



Waterway Transport on Europe's Lifeline, the Danube

Impacts, Threats and Opportunities

Part A: River Ecosystem

Part B: Waterway Transport Needs

Executive Summary



Vienna, January 2002

Acknowledgements

The impacts, threats and development opportunities of Danube waterway transport have been assessed from two perspectives:

- **Part A Ecological Assessment** deals with the status of Danube riverine landscape and the impact of waterway transport both in the past and potentially at conflict sites in the future; this part was completed in January 2002.
- **Part B Technical Assessment** examines the status of European inland waterway transport and future market needs, with a focus on the Austrian Danube east of Vienna; this part was completed in April 2001 and slightly updated in January 2002.

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This report can also be obtained at: <http://www.panda.org/europe/freshwater/>

Part A: RIVER ECOSYSTEM

Executive Summary

The Danube and its tributaries host a diverse system of riverine habitats with a rich and unique biodiversity, such as gravel islands, sand cliffs, networks of side-arms, wet meadows, floodplain forests and more-over the Danube delta at the shores to the Black Sea. Biodiversity in the Danube basin is extremely high. However, since the 19th century in particular, in part drastic interventions into the Danube natural system and the surrounding land for flood protection, agriculture, power production and waterway transport have destroyed over 80% of the original floodplain area along the Danube and its main tributaries, thus greatly reducing the biodiversity in the region.

A variety of legal and political instruments have been agreed upon over the last decades to protect and save the remaining natural habitats of national and international importance. There are some 50 large protected areas along the navigable routes of the Danube and its tributaries as remnants of the former extended floodplains. The new EU Water Framework Directive (2000/60/EC) and the Flora Fauna Habitat (92/43/EEC) and Wild Birds Directives (79/409/EEC) with their Natura 2000 network are new binding regulations which aim at banning the further deterioration of riverine landscapes in EU and EU accession countries.

The Danube with its 2,780 km is navigable from Ulm (Germany) over 2,588 km all the way down to the Black Sea. The Danube stretch of 2,414 km between Kelheim (Germany) and Sulina (Romania) is part of the Rhine–Main–Danube link between the North Sea and the Black Sea as an important international waterway route (Pan-European Transport Corridor VII). There are also some other navigable tributaries (especially the Tisza and the Sava rivers) as well as artificial navigable canals (the largest being the Rhine-Main-Danube and the Danube-Black Sea canals).

Waterway transport on the Danube has numerous effects on the riverine ecosystems. Interventions can be differentiated in general in river re-construction (regulation works, impoundment) and in operational activities (maintenance of the navigation channel, emissions from ships, accidents).

River Regulations

River regulation serve to provide stable conditions in the river bed mainly for waterway transport and flood protection. Concerning matters of ecology, however, unbalanced conditions (varying water levels, erosion and sedimentation) secure the existence of a large variety of rare habitats and species. Unregulated rivers boast a richly structured system of main stream, side-arms and oxbows, with a dynamic balance between the new formation and disappearance of river branches, islands and banks. But the major regulations (mean, low and high water regulations realised from the 19th century until today) brought about a fundamental shift from braided and meandering reaches of the river to a single, straightened, navigable channel, stabilised by fixed embankments and lateral groynes. Many former arms of the original, braided system and the meandering bends were cut off. The artificial embankments reduced the hydrological interaction with the floodplain, and the new, high levees cut off parts of the former floodplain to gain protected land for agriculture and settlements.

The immediate effects for the river ecosystem were:

- A loss of natural riparian structures, affecting for example the crucial biotopes of river fish, insects and birds;
- Reduced hydrological connectivity both with the groundwater and with the floodplains;
- Strongly reduced geo-morphological processes in the floodplain, concentration of the erosive forces on the main channel bed;
- Lowering water tables both instream and in the floodplain due to permanent bed incision.

With lateral distance from the main channel, sedimentation and water retention increase, while erosive processes, hydrological connectivity and the flood-pulses decrease. Outside the flood protection dikes these changes are even stronger.

Impounded River Sections and Dams

Among the many factors leading to the degradation of river ecosystems, dams and barrages - built mainly to improve waterway transport and power production - are the main physical intervention, fragmenting and transforming the river continuum with the aquatic and terrestrial habitats, resulting in a range of effects that vary in duration, scale and degree of reversibility. Each dam disrupts the natural flow regime, the key driving factor for downstream aquatic ecosystems. Dams dissect the lateral and longitudinal continuity of the habitats with the organisms living in and near the river. Riverine biotopes separated by such installations suffer from changed abiotic conditions (e.g. morphological and hydrological processes) and contain merely residual or secondary biological communities of the original riverine landscape.

