



for a living planet[®]

The Danube – a lifeline or just a navigation corridor?

WWF Position Paper on inland navigation on the Danube

December 2005

Prepared by: WWF Danube-Carpathian Programme
and WWF Austria

For further information please contact:

Dr. Christine Bratrich or Suzanne Ebert

WWF Danube Carpathian Programme

Mariahilferstrasse 88a/3/9

1070 Vienna, AUSTRIA

Tel.: +43 1 524 54 70

Email: cbratrich@wwfdcp.org, sebert@wwfdcp.org

Website: www.panda.org/dcpo

Ulrich Eichelmann

WWF Austria

Ottakringer Strasse 114-116

1160 Vienna, AUSTRIA

T: +43 1 488 17 0

Email: ulrich.eichelmann@wwf.at

Website: www.wwf.at

Table of Contents

1	Executive Summary	5
2	Introduction.....	9
3	Current	11
3.1	The Danube River – a living system for people	11
3.1.1	Positive aspects	11
3.1.2	Negative aspects.....	12
3.2	Legislative framework.....	12
3.2.1	The Water Framework Directive (WFD)	12
3.2.2	Natura 2000	14
3.2.3	Trans-European Transport Network (TEN-T).....	14
3.2.4	Recommendations of the Danube Commission and European Agreement on Main Inland Waterways of International Importance (AGN)	16
3.2.5	Present position of the inland navigation lobby	16
3.2.6	International Commission for the Protection of the Danube River	16
3.3	Inland navigation on the Danube.....	17
3.3.1	Channel depth.....	17
3.3.2	The Danube fleet.....	18
3.3.3	Type and forecast of goods transported on the Danube	19
3.4	Summary of the current situation.....	21
4	Impacts of inland navigation on the Danube region.....	22
4.1	Underlying assumptions of the inland navigation lobby.....	22
4.2	Environmental impacts	23
4.2.1	Modification of the river channel.....	23
4.2.2	Air emissions.....	24
4.2.3	Water pollution	25
4.2.4	Ship operation	26
4.2.5	Influence on flood events	27
4.2.6	Re-suspension of sediments.....	28
4.2.7	Hydraulic modification of shallow stretches.....	29
4.3	Socio-economic impacts	30

4.3.1	Loss of Ecosystem Functions.....	30
4.3.2	Infrastructure cost recovery.....	30
4.4	Summary of impacts.....	31
5	Current conflicts	32
5.1	The ecological conflict.....	32
5.2	The transport conflict.....	34
5.3	‘Salami tactics’ vs. holistic approach	35
5.4	Summary of conflicts	35
6	WWF Position.....	36
6.1	Looking at the entire river system vs. ‘salami tactics’	36
6.2	Connecting TEN-T with the WFD	37
6.3	Ecological compensation measures	38
6.4	Promoting innovations for ecologically sound inland navigation.....	39
6.4.1	Fleet modernization.....	39
6.4.2	Improve logistics	40
6.5	Promoting inland navigation to successfully compete with road transport..	41
6.6	No new depth requirements to those of existing conventions	42
6.7	Genuine public participation	42
7	Concluding Remarks	43

1 Executive Summary

The Danube is the world's most international river and the second longest river in Europe at 2,780 km. Its entire catchment includes 18 states¹, covering 801,463 sq. km². The Danube River itself travels through 10 states. Four of Europe's capital cities are situated on its banks and millions of people rely directly on the Danube for their livelihood, e.g. drinking water, fisheries, and tourism. It is the very lifeline of Europe.

Current situation

Despite many man-made changes and technological impacts, the Danube still retains much of its outstanding ecological quality today. WWF considers the Danube as one of the Earth's 200 most valuable ecoregions³ with unique biodiversity, a great potential for ecological improvements and additional socio-economic benefits.

At the same time, the Danube is a major waterway in Europe with a large potential for transporting goods. In its efforts to promote this potential, the shipping industry is focusing on further development of the Danube navigation channel through new dams and regulation projects, as well as construction of new artificial waterways. The European Union (EU) plans to support these developments, providing substantial co-funding to inland navigation within the framework of the Trans-European Transport Networks (TEN-T).

TEN-T revised guidelines promote the Danube, "Pan-European Transport Corridor VII", as the "backbone of the east-west waterway connection" providing, together with the Rhine River, a link between the North Sea and Black Sea.

The Danube River is affected by many legislative frameworks, including the EU Water Framework Directive (WFD), depth recommendations from International Conventions, EU TEN-T guidelines, and pending Natura 2000 sites, to name a few. Organizations, such as the International Commission for the Protection of the Danube River and the Danube Commission, have a main interest in the river and its surroundings.

WWF sees a positive effect in the proposed promotion of inland navigation on the Danube. WWF believes, in principle, that it is possible to establish inland navigation that, at the same time, helps improve the ecology and socio-economics along the river. We are at a crossroads: inland navigation and European transport policy could follow the old strategy of canalizing rivers, or a new strategy could be developed which also includes other needs of the Danube with its "multi-use" services. It's a decision between "friend or foe".

¹ Albania, Austria, Bosnia & Herzegovina, Bulgaria, Croatia, Czech Republic, Germany, Hungary, Italy, Macedonia, Moldova, Poland, Romania, Serbia & Montenegro, Slovak Republic, Slovenia, Switzerland, and Ukraine.

² This is the area of the Danube River Basin determined digitally with GIS, according to the International Commission for the Protection of the Danube River (ICPDR). If other sources are consulted this value may vary slightly, because other methods of calculation have been used.

³ WWF. Global 200: Most Valuable Ecoregions, October 2000.

Impacts of inland navigation on the Danube region

According to the Roof Report⁴ of the International Commission for the Protection of the Danube River (see Section 3.2.6), large parts of the Danube (86%) are “at risk” or “possibly at risk” to fail the objectives of the EU WFD (see Section 3.2.1), especially due to hydromorphological alterations. The three main hydromorphological driving forces behind these alterations are: hydropower generation, flood protection and navigation. Of these three activities, navigation has the highest impact on the Danube River.

Dams, flood protection structures, river regulation, dredging and other river maintenance activities have led to increased sediment deficit and to ongoing riverbed erosion, which has had negative effects on the water table in the alluvial floodplains, on biodiversity, and, therefore, on fish production. Sidearm cut-off and dredging carried out to improve the navigation route has also resulted in progressive silting of side channels and oxbows, with significant losses of indigenous species.

Negative impacts from traditional inland navigation threaten the Danube River and its floodplains, which can be valued in monetary units (Euros) based on the ecosystem services they offer⁵:

- Intact river stretches provide great potential for recreation and tourism worth 189 million Euro a year.
- Nutrient retention of Danube floodplains (i.e. water purification) is worth 368 million Euro per year.
- The estimated current and future value of benefits from the Danube floodplains is 7,660 Euro/ha.

Conflicts

In 2003, the EU and the navigation lobby of the Danube countries defined river stretches as ‘bottlenecks’ - shallow river stretches - with a combined length of about 1,000 km where river engineering measures are to be carried out over the next 15 years. However, these bottlenecks also happen to be places with some of the highest ecological value along the Danube – so-called ecological “hot spots” (see Figure 5.3 in the Conflicts section). It is planned to eliminate these bottlenecks by artificial deepening or other hydraulic measures to reach a minimum draught⁶ of 2.5 metres during all seasons along the entire length of the waterway from the North Sea to the Black Sea.

⁴ ICPDR. Danube Basin Analysis (WFD Roof Report 2004): This report responds to reporting obligations of the Water Framework Directive 2000/60/EC regarding the first characterization and analysis of the Danube River Basin District.
http://www.icpdr.org/pls/danubis/docs/FOLDER/HOME/ICPDR/EXPERT_GROUPS/RBMEG/ROOF_REP_2004/FINAL_DOCUMENT/COMPLETE+ROOF+REPORT+-+FINAL+DOCUMENT+-+MINIMUM.PDF

⁵ WWF. Economic Evaluation of Danube Floodplains, March 1995.

⁶ Draught is the depth of the loaded ship beneath the water level without dynamic effects (surge or squat). The total depth of the canal therefore needs to exceed the draught to ensure safe navigation.

One of the root causes of this conflict is not only the sectoral thinking of the individual countries, but also at the EU level. A holistic view/approach for multi-modal transport on the Danube has not yet been developed. Decisions on navigation strategies and actions are taken without due consideration of the subsequent impacts on the natural environment. Impacts on the natural environment are dealt with in a piece-by-piece fashion, based on local projects. This 'salami tactic' approach runs counter to the spirit of the protection of freshwater ecosystems enshrined in the WFD and may result in serious ecological losses.

WWF's Position

WWF supports inland navigation on the Danube as long as plans and projects:

- Have clear positive effects on river ecosystems, basin-wide and locally,
- Are environmentally sustainable, e.g. help reduce climate-relevant transport emissions by using techniques that do not negatively impact the ecology of the river,
- Respect socio-economic needs, and
- Meet all legal requirements.

These goals can be achieved by following these six principles:

1. Basin-wide 'Sustainable Navigation Plan' for the entire Danube

To establish an ecologically sound and sustainable navigation system, an overarching 'Sustainable Navigation Plan' for transport along Corridor VII, including inter-modal aspects, is essential. This plan has to strike a fair balance between ecological, transport, and socio-economic needs. This holistic approach has to be applied before individual projects are planned locally. The tool to reach the Sustainable Navigation Plan is an international Strategic Environmental Assessment (SEA) process. Individual projects can then be developed afterwards based on the Sustainable Navigation Plan.

2. Connect TEN-T Guidelines with the WFD

So far the TEN-T Guidelines and the WFD have been considered separately. In order to establish a Sustainable Navigation Plan and real 'win-win', these both have to be combined leading to sustainable navigation. This includes respect of transport projects to the WFD requirements: no deterioration, improvement of the ecological status, and genuine public participation.

3. Ecological compensation measures

Sometimes new innovation technologies can compensate for existing hydraulic river constructions through restoration and compensation measures for river morphology and ecology. Such measures aim to reactivate natural dynamic processes of the river in a controlled manner. Some examples are reverse engineering of obsolete or superfluous constructions, opening of side channels, removing shore reinforcements and obsolete dams, and restoring river sections that are not problematic for inland navigation. Such compensation measures should be explored, and implemented alongside navigation projects where suitable.

4. Promoting sustainable innovations

The fleet of the Danube countries needs a modernization push. The necessary upgrade of the fleet offers a chance to introduce state-of-the-art technology, e.g. shallow draught inland vessels, reduced emissions, less wastewater produced. Improved methodologies for forecasting water levels should also be explored, along with river information systems, i.e. radar/GPS guidance and traffic control, regular and good soundings of changing navigation channels, adequate and up-to-date marking of the navigation channel (radar reflectors and buoys). In addition, development and improvement of multi-modal logistical infrastructure should be promoted. Adequate harbour centres to transfer goods from ships to other modes of transport (preferably rail) are required for efficient freight transport.

5. Promote goods transport on the Danube to compete with transport on roads

To achieve a genuine reduction of road traffic (a goal of the EU), one option is to promote container transport on the Danube. Container transport could be the essential transport component for successful inland navigation that may also lead to competition with road transport.

6. No new depth requirements to those of existing conventions

No new depth requirements to those of existing conventions should be introduced unless they are based on ecological assessment and prove that they do not have a negative impact on the ecosystem across the whole river basin. Greater riverbed depth means more aggressive intervention in the ecosystem and less room for ecological improvement. In addition, the implementation of the existing depth recommendations in local projects has to be assessed in terms of ecological needs. In regards to the existing recommendations, their ecological impacts have hardly been discussed until now, and it is not clear whether they would meet the WFD objectives.

2 Introduction

The value of the Danube

Despite many man-made changes and technological impacts, the Danube still retains much of its outstanding ecological quality today. WWF considers the Danube basin as one of the Earth's 200 most valuable ecoregions⁷ with unique biodiversity, a great potential for ecological improvements and additional socio-economic benefits (e.g. drinking water, fisheries, and tourism).

The Danube is the world's most international river and the second longest river in Europe at 2,780 km. Its entire catchment includes 18 states⁸, covering 801,463 sq. km⁹. The Danube River itself travels through 10 states. Four of Europe's capital cities are situated on its banks and millions of people rely directly on the Danube for their livelihood, e.g. drinking water, fisheries, and tourism. It is the very lifeline of Europe.

