

ESPOO INQUIRY COMMISSION

REPORT

ON THE LIKELY SIGNIFICANT ADVERSE TRANSBOUNDARY

IMPACTS OF THE

DANUBE - BLACK SEA NAVIGATION ROUTE

AT THE BORDER OF ROMANIA AND THE UKRAINE

July, 2006

CONTENT

	Executive summary	5
1.	Introduction	8
	1.1. History	8
	1.2 Establishment of the ESPOO Inquiry Commission	9
	1.3 Terms of reference	9
	1.4 Composition of the Commission	10
	1.5 Contributions and references	10
2.	Definitions	
	2.1 Transboundary	13
	2.2 Transboundary impact	13
	2.3 Likely significant	13
3.	Technical details of the disputed activities	17
	3.1 General outline	17
	3.2 Phase 1	17
	3.2.1 Dredging of sills	17
	3.2.2 Dredging of sandbar	18
	3.2.3 Construction of retaining dam	18
	3.2.4 Maintenance	19
	3.3 Phase 2	19
	3.3.1 Dredging of rifts and sandbar	19
	3.3.2 Construction of the retaining dam	19
	3.3.3 Maintenance dredging in the seaward part	19
4.	Statement of the controversies	22
	4.1 Introduction	22
	4.2 Transboundary hydrological impact	23
	4.3 Transboundary impact on sediment discharge and dumping of spoil in the coastal zone	23
	4.4 Transboundary impact of dredging of pollution of coastal waters	24
	4.5 Impact on fisheries	24
	4.6 Impact on biodiversity because of loss of habitat of protected migrating birds	25
	4.7 Social and economic impacts	26
	4.8 Summary of statements by both Parties	27
5.	Expert views on the controversies	29
	5.1 Introduction	29
	5.2 Impact on the hydro-morphology, the sediment discharge and the dumping of spoil	29
	5.3 Water and bed pollution	33
	5.4 Fish stock and migration	34
	5.5 Bird life and migration	39
	5.6 Summary of expert's findings	48

6.	Findings of the Inquiry Commission	52
6.1	Introduction	52
6.2	Controversial positions of both countries of the transboundary impact of the Navigation Route	53
6.3	Transboundary impact on the hydrology of the River Danube	54
6.4	Transboundary impact on sediment discharge and the storage and dumping of dredged material and on the morphology of the coastal zone	54
6.5	Transboundary impact of dredging on pollution of the river and coastal waters	55
6.6	Transboundary impact on fisheries	55
6.7	Transboundary impact on birdlife	56
6.8	Final integral evaluation and conclusions	56
6.9	Outlook to Phase 2.	58
7.	Recommendations	60
7.1	General recommendations	60
7.2	Mitigation	61
7.3	Recommendations for the functioning of the Inquiry Commission	62
	Addendum: Evaluation of the Bilateral Research Programme	62
	Acknowledgements	64

Appendices (on CD-ROM)

Final reports Experts

Report of the Hydro-Morphology Expert	(Jos van Gils)
Report of the Geochemistry Expert	(Nico de Rooij)
Report of the Fishery Expert	(Stefan Schmutz)
Report of the Birdlife Expert	(Mark o'Connell)

Contributions by the Members of the Commission

Dr. Mircea Staras
Danube Delta National Institute, Tulcea, Romania.

- Rom. 1 Documentation on the likely significant transboundary impact of the Ukrainian Deep-water Navigation Canal Danube-Black Sea in the context of ESPOO Convention, 1991. February, 2005
- Rom. 2 Additional information requested for the third meeting of the Inquiry Commission on the likely significant transboundary impact of the Ukrainian Deep-water Navigation Canal Danube-Black Sea in the context of ESPOO Convention, 1991. October, 2005
- Rom. 3 Comments to Annexes no. 15-28, presented by the Ukrainian expert at the third meeting of the Inquiry Commission on the likely significant transboundary impact of the Ukrainian Deep-Water Navigation Canal Danube-Black Sea in the context of ESPOO Convention, 1991. December 2005
- Rom. 4 Comments on documentation presented by Ukrainian expert at 4th meeting of the Inquiry Commission (16 Dec. 2005)

