	5 314	**9 441**
crude oil, mineral oils	0	0	0	**0**
ore, waste metal	2 881	916	26 979	**30 776**
iron, steel, non-ferrous metal	4 475	2 902	3 086	**10 463**
stone, soil	2 593	4 027	2 651	**9 271**
fertilizers	16 001	43 931	34 071	**94 003**
chemicals	0	0	0	**0**
containers, other transported goods	29 651	323 160	388 450	**741 261**
TOTAL	**75 392**	**394 535**	**559 777**	**1 029 704**

RIESA - YEAR 2009				
ARTICLE CATEGORY	Ships	Railway	Trucks	TOTAL
	tons	tons	tons	tons
agriculture, forestry	14 552	9 001	90 032	**113 585**
other food and feed	7 344	1 070	84 160	**92 574**
solid mineral fuels	1 334	0	4 113	**5 447**
crude oils, mineral oils	1 183	0	0	**1 183**
ore, waste metal	1 310	1 510	36 061	**38 881**
iron, steel, non-ferrous metal	17 547	0	380	**17 927**
stone, soil	105	2 960	1 958	**5 023**
fertilizers	9 203	31 935	2 497	**43 635**
chemicals	0	0	1 220	**1 220**
containers, other transported goods	35 478	304 280	399 763	**739 521**
TOTAL	**88 056**	**350 756**	**620 184**	**1 058 996**

2.5.1.8 Torgau

TORGAU - YEAR 2007				
ARTICLE CATEGORY	Ships	Railway	Trucks	TOTAL
	tons	tons	tons	tons
agriculture, forestry	1 736	0	0	**1 736**
other food and feed	20	0	5 000	**5 020**
solid miineral fuels	0	0	0	**0**
crude oil, mineral oils	0	0	0	**0**
ore, waste metal	0	0	16 430	**16 430**
iron, steel, non-ferrous metal	0	0	0	**0**
stone, soil	122 884	0	25 047	**147 931**
fertilizers	8 878	0	6 299	**15 177**
chemicals	0	0	0	**0**
containers, other transported goods	0	0	2	**2**
TOTAL	**133 518**	**0**	**52 778**	**186 296**

TORGAU - YEAR 2008				
ARTICLE CATEGORY	Ships	Railway	Trucks	TOTAL
	tons	tons	tons	tons
agriculture, forestry	5 467	0	0	**5 467**
other food and feed	606	0	0	**606**
solid mineral fuels	0	0	0	**0**
crude oil, mineral oils	0	0	0	**0**
ore, waste metal	0	0	14 520	**14 520**
iron, steel, non-ferrous metal	1 340	0	0	**1 340**
stone, soil	30 045	0	22 042	**52 087**
fertilizers	7 531	1 502	8 842	**17 875**
chemicals	0	0	0	**0**
containers, other transported goods	38	0	0	**38**
TOTAL	**45 027**	**1 502**	**45 404**	**91 933**

TORGAU - YEAR 2009				
ARTICLE CATEGORY	Ships	Railway	Trucks	TOTAL
	tons	tons	tons	tons
agriculture, forestry	30 270	0	16 821	**47 091**
other food and feed	0	0	0	**0**
solid mineral fuels	0	0	0	**0**
crude oil, mineral oils	0	0	0	**0**
ore, w aste metal	0	0	9 927	**9 927**
iron, steel, non-ferrous metal	0	0	0	**0**
stone, soil	21 490	0	1 946	**23 436**
fertilizers	3 211	500	497	**4 208**
chemicals	0	0	0	**0**
containers, other transported goods	75	0	8 004	**8 079**
TOTAL	**55 046**	**500**	**37 195**	**92 741**

2.5.1.9 Rosslau

ROSSLAU - YEAR 2007				
ARTICLE CATEGORY	Ships	Railway	Trucks	TOTAL
	tons	tons	tons	tons
agriculture, forestry	40 848	3 319	608	**44 775**
other food and feed	46 273	1 161	415	**47 849**
solid mineral fuels	0	0	0	**0**
crude oil, mineral oils	0	0	0	**0**
ore, waste metal	3 922	673	126 694	**131 289**
iron, steel, non-ferrous metal	611	22 638	18 018	**41 267**
stone, soil	110 855	7 606	7 441	**125 902**
fertilizers	11 514	3 892	0	**15 406**
chemicals	0	0	0	**0**
containers, other transported goods	38	0	84	**122**
TOTAL	**214 061**	**39 289**	**153 260**	**406 610**

ROSSLAU - YEAR 2008				
ARTICLE CATEGORY	Ships	Railway	Trucks	TOTAL
	tons	tons	tons	tons
agriculture, forestry	58 282	11 328	3 177	**72 787**
other food and feed	11 661	322	945	**12 928**
solid mineral fuels	0	0	0	**0**
crude oil, mineral oils	0	0	0	**0**
ore, waste metal	5 561	2 299	118 982	**126 842**
iron, steel, non-ferrous metal	4 626	7 893	38 171	**50 690**
stone, soil	26 011	1 559	10 960	**38 530**
fertilizers	7 217	2 836	0	**10 053**
chemicals	0	0	0	**0**
containers	4	0	47	**51**
TOTAL	**113 362**	**26 237**	**172 282**	**311 881**

ROSSLAU - YEAR 2009				
ARTICLE CATEGORY	Ships	Railway	Trucks	TOTAL
	tons	tons	tons	tons
agriculture, forestry	94 841	0	9 988	**104 829**
other food and feed	2 877	0	0	**2 877**
solid mineral fuels	0	0	0	**0**
crude oil, mineral oils	0	0	0	**0**
ore, waste metal	23 910	53	112 488	**136 451**
iron, steel, non-ferrous metal	3 315	11 552	26 345	**41 212**
stone, soil	7 597	0	4 852	**12 449**
fertilizers	14 451	5 081	0	**19 532**
chemicals	0	0	0	**0**
containers, other transported goods	434	0	0	**434**
TOTAL	**147 425**	**16 686**	**153 673**	**317 784**

2.5.1.10 Aken

Chart 25 - Import

ARTICLE	2007 [tons]	2008 [tons]	2009 [tons]
Solid fuels	3.400	2.000	2.400
Fertilizers	2.100	4.400	800
Ore, metal	23.600	25.400	7.500
Feed	7.000	4.800	6.900

Chart 26 - Export

ARTICLE	2007 [tons]	2008 [tons]	2009 [tons]
Solid fuels	3.400	2.000	2.300
Fertilizers	9.100	9.200	7.600

2.5.1.11 Magdeburg

The processor was not provided with the data on reloading in the port of Magdeburg.

2.5.1.12 Wittenberge

It is not possible to include data for the Wittenberge port for the statistical comparison as there were no data available for the required years. The available data are fractional from the newly established part of the ElbePort Wittenberge GmbH, which regard the time starting time of operation (December 2009) represented only an insignificant part of the loading volumes (2010 - 68 t).

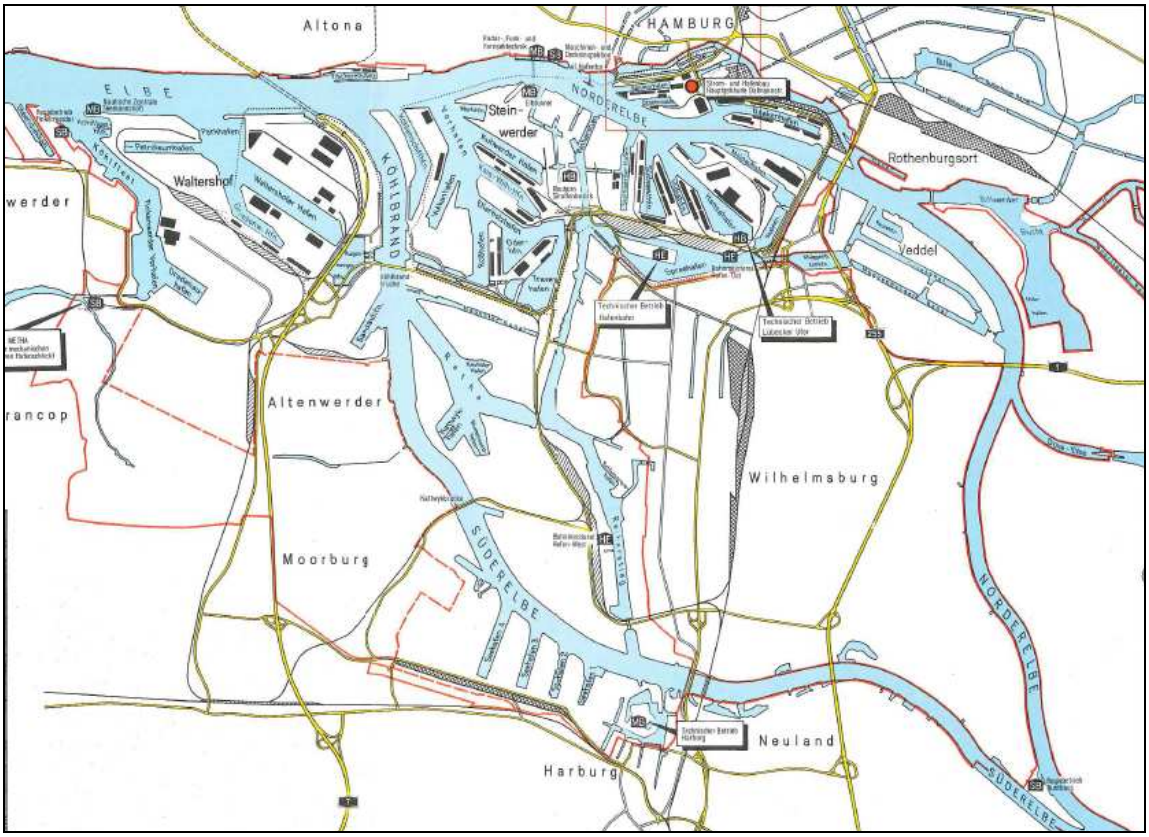
2.5.2 Important origination and destination ports

The important European origination and destination ports linked to the Elbe waterway are Hamburg, Bremerhaven, Rotterdam, Amsterdam and Szczecin-Swinoujscie.

2.5.2.1 Hamburg

Hamburg is one of the most important German seaports and the main transport joint in terms of distribution and logistics. It is situated on the Elbe river, about 80 km inland. Among the container ports, it occupies 2nd position at Europe level and belongs to the TOP ten in the world.

Picture 6 – Map of the Hamburg port



The Elbe waterway provides navigation either directly or through the channels Elbe-Seitenkanal and Mittelandkanal along the inland waterways to Dresden, Leipzig, Magdeburg, Halle, Děčín, Ústí nad Labem, Mělník, Kolín and Prague. The German railway network is connected with other countries and thus enables connecting Hamburg with the entire Germany, Austria and other centers, such as Prague, Amsterdam, Basel, Zurich, and Copenhagen, theoretically within 24 hours (the actual transport time depends on the capacity of the transport routes, which are in the Rheinland region often overloaded).

The total area of the Hamburg port is more than 74 km^2. The Port operates on following terminals:

- for containers
- for road vehicles
- multipurpose
- bulk cargo
- for wood, wood-pulp, and paper
- for food and deteriorating goods

- for hazardous materials
- for oil and other

Picture 7 - Commodity turnover in the Hamburg port

Year	2000	2001	2002	2003	2004	2005	2006	2007
Total (in Mill tons)	85.1	92.4	97.6	106.3	114.5	125.7	134.9	140.4
Bulk Cargo	36.4	39.2	37.5	39.4	37.8	40.0	42.7	41.7
Liquid Bulk	11.6	13.6	11.5	11.6	12.2	13.1	14.2	14.7
Suction cargo	7.8	6.8	6.2	6.7	4.3	5.6	6.3	5.2
Grabber	17	18.8	19.9	21.2	21.3	21.2	22.2	21.7
General Cargo	48.7	53.2	60.1	66.9	76.7	85.8	92.1	98.7
Containers (in Mio. tonnes gross)	45.3	49.8	57.2	64.3	74	83	89.5	95.8
No. of 20' units (TEU)	4248.3	4688.7	5374	6138	7003	8088	8862	9890
Degree of Containerisation (proportion in % of general cargo)	93.1	93.7	95.1	96.1	96.5	96.8	97.2	97.1
Transit traffic via Hamburg (m. tonnes) incl. imports for open customers depots	13.4	12.7	15	20.2	23.8	24.4	-	-
brutto = weight of cargo and empty container TEU (Twenty Feed Equivalent Units)								

Source: http://www.hamburg-port-authority.de/

In 2009, the total volume of goods managed by Czech river transporters from/to Hamburg was:

- 209.952 tons in export,
- 71.102 tons in import.

Unfortunately, the participants are not willing to provide classification of commodities transported in Hamburg and therefore, it is not available.

2.5.2.2 Bremerhaven

According to the volume of reloaded goods, the port of Bremerhaven occupies 2nd position in Germany and 4th in Europe. It is located directly in the estuary of the Weser river and the Mittelandkanal near the Minden city.

Picture 8 – Map of the Bremenhaven port

Source: http://www.bremen-ports.de/

In 2007, the volume of reloaded goods reached 69,2 millions tons, the container reload reached up to 4,9 millions of TEU (Twenty-four equivalent units), i.e. yearly increase by 19 %. With such a volume, Bremerhaven is among the most dynamically developing container terminals in Europe as well as in the world. The increase is triggered by export from Southern Asia, mainly China and Singapore. The increase in container transportation is also expected in the following years. In the next ten years, the container traffic is expected to increase on average by 9 % per year. The capacity of the port is further expanding. After commissioning the CT4 terminal, 7 million TEU per year will be reached.

2.5.2.3 Rotterdam

Rotterdam is the largest European port and one of the largest ports in the world. It is excellently connected to the entire European inland waterway network. The port is situated in the Rhein delta, about 20 km inland. The real importance of the port as a major waterway transport joint is apparent from the fact that 48 % of the total volume (in tons) of transported goods to/from Rotterdam are carried out by water. The total volume of reload goods reached 213 millions tons in the first half of the year 2008.

Picture 9 – Map of the Rotterdam port

Source: http://www.portofrotterdam.com/

The theoretical accessibility of the main destinations in Western Europe is 24 hours. Approximately 12.500 road vehicles leave the European ports per day. The port motorway is connected with the European motorway network.

Rotterdam is connected with more than a thousand seaports worldwide (Northern and Southern America, Africa, South-Eastern Asia, Australia). In 2010, traffic at the port is expected to reach about 40.000 sea vessels.

Concerning the reloaded commodities, the bulk liquid goods constitute about a half of the volume, bulk loose materials approx. 30 % and lump commodities about 20 %, mostly in containers. The container overload rate is the highest in Europe, followed by Hamburg.

The area of the Rotterdam port covers about 100 km^2. The port offers:

- 1.060 ha for overload and storage of bulk liquid materials
- 220 ha for overload and storage of bulk loose materials
- 220 ha of container terminals
- 65 ha of food warehouses

This includes another 270 ha of areas for distribution, logistic centers and warehouses for vesselping companies.

Picture 10 – Overload of goods in the Rotterdam port, 2007

	Total	Netherlands	International	France	Germany	Belgium	Austria	Switzerland	Others
Incoming total	**55.416**	**17.074**	**38.342**	**4.892**	**21.541**	**10.371**	**178**	**692**	**668**
Agricultural products; live animals	5.044	107	4.937	1.757	2.702	41	32	2	403
Food preparations and cattle fodder	1.723	237	1.486	174	1.049	74	23	2	164
Solid fuel	552	125	427	5	296	103	0	1	22
Petroleum and petroleum products	8.621	2.973	5.648	682	2.643	2.267	0	56	0
Ore, metal scrap, roasted iron pyrites	956	234	722		527	65	90	33	1
Metals and semi-manufactured goods of metal	1.910	115	1.795	44	1.639	86	0	0	26
Crude minerals and manufactured goods	11.320	3.713	7.607	1.923	5.295	355	0	32	2
Fertilizers	241	52	189	3	120	37	27	0	2
Chemical products	8.302	1.990	6.312	159	2.838	3.299	0	16	0
Other goods	16.747	7.528	9.219	139	4.432	4.044		550	48
Outgoing total	**133.007**	**26.190**	**106.817**	**4.254**	**69.568**	**23.498**	**1.333**	**3.384**	**526**
Agricultural products; live animals	4.607	1.412	3.195	47	2.639	281	**8**	173	0
Food preparations and cattle fodder	5.892	911	4.981	65	3.393	600	196	501	161
Solid fuel	22.006	216	21.790	2.620	14.084	2.196	**1**	219	50
Petroleum and petroleum products	31.534	13.424	18.110	332	7.113	8.962	16	1.213	142
Ore, metal scrap, roasted iron pyrites	31.073	186	30.887	485	26.789	2.212	880	21	15
Metals and semi-manufactured goods of metal	3.613	153	3.460	106	2.479	312	14	400	43
Crude minerals and manufactured goods	8.702	2.270	6.432	44	5.012	1.034	194	54	50
Fertilizers	612	13	599	139	98		18	80	59
Chemical products	10.523	2.013	8.510	293	4.229	3.656	5	33	1
Other goods	14.445	5.592	8.853	123	3.732	4.179	1	690	5

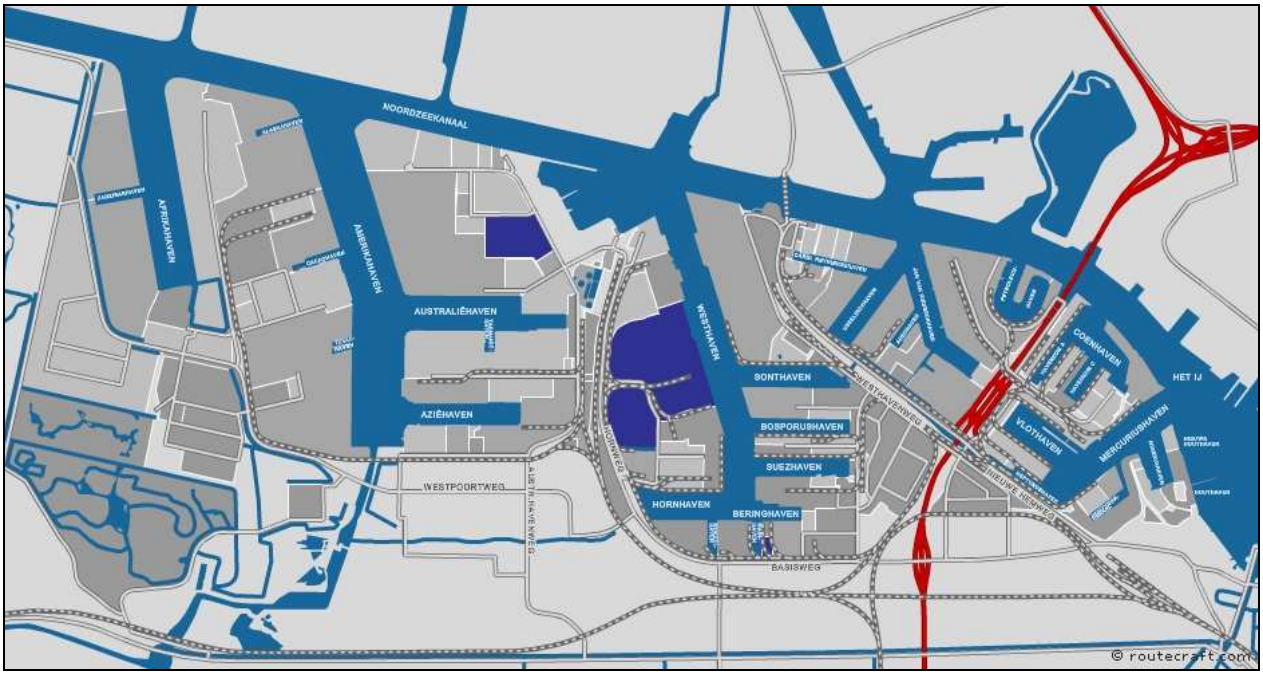
Units: Weight in 1.000 tons

Source: http://www.portofrotterdam.com/

2.5.2.4 Amsterdam

The Amsterdam port is one of the most important European transport centers of the water-railway-road-airway combination. It is situated on a channel connecting the North Sea with inland Markermeer, about 25 km from the North Sea.

Picture 11 – Map of the Amsterdam port



Source: http://www.portofamsterdam.nl/

Substrates transported here are oil, steel, coal, automobiles and lump items. The volume of goods transported by railway to the port and its surroundings reaches 4 million tons per year.

Products transported by waterways from the port to inland destinations are petroleum, supplies for factories in the Netherlands and other European countries and coal. The shuttle container transport is realized several times a week between Amsterdam, Rotterdam, Antwerpen and Germany.

In 2006, 85 million tons of goods were reloaded in the port including bulk loose substrates (bulk agriculture products, biomass, sand, gravel, granite) and liquid commodities (oil products, bio-fuels, specific chemicals).

Picture 12 – Volumes of goods incoming to the Amsterdam port in 2008 (tons)

INCOMING GOODS TO THE PORT OF AMSTERDAM	
1. Colombia	6 525 634
2. United Kingdom	5 428 539
3. Brazil	4 942 819
4. Russia	4 617 036
5. United States	4 440 060
6. Norway	3 210 044
7. Latvia	2 086 656
8. Netherlands	1 927 997
9. South Africa	1 731 823
10. France	1 518 065
11. Japan	1 071 024
12. Indonesia	1 020 734
13. Argentina	854 593
14. China	822 813
15. Israel	821 177
16. Malaysia	811 260
17. Spain	793 315
18. Finland	786 570
19. Sweden	750 070
20. Thailand	507 181
21. Singapore	391 680
22. Trinidad & Tobago	346 966
23. Canada	341 446
24. Nigeria	325 784
25. Germany	283 793
26. Ukraine	249 134
27. India	246 045
28. Belgium	226 902
29. Estonia	218 022
30. Mexico	204 984
Others	*4 072 598*
Total	**51 574 764**

Source: http://www.portofamsterdam.nl/

Picture 13 - Volumes of goods leaving the Amsterdam port in 2008 (tons)

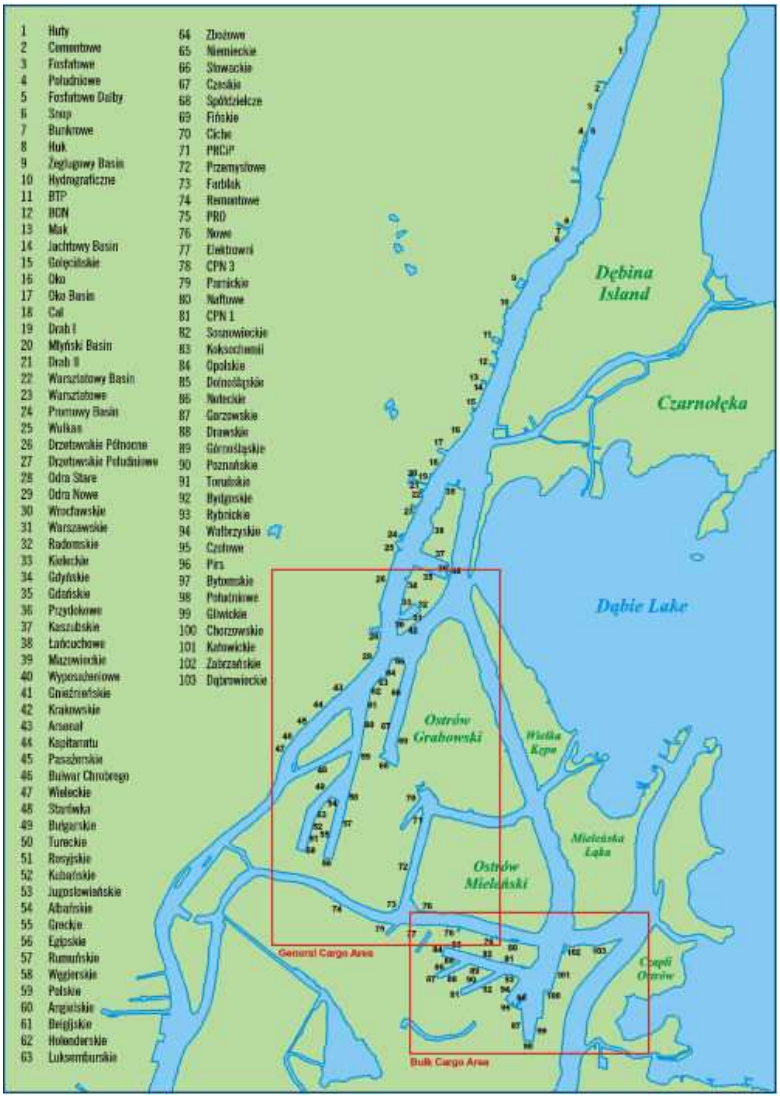
OUTGOING GOODS FROM THE PORT OF AMSTERDAM	
1. Nigeria	5353308
2. United States	3967192
3. United Kingdom	2877922
4. Mexico	2875982
5. France	696942
6. Japan	584168
7. Turkey	563386
8. Poland	546787
9. Germany	481831
10. Canada	368360
11. Finland	364356
12. Spain	347170
13. Norway	339909
14. Sweden	338240
15. Singapore	329004
16. Russia	326303
17. Egypt	296848
18. China	249379
19. Gibraltar (British)	241906
20. Portugal	230935
21. Ghana	213582
22. Ireland	191711
23. Netherlands	176839
24. United Arab Emirates	167847
25. Denmark	161570
26. Namibia	133740
27. Saudi Arabia	126558
28. Angola	123944
29. Malaysia	79500
30. Latvia	73405
Others	1385562
Total	**24 214 186**

Source: http://www.portofamsterdam.nl/

2.5.2.5 Szczecin - Swinojuscie

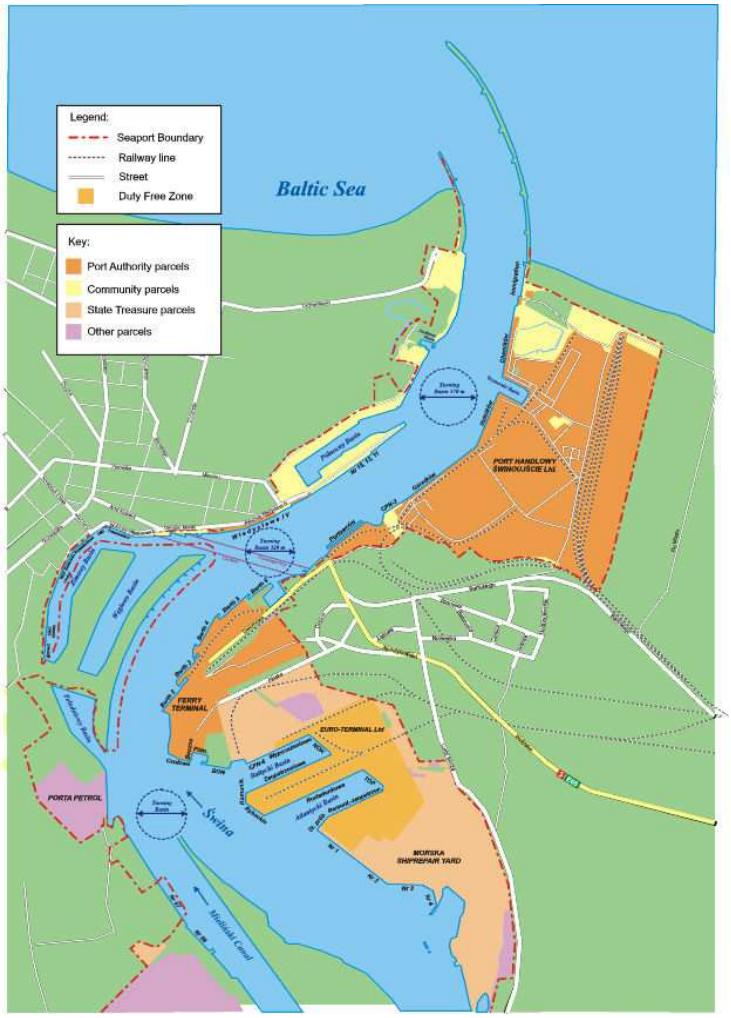
Szczecin is the westernmost location in Poland. The port offers the shortest connection with Scandinavian countries, Germany and Western Europe, the shortest passage across the Baltic Sea to Finland, Russia and the Baltic countries. Szczecin is situated about 65 km inland.

Picture 14 – Map of the Szczecin port



Source: http://www.port.szczecin.pl/

Picture 15 – Map of the Swinojuscie



Source: http://www.port.szczecin.pl/

The share of various modes of transport handled on the port in 2007 was following: river transport 7,6 %, road transport 32,5 %, railway transport 59,9 %. Statistics on goods overloaded in Szczecin-Swinojuscie according to country and commodity is presented in the two following charts.

Chart 27 - Commodity overloaded in Szczecin-Swinojuscie in 2007 (thousands of tons)

Country	CARGO						TOTAL
	Coal	Iron ore	Other bulk	Grain	Timber	General cargo	
1	2	3	4	5	6	7	8
Austria	-	-	-	-	-	109,9	109,9
Czech Republic	113,7	191,2	34,3	-	18,6	530,3	888,1
Germany	159,2	-	267,8	112,2	-	277,1	816,3
Russia	-	-	0,6	-	-	-	0,6
Romania	-	-	0,9	-	-	60,1	61,0
Slovakia	560,0	250,7	1,0	-	-	320,1	1 131,8
Hungary	-	1,7	0,9	-	-	184,0	186,6
Other countries	-	3,5	0,6	-	-	171,4	175,5
Sea transit	58,2	46,3	1,4	-	-	17,7	123,6
TOTAL	891,1	493,4	307,5	112,2	18,6	1 670,6	3 493,4

Source: http://www.port.szczecin.pl/

Chart 28 - Commodity overloaded in Szczecin-Swinojuscie in 2008 (thousands of tons)

Country	CARGO						TOTAL
	Coal	Iron ore	Other bulk	Grain	Timber	General cargo	
1	2	3	4	5	6	7	8
Austria	-	-	-	-	-	101,5	101,5
Czech Republic	436,1	737,3	51,9	-	12,9	531,4	1 769,6
Germany	209,1	-	206,0	134,6	-	267,1	816,8
Russia	-	-	-	-	-	2,7	2,7
Romania	-	-	1,1	-	-	62,9	64,0
Slovakia	546,1	259,1	-	-	-	257,6	1 062,8
Hungary	-	1,4	-	-	-	193,3	194,7
Other countries	-	2,8	14,8	-	-	189,7	207,3
Sea transit	-	-	1,8	-	-	10,4	12,2
TOTAL	1 191,3	1 000,6	275,6	134,6	12,9	1 616,6	4 231,6

Source: http://www.port.szczecin.pl/

2.5.3 Other important ports accessible from the Elbe waterway

- P 70-07 Braunschweig (Mittellandkanal)
- P 70-05 Hannover (Mittellandkanal)
- P 70-04 Minden (Mittellandkanal)
- P 70-06-01 Hildesheim (Stichkanal)
- P 70-02-01 Osnabrück (Stichkanal)

- P 21-01 Lübeck (the Trave)
- P 60-05 Kiel (Kiel Canal)
- P 15-04 Emden (the Ems)
- P 15-05 Leer (the Ems)
- P 13-02 Münster (Dortmund-Ems-Kanal)
- P 13-03 Dortmund (Dortmund-Ems-Kanal)
- P 10-01-04 Lünen (Datteln-Hamm-Kanal)
- P 10-01-06 Hamm (Datteln-Hamm-Kanal)
- P 10-03-01 Essen (Thein-Herne-Kanal)
- P 10-05-01 Mühlheim (the Ruhr)
- P 70-10-05 Westhafen Berlin (Westhafenkanal)
- P 70-10-06 Osthafen Berlin (the Spree)

2.5.4 The ports on the Elbe-Oder-Danube channel (after the construction)

The Danube branch

- the dock in Kojetín km 17,5-17,98
- the dock in Otrokovice km 39,77-40,37
- the dock in Staré Město km 56,8-57,4
- the dock in Veselí na Moravě km 70,53-70,77
- the dock in Hodonín km 93,21-93,69
- the port Břeclav km cca 111,59 (detour)

The Oder branch

- the port Hranice km 32,9-34,2
- the dock in Mariánské hory km 85,43-85,87

- the port Ostrava-Bohumín km 93,2-93,9

The Elbe branch

- the port Olomouc km 13,3
- the dock in Uničov km 40,8-40,92
- the dock in Moravská Třebová km 79,1-79,22
- the dock in Česká Třebová km 97,88-98,32

2.5.5 The ports on the Danube waterway

Picture 16 – Ports on the Danube

Source: http://www.inlandports.be/ – adjusted by processor

Following major international ports are situated on the Danube waterway:

Germany

- P 80-28 Bamberg (Main-Donau Kanal)
- P 80-29 Erlangen (Main-Donau Kanal)

- P 80-30 Nürnberg (Main-Donau Kanal)
- P 80 -31 Regensburg
- P 80-32 Deggendorf

Austria

- P 80-33 Linz
- P 80-34 Linz-Vöest
- P 80-35 Enns-Ennsdorf
- P 80-36 Krems
- P 80-37 Wien

Slovakia

- P 80-38 Bratislava
- P 80-40 Komárno
- P 80-41 Štúrovo

Hungary

- P 80-39 Györ-Gönyü
- P 80-42 Budapest
- P 80-43 Szazhalombatta
- P 80-44 Dunaújváros
- P 80-45 Dunaföldvar
- P 80-46 Baja

Croatia

- P 80-47 Vukovar

Serbia

- P 80-46 bis Apatin
- P 80-47 bis Backa Palanka
- P 80-47 ter Novi Sad
- P 80-48 Beograd
- P 80-48 bis Pancevo
- P 80-49 Smederevo
- P 80-52 Prahovo

Bulgaria

- P 80-53 Lom
- P 80-55 Svishtov
- P 80-56 Rousse

Romania

- P 80-50 Orsova
- P 80-51 Turnu Severin
- P 80-54 Turnu Magurele
- P 80-57 Giurgiu
- P 80-58 Oltenita
- P 80-59 Calarasi
- P 80-60 Braila
- P 80-61 Galati
- P 80-64 Tulcea

- P 80-14-01 Cernavoda (Danube-Black Sea Canal)
- P 80-14-02 Medgidia (Danube-Black Sea Canal)
- P 80-14-03 Constanta (Danube-Black Sea Canal)

Ukraine

- P 80-63 Reni

Moldovia

- P 80-62 Giurgiulesti

2.6 IMPORTANT CHEMICAL INDUSTRY COMPANIES AND THEIR LINK TO WATERWAYS

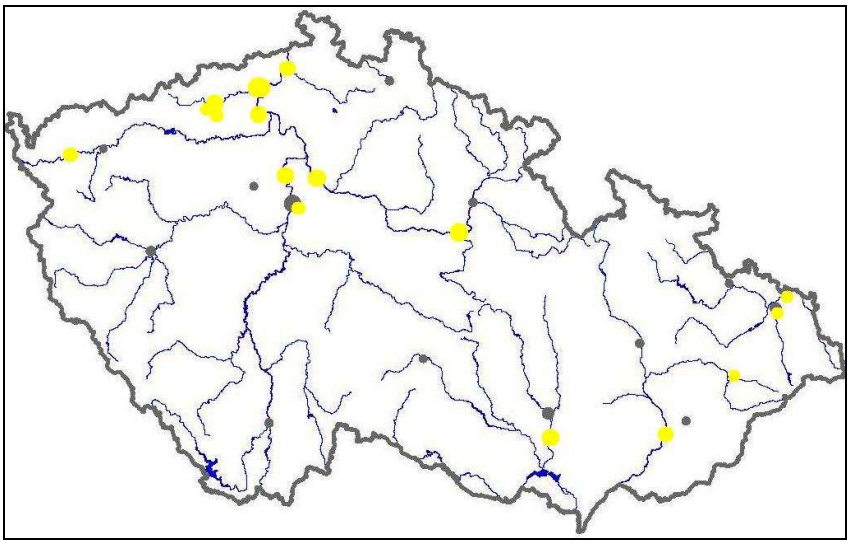
This chapter describes the location of important chemical companies along the corridor of the Elbe river and the Danube river and the future corridor of the planned Danube-Elbe-Oder channel. Obviously, the most important chemical factories, particularly in the field of heavy chemical industry, are located along navigable (or at least navigation enabling) waterways. This is due to high water consumption during the production of chemicals.