At the same time, the Danube is a major waterway in Europe with a large potential for transporting goods. In its efforts to promote this potential, the shipping industry is focusing on further development of the Danube navigation channel through new dams and regulation projects, as well as construction of new artificial waterways. The European Union (EU) plans to support these developments, providing substantial co-funding to inland navigation within the framework of the Trans-European Transport Networks (TEN-T).

The TEN-T program

The European Commission (EC) developed the TEN-T program to improve territorial cohesion and boost the competitiveness and growth potential of the enlarged EU. The initial EU Decision defining the TEN-T was adopted in 1996 and was revised in 2003-2004.

TEN-T revised guidelines promote the Danube, "Pan-European Transport Corridor VII", as the "backbone of the east-west waterway connection" providing, together with the Rhine River, a link between the North Sea and Black Sea. To be eligible for co-funding, projects for Corridor VII have to aim at considerable improvement of conditions for navigation by removing so-called "bottlenecks", or shallow river stretches. These bottlenecks also happen to be places with some of the highest ecological value along the Danube – so-called ecological "hot spots" (see Figure 5.3 in Section 5.1 on Ecological Conflicts). It is planned to eliminate these bottlenecks by artificial deepening (dredging) to reach a minimum draught¹⁰ of 2.5 metres during all seasons along the entire length of the waterway from the North Sea to the Black Sea.

⁷ WWF Global 200, most valuable ecoregions, October 2000

⁸ Albania, Austria, Bosnia & Herzegovina, Bulgaria, Croatia, Czech Republic, Germany, Hungary, Italy, Macedonia, Moldova, Poland, Romania, Serbia & Montenegro, Slovak Republic, Slovenia, Switzerland, and Ukraine.

⁹ This is the area of the Danube River Basin determined digitally with GIS, according to the International Commission for the Protection of the Danube River (ICPDR). If other sources are consulted this value may vary slightly, because other methods of calculation have been used.

¹⁰ Draught is the depth of the loaded ship beneath the water level without dynamic effects (surge or squat). The total depth of the canal therefore needs to exceed the draught to ensure safe navigation.

The planned minimum draught of 2.5 metres would mean substantial modifications to the river, including artificial deepening of several stretches amounting to 1000 km or more.

Inland navigation on the Danube

Within the next few years, trend-setting decisions for the Danube and for navigation on the Danube have to be made. Everywhere conflicts between navigation development and nature conservation interests have become evident, or are just about to start to become such. In Germany and Austria, strategically important decisions on projects to deepen the riverbed are about to be made. In Hungary and Serbia-Montenegro, the so-called “master plans” for Danube navigation are being prepared. Major projects are under way in Croatia and Romania. In Ukraine, the future of the Danube Delta is threatened by the construction of the Bystroye canal, which although is not part of the TEN-T program, was planned and executed to fit with it and may become part of a future TEN-T extension.

Challenges

While no common development plan for Danube navigation has yet been reached, WWF believes that this is, nevertheless, a realistic possibility. The challenge before us is to shape the Danube navigation policies and contribute to solutions that will promote the competitiveness of inland navigation **and** improvement of the Danube's ecological status.

This paper presents the position of the WWF on the issues involved. It is meant to encourage discussion.

3 Current

3.1 The Danube River – a living system for people

3.1.1 Positive aspects

The Danube is still a pulsing, living river with unique ecosystems, with different islands, riverine forest, lakes, sand cliffs, sidearms, reed beds, oxbows and wet meadows. The biodiversity is extremely high. An estimated 5,000 different animal species and over 600 different plant species that live in the Austrian Danube Floodplains National Park alone give an idea of the tremendous variety along the river. Around 100 fish species have been recorded in the Danube, and for some species, the Danube and its wetlands constitutes their main habitat. For example, the only known natural spawning ground in Europe of the Beluga sturgeon (*Huso huso*) is in the Lower Danube in Romania. The majority of the world's population of White Pelican (*Pelecanus onocrotalus*) and Pygmy cormorant (*Phalacrocorax pygmeus*) nest here, and about 90% of the world's population of threatened Red-breasted goose (*Branta ruficollis*) winters in the Danube Delta¹¹.

So far, the Danube includes many protected areas, such as national parks, Ramsar sites, and UNESCO biosphere reserves, in addition to UNESCO two world heritage sites.

The Danube River and its floodplains can also be valued in monetary units (Euros) based on the ecosystem services they offer¹²:

- Intact river stretches provide great potential for recreation and tourism worth 189 million Euro a year.
- Nutrient retention of Danube floodplains (i.e. water purification) is worth 368 million Euro per year.
- The estimated current and future value of benefits from the Danube floodplains is 7,660 Euro/ha.

For more information on the value of ecosystems, see Section 4.3.1.

The Danube has the potential to become one of the main waterways and transport axes of Europe, as is the intention of TEN-T. This could bring prosperity to the people that live in the river basin. Prosperity, however, is more than earning capacity and money alone. People still want to live in a clean and healthy environment, they want to swim with their children in a clean river, and they want to share nature with native wild animals and plants.

¹¹ TACIS. Management objectives for biodiversity - conservation and sustainable development, 2004.

¹² WWF. Economic Evaluation of Danube Floodplains, March 1995.

3.1.2 Negative aspects

Despite these facts, the Danube and its river ecosystem faces many problems. According to the Roof Report¹³ of the International Commission for the Protection of the Danube River (see Section 3.2.6), large parts of the Danube (86%) are “at risk” or “possibly at risk” to fail the objectives of the EU WFD (see Section 3.2.1), especially due to hydromorphological alterations. The three main hydromorphological driving forces behind these alterations are: hydropower generation, flood protection and navigation. Of these three activities, navigation has the highest impact on the Danube River.

The upper part of the Danube (up to Vienna) is an almost uninterrupted cascade of reservoirs with only few remaining small stretches of high ecological value. Since the 1950s, about 15-20,000 km² of Danube floodplains have been cut off from the river by engineering works¹⁴. Fortunately, the middle and lower sections of the river are still bordered by extensive tracts of outstanding natural quality.

Dams, flood protection structures, river regulation, dredging and other river maintenance activities have led to increased sediment deficit and to ongoing riverbed erosion, which has had negative effects on the water table in the alluvial floodplains, on biodiversity, and, therefore, on fish production. Sidearm cut-off and dredging carried out to improve the navigation route has also resulted in progressive silting of side channels and oxbows, with significant losses of indigenous species.

Despite the above-mentioned impacts, the ecological status of the Danube could be characterised as ‘still outstanding in Europe’, but still faces many problems with a great potential for restoration.

3.2 Legislative framework

The following legal frameworks affect the Danube River and its ecosystem.

3.2.1 The Water Framework Directive (WFD)

In 2000, the EU adopted one of the most progressive pieces of environmental legislation today. This is the Water Framework Directive (WFD)¹⁵, which lays down the principles for EU-wide water policy, requiring the achievement of “good ecological and chemical status” in natural water bodies by 2015 as its top priority. The WFD's three main pillars are:

¹³ ICPDR. Danube Basin Analysis (WFD Roof Report 2004): This report responds to reporting obligations of the Water Framework Directive 2000/60/EC regarding the first characterization and analysis of the Danube River Basin District.
http://www.icpdr.org/pls/danubis/docs/FOLDER/HOME/ICPDR/EXPERT_GROUPS/RBMEG/ROOF_REP_2004/FINAL_DOCUMENT/COMPLETE+ROOF+REPORT+-+FINAL+DOCUMENT+-+MINIMUM.PDF

¹⁴ Konold, W. & W. Schütz, Die Donau - Gefährdungen eines internationalen Flusses. Lozán, J.L. & H. Krausch (Hrsg.): Warnsignale aus Flüssen und Ästuaren: 28-38, 1996.

¹⁵ The EU Water Framework Directive - integrated river basin management for Europe,
http://europa.eu.int/comm/environment/water/water-framework/index_en.html

- The prohibition of any measures that would cause deterioration from current status unless very strict socio-economic and ecological criteria are met,
- The requirement to work towards improvement of the ecological status of European waters, and
- The requirement for real citizen/public participation in decision-making.

The WFD (Articles 1, 4.1 [a] and [b]) obliges Member States to refrain from any activity that would lower the ecological, chemical or quantitative status of any water body. This not only includes the new WFD standards, but also all existing water standards set by other EU legislation. Therefore, the WFD provides a clear test case for coherence between EU environmental legislation and other EU policies and funding mechanisms.

The following are highlights of the WFD:

- The first Article of the WFD states that the purpose of the Directive is to prevent further deterioration of the current status of aquatic systems. The final goal of the Directive is for all waters to reach “good ecological and chemical status” by 2015 (Article 4).
- Article 6 requires that a register of protected areas within the river basin district (RBD) be established. This includes Natura 2000 sites. The Danube River is considered to be a single RBD and, therefore, requires a single international river basin management plan, which should identify and ensure the protection of any sites qualifying under the Birds or Habitat Directives (that are directly dependent on water).
- Article 14 requires EU countries “to encourage the active involvement of all interested parties in the implementation of this Directive”. The plans for the TEN-T, despite the fact that at present they are far from meeting the requirements of the WFD, have not been developed through any level of public consultation or environmental impact assessment.
- Existing “inland waterways” could be designated as “heavily modified water bodies” (relevant stretches) and have to achieve “good ecological potential” which may or may not be less ambitious than “good ecological status”, depending on the water body affected. They also have to achieve “good chemical status” (Article 4.3). However, some of the Directive’s exemptions may still apply.
- New “inland waterway” construction will require an exemption from the Directive’s “no deterioration of current status” and achieving “good ecological and chemical status” objectives (Article 4.7).
- Indeed, in order to avoid a conflict between carrying out this policy and meeting important societal demands, the WFD allows some exceptions (via implementation of paragraph 7 of Article 4) to the ‘no-deterioration’ objective, provided that the following conditions are met:
 - If there is no better environmental alternative.

- If the activity is a new physical modification or groundwater abstraction, or presents new sustainable human development.
- If the activity is of overriding public interest or delivers human health or safety benefits, which outweigh the environmental benefits.
- If all practicable measures are taken to mitigate its effect

Strict tests are detailed in the above-mentioned paragraph of the Directive and some relevant guidance is given in the 14 guidance documents from the European WFD Common Implementation Strategy. However, some criteria to make this possible have not been defined, such as “overriding public interest”.

As well as these conditions, the WFD (Article 4.8 and 4.9) requires that if meeting these demands causes the situation to deteriorate, it must not make it impossible to achieve the WFD objectives in other water bodies, or contradict EU environmental policies, or lower the environmental protection set out in other EU legislation, such as the Habitats Directive.

3.2.2 Natura 2000

Natura 2000 is the centrepiece of EU nature & biodiversity policy. It is an EU-wide network of nature protection areas established under the 1979 Birds Directive and the 1992 Habitats Directive. The aim of the network is to assure the long-term survival of Europe's most valuable and threatened species and habitats. “A favourable conservation status” for all species and habitats has to be met. There is not necessarily a prohibition on new activities or developments within Natura 2000 sites. However, these need to be judged on a case-by-case basis. There is a clear procedure in the Habitats Directive for assessment of development proposals that are likely to have impact on designated sites (Article 6).

The selection of Natura 2000 sites is based exclusively on scientific criteria, such as the size and density of populations of target species and the ecological quality and area of target habitat types present in the site. The Directives do not lay down rules regarding the consultation process to be followed in selecting the sites. This is for the Member States to determine.

In order to ensure that Member States fully comply with the Natura 2000 legal requirements, especially those involving EU funded programmes, the EC stated that a failure to present lists of Natura 2000 sites could result in the suspension of payments under certain EU Structural Funds programmes. The threat of suspension of payments from such programs was a precautionary measure to ensure that EU funded programs would not contribute to irreparable damage to sites before they have been proposed officially for the protection under the Natura 2000 regime.

3.2.3 Trans-European Transport Network (TEN-T)

The European Commission developed the TEN-T program to improve territorial cohesion and boost competitiveness and growth potential of the enlarged EU. The initial EU Decision defining the TEN-T was adopted in 1996 (Decision No.

