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THE DANUBE-ODER-ELBE NAVIGATION LINK IN THE EUROPEAN AND CZECH TRANSPORT IFRASTRUCTURE

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This paper brings basic information about the history, technical solution and economic importance of the Danube-Oder-Elbe navigation connection. This project can be appreciated in a different way from the point of view of the Czech Republic and from the point of view of European transport policy. It can be realized by stages. Practical preparation of the first stage has been already launched.

Waterways, European transport infrastructure

Short history of the project

The route between the Danube and the Baltic has always been important for European trade. Centuries ago the „Amber Path“ crossed the watershed between the Danube and the Oder rivers at the Moravian Gate, offering the most simple connection between the South and the North of the continent. In the 16th century the first proposals for connecting these rivers by navigation link were discussed. In the year 1700 the Latin tractate of Lothar Vogemont (Dissertatio de utilitate, possibilitate et modo conjunctionis Danubii cum Odera, Vistula & Albi fluvius per canalem navigabilem) was published in Vienna. It was the first proposal suggesting not only the Danube – Oder connection, but also the complete connection Danube-Oder-Elbe with three branches and a junction point near Přerov in central Moravia.

During the 18th and 19th century several more convenient plans for this connection were discussed. However, the increasingly dense railway network on the European continent led to serious discrediting of waterway projects in Europe. The important event that negatively influenced the chances of the Danube-Oder-Elbe connection was the construction of the railway link Vienna – Krakow. The route of this railway (that was the first railway line in the former Austria-Hungary) was parallel with the route of the Danube-Oder connection and offered better conditions for the transportation of goods in comparison to inland river transport, which used only very small barges at the time.

In spite of this unfavourable situation, the final influence on waterway developments was positive. The project of the waterway was consequently modernized in order to allow the operation of larger vessels and barges and to simplify the traffic by a reduction of number of necessary locks. The so-called **Waterways Law** came about as a result of these changes. This

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law was passed in Austria in the year **1901**. It included a construction plan for of modern waterways in the Austro-Hungarian Empire. According to this plan, the Danube-Oder-Elbe Canal was to form the main element of the proposed network that was to be finished within 20 years. However, only a minor part of the programme was realized. World War I and the fall of Austria-Hungary brought a final end to the ambitious plan.

In the Czechoslovak Republic the old Austrian plans were adapted to the new political and economic situation. **On 19th November 1938 an agreement of the Czechoslovak and German governments** about the construction of the Danube-Oder canal was concluded in Berlin. According to this agreement the Danube-Oder link was to be finished within 6 years. However, a very limited extent of the work (the excavation of the canal bed near Vienna and near Koźle) was realized. World War II put an end to all plans again.

In the era of communism the project was rejected because the economy of the Soviet block had other priorities.

The only positive development occurred in the year 1981. In that year a special Group of Rapporteurs of the **Economic Commission for Europe** in Geneva that examined the economic effectiveness and international importance of the Danube-Oder-Elbe link (D-O-E link) finished an extensive study. This study (Document TRANS/SC3/AC.2/R.1) demonstrated very positive economic efficacy of the project. It can be considered to be an **opening of international interest in the construction of the link.**

In April 1993 the **European Communities** published an **Outline Plan of European Inland Waterways Network** containing new projects, necessary for the improvement of the network. In this plan the D-O-E link was included too - although its route did not touch the territory of the European Communities at that time.

Another demonstration of the reputed international importance of the project is the **European Agreement of Main Inland Waterways of International Importance** (AGN) accepted in Geneva on January 19th 1996 that came into operation on June 23rd 1997. This agreement ranks the D-O-E- link among the most important parts of the network, i. e. among the so-called trunk waterways.

As a start of new efforts in this sphere in the Czech Republic, let us mention the **decree of the Czech Government N° 635/1996**. By this decree the government entrusts the Minister of Transport to contact neighbouring states and discuss the realisation of the first stages of the link.

In the year 2003 a **feasibility study** of the waterway Danube - Southern Moravia should be prepared in order to choice the best variant of the route in conformity with the interests of the respective neighbouring states (Czech republic, Austria, Slovakia). In this way, the preparation of the 1st stage of the navigation connection D-O-E will be at last launched.

The actual role of the Danube-Oder-Elbe canal

The present situation brings completely new views that were not duly appreciated or even unknown in the history. One can separately consider the importance of the project for the Czech Republic and for the member countries of the European Union.