Because of the location, waterway transportation is evidently the most suitable mode of transport for supply and for distribution of products.

Waterway transport is desirable especially at times when road and railway network are overloaded and often unreliability, furthermore when considering the economic and ecological aspects.

2.6.1 The Czech Republic

Picture 17 - Location of the most important chemical companies in the CR



Source: VÚOS a.s: SWOT analýza pro přepravu chemických látek v ČR, 2009

Bochemie, a. s.

- Lidická 326, Bohumín, http://www.bochemie.cz/

- disinfection, fungicide and cleaning products, materials for surface treatment of metals

- presumed interconnection with the Danube-Oder-Elbe channel (D-O-E): direct railway and road connection with the Ostrava port, distance to the Northern port of Ostrava (Vrbice) within 5 km

BorsodChem MCHZ, s. r. o.

- Chemická 1/2039, Ostrava-Mariánské Hory, http://www.bc-mchz.cz/

- production of chemical compounds (amines, aniline etc.)

- presumed interconnection with the D-O-E: ideal location, direct railway and road connection with the port of Ostrava, distance within 2 km

Čepro, a. s.

- Dělnická 12, Praha 7, http://www.ceproas.cz/

- wholesale and retail sale of petrol, diesel and light fuel oil, reserves, tubular network

- a number of warehouses all around the CR, suitable centers for waterway services are e.g. Roudnice n. Labem, Mstětice (road transport: 20 km away from Neratovice, 35 km from Nymburk),

Litvínov (56 km railroad to Ústí / 50 km roads including the D8 motorway). The filling factory-site and the Hněvice port belong to the premises of the company. The port is currently not used, but the potential use for Elbe navigability is guaranteed.

Česká rafinérská, a. s.

- Záluží 2, Litvínov, http://www.crc.cz/

- oil processing, and petroleum products, a joint company of Shell, ENI and PKN

- connected to the Elbe waterway: railroad connection with Ústí nad Labem (56 km), road connection including the D8 motorway (50 km)

DEZA, a. s.

- Masarykova 753, Valašské Meziříčí, http://www.deza.cz/

- benzol and tar processing

- presumed connection with the D-O-E: a direct railway connection to Hranice (25 km), road connection to Hranice (23 km by the I/35 road)

Explosia, a. s.

- Semtín 107, Pardubice, http://www.explosia.cz/

- production of explosives

- connected with the Elbe river: completing the navigable section of the Elbe river to Pardubice will result in direct connection with the port by shuttle train (2 km), otherwise railway connection to Chvaletice (30 km) and road connection by the II/333 road (30 km)

Fatra, a. s.

- tř. T. Bati 1541, Napajedla, http://www.fatra.cz/

- processing of plastics (PVC, PO, PET, PP)

- connection with the D-O-E: direct connection by the Tomáš Baťa Channel, direct railway connection with Napajedla-Otrokovice (4 km) to the planned Otrokovice port, road connection by the I/55 road (6 km)

Hexion Specificty Chemicals, a. s.

- Tovární 2093, Sokolov, http://www.hexion.com/

- acrylates, polymers

- connected with the Elbe river: rather complicated due to considerable distance, railway transport by shuttle train to Sokolov and Sokolov-Ústí (153 km), road transport (136 km) by the I/13 road

Chemotex Děčín, a. s.

- Tovární 63, Děčín 32 - Boletice n.L., http://www.chemotex.cz/

- industrial chemicals

- connected with the Elbe river: a direct railway connection to the port Děčín-Loubí (14 km)

Lovochemie, a. s.

- Terezínská 57, Lovosice, http://www.lovochemie.cz/

- production of fertilizers

- connected with the Elbe river: directly from the premises. On 1st June 2010 Lovochemie took over the reloading area for agriculture commodities in the Ústí nad Labem port from the company AGROFERT Trading, Ltd.

PARAMO, a. s.

- Přerovská 560, Pardubice, http://www.paramo.cz/

- oil processing into refined and tar products, production of lubricants and process oils

- connected with the Elbe river: after completing the navigable part of the Elbe to Pardubice by shuttle train (about 1 km), otherwise by railway connection to Chvaletice (28 km) and road connection by the I/2 road (30 km)

SETUZA, a. s.

- Žukovova 100, Ústí nad Labem-Střekov, http://www.setuza.cz/

- production of oils and drugstore products

- connected with the Elbe river: excellent position, direct link to the Ústí port by shuttle train (3 km)

SIAD Czech, spol. s r. o.

- Doubravínova 25/330, Praha 6, http://www.siad.cz/

- production and application of technical and specific gasses

- connected with the Elbe river: the SIAD company operates two main factories, one of them in Brňany near Most – connection with the Elbe directly by the I/13 road and the D8 motorway (36 km) to Ústí nad Labem

- connection with the D-O-E: the other factory is located in Rajhradice near Brno, connected with the planned Břeclav/Lanžhot port by road transport (the D2 motorway, 50 km) or less conveniently by railway (Rajhrad-Břeclav, 47 km), no direct connection with the producing factory

Spolana, a. s.

- Práce 657, Neratovice, http://www.spolana.cz/

- plastics, acids, specific products

- connected with the Elbe river: direct connection with the river enabling direct loading and unloading

Spolchemie, a. s.

- Spolek pro chemickou a hutní výrobu, a. s., Revoluční 86, Ústí nad Labem, http://www.spolchemie.cz/

- synthetic resins, inorganic compounds

- connected with the Elbe river: ideal connection by railway directly by the premises, distance to the port 2 km

Synthesia, a. s.

- Semtín 103, Pardubice, http://www.synthesia.eu/

- pigments, dyes, nitrocellulose

- connected with the Elbe river: after completing the navigable part of the Elbe river to Pardubice a direct link with the port by shuttle train (about 2 km), otherwise by railway transport to Chvaletice (30 km) and road transport by the II/333 road (30 km)

Synthos Kralupy, a. s.

- O. Wichterleho 810, Kralupy nad Vltavou, http://www.synthesia.eu/

- plastics, synthetic rubber, monomers

- connected with the Elbe river: by the Vltava waterway (19 km), railway to Lovosice (57 km) or to Mělník or Neratovice (33 km or 17 km) or road network by the I/16 road to Mělník (21 km)

Unipetrol RPA, a. s.

- Záluží 1, Litvínov, http://www.unipetrolrpa.cz/

- petrochemicals, oil processing, agrochemicals

- connected with the Ellbe river: railway transport to Ústí nad Labem (56 km), road by motorway D8 (50 km)

Zentiva Group, a. s.

- U Kabelovny 130, Praha 10, http://www.zentiva.cz/

- pharmaceuticals

- connected with the Elbe river: railway directly from the premises to the Praha-Smíchov station (14 km), by Vltava river to Mělník, from Mělník by the Elbe river, or by road (17 km)

2.6.2 Germany

The largest chemical companies in Germany are situated in so-called chemical parks. The largest of them (30 parks) are marked yellow in the map below.

Federation countries and their chemical parks, their waterway connections and enumeration of companies located in each parks are listed in the following section.

Picture 18 - Chemical parks in Germany

Source: http://www.chemicalparks.com/

2.6.2.1 Schleswig-Holstein

Bayer Industriepark Brunsbüttel

- http://www.brunsbuettel.bayer.de/

- immediate vicinity of the Elbe river and the Kühl channel

- chemical companies: DyStar Textilfarben GmbH & Co. Deutschland KG; Linde AG; Lanxess Deutschland GmbH; 3B Biofuels GmbH & Co. KG

2.6.2.2 Brandenburg

BASF Schwarzheide GmbH

- http://www.basf-schwarzheide.com/

- the nearest port: the Elbe-Riesa; road connection: A13 and B98 (approx. 60 km)

- BASF

2.6.2.3 Sachsen-Anhalt

Solvay Bernburg Industrial Park

- http://www.solvay.com/

- channel – the river Saale; a shuttle train – connection with the Elbe ports Magdeburg and Aken (approx. 50 km)

- Solvay

Industrial Park Bayer Bitterfeld GMBH

- http://www.bitterfeld.bayer.de/

- a shuttle train: the nearest port is Rosslau-Elbe (approx. 30 km)

- Bayer AG

DOW Olefinverbund GMBH, VALUEPARK

- http://www.dow.com/valuepark/

- direct railway connection from Schkopau to the Halle port (Saale)

- DOW

Chemical Site Leuna

- http://www.infraleuna.de/

- direct railway connection from Schkopau to the Halle port (Saale)

- ADDINOL, Arkema, BASF, ChemComm, CHEMTEC LEUNA, DOMO, Dow Hexion, Innospec

2.6.2.4 Niedersachsen

Industriepark Walsrode

- http://www.industriepark-walsrode.com/

- the E45 and E234 motorways enable fast road connection with important ports of Hannover (Mittellandkanal), Hamburg (the Elbe river), Bremen (the Wesser)

- Dow Wolff Cellulosics (The Dow Chemical Company), Epurex Films (Bayer MaterialScience), Casetech, Wipak Group

2.6.2.5 Nordrhein-Westfalen

Chemiepark Marl

- http://www.chemsite.de/

- direct connection by channel to the Rhein through Mohan channel to the Danube

- Evonik Industries, Rohm and Haas, Ineos Styrenics, Sasol, ISP and Vestolit

Solvay Rheinberg Industrial Park

- http://www.solvay.de/rheinberg/

- immediate vicinity of the Rhein, shuttle train

- Solvay

Chempark Krefeld-Uerdingen

- http://www.chempark.com/

- immediate vicinity of the Rhein, shuttle train

- the largest producer of polycarbonates and polyamids in Western Europe

Henkel AG & CO. KGAA

-http://www.henkel.com/index.htm

- vicinity of the Rhein, the port of Reisholz or Düsseldorf

- Henkel, Cognis, Ecolab, T-Systems, Oleochemicals, Zamek, Scheren, Imtech, JHB

Chempark Leverkusen

- http://www.chempark.com/

- immediate vicinity of the Rhein, the port of Leverkusen, a shuttle train

- one of the largest and most universal chemical parks in the world

Chempark Dormagen

- http://www.chempark.com/

- immediate vicinity of the Rhein, a shuttle train

Industriepark Köln – Merkenich

- http://www.thyssenkruppxervon.de/

- immediate vicinity of the Rhein, the port of Ölhafen Leverkusen

- ThyssenKrupp Xervon, BASF, Vinnolit, Wacker Chemie

Chemical Park Knapsack

- http://www.infraserv-knapsack.de/

- own container terminal, a shuttle train connects with the Rhein, the port of Cologne Niehl (approx. 20 km)

- Abwasser-Gesellschaft Knapsack, Bayer CropScience AG, CABB Chemicals, ..

Akzo Nobel

- http://www.akzonobel.com/de/

- a shuttle train leading into the park premises, connection with the port of Cologne (approx. 50 km)

- Akzo Nobel Chemicals GmbH, Hansa Group AG, Grace Silica GmbH, Chemson GmbH

Industriepark Oberbruch

- http://www.industriepark-oberbruch.de/

- a shuttle train, the nearest port of Düsseldorf (approx. 60 km)

- Toho Tenax Europe GmbH, Ceramic Fuel Cells Ltd., SAXID GmbH, Polymer Oberbruch GmbH, GNT Europe GmbH

2.6.2.6 Rheinland-Pfalz

BASF SE

- http://ludwigshafen.basf.de/

- situated directly on the Rhein, the Ludwigshafen port

- BASF

2.6.2.7 Hessen

Kalle-Albert Industrial Park

- http://www.infraserv-wi.de/

- own port on the Rhein, Wiesbaden

- Agfa Gevaert Graphic Systems, AZ Electronic Materials (Germany) GmbH, Chemagis (Germany) GmbH, Clariant Produkte (Deutschland) GmbH, Cytec Surface Specificties Germany GmbH & Co. KG, InfraServ GmbH & Knapsack Co. KG, Kalle GmbH, ..

BASF Lampertheim GmbH

- http://www.ciba.com/lampertheim

- situated directly on the Rhein, a port

- BASF, Chemtura

AllessaChemie GmbH

- http://www.allessa.com/

- situated directly on the Main, own docks

- AllessaChemie

Industriepark Höchst

- http://www.industriepark-hoechst.com/en/

- directly on the bank of the Main river, a landing stage

- Akzo Nobel, BASF Fuel Cell, Bayer CropScience, Cabot, Cargill, Celanese, Clariant, DyStar, Grillo, IonGate, ..

Industrial Park Griesheim

- http://www.industriepark-griesheim.de/

- own port on the Main river

- Clariant, Weylchem Frankfurt, SGL Carbon, AllessaChemie, Infraserv Logistics, BIS Industrieservice Mitte

Industriepark Wolfgang

- http://www.industriepark-wolfgang.de/

- within a few kilometers from the Hanau port (the Main river)

- Evonik Degussa GmbH, Evonik Röhm GmbH, Industriepark Wolfgang GmbH, Umicore AG & Co. KG, SolviCore GmbH & Co. KG, Ferro GmbH

2.6.2.8 Baden-Würtenberg

Rhodia Acetow GmbH

- http://www.infrarhod.de/

- a shuttle train, connected with the city of Breisach – a port city on the Rhein (approx. 25 km)

- Rhodia GmbH, Rhodia Engineering Plastics GmbH, Reuter Chemische Apparatebau KG, BAD GmbH

2.6.2.9 Bayern

Industry Centre Obernburg Mainsite GmbH

- http://www.ico-obernburg.de/

- directly on the river bank, a landing stage on the Main

- AAP mebio, Cordenka GmbH, Membrana Accurel GmbH, Polyamide High Performance GmbH, PUREC, ..

Industriepark Gersthofen

- http://www.industriepark-gersthofen.de/

- a shuttle train, the closes ports are Kelheim and Nürnberg (the Main channel), (approx. 120 – 140 km), both with shuttle trains

- Abieta Chemie GmbH, CABB GmbH, Clariant Produkte (Deutschland) GmbH, Infraserv Logistics GmbH, INVISTA Resins &Fibers GmbH

Chemiepark Trostberg

- AlzChem: www.alzchem.com, BASF: www.basf.com, Evonik: www.evonik.com

- a shuttle train into the nearest ports Degendorf or Pasau (the Danube), (approx. 120 km)

Industriepark Werk Gendorf

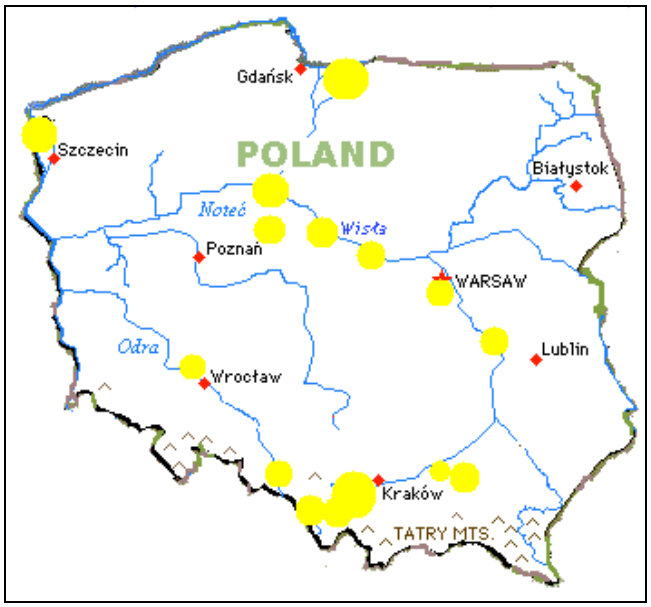
- http://www.gendorf.de/

- a shuttle train into the nearest ports Degendorf or Pasau (the Danube), (approx. 90 km)

- Clariant, Dyneon, InfraServ, Linde Gas, Klöckner Pentaplast,Vinnolit

2.6.3 Poland

Picture 19 – The most important companies within the chemical industry in Poland



Source: Hanna Kilen, Polish Chamber of Chemical Industry, pipc@pipc.org.pl

Akzo Nobel Decorative Paints Sp. z o. o.

- ul. Wybrzeże Gdyńskie 6d, Warszawa, http://www. akzonobelcoatings.pl/

- dyes, pharmaceutical products

- connection with the D-O-E: directly on the river Wisla (the city of Wloclawek), although there is no port directly available. The nearest port is Bydgoszcz (106 km by railway, 108 km by road) from where it is possible to reach through the channel to rivers Notoc and Warta and to the city Kostryn on the Oder river. Roads lead directly to Wroclaw (281 km on the I. and II. class roads); railway connection is not direct.

ANWIL S. A.

- ul. Toruńska 222 , Włocławek, http://www.anwil.pl/

- fertilizers, plastics, sodium chemicals

- connected with the D-O-E: located directly on the Wisla (the city of Wloclawek), own port is not available. The nearest port is in Bydgoszcz (97 km by railway, 99 km by road transport) from where trough a channel it is possible to reach rivers Notoc and Warta to the city Kostryn on the Oder river (330 km). Railway transport leads directly to Wroclaw (281 km by I. and II. class roads), railway connection is not direct.

Basell Orlen Polyolefins Sp. z o. o.

- ul. Chemikow 7, Plock, http://www.basellorlen.pl/

- PET, polypropylen

- connected with the O-D-E: The two main factories are in Plock and Warsaw. The best access to both is by water – a direct connection to Warsaw with the port on the Wisla, then through above-mentioned channel to the Oder river feed (620 km in total). The factory in Plock can be reached by railways to Warsaw (193 km) or to Bydgoszcz (214 km).

BASF Polska Sp. z o. o.

- Al. Jerozolimske 154, Warszawa, http://www.basf.pl/

- plastics, processing of oil products, factory protecting products

- connected with the O-D-E: directly by railway from the factory to the port (16 km), then through the channel of Bydgoszcz onto the Oder (620 km)

BRENNTAG POLSKA Sp. z o. o.

- ul. J. Bema 21, Kędzierzyn-Koźle, http://www.brenntag.pl/

- a wide variety of products – oils, cosmetics, feed, oil products, lubricants

- connected with the D-O-E: excellent position on the Oder, direct connection with the Koźla port by a shuttle train (4 km)

CIECH S. A.

- Puławska ul. 182, Warszawa, http://www.ciech.coml/

- nitrates, organic adducts, a wide focus – oils, cosmetics, feed, oil products, lubricants

- connected with the D-O-E:: The company operates a number of factories. The factory in Bydgoszcz is very well linked with a waterway – there is a port right in the city and it is channelled to the Oder. Another of the factories is located in Alwernia – there is a connection with the port of Gliwice on the Oder by railroad (93 km), by road (84 km down the A4 motorway). Another of the factories is located in Inowroclaw (a direct railway connection to Bydgoszcz (65 km) and then through a channel as far as the Oder).

Fabryka Farb i Lakierów ŚNIEŹKA S. A.

- Śnieżka" Paints and Varnishes Factory S.A., Lubzina 34a, http://www.sniezka.pl/

- dyes, varnishes

- connection with the D-O-E: very complicated, the nearest port in Koźle can be reached by railway (221 km with additional need for transportation to the nearest 5 km distant railway station) or by road (240 km by the A4 motorway).

LOTOS S. A.

- ul. Elbląska 135, Gdańsk, http://www.lotos.pl/

- oil products

- connection with the D-O-E: The two main sources of chemicals produced by this company are situated in Gdansk and in Czechowice. The connection of the Gdansk refinery to the D-O-E is

provided by a shuttle train enabling transport to the sea and inland port Gdansk, then through the Wisla and the channel of Bydgoszcz to the Oder. It would be possible to establish the connection of the CZECHOWICE S.A. refinery on the D-O-E through Ostrava by railway (60 km) or less efficiently by road transport – there are two alternative routes: 1) Northern route via Pawlowice and Bohumín (78 km) or 2) Southern route by the S1 road via Frýdek-Místek (90 km).

PCC ROKITA S. A.

- ul. Sienkiewicza 4, Brzeg Dolny, http://www.pcc.rokita.pl/
- Specific chlorine-based chemical products
- connected with the D-O-E: the nearest port is Wroclaw by railway connection (31 km, the shuttle train within the premises) or by road no. 341 (35 km).

Polski Koncern Naftowy Orlen S. A.

- ul. Chemików 7, Plock, http://www.orlen.pl/

- oil products, oil processing

- connected with the D-O-E: There are two main factories - Plock a Warszawa. Both are easily connected to the Oder river by water transport – direct connection of Warsaw with the port on the Wisla, through the above-mentioned channel to the Oder (620 km in total). For the Plock factory, it is necessary to use railway transport to Warsaw (193 km) or to Bydgoszcz (214 km).

PPG POLIFARB CIESZYN S. A.

- ul. Chemików 16, Cieszyn, http://www.ppg-polifarb.pl/

- polyester paints, dyes

- connected with the D-O-E: The nearest planned port on Oder river is Ostrava. It is connected by railway transport to the factory (47 km) or by road transport (58 km via Frýdek-Místek, 46 km via Karviná).

SYNTHOS S. A.

- ul. Chemików 1, Oświęcim, http://www.synthosgroup.com/

- rubber, latex, adhesives

- connected with the D-O-E: possible link to the already-existing port Gliwice either by the shuttle train on the factory premises (76 km) or by road transport (66 km).

ZAK S. A.

- ul. Mostowa 30 A, Kędzierzyn-Koźle, http://www.zak.eu/

- nitrous fertilizers, plastics, dyes

- connected with the D-O-E: located in Koźla on the Oder river, excellent connection by a shuttle train from the factory to the port (9km).

Zaklady Azotowe PULAWY S. A.

- Al. Tysiąclecia Państwa Polskiego 13, Pulawy, http://www.zapulawy.pl/

- fertilizers and other specific chemicals

- connected on the D-O-E: a shuttle train on the factory premises – a railway connection to Warsaw (140 km), through Bydgoszcz channel to the Oder river. Alternative longer route by railway leads directly to Gliwice (600 km).

Zaklady Azotowe w Tarnowie-Mościcach S. A.

- ul. E. Kwiatkowskiego 8, Tarnów .A., http://www.zak.eu/

- plastics, fertilizers, chemical materials

- connected with the D-O-E:, there is a shuttle train directly on the factory premises linking the factory with a port on the Oder, Gliwice (distance: 184 km).

Zaklady Chemiczne POLICE S. A.

- ul. Kuźnicka 1, Police, http://www.zchpolice.pl/

- titanium, fertilizers, dyes

- connected with the D-O-E: located directly at the influx of the Oder into the Baltic Sea. A shuttle train allows excellent connection with the port.

Zaklady Chemiczne ZACHEM S. A.

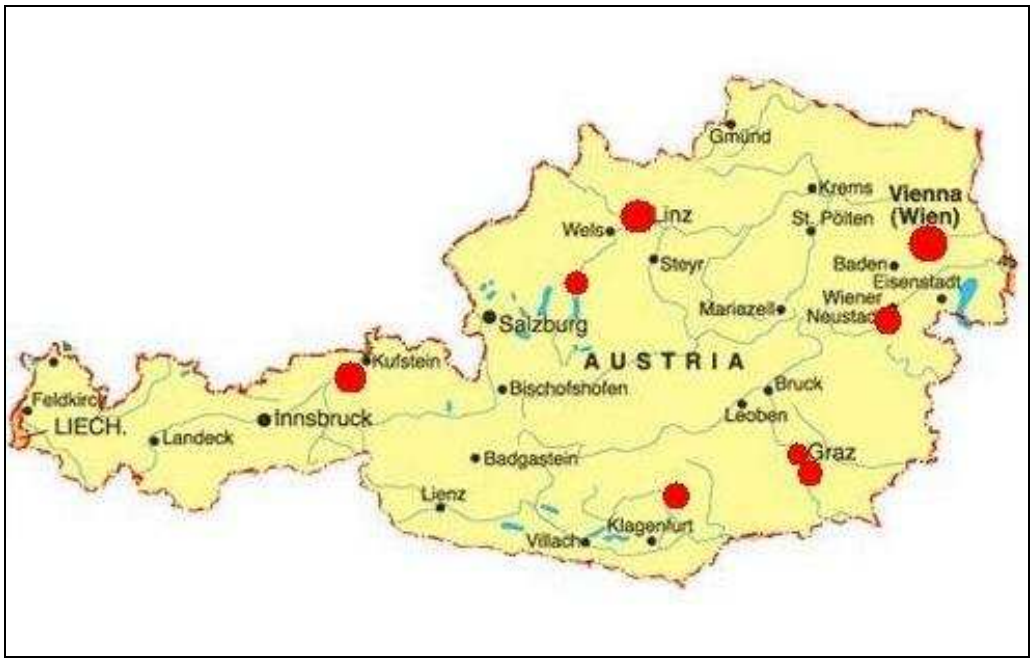
- ul. Wojska Polskiego 65, Bydgoszcz, http://www.zachem.com.pl/

- plastics, foam, monomers

- connected with the D-O-E: a cargo port is located directly in the city of Bydgoszcz (connected by a shuttle train) allowing direct connection of the Wisla with the Oder river.

2.6.4 Austria

Picture 20 – The most important chemical factories in Austria



Source: Dr. Wolfgang Eickhoff, Director General, Fachverband der Chemischen Industrie Österreichs - FCIO

Baxter AG

- Baxter Healthcare GmbH, Stella-Klein-Löw-Weg 15, Wien, http://www.baxter.at/

- medical and pharmaceutical products

- connected with the Danube river: The port in Vienna is 5 km away, reachable by road.

BOEHRINGER Ingelheim RCV GmbH & Co KG

- Dr.Boehringer-Gasse 5-11, Wien, http://www.boehringer-ingelheim.at/

- pharmaceutical products

- connected with the Danube river: The port in Vienna is 16 km away, reachable by road or by railway (a railway station is 1 km away) and then to the port (16 km).

Borealis Agrolinz Melamine GmbH

- St.-Peter-Straße 25, Linz, http://borealisgroup.com/

- basic chemical products, fertilizers, melamine

- connected with the Danube river: the port of Linz is reachable directly from the factory premises.

Borealis Polyolefine GmbH

- Danubiastrasse 21-25, Schwechat-Mannswörtht, http://borealisgroup.com/

- specific plastics

- connection with the Danube river: the port of Vienna in the distant of 6.5 km is reachable by railway directly from the factory.

Cytec Surface Specificities Austria GmbH

- Cytec Austria GmbH, Bundesstrasse 175, Werndorf, http://www.cytec.com/

- a wide variety of chemicals – aircraft industry, textile, polymers, etc.

- connection with the Danube river: complicated – either by railway (a railway station is 200 m away from the factory) to Vienna (228 km) or by road (212 km).

DSM Fine Chemicals Austria NLG GmbH & Co KG

- St.-Peter-Straße 25, Linz, http://www.dsm.com/en_US/html/dfc/home_page.htm

- food-industry and agriculture-industry chemicals

- connected with the Danube: the port of Linz accessible from the factory.

FRESENIUS Kabi Ausitria Gesselschaft m.b.H.

- Hafnerstraße 36, Graz, http://www.fresenius-kabi.at/

- medical products

- connected to the Danube river: the first factory of the company is located in the South-Austrian metropolis Graz. The connection of the factory with the Danube is complicated – by railway (215 km; a station 300 m away from the factory), by road (199 km). The other factory is located in Linz and the port is available directly from the factory premises.

HENKEL Central Eastern Europe GmbH

- Erdbergstraße 29, Wien, http://www.henkel.at/

- cosmetics, cleaning products, adhesives

- connected with the Danube river: directly to the port of Vienna by road transport (18 km).

ISOVOLTA AG

- ISOVOLTA AG, IZ NÖ-Süd, Straße 3, Wiener Neudorf, http://www.isovolta.com/

- fiberglass, impregnation

- connected with the Danube river: the factory in Neudorf is linked with the port of Vienna by railway (16 km). The railway route from the factory in Lebring (South of Graz) to Vienna is 238 km long.

LENZING AG

- Werkstraße 2, Lenzing, http://www.lenzing.com/

- products originating by wood-processing, acids, plastics

- connected with the Danube river: by railway to the port of Linz (70 km)

NYCOMED Austria Gesellschaft m.b.H

- St.Peter Straße 25, Linz, http://nycomed.at/

- pharmaceutical products

- connected with the Danube river: the port of Linz is accessible directly from the factory premises

OCTAPHARMA Pharmazeutika Produktions Gesellschaft m.b.H.

- Oberlaaer Straße 235, Wien, http://www.octapharma.com/

- pharmaceutical products

- connected with the Danube river: by railway from the factory to the port in Vienna (20 km)

Sandoz GmbH

- Biochemiestraße 10, Langkampfen, http://www.biochemie.com/

- pharmaceutical products

- connected with the Danube river: both factories are located close to each other. The nearest port on the Danube is Linz and the distance is 315 or 350 km (the factory in Kundl).

Semperit technische Produkte Gesellschaft m.b.H.

- Triester Bundesstraße 26, Wimpassing, http://www.semperit.at/

- medical equipment, plastics

- connected with the Danube river: by railway from the factory to the port of Vienna (66km)

TREIBACHER INDUSTRIE AG

- Auer von Welsbach Strasse 1, Althofen, http://www.treibacher.com/

- pigments, polish, catalysts, pharmaceutical products

- connected with the Danube river: very inconvenient; by railway to Vienna (288 km) or Linz (273 km).

2.6.5 Slovakia

Picture 21 – Major chemical industries in Slovakia

Source: Ing. Jaroslav Čermák, the ChemLog project representative in Slovakia

Slovnaft Bratislava, a. s.

- Vlčie hrdlo 1, 824 12 Bratislava, http://www.slovnaft.sk/sk/
- petrol, diesel, oils, tar, other chemicals
- storage capacities, automated blending, charging bridges for road and railway transport, pipeline to the port in Bratislava (the Danube river)

Duslo Šaľa, a. s.

- Administratívna budova ev. č. 1236, 927 03 Šaľa, http://www.duslo.sk/
- fertilizers, rubber chemicals, pesticides, industrial explosives, polypropylene fibers
- distance to Bratislava: 65 km. The port of Šaliany on the Váh and the railway corridor Budapest - Šaľa - Bratislava - Vienna or Bratislava - Prague are very important for transportation of the Duslo products

Novácke chemické závody, a. s.

- M. R. Štefánika 1 , 972 71 Novák, http://www.nchz.sk/

- polymers, plastics, the organic and inorganic products of the chemical industry

- a road connection to the port of Bratislava via E572 and a link to the D1 motorway (approx. 150 km); a railway connection: a shuttle train Nováky - Bratislava (148 km)

Continental Matador Truck Tires, s. r. o., Púchov

- Terezie Vansovej 1054/45, 020 01 Púchov, http://www.continental.sk/

- rubber industry – automobile tires

- immediate vicinity of the Váh river – potentially via the Váh waterway; a railway connection to Bratislava (159 km); a road connection via the D1 motorway (166 km)

Chemko Strážske, a. s.

- Priemyselná 720, 072 22 Strážske, http://www.chemko.sk/

- alehydes, phenolic bitumens, light stabilizers

- a railway connection: Strážske - Košice (188 km), also Košice - Bratislava (445 km), Košice - the port of Štúrovo (362 km), Košice - Budapešť (272 km)

Chemosvit, a. s.

- Štúrova 101, 059 21 Svit, http://www.chemosvit.sk/

- sheets, polypropylene fibres, plastic products

- by road: the D1 motorway Svit - Bratislava (336 km); hypothetically via the Váh waterway to Žilina (134 km); by railway: Svit - Žilina 134 km, Svit - Bratislava 337 km

Chemolak Smolenice, a. s.

- Továrenská 7, 919 04 Smolenice, http://www.chemolak.sk/

- dyes, varnishes, sealants, adhesives

- a shuttle train to Trnava and then to Bratislava (22 + 46 km)

Hnojivá Duslo, s. r. o.

- Priemyselná 720, 072 22 Strážske, http://www.duslo.sk/

- fertilizers, rubber-industry chemicals, pesticides, industrial explosives, polypropylene fibers

- a railway connection: Strážske - Košice (188 km), also Košice - Bratislava (445 km), Košice - the port of Štúrovo (362 km), Košice - Budapešť (272 km)

Diakol Strážske, s. r. o.

- Priemyselná 720, 072 22 Strážske, http://www.diakol.sk/

- formaldehyde concentrates, production of formalin and adhesives

- by railway: Strážske - Košice (188 km), also Košice - Bratislava (445 km), Košice - the port of Štúrovo (362 km), Košice - Budapešť (272 km)

Zentiva, a. s.

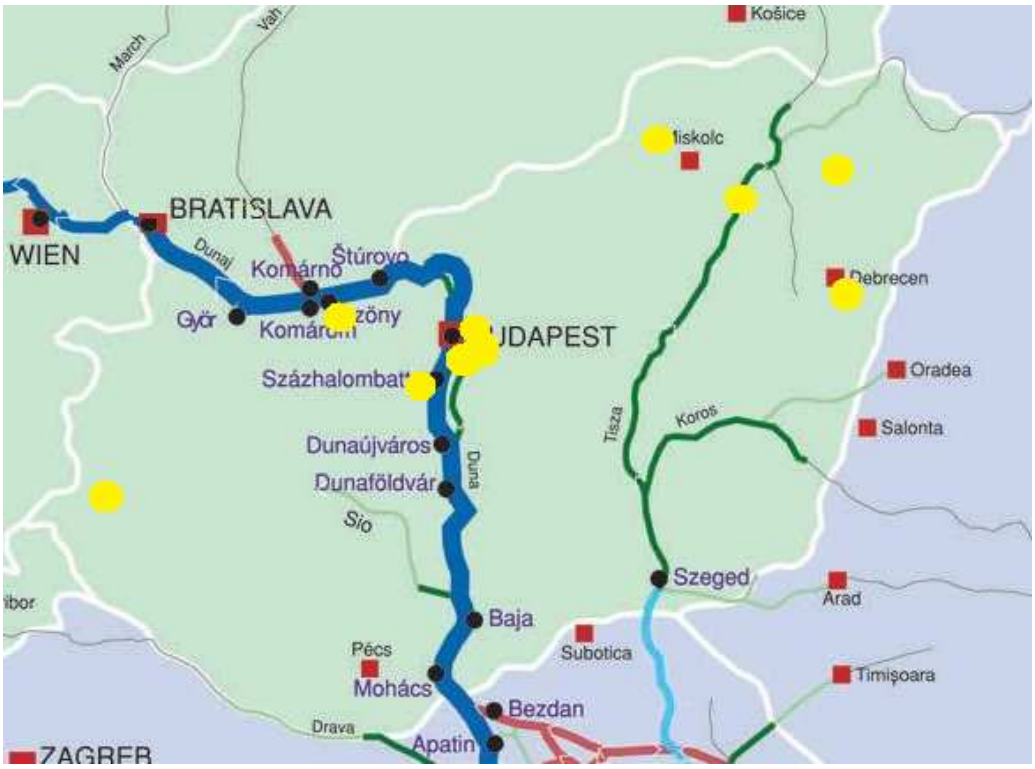
- Nitrianska 100, 920 27 Hlohovec, http://www.zentiva.sk/

- pharmaceutical products

- by road to the port of Bratislava via the D1 motorway (67 km); by railway from Hlohovce via the shuttle train on the premises of the Zentiva factory to the port of Bratislava; potentially by water on the Váh waterway and the planned port in Hlohovec

2.6.6 Hungary

Picture 22 – Major chemical industries in Hungary



MOL Magyar Olaj

- H-1117 Budapest, Október huszonharmadika u. 18, http://www.mol.hu/
- oil products, oil refinery
- the Százhalombatta refinery is situated directly on the Danube, a landing stage available
- the Almásfüzitõ refinery; the nearest port is in Komárom (approx. 10 km), a shuttle train on the premises of the refinery, a direct connection with the port

Tiszai Vegyi Kombinát

- H-3581 Tiszaújváros, http://www.tvk.hu/
- production of plastics
- a shuttle train leading to the factory premises, the nearest port: Budapest (approx. 180 km)

Chinoin Gyógyszer – És Vegyészeti Termékek Gyára

- 1045 Budapest, Tó utca 1, http://sanofi-aventis.hu/
- pharmaceutical products
- directly in Budapest, a nearby port available

Ricchter Gedeon Vegyészeti Gyár Nyrt

- 1103 Budapest, Gyömrői út 19, http://www.richter.hu/
- pharmaceutical products
- directly in Budapest, a nearby port available, a shuttle train

Borsodchem ZRT

- Bolyai tér 1., H-3700 Kazincbarcika, http://www.borsodchem.hu/
- production of plastics
- a shuttle train, the nearest port is in Budapest (approx. 200 km)

Michelin Hungária Abroncsgyártó Kft

- Nyiregyhaza, http://www.michelin.hu/
- rubber industry, automobile tires production
- a shuttle train, the nearest port is in Budapest (approx. 200 km)

EGIS Gyógyszergyár Nyrt

- 1106 Budapest, Keresztúri út 30-38., http://www.egis.hu/
- pharmaceutical products
- two production factories directly in Budapest, a port available
- another factory in Körmendi, a shuttle train, the distance to the Budapest port is about 220 km

TEVA Gyógyszergyár Zrt

- Debrecen, Pallagi street 13, http://www.teva.hu/

- pharmaceutical products

- a shuttle train, the distance to the Budapest port is about 220 km

2.6.7 Romania

Picture 23 – Major chemical factories in Romania

Sources: Carman Petrescu,Operations Manager,
http://www.visionwise.ro/chemicals_industry_ro.pdf,
a selection from:
http://www.doingbusiness.ro/financial/OPT/ a http://mcir.doingbusiness.ro/ro/industrie-chimica

Alchimex

- Calea Grivitei 46, Bucuresti, http://www.alchimex.ro/

- fertilizers, herbicides, other agricultural products

- connected to the Danube river: a direct connection to the railway transportation, ports in Giurgiu and Oltenita (89 km or 83 km)

Azomures

- Gh. Doja 300, Targu Mures, http://www.azomures.com/

- fertilizers

- connected to the Danube river: the factory is located in the inland Romania towards the Central Europe, Drobeta Turnu Severin is the nearest (or the best accessible) reachable by railway (430 km)

Chimcomplex S. A. Borzesti

- str. Industriilor nr. 3, Onesti, http://www.chimcomplex.ro/

- organic and inorganic chemicals

- connected to the Danube river: an important port in Galati is directly accessible by railway (167 km)

CHIMOPAR S. A.