1692/96/EC and Regulation 2236/95)¹⁶ and TEN-T implementation guidelines were revised in 2003-2004. The content of this revision included:

- New priority projects were identified.
- International cooperation was reinforced.
- New financial rules for transborder projects were developed.

The TEN-T financial rules were also revised in 2003-2004. The European Union offers to support relevant projects by co-financing possibly up to 50% of total project costs. The total costs for the TEN-T network is estimated at approximately 600 billion EUR¹⁷.

TEN-T revised guidelines promote the Danube, “Pan-European Transport Corridor VII”, as the “backbone of the east-west waterway connection” providing, together with the Rhine River, a link between the North Sea and Black Sea. To be eligible for co-funding, projects for Corridor VII have to aim at considerable improvement of conditions for navigation by removing so-called “bottlenecks”, or shallow river stretches. There is no definition of how this improvement is to be achieved.

The TEN-T revised guidelines designated 30 priority projects of particular importance for the EU. The Corridor VII inland waterway axis is listed as one of these projects, with the following five bottlenecks considered as priorities for development:

- Bottlenecks in Romania and Bulgaria
- Palkovicovo-Mohács
- Vienna-Bratislava cross-border section
- Vilshofen-Straubing
- Rhine-Meuse with the lock of Lanaye as cross-border section (this will not directly affect the Danube River)

These “bottlenecks” are planned to be eliminated by artificial deepening and/or other hydraulic measures to reach a minimum draught¹⁸ of 2.5 metres during all seasons along the entire length of the waterway from the North Sea to the Black Sea. The planned minimum draught of 2.5 metres would mean substantial modifications to the river including artificially deepening several stretches amounting to of 1000 km or more. These bottlenecks also happen to be places with some of the highest ecological value along the Danube – the so-called ecological ‘hot spots’ (see Figure 5.3 in the “Conflicts” section). A large number of important protected sites and an

¹⁶ TEN-T Guidelines, http://europa.eu.int/comm/ten/transport/guidelines/index_en.htm.

¹⁷ European Commission, DG for Energy and Transport. Memo on the Trans-European Network: The new priority projects and financial rules, updated 21 June 2005, http://europa.eu.int/comm/ten/transport/agency/doc/2005_07_20_memo_en.pdf

¹⁸ Draught is the depth of the loaded ship beneath the water level without dynamic effects (surge or squat). The total depth of the canal therefore needs to exceed the draught to ensure safe navigation.

enormous share of designated, or potential, Natura 2000 sites provide clear proof of this fact¹⁹.

3.2.4 Recommendations of the Danube Commission and European Agreement on Main Inland Waterways of International Importance (AGN)

Provisions concerning navigation on the Danube waterway are specified in two international agreements: the recommendations of the Danube Commission²⁰ (1988) and the European Agreement on Main Inland Waterways of International Importance (AGN)²¹. The AGN was drafted by UNECE in 1996 and ratified by the European Union in 2001.

Their position on inland navigation on the Danube are summarised in the table below:

Danube Commission 1988	Varying depth and width, depending on water discharge and riverbed conditions. Between Vienna and Bratislava: 2.50 m navigable channel depth on 343 days/year (at LNRL: Low Navigation and Regulation Level)
AGN 1996	2.50 m draught on 240 days/year along the whole river

3.2.5 Present position of the inland navigation lobby

The international inland navigation lobby has defined the deepening of the Danube navigation channel to ensure 2.50 m draught as its priority objective. This corresponds to a channel depth of 2.70 m to 2.80 m, depending on the riverbed type at Low Navigation and Regulation Levels. This would require more extensive engineering and additional deepening of the channel, resulting in more interference with the river's ecosystems and higher costs. The bottlenecks seen in Figure 5.1 have been determined in accordance with these depth targets. In effect, the transport lobby is pursuing the old strategy of "deeper and deeper".

The above-mentioned depth demand was eventually mentioned in the Report by the Van Miert High Level Group on the Trans-European Transport Network (2003), which proposes 2.50 m draught on 343 days/year (LNRL) for the entire Danube

3.2.6 International Commission for the Protection of the Danube River

The International Commission for the Protection of the Danube River (ICPDR) was created to make the Danube River Protection Convention a possible tool. Since its establishment, the ICPDR has grown into one of the largest and most active international bodies on river basin management in Europe. Its mission is to promote and coordinate sustainable water management, including conservation, improvement

¹⁹ NGO Consortium (including WWF). Conflict areas between the TEN-T and Nature Conservation: Case Studies, July 2003, <http://assets.panda.org/downloads/casestudiesfinalversion.pdf>.

²⁰ Danube Commission. Empfehlungen bezüglich der Aufstellung von Regelmaßen für die Schifffahrtnisse sowie den wasserbaulichen und sonstigen Ausbau der Donau, Budapest, 1988.

²¹ European Commission, Inland Transport Committee. European Agreement on Main Inland Waterways of International Importance (AGN), 1996. <http://www.unece.org/trans/conventn/agn.pdf>

and rational use of water for the benefit of the Danube River Basin countries and inhabitants and citizens.

The ICPDR pursues its mission by making recommendations for the improvement of water quality, developing mechanisms for flood and accident control, agreeing on standards for emissions and by assuring that these are reflected in the national legislation of contracting parties (countries that are members of the ICPDR). The ICPDR is formed by the contracting parties' national delegations, which are made up of ministerial representatives, technical experts, and representatives of civil society and the scientific community.

One of its main roles is to act as coordinator to promote the implementation of the WFD in the entire Danube basin.

3.3 Inland navigation on the Danube

3.3.1 Channel depth

Despite numerous and often large efforts, the 10 Danube states have, without exception, failed to meet the recommendations of the Danube Commission for navigation improvements including permanent dredging, river development, canal engineering and damming. In other words, ecological damage has been inflicted on the Danube for more than 40 years without ever achieving internationally agreed navigability targets. On the other hand, the Rhine River has shallow stretches similar to those of the Danube, but this has not been an immediate obstacle for navigation. Thus, transport volumes on the Rhine are 10 to 20 times larger than on the Danube. This is important to note since one of the main arguments made for deepening the Danube is to create better navigation conditions for ships, which would allegedly increase transport volumes.

Table 3.1: Selected shallow stretches on the Rhine-Main-Danube waterway

Section	Length (km)	ECWL ¹ /LNRL ² (m)	
Rhine Koblenz-St. Goar (DE)	35	2.1	1) ECWL (Equivalent Control Water Level): Minimum water depth found in the navigation channel during 94% of the ice-free period.
Rhine St. Goar - Budenheim (DE)	49	1.9	
Rhine Budenheim - Main Mündung (DE)	9	2.1	
Danube Straubing - Vilshofen (DE)	68	1.8	2) LNRL (Low Navigation and Regulation Level): Minimum water depth of the navigation channel during 94% of the ice-free period, based on a 40-year observation interval.
Danube Wachau (AT)	26	2.2	
Danube Vienna - Bratislava (AT)	50	2.2	
Danube Palkovicovo - Budapest (HU)	165	2.1	
Danube Belene (BG)	15	1.85	
Danube Caragheorghe - Fermecatul (RO)	23	1.45	

Sources: EC, Directorate 1A/B5: Study to improve waterway transport on the Danube in Bulgaria and Romania, 1999; ÖIR: Beiträge zur Planung des Nationalparks Donauauen, Vienna, 1995; Wösendorfer H.: Vienna, 1992, 2001 (oral information); Kleemeier H.: Beiträge zum Arbeitskreis "Die Wasserstrasse Donau". In: ÖIR: Europäische Binnenschifffahrt – Perspektiven im erweiterten Europa, Vienna, 1998.

3.3.2 The Danube fleet

As of the end of 2004, about 1,500 self-propelled vessels were operating on the Danube, roughly 500 of which were cargo ships, and 1,000 were pusher boats and tugboats²². The following table lists the number of vessels by country:

Table 3.2: Danube fleet by country (cargo and passenger ships)

Country	Number of vessels
Austria	24
Belgium	50
Bulgaria	20
Croatia	15
Czech Republic	10
France	20
Germany	230
Hungary	30
Malta	2
Netherlands	500
Romania	300
Serbia	120
Slovakia	35
Switzerland	20
Ukraine	130
Total	1506

Source: Steindl, O. Konsulent Kapitän, 2005.

As opposed to goods transport (see Section 3.3.3 below), passenger transport on the Danube has continued to grow in recent years. At present, about 120 passenger ships (cruisers, day excursion boats) and 10 hydrofoil boats operate on the Danube (Steindl 2005). In 2005, 97 cruise ships were registered on the Danube, 13 more than in 2004, which equals a growth of about 15.4% in one year²³.

Table 3.3: Passenger transport on the Danube, 1975 to 2002

	1975	1985	1995	2000	2002
Passenger transport on the Danube – number of journeys (only Austrian carriers on the Austrian river section):	962	1,576	*	2,425	2,450
Cross-border passengers (in 1,000):	*	65	76	116	148

Source: Statistik Austria - Statistisches Jahrbuch 2005

** no figures available*

With most vessels built between 1965 and 1980, the Danube fleet is characterized by a relatively high median age²⁴. Consequently, energy consumption and emission rates are high, and wastewater disposal problems exist. Most vessels do not meet modern technological standards.

²² Steindl, O. Konsulent Kapitän. Im Auftrag des WWF-AT, 2005.

²³ FVW International, The Magazine for the German Travel and Tourism Industry, 2005.

²⁴ Steindl, O. Konsulent Kapitän. Im Auftrag des WWF-AT, 2005.

3.3.3 Type and forecast of goods transported on the Danube

Inland navigation is losing market shares to other transport modes in the European Union, and the volume of goods shipped on the Danube is declining or stable. According to Statistik Austria²⁵, decline of volumes transported by inland navigation on the Austrian river section is mainly due to the market decreases in the recent (2000-2004) volumes of goods in the “mineral raw materials and products and construction materials” category (-98.8%).

Statistik Austria explains that this has been caused by a reduction of gravel extraction in the Danube. Note that gravel dredged out to maintain inland navigation conditions is also counted as tonnage of goods transported on the Danube. This apparent paradox should be considered when planning further development of inland navigation on the Danube.

Table 3.4: Development of transport volumes on the Danube in Austria

Year	Volume in million t	Capacity in billion t-km
1980	7.6	7.2
1990	8.1	9.0
1995	8.8	8.2
2000	11.0	8.6
2004	9.0	8.8

Source: Statistik Austria 2005

Table 3.5: Development of transport volumes on the Danube in Eastern Europe (in million t)

Country	1980	1990	1998	2002
Slovakia	3,750	5,510	4,985	3,103
Hungary	11,098	13,223	3,706	3,452
Yugoslavia	15,768	10,628	4,519	3,759
Bulgaria	9,292	3,537	905	1,794
Romania	18,772	10,264	4,592	9,284
Ukraine	19,507	19,847	6,090	6,188
Total	78,187	63,009	24,797	29,582

Source: UNECE 2002, Annual Bulletin of Transport Statistics.

Inland navigation on the Danube predominantly transports bulk goods²⁶ over long distances. On the Danube, where bulk goods make up 95% to 100% of the cargo²⁷, the average shipping distance is 800 km to 900 km.

²⁵ Statistik Austria, 09 March 2005: <http://www.statistik.at/cgi-bin/presstext.pl?INDEX=2005003792>

²⁶ Bulk goods are unpacked (un-bundled or un-bound) and are of the same or a similar kind or nature (homogeneous). These cargos are usually dropped or poured, with a spout or shovel bucket, as a liquid or solid, into a bulk carriers hold, train car, or truck-trailer body. Bulk cargos are classified as liquid or dry.

²⁷ Hiess, H. Positionen und Argumentarium zu einer ökologisch verträglichen Binnenschifffahrt in Europa, Rosinak & Partner Ziviltechniker GmbH, 2004.

In view of the rather stagnating (or standstill) situation of Danube navigation, forecasts are an important argument that could justify increased investment in the waterway. Many studies that discuss the projected impacts of inland navigation suggest that substantial volumes of goods may be shifted from road to inland navigation. However, none of these studies explain in sufficient detail what their underlying assumptions are and which models have been used to make these projections. Therefore, review and checking of results is not possible.