The Czech Republic - that shares the decisive and the longest part of the route of this waterway - will be probably a member of European Union in 2004. It will be thus the **only member of the EU without any possibility to make use either of short sea navigation** (it has neither seaports, no inland ports accessible for river-sea going vessels) **or of modern inland navigation** (it has no reliable connection to the integral navigation network of the

EU)[2]. Existing connection using the river Elbe offers only very limited navigation conditions. Navigation breaks caused by insufficient draught are usual on this river and their length amounts to 1 month approximately on average and even to several months in dry years. Ship owners operating on this river have practically no possibility to secure a mere innovation of their fleets. It can be said that even the **bare survival of inland navigation in the Czech Republic depends on a realization of another, modern and reliable navigation connection with the network of EU countries.**

The importance of the project for the European Union as a whole (and for all European countries generally) can be appreciated from the point of view of integrity and homogeneity of navigation system as well as from the point of view of the main role of European inland navigation.

According to the above-mentioned AGN agreement, **the Danube – Oder – Elbe link constitutes a substantial part of the trunk waterways E20** (Hamburg – Magdeburg – Pardubice – Přerov – Danube) and **E30** (Szczecin – Wroclaw – Koźle – Ostrava – Přerov – Danube). It therefore doubtlessly belongs to the most important parts of the future network but – at the same time – to the most inconvenient missing links.

It can offer the most advantageous routes from the Danube countries to the main European seaports (Tab. 1).

Tab. 1

Seaport	Route					
	D-O-E (Oder branch)		D-O-E (Elbe branch)		M-D	
	Length (km)	N° of Locks	Length (km)	N° of locks	Length	N° of locks
Szczecin	**1005**	**45**	1239	56	2107	81
Hamburg	1316	58	**1195**	**52**	1885	75
Bremen	1446	64	**1325**	**58**	1745	79
Rotterdam	1722	63	1601	**57**	**1567**	65

The Tab. 1 shows a relatively low number of locks on the routes using the D-O-E canal as well. This phenomenon can be explained in a following way. All transport ways crossing Europe from the Danube basin to the northern, western and central parts of the continent must overcome the main European watershed that is relatively high – especially on the ridge of the Carpathians, the Bohemian Forest and the Swabian mountains. This barrier is especially serious for waterways, because dealing with great differences of elevation is not simple in this case. An important exception is the so-called **Moravian Gate** (Porta Moravica, Porta Moraviensis) between the towns of Přerov and Ostrava, where the elevation of the terrain is not practically higher than 300 m. This broad saddle offers the most convenient conditions for the route of a waterway between the Danube and the network of waterways in central Europe. The Oder branch of the D-O-E link makes use of this advantageous place and therefore can be

[2] It is necessary to stress that the share of both short sea and inland navigation represents nearly a half of total transport performance (in tkm) in the member states of EU at present. The handicap of the Czech Republic will be therefore serious.

considered for the **simplest alternative for the integration of the European waterway network**. The Elbe branch has to cross the watershed in a more difficult place near Česká Třebová. Nevertheless, this site can be considered for the second most advantageous saddle dividing the Danube basin from the rest of Europe.

A practical illustration of the above-mentioned advantages of the D-O-E link offers the comparison of elevation of water levels in the dividing pools of European waterways. It is included in the following table (Tab. 2):

Tab. 2

Waterway	Elevation of the dividing pool[3]	Notice
Main-Danube canal	406	Existing waterway
D-O-E link – Oder branch	275	
D-O-E link – Elbe branch	390	The variant solution with a long tunnel has a considerably lower dividing pool (elevation 350 m)

The D-O-E project could substantially improve the configuration of existing waterway network and to bring new cargo flows to it. It can contribute not only to a better utilization of the Danube, but also to the increase of transport density on the eastern part of the above mentioned main circle – especially on the rivers Elbe and Oder It must be said that the utilization of European waterways descends at present very conspicuous from the West to the East: the transport density on the lower Rhine exceeds 100 million t/year, on the Mittelland canal between Rhine and Elbe has a value of 10 – 20 million t/year, on the river Elbe upstream of Magdeburg amounts to only 2 million t/year and on the middle Oder does not even reach 1 million t/year. This striking functional asymmetry of the European navigation network is caused on the one hand by the fact that the rivers Elbe and Oder represent only a peripheral „deadlocks" of the network and on the other hand by a very inconvenient navigability of these rivers. The D-O-E connection can solve both mentioned problems at once: it will integrate both rivers into important transcontinental routes and - at the same time – create conditions for a suitable economic efficacy of necessary improvement of their navigability.

Non-transport functions of the waterway

The specific geographical and economical conditions enable important additional non-transport functions of the D-O-E connection. We must mention particularly:

1. The important role in the **water management balance** in the river basins of the rivers Morava, Oder and Elbe.
2. A contribution of the D-O-E canal to **flood protection**, especially in central Moravia, where the flood of July 1997 was disastrous. If the canal had been in operation in 1997, the flood damage in its vicinity would have been negligible.