- B-dul Theodor Pallady N.50, Bucuresti, http://www.chimopar.com/

- laboratory chemicals, acids, peroxides

- connected to the Danube river: by railway (77 km) to the port of Oltenita

Ecolab S. R. L.

- Sf. Lazar Street 50, Iasi, http://www.ecolab.com/

- cleaning products

- connected to the Danube river: the nearest port Galati can be reached by railway to Iasi-Galati (255 km) and it is necessary to transport the products to the railway station in Iasi for about 2 km.

Linde Gaz Romania S. R. L.

- Str. Avram Imbroane 9, Timisoara, http://www.linde-gaz.ro/

- specific gases

- connected to the Danube river: by railway to the port of Pančevo (SERBIA) - (123 km)

MOL Romania PP S. R. L.

- Calea Dorobantilor nr. 14 – 16, Cluj-Napoca, http://molromania.ro/

- fuels, lubricants, brake fluids

- connected to the Danube river: the nearest port of Drobeta Turnu Severin is in a great distant reachable by train (435 km)

OLTCHIM S. A.

- Uzinei Street 1, Rm. Valcea, http://www.oltchim.ro/

- lye, acids, plastics

- connected to the Danube river: the most convenient way to Europe is via the port of Drobeta by railway (250 km)

OMV PETROM S. A.

- Mihai Eminescu St.105, Işalnița, Doljchim, http://www.petrom.com/

- a wide range of products, mainly fertilizers

- connected to the Danube river: the port of Calafat – (107 km) by railway.

Purolite Romania

- Str. Mihai Eminescu No.105-107, Bucuresti, http://www.purolite.com/

- catalysts, resins, acids, pharmaceutical products

- connected to the Danube river: a railway station is 3 km away, the port of Oltenita can be reached by railway (83 km)

Rompetrol Rafinare S. A.

- 8736 Navodari, DJ 226, http://www.rompetrol-rafinare.ro/

- petrochemicals

- connected to the Danube river: the factory is located at the very bank of the Black Sea and there is a direct link to the Danube.

S.C. Amonil S. A. Slobozia

- Calarasi Road, Km.4, Slobozia, http://www.amonil.ro/

- agricultural products - fertilizers

- connected to the Danube river: a direct connection to the port of Cernavoda (80 km).

S.C. DONAU CHEM S. R. L.

- Portului 1, Turnu Măgurele, http://www.donauchem.ro/

- fertilizers - ammonia, carbamide, ammonium nitrate

- connected to the Danube river: excellent location in the direct vicinity of the port of Tornu Magurele.

SC GHCL UPSOM Romania S. A.

- Portului 1, Ocna Mures, http://www.dalmiabrothers.com/bega.htm

- sodium ashes used in glassmaking and building industry

- connected to the Danube river: by railway to the port of Drobeta Turnu Severin: 360 km.

S.C. PETROTEL LUKOIL S. A.

- str. Mihai Bravu nr. 235, Ploiesti, http://www.lukoil.ro/

- petrochemicals, lubricants

- connected to the Danube river: by railway to the port of Giurgiu: 150 km.

Viromet S. A.

- Aleea Uzinei Nr. 8, Victoria, http://www.viromet.ro/

- methyl alcohol, formaldehyde, resins, bio-fuels

- connected to the Danube river: by railway to the port of Drobeta Turnu Severin (390 km)

2.6.8 Ukraine

Lysychanska Naftova Investyciina Kompaniya

- oil products, oil processing

- the factory is situated about 280 km east of the nearest port on the Dnieper - Dnětropetrovsk, then across the Black Sea to the Danube

UKRTATNAFTA

- Svyshtovskaya 3, AG Kremenčug, 39609, http://www.ukrtatnafta.com/

- oil and natural gas processing

- oil pipeline installed on the factory premises; the factory is situated at the banks of the Dnieper, there is a port immediately on the factory premises, connected with the Danube across the Black Sea

UKRNAFTA

- 04053 Ukraine Kiev, Nesterovsky str, 3-5, http://www.ukrnafta.com/
- oil and natural gas processing
- The main regions of production:

• Chernihiv-naftogaz, approx. 200 km north of Kiev, along the Dnieper and across the Black Sea into the Danube

• Okhtyrka naftogaz, near Dněpropetrovsk on the Dnieper

• Kachanivsky, Hlinsko-Rozbyshivsky a Anastasivsky

• Dolynsky, Pasichnyansky a Boryslavsky

Concern STIROL

- Gorlovskoi Divizii Street, Gorlovka, Donetsk region, 84610 Ukraine, http://www.stirol.net/
- fertilizers, polystyrene, pharmaceutical products
- Gorlovka is situated about 250 km east of Dněpropetrovsk which is the nearest port connected through the Dnieper and across the Black Sea into the Danube

Severodonetsk AZOT Association

- Close Joint Stock Company “Severodonetsk Azot Association” 5, Pivovarova street, Severodonetsk 93403, Lugansk region, http://www.azot.lg.ua/
- nitrogen fertilizers production, polymers, acids
- the factory is situated approx. 300 km east of the port of Dnětropetrovsk connected to the Danube

Lukoil

- http://www.lukoil.com/
- oil products, oil processing

- a refinery in the port of Odessa, connected to Danube across the Black Sea

- petrochemical industry centered in Karpatneftekhim (Kalush), the nearest connection to the Danube is by the port of Budapest

2.6.9 Croatia

Picture 24 – Main chemical industries in Croatia

Ina-Industrija Nafte, D. D.

- http://www.ina.hr/

- oil products, oil processing

- the Rijeka refinery: immediately on the shore of the Mediterrenean Sea, connected by a shuttle train; the nearest port on the Danube (approx. 450 km)

- the Sisak refinery: a shuttle train, the nearest port on the Danube is Vukovar (about 250 km)

Petrokemija, D. D.

- Aleja Vukovar, 44320, Kutina, http://www.petrokemija.hr/
- nitrogen fertilizers production
- a shuttle train, the nearest port is Vukovar (about 250 km)

Pliva Hrvatska D. O. O.

- Ulica grada Vukovara 49, 10000 Zagreb, http://www.pliva.com/
- pharmaceutical preparations
- a shuttle train, the nearest port is Vukovar (approx. 290 km)

Dioki

- http://www.dioki.hr/
- petrochemical industry, polyethylene, polystyrene
- an industrial zone in Zagreb – Žitnjak with a shuttle train, the nearest port is Vokuvar (about 290 km)
- another industrial zone is situated on the island of Krk in the port of Omišalj (the Mediterranean Sea)

Chromos Agro D. D.

- Ulica grada Vukovara 271, 10000 Zagreb, http://www.chromos-agro.hr/
- pesticides, fertilizers
- in direct vicinity of the railway, the nearest port is Vukovar (about 290 km)

2.6.10 Serbia

Picture 25 – Major chemical industries in Serbia

Elan Chemical Industry A. D.

- Ljubisa Miodragovica 11, Prijepolje, http://www.elan.rs/
- lubricants
- connected to the Danube river: difficult - the nearest port is Belgrade reachable by railway (240 km)

Agrohem A. D.

- Novi Sad
- fertilizers, pesticides
- connected to the Danube river: directly by the port of Novi Sad

ALBUS Novi Sad

- Privrednikova 10, Novi Sad, http://www.albus.rs/
- cleaning products and detergents, drugstore products
- connected to the Danube river: the port of Novi Sad (approx. 1.5 km)

Barentz D. O. O.

- Bul. Arsenija Carnojevica 104, Novi Beograd, http://www.barentz.com/

- materials for chemical industry
- connected to the Danube river: the large port of Belgrade (approx. 2 km)

Galenika A. D.

- Batajnički drum bb, Beograd, http://www.galenika.rs/
- pharmaceutical products, cosmetics
- connected to the Danube river: by road to the port of Belgrade (20 km).

Hemijska industrija PRVI MAJ

- ul. Nikole Tesle br.9, Čačak, http://www.prvimaj.co.rs/
- adhesives, binding substances
- connected to the Danube river: a railway connection between Čačak and Bělehrad (180 km)

HEMOFARM A. D.

- Šabac, http://www.hemofarm.rs/
- pharmaceutical products
- connected to the Danube river: the factory in Šabac is directly by the port connected by waterway with Belgrade on the Danube river (100 km).

Henkel Merina D. O. O.

- Stanoja Atanackovića bb, Kruševac, http://www.henkel.com/
- drugstore products
- connected to the Danube river: Smederevo is the nearest port accessible by road E75 (155 km) or by railway (150 km).

Hipol A. D.

- Industrijska zona b.b., Odžaci, http://www.hipol.com/
- polypropylene
- connected to the Danube river: by road with the port of Backa Palanka (26 km) or by

railway with the larger port of Novi Sad (50 km).

HIP-AZOTARA D. O. O.

- Spoljnostarcevacka 80, Pancevo, http://www.hip-azotara.rs/
- fertilizers
- connected to the Danube river: a direct shuttle train to the port of Pančevo (10 km).

HIP Petrochemija A. D.

- Spoljnostarcevacka 82, Pancevo, http://www.hip-petrochemija.com/
- an extensive portfolio of specific chemicals
- connected to the Danube river: a direct shuttle train to the port of Pančevo (10 km), other factories in Elemi a Crepaja connected to Pančevo by railway

Lukoil - Beopetrol A. D.

- Mihajlo Pupin 165 d, Beograd Novi, http://www.lukoil.rs/
- retail sale of petrol, diesel, oil, gas
- connected to the Danube river: directly with the port of Belgrade

Messer Technogas

- HIP-AZOTARA D.O.O, Spoljnostarcevacka 80, Pancevo, http://www.messer.rs/
- industrial gases
- connected to the Danube river: the company operates several factories in all Serbia. Pančevo, Smederovo, Novi Sad (directly connected with the Danube) are port cities. Other factories in Nis, Kraljevo, Bor, Odžaci are linked by road or railway.

MSK A. D.

- Miloševački put bb, Kikinda, http://www.msk.rs/
- methyl alcohol, acetic acid
- connected to the Danube: Senta on the Tisa river is the nearest port (70 km) reachable by railway. Distance to the Danube river is about 150 km.

Naftna Industria Srbije A. D.

- Narodnog fronta 12, Novi Sad, http://www.nis.rs/
- petrochemical industry
- connected to the Danube river: the two main refineries Pančevo and Novi Sad are directly connected with the river

PKS - LATEX-HLC A. D.

- Nikole Tesle 11, Čačak
- dyes, varnishes
- connected to the Danube river: the closest port is Belgrade reachable by railway (180 km)

PRVA ISKRA - Namenska proizvodnja A. D.

- Barič, http://www.prvaiskra-namenska.com/
- explosives
- connected to the Danube river: by road (100 km) into the port of Smederevo.

Župa A. D.

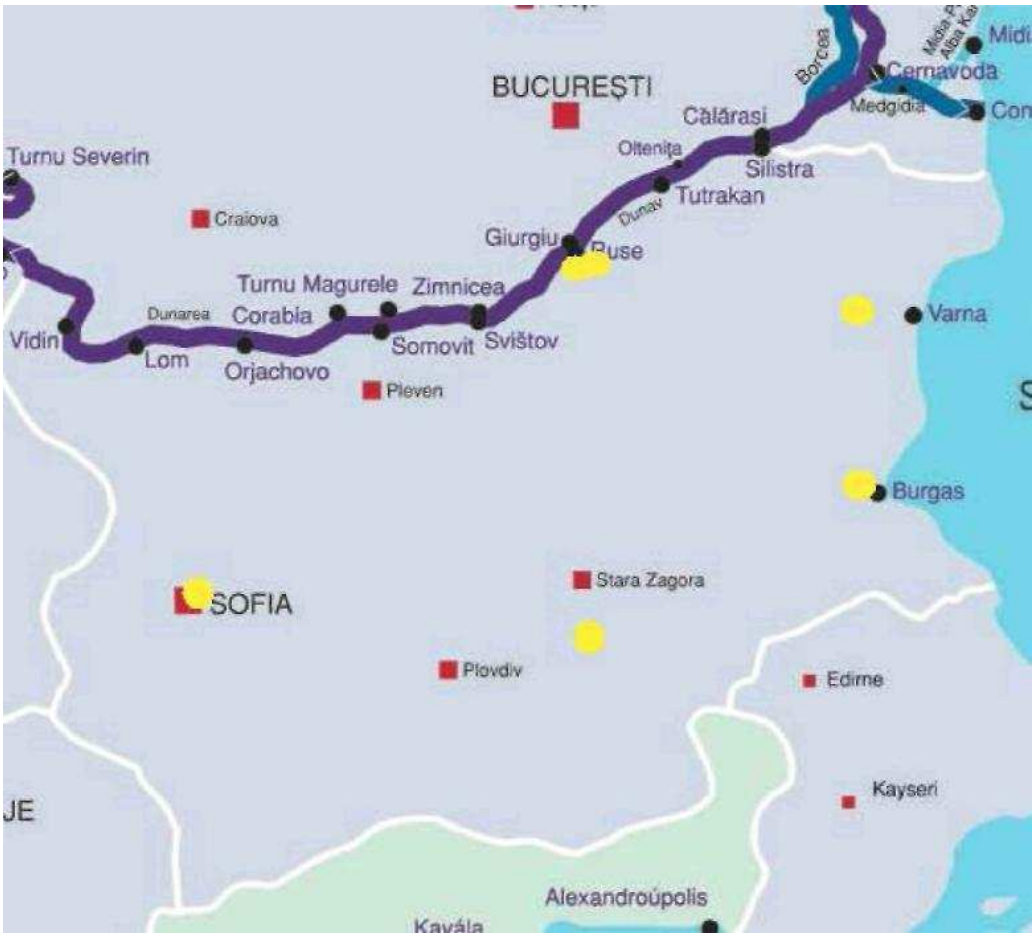
- Šandora Petefija bb, Dedina, Kruševac, http://www.zupachemical.com/
- pesticides, inorganic compounds
- connected to the Danube river: the nearest port is Smederevo which is accessible by road (155 km by the E75 road) or by railway (150 km).

Zorka Chemical industry, holding

- Sabac
- an extensive portfolio of products – pharmaceutical products, specific chemicals, etc.
- connected to the Danube river: directly in the port of Sabac

2.6.11 Bulgaria

Picture 26 – Major chemical industries in Bulgaria



Lukoil Neftochim Burgas

- http://www.lukoil.bg/
- oil products, oil processing
- the factory is located a few kilometers from the port of Burgas connected by shuttle train, the river flows into the Danube (after about 270 km) or by railway
- the inland Danubian ports (e.g. Svištov or Ruse) are approx. 300 km distant

Prista Oil

- 73 Borisova Str. Ruse 7012, http://www.prista-oil.com/
- petroleum oils
- a port directly on the banks of the Danube river

Orgachim Ruse

- 21 3 March Boulevard, 7000 Rousse, http://www.orgachim.bg/
- production of synthetic dyes, coatings and varnishes
- a port directly on the banks of the Danube river

Solvay-Sodi Devnya

- Industrial Zone, 9160 Devnya, http://www.solvaychemicals.com/
- products of inorganic chemistry
- a railway connection from the factory premises into the port of Varna (the Black Sea), then northwards into the influx of the Danube river (about 150 km); railway connects the factory with the inland ports in Ruse, Tutrakan, Silistra (approx. 170 km)

Neochim Dimitrovgrad

- 6403 Dimitrovgrad, http://www.neochim.bg/
- nitrogen fertilizers
- an installed shuttle train, the nearest ports of Svištov and Ruse (approx. 260 km)

Neohimiki Bulgaria Sofia

- 38 Maistor Aleksi Rilets Str.,1618 Sofia, http://www.neochimiki-sa.gr/
- manufacture of pesticides and other inorganic products
- the nearest ports of Orjachovo and Lom (about 170 km)

Polimeri Devnia

- http://www.polimeri.org/
- the primary polymer production
- a railway connection to the port of Varna at the Black Sea, then for about 150 km northwards to the influx of the Danube river; or by railway to the inland ports of Ruse, Tutrakan, Silistra (about 170 km)

2.6.12 Moldovia

Picture 27 – Major chemical industries in Moldavia

The major centers for chemical industry are located in two main regions:

- **the capital city Chisinau:**

- AGAT S. A., http://www.agat.md/
- I.M. EUROPLAST Chisinau S. R. L., http://www.europlast.ru/
- I.M. SANIN S. R. L., http://sanin.md/
- I.M. MOLD-PlastChim S. R. L.., http://abs.conuv.com/
- Policontract Ltd.
- ECOCHIMIE S. R. L.., http://www.ecochimie.md/
- ATAI Group, http://ataigroup.com/
- Barkan-Farma, http://barkan.md/
- FARMACO S. A., http://farmaco.md/

- connection to the Danube river: Giurgiulesti is the only Danubian port in Moldova, which is located in the south of the country connected directly by railway (370 km). Another connection via

railway to Tiraspol and then by a waterway across the Black Sea is time-consuming (over 600 km in total) and ineffective due to a low-quality infrastructure (including zero terminal utilities).

- **Tiraspol:**

- Anfilada S. R. L., http://www.anfilada.md/

- Uzina MOLDAVIZOLIT S. A., http://moldavizolit.md/

- the connection to the Danube: railway transport to the port of Giurgiulesti is not feasible due to large distance. Another solution is direct load of a vessel in the port of Tiraspol (which is poorly equipped) and further navigation to the Prut and across the Black Sea into the influx of the Danube river (400 km).

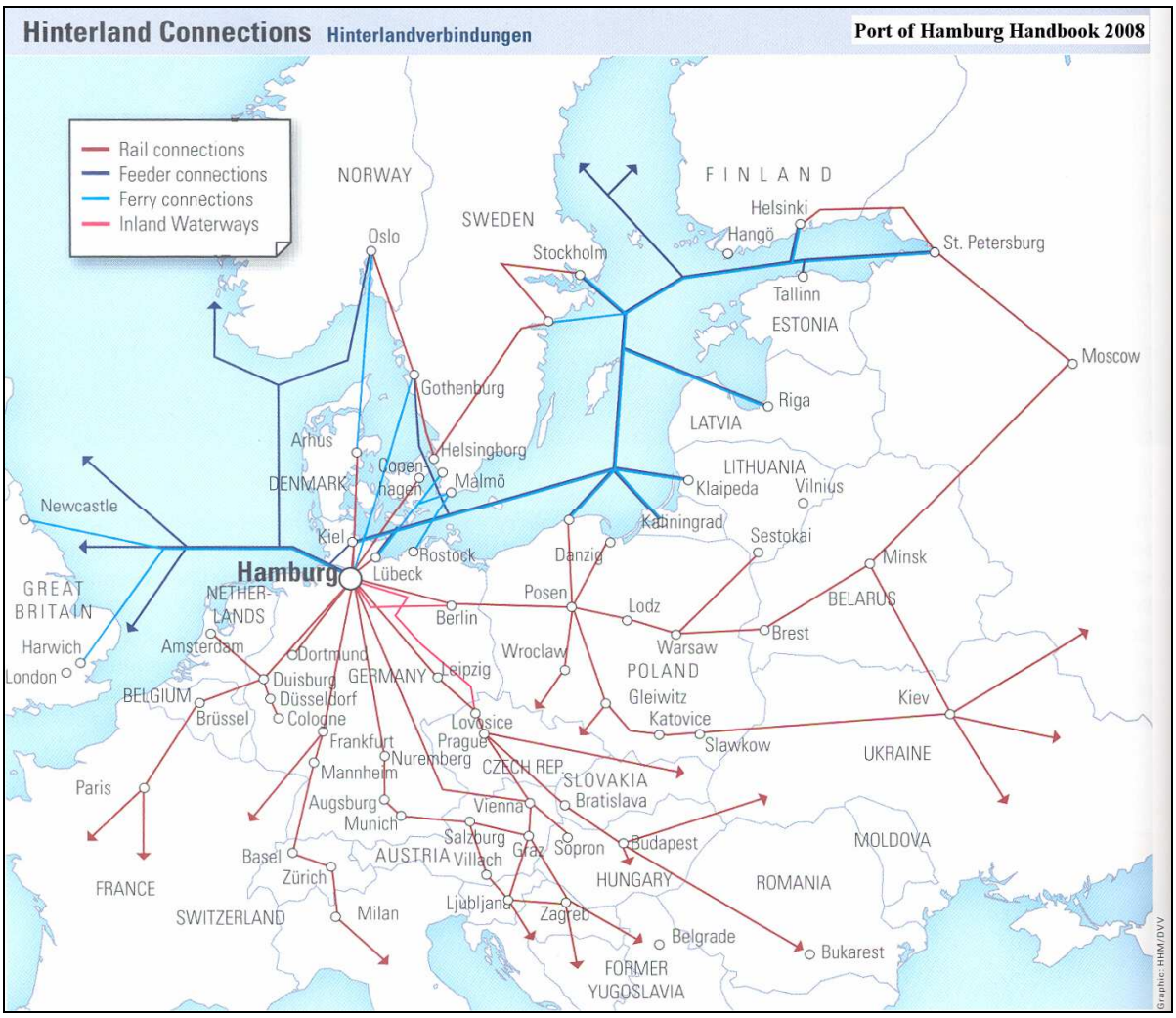
2.7 CONSECUTIVE TRANSPORT

The connection of the Elbe waterway with the afore-mentioned ports of Hamburg, Bremerhaven, Rotterdam, Amsterdam and Szczecin proves the great potential of the waterway in consecutive transport.

Hamburg

The rail network of Germany and surrounding countries enables connection of Hamburg with the entire Germany and Austria and other important transport joints, such as Prague, Amsterdam, Basel, Zurych, or Copenhagen, within 24 hours (the real time of transportation depends on the capacity of the network, which is often overloaded within the Rhein region). There are over 200 loaded trains dispatched every day, while more than a half are domestic and international container connections. Considerable volume of trains are managed by the Port Railway Company with an extensive railway network in Hamburg (330 km, 5 stations, 7 checkpoints). It is currently used by more than 40 national and international railway companies.

Picture 28 – The Hamburg port connections realised by railways, feeders, ferries and inland waterways



Source: Port of Hamburg Handbook 2008

The road transport also plays an important role. Hamburg is connected with the surrounding areas by an extensive motorway network. The A1 and A7 motorways leading through Hamburg are one of the most important European north-south links. Along the east-west axis, Hamburg and Berlin are linked by the A24 motorway and the recently-built A20 motorway provides a link with Eastern Europe.

Either directly or through the Elbe-Seiten-Kanal and Mittelandkanal, the Elbe river provides direct navigation on inland waterways through Dresden, Leipzig, Magdeburg, Halle, Děčín, Ústí nad Labem, Mělník, Kolín and Prague.

Bremerhaven

The Transfracht International Company provides several times per day train connections on more than 22 inland terminals and operates the major economical centers in Germany, Austria and Switzerland. The Eurogate Intermodal Company offers daily shuttle containers to the economic centers in Hungary. The Polyug Intermodal Company operates asorted trains in the economic regions of Poland, Ukraine, Lithuania, Latvia, Estonia Russia and Belarus. The Metrans Company ensures connection to the ports in northern Germany, the Czech Republic, Slovakia and Hungary by container trains.

The ports in Bremen are linked to the European motorway network by the A1 and A27 motorways.

For waterway transport, mainly the Weser river, a coastal channel linking the Rhein region and the western ports, and the Mediterranean channel linking the Eastern Europe are utilised.

Picture 29 - Connections of the Bramenhaven port realised by railway, road and feeders

Source: http://www.bremen-ports.de/ - Hafenzukunftskonzept

Rotterdam

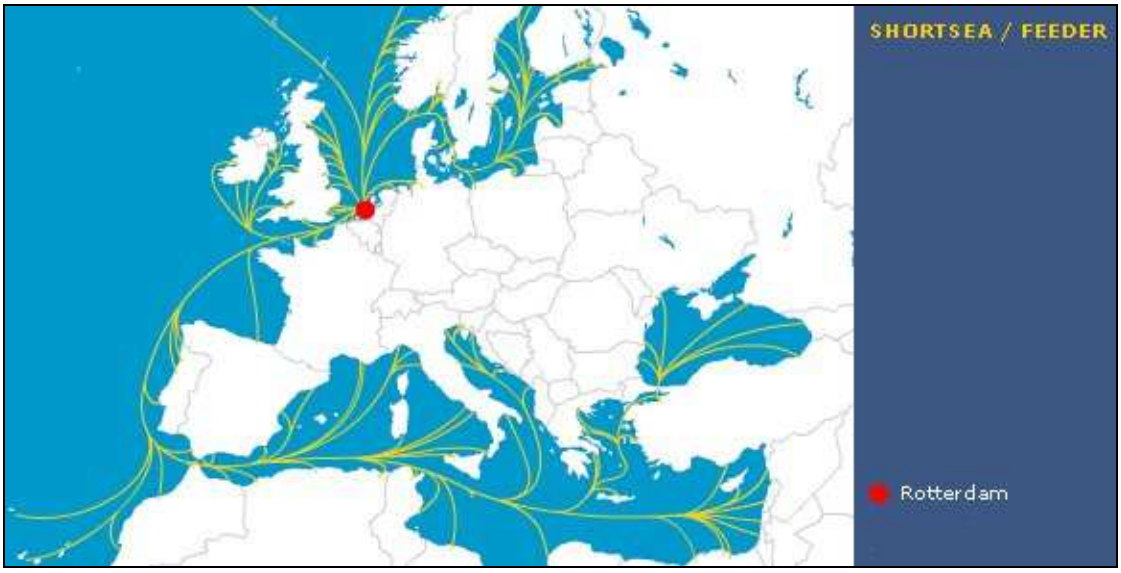
The main destinations in Western Europe are theoretically reachable by road from Rotterdam within 24 hours. Over 12.500 road vehicles leave the ports every day. The port motorway is connected to the European motorway network.

Picture 30 - Regular railway connections to/from the Rotterdam port in the year 2007

Source: Rotterdam, The European Rail Port (http://www.portofrotterdam.com/), 2007

Rotterdam is linked with more than a thousand sea ports worldwide (Southern and Northern America, Africa, Southeastern Asia, Australia). The real importance of the port as a joint for waterway transport is apparent from the fact, that 48 % of the total volume of transported goods (in tons) to/from Rotterdam is realised by water.

Picture 31 - Connections of the Rotterdam port by sea transport routes



Source: http://www.portofrotterdam.com/

Amsterdam

Amsterdam is very well-connected with the European railway network. The port has its own rail yard and is linked to all major routes. The Amsterdam port is connected by international shuttle railway link with Belgium, France, Switzerland and other countries. The port is also linked to the Betuwe railway (by a frieght shuttle train between Rotterdam and Amsterdam in the west and with the German border in the East) to Geldermalsen. Trains are dispatched from Amsterdam to Rotterdam 5 times per week and it is accessible from all major destinations in Europe.

Within road transport, it is linked to the A9 and A10 motorways. The western ring road provides new link between the Coen tunnel (A10) and the A4 and A9 motorways.

More than a third of the volume reloaded in Amsterdam is further transported by inland waterways. The port is linked with the Rhein and thus with the major European centers in Germany, Switzerland and Austria. A large part of the transported commodities are petroleum products, feed, coal and containers. There are regular container links established between Amsterdam, Rotterdam, Antwerpen and Germany, operating several times per week.

Picture 32 - Distance from Amsterdam to the major European centers

Source: http://www.portofamsterdam.nl/

Szczecin and Swinoujscie

The convenient location of the Szczecin and Swinoujscie ports is reinforced by a quality railway network connecting the two ports with the business centers in Western and Southern Europe by the long-distance railway line Oder and with Szczecin and Poznań. The E-59 and C-E 59 railway lines connect the port with the central and southern part of Poland and with Southern and Eastern Europe. The Szczecin - Berlin railway interconnects the two Polish ports with the railway network in Germany.

The E65 speedway links the ports of Szczecin and Swinoujscie with the motorway network leading to the Czech Republic, Germany, Slovakia, Austria, Hungary and Slovenia. Szczecin and Berlin are connected with the A11 motorway (E28) and thus with the European motorway network.

The twin ports are also connected with the Western European inland waterway network. In 1998, a large part of the Szczecin - Berlin waterway was modernized on the German side; the modernization in the full length is scheduled for the year 2010. These adjustments are supposed to make the transportation more effective by utilizing larger cargo vessels and supporting regular container transportation.

Picture 33 - The ports of Szczecin and Swinoujuscie - consecutive routes

Source: Port of Szczecin & Świnoujście Authority S. A.

3 COMPARATIVE ECONOMIC CONDITIONS FOR TRANSPORT MODE SELECTION

The issue of comparative economic conditions for the selection of a transportation mode is rather complicated. The selection differs according to:

- the type of transported commodities,
- the amount of transported goods (suitable for cargo vessel or the whole train, etc.),
- the requirements of the final customer (e.g. shipments for the production mode “just in time“),
- other specific parameters.

It may seem that some of the required transport parameters are not of economic nature. Generally, substitution for a selected transport mode is always possible with the corresponding consequences, such as increased costs for either originator or recipient, or both. Therefore, it is necessary to assess the transportation costs in a complex way.

3.1 COMPARISON OF COSTS FOR A TRIP REALISED BY ROAD, RAILWAY AND INLAND WATER TRANSPORT

The system of charging individual trips realised by different transport modes is various. In case of road and water transport, the difference in costs is not fundamentally different within EU member countries. For road transport, there are two basic types of charging distinguished (performance fee or time fee). For national waterway transport, charges are applied only on selected artificially constructed sections of waterways. For railway transport, charges differ in each country.

It is necessary to emphasize the further development of future pricing of trips. The intention of the EU is to charge road and railway transportation according to the impact on the environment. There is a rising tendency in increasing road-tolls and railway fees. This fact may bring another comparative advantages to the waterway transport.

In the following chapters, the basic system of charging different transport modes is presented for relevant countries. To enable comparison, charges are converted to EUR as a common currency. The following conversion rates were used: 1 EUR = 25,5 CZK and 1 EUR = 4,12 PLN.

3.1.1 The price for using road transport infrastructure

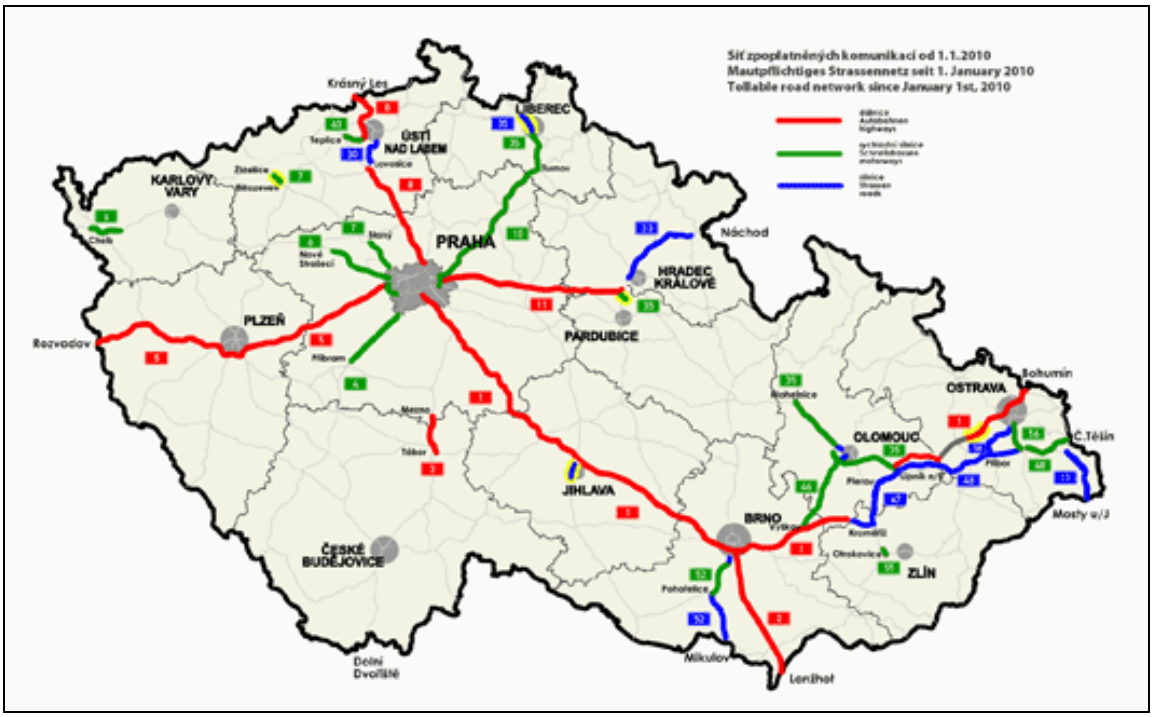
There are two basic charging systems in the EU member countries - “performance fee” or the road toll depending on the travelled distance, and “time fee” depending on the selected time period (for example week, year etc.)[7]

In the following text, the current rates (year 2010) in selected countries are listed for a model vehicle with the highest allowed weight of 12 tons and more in total, having five axles and belonging to the EURO 5 emission class.

3.1.1.1 The Czech Republic

In the Czech Republic, 2 % of roads is a subject to charging, which equals to approximately 1.300 km from the total length of 56.000 km. The charges apply to motorways, speedways and selected sections of 1st class roads (see the picture below). Neither tunnels nor bridges are charged in the Czech Republic.

Picture 34 – Map of charged roads in the CR (the year 2010)



Source: http://www.mytocz.cz/

The performance fees for vehicles with the highest allowed weight of 12 tons, having five axles and belonging to the EURO 5 emission class, valid from 1st January 2010, according to the Government regulation no. 484/2006 Coll.[8]:

- motorways and speedways: 6,30 CZK/km, i.e. 0,247 EUR/km (Fridays from 3 p.m. to 9 p.m. incl.), 4,12 CZK/km, i.e. 0,162 EUR/km (the rest of the week),
- 1st class roads: 3,00 CZK/km, i.e. 0,118 EUR/km (Fridays from 3 p.m. to 9 p.m. incl.), 1,96 CZK/km, i.e. 0,077 EUR/km (the rest of the week).