Each weir or dam causes a lasting change in the natural transport of solid matter. Major consequences include:

- A deepening of the river bed downstream the dam with a corresponding lowering of the groundwater level, and
- An increasing tendency of downstream aquatic habitats and wetlands towards draining and drying out.
- Upstream in the impounded section, fine sediments are trapped and start clogging the permeable interphase in the river banks and bed (unless the reservoir was already sealed for the safety of the impounding dikes): On the Danube, large sediment accumulation has been measured in many reservoirs. Over time, this process hampers navigation and makes regular sediment excavation or flushing necessary which both pose new environmental problems.
- Conventional dam construction goes hand in hand with the building of fixed, linear, monotonous structures, eliminating or drowning the natural river banks, bed and islands in deep reservoirs.
- The upstream lateral and vertical water exchange between the river, the groundwater and the floodplain ceases. The former characteristic water fluctuations between inundation and low water periods (causing an exchange of the soil air: the "breathing" of the floodplain) and the species migration (for reproduction, feeding, sheltering) are stopped. The once dynamic habitats with many floodplain specialists turn into monotonous areas dominated by ubiquitous.
- The natural river system capacity for self-purification processes of water pollution is much reduced.

The first 1,000 km of the Danube have been developed into an almost uninterrupted artificial waterway by a chain of 59 hydropower dams. Along the Bavarian (Germany) navigation route, there is only one large free-flowing section left (between Straubing and Vilshofen: 70 km long). In Austria, two free-flowing sections of the Danube have been preserved thus far, in the "Wachau" region (35 km) and between Vienna and Bratislava (47 km). Downstream from the Gabčíkovo hydrodam system in Slovakia, the more than 1,800 km long free-flowing section of the middle and lower Danube up to the Black Sea is interrupted only by the large impounded section of the two hydro dams at the Iron Gate (270 km long).

Dredging and Channel Maintenance

Low-flow river regulation and/or dredging ensures stable and convenient navigational parameters such as waterway depth and width for most of the year.

On the upper and middle reaches of the Danube, lateral shifting of the navigational channel in free-flowing sections is prevented mainly by groynes; regular dredging guarantees minimum draught for ships. Despite some uncertainties, the river Danube is nowadays considered as very convenient for waterway transport.

Along the unregulated stretches of the middle and lower Danube, many fords can still be found, which are being cleared for waterway transport by regular dredging.

Since the construction of dams and the continuous regulation measures have lastingly changed the natural sedimentation regime, dredging further increases the deepening of the riverbed in all free-flowing sections. This progressive erosion of the river bed has become the major problem for preserving the natural state of the free-

flowing sections of the Danube and their aquatic habitats. Their ecological function can be safeguarded in the long term only by means of a sustainable stabilisation of the riverbed. This can be achieved by recharging the missing bed load, as is presently being applied at the Upper Rhine at the Iffezheim dam or at the Danube east of Vienna.

Physical and Mechanical Impacts of Regular Ship Traffic

Ship traffic, specifically the whirling up effect of ship engines, can lead to a re-suspension of finer sediments. This can impair many aquatic organisms which are not adapted to such unnatural conditions. Fine sediments can damage the respiratory organs of the larvae of many water insects. The increased turbidity reduces light penetration which, in turn, decreases the photosynthesis rates of plankton, benthic algae and vascular plant species.

Further, the waves caused by ship traffic can de-root many plant species along river banks that are vital for the reproduction of many fish and for the zoo-benthos. Young fish can be directly affected by waves.

During shipping, various species can also be transported over unnatural distances and beyond natural borders. In this process species may be introduced in areas where they would naturally not exist (e.g. from the Danube into the Rhine system via the Rhine-Main-Danube canal). Such distortion of biodiversity can have various negative effects on local populations.

Chemical and Material Impacts of Regular Ship Traffic

Mineral oil contains a variety of hydrocarbons, which, once in a body of water, may have damaging effects on amphibians, fish or birds. The photosynthesis of plants can also be reduced. Oil slicks affect the oxygen supply of many water organisms and natural biochemical processes (self-purification).