In contrast, the transport of goods on the Rhine River increased between 1991-1999 from 4.1 million tonnes up to 10.1 million tonnes (see Figure 3.1). This is mainly due to the fact that functioning container transport has been established on the Rhine over the last 20 years, which is not the case for the Danube. Container transport predominantly changed the type of goods transported from bulk to semi-finished. To date, all attempts to establish a system of scheduled container transports on the Danube have failed (most recently, an attempt to establish such services on the Regensburg-Budapest route). This is because there is less market to ship semi-finished goods than bulk goods on the Danube.

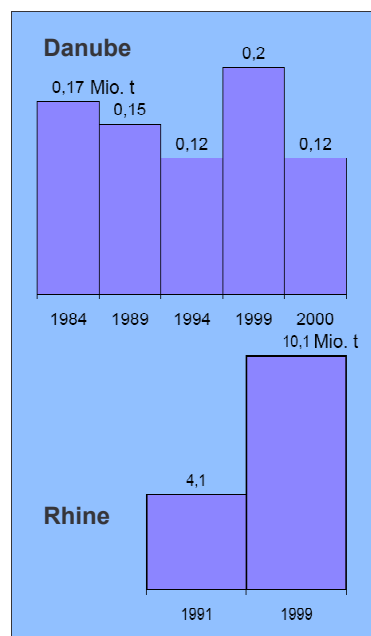


Figure 3.1: Comparison of goods transport (in mill. t) on the Danube and the Rhine. (Source: Hiess 2004)

A comparison of statistics for 2002 and 2003 in Germany how the bulk goods typically shipped on rivers could not be transferred to road transport during this time period. The hot and dry summer of 2003 brought extremely low water levels, and transport volumes on the river generally declined. The impact on the transport industry is reflected in the table below. One can see that the volume of goods transported by inland navigation went down between 2002-2003. **Most of this was picked up by rail transport rather than road.** Compared to the Rhine River, competition with rail is much stiffer along the Danube corridor given that industrial

sites are not, with a few exceptions, situated along the waterway, and direct transport is the exception rather than the rule²⁸.

Table 3.6: Development of goods transport volumes by mode in Germany, 2002-2003

Transport mode	in million tons		change	
	2002	2003	in million tons	in %
Inland navigation	231	218	- 13	- 5.8
Rail	283	297	+ 14	+ 4.7
Lorry	2,953	2,909	- 44	- 1.5
Total	3,467	3,424	- 43	- 1.2

Source: Statistisches Bundesamt 2004

Many prognoses on the effects of measures for inland navigation suggest large shifts from road to ship (see Table 3.7 for prognosis summary). According to this table, it is assumed that greater permissible draught plus logistics and telematics development could result in inland navigation growth, with 80% of freight volume shifted from road transport, and only 20% coming from rail. 70% of the effect is attributed to the increased draught, and only 30% to logistics and telematics development²⁹.

Table 3.7: Projected transport volumes by 2015 (million t) due to deepening of the navigation channel to 2.5 m draught for all sections of the Danube

	No action	Logistics and telematics		2.5 m draught		Combined effect	
		abs	%	abs	%	abs	%
Road	50	- 3	- 6	- 7	- 14	- 10	- 20
Rail	28	- 1	- 3.6	- 2	- 7.1	- 3	- 10.7
Water transport	16	+ 4	+ 25	+ 9	+ 56	+ 13	+ 81
Total	94						

Source: ÖIR 2002, *Prognose Grenzüberschreitender und Donauparalleler Binnenverkehr*.

However, climate change will lead to more marked meteorological extremes, in particular on the upper reaches of the Danube, and the effects of hot and dry summers will be felt increasingly often. As a result, more periods with extremely low water levels (substantially below Low Navigation and Regulation Level) are to be expected. The summer of 2003, when hardly any ships could navigate the Danube, was a prequel of future trends in this respect. The calls for year-round navigability with maximum draught are, therefore, unrealistic.

3.4 Summary of the current situation

- ➔ The Danube fleet is outdated.
- ➔ Navigation on the Danube is stagnating, and even declining on some stretches; it uses only a fraction of the existing shipping potential of the river.

²⁸ WWF, *Waterway Transport in Europe's Lifeline, the Danube*, 2002.

²⁹ Hiess H. *Positionen und Argumentarium zu einer ökologisch verträglichen Binnenschifffahrt in Europa*, 2004.

- ➔ Goods transport on the Danube consists almost exclusively of bulk goods.
- ➔ It is possible to shift typical road transport goods to inland waterways (example: Rhine, semi-finished goods), but rail transport competes with inland navigation in this sense.

4 Impacts of inland navigation on the Danube region

Hydromorphological alterations on the Danube, with inland navigation being a major driving force, have impacted the river through regulation and canalization. According to the Roof Report of the International Commission for Protection of the Danube River, these impacts have created increased sediment deficit, ongoing channel incision, reduction in water tables in alluvial floodplains, changes in the water table due to meander cut-offs carried out to improve the navigation route, pronounced sediment accumulations before the Iron Gate dams, disappearing pioneer species, and reduced water quality³⁰. The following sections describe these impacts in more detail.

The negative social, economic and ecological impacts from inland navigation can be significant, and therefore, its sustainability does not only need to be evaluated against other transport media in an isolated context, but rather against the impacts (environmental, social and economic) of each transport mode in a specific context in terms of possible alternatives.

Furthermore, other questions also need be raised: Do the plans for inland navigation meet the requirements of EU legislation on water and nature protection? Can inland navigation be sustainable if all we are doing is transferring negative environmental (or social or economic) impacts from one sector or medium (i.e. land or air) to another (e.g. water and wetlands)? And is it really sustainable to use a key part of the environment (i.e. rivers) for one economic use (transport), while ignoring the myriad of other economically useful functions that they supply?

4.1 Underlying assumptions of the inland navigation lobby

The EU and many Danube states see the river as an important future transport route. However, the Danube's transport capacity is underused today, and the trend in annual transport volumes is far from satisfactory. In view of these facts, hope has been placed in a fresh start for the Danube waterway.

Nevertheless, the inland navigation industry (and many decision-makers) take a number of assumptions concerning inland navigation for granted when justifying river engineering measures on the Danube (and other rivers). They assume that inland navigation:

- is the most environment-friendly mode of transport, in particular because of lower CO₂ emissions,

³⁰ ICPDR. Danube Basin Analysis (WFD Roof Report 2004):
http://www.icpdr.org/pls/danubis/docs/FOLDER/HOME/ICPDR/EXPERT_GROUPS/RBMEG/ROOF_REP_2004/FINAL_DOCUMENT/COMPLETE+ROOF+REPORT+-+FINAL+DOCUMENT+-+MINIMUM.PDF

- causes hardly any negative impacts on natural river ecosystems, and
- may contribute substantially to solving existing transport problems and reducing road traffic.

The first two assumptions are discussed in the following sections. The third one was proven wrong in the previous section.

4.2 Environmental impacts

In order to “improve” rivers and inland waterways for navigation, substantial engineering works aimed at adapting the river to the needs of the ships are traditionally the adopted solution. The methods often used are based on the need to “tame” the dynamic nature of the rivers and include:

- Straightening the channel to reduce the distance travelled,
- Removing islands and sand/mudbanks
- Stopping sideways movement (meandering)
- Fixation of the riverbed to one standard width, e.g. through groynes and lateral dams
- Deepening the channel to allow for larger ships,
- Reinforcing the banks in order to halt erosion and maintain water levels (also often aimed to reduce flooding),
- Removing vegetation and other natural “obstructions” and
- Constructing riverside port facilities.

Although natural waterways are highly dynamic, they can sustain some disturbance through their natural resilience. Thus, under normal conditions, they are able to cope with natural variations, such as fluctuation in seasonal discharges. Fluctuations beyond these natural margins, induced by disturbances that ignore the prerequisites for recovery such a dynamics, space, networks, spatial differentiation and ecological gradients, endanger this resilience and lead to spiralling negative impacts on the natural functions.

Impacts from inland navigation on aquatic ecosystems are most often associated with the following pressures:

4.2.1 Modification of the river channel

The “best” inland waterways for navigation are predictable ones, usually deep and straight, with strong banks to reduce erosion and, therefore, the need for hydraulic measures and dredging. Unfortunately, these are almost the opposite optimum conditions for aquatic biodiversity. Aquatic flora and fauna favour rivers with a variety of depths, vegetation and high habitat heterogeneity. Natural river systems are very dynamic and self-regulating. Rapids, sandbanks and sandbars; floodplains and reed-beds; and meanders and ox-bow lakes provide habitats for the greatest diversity of

aquatic life, and thus the valuable social, economic and environmental natural functions of rivers.

Rivers transfer sediment throughout river basins, providing constant replenishment of nutrients and minerals. Over time, however, sedimentation, hampers navigation and makes regular sediment excavation or flushing necessary, which both pose new environmental problems, along with serious maintenance costs (particularly when shipping intensifies the rate of erosion). Excavated material needs to be deposited somewhere, flushed fine sediments bring a sudden, thick cover on wetlands and farmlands. Birds nesting on gravel (plovers, common sandpipers, little terns etc) lose their breeding grounds. Studies on the Austrian Danube have shown that downstream of Vienna, in the area of Hainburg, 60% of the deepening of the riverbed is caused by conservation dredging activities for inland navigation³¹.

Rivers have been severely modified in Europe for many centuries to make inland navigation safer and cheaper. Europe has lost 90% of its floodplains due to river alterations for navigation³², flood control and other purposes. Many of the remaining floodplain areas are still found in the Danube, particularly in its lower reaches. Future navigation plans for the Danube River could lead to the significant loss of the last remaining floodplains in Europe. Alluvial floodplains play a key role for the life of a river, which they are closely connected with. The reproduction and development of a major share of the river fauna takes place in these floodplains. They are areas of retreat and migration corridors (resting and migration posts) for many animal species. Alluvial floodplains, especially their hard and softwood forests, are vital for natural processes for the nutrient and water cycles.

4.2.2 Air emissions

One of the arguments behind the development of inland navigation is that it is more environmentally friendly than other modes of transport, in particular because of lower climate relevant emissions.

Climate-relevant emissions and toxic air pollutants are suitable indicators to compare “environmental friendliness” of freight transport modes. A series of studies have been conducted in this area, some with widely diverging results. Variation in the study results is due to differences in input data and in the definitions of system categories, as well as different assumptions concerning the energy sources of rail transport (share of hydropower) and the composition of vehicle fleets (e.g. share of diesel-powered vehicles).

Results also differ because usually they do not assume a significantly higher share of inter-modal transport (‘total trips’) in combination with inland navigation; a share of road transport has to be factored in to cover the actual ‘source-to-destination’ relation. Such a study by Kolb and Wacker³³ takes ‘total trips’ into consideration.

³¹ Bernhart H. H. Et al. Massnahmen gegen die Sohleintiefung der Donau östlich von Wien. Studie i.A. des Nationalparkinstitutes Donauauen, Wien, 1990.

³² Tockner K. & Stanford, J.A. Riverine floodplains: present state and future trend. *Environmental Conservation*: 308-330, 2002.

³³ Kolb, A. and Wacker M. Calculation of energy consumption and pollutant emissions on freight transport routes, *The Science of the Total Environment* 169, pp 283-288, 1995,

Total trips refer to different distances for the single means of transport, as well as pre-trips, post-trips (e.g. taking goods to and from the train station/port), and different weight load factors. The study also suggests that the use of flat-rate average factors to compare different types of freight transport is not permissible (which is the method usually used for simple estimation of freight transport emissions). In most 'total trip' transport tasks investigated in this study, railway was the most favourable mode of transport, although inland navigation was the most favourable for some types of transport in terms of specific energy consumption and CO₂ emissions. In this case, there was still not an overwhelming advantage of inland navigation over rail.

As seen in Figure 4.1, inland navigation is not always the most environmentally friendly mode of transport in terms of climate-relevant emissions. However, rail and inland navigation are still significantly more 'environmentally friendly' modes of transportation compared to road transport.