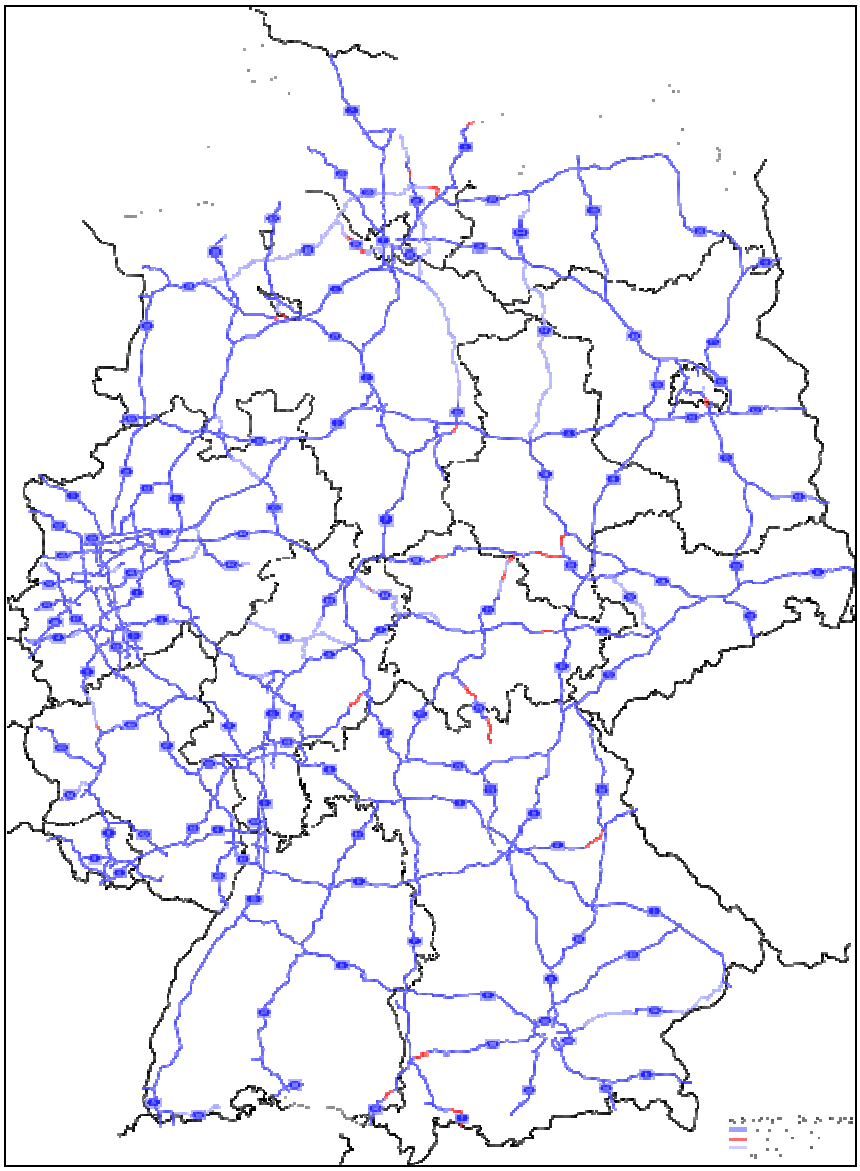
3.1.1.2 Germany

In Germany, the roads subjected to fees are motorways – approx. 12.600 km (since 1st January 2005) and selected sections of federate roads (since 1st January 2007). The legal basis are the law on motorway toll, the regulation setting the toll rate, the regulation on cargo toll and the regulation on toll-duty distribution. Neither tunnels nor bridges are charged in Germany.

[7] Source: Charges of the railway network in terms of its competitiveness in the international transport, The 2008 Report, CityPlan spol. s r. o.

[8] Source: http://www.mytocz.cz/

Picture 35 - Germany - Map of the motorway network (2010)



Source: http://en.wikipedia.org/wiki/Autobahn (March 2010)

The performance fee for vehicles with the highest allowed weight of 12 tons, having five axles and belonging to the EURO 5 emission class valid from 1st January 2009[9]:

- motorways and selected sections of federal roads: 1,55 EUR/km.

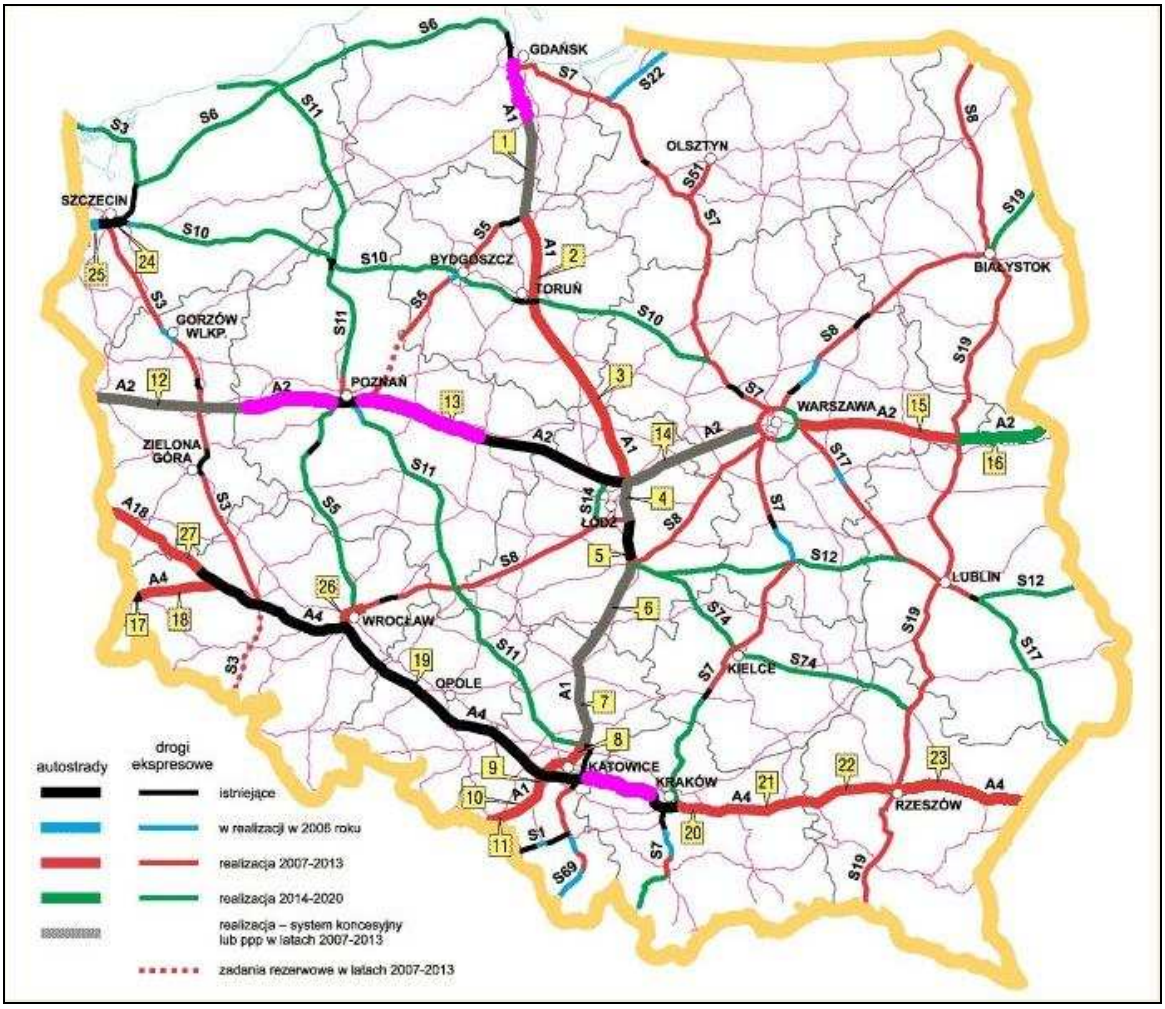
3.1.1.3 Poland

The charging of Polish road network (the total length is approx. 5.500 km) is realized by time fees for all vehicles crossing the state border. The performance fee is implemented on motorways

[9] Source: http://www.toll-collect.de/

on given road sections (not per driven kilometer) for all vehicles. Neither tunnels nor bridges are charged in Poland.

Picture 36 - Poland - Map of charged roads (valid for the year 2010; roads charged by performance fee are marked purple)



Source: http://www.ceskedalnice.cz/ (March 2010), graphic adjustments by CityPlan spol. s r. o.

The performance fee for vehicles with the highest allowed weight of 12 tons, having five axles and belonging to the EURO 5 emission class[10]:

- A1 Rusocin - Swarozyn: 48,40 PLN (i.e. 11,75 EUR),
- A4 Krakow - Katowice (lenght: 65 km): 24,50 PLN (i.e. 5,95 EUR),
- A2 Konin - Wrzesnia: 110 PLN (i.e. 26,70 EUR),
- A2 Wrzesnia - Krzesiny: 110 PLN (i.e. 26,70 EUR),
- A2 Komorniki (Poznan) - Nowy Tomysl: 110 PLN (i.e. 26,70 EUR).

[10] Source: http://www.uamk.cz/

3.1.2 The price for using railway transport infrastructure

The rules for charging a railway route (RR) are set in the Directive 2001/14/EC. The directive defines the way of charging based on so-called marginal costs.

Individual items of basic charges of the RR for selected countries are listed below. The additional charges for passing through a tunnel, parking in a station, forming of trains etc. are not included.

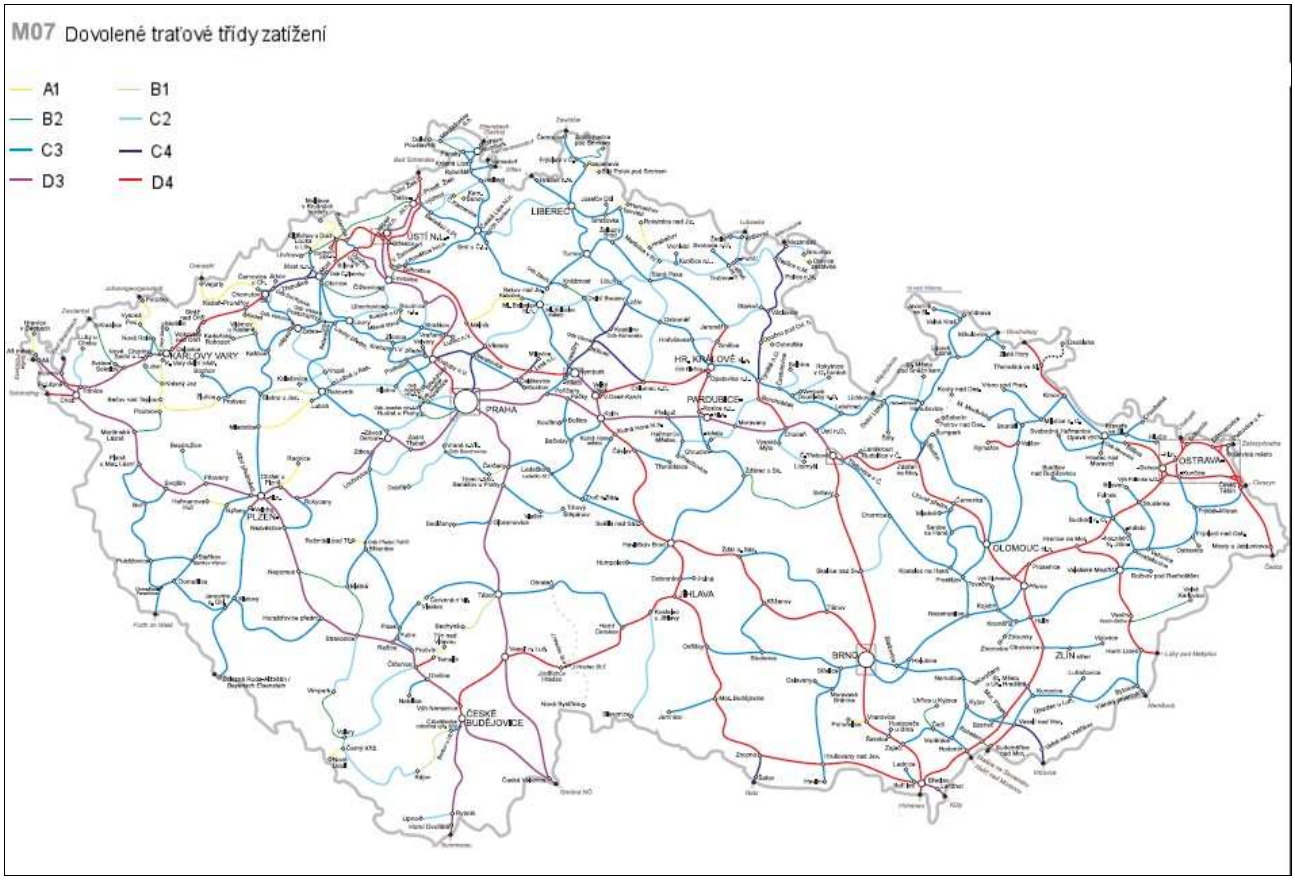
The rates of charges are valid for the year 2010.

3.1.2.1 The Czech Republic

The amount and the type of charges of the RR are adopted from the Price Notification of the Ministry of Finance no. 01/2010 and the Railway Statement 2010 / 2011. The minimum access packages include charges based on passed distance “train km” and “brutto tons km” and on assigned capacity. The charges vary according to the RR category. For the purpose of comparing transported load by various transport modes, the national railway network included in the European railway system was selected[11].

[11] Charging of the railway infrastructure in terms of its competitiveness in the international transport, the 2009 Report, CityPlan spol. s r. o.

Picture 37 - CR - Map of the railway network with distinguished railway load categories (2008)



Source: SŽDC Network Statement, graphically adjusted by CityPlan, spol. s r. o.

The total costs of RR pricing include expenses for maintenance of RR for operation costs.

The maximum price for cargo transport for using the RR in CR (concerning the national railway network included in the European railway system)[12]:

- Charges for assigned capacity of the RR:15 CZK global route / day (i.e. 0,59 EUR),
- Operation of the RR: 42,65 CZK / train km (i.e. 1,67 EUR / train km),
- Ensuring ability to operate: 56,51 Kč / 1.000 brutto tons km (i.e. 2,22 EUR / 1.000 brtkm)

[12] *Source: attachment no. 1 of the Price precept of the Ministry of Finance no.01/2010*
Note: This is the maximum rate for electrified corridor railways. The fees for other railways are lower with the exception of an idenpendent traction driving on an eletrified.

3.1.2.2 Germany

The rates for these charges are adopted from "The Train Path Pricing System of DB Netz AG", available on http://www.deutschebahn.com/, valid since 13th December 2009 to 10th February 2010. The basic charge is the component dependent on the railway user, taking into account the railway category and train type. For the purposes of the project, the F5 category was selected (railways intended for "slower" long-distance transport, the travelling speed under 120 km/h).

The total price consists of three basic components:

1. The component depending on the railway user
2. The component depending on the services offered by the railway
3. Other components

Ad 1. The component depending on the railway user

This component includes:

- the railway route category
- so-called „train path product" distinguishing express cargo trains, standard cargo trains and power units (locomotives).

The final price of this component is determined by multiplying charges for the relevant RR category and the coefficient relevant to the type of the cargo train. The coefficient is calculated separately for passenger trains and for cargo trains. The coefficient for the "standard train" [13] type equals 1.

Chart 29 - Basic charges for using German railway network relevant to cargo transport

the category F5 railway routes	1,90 EUR / train km
the "standard train" coefficient	1,00

Source: The Train Path Pricing System of DB Netz AG 2010

[13] *Source: The Train Path Pricing System of DB Netz AG 2010*

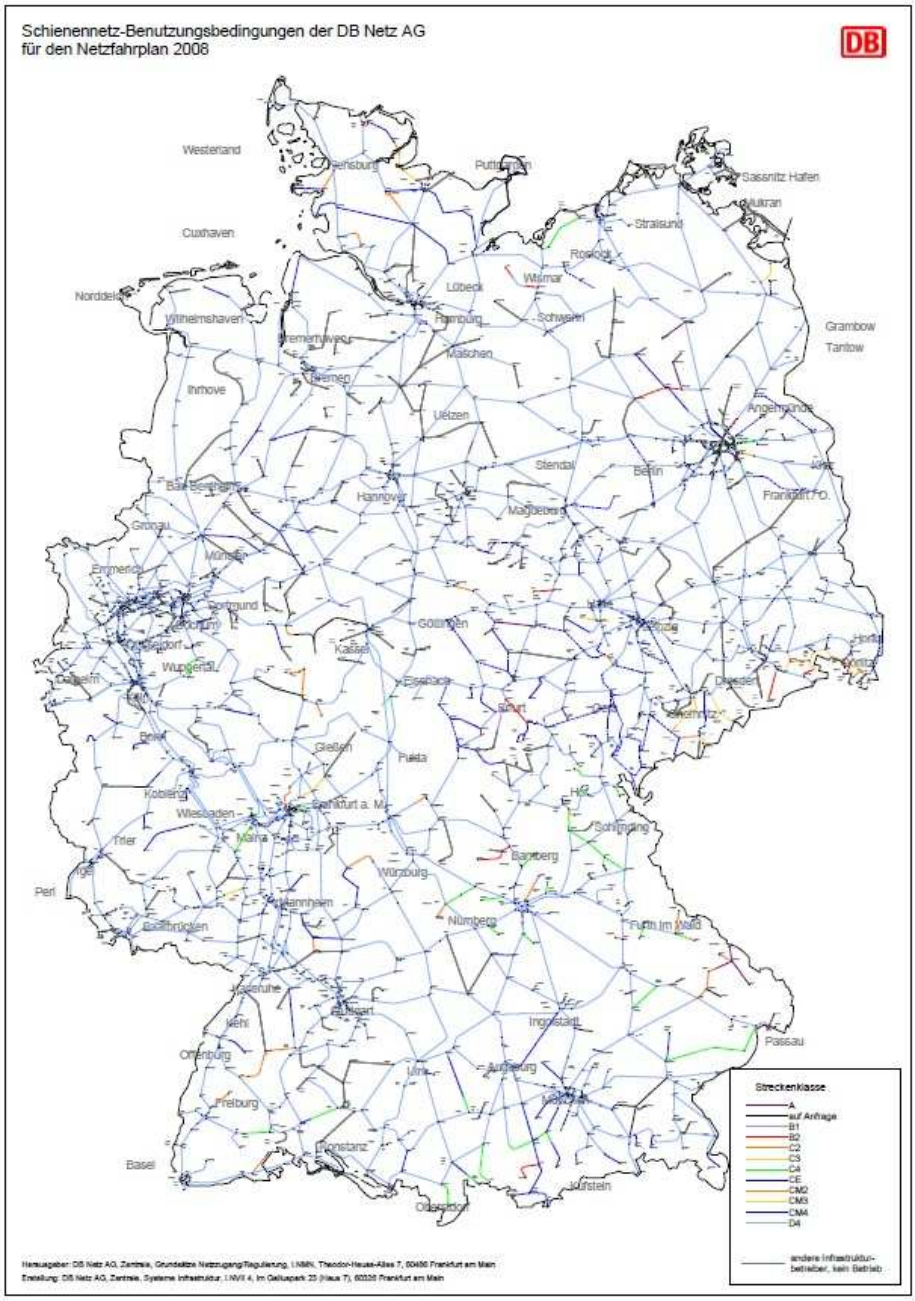
Ad 2. The component depending on the services offered by the railway

The railway route is charged according to its capacity utilization, with regard to operation of slow trains (speed up to 50 km/h), which may considerably lower the capacity of a railway route.

Ad 3. Other components

This includes fees for cancelling the assigned capacity, additional fees for heavy trains, etc.

Picture 38 - Germany - Map of railway network with railway load classes (the year 2008)

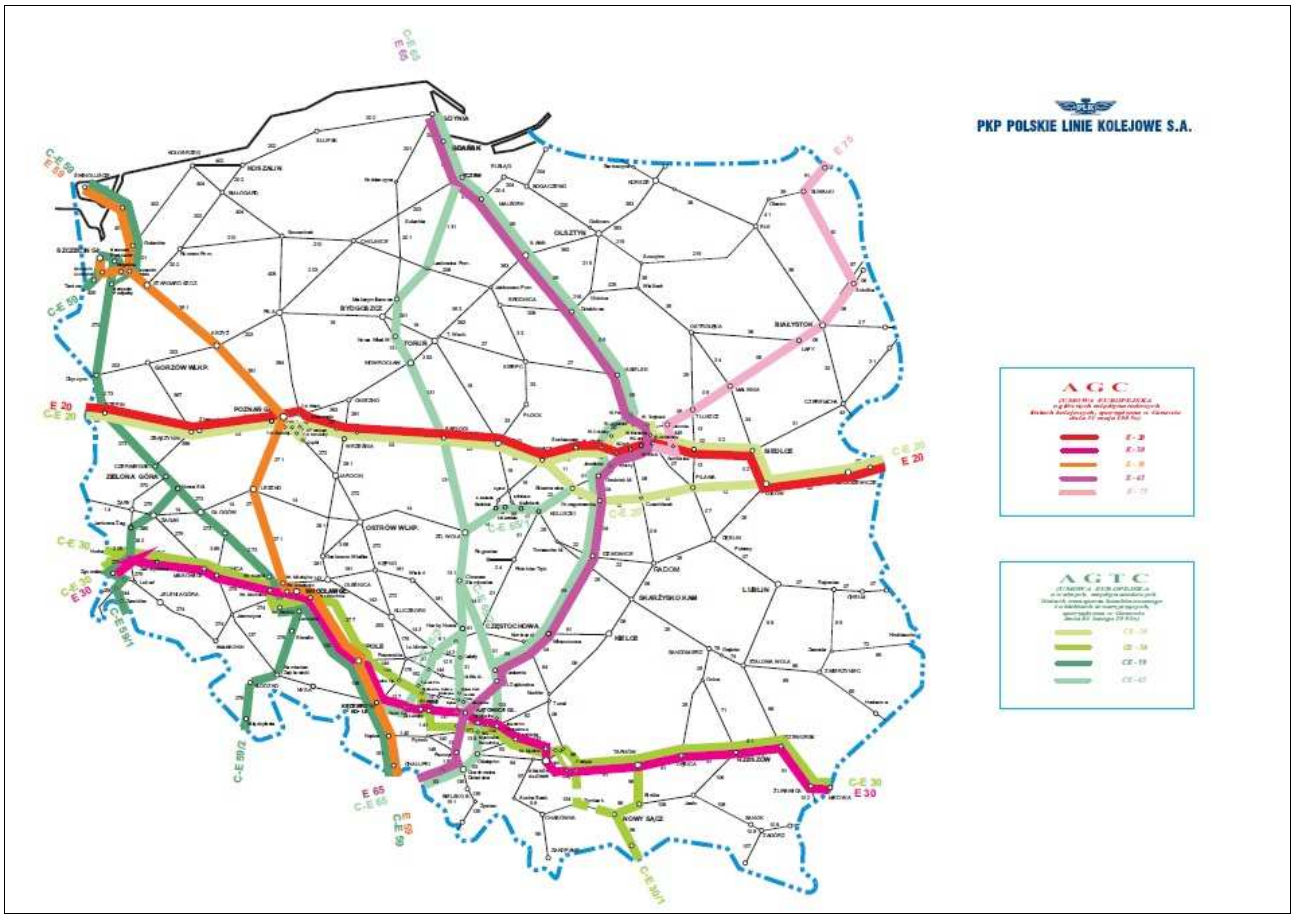


Source: Network Statement, Annex 6

3.1.2.3 Poland

The charging of the RR is designed to cover full-cost (FC). The charging principle is based on covering the anticipated costs of the following year. The fee rate consists of total costs for maintenance and management, the costs of the network construction works, partially of the external expenses and of total costs on the protection of movable and immovable property. The objective is to compensate as many expenses as possible, which should cover the total costs of the railway network provider. The charges are designed to cover about 91 % of the total costs of the total railway network costs. The fee for railway network does not contain the expenses for electricity, which are paid by individual operator separately to the PKP Energy Ltd. Fees are collected by railway network provider, the Polskie Koleje Państwowe (PKP).

Picture 39 - Poland - Map of the railway network with marked corridors of the AGC and AGTC network (2008)



Source: http://www.plk-sa.pl/

Chart 30 – Charges for using the Polish railway network valid for both passenger and cargo transport

1 train km	*10,47 PLN (i.e. 2,54 EUR)*

Source: SŽDC, s.o. (2009)

3.1.3 The price for using waterway transport infrastructure

The use of waterways on a river is not subjected to fees. According to the Law on waters, a river does not belong to any owner, is considered as a public property and thus its utilization and parking of vessels cannot be charged. However, selected sections of artificial waterways are charged, e.g. the channel link between the Rhein, the Main and the Danube rivers.

3.1.3.1 The Czech Republic

There are no fees for using a waterway for cargo transport in the Czech Republic, according to the “common law”. The entry on a waterway is free of charge also for private vessels. There are no charges for passing through chamber locks either.

Picture 40 - Waterways in the Czech Republic

Surce: http://www.eurocanals.com/

3.1.3.2 Germany

The international waterways in Germany, such as the Danube, the Rhein, the Elbe and the Mosel rivers, are not charged. Otherwise, utilization of rivers outside the international waterway

system is charged. Charged rivers are for example the Neckar, the Weser etc. Also, selected sections of artificial waterways are subjected to fees.

The German Federal Republic recently examined benefits of completely cancelling the charges in order to support navigation, but such solution was not approved. However, there is an ongoing review of the charging system as the present situation is unsatisfactory for the operators (providing many exceptions).[14]

Picture 41 - Waterways in Germany

Source: http://www.eurocanals.com/

[14] Based on the consultation with *Ing. Jiří Aster* (The department of waterway transportation SD CR) and on the information provided by the Wasser-strassendirektion West in Münster responsible for system of the channel fees in Germany.

3.1.3.3 Poland

In Poland, as well as in other countries, the network of waterways is not subjected to charging, according to the “common law”. Only selected sections of artificial waterways are charged in Poland.

Picture 42 - Waterways in Poland

Source: http://www.eurocanals.com/

3.1.4 Price comparison of individual transport modes in particular relations

It is appropriate to compare prices on specific routes with identical initial and final points. For the purposes of the study, the Hamburg - Děčín relation was selected.

3.1.4.1 The Hamburg – Děčín relation

Generally, the prices of cargo transport are determined by agreement. For road transport, the price is not calculated per tons or tone-kilometers, but per vehicle-kilometers with almost no regard to the load.[15] For railway transport, different price is charged for full wagon load and for a whole train (lower price). Therefore, the following comparison is only of informational character.

To enable the comparison of the transport prices by road, railway and inland water routes, single transport load of 1.050 tons is considered as a unit, which corresponds with the load of one vessel with the draft of 2,2 m for water transport, 22 wagons of 47 tons load capacity for railway transport and 42 cargo trucks with 25 tons of average load capacity for road network.

Note: The average load of the cargo vessel on the Elbe river is commonly stated as 1.000 t.[16] To simplify the comparison for purposes of this project, a cargo weight was set to 1.050 t. The difference of 5 % from the actual figure is insignificant for the final evaluation. The average weight of a load 1.050 tons for the Hamburg - Děčín relation was adopted from the study "Verkehrswirtschaftlicher und ökologischer Vergleich der Verkehrsträger Straße, Bahn und Wasserstraße (PLANCO Consulting GmbH, lisOPTad 2007)".

Due to different lengths of routes for individual modes of transport, it is necessary to compare the total price for transportation rather than the transported unit (tons km).

The all-in price for transportation is understood as complete and final. It includes all necessary expenses, i.e. fees for traffic routes and similar fees paid by the actual transporter on behalf of the final client. The price is calculated as costs of realizing the transportation plus the transport reward including other possible expenses. The all-in price is presented as a total sum invoiced to the client.

[15] The fact, that the prices for road transport are calculated in vehicle-kilometers, was verified by the ČESMAD Bohemia company.

[16] Source: „The improvement of conditions in navigation on the Elbe between Ústí nad Labem-state border CR-Germany – Děčín navigation degree (CITYPLAN spol. s r.o. – 2010)

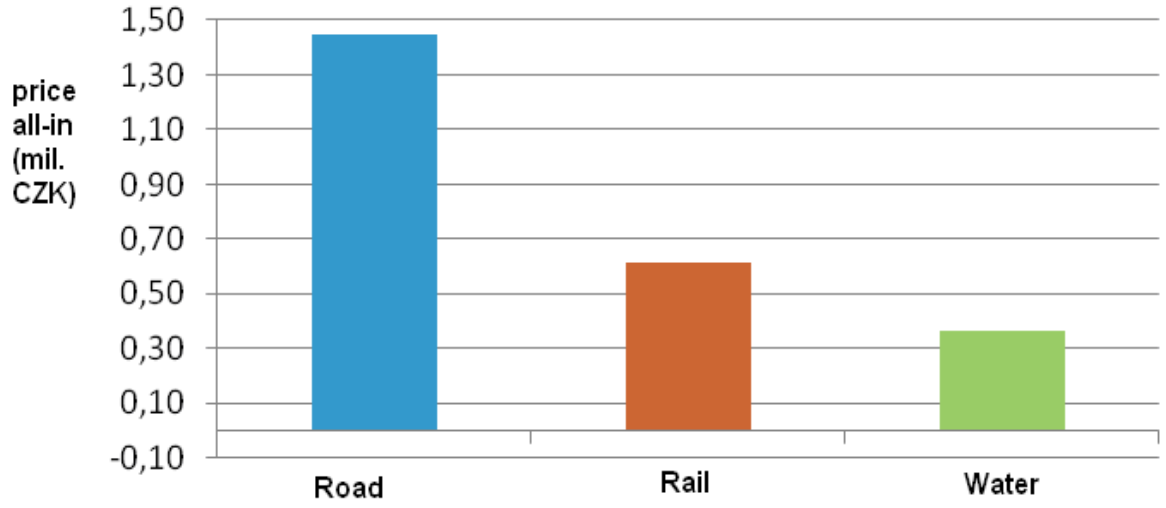
Chart 31 - Comparison of all-in prices for individual transport modes, the Hamburg - Děčín relation (1.050 tons transport load)

Hamburg - Děčín	Road	Railway	Waterway
Distance [km]	552	563	640
All-in price [CZK]	approx. 1.283.100	approx. 627.900	approx. 368.550

Source: CityPlan, spol. s r.o.

Note: For water transport, the route between the Děčín-Loubí port and the Hamburg port is considered; the port of Hamburg is located 100 km from the Elbe influx entering the North Sea. This route is 640 km long.

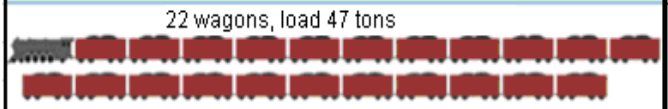
Graph 7 - Comparison of all-in prices for individual transport modes, the Hamburg - Děčín relation (1.050 tons transport load, millions of CZK)



Source: CityPlan, spol. s r.o.

When comparing advantages of individual transport modes, it is necessary to consider water transport as fractional, i.e. the price is constituted of waterway transport costs, overloading in ports and costs of consecutive transport, which lowers its competitiveness. Similarly, the railway cargo transport is limited by non-existing shuttle trains, by the necessity to overload, etc.

Picture 43 - Comparison of all-in prices for individual transport modes, the Hamburg - Děčín relation (1.050 tons transported load)[17]

	Trip lenght (km)	Costs of bulk shipments (EUR / ton)
	640	12 - 15
	552	23
	563	40 - 54

Source: CityPlan, spol. s r.o.

Note: The approximate price for transporting bulk cargo by road (40 €/t) applies to fully loaded vehicle (which is especially for cross-border transport rather unusual).

The comparison of approximate prices indicates that waterway transport is the most cost-effective mode for bulk cargo transport. Transportation of large volume cargo by waterway transport in the Hamburg - Děčín relation, where navigation is possible, is about twice as cheap as railway transport and four times cheaper than road transport.

17

approximate costs of water transport – based on consultations with Ing. Jiří Aster (The Department of waterway transport SD CR),

approximate costs of railway transport – based on the data from the Common Study by PLANCO Consulting s. r. o. and the Federal Hydrological Agency: "Comparison of inland waterway, railway and road transportation from ecological and economic aspects", Germany – 2007 and The Outputs of the VaV task no. 1F84C/065/410 "Introducing charges for railway network in terms of its international competitiveness" – CityPlan, spol. s r.o. 12/2009,

approximate costs of road transport – based on the data from the Common Study by PLANCO Consulting s. r. o. and the Federal Hydrological Agency: "Comparison of inland waterway, railway and road transportation from ecological and economic aspect", Germany – 2007 and The Outputs of the VaV task no. 1F84C/065/410 "Introducing charges for railway network in terms of its international competitiveness" – CityPlan, spol. s r.o. 12/2009,

3.2 COSTS OF TRANSPORT AND OVERLOAD, SPEED OF TRANSPORT AND OTHER ECONOMIC ASPECTS

The transport cost is a complex figure constituted of direct and indirect expenses. These partial expenses differ according to following variables: transported commodities and their potential hazards, equipment of overloading and loading points, requests of recipients, means of transport and other parameters. The conditions for combined transportation are different and so are the associated expenses. The expenses are basically divided into direct and indirect costs.

3.2.1 Direct costs

These expenses are constituted by transportation price, loading expenses of the sender, unloading expenses of the recipient and expenses for preparatory overload between individual transport modes.

- The actual costs of transport were addressed in the section 3.1. The price depends on the transport mode and the commodity type. The transportation prices under ADR, RID and ADN are generally higher than prices for transporting common goods.

- The loading costs of the sender and the unloading costs of the recipient are the most variable expenses. The price is different for loose bulk commodities unloaded by elevators and by dredgers. Pallet goods are not very suitable for closed railway wagons, but they are ideal for truck transport. The price for transporting depletible commodities is the lowest unless deeply frozen liquid gasses are handled. **Generally, the loading costs of the sender and the unloading costs of the recipient for various transport modes do not significantly differ.**

- The expenses associated with overload among transport modes – obviously, these expenses are not solely bound to single-mode transport (pure road transport, railway - shuttle train, waterway – port). Change of a transport mode means an increase in total transport costs. A double or multiple changes of transport modes (road-railway-road) deteriorate the benefits of a cheaper transport mode.

- Combined transport by ISO containers is less burdened with overload costs (easier handling, identical overloading equipment for all transported commodities). Furthermore, the necessity to shelter storage areas is eliminated and space requirements are lower. Also, hazardous materials are in containers secured more easily (containers are closed, possibly with safety locks, seals etc.).

Direct costs may involve package price. These costs are rather not dependent on a transport mode, and therefore they are not included by the processor.

3.2.2 Indirect costs

Indirect costs are originated on the side of the sender or the recipient. There are two fundamental factors:

- The most significant factor is unreliability of transport. For a sender, this results in a need of producing in advance and maintaining a loading crew for all days of a week (for railway transport). The problem is much worse for a recipient, who must order in advance of consumption and therefore must operate more extensive warehouses than it is necessary for reliable transport. Ownership or renting of warehouses and maintaining personnel for each day of a week results in significant indirect expense. Transport unreliability is related to railway transport, to waterway transport only in case of undirected water levels (lower section of the Elbe river without the Děčín navigable lock).

- Also, indirect costs may be caused by insufficient speed of transport. Surprisingly, speed of waterway transport („door to door“) may be higher than of railway transport (see the Government regulation no. 1/2000 Coll., on the transport system for public railway cargo transport, as amended by the Government regulation no. 295/2000 Coll.). (The experience of Railway engineering, Prague, 6 wagons Doloplazy – Žebrák (shuttle train – shuttle train) 5 days, Kablo Děčín – Praha Rohanský ostrov railway, 3 days, no guarantee, water 2 days guaranteed).

  Such indirect costs relate only to a small number of transportations and are relevant to the choice of a transport mode. However, the need to select a more expensive transport mode is also an indirect cost.

Note: “The Government regulation on public railway cargo transport system” reserves the consumption time to 12 hours at maximum. For full wagon load, the transportation time is 24 hours for every anticipated 200 km, for express deliveries 24 hours for every anticipated 400 km.