Mineral oil is introduced into navigable waters mainly as bilge oil. This mixture of water, lubricants, engine oil, etc. is - illegally - disposed of into the river. For the Danube river, the regular controlled disposal of bilge oil is an issue still to be improved. Also the direct disposal of wash waters from tank cleaning works is repeatedly being observed.

Tensides are used for the cleaning of ships and frequently end up untreated in waters. Many of the tensides widely used today are not easily degradable and partly have a toxic effect on aquatic organisms.

Other inputs of problem substances into rivers originate from ship paints that contain anti-foulants which serve to prevent the growth of organisms on the hull. Some paints contain biocides which, over time, are dissolved out of the paint matrix and released into the surrounding water.

With regard to energy consumption and the resulting emissions that impact the climate in waterway transport in comparison to other transport modes, the results found differ in their details. Still, all studies have in common that the emission of pollutants as well as energy consumption in regular inland ship traffic can be considered less harmful to the environment than the transport of goods on roads or in the air. In comparison to rail-bound traffic, however, inland waterway transport does not offer, by any means, any significant advantages.

Impacts Caused by Accidents

The probability of accidents in inland waterway transport depends mainly on traffic density, on nautical conditions, the travelling speed, the training and reliability of the crew, the technical state of the ship and the availability of effective and reliable navigation systems.

While the ecological effects of ship accidents vary case by case, the environmental hazards are clearly a serious threat to river ecosystems. In case of a spill or loss of a load, the ecological impacts can pollute large river sections: Mineral oils, oil products and other chemical goods are most risky types of freight commonly transported on ships.

In spite of all the safety measures taken, accidents occur repeatedly in the Danube region. Their prevention would require improved crew training, communication, technical standards and transport restrictions.

Case Studies of Ecological Conflict Areas

While in general waterway transport should be supported as an environment-friendly means of transportation in the Danube region, there are repeated disputes over new waterway transport routes as well as over the ecologically destructive expansion of year-round navigability in existing routes.

The study presents *11 conflict areas* presently under discussion where a strong dispute and opposition over major ecological impairments already exists or will be inevitable in case of realisation. These plans would suggest to impound the last free-flowing sections of the upper Danube and to re-construct river sections of highest ecological value in the middle and lower Danube and on some tributaries:

- Straubing – Vilshofen (D)
- Wachau (A)
- Danube east of Vienna (A)
- Danube-Oder-Elbe Canal (A, SK, CZ, P, D) with the Port at Devinska Nova Ves (SK)
- Gabčíkovo (SK, H)
- Navigation route upstream of Budapest (H, SK)
- Danube between Paks (H) and Beograd (FRY)
- Danube-Sava-Adria Canal (HR, BiH)
- Danube Islands (BG, RO)
- Danube Port of Moldova
- Ukrainian Danube Delta

Conclusions

This comprehensive assessment presented a long and serious list of waterway transport-related interventions and impacts. Due to the fact that this waterway transport mode is usually happening in the core zones of sensitive freshwater ecosystems, the ecological state of most stretches of the Danube is already highly deteriorated.

In addition, new waterway transport projects constitute the largest threat for the few remaining natural areas in this part of Europe. Their future implementation is unrealistic and unacceptable from both the environmental, social, political and economic perspective.

Still, waterway transport was and can be performed in an ecologically acceptable way along the Danube. European transport ministers voted in their *Rotterdam Declaration* (6 September 2001) for the environmental sustainability, safety and efficiency of inland waterway transport. They want to foster the growth of inland waterway transport by improving many institutional co-operation problems (legal and economic conditions, administrative procedures, safety and transport efficiency, logistics and information service, etc.). Rather than further re-engineering our rivers according to certain types of ships, this upgrading of transport intelligence is the opportunity to make waterway transport in Europe competitive and ecologically sustainable.

Part B: WATERWAY TRANSPORT NEEDS

Executive Summary

The objective of the *technical part of the study* was

- to explore the political, economical and technical conditions needed for ecologically compatible waterway transport,
- to document the latest knowledge on this matter and
- to indicate further necessary investigations.

The Danube is considered as part of the whole transport system, embedded in the European inland waterway network along its entire route. Special focus is put on the Danube section east of Vienna up to the Austrian border.

The major issue for conflict between waterway transport and nature conservation regards the development of waterways allowing a greater draught of vessels. The construction of barrages or river engineering measures are among the possible means to achieve this aim.