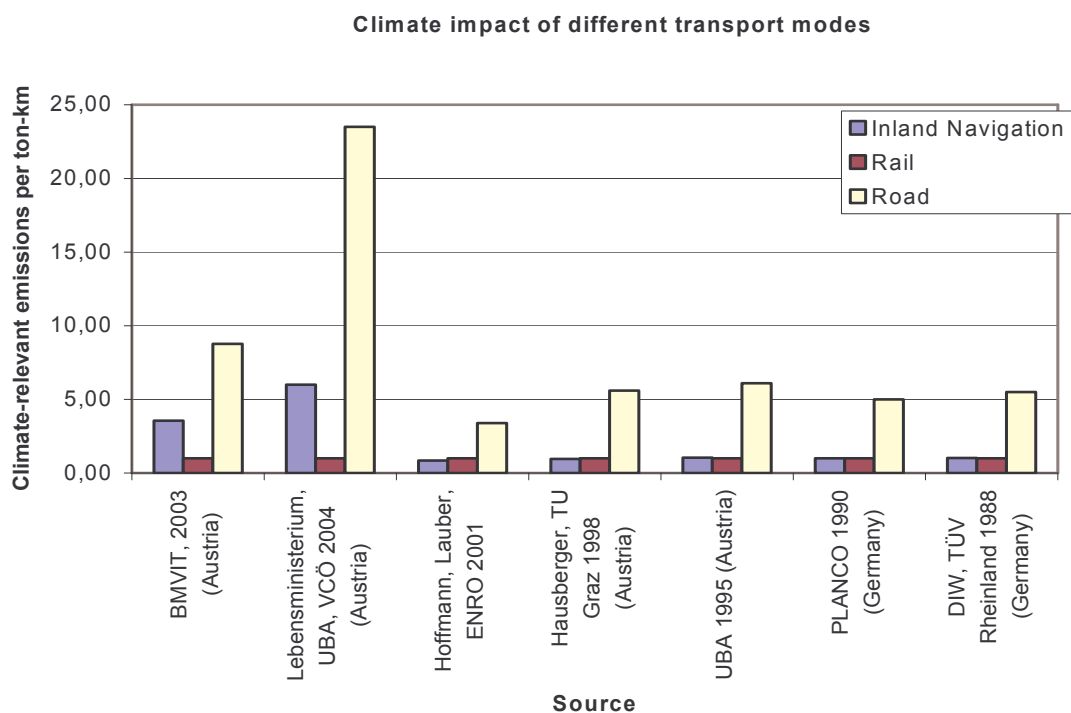


Figure 4.1: Climate impact of different transport modes (climate-relevant emissions per ton-kilometre). Sources: TU Graz 1997; Hausberger S., *Globale Modellbildung für Emissionen- und Verbrauchsszenarien im Verkehrssektor*, 1998.

Emissions from inland navigation cannot be clearly proven that they are cleaner for the environment than road transport because sometimes emissions from road for total trips are not factored into studies. Although inland navigation and rail transport are usually thought to be cleaner than road transport, no conclusive studies can show that inland navigation is cleaner than rail.

4.2.3 Water pollution

The operation of vessels contaminates river water with oily substances, tensides and ship paint. Every vessel generates bilge water, a mixture of lubricants, engine oil and water. These liquid wastes have to be disposed of regularly, but in reality, they are

often simply dumped into the river. The quantity of dumped bilge water is unknown. An EU Phare study published in 2000 criticized that, compared to the Rhine, there are fewer, and unevenly distributed, wastewater collection and treatment facilities along the Danube³⁴.

In addition, ships are cleaned with tensides, which are not easily biodegradable and end up untreated in the river. Tensides have direct toxic effects on aquatic fauna and flora, and among other things, they reduce the surface tension of bodies of water. In particular organisms living on the interface between water and air are damaged³⁵.

Pollution and damage to habitats resulting from ship collisions and spills happen on both an acute basis (dramatic accidents, which result in major pollution incidents leading to substantial environmental, economic and social costs) and on a more chronic, daily basis, such as the constant release of oils into the waterway and the continual disturbance of the riverbed and banks. Oil is a mixture of a variety of hydrocarbons, which may have different effects on aquatic organisms. Due to their permeable skins, amphibians are particularly sensitive to oils. Birds may be impaired because oil sticks on their feathers. Oil has a toxic effect on fish already at relatively low concentrations. The photosynthesis of plants works only to a reduced extent already at low concentrations of oil. Also, oil sludge may deposit in groyne fields and mainly inflict damage on substrate-dependant organisms. Compared to rail transport, inland navigation has a higher accident risk which can be particularly critical with the downstream transport of spilled hazardous substances³⁶.

4.2.4 Ship operation

The design, management and operation of inland navigation vessels may have detrimental environmental impacts. For instance, the design and speed that a vessel travels can determine the intensity of wave wash, and therefore, the extent of disturbance to other users and the erosion of banks. Fisheries and scientific experts have recently developed increasing interest in how the waves caused by vessels affect populations of young fish, which are most frequently found in shallow water. A study conducted by limnologists of the University of Vienna on the Vienna-Bratislava river section found that young fish are at considerable risk. The experts concluded that wave wash has an especially severe impact on young fish in the spring and summer season³⁷.

Air, noise and water pollution can be reduced through improved design of ships. Significant improvements in sustainability can be achieved cheaply by simply improving vessel design and operations.

Today's large vessels require even more intensive waterway development and permanent maintenance work. Damming, permanent dredging and canalization are used in an effort to increase water depth and stabilize navigation conditions. This is

³⁴ EU Phare Study OSS 99-5052.00. "Ship Waste on the Danube", 2000.

³⁵ Gunkel, G. Bioindikation in aquatischen Ökosystemen, Gustav Fischer Verlag, 1994.

³⁶ WWF, Waterway Transport in Europe's Lifeline, the Danube, 2002.

³⁷ Hirzinger et al. "Changes in habitat conditions caused anthropogenic wave wash and the potential influence on the Danube 0+ fish fauna", Österreichs Fischerei 55/2002.

counterproductive to the fundamental dynamics of riverine systems, and results in structureless, impoverished habitats with fundamentally changed flow conditions, erosion and sedimentation processes.

Greater depths can be achieved only by massive river engineering. In Bavaria, the river would have to be dammed to achieve a 2.80 m navigable depth. Further downstream, such depth can only be achieved by construction of groynes and training walls, and/or continuous dredging.

In addition to loss of aquatic habitats and species, measures for improved navigability of the Danube can lead to increased riverbed erosion, which means that the water flow cuts deeper and deeper into the river bottom. In turn, this lowers groundwater levels, causing sidearms to fall dry and reducing water flow to the river wetlands. In the adjacent wetland, the hardwood forests of the floodplain spread at the expense of the softwood floodplain forests. Habitats typical for the wetlands, whose biogenesis depends on the constant change between dry and wet periods, may disappear. Species typical for the wetlands could therefore become rare or extinct. Lower groundwater levels also lead to a reduction of drinking water resources.

4.2.5 Influence on flood events

The construction or extension of groynes, or jetties, and training walls could increase flood intensity, as both flow rates and water levels rise (see Fig. 4.2 for a picture of groynes).



Fig. 4.2 Groynes along the Danube stretch in Austria. (*Photo credit: B. Lötsch*)

According to one study, a modification of the Danube section between Vienna and Bratislava from the present 2.20 m to ensure a water depth of 3.20 m would result in

a rise of the water level by about 1 metre³⁸. Figure 4.3 illustrates this effect: the difference between the green (current water level of the river) and red (water level after implementation of groynes) lines is about one metre, even with increasing flows. This one metre height difference must be taken into account for changes in flood protection. Groynes also prevent sideways erosion, and thus accumulation of sediments in the floodplain. The effect is that the river sinks, and the floodplain rises and flattens out.

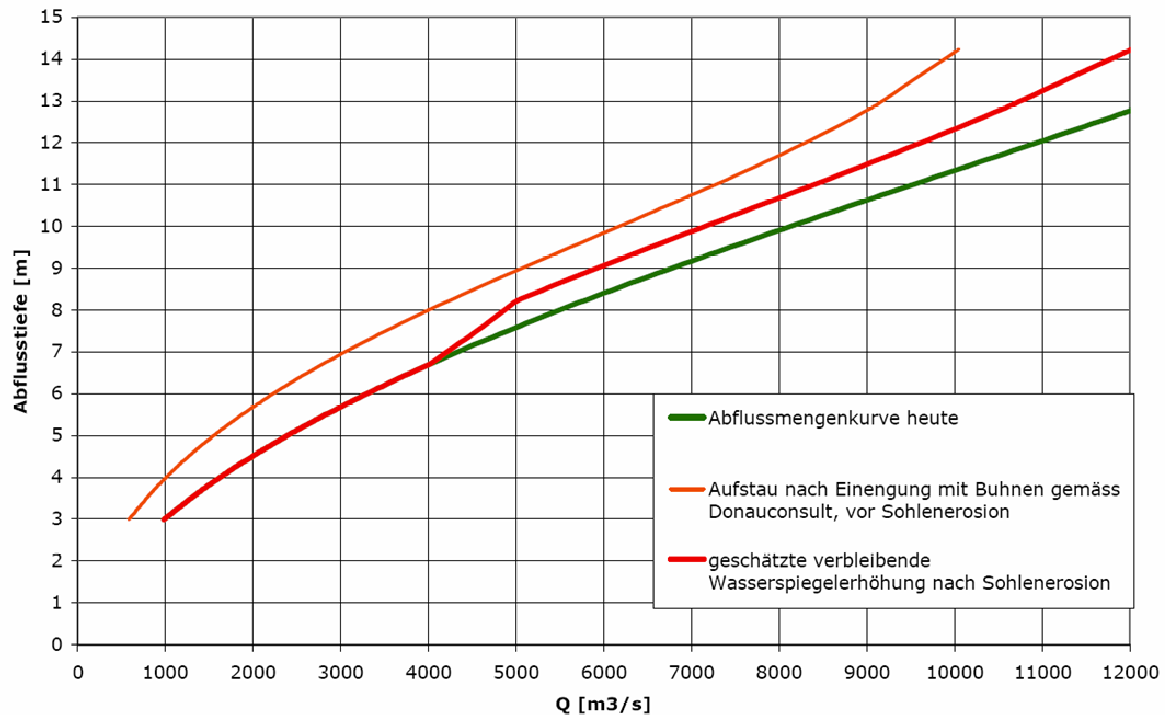


Figure 4.3: Example Vienna – Bratislava, proposed regulation measures would increase the flood wave by 1 metre (Source: Jäggi M. *Zustandanalyse und alternativer Projektvorschlag für den Donauausbau im Bereich des Nationalparks Donau-Auen*, 2003.)

4.2.6 Re-suspension of sediments

The re-suspension of sediments generated by ship propeller rotations and ship waves can lead to increased turbidity in shallow waters. In the Danube Delta, an increase in the content of suspended particles in the water due to inland navigation has been noted³⁹. The re-suspension of sediments impairs different aquatic organisms in different ways. Fine sediments damage the respiratory organs of larvae of water insects. The increased turbidity reduces the light intensity, which in turn decreases the photosynthesis of plankton and benthic algae and of vascular plant species. This lowered production rate at the lower levels of the food chain is reflected

³⁸ Jäggi M. *Zustandanalyse und alternativer Projektvorschlag für den Donauausbau im Bereich des Nationalparks Donau-Auen*, 2003, Ebmingen/CH im Auftrag des WWF Österreich.

³⁹ Constantin N. Efectele poluante ale circulatiei navale asupra ecosistemelor Rezervatiei Biosferei Delta Dunarii (The effects of naval traffic pollution on the ecosystems in DDBR). *Analele stiintifice ale Institutului Delta Dunarii*, Tulcea: 247-252, 1992.

also in higher ones. In navigable British canals, it has been found that increased turbidity leads to a change in fish communities⁴⁰.

4.2.7 Hydraulic modification of shallow stretches

Shallow stretches (fords) are areas of crucial importance for the river system – both for river navigation and for the river's ecosystems. Fords act as natural “submerged weirs”. They regulate the water level of the upstream river stretches, especially in low water periods. A series of successive fords and pools short distances apart is therefore ideal in terms of river ecology by offering habitats for aquatic, especially rheophilous fish species, but also with respect to hydrological and hydromorphological parameters.

From the river navigation perspective, fords are bottlenecks and must be eliminated, however, dredging of fords could lead to upstream erosion with all the consequences this entails, e.g. lowering of the groundwater and surface water levels and declining interconnectivity with sidearms⁴¹.