Risk of violating transportation parameters is a probable expense. Indirect cost is directly proportional to the percentage of the risk that the violation occurs. It is necessary to consider that in many cases it is not important how long the transportation takes, but weather the agreed time of delivery is met, within at least 3 hour tolerance.

The project VaV no. 1F84C/065/410 – „ Introducing charges for railway network in terms of its international competitiveness“ dealt also with motives influencing the transporter to choose certain transport mode. The conclusion was following:

Apart from transportation of energetic coal, ore and cheap chemical mass products (fertilizers, salt, sodium carbonate, ilmenite), the transportation price is not the major factor, neither is speed of transportation in most cases. The crucial conditions are reliability and a customer-friendly approach of the transporter. These two parameters are the weakest point of railway transport. On the other

hand, if the navigability conditions were ensured at all times, the waterway transport would gain advantage over railway transport and would be able to compete (for certain commodities) with road transport. It can be deduced that the speed and fluency of loading, overloading and unloading are more important than their price.

It would be false to assume that the customer decides exclusively based on the price offered by transporters. Customer actually evaluates the total economic expenses including the “non-transport” costs. If we accept this fact, then we easily understand popularity of road transport despite its highest all-in costs.

The competitiveness of waterway and railway transport does not only concern price, but also reliability of transportation. Higher reliability and lower price are the comparative advantages of waterway transport, which are degraded by unreliable navigation conditions on the Elbe river between Střekov and Dolní Žleb.

The availability to use a transport mode with the most comparative advantages obviously improves the position of chemical industry producers. Use of comparative advantages of various transport modes therefore becomes a comparative advantage for producers.

4 CONDITIONS FOR MAXIMUM EXPLOITATION OF TRANSPORTATION AND LOGISTIC POTENTIAL OF A ELBE WATERWAY

The basic condition for efficient logistics is fully functional transport network. To utilize the potential advantages of all transport modes, development of all types of transport network must be ensured. Utilization of only road or railway transport for commodity transportation and construction of logistic facilities for these two modes only is not sustainable in a long-term perspective. Capacity of road and railway infrastructure will not be sufficient for increasing transport volumes causing negative impact on traffic flow (the congestion costs reach 1,5 % of GDP in some European countries), decreased safety and reliability, and furthermore the negative impact on the environment. The share of logistics in Europe is for recent years estimated to around 14 % of GDP, while the growth of this industry is faster than the average growth of the entire economy. In the Czech Republic, the share of transport and logistics is approximately 10% of GDP. The logistic activities associated with commodity transportation constitute about 38 % of the total logistic costs. Support of the intermodal transport and logistics is valuable only for the fully functional transport network.

4.1 SUPPORT SRATEGY FOR LOGISTICS AND WATERWAY TRANSPORT IN THE CZECH REPUBLIC

During the meeting on 12th December 2009, the Government of the CR adopted the "Strategy for supporting logistics by public funds" elaborated by the Ministry of Transport as a default system approach for the field of logistics. The strategy includes specific procedures supporting establishment of public logistic centers (PLC), which is important for providing logistic services in areas associated with various transport modes. By its resolution, the government requires from the Ministry of Transport to suggest specific instruments for funding of the PLC development, to ensure protection of areas proposed for the future PLC including further measures and to evaluate efficiency of these measures by the end of 2010.

The issue of the PLC is not closed yet. Financing by public resources is not very probable in times of required saving. On the other hand, almost every inland port is a logistic centre (not to be confused with logistic warehouses, which are part of logistic centers). PLC should be available to every provider of logistic services interested in providing commodity transportation. However, this does not imply that a private investment with a private owner must exist. In reality, almost every inland port naturally operates as PLC (e.g. the public ports of Lovosice and Mělník). The opposite example is the non-public port Lovochemie Lovosice.

Czech Republic is in terms of PLC issues below average, especially compared to Germany. Although there are plenty modern storage centers, they are almost exclusively situated near

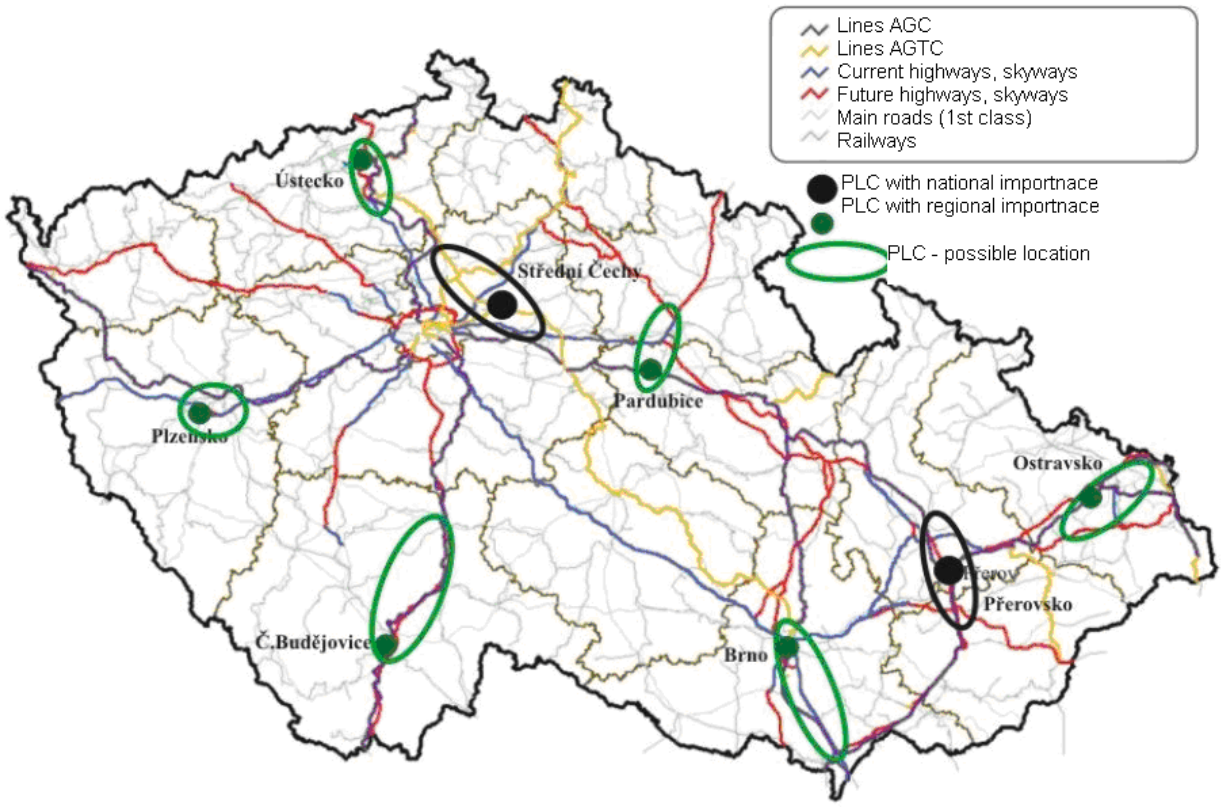
motorways with no link to other modes of transport. On the contrary, the German territory is densely covered by PLCs (see the picture), which are excellently linked to transport infrastructure.

Picture 44 – PLCs in Germany

Source: http://www.gvz-org.eu/index.php?id=102&L=1

The author of the “Strategy for supporting logistics by public funds” suggests specific locations for the PLCs in the CR as presented in the following picture. Apparently, Ústí nad Labem and Pardubice region have great potential in logistics, therefore fully operational Elbe waterway would be an important factor.

Picture 45 - Public logistic centers (PLC)



Source: "Strategy for supporting logistics by public funds" presentation (Strategie podpory logistiky z veřejných zdrojů), The Ministry of Transport, The Department of Strategy planning, V.Sedmidubský

In November 2009, the Transport Association (member of the Association of Industry and Trade in CR) established "Priorities of waterway transport" within the sector strategy as follows:

1. To improve navigation conditions of the Elbe waterway between Ústí nad Labem and the state border and to ensure navigability of the Elbe river up to the Pardubice port.

2. Until the navigability of the Elbe river is implemented, to apply the "Measures to decrease losses of international waterway transport operators resulting from insufficient navigability of the Elbe river for the period 2004 –2010" in accordance with the resolution of the European Commission from 26th September 2006, no. K (2006) 4215 in the matter of "State funds no. N564/2005 – The Czech Republic".

3. To proceed with modernization of vessels.

4. To establish agency supporting the inland navigation based on the model of other European countries, using the European funds in order to support the development and enhance the image of waterway transport.

5. To ensure more convenient motivational environment to increase share of waterway transport in multimodal/fractional transport, e.g. by tax relieves for road users transporting to and from ports, fee reduction for railway users transporting to and from ports etc.

6. To address the solution of the D-O-E project in accordance with European interests and to begin its realization in cooperation with all participating countries until the year 2020.

7. To codify the basic infrastructure of inland public ports as part of national transport network by introducing the new law on State Fund of Transport Infrastucture and the law amendment no. 114/1996 Coll.; and consequently to facilitate development of the current multimodal PLCs by introducing investment projects in order to shift transport of commodities from road transport to railway and waterway transport in accordance with the declared policy of the state and of the EU.

4.2 IMPROVEMENTS OF NAVIGABILITY CONDITIONS ON THE ELBE – THE DĚČÍN NAVIGABLE LOCK

Full utilization of the Elbe waterway is prevented by 40 km long stretch of the river between Ústí nad Labem and the state border with Germany. The chart below presents so-called “guaranteed water levels”, i.e. water levels officially set at the water gauge in Ústí nad Labem determined by the State administration for navigation. These water levels are authoritative for vessel operators to calculate the allowed vessel draft for navigation between Ústí nad Labem and the German border.

Year overview of ensured water stage (quantity of the days)							
	2003	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
draught less than 110 cm	176	107	28	30	76	125	52
draught less than 140 cm	218	184	122	137	177	202	152
draught less or equalling to 140 cm	224	198	134	161	183	182	165
draught more than 140 cm	141	167	231	204	182	154	199

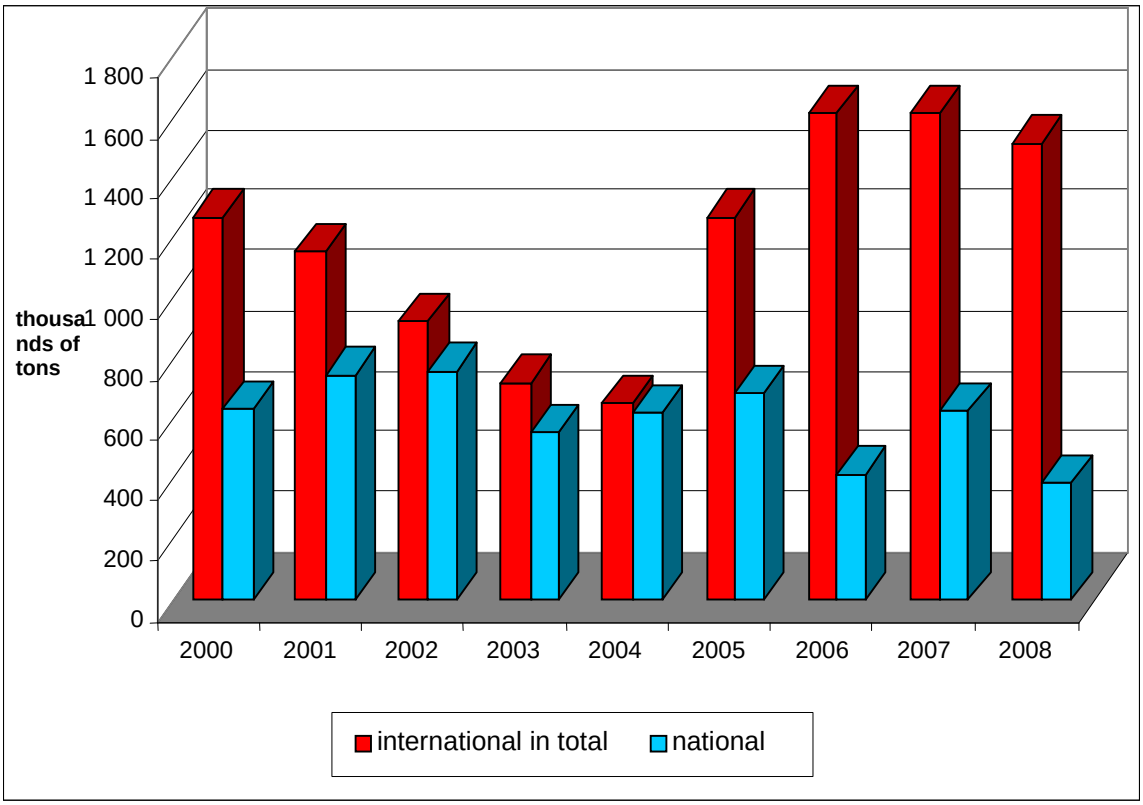
Source:The Ministry of Transport of the CR

- draft less than 110 cm – days of virtually suspended navigation for low water levels
- draft less than 140 cm – days of allowed draft under economic interface for operation
- draft less and equal to 140 cm – days of allowed draft under economic interface for operation including days with water level 200 cm water level – 140 cm draft
- draft more than 140 cm – days of profitable navigation

The statistical data from the Transport yearbook of the CR indicate that after a period of decrease, an increase in the inland waterway transport volumes occurred between 2005 - 2007; the increase reached 14,6 % in 2008 however, the transport volumes decreased again 15 %. The

international transport is essential, mainly the increasing share of the third-country transport and cabotage.

Graph 8 - Inland waterway transport volumes (thousands of tons) – realized only by vessels registered in the CR



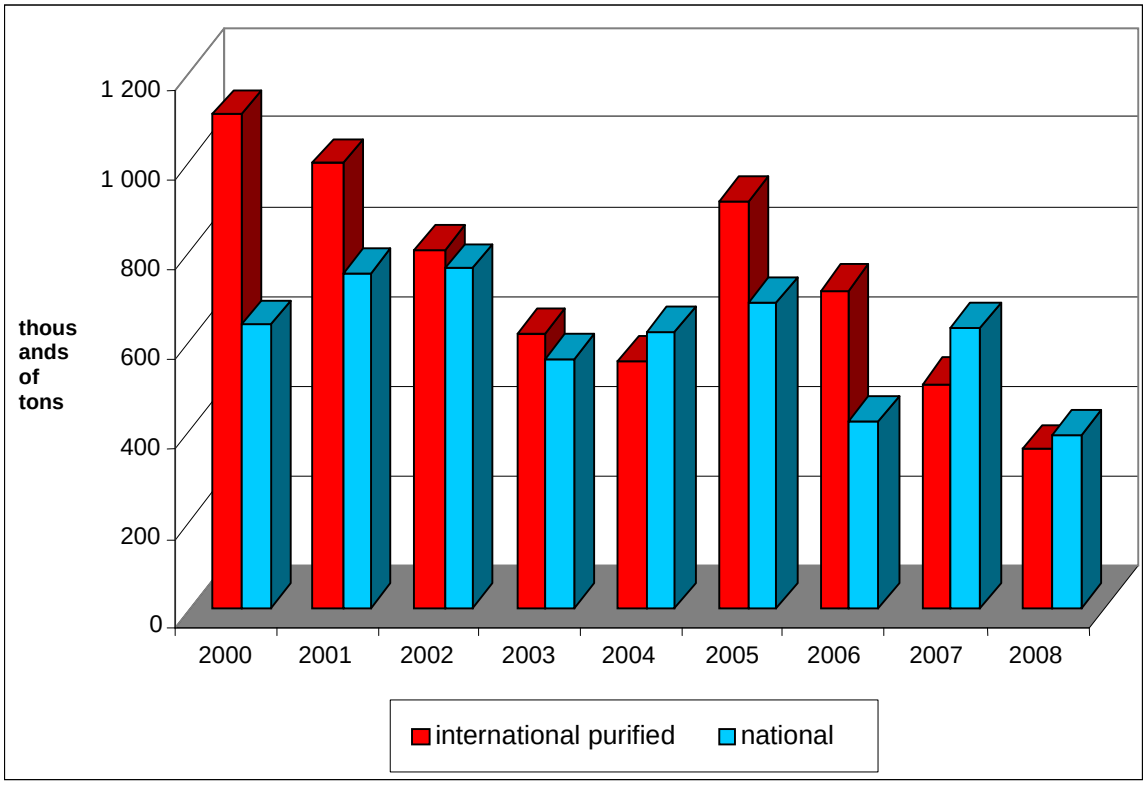
Source: CityPlan based on the Transport yearbook data

Apart from the import and export data, the graph above also depicts transport in third countries and cabotage[18]. Considering the Elbe waterway, the statistics must be purified of these data to gain actual data about international transport realized on the Elbe with regard to the CR. Such data are following:

[18] Cabotage – a transport mode realized on the territory of one country by a transporter from another country (the loading and unloading points are located in the same country)

Transportation into third countries – transportation from one country to other countries (the loading and unloading points are located in different countries)

Graph 9 - Commodity transport by inland waterways (thousands of tons) – only vessels registered in the CR – purified data



Source: CityPlan based on the data from the Transport yearbook

The purified data offer a completely different view of the Elbe transport. While the performance of Czech transporters within third country and cabotage transport is increasing, the national transport in the CR decreases. Total volume of transported goods by inland waterways (purified national & international transport) decreased by 57 % between the years 2000 and 2008 (vessels registered in the CR only) with the exception of the year 2005 when a temporary increase occurred, which was not comparable to the values from the year 2000.

Many studies proved that the only possible way to improve navigation conditions in such problematic section is by building navigable locks. After rejecting three- and five-level options, the suggested solution settled on a two-level option with one navigable lock in Malé Březno (82nd river km) and the other in Dolní Žleb (103rd river km). Due to disapproval of state environmental authorities and environmental groups, the navigable lock was relocated from Dolní Žleb to Prostřední Žleb. After this project was also refused, the compromise was reached by a one-level project The Děčín navigable lock (the Government resolution no. 337/2005).

Picture 46 - Plan for the two-level solution

Source: http://www.ujep.cz/

Picture 47 – Position of the Děčín navigable lock

Source: http://www.rvccr.cz/

The Děčín navigable lock is the crucial point for full utilization of the Elbe potential in the field of passenger and cargo transport. The structure will be situated at the Děčín city outskirts, down-river from the current port of Děčín-Loubí, navig. km 737,12 (98,88th km according to the former kilometer system)[19]. The solution fulfils the parameters of the Elbe waterway on the German territory and it will provide a navigation draft of 140 cm for 345 days per year and the average draft of 220 cm for 180 days per year.

In addition to improved navigation conditions on the Elbe river, the structure will also enable to utilize the energetic potential of the Elbe on this section. The Děčín navigable lock project includes construction of a small hydropower station with 7,90 MW performance and annual power production of 46,9 GWh, which should cover (with the exception of industrial zones) the demand for energy in Děčín (given the energy consumption is evenly distributed throughout a day).

The total construction costs are 4.769.957 thousand CZK (without VAT), including:

- the navigable lock 3.802.267 thousand CZK

- small hydropower station 967.690 thousand CZK

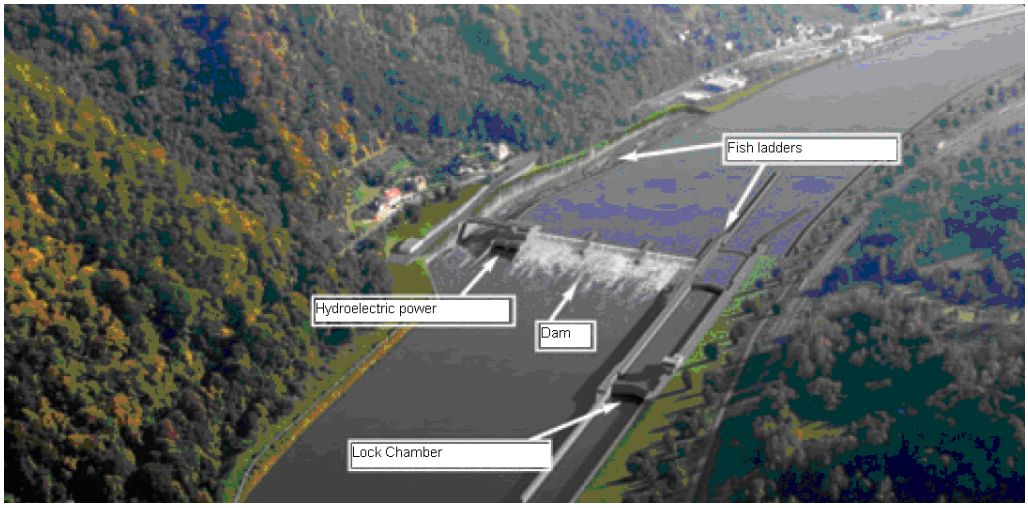
The total cost includes project and exploratory works, costs of operating units and buildings, subsidiary costs (equipment of the construction site), unexpected costs, purchase of land and other resources, charges for land removal and costs for preparation and security of construction.

Picture 48 - Current state of the proposed profile for the Děčín navigable lock

Source: http://www.casopisstavebnictvi.cz/

[19] The new kilometer system for the Elbe waterway was established on the basis of the amendment of the law no. 114/1995 Coll. for inland navigation, valid since 1st January 2009, which led to the formal replacement of the existing kilometer system issued by Povodí Labe, s.p. used for recording water constructions and objects. The change of the kilometer system was caused mainly by implementing river information services (RIS) and by the effort to clarify the topographical orientation on waterways. The kilometer system begins at the state border in Hřensko at the 726,6th km and continues uninterrupted upriver. At the 730th km, it is consistent with the 0km of the German kilometer system. In the official documents and reports to vessel operators, the new kilometer system was implemented on 1st January 2009, but always together with the original kilometer system.

Picture 49 - Visualization of the Děčín navigable lock



Source: http://www.rvccr.cz/

As mentioned earlier, the Děčín navigable lock is the crucial but not the only condition for the full utilization of the Elbe waterway potential. The section between Ústí nad Labem and Děčín remains unsolved and also requires construction of a navigable lock.

On 24th August 2010, the Headquarters of waterways in CR made and important step for the Děčín navigable lock project as they submitted the EIA document to the Ministry of the Environment. The Děčín navigable lock project is perceived as a strategic extension of transport options in one of the Czech key transport corridors.

Materials and findings of this study were used as a basis for EIA documentation of the Děčín navigable lock project.

4.3 THE ELBE NAVIGABILITY TO PARDUBICE

Nowadays, the navigability of the Elbe river finishes in Chvaletice with no port or terminal enabling a link to other transport modes to increase share of inland waterway transport. The expected costs of "The Elbe navigability to Pardubice" project are 2,403 billion CZK, including following structures:

- **The Elbe river basin reconstruction between Chvaletice and Přelouč**

- completed

- **New navigable lock in Přelouč**

- the navigable lock Přelouč requires construction of a canal 3,15 km long, with a lock chamber of dimensions 115x12,5x4 m accompanied by a bio-corridor. The project further includes new complex of bridges replacing the former unsatisfactory bridge across dam insufficient for road transport. **THE PROJECT IS CURRENTLY SUSPENDED.**

- **Modernization of the Srnojedy navigable lock**

- modernization of construction and technological parts of the existing lock chamber built in 1937, including construction of one waiting area in lower and upper section of the lock, construction of a control centre and an access road. **THE PROJECT IS CURRENTLY SUSPENDED.**

- **Public port Pardubice**

- Stage 1 (a construction of the bank well for overloading premises, two waiting areas, service station for vessels, public access roads, utility connections, rerouting of the trans-regional bio-corridor around the port). **THE PROJECT IS CURRENTLY SUSPENDED.**[20]

Picture 50 – Current state of the proposed profile of Přelouč II navigable lock

Source: http://www.rvccr.cz/

[20] On 30th June 2010, the Regional Office issued an exception from the law on the environment and landscape protection under the condition that the structure will not have any grave impact on protected species on the Slavíkovy Islands. Civil association Zelená pro Pardubicko appealed to the decision Ministry of Environment.

Picture 51 - Visualization of the Přelouč II navigable lock

Source: http://www.rvccr.cz/

4.4 THE DANUBE-ODER-ELBE CHANNEL

The D-O-E project is of all-European importance. It would considerably shorten the route from the Baltic Sea to the Danube and to the Black Sea. The waterway would become part of the TEN-T network.

Source: http://ec.europa.eu/transport/

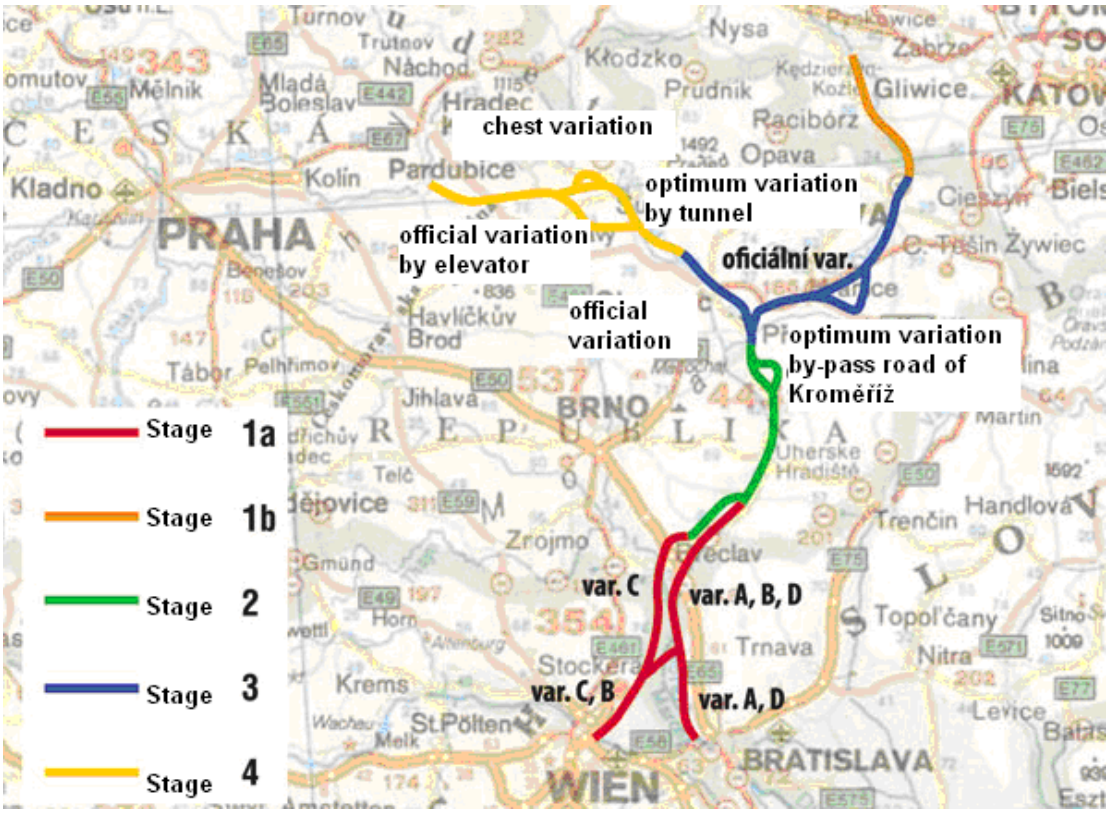
The project of linking these three rivers has a long history, but its realization has many opponents and its construction in improbable in the coming years.

Parameters proposed for the waterway:

- Waterway category: Vb

- Allowed length of push assembly: 185 m
- Allowed length of engine-driven cargo vessels: 135 m
- Allowed width of vessels: 11,4 m
- Allowed draft: 2,8 m
- Maximum assembly load: 4.000 tons
- Maximum load of engine-driven cargo vessels: 2.700 tons
- Length of lock chambers: 190 m
- Width of lock chambers: 12,5 m
- Width of fairway: 40,0 m
- Under-bridge height: 7,0 m

Picture 52 – D-O-E map with stages and variants



Source: http://www.casopisstavebnictvi.cz/

From the total length of 499 km, 381 km is supposed to pass through Czech territory, 75 km on the Austrian territory and 43 km on the Polish territory. Realization of the project is planned in five stages:

- Stage 1a (the Danube river – Břeclav) – 80 km
- Stage 1b (the Oder river – Ostravský region) – 53 km
- Stage 2 (Břeclav – Přerov) – 112 km

- Stage 3 (Přerov – Ostrava) – 94 km
- Stage 4 (Přerov – the Elbe river) – 160 km

Investment costs for D-O-E corridor are estimated at approximately 300 billion CZK.

Chart 32 - Classification of consecutive sections of European waterways

A classification of consecutive sections of European waterways			
Waterway	**Section**	**Waterway / channel**	**The AGN classification - category**
THE ELBE	the North Sea influx – Geesthacht	natural course	VIb
	Geesthacht – Elbe Seitenkanal	channel	Vb
	Mittenlandkanal – Magdeburg	channel	Vb
	Magdeburg – Dresden – Ústí nad Labem	natural course	Va
	Ústí nad Labem – Mělník	channeled course	Va
	Mělník – Chvaletice	channeled course	IV
THE ODER	Svinoujscie – Szczecin	natural course	VIb
	Szczecin – ústí Nisy	natural course	IV
	the Nisa influx – Brzeg Dolny	natural course	III-II
	Brzeg Dolny – Kozle	channeled course	IV-III
THE DANUBE	Frankfurt am Main – Bamberg	channeled course	Vb
	Bamberg – Regensburg	channel	Vb
	Regensburg – Wien	channeled course (with short natural-course sections)	VIb
	Wien – Bratislava - Györ	channeled course (with short natural-course sections)	VIb
	Györ – Beograd	natural course	VIb
	Beograd – Drobeta-Turnu-Severin	channeled course	VII
	Drobeta-Turnu-Severin - Sulina	natural course	VII
	a link with the portof Constanta	channel	VIc

Source: An objectivity and expediency territorial study of the D-O-E channel link territorial protection (Územní studie reálnosti a účelnosti územní ochrany průplavního spojení D-O-L), Atelier T-plan s.r.o., 2007

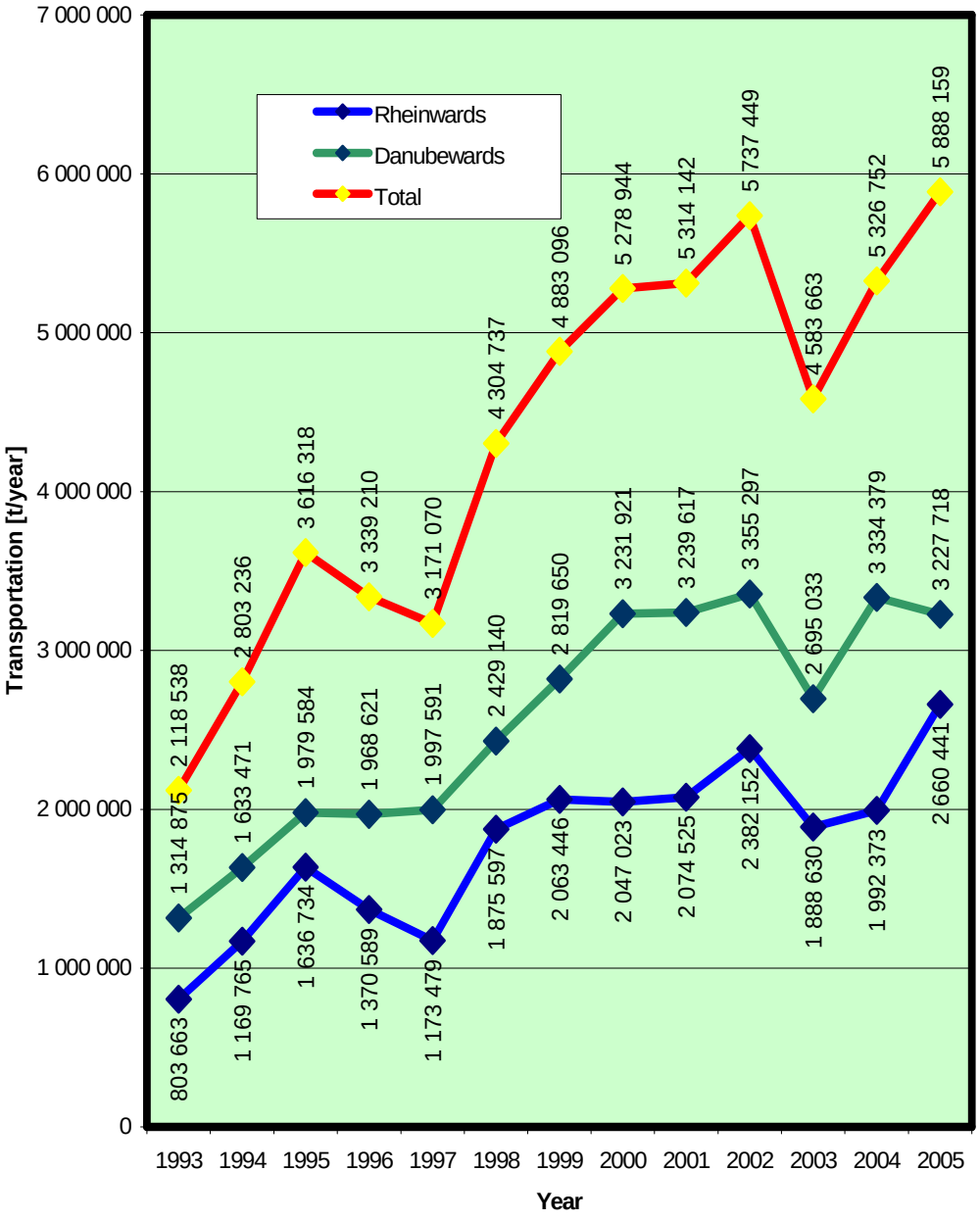
The transport importance of the D-O-E construction illustrates the canal connection of large rivers Rhein and the Danube by water corridor Rhein-Main-Danuber.

Picture 53 - Main - Danube channel

Source: CityPlan, spol. s r. o.

The consecutive operation of the Main-Danube channel started in September 1992. In the following graph, the rising transport volumes are presented.

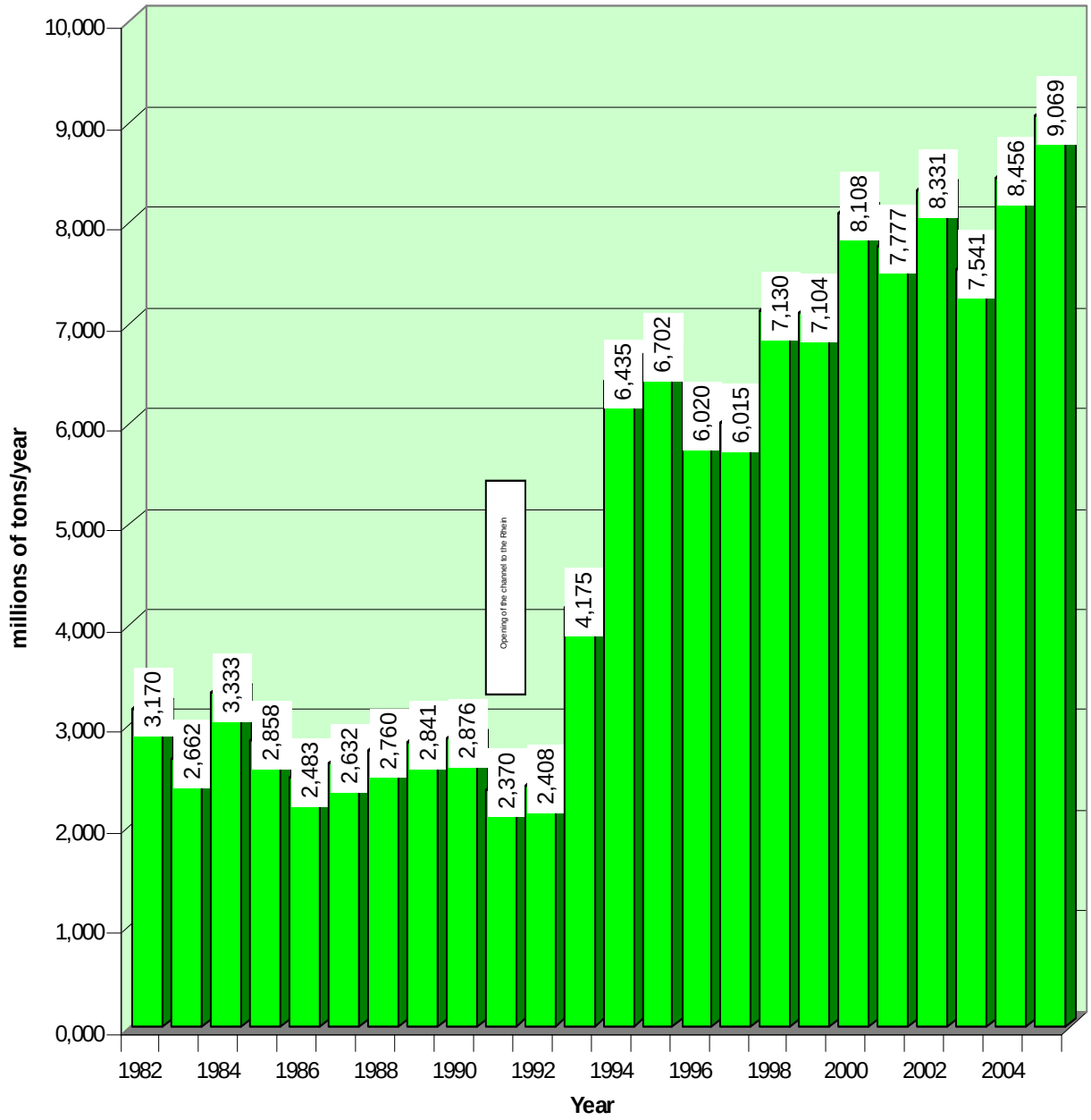
Graph 10 - Development of the transport volume between Danube-Rhein



Source: Informational bulletin Porta Moravica, No. 8 June 2006

Operation stimulated increase of traffic on the German part of the Danube river – between 1992 - 2005, the transport volume increased about four times.