Dr Lyudmyla Anischenko

Ministry of Environment Protection of Ukraine, Kharkiv, Ukraine,

- Ukr. 1 The assessment of transboundary impact of the navigation route reopening in the Ukrainian part of the Danube Delta
Report + Annex 1 - 14, February 2005
- Ukr. 2 Annex 15 - 28, October 2005
- Ukr. 3 Annex 29 - 32, December 2005
- Ukr. 4 Annex 33 - 40, April 2006
- Ukr. 5 Annex 41 - 47, May-June 2006
- Ukr. 6 Report on Scientific Research Work:
"Environmental Assessment (EA) within the framework of the project "Creation of the Danube – the Black Sea deep-water navigable passage in the Ukrainian part of the delta. Stage 1". Ministry of Environment Protection of Ukraine. Kharkiv, Ukraine, 2003

EXECUTIVE SUMMARY

The Inquiry Commission came unanimously to the following conclusions:

1. *Likely significant* adverse transboundary impact:
 - impact of dredging or deepening of the rifts on the distribution of the flow discharge between the Bystre and the Starostambulski branches and on the water level dynamics along the Bystre branche, resulting in loss of floodplain habitats, important for fish (spawning and nursery) and birds (nesting, feeding)
 - impact of habitat loss by coverage of riparian dump sites and dredging through the offshore sandbar and measures for bank protection on birdlife and fish
 - impact on the increase of suspended sediment concentration, downstream of the dredging site on fish
 - impact on the turbidity of marine waters as a result of dumping of spoil at the dump-site at sea, under conditions of southbound alongshore currents
 - impact of repeated maintenance dredging hampering the recovery processes of affected areas for fish in the long term
 - cumulative impact of loss and/or disturbance of habitats and by shipping traffic on fish and bird life on a large scale and long time
2. *Hardly likely significant* (inconclusive) adverse transboundary impact:
 - impact of increased salt penetration in the Bystre Channel
 - impact of dredging the sandbar and construction of the retaining dam on the migratory behaviour of sturgeon and shed
3. *Unlikely significant* adverse transboundary impact:
 - impact of dredging on the hydro-morphological developments over larger distances and time scales
 - impact of dredging on the distribution of the discharges and the associated water level dynamics between the Chilia and the Tulcea branches
 - impact of dredging in the sandbar section of the Bystre Channel
 - impact of dredging on the increase of nutrient concentrations
 - impact of toxic sediment contamination
 - impact of overall increase of nutrients, heavy metals and organic micro-pollutants
 - impact from fish entrainment in dredgers
 - impact of the dump site in the Black Sea on fish
4. *Likely* adverse transboundary impact but *insufficient information* to judge significance:
 - impact of dredging on the turbidity of the river and marine waters
 - impact on the coastal morphology of the Romanian coastal section between the Chilia and the Sulina Branches from the construction of the retaining dam and the maintenance dredging of the Bystre sandbar section
 - impact of the navigation on fish and bird life
 - impact of increase of suspended sediment concentration at and near the dredging site
 - impact on migratory fish, passing the dredging area and/or shifting between different habitats across the border during dredging operations
 - impact of morphological modifications (e.g. bank protection), resulting from dredging activities, causing more uniform and degraded habitat conditions
 - effect of the dump site in the Black Sea on the benthic fauna at and around the dump site in relation to the increased suspended sediment concentrations and deposition, loss of habitat and burial of fish food organisms

5. *Unlikely* adverse transboundary impact but *insufficient information* to judge significance
 - presence of toxic concentrations of Zinc and Copper.