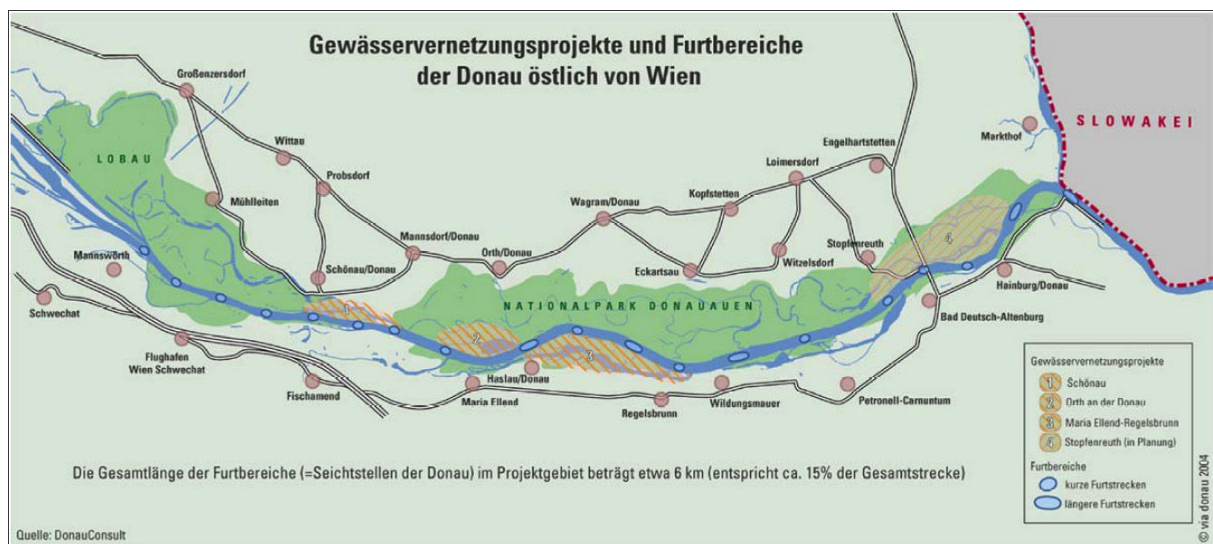


Figure 4.4: Water network projects and ford areas of the Danube east of Vienna. The total length of fords (shallow stretches) in the project area is about 6 km (ca. 15% of total length). (Source: DonauConsult)

In view of these facts, the shipping industry's line of argument that ford-dredging operations are local actions with restricted local impact is not accurate. In reality, such dredging operations have far-reaching impacts.

Figure 4.4 is used by Via Donau (the Austrian waterway authority) to illustrate their point that alterations of the Danube between Vienna and Bratislava to improve inland navigation would affect a total river length of only 6 km. In reality, ensuring a draught of 2.5 m at these 19 fords would affect an entire 47 km river section.

⁴⁰ Murphy K.J., N.J. Willby & J.W. Eaton, Ecological impacts and management of boat traffic on navigable inland waterways, *Ecological basis for river management*, Wiley, Chichester, 1995.

⁴¹ Jäggi M. Zustandanalyse und alternativer Projektvorschlag für den Donauausbau im Bereich des Nationalparks Donau-Auen, 2003, Ebmingen/CH im Auftrag des WWF Österreich.

Further downstream, dredging of the fords along the Romanian-Bulgarian border section could result in dramatic consequences for the entire stretch of nearly 500 km length. The impacts could hit not only the riparian ecosystems, but would also affect the inhabitants of the region. Among other things, fish populations could decline, groundwater tables would be affected, and more severe flooding with higher water levels and accelerated flow rates could be expected.

4.3 Socio-economic impacts

4.3.1 Loss of Ecosystem Functions

Humans have generally chosen to settle near to rivers because of the multiple benefits that the access to the water and the aquatic habitats provide. One of these reasons is, of course, the transport and navigational opportunities. However, there are many others. On a single river, thousands of communities, companies and individuals may depend on it for their business, food, drinking water and recreation.

Section 3.1.1 above outlined an estimation of the monetary value of several of the Danube's ecosystem functions based WWF studies. These functions are now under threat from further development of inland navigation on the river.

Indeed, the negative impacts of traditional inland navigation, as listed earlier in this section, can lead to increased pollution and ecological disturbance, which compromises other uses of the river, particularly activities such as fishing, tourism, sailing, swimming and the simple enjoyment of nature. Pollution associated with spills, discharges and waste disposal can lead to pollution of drinking water, disrupt the use of water for industries such as bottling plants and reduce water volumes available for irrigation.

To prevent loss of water from the fairway and maintain "navigability", dams are built to separate the river from the aquifer, which halts the exchange between surface and groundwater. The surface water loses its ability for self-purification, leading to increases in pollution and increases of nitrates and phosphates in groundwater supplies, often the source of drinking water.

An example of this is the Upper Danube, where water quality worsened after impounding the Danube downstream of Regensburg (Straubing and Geisling dams) from class II in 1995 to class II/III in 1999⁴². The loss of habitat and natural ecosystem functions has led to the local loss of whole industries, such as fishing. The construction of embankments to reduce erosion and to maintain the high water levels has increased the incidence of flooding downstream as natural sink (sponge) functions of floodplains and wetlands have been lost.

4.3.2 Infrastructure cost recovery

In 1987, the German Institute for Economic Research published the most recent study dedicated exclusively to the question of infrastructure cost recovery (i.e.

⁴² WWF. Waterway transport on Europe's Lifeline, the Danube: Impacts, Threats and Opportunities, 2002.

contribution, through payment of charges, by infrastructure users towards expenses for the construction, expansion, operation and maintenance of infrastructure) achieved with inland waterways that charge levies for use of the waterway. The study found a cost recovery rate of 10.3%, based on return of invested capital. By comparison, rail transport has a similar cost recovery rate of 15.8%⁴³.

A similar review was conducted for the Austrian section of the Danube in 1987. As no charges are levied on the Danube, income comes only from tax revenue and contributions of Austrian shipping companies. In 1987, revenue amounted to 160,000 Euro, while expenditure was as high as 36 million Euro⁴⁴. The stated expenditure is after deduction of costs of energy production and flood protection. In total, the shipping industry contributes less than 1% towards recovery of the waterway costs on the Austrian part of the Danube. The infrastructure cost comparison, therefore, shows rail to have a better infrastructure cost recovery rate than inland navigation.

The situation as described above should soon change with the implementation of Article 9 of the WFD. This would require defining the infrastructures supporting inland navigation (e.g. for impoundment, regulation, etc.) as “water services” and the navigation per se as a “water use”⁴⁵. Article 9 introduces the principle of cost recovery, including environmental and resource costs, for water services. It specifies that Member States shall ensure that different “water uses” make an adequate contribution to recovering the costs of water services. This would have to go beyond the (very poor) purely financial cost recovery (from infrastructures linked to inland navigation) illustrated above to encompass the costs of the impact/damage on the environment and aquatic resource

In view of the numerous environmental impacts from inland navigation as shown above, WFD cost-recovery implementation might be a crucial factor to take into account when deciding over further extension of inland navigation on the Danube.

4.4 Summary of impacts

- ➔ The navigation lobby assumes that inland navigation is the most environmentally friendly mode of transport (lower CO₂ emissions), which is the case compared to road and air transport.
- ➔ At the same time, inland navigation results in negative impacts on the natural river ecosystem.

⁴³ Deutsches Institut für Wirtschaftsforschung (DIW). Wegekostenrechnung für die Binnenschifffahrt, 1987.

⁴⁴ BMöWV (Federal Ministry of Public Economy and Traffic) 1987; Hiess/Korab 1992.

⁴⁵ See also “Tips and Tricks for WFD implementation: A resource document for environmental NGOs on the EU guidance for the implementation of the WFD” available at: http://www.panda.org/about_wwf/where_we_work/europe/what_we_do/epo/initiatives/freshwater/publications/index.cfm?uNewsID=12247 and WFD Common Implementation Strategy Guidance Document Economics and the Environment: The Implementation Challenge of the Water Framework Directive available at: http://forum.europa.eu.int/Public/irc/env/wfd/library?l=/framework_directive/guidance_documents/gds01swatecspolicysumm/EN_1.0_&a=d

- ➔ Deep, straight rivers with strong banks are ideal for the traditional form of inland navigation, which unfortunately contradicts ideal conditions for aquatic biodiversity.
- ➔ The operation of ships contaminates river water with oily substances, tensides and ship paint.
- ➔ Wave wash from vessels disturbs wildlife, both aquatic and terrestrial, as well as adds to bank erosion.
- ➔ The construction or extension of groynes and training walls could cause increased flood intensity, as water levels rise in the river.
- ➔ Dredging of shallow river stretches to improve inland navigation could lead to upstream erosion; consequences of this entails the lowering of groundwater and surface water levels and declining interconnectivity with sidearms.
- ➔ The negative impacts of inland navigation can lead to loss of ecosystem functions (and loss of economic value) by compromising other uses of the river, e.g. fishing, tourism, sailing, swimming and the simple enjoyment of nature.
- ➔ Inland waterways have a lower infrastructure cost recovery than rail transport systems.

5 Current conflicts

Wetlands and riparian areas are one of the most threatened ecosystem types worldwide, which appear to be deteriorating faster than that of any other ecosystem⁴⁶. As opposed to road and railway routes, which usually just cross, divide or overlap ecologically valuable areas, inland navigation uses and impacts on such sensitive ecosystems 100%.

The new navigation plans for the Danube threaten around 1,000 km of Europe's most valuable river habitats. These plans may potentially destroy the last remaining Danube wetlands, including national parks, Ramsar sites, World Heritage sites, and Natura 2000 sites.

5.1 The ecological conflict

In 2003, the EU and the navigation lobby of the Danube countries defined several river stretches as 'bottlenecks'— too shallow to allow for "traditional" inland navigation - with a combined length of about 1,000 km where river engineering measures are to be carried out over the next 15 years (see Figure 5.1). At the same time, these stretches overlap with ecological 'hot spots' - areas of high ecological value (see Figure 5.2 and Figure 5.3).

⁴⁶ Millennium Ecosystem Assessment, www.maweb.org. The MA report is the largest ever scientific assessment of ecosystems and human well being, carried out between 2001 and 2005 by 1,300 authors from 95 countries and governed by a Board comprised of representatives of international conventions, UN agencies, scientific organizations and leaders from the private sector, civil society, and indigenous organizations.