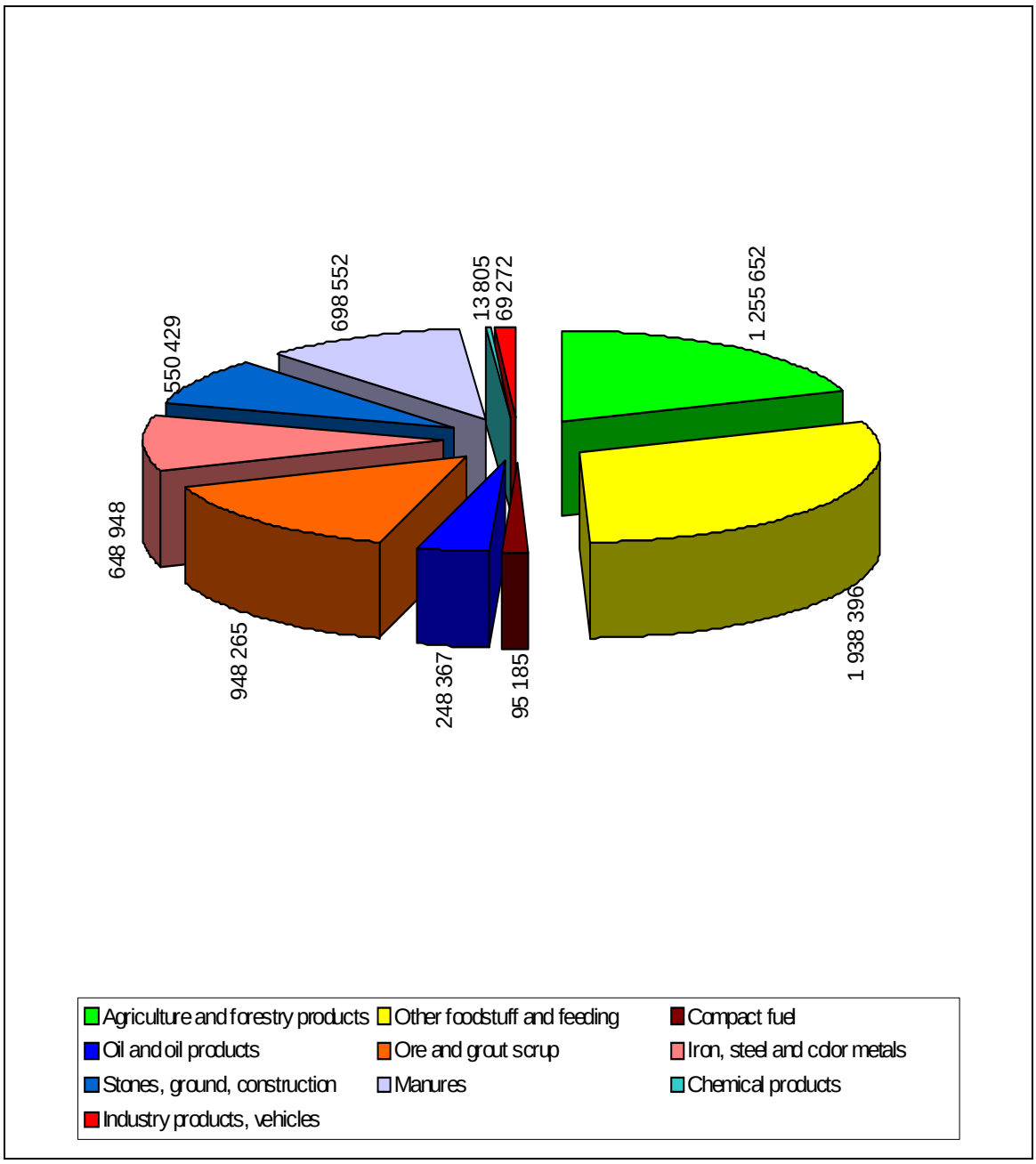
Graph 11 - Total transport volume on the German part of the Danube river



Source: Informational bulletin Porta Moravica, No. 8 June 2006

The following graph presents structure of commodities transported in 2005 through the chamber lock Kelheim, which is the entering chamber from the Danube into the channel.

Graph 12 - Total volume of goods (6.466.871 tons) transported through the lock chamber Kelheim divided by commodities (2005)



Source: Informational bulletin Porta Moravica, No. 8 June 2006

Similarly to the Rhein-Danube channel, the D-O-E may bring advantages in the balance of water-utilization and flood protection. The flood protection includes following aspects:

- Where the corridor route passes through current rivers, the river profile will be enlarged by deepening and therefore the flow capacity will be increased
- Where the corridor, as a separate canal, is conducted in parallel with other rivers, part of flood flows will be redirected by this parallel route during short-term interruptions of navigation

- Canal located by river plains forms in some areas “barricades” for certain areas suitable for establishing polders. It will prevent higher water levels in polders from flooding the important infrastructure by the waterway.

The D-O-E channel will enable transport of oversized load, which are currently transported with difficulties by road transport. Futhermore, transport of bulk materials will be easier. Possibility to use more effective transport mode also results in cost savings. The server http://www.d-o-l.cz/ presents potential savings of 15-60 EUR per a ton of transported substrate (for a distance 500-2.000 km).

Construction of the channel would lead to linking Poland and the Czech Republic with the important waterway route from Amsterdam to Constanta, establishing direct waterway connection among the important port of Hamburg and the countries in Central and Southern Europe, improving connection of the North and South Europe and connecting polish port of Szczecin on the Danube river.

The significance of the waterway consists in the fact that it would be an alternative for natural gas (liquid) transport to the important disposal sites in the Hodonín region, especially in a case of a crisis in the Ukraine-Russia relationship like the one in 2009.

4.5 PROGNOSIS FOR DEVELOPMENT OF TRANSPORT FLOWS

A long-term prognosis on human activities is problematic since there are many hardly predictable influences. The mortgage crisis in the USA is a typical example, which was not expected by any prognoses from the year 2006 and before and which spread into a global economic crisis still causing considerable insecurity. Problem with transport prognoses (volumes expressed in tons and performances in tone-kilometers) commonly occurs due to the fact that it is focused on one transport field (the problem is called usurpation of passengers and load). **To avoid this error, construction of the overall prognosis of commodity flows in the EU was carried out in the first stage, regardless to the transport mode.**

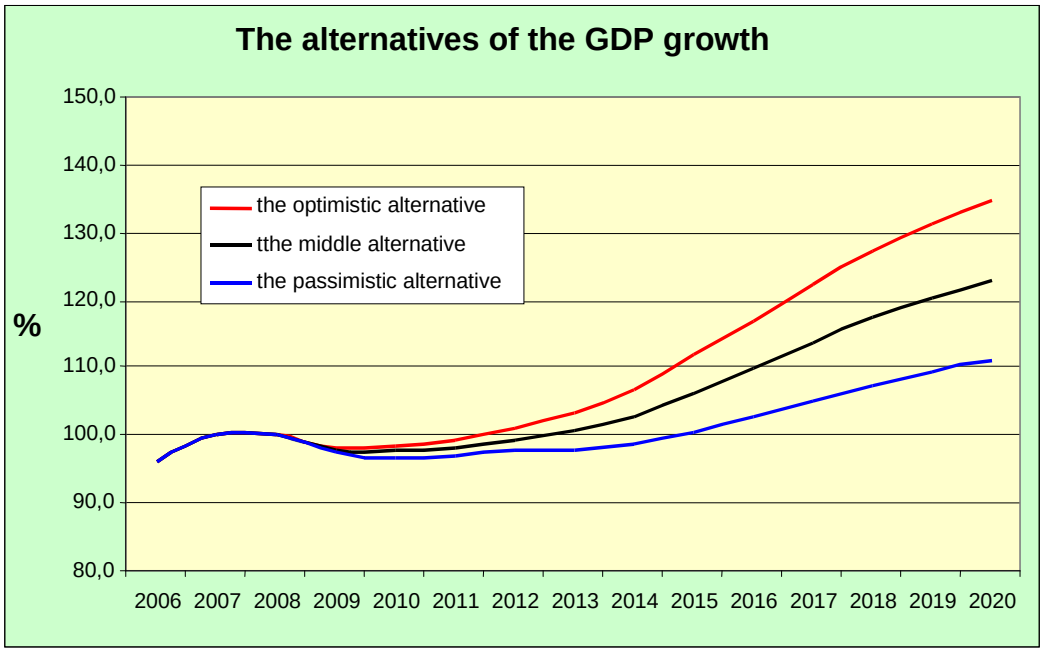
Chart 33 - Variants of GDP development in the EU (in %)

The alternatives of the GDP development in the EU

monitored years	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
the optimictic alternative	96,2	100,0	100,2	98,0	98,4	99,2	101,0	103,4	107,0	112,0	117,0	122,2	127,2	131,5	134,6
the middle alternative	96,2	100,0	100,1	97,8	97,7	98,2	99,3	100,6	102,9	106,3	109,8	113,7	117,4	120,6	122,8
the pessimistic alternative	96,2	100,0	100,1	97,5	96,9	97,1	97,6	97,8	98,7	100,5	102,6	105,1	107,6	109,6	111,0

Source: CityPlan, spol. s r.o.

Graph 13 - Prognosis for GDP development in the EU until 2020



Source: CityPlan, spol. s r.o.

4.5.1 Long-term prognosis for transport volume development

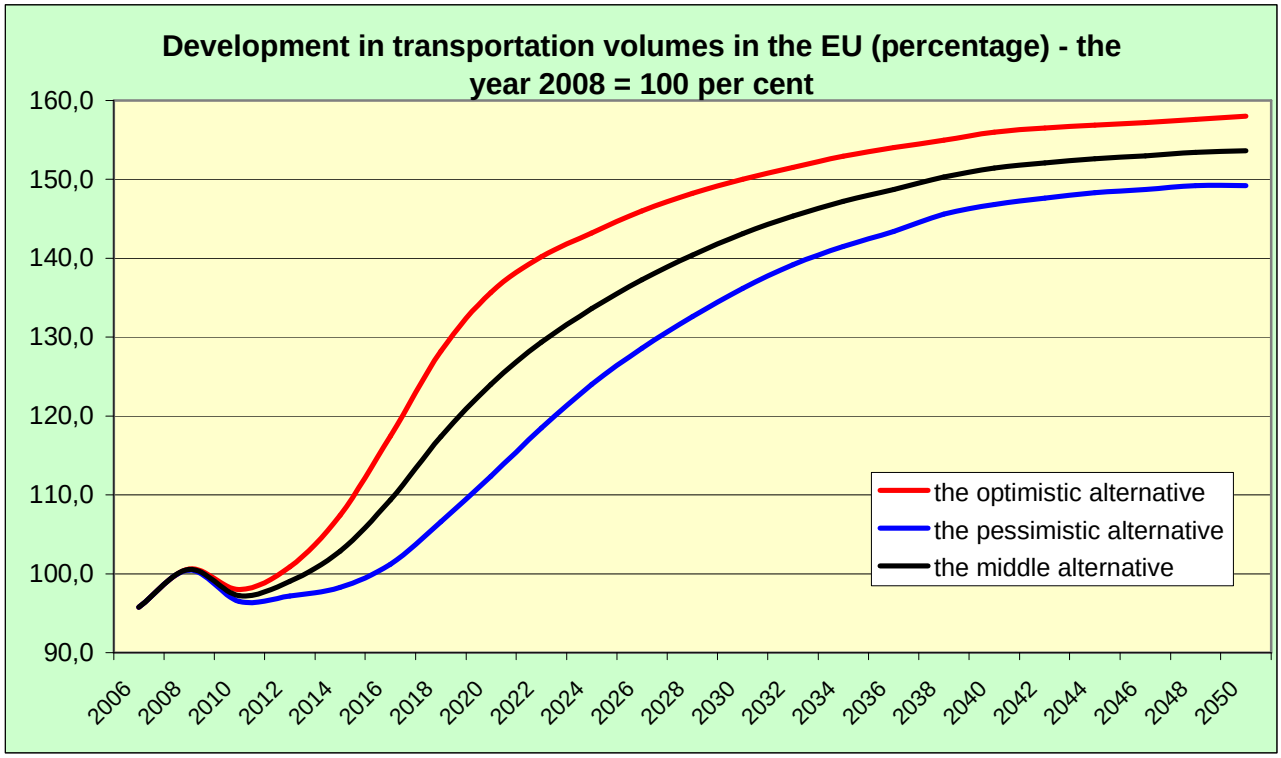
The estimated transport volume until 2050 was derived from the expected development of GDP in the EU (the reason for selecting year 2050 is current suspension of the Děčín navigable lock project). The assumed year of realization is 2016, therefore, the period is long enough to reveal its effects).

Chart 34 - Prognosis for development of transport volumes in the EU until 2050 (in %)

monitored years	2006	2008	2010	2012	2014	**2016**	2018	2020	2022	2024	2026	2028
the optimistic alternative	95,8	100,6	98,0	100,9	107,4	**117,5**	128,2	135,7	140,2	143,2	146,0	148,2
the pessimistic alternative	95,8	100,5	96,5	97,2	98,3	**101,2**	106,6	112,3	118,5	124,0	128,6	132,6
the middle alternative	95,8	100,5	97,3	99,1	102,9	**109,3**	117,4	124,0	129,4	133,6	137,3	140,4
monitored years	2030	2032	2034	2036	2038	2040	2042	2044	2046	2048	2050	
the optimistic alternative	150,0	151,5	152,9	154,0	155,0	156,0	156,5	156,9	157,2	157,6	158,0	
the pessimistic alternative	136,2	139,2	141,5	143,4	145,6	146,8	147,6	148,3	148,7	149,2	149,2	
the middle alternative	143,1	145,4	147,2	148,7	150,3	151,4	152,1	152,6	153,0	153,4	153,6	

Source: CityPlan, spol. s r.o.

Graph 14 - Prognosis for the development of transport volumes in the EU until 2050 (in %)



Source: CityPlan, spol. s r.o.

4.5.2 Allocation of commodity flows within transport networks

4.5.2.1 Present state

The following chart presents total commodity flow to and from selected directions. Seemingly, the border crossings in Frýdlant, Královec and even Meziměstí could be used for Szczecin direction, but according to the statement of CD Cargo it is not used due to single-track railways with low operation speed, longer routes and close cooperation with DB Cargo.

Chart 35 - Commodity flow crossing Děčín station

Transportation volumes on the Děčín-Germany route		
		the container share
export	4 596 414 t	314 307 TEU
transit	1 206 644 t	
total	5 803 058 t	
Transportation volumes on the Děčín → Germany route		
		the container share
export	5 135 032 t	297 024 TEU
transit	1 218 462 t	
total	6 353 494 t	

Source: ČD Cargo, a. s., 2008, Container transport operators, 2008

Vehicles crossing the border according to the census from 2007:

Chart 36 - Annual number of vehicles according to the census from 2007

Yearly counts of vehicles crossing the border				
		Czech	Foreign	Total
Bavaria	export	1 279 325	1 006 670	2 285 995
	import	1 093 905	859 940	1 953 845
Saxony	**export**	**693 865**	**603 345**	**1 297 210**
	import	**599 330**	**525 600**	**1 124 930**

Source: CityPlan, spol. s r. o.

According to the 2007 Transport yearbook (comparable with the census from 2007), the average utilization is 3,9 tons/vehicle. In reality, approximately 50 % of vehicles crosses the border empty so the utilization of loaded vehicles is about 7,5 tons. This figure also corresponds with data of ČESMAD-BOHEMIA. Commodity flows from and to Bavaria is also monitored as the direction represents a back-up route to North Sea ports. Commodity flows are following:

Chart 37 - Annual commodity flows (t) by road transport

Yearly trasnportation in tons				
		Czech vehicles	Foreign vehicles	Total
Bavaria	export	4 989 368	3 926 013	8 915 381
	import	4 266 230	3 353 766	7 619 996
Saxony	**export**	**2 706 074**	**2 353 046**	**5 059 119**
	import	**2 337 387**	**2 049 840**	**4 387 227**

Source: Transport yearbook, 2007; calculation by CityPlan, spol. s r. o.

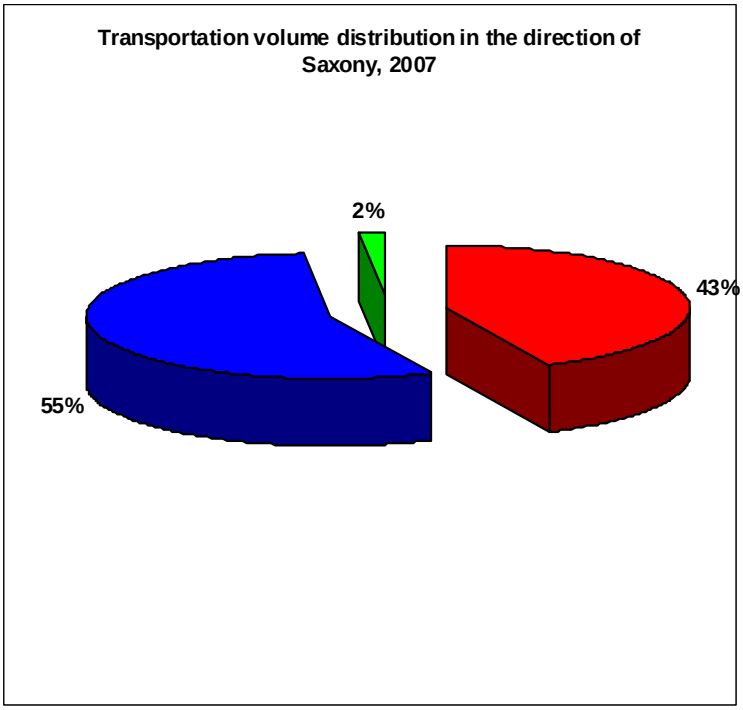
In 2007, **the Elbe waterway** transport volumes reached approx. **343.500 t** (without foreign vessel-owners)[21].

For the Czech-German (incl. North Sea ports) interchange, the transport volume distribution differs in the region of Saxony from internal distribution in the Czech Republic. In 2007, the transport volume distribution was following:

[21]Source: CityPlan, spol. s r. o.

Graph 15 - Transport volume distribution in the Czech-German relation (bidirectional)

(note: RED – road, BLUE – railway, GREEN – water)



Source: CityPlan, spol. s r. o.

4.5.2.2 Railway capacity potential

Overutilization of railway capacity (over 90 %) leads to reduced transport reliability to beyond acceptable.

- **The Czech Republic**

Czech railway network is on the route Prague - Děčín partially exhausted due to interval passenger transport. The daily reserve is approx. 20 - 25 %, total reserve is approx. 30 – 35 %. Higher capacity reserves are during night periods, which prolongs transportation time[22].

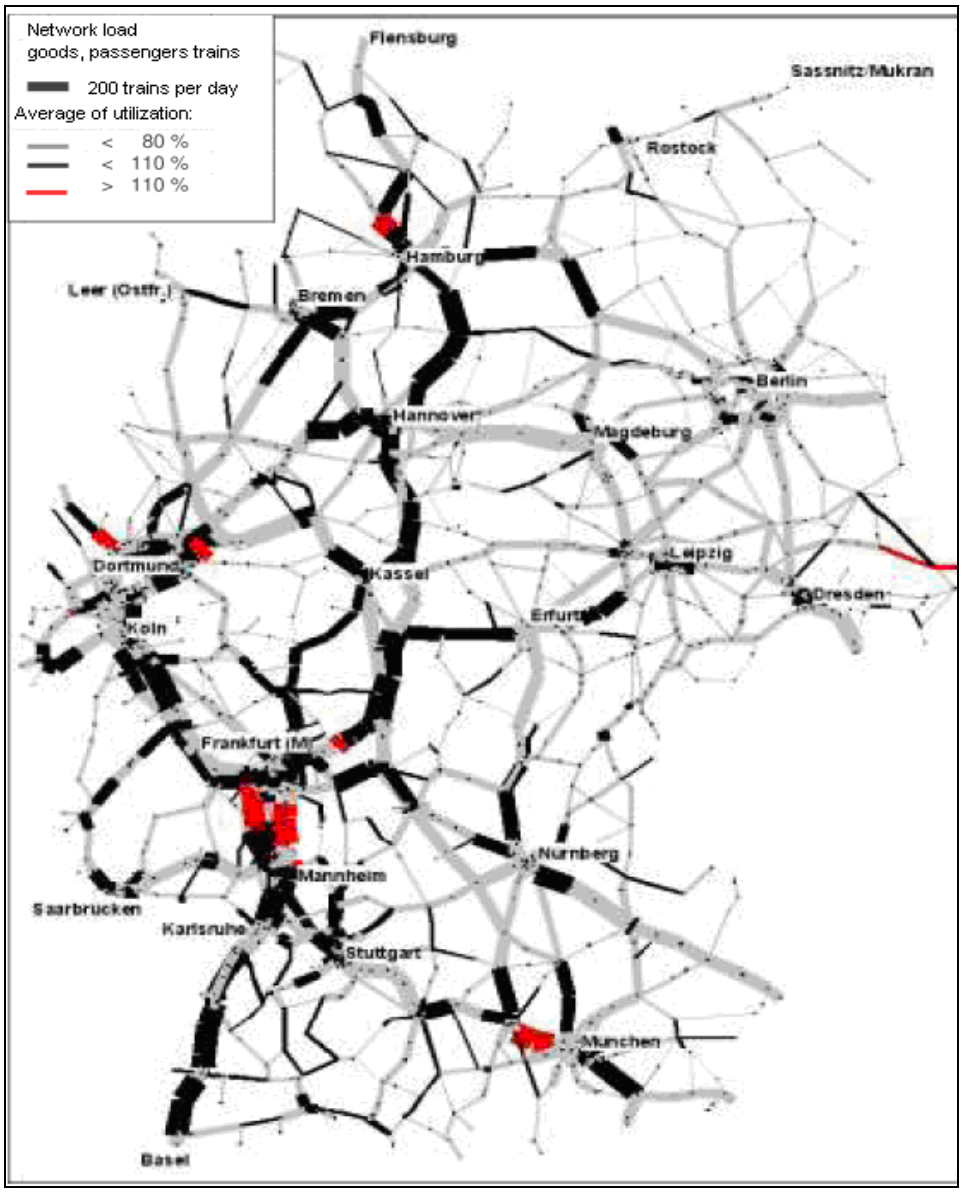
- **Germany**

Currently, burden on the German railway network is close to its load capacity maximum. The map below presents loads predicted in 2015. Although this particular prognosis does not predict crises, it is expected around the year 2025 at most. Furthermore, it is important to

[22] See SŽDC: „Load and transmission of railway network in the year 2009 - I, III., a IV. Transit corridor“

realize, that utilizing capacity above 100 % is not possible. It means that utilizing capacity by 110 % in real traffic results in 15 % of unsatisfied demand[23].

Picture 54 - German railway network load in 2015 (2025)



Source: A study by PLANCO Consulting s. r. o.

Study elaborated by PLANCO Consulting s. r. o. reveals that significant increase of transportation in the section Děčín - North Sea ports is not possible. The capacity reserves are sufficient for Dresden, Berlin and Hannover at most.

[23] Capacity utilization of the railway along the Elbe river was estimated by Saxon government to 87% in the presentation of the Saxon Minister of Transport and Economics Dr. Rohde on 4th May 2010. The capacity reserve is expected to be exhausted by the year 2015.

4.5.2.3 Road (motorway) capacity reserve

- **The Czech Republic**

The D8 motorway represents the crucial aspect necessary for evaluating road transport load parallel to waterway transport. According to the updated “transport model of the CR” for the year 2020, it will be:

Chart 38 - Yearly average daily intensity of vehicles on the motorway D8 in the year 2020

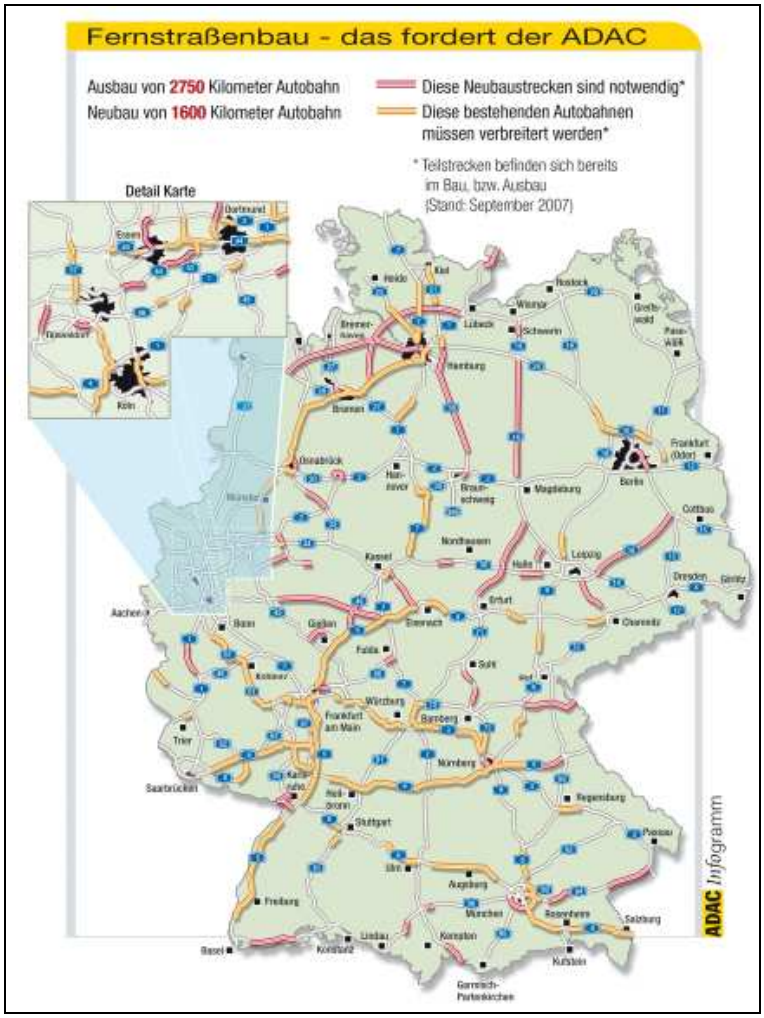
Motorway section	Vehicles in total	Lorries	Trucks
Zdiby - Odolena Voda	53 370	4 600	16 390
Odolena Voda - Úžice	46 860	4 060	15 950
Úžice - Nová Ves	39 500	2 990	14 200
Nová Ves - Roudnice	30 630	2 320	11 330

Source: CityPlan, spol. s r. o. - The transport model of the CR, a 2009 update

- **Germany**

German road and motorway network is very dense and provides several routes to each destination, but it suffers from extensive congestions. Therefore, the network is undergoing an extensive reconstruction into six-line sections (see the following picture). Despite the six-line roads, hazardous areas still remain in vicinity of large cities with common traffic jams and negative impact on traffic flows.

Picture 55 – Motorways in Germany



Source: http://www.adac.de/

4.5.2.4 Zero option – without the Děčín navigable lock

The zero option does not generates increase in waterway transport, with one exception: in case of exceeding the capacity reserve of land transport routes in Germany (Rhein area), waterway transport can be utilized until the Dresden port with consecutive road or railway transport to the CR. With regard to quite short distance to the destination point (200-300 km), preference of road transport is assumed due to economic reasons, while insufficient capacity indicates preference of railway transport.

Considering capacity reserve of the German railway network, most of the increased transport volumes would have to be absorbed by road transport. The prediction is following:

Chart 39 - Required transport increase of railway and road transport volumes (%) with regard to the capacity reserve of the railway network in Germany

monitored years	2008	2010	2012	2014	2016	2018	2020	2022	2024	2026	2028
railway	56,6	54,8	55,8	57,9	61,6	66,1	62,3	62,3	62,3	62,3	62,3
road	43,9	42,5	43,3	45,0	47,8	55,1	61,7	67,1	71,3	75,0	78,1
monitored years	2030	2032	2034	2036	2038	2040	2042	2044	2046	2048	2050
railway	62,3	62,3	62,3	62,3	62,3	62,3	62,3	62,3	62,3	62,3	62,3
road	80,8	83,1	84,9	86,4	88,0	89,1	89,8	90,3	90,7	91,1	91,3

Source: CityPlan, spol. s r. o.

The road capacity is expected to be exceeded around the year 2026. **The only acceptable solution is utilization of the Elbe waterway in the section with unlimited navigation draft (the guaranteed draft in Germany is 1,4 m)**. The last port in a direction towards CR well connected to railway network is Dresden. The capacity reserve revealed for the route Dresden – Děčín – further to the CR is about 20 % (in 2008). As 10 % of railway network capacity will be exceeded (the maximum for the Rhein region), capacity remaining for utilization on the section to Dresden is 10 %. Exploiting this alternative would lower the share of unsatisfied demand (with the road transport still increased “only” by 50 % in 2050) but only at the cost of significant decrease of transportation speed and increase of transportation costs (there is inverse ratio between a transport price and distance + additional overload). Therefore, transport demand would probably not be satisfied while cumulating road congestions with all their negative consequences.

If we admit maximum increase of road transport by 50 %, the transport development will be following:

Chart 40 - real railway and road transport increase (%)

The growth in transportation volume reduced by capacity possibilities of networks											
monitored years	**2008**	**2010**	**2012**	**2014**	**2016**	**2018**	**2020**	**2022**	**2024**	**2026**	**2028**
railway	56,6	54,8	55,8	57,9	61,6	62,3	62,3	62,3	62,3	62,3	62,3
road	43,9	42,5	43,3	45,0	47,8	55,1	61,7	66,0	66,0	66,0	66,0
monitored years	**2030**	**2032**	**2034**	**2036**	**2038**	**2040**	**2042**	**2044**	**2046**	**2048**	**2050**
railway	62,3	62,3	62,3	62,3	62,3	62,3	62,3	62,3	62,3	62,3	62,3
road	66,0	66,0	66,0	66,0	66,0	66,0	66,0	66,0	66,0	66,0	66,0

Source: CityPlan, spol. s r. o.

4.5.2.5 Option with the Děčín navigable lock constructed

Until commissioning the Děčín navigable lock, development of transport is consistent with the zero option. The navigable lock is expected to operate since the year 2016. The transported volumes would then gradually grow. Full utilization of the waterway would be realized only after capacity of road and railway transport is exceeded, i.e. after the year 2018. To assess the future loads, the medium option of foreseen development of transport volumes is selected with regard to navigable days to Střekov and navigable days for loading and unloading in Děčín.

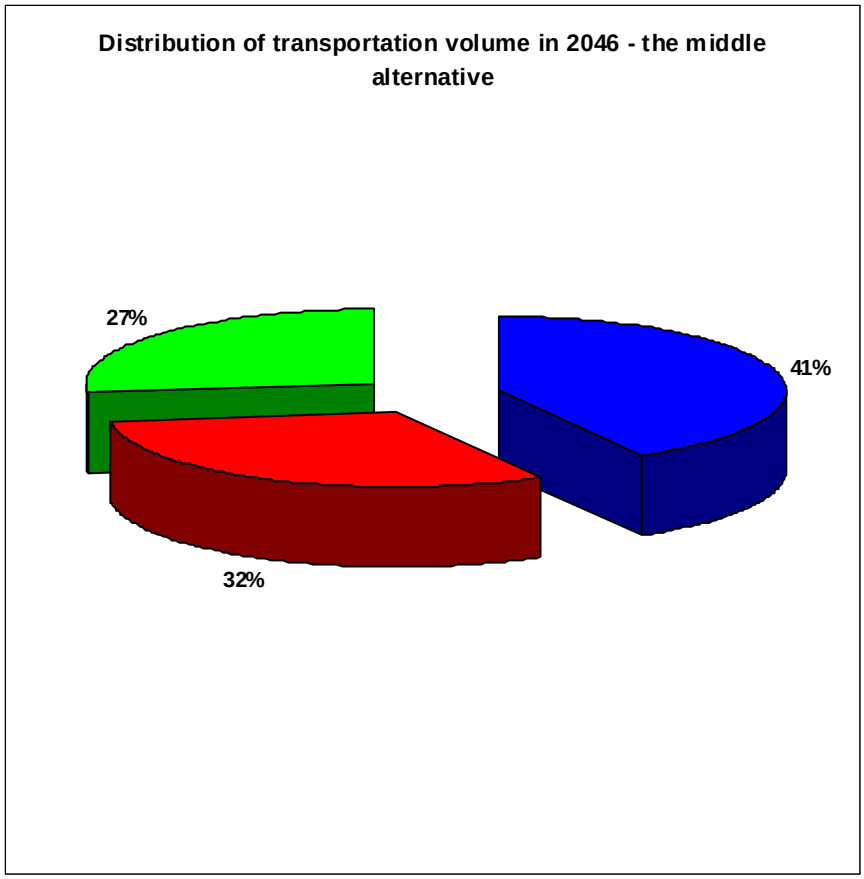
Chart 41 - Import and export between Děčín and Saxony (thousands of tons)

Export and import between Děčín and Saxony (thousands of tons) - required transportation volume											
monitored years	**2008**	**2010**	**2012**	**2014**	**2016**	**2018**	**2020**	**2022**	**2024**	**2026**	**2028**
railway export	5803	5615	5719	5940	6316	6378	6378	6378	6378	6378	6378
road export	5059	4895	4986	5179	5506	5914	6248	6324	6324	6324	6324
waterway export	0	0	0	0	0	406	789	1294	1755	2157	2494
total export	**10862**	**10510**	**10705**	**11119**	**11822**	**12699**	**13416**	**13996**	**14457**	**14859**	**15196**
railway import	6353	6147	6607	6862	6988	6988	6988	6988	6988	6988	6988
road import	4378	4471	4553	4729	5026	5397	5473	5473	5473	5473	5473
waterway import	0	0	0	0	305	844	1512	2114	2592	3009	3359
total import	**10731**	**10618**	**11161**	**11591**	**12319**	**13229**	**13973**	**14575**	**15053**	**15470**	**15820**
total turnover	**21593**	**21127**	**21865**	**22710**	**24141**	**25928**	**27388**	**28570**	**29511**	**30330**	**31016**
monitored years	**2030**	**2032**	**2034**	**2036**	**2038**	**2040**	**2042**	**2044**	**2046**	**2048**	**2050**
railway export	6378	6378	6378	6378	6378	6378	6378	6378	6378	6378	6378
road export	6324	6324	6324	6324	6324	6324	6324	6324	6324	6324	6324
waterway export	2787	3032	3233	3395	3569	3689	3759	3819	3857	3906	3928
total export	**15489**	**15734**	**15935**	**16097**	**16271**	**16391**	**16461**	**16521**	**16559**	**16608**	**16630**
railway import	6988	6988	6988	6988	6988	6988	6988	6988	6988	6988	6988
road import	5473	5473	5473	5473	5473	5473	5473	5473	5473	5473	5473
waterway import	3663	3916	4125	4294	4474	4598	4671	4733	4773	4823	4846
total import	**16124**	**16377**	**16586**	**16755**	**16935**	**17059**	**17132**	**17194**	**17234**	**17284**	**17307**
total turnover	**31613**	**32111**	**32520**	**32852**	**33206**	**33450**	**33594**	**33715**	**33793**	**33892**	**33937**

Source: CityPlan, spol. s r. o.