The situation of European Inland Waterway Transport

European inland waterway transport as a whole is stagnating, losing market shares and facing hard competition, mainly with rail, as regards the carriage of long-distance bulk goods. This development has structural reasons. Bulk goods that have traditionally been carried by ship are characterised by low growth dynamics. The consumption of solid fuels, petroleum products or fertilisers stagnates. The dynamic growth of highly processed parcelled goods with smaller freight sizes and higher requirements as for flexibility and punctual delivery are of benefit to the truck.

On the Danube these problems become even more critical than in the Rhine area, given that only a few industrial sites are situated along the waterway and that for goods carried by ship inter-modal transports are thus rather the rule than an exception. The result is a considerable competitive disadvantage as against truck and rail, offering substantially better covering of space. Moreover, on the Danube in Eastern European countries, the structural change of economy, liberalisation of the transport market and the political crisis in the Balkan area have caused a dramatic fall of transported goods to less than one third of the volume carried in 1980.

Perspectives of Inland Waterway Transport

In this context the question arises on the future perspectives of European inland waterway transport in general and on the future of transport on the Danube in particular. One may generally proceed on the assumption that, to secure its own survival and for eco-political reasons as well, inland waterway transport has to gain goods from the dynamically growing parcelled goods market, i.e. groups of goods that have not traditionally been carried by ship (chemicals, semi-finished and finished goods). This is why container shipping, roll-on / roll-off transport and the use of flexible multi-purpose vessels has to be extended. Technical adaptation and increase of capacity of port terminals, as well as coherent logistic chains are also prerequisite. As for infrastructure, the overhead clearance under bridges is of great importance whereas a maximisation of the navigation channel depth is no priority task.

The example of the Rhine has shown that it is actually possible that waterway transport gains more and more goods that are traditionally not typical for ship: While between 1991 and 1999 the volume of heavy bulk goods decreased by 14 mio. tons (7.3 %), this fall could however be almost compensated, thanks to both an 8.7 mio. tons (+ 44.4 %) increase in chemical products and in semi-finished and finished goods, and a 4.2 mio. tons (+ 20.8 %) increase in agricultural products, foodstuff and animal feed. For the Danube all forecasts show that a mere change of the trade relations after the collapse of the planning economy in Eastern Europe and given the future integration of Eastern Europe in the European Union, a considerable increase in transported goods is to be expected, most of all on the Hungarian, Slovakian, Austrian and Bavarian Danube (+ 20 % up to 100%). In addition, this trend is being strengthened by the opening of the Rhine-Main-Danube canal in 1992.

The question that arises now is which measures are required to carry these eco-politically desirable additional goods. Eco-politically desirable transports are mainly those which are transferred from the truck to the ship, i.e. exactly those goods that have not traditionally been carried by ship, which are, however, of special importance to the future of European inland waterway transport. In this respect one has to consider the fact that over the last twenty years the ecological requirements of the Danube as a natural entity have become a significant criterion for the evaluation of the ecological compatibility of waterway transport.

Alternative Global Concepts for the Development of the Danube Waterway

At present, two fundamental concepts for a further development of the Danube Waterway are under discussion:

- (1) Proceeding from the 1959 Belgrade Danube Convention and the subsequent resolutions passed by the Danube Commission, a final development, mainly based on the construction of a continuous hydropower plant chain, has been drawn up for the Danube waterway. On this occasion the Danube has been split up into an upper section (upstream of Vienna) with a waterway transport channel depth of 27 dm below LNRL (low waterway transport and regulation level), and a lower section (downstream of Vienna) with a channel depth of 35 dm below LNRL. As the implementation of a continuous chain of hydropower plants was revealed to be non-feasible for political reasons (Wachau, Hainburg, Nagymaros), now as much as possible of the initially proposed channel depths are to be obtained by means of river engineering measures.
- (2) Alternative to this a concept has been elaborated which rejects the initially planned maximum development and the splitting of the Danube into two training sections. As a continuous hydropower plant chain is no longer to be constructed, the Danube should now be transformed by means of moderate river engineering measures into a waterway with guaranteed and harmonised waterway transport channel depths. The channel depths should comply with the major, for a long time non-changeable river sections of the whole Rhine-Main-Danube waterway. These changes should be achieved only through interventions that are compatible with floodplain ecology.

This is the background for the discussion regarding the development measures on certain river sections.