The Inquiry Commission came to the following evaluation:

- All impacts of the dredging of the Navigation Route in the Chilia Branch and the Starostambulski Branch are ipso facto transboundary, because the dredging is operated at and on the state boundary between Romania and the Ukraine. The question is whether the effects are likely significant and adverse.
- The deepening of the rifts will not result in a significant effect on the distribution of the water discharge between the Chilia and the Tulcea branches and therefore on the frequency distribution of the water levels along the Chilia Branch. Hence it is unlikely that the frequency of flooding of the floodplains and riparian wetlands will change significantly. In addition the anticipated effects for fish and birdlife are unlikely.
- As a result of the deepening of the rifts the discharge distribution between the Bystre and the Starostambulski branches will change significantly. As a consequence the frequency of high water levels along the Bystre Branch will increase significantly, which has a likely adverse transboundary impact on fish and birdlife. In addition, the dredging especially on the sand bar, results in a loss of habitat of some 600.000 m², which has a likely adverse transboundary impact on birdlife, specifically on terns.
- The sediment delivery to the coastal system will change due to the increased discharge by the Bystre, the effects of the retaining dam and the sediment injection at the sea dump site. At the moment there are insufficient data to quantify this change, but a preliminary indication revealed that the effect might possibly be transboundary. The inferred increase of the concentration of inorganic suspended sediments at the Romanian state border seems to be in the same order as the existing background.
- Changes in sediment transport patterns may also influence the morfological developments of the area of the Ptichiya spit and the nearshore mud flats, but these developments are expected to be relatively slow, because of the rather low sediment concentrations and deposition rates. These shallow areas are very important as habitats for fish and particularly birds.

This supply of sediment to the nearshore system is however not yet considered as adverse, because it is not anticipated that this will result in a reduction in food availability or in a rapid siltation of the area between the spit and the mainland or in a reduction in food availability for fish and birds.

- Local and restricted likely adverse transboundary impacts on fish and bird life may result from habitat loss by dredging and maintenance of rifts and sandbar and of bank protection measures; in the vicinity of and during the dredging operations; by covering of riparian dump sites and by shipping traffic (ship waves, noise, pollution, accidents etc). Especially the riparian areas are important habitats for fish and birds. However, in the case of migratory fish species, the cumulative impact is likely to be a large scale and long term effect.
- It seems hardly likely, that the dredging of the sandbar and the construction of the retaining dam will have a significant adverse transboundary effect on the migratory behaviour of the commercially important sturgeon and shed. In addition, it is unlikely that the dump site in the Black Sea will have an adverse transboundary effect on fish.
- From the point of view of the hydro-morphology and the pollution aspects the conclusions for Phase 2 does not deviate from those of Phase 1. However it is anticipated. that the length of the retaining dam will reduce the sediment influx from the North and will also hamper the

Northbound sediment transport during southern wind. It is anticipated that the delta section between the Bystre and the Sulina branches will receive a smaller sand input. than it does today, which may influence the developments of the Ptichya spit, which represents a very high ecological value.

- The deeper Navigation Route will require additional dredging of the sills, larger maintenance dredging, extended dump sites and possibly larger and longer bank protection measures. It is anticipated that the adverse transboundary impacts will at least be similar of those for Phase 1, but in some aspects even greater.
- As larger ships can be accommodated in the deeper Navigation Route also the disturbance of fish and bird life may increase.

The Inquiry Commission presents the following recommendations

1. The Commission identifies under point 4 and 5 of the above conclusions important subjects for which no conclusive evidence was available to judge the transboundary consequences of the Navigation Route.

The Commission, realising that the Navigation Route is and will be an political issue, recommends that a bilateral research programme is started as soon as possible, addressing the gaps in scientific information and knowledge related to the general problem of dredging a Navigation Route at and in the vicinity of the Romanian-Ukraine boundary. Such a research programme may contribute to a realistic evaluation of such Route and to adequate mitigation measures. Suggestions for the subjects of such research programme have been proposed.

International funding and assistance for the start of the proposed research programme may be organised via the Secretariat of the UNECE.

2. The present Inquiry Commission was the first that has been established in the framework of the ESPOO Convention and therefore some learning experiences may be mentioned.
 - it is recommended that *before* an Inquiry Commission is established a budget is agreed and paid to a trust fund by the parties. The trust fund may technically, financially be handled by the Secretariat of the UNECE, under special rules which reflects the independent and the specific nature of the Commission and which ensures a quick, adequate and alert handling of the financial matters and contracts.
 - a site visit of the Commission and the experts is strongly recommended. During this visit consultations with the governmental and local authorities; the national and local NGO's and the local population may be organised. In addition an extensive field reconnaissance of the problem area is very rewarding.
 - a time limit of 4 months for the delivery of a final report is very tight. Especially the experts need time to familiarise themselves with the key points of the problem and the existing (sometimes detailed) information.