Figure 5.1: TEN-T eliminating navigation bottlenecks (EU, DG-TREN)

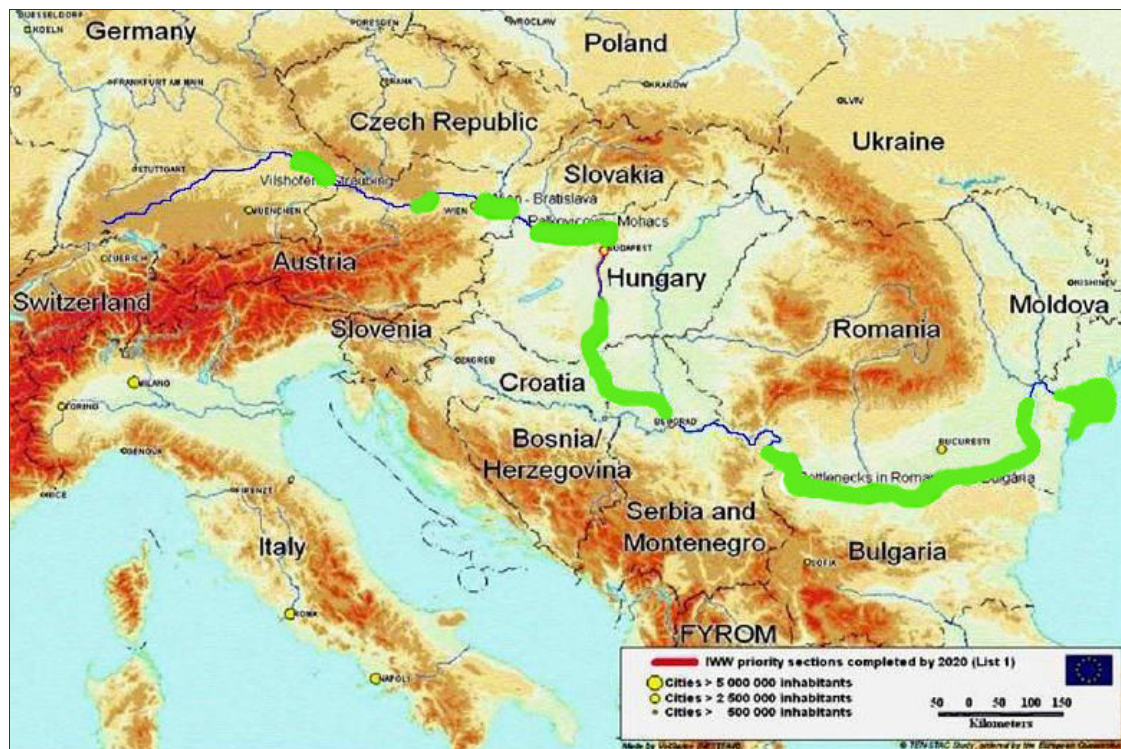


Figure 5.2: Ecologically outstanding river stretches (WWF 2002)

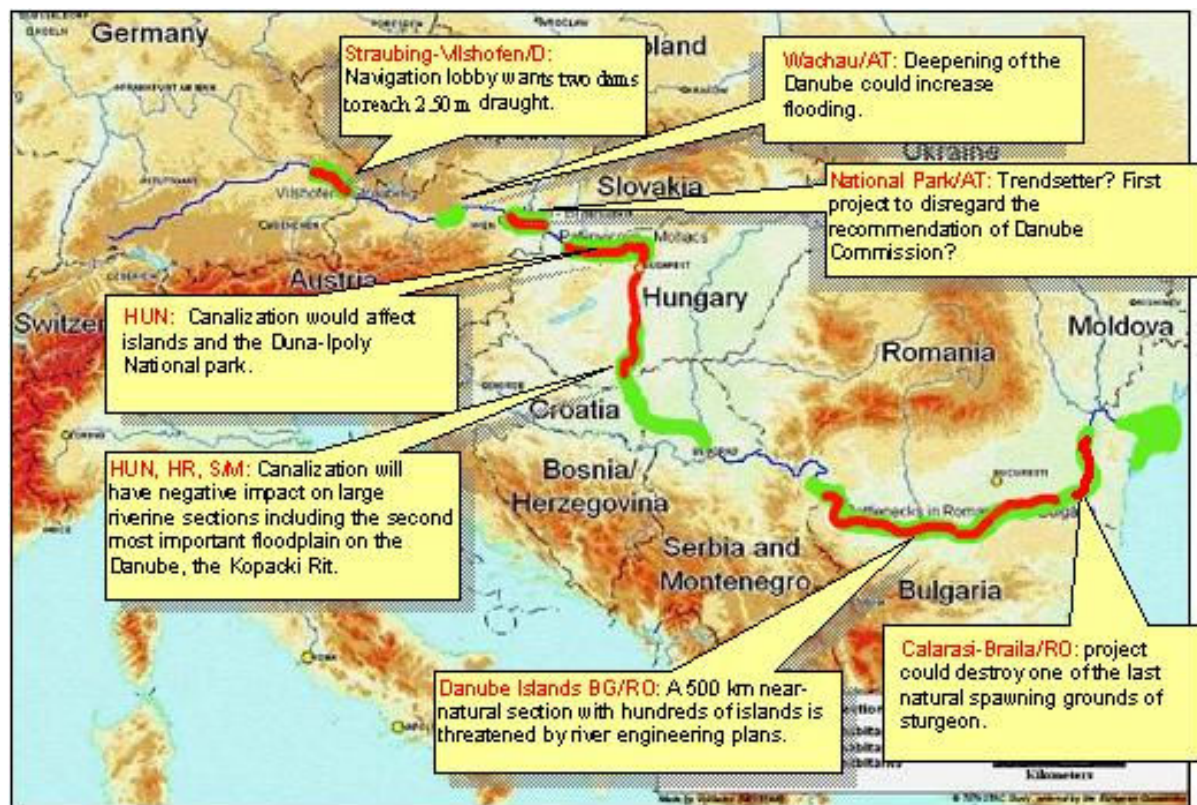


Figure 5.3: TEN-T navigation versus ecological hot spots (WWF Austria)

In order to eliminate these bottlenecks, it is planned to deepen the Danube navigation channel by dredging, river training and possible impoundment to a minimum draught⁴⁷ of 2.50 m during **all** seasons. This is despite the fact that existing international agreements^{48,49} do not envisage such use all year round, but only for part of the year. As a result, *inter alia*, the navigation waterway will need to be substantially deepened in order to reach approximately to 2.70-2.80 m total depth. Section 4.2 has already detailed the negative impacts of river channel deepening on aquatic fauna and flora

5.2 The transport conflict

The original regulatory framework for navigation on the Danube (recommendations of the Danube Commission and AGN, see Section 3.2.4) was established without consideration of ecological impacts. As a result, the effects of navigation and river engineering on the ecosystem of the river and its adjacent wetlands were not taken into account, and neither were the consequences affecting the people living along the

⁴⁷ Draught is the depth of the loaded ship beneath the water level without dynamic effects (surge or squat). The total depth of the canal therefore needs to exceed the draught to ensure safe navigation. ALSO USE IT EARLIER IN SECTION

⁴⁸ Danube Commission, Empfehlungen bezüglich der Aufstellung von Regelmassnahmen fuer die Schifffahrtsrinne sowie den wasserbaulichen und sonstigen Ausbau der Donau, Budapest, 1988.

⁴⁹ European Commission, Inland Transport Committee, European Agreement on Main Inland Waterways of International Importance (AGN), 1996. <http://www.unece.org/trans/conventn/agn.pdf>

river (e.g. drinking water, fisheries, flood intensity). Unfortunately, this mistake was not corrected in the present TEN-T guidelines. The guidelines foresee further development of the Danube as Transport Corridor VII without taking into account the ecological consequences.

5.3 'Salami tactics' vs. holistic approach

One of the root causes of these conflicts is not only the sectoral thinking of the individual countries, but also at the EU level. A holistic view for multi-modal transport on the Danube has not yet been developed. Decisions on navigation strategies and actions are taken without due consideration of the subsequent impacts on the natural environment. Environmental authorities, let alone NGOs, are not properly consulted before decisions are taken; more often than not, they are only informed *ex post facto*.

Another aspect of this compartmentalization concerns planning phases and the possible precedent set by new riverbed depths on which projects are based for the rest of the river. Where transport issues and policies are concerned, the debate focuses on the whole of the Danube, and participants in the discussion call for uniform objectives (Danube Commission recommendations, AGN, 'Van Miert' report). However, impacts on the natural environment are dealt with in a piece-by-piece fashion, based on local project areas. This 'salami tactic' approach runs counter to the spirit of the protection of freshwater ecosystems enshrined in the WFD and may result in serious ecological losses.

Thus, individual projects may create new conditions on the ground, which are used as precedents in other areas, even though these other areas were never considered when the original project decision was made. A case in point is, for example, the Vienna-Bratislava TEN-T priority project. Here, in order to promote inland navigation and remove "bottlenecks", the Austrian Transport Ministry wants to reach 2.5 m draught along this section, which goes beyond the level recommended by the Danube Commission (see Section 3.2.4) – an unprecedented decision which could have not only impacts in this stretch itself, but also potential impacts on other ecologically valuable areas on the Danube that have not been considered at all. This could have a "domino effect", promoting the use of the same depth for other projects along the Danube regardless economic, technical and environmental feasibility (i.e. as has been shown by hydropower dam construction).

5.4 Summary of conflicts

- ➔ Traditional inland navigation is not compatible with nature conservation. Development and maintenance work on the Danube navigation channel has resulted, and will result in, massive damage to the river's ecosystems, causing negative consequences for the inhabitants of the Danube area as well.
- ➔ The present planning approach ('salami tactics') could result in careless treatment of the Danube by only evaluating local projects without regard to basin-wide impacts.
- ➔ An integral, holistic planning approach is missing.

6 WWF Position

Requirements for sustainable inland navigation on the Danube

The challenge is to shape inland navigation on the Danube River so that it could genuinely help to relieve not only transport, but also socio-economic and environmental, problems elsewhere. To achieve this, Danube navigation must be economically competitive and, at the same time, contribute to improving the river's ecological status. The present 'lose-lose' must be turned into 'win-win'. Neither of these goals can be met separately – if one aspect does not work, the other will also fail.

Today's plans for further development of the Danube navigation channel are, therefore, based on an obsolete, unsuccessful strategy. Implementing this strategy would mean sacrificing the last valuable landscapes that have survived on the Danube, without achieving more than a negligible shift in goods transport patterns.

The section below puts forward the main elements leading to a win-win situation.

6.1 Looking at the entire river system vs. 'salami tactics'

TEN-T inland navigation projects on the Danube may cause local and/or basin-wide negative ecological impacts. The International Commission for the Protection of the Danube River (ICPDR) believes that implementation of these projects "will lead to a deterioration of the current status of the water bodies affected" and could break EU laws (i.e. the WFD)⁵⁰.

To ensure that no further or new negative ecological impacts occur, the precautionary principle must be applied, and potential impacts must be assessed prior to project implementation. According to the ICPDR, "these future projects must be subject to an EIA and/or SEA"⁴⁴.

A **Strategic Environmental Assessment** (SEA) is a suitable planning instrument for this international task. SEA is a process designed to advance sustainable development, contribute information to the decision-making process, and overcome weaknesses in project-level Environmental Impact Analysis (EIA). In other words, a SEA should effectively address cumulative, large-scale and transboundary developments, and consider issues of need and alternatives at an earlier stage in the decision-making process. As opposed to an EIA, which is applied to individual projects, a SEA is applied to plans and programs. A SEA is undertaken much earlier in the decision-making process than an EIA and is, therefore, seen as a key tool for sustainable development. One of the most significant advantages of a SEA is that the process considers alternatives that have been evaluated by using multi-criteria or cost-benefit analyses. As there has been no SEA or any public consultation process within the TEN-T program, the true costs compared to the benefits of these plans have never been compared.

⁵⁰ ICPDR. Danube Basin Analysis (WFD Roof Report 2004), p. 91, http://www.icpdr.org/pls/danubis/docs/FOLDER/HOME/ICPDR/EXPERT_GROUPS/RBMEG/ROOF_REP_2004/FINAL_DOCUMENT/COMPLETE+ROOF+REPORT+-+FINAL+DOCUMENT+-+MINIMUM.PDF

Contrary to other transport routes, waterways are part of very sensitive natural landscapes and ecosystems. Therefore, conditions for river navigation vary greatly, and so do ecological requirements. This means that:

1. Ecologically sensitive sections of the Danube must be used as a benchmark for any development projects in the rest of the river system.
2. No uniform development standards can be defined for European waterways; rather, specific standards must be set for each individual river system based on the requirements of the most ecologically sensitive stretches of the river system in question.
3. WWF requests a SEA process for Danube inland navigation to ensure that site-specific projects do not cause basin-wide negative ecological impacts. A SEA should also ensure that all projects conform to the provisions of the EU's WFD, as recommended by the ICPDR. The SEA process should:
 - Lead to a 'Sustainable Navigation Plan' for the Danube, including standards for inland navigation and associated ecological measures.
 - Be embedded within a larger 'Strategic Development Plan' (SDP) that guides and informs all multi-modal transport planning and projects for the Danube Basin, taking into account ecological, economic and social considerations.
 - Determine the use of European funding for the implementation of individual TEN-T projects. No funding should be given if a project is either not mentioned in the Sustainable Navigation Plan or if it does not meet the requirements described within the SEA.
 - Ensure that all projects comply with the WFD.

In light of Austria's upcoming EU Presidency in January 2006, the Austrian government should lobby for support of the development of a SEA process for inland navigation on the Danube. The SEA process could then be carried out by the EC, Danube Commission, ICPDR, as well as Danube countries, including Austria.