Development Standards of the Rhine-Main-Danube Waterway

The decisive river sections of the Rhine-Main-Danube waterway (sections that in the long term will not be developed) as for their waterway transport channel depth are situated on the Rhine, in the Wachau and between Palkovicovo and Budapest (see table 3).

Even if we assume favourable discharge conditions for the Rhine, a harmonisation of the Danube development to about 25 dm waterway transport channel depth below LNRL turns out to be a realistic long-term perspective for the whole RMD waterway. This is why the development of the section east of Vienna to a channel depth of 32 dm has to be looked at and questioned as a strategy in the spirit of the old concept of hydropower dam construction.

Table: Bottlenecks in major river sections along the RMD waterway as for their navigation channel depth.

River section of Rhine and Danube (managing state)	Length in km	ECWL ²⁾ resp. LNRL ³⁾ in dm	Minimum availability in days / year		Maximum development (ECWL resp. LNRL)
			25 dm navigable depth	25 dm draught	
Rhine Koblenz – St. Goar (D)	35	21	315	265	21
Rhine St. Goar – Budenheim (D)	49	19	300	250	21
Rhine Budenheim–Mouth of the Main (D)	9	21	315	265	21
Danube Straubing – Vilshofen (D)	68	20.0	153	40	25
Danube Wachau (A)	26	25	343	300	25
Danube Vienna – Bratislava (A)	50	25	343	300	32
Danube Palkovicovo – Budapest (H)	165	21	252	1)	25
Danube Belene (BG)	15	18.5	280	1)	25
Danube Caragheorge – Fermecatul (RO)	23	14.5	275	1)	25

1) no data available

2) ECWL (Equivalent Control Water Level): minimum depth of the navigable route obtained for 94% of the ice-free period

3) LNRL (low waterway transport and regulation level): corresponds to the water level obtained for 94 % of the ice-free period on the basis of an observation period of 40 years.

Sources: EC, Directorate 1A / B5: *Study to improve waterway transport on the Danube in Bulgaria and Romania*, 1999

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Political and Legal Framework Conditions

The analysis of the existing international agreements also shows that the Austrian Danube responds to all minimum norms recommended and agreed upon. This applies to the 1996 “European Agreement on Main Inland Waterways of International Importance”, which assigned a minimum draught of 25 dm for 240 days / year, as well as to the agreements for Trans-European Networks. It also applies for the 1988 “Recommendations on the determination of standard dimensions for the waterway transport channel as well as on river engineering and other development of the Danube.” In the latter, the Danube Commission recommends a minimum depth of the waterway transportal route of 25 dm below LNRL for the free-flowing stretch east of Vienna.

In a memorandum on waterway transport dated 1992, the development of the Danube section east of Vienna to a channel depth of 32 dm to avoid a “structural bottleneck” on the Austrian Danube was planned by the Federal Government. However, given the fact that no further hydropower plants will be constructed on the Hungarian Danube, these arguments can no longer be raised.

Opposite to the navigable depth, the overhead clearances under bridges constitute numerous bottlenecks that are relevant to container shipping. This applies to four bridges on the Main river and on the Bavarian Danube that do not reach the required minimum height of 5.25 m for two-layer container transports; the same is true for the RMD waterway which does not secure the required overhead clearance for three container layers.

The Need for Measures

The eco-politically important transfer of goods from the truck to the inland waterway vessel primarily regards parcelled goods that have fundamentally different requirements for transport management than do the bulk goods traditionally carried by ship. The transport occurs by means of container or roll-on / roll-off vessels. *The main bottlenecks are not the draughts of the vessels but the overhead*

clearances of bridges. The Austrian Danube already provides good conditions for the traditional transport of bulk goods. Bulk goods with a specific weight of less than 0.8 t/m³ (solid fuels, cereals and foodstuff / animal feed, forestry products, benzine / benzol and chemical products) may be carried on all important types of vessels in operation on the Austrian Danube on about 300 days / year, at a capacity utilisation of 100 %. At the moment, existing vessels are even being reconstructed for this purpose and to increase their cargo capacity. As they can be stored, more heavy goods (ores, metal products, minerals, building materials, fertilisers, heavy oils) may be transported in periods with favourable water levels, thus limiting productivity losses.