Through this scientific evaluation the Inquiry Commission has come to the conclusion that a significant adverse transboundary impact is likely and thus the provisions of the UNECE Convention on Environmental Impact Assessment in a Transboundary Context (hereafter referred to as the Espoo Convention) apply. This means in concrete terms that Ukraine is expected to send a notification about the Canal to Romania and that the procedure in the Convention should start including communication between the Parties and public participation in the two Parties concerned should be held.

1. INTRODUCTION

1.1 History

The Danube Delta is a pristine area of high environmental values. It is an important wildlife habitat, the second largest delta in Europe. It has the largest number of birds of any South European wetland, being a key area for passage of migrants and wintering birds; the number of winter wildfowl may exceed 2 million. Over 320 species of birds are of European importance, of which 12 are globally threatened.

A large part of the Danube Delta, now some 580,000 ha, is incorporated into the transboundary Danube Delta Biosphere Reserve which was designated a Wetland of International Importance under the Ramsar Convention in 1991, inscribed on the World Heritage List in 1991 and internationally recognised as a Biosphere Reserve under UNESCO's Man and the Biosphere Programme in 1992.

Some branches in the Danube Delta are adapted for navigation from the inland to the Black Sea and vice versa. Navigation by larger ships is important for the economic development of the upstream cities and areas and for the sea-related activities: ship building, ship repair and fish processing.

It is anticipated that the Danube River may develop as an important cargo route between the Atlantic European and the Asian regions.

In 2001 an Ukrainian Company (Delta-Lotsman Company, now Delta Prospect) submitted a Feasibility Study to the Ukrainian Government covering the dredging of a Danube-Black Sea Deep Water Navigation Route, partly in the Ukrainian part of the Danube Delta and partly in the Danube River, which forms the boundary between Ukraine and Romania. The feasibility study included an Environmental Impact Assessment.

In 2002 a revised feasibility study was prepared addressing the various options for the Deep Water Navigation Route. This study also included an EIA.

In 2003 the Ukraine Cabinet approved the Project and adopted the Bystre variant as the seaward branch of the Navigation Route. The Government of Romania was informed accordingly. The construction of the Navigation Route raised concern in Romania.

In May 2004 The Ukraine Minister of Transport approved Phase 1 of the Project, consisting of the deepening of the sandbar section of the Bystre Branch and the dredging of some rifts (sills) in the River section between Ismail and Vilkove and the construction of a part of the retaining dam into the sea perpendicular to the coastline. The waterway was opened for navigation in August 2004. Also in August 2004 an EIA was completed for Phase 2 of the project, addressing the dredging of various rifts upstream; the location of the dump sites and the outbuilding of the retaining dam. It was anticipated that Phase 2 would be completed at the end of 2005, but that the works may continue up till 2007.

1.2. Establishment of the Inquiry Commission

The concern of the Romanian Government resulted in the initiation of a inquiry procedure under the UNECE Convention on Environmental Impact Assessment in a Transboundary Context (the 'ESPOO-Convention'). In the context of this procedure an Inquiry Commission may be established with the objective to advice the Parties concerned on the likelihood of significant adverse transboundary impacts of the construction and use of Navigation Route.

The Commission should consist of three scientific or technical experts, one nominated by each of the Parties and a third independent chairperson, agreed by both parties.

On 16 december 2004 the Permanent Mission of Romania forwarded to the Executive Secretary of the UN Economic Commission for Europe (UNECE) a letter from the Romanian Ministry of Foreign Affairs informing that no common agreement on the composition was reached and requesting the nomination of a third expert, according to article 3, Appendix IV of the Convention. The Inquiry Commission was established by a letter of 11 January 2005 of the Executive Secretary of the UNECE.

The Commission started with a meeting on 26 January 2005.

The work of the Commission was temporarily hampered from March to October 2005 due to problems with the settlement of the budget of the Commission and other administrative difficulties.

The Commission visited Bucharest and Kiev for consultations and discussions of the relevant authorities and representatives of NGO's and other organisations and also for a visit to the Danube Delta.