[3] Metres above the sea level.

3. **Environmental aspects** of the waterway. We can speak of the development of the man-made natural environment, or of the regeneration of landscapes damaged by intensive agriculture and single-purpose civilisation interference etc.
4. Creation of favourable conditions for **sports and recreation activities** (pleasure navigation, biking etc.).
5. **Valorisation of adjoining land** enabling economic and social development.
6. Utilization of **waterpower and other restorable energetic sources.**
7. **Efficient utilisation of natural resources.** The route of the waterway crosses regions with rich resources of sand and gravel. A major part of the excavated material could therefore be utilised in the building industry and the extent of the traditional gravel pits can be reduced.
8. Benefits in the **social sphere**.
9. Benefits in the sphere of **pisciculture and angling**.

General data about the technical solution of the D-O-E waterway

The D-O-E waterway represents no one simple connection and consists of three branches with a nodal point in the vicinity of Přerov in central Moravia.

The **Danube branch** begins near Vienna and is led generally along the river Morava (March) or - in some sections - through the bed of this river up to Přerov. One can therefore speak about a combination of river canalization and lateral canals. The **Oder branch** between Přerov and the navigable Oder crosses the main European watershed at the so-called Moravian Gate. It should be constructed predominantly as a man-made canal; only shorter section of it can be realized by canalization of the river Oder.

The **Elbe branch** between Přerov and Pardubice crosses the main European watershed near Česká Třebová. It will be realized exclusively as a man-made canal.

In conformity with the AGN agreement and with the classification of European waterways, the D-O-E link should have parameters of the **class Vb**. It should therefore be accessible for self-propelled vessels with dimensions 110 x 11.4 m (deadweight up to 2 500 tons with a draught of 2.8 m) and for pushed convoys with dimensions 185 x 11.4 m (corresponding deadweight up to 4 000 tons). The conditions offered to inland navigation are thus similar as in the case of the M-D canal.

Necessary investment costs, stages of the construction

The D-O-E waterway can be realized by several stages. A survey of the stages including estimated investment costs is shown in the following table (Tab. 3).

Prognosis of the future transport density

One can expect that after the opening of the O-D connection about 13 million tons of export and import goods will be transported: 12 million tons via the Danube and 1 million via the Oder river. Additionally a transit of about 5 million tons – in conformity with estimations of older studies[4] - can be expected. These values do not include transport flows using the Elbe branch that cannot be exactly specified at present.

[4] In the above-mentioned document of ECE/UNO three times higher transit was estimated.

Tab. 3[5]

Stage	Section	Length (km)	Number of locks	Estimated cost (mill. €)	Ditto per 1 km
1a	Danube – Břeclav (port)	80	3	650.0	8.1
1b	Koźle (Kędzierzyn can.) – Ostrava (port)	63	4	450.0	7.1
2	Břeclav(port) – Přerov (port)	95	5	780.0	8.2
3	Přerov (port) – Ostrava (port)	94	8	1 500.0	16.0
3	Branch Přerov (junction) - Pňovice[6]	35	0	350.0	10.0
4	Pňovice – Pardubice (Elbe)	125	14	3 250.0	24.8
	Total	**492**	**34**	**6 980.0**	**13.8**

Results of the analysis of the IRR

The economic efficacy of the project has been analysed by means of calculation of the Internal Rate of Return (IRR). Relevant results, includes the Tab. 4. One calculates with min., middle and max. savings in the sphere of transport in order to characterize the sensitivity of results. The calculation has been made only for the Danube-Oder connection (stages 1a - 3). The efficacy of the Elbe branch cannot by analysed owing to the lack of necessary data.

Tab. 4

	Value of the IRR (per cent)		
	Min.	Middle	Max.
Transport benefits only	13.6	19.4	24.7
All benefits	15.8	22.0	27.8

These values are extremely high and no doubt very positive.

Financing of the project

A part of transport benefits can be in the case of man-made waterway realized by means of collection of tolls. It is therefore possible to cover a part of investment costs from private sources and pay back the private capital by means of these tolls. Possible share of the private sector depends on the level of tolls as well a on the interest rate and time of repayment demanded by the investor. Existing analyses show that this share can be quite interesting and can reach 13 – 60 per cent of the total investment costs.

Conclusion

It is not possible to explain in this short paper all aspects concerning this project having indisputably an European scale. Author is therefore prepared to offer any further information during the conference discussion.

[5] This table characterizes only data concerning the most probable variants. All data can be therefore to some extent modified.
[6] This part of the Elbe branch is important for the flood protection in the vicinity of Olomouc, Přerov and other towns.