Graph 16 - Distribution of transport volumes

(note: RED – road, BLUE – railway, GREEN – water)



Source: CityPlan, spol. s r. o.

4.5.2.6 Transfer of commodity flows to number of vehicles

The default values of cross-border transport census are a one-day picture, which explains different numbers for export and import. The prognosis of the processor concludes that the flows are balanced on yearly basis so the input data were adjusted accordingly.

4.5.2.6.1 Zero option

Chart 42 – Foreseen values for category N3 vehicles

roads - the zero alternative

monitored years	**2008**	**2010**	**2012**	**2014**	**2016**	**2018**	**2020**	**2022**	**2024**	**2026**	**2028**
export [thousands of TNV]/year	1211	1171	1193	1239	1317	1519	1701	1819	1819	1819	1819
import [thousands of TNV]/year	1211	1171	1193	1239	1317	1519	1701	1819	1819	1819	1819
total [thousands of TNV]/year	2422	2343	2386	2478	2634	3037	3402	3638	3638	3638	3638
monitored years	**2030**	**2032**	**2034**	**2036**	**2038**	**2040**	**2042**	**2044**	**2046**	**2048**	**2050**
export [thousands of TNV]/year	1819	1819	1819	1819	1819	1819	1819	1819	1819	1819	1819
import [thousands of TNV]/year	1819	1819	1819	1819	1819	1819	1819	1819	1819	1819	1819
total [thousands of TNV]/year	3638	3638	3638	3638	3638	3638	3638	3638	3638	3638	3638

Source: CityPlan, spol. s r. o.

Chart 43 – Yearly amount of cargo trains in Děčín

Yearly amount of cargo trains in Děčín 2007					
import	transit to the CR	total	export	transit from the CR	total
4 105	1 078	5 183	4 318	1 025	5 343

Source: CityPlan, spol. s r. o.

The following calculation is based on foreseen increasing number of transit trains (transits). Different number of trains in both directions are possible as the train can be disjointed and reorganized at place of received cargo or it can be utilized within national transport (DB Cargo). Foreseen number of trains is following:

Chart 44 – Number of cargo trains in Děčín – zero option

railway - the zero alternative

monitored years	**2008**	**2010**	**2012**	**2014**	**2016**	**2018**	**2020**	**2022**	**2024**	**2026**	**2028**
Děčín - Germany	5343	5170	5265	5468	5811	5882	5882	5882	5882	5882	5882
Germany - Děčín	5183	5015	5107	5304	5637	5706	5706	5706	5706	5706	5706
trains in total	10526	10184	10372	10772	11449	11587	11587	11587	11587	11587	11587
monitored years	**2030**	**2032**	**2034**	**2036**	**2038**	**2040**	**2042**	**2044**	**2046**	**2048**	**2050**
Děčín - Germany	5882	5882	5882	5882	5882	5882	5882	5882	5882	5882	5882
Germany - Děčín	5706	5706	5706	5706	5706	5706	5706	5706	5706	5706	5706
trains in total	11588	11588	11588	11588	11588	11588	11588	11588	11588	11588	11588

Source: CityPlan, spol. s r. o.

4.5.2.6.2 Option of the Děčín navigable lock constructed

To determine the number of vessels, the processor based the prognosis on an average load of 900 tons/vessel and 345 navigable days per year. Ensured minimum navigability at least to Děčín is presumed.

Chart 45 - numbers of vessels between Hřensko – the Děčín navigable lock

waterway transportation - medium option

monitored years	**2008**	**2010**	**2012**	**2014**	**2016**	**2018**	**2020**	**2022**	**2024**	**2026**	**2028**
export (vessels/year)	191	191	191	191	361	886	1469	2084	2606	3061	3442
import (vessels/year)	191	191	191	191	361	886	1469	2084	2606	3061	3442
total (vessels/year)	382	382	382	382	721	1771	2939	4168	5213	6123	6885
monitored years	**2030**	**2032**	**2034**	**2036**	**2038**	**2040**	**2042**	**2044**	**2046**	**2048**	**2050**
export (vessels/year)	3774	4051	4278	4463	4660	4795	4875	4942	4985	5041	5065
import (vessels/year)	3774	4051	4278	4463	4660	4795	4875	4942	4985	5041	5065
total (vessels/year)	7549	8102	8557	8926	9319	9590	9749	9885	9971	10081	10131

Source: CityPlan, spol. s r. o.

The data in the chart are valid for Boletice. Navigation between Boletice and Střekov will continue to be limited by low water levels. It is impossible to predict periods with low water levels, or whether the period will be continuous or distributed within a year. The only solution possible is to process the average figures. The project is based on average number of navigable days for the section Děčín - Střekov.

4.5.2.6.3 Benefits of the Děčín navigable lock for the number of freight vehicles transporting on the route Děčín – Sachsen

The assessment was conducted for medium option. The expected low water levels between Boletice – Střekov were considered, as well as more intensive utilization of the overload point in Děčín – Loubí connected to the railway network.

Chart 46 - Annual decrease of freight vehicles (in thousands) on the D8 and A17 motorways with the influence of low water levels – medium option – both directions

monitored years	**2008**	**2010**	**2012**	**2014**	**2016**	**2018**	**2020**	**2022**	**2024**	**2026**	**2028**
effect of water lock	0	0	0	0	0	29	394	630	630	630	630
effect of low water level	0	0	0	0	0	29	199	273	336	390	436
difference = decrease of number trucks (thousands)	**0**	**0**	**0**	**0**	**0**	**0**	**195**	**357**	**295**	**240**	**194**
monitored years	**2030**	**2032**	**2034**	**2036**	**2038**	**2040**	**2042**	**2044**	**2046**	**2048**	**2050**
effect of water lock	1727	1727	1727	1727	1727	1727	1727	1727	1727	1727	1727
effect of low water level	476	509	536	558	582	598	608	616	621	628	631
difference = decrease of number trucks (thousands)	**1251**	**1218**	**1190**	**1168**	**1145**	**1128**	**1119**	**1111**	**1106**	**1099**	**1096**

Source: CityPlan, spol. s r. o.

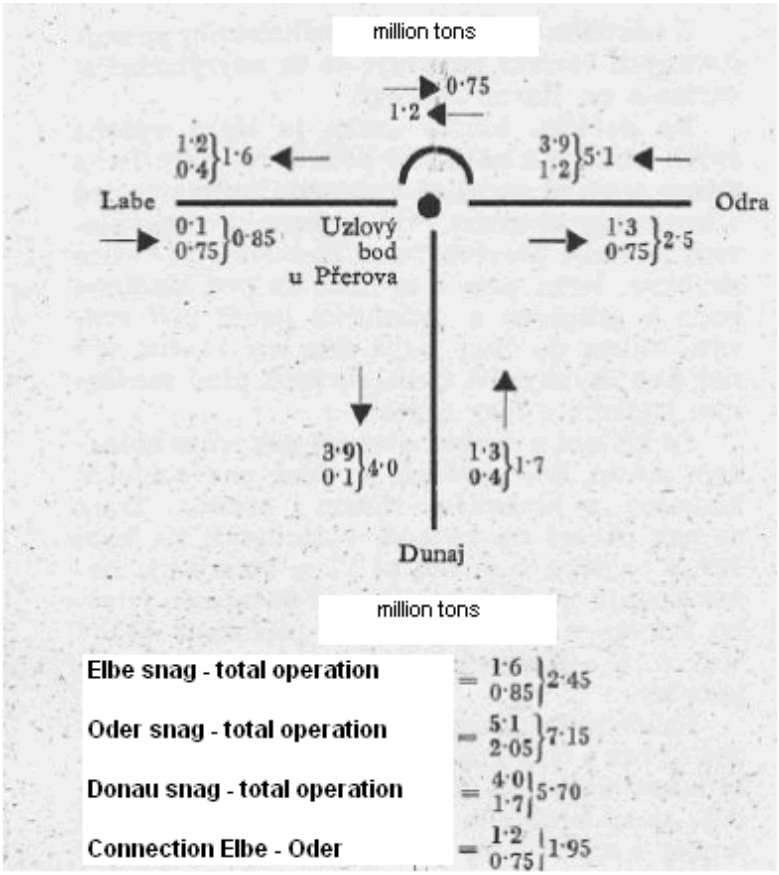
4.5.2.6.4 Foreseen use of the Danube-Oder-Elbe waterway

The following analysis of transport opportunities of the D-O-E waterway is based on the AGN Agreement (the most recent document by the EU referring to the D-O-E waterways is the resolution 04/2008 of the EP Doc 10730). The basic conditions are following:

- Construction of the D-O-E channel with associated adjustments of the Elbe and the Oder rivers will be realised.
- The construction will take approx. 20 years.
- At the time of launching the channel (the earliest year is 2035), problems related to exceeding road and railway capacities will appear (the expected increases of railway transport volumes according to the CDV prognosis from 2008[24] shows much earlier depletion).
- The transport volumes will not be lower than the prognosis from the year 1940.
- Heavy industry in the Ostrava and Katowice regions will not perish.

As an illustration, two historical prognoses are presented from times, when the railway network concerning was developed into the similar extent to the current state.

Picture 56 – Prognosis from the year 1901



[24] DOPROG Transportation prognosis – processed for the department 520 MD v CDV, v.v.i. August 2008

Source: The Library of the Waterway Danube-Oder-Elbe Magazine. Volume 4.

Chart 47 – The prognosis from the year 1940 - the Elbe branch

Pardubice-Přerov-Mor. Ostrava	50.000 t	
		450 000 t
Pardubice-Přerov-Dunaj	400.000 t	
Mor. Ostrava-Přerov-Pardubice	1,000.000 t	
		1, 400 000 t
Dunaj-Přerov-Pardubice	400.000 t	
.....		
	1,850.000 t	

Source: The Library of the Waterway Danube-Oder-Elbe Magazine. Volume 4

There are not sufficient source materials from Poland and the Baltic states for a direct prognosis of transport volumes during a full-time operation period on the waterway (the time horizon after the year 2040). Certain possibility represents the commodity flow on the Rhein-Main-Danube channel reaching 6.240 thousands t[25]. Compared to the year 2004, the decrease is caused by the dumping currency policy of the DB Cargo. It can be reasonably concluded, that the transport volumes on the Oder – Danube will not be lower than 5.000 thousands tons/year and on the Přerov – Labe route lower tan 1.800 thousands tons/year.

4.6 PROJECT FUNDING

With regard to the initial stage of the D-O-E corridor, it is not currently possible to precisely determine its funding resources. As mentioned earlier, the investment costs are estimated to approximately 300 billion CZK, therefore not only national, but also European resources will be necessary. So far financing by PPP (Public Private Partnership) is not considered. The crucial year for enlisting of the D-O-E project into the financial plan of the EU will be 2013. After this year, financing of major priority projects will be initiated, undoubtedly including the D-O-E project. This is an opportunity to draw up to 85 % of the planned investments from the European Cohesion Fund for the State Fund for Transport Infrastructure.

Two funding sources are considered for the navigable locks in Děčín and Přelouč II – the State Fund for Transport Infrastructure and the European funds. Investor for both constructions is an institution established by the state - The Headquarters of Waterways in the CR, which must not run into debt, therefore, a bank loan is not acceptable.

[25] http://cs.wikipedia.org/wiki/Pr%C5%AFplav_R%C3%BDn-Mohan-Dunaj

4.6.1 The State fund for transport infrastructure

The State Fund for Transport Infrastructure (SFDI) is established by law no. 104/2000 Coll. from 4th April 2000, effective from 1st July 2000. The purpose of the fund is development, construction, maintenance and modernization of roads and motorways, railways and inland waterways. The fund also provides contributions for research, study, expertise and project activities aimed at the transport infrastructure. The fund revenues include transfer of road taxes, transfer of a share from consumer taxes, from fossil fuels and lubricants, and from road tolls. This ensures that part of the revenues generated by transport comes back. Contributions of the European commission provided via the corresponding European funds will flow to SFDI as well.

4.6.2 EU funds for the years 2007 - 2013

The financial support from the EU funds to transport in CR between 2007 - 2013 is realized mainly through the Operational Programme of Transport (OPT). Condition for funding is to complete the project in the year 2015. The maximum amount of financing for current OPT is 85 % of the total eligible costs.

Financially, the OPT is the largest operational programme in the CR. The total funds allocated to the programme reach 5,774 billion EUR, which is about 22 % of the entire EU funds addressed to the CR. Additional funding from the Czech public resources is supposed to increase the amount by another 1,01 billion EUR. The OPT is financed by two funds – The European Regional Development Fund (ERDF) and the Consistency Fund (CF). The governing authority of the OPT is the Ministry of Transport of the CR.

The OPT includes 7 priorities:

1. Modernization of the TEN-T network
2. Construction and modernization of the TEN-T road and motorway network
3. Modernization of the railway network outside the TEN-T network
4. Modernization of I. class roads outside the TEN-T network
5. Modernization and development of the Prague underground and the systems of road transport management in the capital city Prague
6. **Support of multimodal freight transport and development of inland waterway transport**
7. Technical support

Priorities are also aimed at improving the water transport infrastructure by finding solutions for navigability of major inland waterways, by modernizing river vessels, by supporting of new multimodal overload technologies, etc. For the priority no. 6, EU allocated 0,119 billion EUR, i.e.

2,07 % of the OPT. As the new planning year of the EU begins on 1st February 2014, it is not yet possible to determine percentage of funds for the Děčín navigable lock. Until the end of 2013, the OPT funds are distributed among other projects (navigability of the upper section of the Vltava river). To gain financial assistance from the EU, it is necessary to elaborate an appropriate application with required annexes, i.e. a feasibility study, financial and economic analysis, analysis of risks and a study of sensitivity.

Regarding time spaces between preparation and assumed realization of constructions, it is apparent that funding from the OPT will be largely limited in order to use the resources until the end of 2015 (the rule 2013+2). Funds can be further drawn from the consecutive analogic programme.

4.6.3 Public Private Partnership (PPP)

Such type of funding is currently not common in the Czech Republic and is not suitable for projects on navigable locks, because it would be rather difficult to reach higher added value expected for the PPP projects. Traditional funding is much more convenient.

4.6.4 Other support of inland navigation

Another programme focused on inland navigation is the European programme NAIADES (Navigation And Inland Waterway Action and Development in Europe) – an action programme for inland navigation for the years 2006 – 2013. The aim of the NAIADES is to support the inland waterway transport **"which is highly secure and environmentally friendly and which may facilitate transfer to other modes of transport and therefore lower problems with congestions and overload generated by other modes of transport"**.

The programme includes five key elements:

- Provide favorable conditions for services and new market acquisition – to gain new transport markets, to encourage development of businesses within this sector and to improve regulatory and administrative framework.
- Support modernization and innovation of the fleet – to improve efficiency of logistics, safety and to introduce environment-friendly technologies.
- Recruit new labor and increase investments into the human resources – to improve working and social conditions for workers within waterway transport, to invest into the human resources within this field.
- Promote inland waterway transport – to create the image for water transport as a successful businesses partner by promotional network, to monitor and promote new trends in development of water transport.
- Provide suitable infrastructures for inland waterways – to support and coordinate creation of an integrated waterway information system of transport, to support construction of ports and overloading facilities.

Picture 57 - Overview of the NAIADES action programme[26]

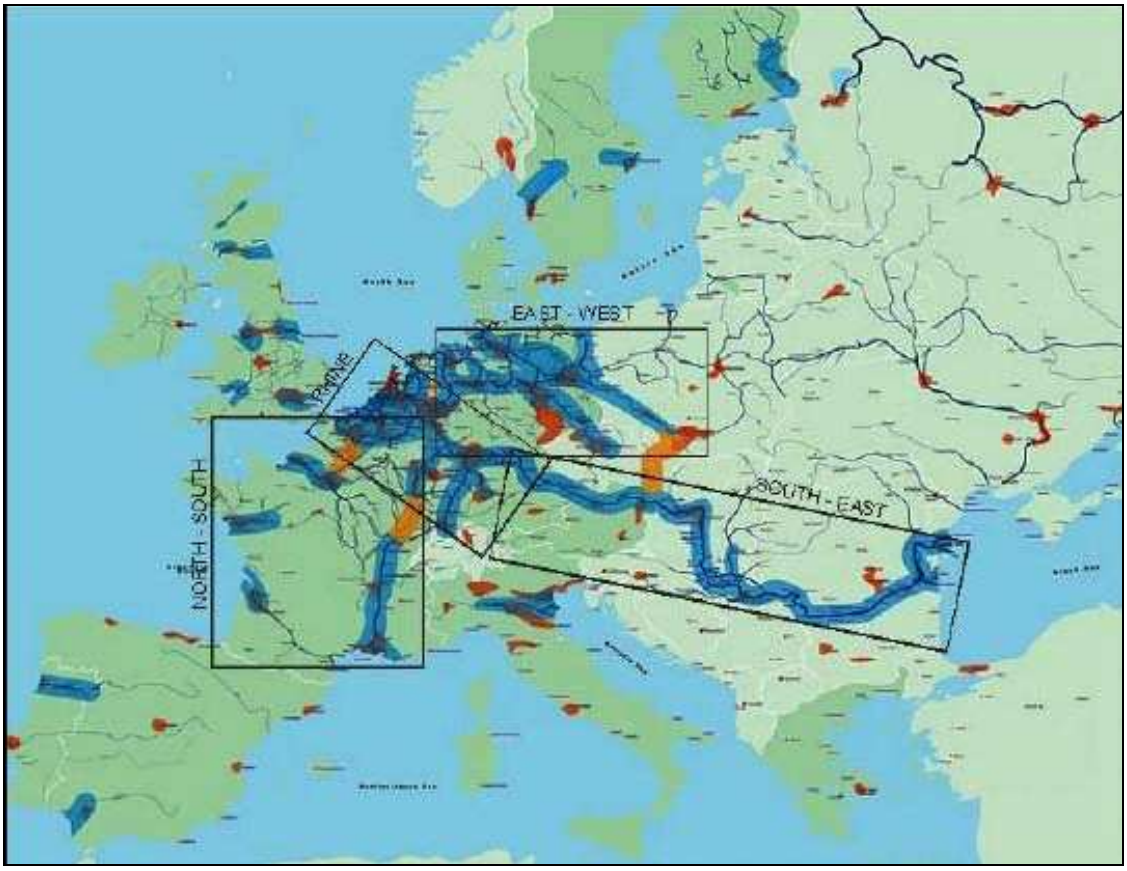
An overview of the NAIADES programme

A. LEGISLATIVE TOOLS		B. POLITICAL TOOLS		C. SUPPORTIVE TOOLS	
Harmonization of ▪ technical requirements on the vessels ▪ intermodal overload units ▪ the statistics of commodity transportation on the inland waterways	in progress 2006 2007	The coordinator of the TEN waterways	2006	European reserve fund of inland waterway transportation	2007/8
		A handbook of the funding of the inland waterway transportation	2006/7	National support programmes ▪ The support of transition to another transportation mode, investent facilitation ▪ Efficiency, the environment and safety technologies ▪ Promotion and development institutions ▪ Infrastructure improvement and keeping	
		Dection of obstructions in the current and future European and national legislation	2006/7		
		Unified government checkpoints and central points for inland waterway transportation	2006/7		
Instructions for the state support of subsidiary programmes and possible *de minimis* regulations for inland waterway transportation	2007	Social dialogue within the sector	2006/7		
		Observation of the inland waterway transportation	2008		
Harmonization of ▪ hazardous commodity transportation ▪ engine emissions	 2007 2007	The European strategy for waterway infrastructure development and overload facilities	2009	European research and technological development programmes and subsidiary pragrammes ▪ Services: marco Polo, CIP, INTERREG etc. ▪ The fleet: Research and technical development programmes (The framework programme no. 7) etc. ▪ working opportunities and skills: SOCRATES, LEONARDO DA VINCI etc. ▪ Infrastructure: - TEN-T 18 and 30 priority projects - Waterway information service (TEN-T MIP) - PHARE, ISPA, CARDS, INTERREG etc.	2013
		Recruitment campaigns			
Reinforcement of the position and the normative framework of the inland waterway navigation	2008	Land-use planning with a higher priority of (re-)construction of industrial zones in the vicinity of waterways			
Harmonization of ▪ captain certificates ▪ intermodal responsibility ▪ the crew composition requirements ▪ waste disposal ▪ education and special training standards ▪ intermodal documentation ▪ infrastructure charging ▪ fuel quality	 2008 2008 2009 2009 2009 2010 2013	Interdisciplinary dialogue on the project level			

The project "Prospects of inland navigation in wider Europe (PINE)" is an important achievement towards developing inland navigation. The project is a result of the consortium of four organizations (Buck Consultants International – the Netherlands, ProgTrans - Switzerland, VBD European Development Centre for Inland and Coastal – Germany, Via Donau - Austria). This study is aimed mainly at four corridors (see the picture), while the CR is included in the "East-West" corridor, and separately, in waterways of Great Britain, Finland, Sweden, Lithuania, Italy, Spain and Portugal.

[26] SEK (2006) 34

Picture 58 – PINE corridors



Source: http://www.pineproject.org/

The North – South corridor includes Belgium, France and part of the Netherlands, the East – West corridor includes Poland, the CR and the north and east Germany, the Rhein corridor covers the Netherlands, France, Switzerland, Luxemburg and part of Belgium, the South-East corridor includes part of Germany, Austria, Slovakia, Hungary, Romania and Bulgaria.

The study points out the great importance of the Rhein river and its tributaries caused by the quality and efficiency of waterways and ports. The study indicates that 85 % of the total volume of cargo transported by inland waterways of the EU 25, Bulgaria and Romania (in that time non-member countries) is realized in the EU 15.

One of the contributions to the inland waterway navigation is undoubtedly implementation of the River Information Services (RIS) intended to enhance efficiency and support the inland navigation by integrating information services for all subjects involved in water transport. This system is included in the European Parliament and Council regulation 2005/44/ES from 7th September 2005 on harmonization of information services of inland waterways within the Community. The basic objectives of the RIS are:

- increase safety of inland navigation, the RIS contributes to quality improvements of rescue operations, enables continuous monitoring waterway traffic transport of hazardous materials commodities,

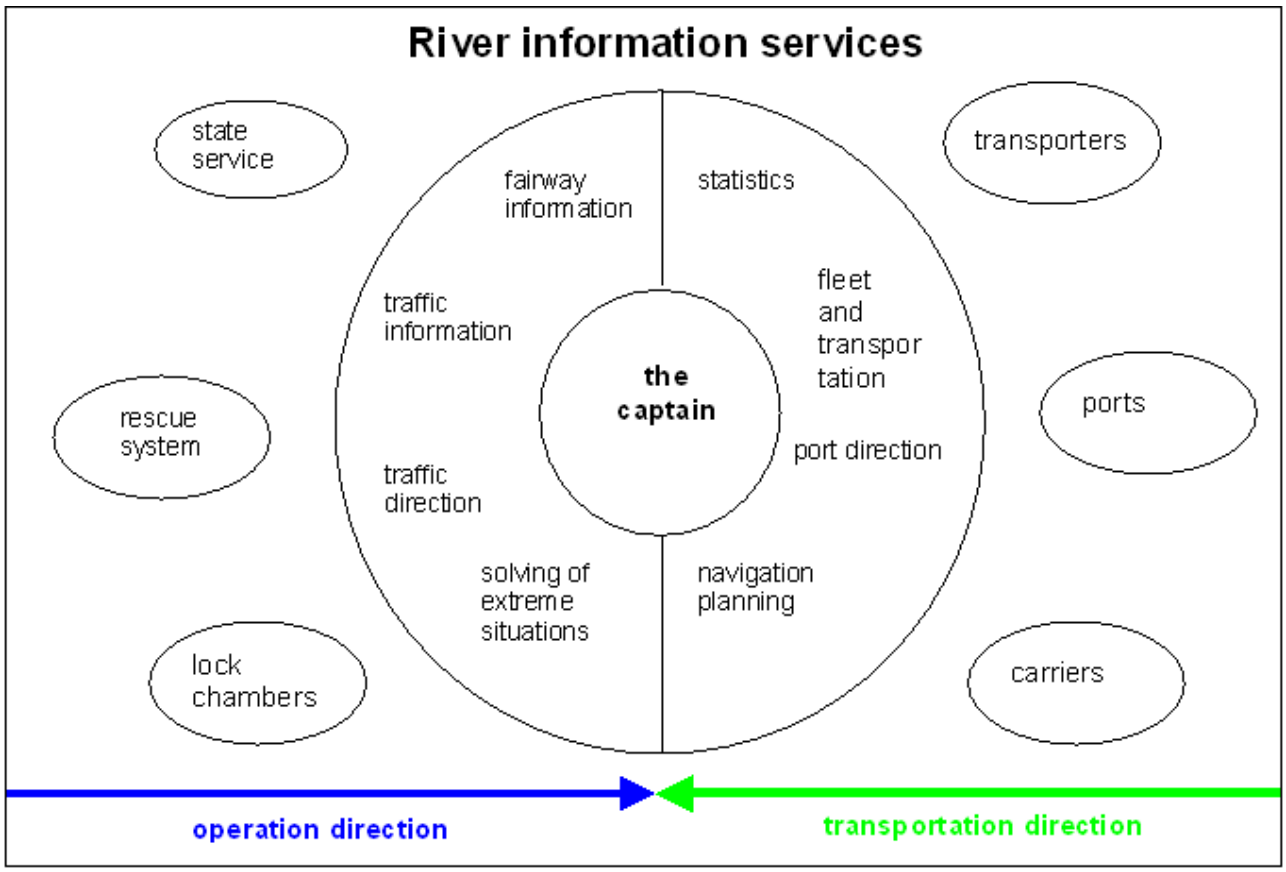
- increase efficiency of water transport (easier exchange of information among vessels, lock chambers, ports and the state navigation management as the RIS system provider)

- provide better opportunities for waterway utilization based on high-quality information about current navigation conditions

- protect the environment resulting from sufficient awareness about extreme situations

In the Czech Republic, the RIS concerns the Elbe-Vltava waterway and the condition to use an access the information system is to equip vessels by compatible technologies. The RIS was introduced in the amendment of the law no. 114/1995 Coll. on inland navigation, as amended in 2008, effective since 1st January 2009.

Picture 59 - River information services



Source: http://www.lavdis.cz/

4.6.5 Comparison of investments into long-distance infrastructure in road, railway and waterway transport in the CR

The method of financing transport infrastructure considerably changed over time. Until 1989, investments were financed from the state budget according to the proposal of the state planning commission. Between 1989 and 30th June 2000, development of road and water infrastructure was financed from the state budget while railway transport was funded from the allocated budget of ČD, s.o. (Czech Railways). Since 1st July 2000, the transport infrastructure is funded by the State Fund for Transport Infrastructure (SFDI). On 1st January 2003, the Railway Infrastructure Administration (Správa železniční dopravní cesty - SŽDC) was established to finance railway transport. The SFDI and SŽDC are partially funded by public resources and by own incomes:

- SFDI – apart from public resources financed from road tolls, motorway stamps (the road tax is transferred to SFDI in full amount, fuel tax only partially), direct grants from the state budget and EU funds
- SŽDC – the actual income is from route fees (public budgets are represented by SFDI)

The SFDI is of public budget nature. The SFDI budget is approved by the Parliament of the CR, Chamber of Deputies. SZDC is not under public control.

Fundamental changes were caused by the revolution in the year 1989 and splitting of the state in 1993. The subsequent changes in transport infrastructure funding resulted in impossibility to trace integrated line of investments for transport infrastructure. Also since 1st January 2005, funding of II. and III. class roads is transferred to the regional level (with SFDI partnership). Before 1989, the investments within the “planned economy” were realized in waves (campaigns), which surged and then declined:

- in the 50s - 70s the electrification of railway lines
- in the 70s navigability of the upper section of the Elbe river to Chvaletice completed
- since the 70s construction of motorways and speedways in progress

After each wave, only maintenance was realized.

4.6.6 Infrastructure investments

The only relevant data line is available since 2000 (see the chart below). The figures are presented per year, the amount without inflation is not available.

Chart 48 - Infrastructure investments between 2000-2008

field of investment [billions of CZK]	2000*	2001	2002	2003	2004	2005	2006	2007	2008
inland waterways	0.16	0.27	0.5	0.36	0.31	0.3	0.53	0.39	0.54
national and regional railways	1.9	10.03	16.52	15.5	16.19	18.81	19.05	22.93	32.87
terrestrial communications	5.68	15.61	21.82	25.21	35.18	29.15	36.01	45.94	53.82
other programmes**	0.01	0.04	0.07	0.18	0.36	0.25	0.24	0.64	0.82
total	7.59	25.68	38.41	40.89	51.73	48.21	55.3	69.51	87.51

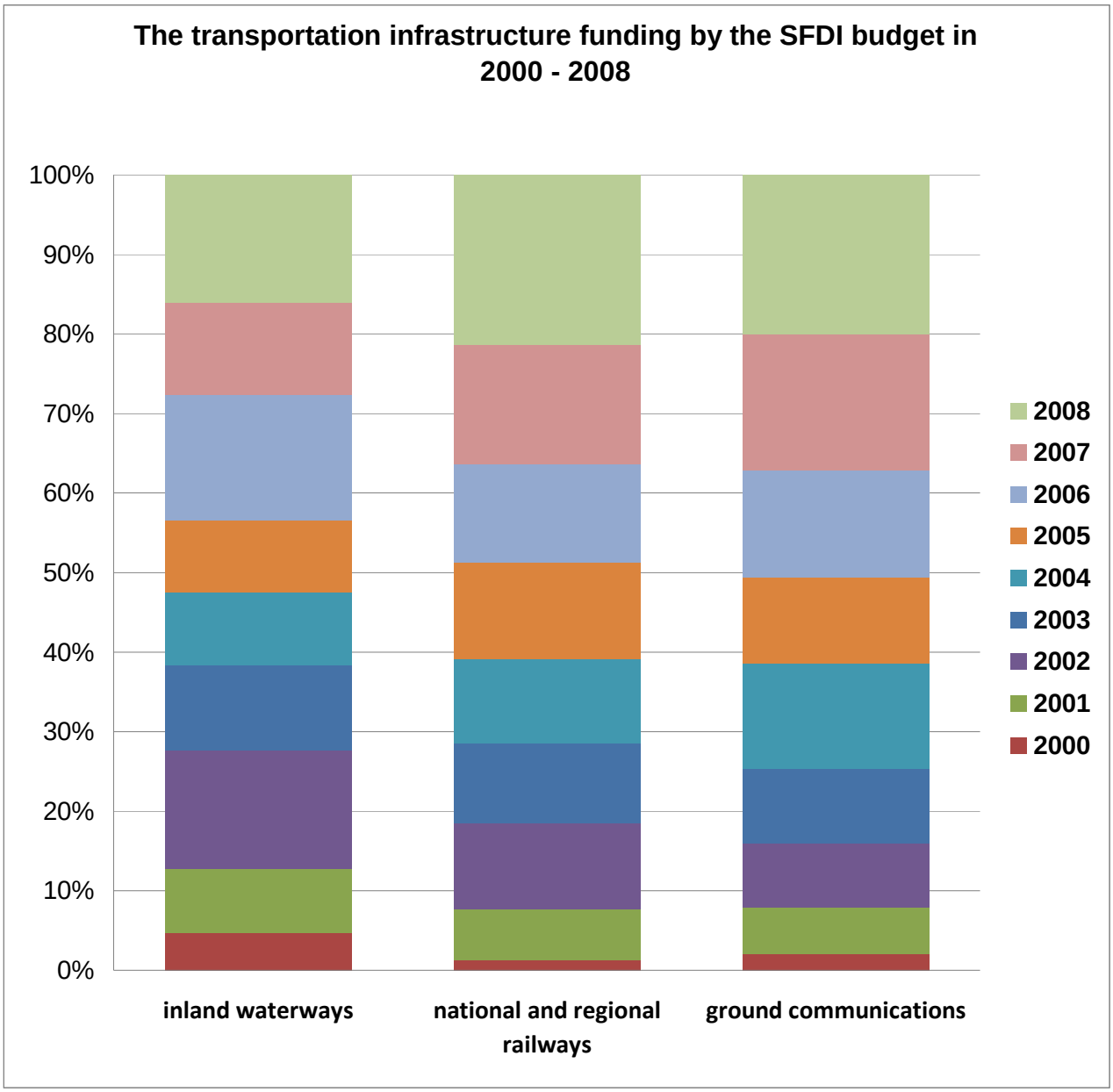
* The data are only since 1st July – the SFDI was established

**Other programmes also include own costs of the SFDI

Source: The annual report on activity and the accounting balance of the SFDI, year 2008 – adapted by CityPlan, spol.s r.o.

When presented in a graphical format, two outputs are illustrated presenting distribution of investments into various transport modes.

Graph 17 - Development of investments for individual transport modes



Source: The annual report on activity and the accounting balance of the SFDI, year 2008 – adapted by CityPlan, spol.s r.o.

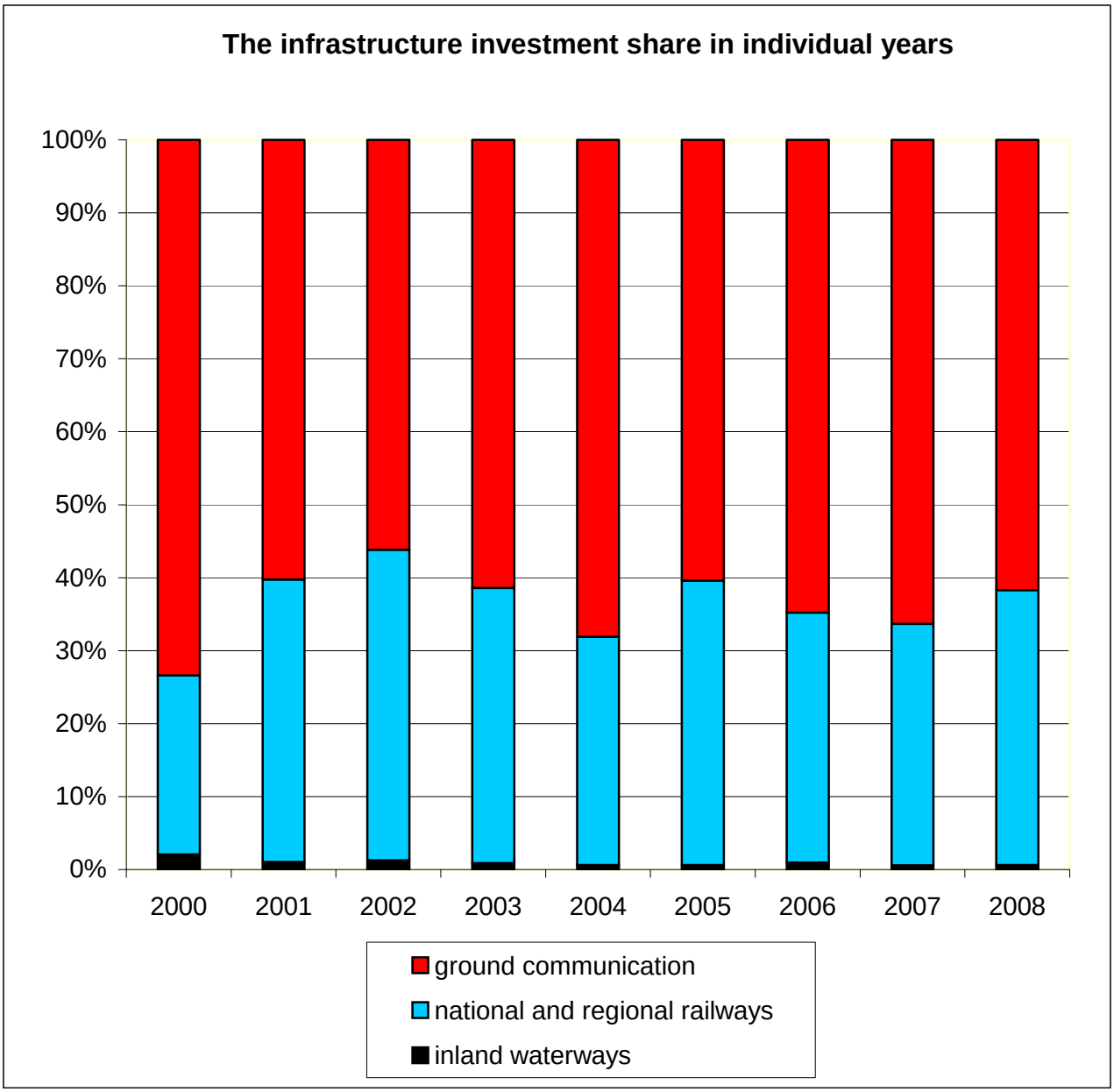
The graph demonstrates the growth of investments for transport infrastructure. Nonetheless, there are no data on investments for individual transport networks (investment distribution). The percentage of investments distribution offers a completely different view:

Chart 49 - Infrastructure investments in 2000 - 2008 (%)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
inland waterways [per cent]	2,06	1,04	1,29	0,87	0,60	0,62	0,95	0,56	0,61
national and regional railways [per cent]	24,52	38,65	42,46	37,58	31,11	38,78	34,12	32,80	37,33
ground communications [per cent]	73,29	60,15	56,08	61,12	67,60	60,09	64,50	65,72	61,12
other programmes (incl. The SFDI apparatus) [per cent]	0,13	0,15	0,18	0,44	0,69	0,52	0,43	0,92	0,93
total [per cent]	100,00	100,00	100,00	100,00	100,00	100,00	100,00	100,00	100,00

Source: The annual report on activity and the accounting balance of the SFDI, year 2008 – adapted by CityPlan, spol.s r.o.