The Commission presented their Final Report on 16 July 2006.

1.3. Terms of Reference of the Commission.

- The objective of the Commission is to assess the likelihood of a significant adverse transboundary impact of the dredging and maintenance of the entrance channel and the rifts in the Danube River and the dumping of dredged spoil on riparian land or at a dump site offshore at sea.
- The Commission will operate according the provisions of Appendix IV of the ESPOO Convention of 25 February 1991.
- The Commission will include the views and findings of experts on specific matters or subjects.
- The Commission will provide a Report to the Executive Secretary of the UNECE by mid July 2006.

1.4 Composition of the Inquiry Commission

The Commission consisted of:

- Prof. Dr Joost H.J. Terwindt, Chairperson
Emeritus Professor Physical Geography, Faculty of Geosciences, Utrecht University, The Netherlands.
- Dr. Ludmila Ja Anischenko,
Ministry of Environmental Protection of Ukraine. Ukrainian Scientific and Research Institute of Ecological Problems. Head of Laboratory. Kharkiv, Ukraine.
- Dr. Mircea Staras,
Ministry of Environment and Water Management. Danube Delta Institute, Scientific Director. Tulcea, Romania.
- Mr. Wiek Schrage, Executive Secretary, appointed by the Commission, UNECE, Geneva

1.5 Contributions and References

It should be noted, that the Commission and the Experts entirely rely on the information which was provided by both parties and/or could be retrieved from international accessible literature. There was no time for executing additional measurements, field/laboratory work or model studies in the framework of this Report.

This Report was drafted by the Chairman and unanimously agreed by all members of the Commission.

In this Report at various places reference will be made to the contributions to the Commission by both Parties. The following abbreviations will be used.

- Ukr.1: The Assessment of Transboundary Impact of the Navigation Route Reopening in the Ukrainian Part of the Danube Delta. February 2005
- Ukr.2: The Assessment of Transboundary impact of the Navigation Route Reopening in the Ukrainian Part of the Danube Delta.
(Annexes No 15-28). October 2005
- Ukr.3: The Assessment of Transboundary impact of the Navigation Route Reopening in the Ukrainian Part of the Danube Delta. Annexes No 29-32). December 2005
- Ukr.4: Annexes No 33-40. April 2006
- Ukr.5: Annexes No 41-46. May 2006
- Ukr.6: "Environmental Assessment (EA) within the framework of the project "Creation of the Danube – the Black Sea deep-water navigable passage in the Ukrainian part of the delta. Stage 1". Kharkiv, 2003
- Rom.1: Documentation on the likely Significant Transboundary Impact of the Ukrainian Deep-water Navigation Canal, Danube -Black Sea in the Context of the ESPOO Convention, 1991. February 2005.
- Rom.2: Additional Information Requested from the Third Meeting of the Inquiry Commission on the likely Significant Transboundary Impact of the Ukrainian Deep-water Navigation Canal, Danube -Black Sea in the Context of the ESPOO Convention, 1991. October 2005

- Rom.3: Comments to Annexes No 15-28 Presented by the Ukrainian Expert at the Third Meeting of the Inquiry Commission on the likely Significant Transboundary Impact of the Ukrainian Deep-water Navigation Canal, Danube -Black Sea in the Context of the ESPOO Convention, 1991. December 2005
- Rom.4: Comments on Documentation Presented by Ukrainian Expert at the Fourth Meeting of the Inquiry Commission (16 Dec.2005)

All information presented to the Commission and the full reports of the Experts have been added to this Report on the attached CD-ROM.



DANUBE AT TULCEA



FLOODED WETLAND

2. DEFINITIONS

2.1 Transboundary

Upstream of Ismail the Danube River forms the boundary between Romania and the Ukraine. Downstream of Ismail the Chilia Arm and the Starostambulsky Arm mark the boundary between the two countries. More precise the boundary is situated in the middle of the river course between the two banks.

Romania and the Ukraine have established agreements as to the maintenance of the navigation channel.