6.2 Connecting TEN-T with the WFD

TEN-T inland navigation plans need to be made compatible with the WFD. New shipping and river engineering projects that would prevent achieving the WFD's "good status" (ecological and chemical) and avoid further status deterioration can only be developed if certain WFD provisions are met, including:

- Article 4.7 Exemption: "New physical modification", needs strict sustainability tests and mitigation.
- Article 4.8: No other water bodies in the river basin district are affected and other EU laws, including Habitats, Birds and EIA Directives, are respected.
- Article 4.9: The same level of environmental protection as other EU laws is guaranteed.

So far, TEN-T Guidelines and the implementation of the WFD have been considered separately. In order to establish the above-mentioned Sustainable Navigation Plan and real win-win, these have to be combined leading to sustainable navigation.

No-deterioration: neither navigation projects nor navigation channel maintenance may cause negative impacts on the hydrological system unless the strict conditions granting an exemption from this WFD objective are met. The first Article of the WFD states that the purpose of the Directive is to prevent further deterioration of the current status of aquatic systems. The final goal of the Directive is for all waters to reach “good ecological and chemical status” by 2015. In the case of major development programs, such as the TEN-T, the entire program must be examined with a view to compliance with the “no deterioration” ban.

Improvement of the ecological status: navigation projects should be planned so as to provide ecological improvements, both basin-wide and locally, with an overall positive net gain at each project site and for the river system as a whole (e.g. through restoration activities tied to the project). This also follows the idea of the ‘polluter-pays’ principle. Until now, inland navigation has caused huge negative impacts without ‘paying’ for them. For example, Danube vessels are not even charged fees to navigate on the river, although they directly create to negative impacts. Improvement measures have to be oriented towards “good ecological and chemical status” or “good ecological potential” as required by the WFD. Improvement (ecological) measures have already been considered and researched in detail for the Vienna-Bratislava project.

Genuine public participation: In the planning process, key stakeholders from all relevant groups have to be integrated from the start. See Section 6.7 for more information.

6.3 Ecological compensation measures

Sometimes new innovation technologies can compensate for existing hydraulic river constructions through restoration and compensation measures for river morphology and ecology. Such measures aim to reactivate natural dynamic processes of the river in a controlled manner. Some examples are:

- Reverse engineering of obsolete or superfluous constructions
- Opening of side channels
- Removing shore reinforcements and obsolete dams
- Allowing sideways movement of the river (meandering) in suitable locations
- Allowing dynamic sandbanks and islands in suitable places
- Opening of the floodplain through lateral channels (inlets and outlets where water can flow through)

Restoration work could also be carried out on river stretches where no problems for inland navigation exist. Such compensation measures should be explored, and implemented alongside navigation projects where suitable.

6.4 Promoting innovations for ecologically sound inland navigation

The message is clear: Be sustainable and innovative! Do not allow a type of inland navigation that compromises other development. Do not destroy a rich natural legacy for “traditional” inland navigation sake.

Innovative technologies could hold significant potential for better competition of inland navigation with other modes of transport, without any need for new river engineering interventions. The potential of the following aspects should be fully utilized before considering any further waterway engineering measures.

6.4.1 Fleet modernization

Adapt the ships to the river, not the river to the ships. In order for inland navigation to meet the challenges and become a truly sustainable transport mode in the future, “traditional” navigation methods (based on taming and controlling the natural self-regulating systems) must be changed to “ecologically sustainable” navigation. The fleet of the Danube countries needs a modernization push. Most existing vessels are designed for the traditional transport of bulk goods and do not meet the requirements of the Western European waterway network. The necessary upgrade of the fleet offers a chance to introduce state-of-the-art technology (e.g. shallow draught inland vessels, reduced emissions, less wastewater produced).

The ongoing "Futura Carrier" project in Germany is an example of new ship technology. It aims at the development of a new, environmentally friendly type of inland waterway vessel that will cause less harm to river ecosystems. To be unveiled by December 2005, the Future Carrier will release 70% less NO_x and 99% less particulate emissions (P₁₀) into the atmosphere, with anticipation of the EU emission limit values scheduled to come into force in 2010. A novel hull shape will drastically reduce wave wash, minimizing impacts on riverine vegetation and fauna. The Future Carrier can operate at low water levels and is easy to manoeuvre. The total cost of the Future Carrier is 7.3 million Euro, of which 2.2 million Euro are funded by the German Federal Ministry of the Environment⁵¹.

⁵¹ Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit (Germany), “Modernes Binnenschiff für saubere Rheinluft”, Pressemitteilungen Nr. 079/05, Berlin, 5 April 2005, http://www.bmu.de/pressemitteilungen/pressemitteilungen_ab_01_11_2004/pm/35293.php



Figure 6.1: The new 'Futura Carrier' container ship for inland waterways will release less NO_x and P₁₀ emissions than traditional ship technologies. (Source: New-Logistics GmbH⁵²)

Another option to achieve high loading weight with less navigable depth is to develop wider and/or longer barges and vessels. It is technically feasible to build 22.80 meter-wide container ships (instead of the usual 11.40 m), which require a total navigable depth of no more than 1.80 m⁵³ when fully loaded. Such vessels could operate on most of the Danube, from the Black Sea to Passau (Germany), as the locks of the existing hydropower dams provide a width of 24 m across. Upstream of Passau, the locks are narrower and the transported goods would have to be loaded onto narrower ships ("broken transport").

Other potential innovations in shipbuilding include the development of new ship propulsion technologies, and new ship types for goods that are traditionally transported by lorries (pallet ships, interchangeable containers); these are in any event preferable to navigation channel deepening.

6.4.2 Improve logistics

Modern information and communication technologies offer a lot of potential to improve the competitive position of inland navigation without any impact on the river ecosystems.

Improved methodologies for forecasting water levels should be explored. These instruments will help to optimize the use of ships' loading capacities. As a result, loaded draught may potentially increase by 0.2-0.3 m even with unchanged water depths⁵⁴. Since some dynamic morphological processes are still active, constant

⁵² New-Logistics GmbH, Kaiserstraße 4, 24143 Kiel, Germany, <http://www.new-logistics.biz/>

⁵³ Loidl, W. Breiter Ro-Ro Verband als "Schwimmende Landstraße", Projekt-Kurzbeschreibung, 2004.

⁵⁴ Hiess H. Positionen und Argumentarium zu einer ökologisch verträglichen Binnenschifffahrt in Europa, 2004.

monitoring of the navigation waterway is necessary; captains must be informed about the waterway conditions. Continuous soundings could update online maps available for ships in the “bottlenecks”.

In addition, development and improvement of multi-modal logistical infrastructure should be promoted. Adequate harbour centres to transfer goods from ships to other modes of transport (preferably rail) are required for efficient goods transport.

6.5 Promoting inland navigation to successfully compete with road transport

To achieve a genuine reduction of road traffic, one option is to promote container transport on the Danube. What are the requirements of container transport?

Navigable water depth for container transport

Along with canal construction, the deepening of navigation channels is one of the most aggressive interventions in river ecosystems. The question of container transport requirements in terms of navigable water depth and permissible draught is therefore of crucial importance. In this context, the decisive parameter is the average weight of loaded containers.

The statistics of container shipping in Germany show that average loaded weight, including the tare weight of the containers, is slightly over 50% of the permissible total container weight. As we assume that transport vessels carry a mix of loaded and empty containers, we assume the average total load of a container vessel will be just slightly over 50% of the permissible total container weight.

Table 6.1: Container transport in Germany in 2000, in TEU¹⁾

	in 1,000	in %	in 1,000 incl. tare weight	in t / container	in % of permissible total container weight
Loaded containers	897	66	11,158	12.4	51.70
Empty containers	461	34	921	2.0 ²⁾	0.08
Total	1,358	100	12,080	8.9	37.10

Source: Reim, U. 2000. (In: Statistisches Bundesamt, Wirtschaft und Statistik, 12/2001)

¹⁾ Twenty feet Equivalent Unit

²⁾ Container weight

The fact that container ships do not carry as much weight as bulk goods transport vessels is due to the significantly lower specific weight of the goods that are transported in containers. The latter are mainly used for consumer goods and industrial goods.

Table 6.2: Draught and required navigable water depths for container ships carrying 3 layers of containers

	Motor cargo ship	Large motor cargo ship		Pushed convoy II
	3 layers	3 layers	4 layers	3 layers
Draught	1.50	1.57	1.85	1.43
Required water depth 0.2 m distance to river bed	1.70	1.77	2.05	1.63
Required water depth 0.4 m distance to river bed	1.90	1.97	2.25	1.83

Source: Hiess, H: Position und Argumentarium zu einer ökologisch verträglichen Binnenschifffahrt in Europa, 2004. Studie im Auftrag des WWF-AT.

On the German Danube stretch from Straubing to Vilshofen, a total navigable depth of 2.2 m, which would require some “soft” engineering (e.g. dredging), is sufficient for economically viable container shipping.

We can, therefore, conclude that:

- Container ships could be the true future for Danube navigation.
- Navigable water depths of 2.2 to 2.5 m would be acceptable in this case.
- Neither dams nor “hard” river engineering measures are needed.

6.6 No new depth requirements to those of existing conventions

No new depth requirements to those of existing conventions should be automatically introduced unless they are based on ecological assessment and prove that they do not have a negative impact on the ecosystem. Greater depth of the riverbed means more aggressive intervention in the ecosystem and less room for ecological improvement.

In addition, the implementation of existing depth recommendations in local projects has to be assessed in terms of ecological needs. In regards to the existing recommendations, their ecological impacts have hardly been discussed until now.

6.7 Genuine public participation

The concept of sustainability means to ensure that future generations will have the same survival chances and living potentials as the present one. If this goal is to be achieved, social, ecological and economic interests must be fairly balanced on a basis of equal standing. The way to do this in practice is to involve all stakeholders in planning and decision-making processes from an early stage. For plans promoting the development of the inland navigation on the Danube, this means that all relevant scientific and engineering input has to be integrated from the start. Also local inhabitants, interest groups and environmental NGOs have to be involved in a fair, transparent and clearly structured planning and decision-making process. In other words, it means ‘capacitating’ interested parties to be active and valuable partners in the TEN-T implementation process.

Article 14 of the WFD requires Member States to “encourage the active involvement of all interested parties in its implementation”; in particular, public consultation is essential during the production, review and updating of the river basin management plans, which form the basis of the Directive. WWF believes – in line with the “Public Participation” Horizontal Guidance Document⁵⁵ produced by the WFD Common Implementation Strategy – which this active involvement must be built from the very beginning of the implementation process. This means informing interested parties in order to seek their participation, distributing them consultation documents related to the WFD implementation tasks and involving them not only in the implementation but also in the definition of these tasks.

In order to not only manage public expectations and avoid “over participation”, but also for the reasons explained in the rest of this Section, it is clear that the WFD implementation process should be the context in which further inland navigation on the Danube must be agreed and developed. Also because, as stated above, any measures/projects that can jeopardise the achievement of the main WFD objectives must respect not only Article 4 exemptions but also Article 3, 4 (in full), 11, 13 and 14 of the WFD.

7 Concluding Remarks

The Danube has the potential to become one of the main waterways and transport axes of Europe, as is the intention of TEN-T. This could bring prosperity to the people that live in the river basin. Prosperity, however, is more than earning capacity and money alone. People still want to live in a clean and healthy environment.

At the same time, numerous man-made changes, regulation structures, dams and dredging activities, outstanding river habitats along the Danube still remain today that have long disappeared elsewhere in Europe.

WWF believes, in principle, that it is possible to establish inland navigation that, at the same time, helps improve the ecology and socio-economics along the river. We are at a crossroads: inland navigation and European transport policy could follow the old strategy of canalising rivers, or a new strategy could be developed that also includes other needs of the Danube with its “multi-use” services. It’s a decision between “friend or foe”.

⁵⁵ Guidance Document no 8 “Public Participation” is available at:
http://forum.europa.eu.int/Public/irc/env/wfd/library?l=/framework_directive/guidance_documents/guidancesnos8spublicspar/_EN_1.0_&a=i

WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature, by:

- conserving the world's biological diversity
- ensuring that the use of renewable natural resources is sustainable
- promoting the reduction of pollution and wasteful consumption



for a living planet®

WWF Standort Österreich

Ottakringer Straße 114-116
1160 Wien

Tel: +43 1 48817-0

WWF Danube Carpathian Programme

Mariahilfer Straße 88a/3/9

Tel: +43 1 5245470