Inland waterway transport is presently in a stage of technological change and renewal which considerably increase the prospects for an ecologically compatible river transport. In the 1960's the objective was the development of waterways for larger vessels with deeper draughts carrying few bulk goods (especially on the Danube). Today, new ship-building technologies as well as new information and communication systems offer the possibility of increasing both productivity and interest of inland waterway transport without extending massive interventions in the riverine landscape. A re-orientation to other groups of goods also changes the requirements for inland waterway transport, i.e. more flexible, regular and frequent offers. This in turn demands closed logistics chains, where the emphasis is put on types of vessels showing the following characteristics: multipurpose use, high specialisation, integration in an information and communication network of the waterway, fleet and logistics management; draught is less important in this context.

The improvement of waterway transport systems, faster updates as well as better and more precise forecasts of water levels have about the same effect as an increase in the channel depth of about 10 % (in the area east of Vienna from 25 dm to 27 dm).

The Danube East of Vienna

Proceeding from the assumption that the Wachau, a Natura 2000 area and established UNESCO World Heritage Site, is to be considered as an decisive section with regard to the depth of the waterway transportal channel on the Austrian Danube, one may determine the losses in capacity if the section between Vienna and Bratislava is not developed to a channel depth of more than 25 dm. Only about 10 – 15 % of the traffic volume could benefit from an increasing in the channel depth east of Vienna – or alternatively would be disadvantaged if the development did not occur.

For these transports a total loaded draught may be guaranteed on 200 – 270 days / year (55 – 75 % of the year). As the whole loaded draught is, however, not used for every transport (lighter goods, smaller vessels with a smaller draught, partly loaded vessels at smaller carriage), only a maximum of 5 % of the transport volume would be negatively affected if the maximum development of 32 dm navigable water depth did not occur, compared to the present 25 dm. This would mainly affect the transport of heavy bulk goods, most of which, however, being characterised by their storability. Thus, they may be transported at favourable water levels and with an optimum utilisation of vessel capacities. *One may thus proceed on the assumption that the development of the Austrian Danube section east of Vienna would neither lead to remarkable increases in waterway transports, nor would a non-development lead to a loss of transported goods.*

The decision regarding the development of the waterway transport channel in this section has therefore primarily to be taken according to financial and ecological criteria (stabilisation of the river bed, raising of the water level, extend of the shallow water areas in the riparian zones etc.), provided that the conditions for waterway transport will not worsen compared with today. But the possible widening of the waterway transportal channel from 100 m to 120 m coming along with the stabilisation of the river bed will, by all means, be an improvement for waterway transport.

Conclusions

It is recommended that the Rhine-Main-Danube waterway be considered as a whole and that development standards be harmonised in line with those decisive river stretches which will be over long time stable. This corresponds to a target development standard of 25 dm navigable depth at LNRL (Low Navigation and Regulation Level: a depth that is available for 94% of the ice-free period). This standard allows to manage even ecologically sensitive sections without additional impounding dams, provided that small restrictions are accepted. On the Bavarian Danube, for instance, this would require a reduction of the navigable width at 70 m in some sections. A navigable depth of 25 dm can

also be provided by means of technical river engineering measures along the Hungarian (Palkovicovo - Budapest), the Bulgarian (Belene) and the Romanian (Caragheorghe - Fermecatul) Danube.

For the Austrian Danube the present development standard of 25 dm waterway transport channel depth may then be considered as adequate. This strategy would constitute a turning away from the "maximum development paradigm", orienting on a continuous impoundment chain, and would allow an ecologically compatible design of the waterway.

The measures for improving waterway transport should rather concentrate on better-elaborated waterway transport, information and communication systems. The establishment of an intelligent waterway, fleet and logistics management is prerequisite for the competition for goods that are presently largely carried by truck – "competition" that is both ecologically welcome and evoked by the shipping lobby. An intensified competition with rail for bulk goods by means of expensive and ecologically hardly compatible waterway development measures is appropriate neither from an ecological, nor from a national economics point of view.

The "Comprehensive River Engineering Project" for the development of the Danube east of Vienna is thus to be evaluated primarily from an ecological and financial point of view: However, an extensive comparison of the ecological and financial consequences for different development variants (25 dm, 27 dm, 32 dm waterway transportal depth) is not available at the moment.

An agreement on a moderate development standard of the RMD waterway - orienting on those decisive river stretches which will remain as they are over long time and, at the same time, the optimised use of new information, communication and logistics technologies - offers the chance to link secured and predictable navigation water conditions for waterway transport with an ecologically compatible development of the riverine landscape. This could resolve the conflict between waterway transport being attractive for traffic and environment politics, and the protection goals for river and floodplain ecology.