2.2 Transboundary impact

In the Guidance on the Practical Application of the ESPOO Convention, Annex 1, Article 1 (lit.1) the terms "impact" and "transboundary impact" are defined as follows:

"Impact means any effect caused by a proposed activity on the environment including health and safety, flora, fauna, soil, air, water, climate, landscape and historical monuments or other physical structures or the interaction among these factors; it also includes effects on cultural heritage or socio-economic conditions resulting from alterations to those factors".

"Transboundary impacts means any impact, not exclusively of a global nature, within an area under the jurisdiction of a Party caused by a proposed activity the physical origin of which is situated wholly or in part within the area under the jurisdiction of another Party".

These definitions mean that the subject of the focus of the Inquiry Commission is the *adverse transboundary impact* of the dredging of a navigation route via the Bystre Canal and the lower deltaic part of the Danube River on the Territory of the Ukraine and in the River, being the border upstream of Vilkovce, on the territory of Romania as well.

2.3 Likely Significant

Appendix IV of the ESPOO Convention describes the Inquiry Procedure. In article 1 it is stated that the main subject of the Inquiry Commission is: "the question of whether a proposed activity, listed in Appendix 1 (of the Convention) is *likely to have a significant adverse transboundary impact.....*". Keywords are: "*likely significant*".

In natural systems variables pertinent to the system may show a rather large variability due to daily, seasonal, yearly or decadal conditions and to unknown inherent system-specific causes. This means that time series of measurements of such variables show a certain realm in which the measurements vary. Such variations may be random or systematic related to daily, seasonal etc. conditions.

When the boundary conditions of a system are changed some variables may be affected, resulting in a change of the realm of the measurements and/or the systematic conditions. This may result in a change or a break in the trend in the measurements.

The above described main subject of the Inquiry Commission strictly speaking require that these changes in realm and/or trend should be significant: distinguishable with some certainty. The problem is, that engineering works mostly result in abrupt changes in the boundary conditions and that the conclusion that they are significant can only be based on measurements in the future.

Shortly after the change in boundary conditions the measurements will be inconclusive in a strict statistical sense.

This reflects the problem of the prediction of the consequences of a sudden change in the system. In the *a-biotic* world there is a lot of knowledge, which may be systematised into models. Predictions may be gained by changing the boundary conditions of the models or to introduce some adaptations in modules. The significance of the results of the models can be tested in confronting these with real world measurements or observations.

In the *biotic* world predictions are much more difficult because the relationships are very complex and the speed of adaptation is variable for different organisms. In addition some organisms (e.g. birds, fish) may have a large spatial reach (they fly and swim over great distances). They use habitats over the whole delta and state boundaries are irrelevant in this respect. Furthermore their numbers show large variations in time also for reasons outside the Danube Delta. Therefore it is almost impossible to assess the impact of a certain human interference quantitatively. Normally reduction or extension of areas of habitats may be used as a qualitative indication of the order of magnitude of the change due to an human interference, but a quantitative prediction is very hard.

In addition it may be noted, that sometimes effects of a human activity may generate other additional effects. In such cases *cumulative effects will occur*. The prediction of cumulative effects may be difficult, because it requires a good knowledge of the functioning of the ecosystems of habitats. Reliable quantitative knowledge of these complex systems is sometime insufficient.

These problems of evaluation of impacts of human activities have been envisaged in the ESPOO Convention by the Document: "Current Policies, Strategies and Aspects of Environmental Impact Assessment in a Transboundary Context" (lit.2). In Part Three, Section 2 of this document, a treatise is presented on the "Significance of Adverse Transboundary Impact". Some relevant quotes may be reproduced here. "Criteria on the significance of any impact should be set in a general decision-making framework. In some cases, it may be possible to establish generally acceptable *criteria on significance*. In most cases, however, the decision that an adverse transboundary impact is likely to be significant would be based on a comprehensive consideration of the characteristics of the activity and its possible impact. An element of judgement would always be present". It is noted here that "judgement" implies an undefined uncertainty; it is based on knowledge and experience(s) from other, more or less similar areas or phenomena.

The Inquiry Commission, realising the above described difficulties, has sought the advice of internationally renown experts in order to receive the best-professional judgement on certain aspects of the present subject of the Commission. This is especially important for assessing the *adverse character* of the impacts for the environment.