Graph 18 - The graphical representation of investment distribution in various years.



Source: The annual report on activity and the accounting balance of the SFDI, year 2008 – adapted by CityPlan, spol.s r.o.

The graph presents minimum investments for waterway infrastructure. For railway infrastructure, investments are solely for acceleration of passenger transport (the corridors of the Czech Railways – ČD, new connection in Prague).

4.6.6.1 Tax reliefs for freight transport and subsidies to other modes of transport

In some of the neighboring countries, there are certain economic allowances for environmental friendly transport modes, particularly in the field of fuel consumer taxes. Tax reliefs for transport are not introduced in the CR (the only relief is for farmers – green diesel). Direct subsidies for individual transport modes are following:

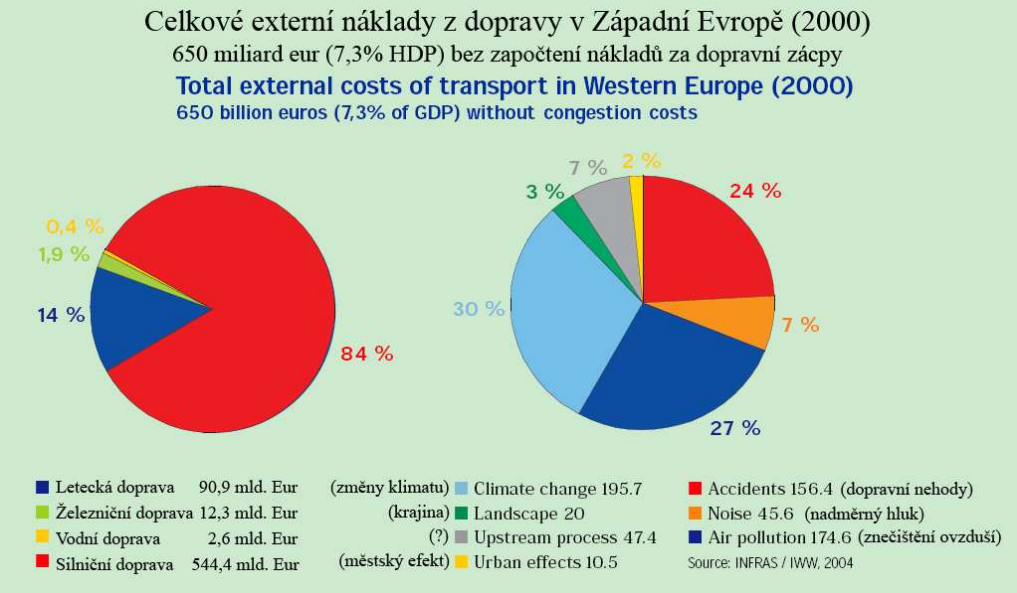
- Road freight transport does not receive grants or subsidies. The environmental aspect is presented in different prices of road tolls.
- Railway cargo transport is involved in certain programmes for combined transport (not permanently, but in some years - e.g. the RoLa between Lovosice and Dresden funded annually by 60 million CZK, purchase of the Sgnss wagons from grants).
- For waterway transport, programme OPD is in progress (modernization of inland vessels). It includes three projects of the total grant 133 million CZK. The subsidies for vessel operators to cover losses caused by insufficient navigation drafts on the lower section of the Elbe river are awaiting approval of the CR government.

5 BENEFITS OF WATERWAY TRANSPORT

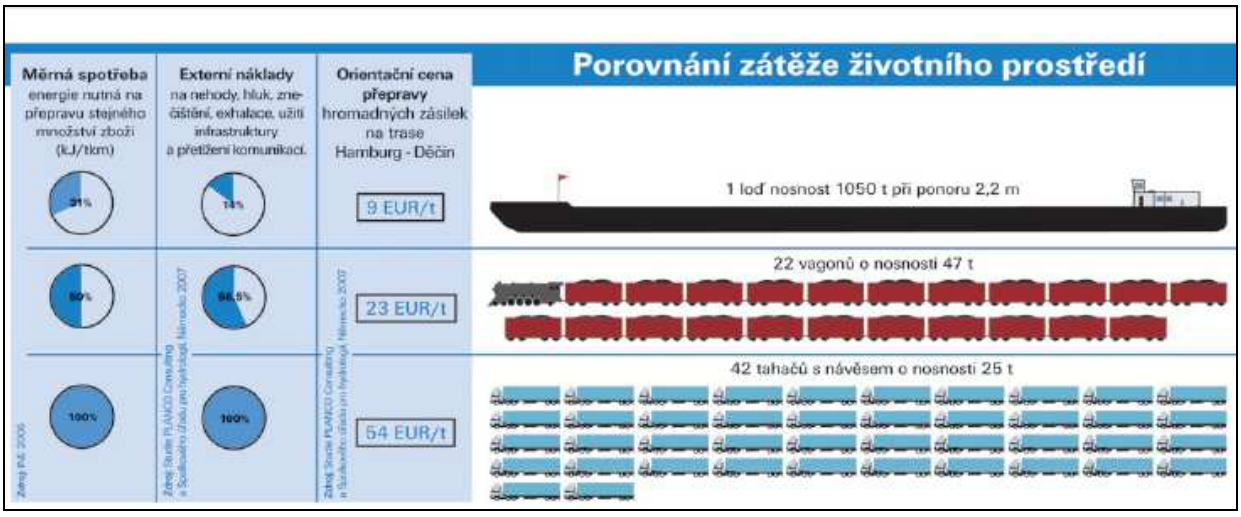
Benefits of waterway transport are mainly low external costs and low transport costs.

According to the study „Verkehrswirtschaftlicher und ökologischer Vergleich der Verkehrsträger Straße, Bahn und Wasserstraße (PLANCO Consulting GmbH, November 2007), the external costs for transporting bulk commodities by waterways are **3,5 times lower than by railways, and 6,3 times lowe**r than by **roads**.

Picture 60 - Total external costs of transport in Western Europe



Picture 61 - Comparison of the impact on the environment

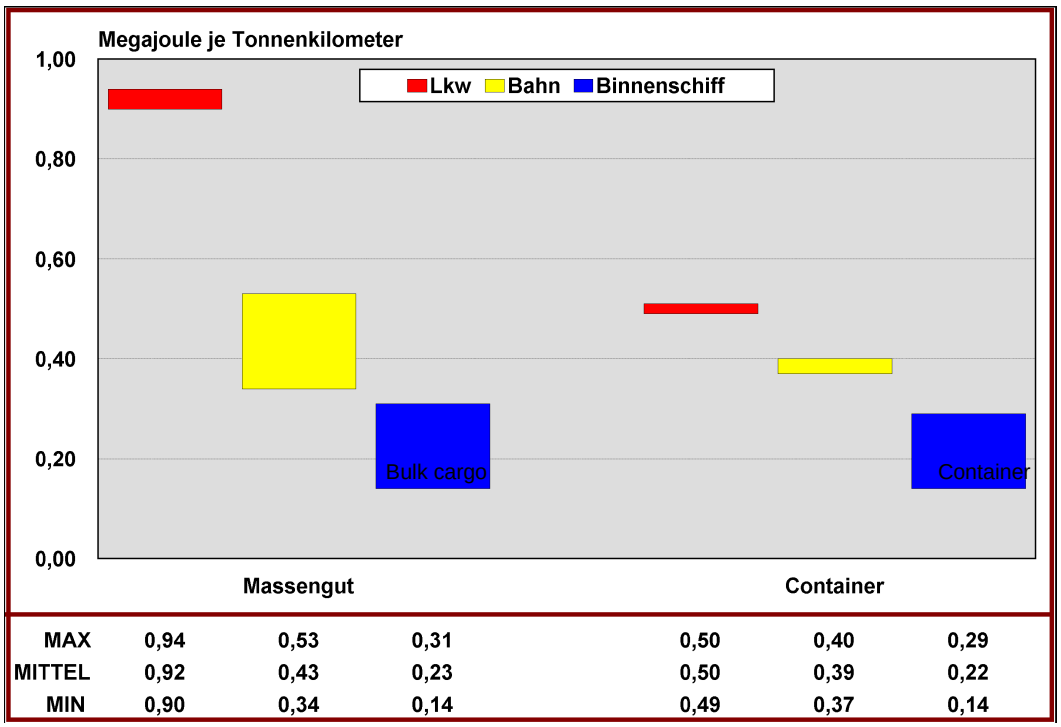


Source: http://www.rvccr.cz/

5.1 ENERGY CONSUMPTION

The energy consumption is a very important factor for assessing the impact of transport and means of transport on the environment. This involves many harmful emissions. The study by PLANCO company describes following energy consumption of the three corresponding transport modes (Megajoules/tons-km).

Picture 62 – Energy consumption according to „Planco“



MAX	0,94	0,53	0,31	0,50	0,40	0,29
MITTEL	0,92	0,43	0,23	0,50	0,39	0,22
MIN	0,90	0,34	0,14	0,49	0,37	0,14

trucks railway river vessels

Source: Verkehrswirtschaftlicher und ökologischer Vergleich der Verkehrsträger Straße, Bahn und Wasserstraße (PLANCO Consulting GmbH, November 2007)

Lately, the CityPlan elaborated several studies comparing road and railway transport prices, costs and energy consumption. The studies are based on data from national (more Czech sources) and foreign statistics (e.g. prepared for the Road Haulage Association by DFF INTERNATIONAL). These findings significantly differ mainly for road transport.

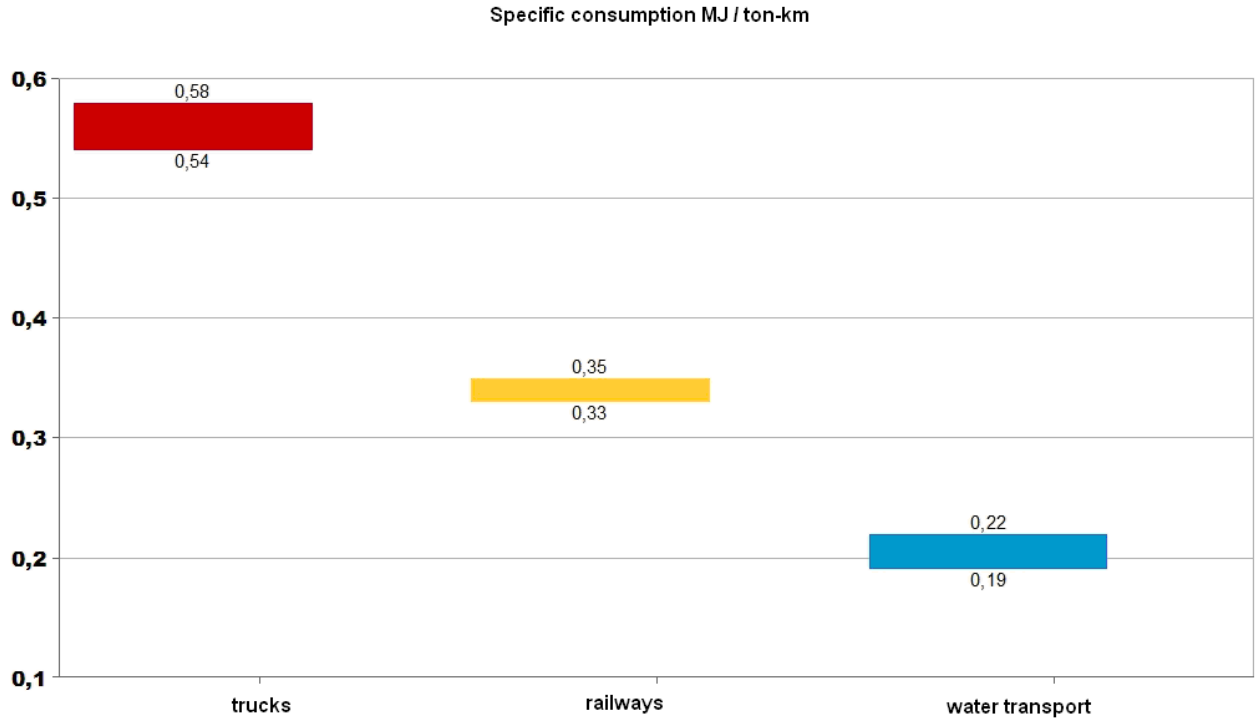
Chart 50 - The energy consumption according to „CityPlan“

Average energy consumption of individual transport modes between Hamburg - Děčín trucks (specific consumption 0,2 l$/kWh)				
transport mode	MJ/Tkm	kWh/Tkm	diesel g/Tkm	litres of diesel/Tkm
road	0.58	0.1611	22.56	0.032
railway	0.3456	0.096	egivalent 13,44	eq. 0,0194
waterway	0.21	0.06	8.4	0.012

Note: According to PLANCO, the diesel consumption of trucks would have to be 130l/100 km.

Source: CityPlan based on the 2008 Transport yearbook, the annual report by ČD (Czech Railways), the study by „PLANCO“ (waterway transport) and other materials

Picture 63 – Energy consumption of individual transport modes



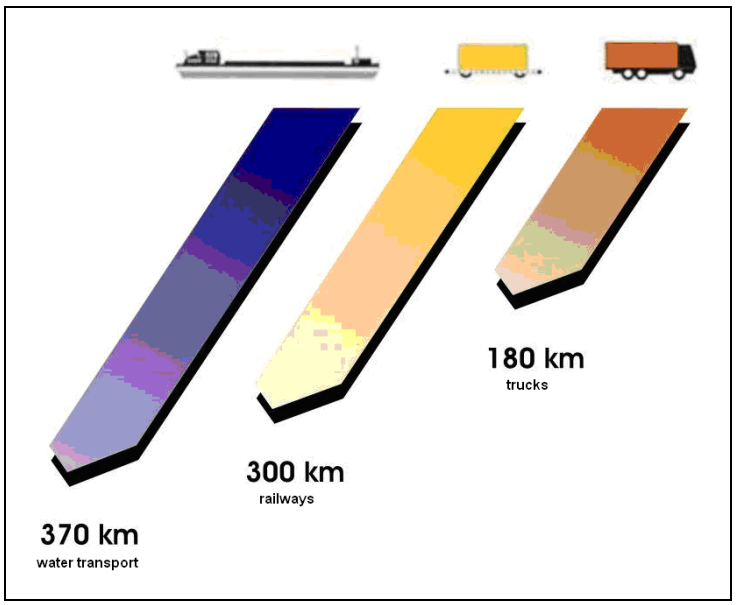
Source: CityPlan, spol. s r.o.

Picture 64 - Transport distances for 1 ton commodities with the same energy consumption

Source: Stand und Potenziale der Elbe-Binneschifffahrt

The two previous images apparently contradict each other. They were adopted from two different studies elaborated by two different processors with different goals. Based on the data from "CityPlan", Picture 64 should be following:

Picture 65 - Transport distances for 1 ton commodities with the same energy consumption according to "CityPlan"



Source: CityPlan, spol. s r.o.

5.2 EMISSIONS

All modes of transport produce emissions by burning fuels. The gravest emissions are carbon dioxide, dust, nitrogen and sulfur oxides. The inland waterway transport has a smallest negative impact on the environment. An average inland waterway vessel with 5 l of fuel transport 1 t of load to the distance of 500 km, while train 333 km and truck 100 km.

Chart 50 - Amount of carbon dioxide emissions (g/ton-km)

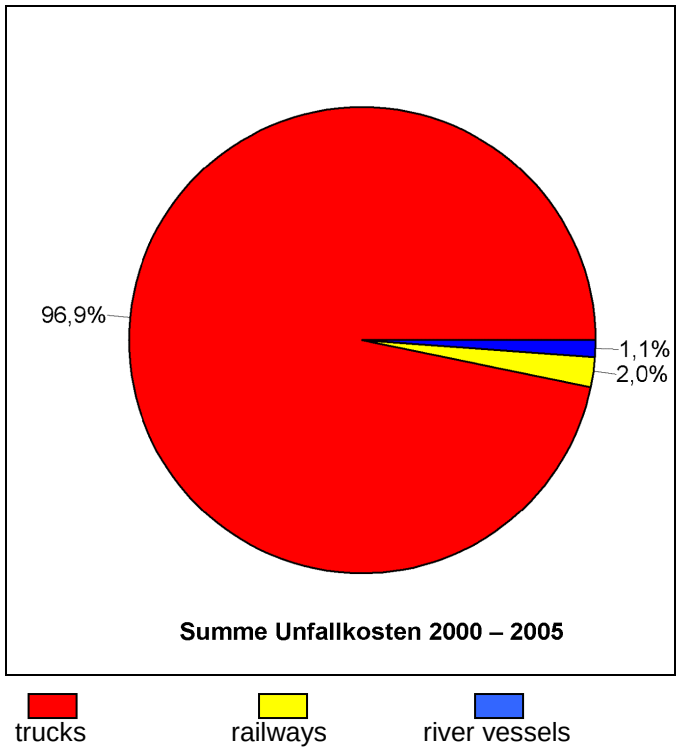
water	33,4
railroad	48,1
road	164 *(Note: according to an older version of the GEMIS model, the later version shows lower figures)*

Source. http://www.rvccr.cz/

5.3 TRANSPORT SAFETY

Analyses and calculations performed by the German company Planco for above mentioned studies proved that waterway cargo transport is the safest transport mode. Between 2000 and 2005, the average number of people killed in waterway cargo transport was 0,04 persons, in railway cargo transport was 0,28 persons and in road freight transport was 2,48 persons. Unfortunately, the original study does not state the basic unit applied for these figures - it is impossible that 2,48 people were killed in truck accidents. The absolute figures are not sufficient, it is necessary to understand the data with their relations. From the same source, total cost of transport accidents between 2000 – 2005 was 96,9 % for road freight transport, 2,0 % for railway cargo transport and 1,1 % for inland waterway transport.

Picture 66 - Total costs of accidents

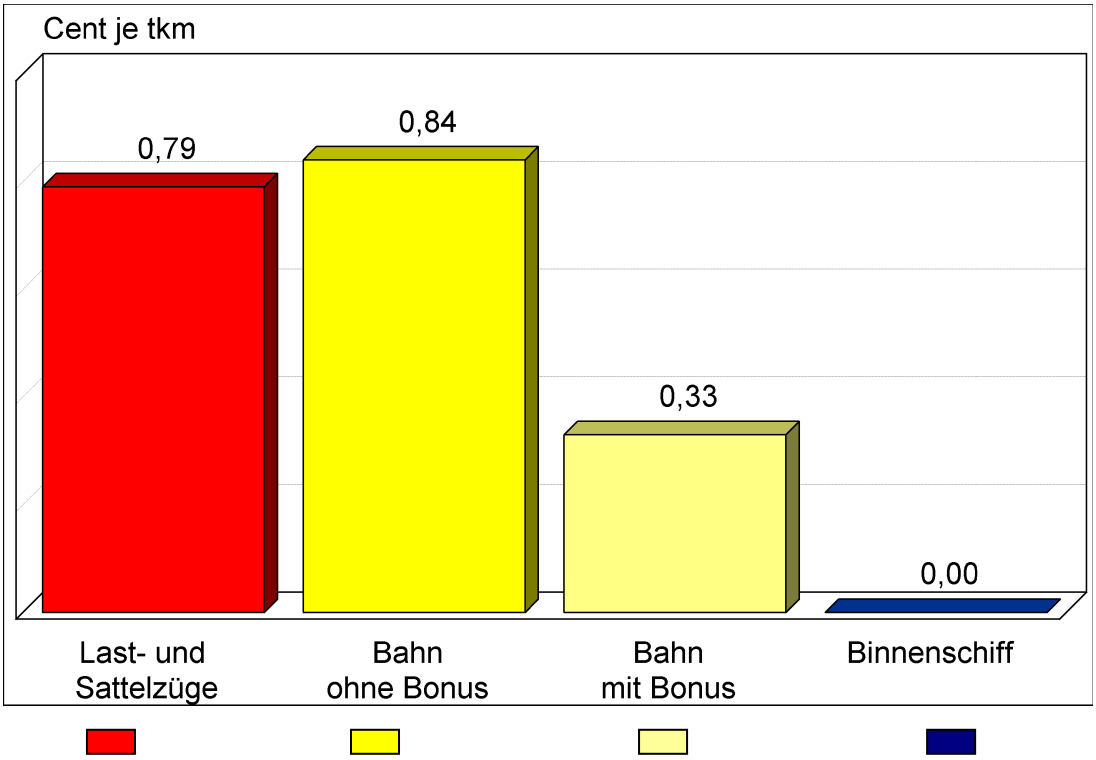


Source: Verkehrswirtschaftlicher und ökologischer Vergleich der Verkehrsträger Straße, Bahn und Wasserstraße (PLANCO Consulting GmbH, November 2007)

5.4 NOISE

Noise level at the origin is for inland waterway transport lower by 10 dB than for railway and road transport. From a subjective perspective, the noise burden is perceived as half. The noise level is also influenced by the width of a transport route. By a railway route, the noise level is higher by 15dB than by a waterway. By a road, the difference is 12dB. Based on related health risks and health care costs, calculation of average external costs for transport noise per tkm was carried out with following results: railway transport – 0,33 cents, road transport – 0,79 cents. A 5dB bonus was calculated for railway transport lowering the noise level theoretically by 40 %. Following graph presents noise values of railway transport with and without the bonus.

Picture 67 - Average external costs of noise generated by transport



Source: Verkehrswirtschaftlicher und ökologischer Vergleich der Verkehrsträger Straße, Bahn und Wasserstraße (PLANCO Consulting GmbH, November 2007)

6 SUMMARY AND CONCLUSIONS

The transport of chemicals includes loading, overloading, unloading and cleaning. The chemicals may be transported by air, railway, road, water (sea, inland waterways) or through pipelines. Comparing individual transport modes (excluding the air transport not relevant for this project), waterway transport offers great benefits, such as high transport capacity (in contrast with limited capacity of road transport), lack of congestions, no fix schedules unlike the railway transport, safety (in terms of transport accidents), environmental friendly operation, low costs for long-distance transport. On the contrary, its disadvantages are the limited network of waterways and dependency on weather conditions, which is relevant for the Czech Republic, or the Elbe waterway on its territory.

The main reason for the unsatisfactory conditions of the waterway transport on the Elbe river is the ecological and economic concern despite its proven environment delicacy. In west European countries with well-developed network of inland waterways, support of the water transport is obvious. Although the CR waterway transport represents only a small part of the industry compared to these countries, it is still the least utilized transport mode within the state with negligible importance. The Elbe waterway represents an important link between the CR and major international ports. It has an irreplaceable role in generating competitive environment for commodity transport, limiting the monopoly position of the railway transport in the Elbe corridor.

The importance of water transport is underestimated, which is apparent from the following list of construction works on rivers in CR:

- 1902-1918 (16 years) 10 navigable locks (navigable locks Hadík and Vraňany were terminated between 1948 – 1989)
- 1918-1939 (21 years) 13 navigable locks + 14 chamber locks along the Baťa channel (1934 -1938)
- 1939-1945 (6 years) 4 navigable locks
- 1945-1948 (3 years) 2 navigable locks
- 1948-1989 (41 years) 10 navigable locks
- 1989-2009 (20 years) 1 navigable lock incompleted (Hněvkovice)

Every inland port without a direct access to the sea is handicapped compared to sea ports. This affects the GDP, where the difference fluctuates between 1 – 5 %. In this respect, the Elbe waterway should be the contrary example. The CR is the only continental country in Europe (with the exception of microstates), which does not have access to the western European waterway network and sea ports on navigable rivers. Parallel can be found in Switzerland - its

vigorous effort to ensure access to the Rhein expressway. Due to the problematic navigability through Ústí nad Labem – German state border, the Elbe – Vltava channel waterway remains almost unutilized, although it meets European standards and its estimated value reaches about 160 billion CZK. The maintenance of this waterway costs tens of millions CZK per year. The non-utilization of such transport route is apparently a political and economic mistake. Another problem is the intermodal competition, which is not regulated by the EU and the "global players" abuse the environmental issues to gain advantages over water and road transport (by funding quasi-ecological organizations preventing construction of hydropower station on the Elbe and completion of the D8 motorway).

Improving navigation conditions of the Elbe river would have positive impact on freight rates of all transport modes, as it is abroad. According to the statement of the Waterway transport association authorities of CR, competition of water, rail and road transport in the Rhein region results in the lowest transport costs, calculated per transported unit. When evaluating benefits of the waterway transport compared to other modes of transport, it is necessary to consider future transport trends. Mainly, it is important to include so-called external costs of railway and road transport, which must be addressed by the EU and the Czech Republic must be prepared to prefer waterway transport accordingly (improving navigation conditions of the problematic section on the Elbe river).

Development of the waterway transport on the Czech side is based on the "Děčín navigable lock project" currently in progress, i.e. the construction of a dam by the city of Děčín as a necessary step to ensure navigation draft of 1,40 m on the critical 40 km section of the Elbe between Ústí nad Labem-German border 345 days per year. The project is currently undergoing the EIA procedure and its realization depends on approval of the Czech Ministry of Environment. It is further necessary to engage in improving the Elbe navigability between Děčín and Střekov.

The Elbe waterway is in the considered section unstable and fully dependent on weather conditions with negative impact on economics of water transport. The transporters are unable to ensure the delivery dates and become excluded from logistic chains. They must undergo the risk to predict future water levels (impossible more than 24 hours in advance) and in case of limited or even impossible navigability, they must ensure delivery by other means of transport. This essentially increases costs of transportation and therefore, transporter cannot offer attractive fright rates. Transporters are aware of this fact and so they prefer more reliable transport modes even at higher transport costs. Furthermore, **the instability of water levels results in inconvenient environment for implementation of new projects within the multimodal transport field.**

Nowadays, conditions for navigation are improved by so-called "waving". The water level in Střekov is artificially increased by releasing of retaining water. The generated waves increase the water level in the range of 3-10 hours according to the navigation needs. It is only a temporary solution, which is causing fluctuations of the water level in Střekov by 1 m.

At the present state, the continuous waterway (with a certain exception of the Střekov – Dolní Žleb section) ends in Chvaletice. To prolong navigability to Pardubice, realization of the navigable lock Přelouč II needs to be approved but it is currently suspended due to not granted exception from the environmental protection of species by the Ministry of Environment despite the confirmative conclusions of the EIA process and the legitimate territorial verdict. Realization of the Přelouč II navigable lock project will extend the Elbe waterway from Hamburg to Pardubice by 870 km and it will provide connection with other modes of transported via the Pardubice port.

Improvement of navigation conditions on the Czech part of the Elbe river would significantly improve position of waterway transport within the transport market. **Possibility to choose from three transport modes for logistics of chemical materials and products would furthermore strengthen the position of the Czech chemical industry in the world market.** Beside the economic aspects, pollution of harmful carbon dioxide and noise would be decreased.

In the future, the D-O-E corridor is supposed to be one of the Czech major waterways within the trans-European waterway network. Realization of this project presents significant all-European importance (shortening the route from Baltic ports to the Danube and further to the Black Sea). Lately, **the importance of the D-O-E corridor is increasing in following aspects:**

- **the trans-European traffic route** connecting the European network of waterways will provide the CR with a quality access to seas and sea ports and will enable construction of multimodal logistic centers and industrial zones,

- **economic development along the D-O-E corridor** (urbanization, agriculture, sports, tourism, electric energy source and moderator, protection from floods, other water utilization, territorial system of ecologic stability)

- **anti-flood actions and water management with** growing importance in the perspective of recent destructive floods

- **energetic aspects** (possibility to cumulate redundant energy)

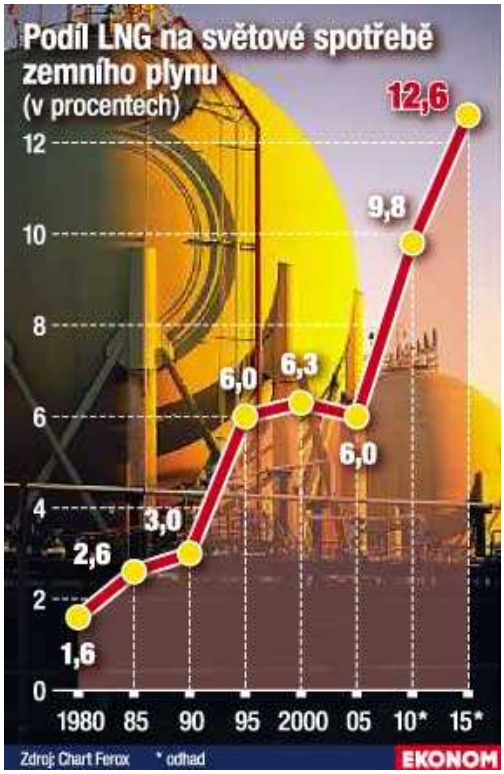
- **European investments** funded by resources for major infrastructure of essential European importance.

By improving navigability on the Elbe river, the transport capacity to North Sea ports can be gained in coming years, which will reach 8,5 million tons/year and which will have essential impact on future predicted capacity deficits of other modes of transport. Other major importance of the Elbe waterway is in transportation of strategic commodities, such as liquefied natural gas (LNG), oil, coal and hydrocarbon emulsions.

Due to German energetic policy (termination of nuclear power stations, replacement by thermal power stations) and the fact that the Czech mining limits will not be extended, black coal may be another alternative, for example for Mělník power station situated on the Elbe.

Every year, approximately 150 million tons of LNG is burnt worldwide and the consumption of LNG is increasing by 13 % every year. According to lobbyists, the waterway import of LNG in the CR might reach 5 % of domestic natural gas consumption. Based on the TV statement of the ČEZ representative, cheap supply of LNG is currently high and is expected to remain the same in near future.

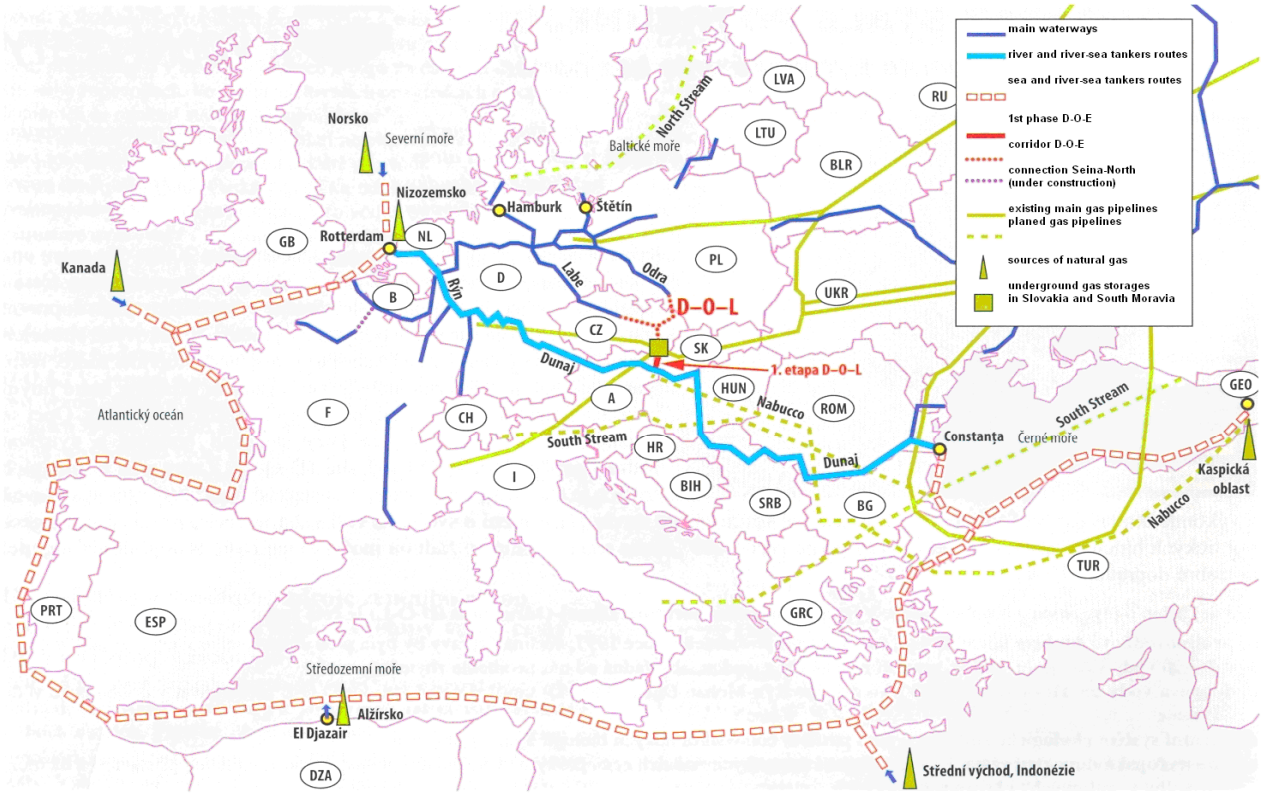
Picture 68 – Share of LNG on the world natural gas consumption (%)



Source: http://www.ekonom.ihned.cz/

Construction of the D-O-E is not a fundamental condition for transporting natural gas by water. After establishing the necessary infrastructure, LNG may be unloaded for example in Mělník, Děčín, Ústí nad Labem and Lovosice. It would be possible to utilize river tankers or containers. The LGN import could help to diversify the delivery and origin of LNG (for various reasons, e.g the January 2009 gas crisis, the June 2010 gas crisis in Belarus).

Picture 69 - The interconnected network of trans-European waterways and current and planned gas lines



Schematická mapa hlavních transevropských vodních cest a plynovodů včetně budovaného průplavu Seina-sever a plánovaného vodního koridoru Dunaj-Odra-Labe. Za povšimnutí stojí plánovaný plynovod Nabucco ze střední Asie do Vídně, který přesně kopíruje existující říčně námořní trasu přes Turecko, Bulharsko, Rumunsko a Maďarsko.

Source: Vodní koridor Dunaj-Odra-Labe: projekt stále potřebnější. Plavba a vodní cesty o.p.s., Praha 2009 (The D-O-E corridor: a more and more useful project. Plavba a vodní cesty o.p.s.,Prague 2009)

The absence of all-year access to the North Sea by inland waterways and complete lack of access to the Danube may cause future traffic and economic problems with fierce price fluctuations of petroleum products and increased demand for cheap and reliable connection of the CR and major European and world loading terminals. Therefore, it is necessary to supervise development of waterways from the long-term strategic perspective.

7 RESOURCES

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