The Commission has categorised the "likely significance of adverse transboundary impacts" as follows:

- * unlikely
- * hardly likely (inconclusive)
- * likely
- * very likely

-
- Lit. 1. Guidance on the Practical Application of the ESPOO Convention.
Convention on Environmental Impact Assessment in a Transboundary Context. (UN/ECE).
2003: 48 pp.
- Lit. 2. Current Policies, Strategies and Aspects of Environmental Impact Assessment in a
Transboundary Context. Environmental Series No 6. United Nations Economic Commission
for Europe. Geneva, 1996: 75 pp.



DELTA



VEGETATED BANK

3. TECHNICAL DETAILS OF THE DISPUTED ACTIVITIES

3.1 General outline

The activities comprise the creation of a deep-water navigation route from the city of Ismail seawards via the Chilia Branch and the Bystre (Bystroe) Channel and Outlet towards the Black Sea (see figures at the end of this chapter for locations).

The engineering works are planned in a section with an overall length of 162.2 km. In general it involves the dredging of 14 rifts (sills) in the river part of the delta and the construction of flow guidance and bank protection measures, seawards of Vilkovce and in the Bystre Branch and the dredging of the seaward access channel and the building of a retaining dam offshore.

As explained in the Introduction the activities will be carried out in two phases.

Phase 1 consists of the dredging of the rifts in the Chilia Branch upstream of Vilkovce; the dredging of the access channel in the sandbar at the mouth and the construction of a part of the retaining dam in the sea. The objective is to facilitate the navigation of vessels with a draft of 5.85 m (Ukr.1, Annex 8; Ukr.6).

This Phase 1 is almost finished by now, but from October 1, 2005 all dredging operations under Phase 1 were suspended by the Ukrainian Government, till the end of flooding and spawning period in 2006 (information Dr Anischenko, April 26, 2006).

The Phase 2 envisages the deepening of the route in the River (Ukr.4, Annex 40) the construction of the engineering works seaward from Vilkovce (Ukr.1, Annex 3) and the remaining part of the retaining dam. Phase 2 has not started yet (information Dr Anischenko, April 26, 2006).

An extensive description of the characteristics and developments of the river and the delta and the environmental effects of the construction of the Navigation Route is presented in the Environmental Assessment (EA) for Phase 1 (Ukr.6). The EA for Phase 2 was not provided to the Commission.

An account of the characteristics of the river part of the Danube River Deep Water Navigation Route is presented in Ukr.3, Annex 29 and Rom.1, Annex 1.

3.2. Phase 1.

3.2.1. Dredging of rifts

According to Ukr.1, Annex 2, the navigation channel in the river up to the sea has a projected design width of 120 m (some parts 60 m) and a projected design depth of 7 m with slopes ranging from 1:6 to 1:1,5. This involves a dredging volume of in total about 1,9 million m³.

Comparison of Ukr.2, Annex 15 and 17 learns that for various rifts the design depth ranges between 7,1 and 7,2 m.

From Ukr.2, Annex 17 it can be seen that the designed increase in depth over the rifts ranges from some 0,5 m to 3,8 m. The following table gives an impression of the position of the incisions larger than 1 m.

Incision depth (m) below present bed	Location Km (approx.)
> 3	31, 61
2-3	30, 32, 37
1-2	29, 30, 31, 36, 47- 49, 62, 65, 73

It turns out that most deeper incision are located around Km 29-32 and Km 61-65.

According to Ukr.2, Annex 25, by October 2005 1.327.570 m³ has been dredged in the river. As stated above by October 1, 2005 all dredging operations under Phase 1 were suspended by the Ukrainian Government. The channel widths in some river sections then were below the design values.

The spoil was dumped on land in 8 riparian storage sites along the river (Ukr.2, Annex 2 and 18) in which it was foreseen that some 1,725 million m³ of dredging material could be deposited. In fact some 1,686 million m³ has been stored on the onshore sites (Ukr.4, Annex 35).

Ukr.2, Annex 19 indicates, that in total some 125 ha of riparian land are expected to be covered with spoil from the dredging activities in the river. Annex 19 also indicates the original land cover before the storage of the spoil.

Ukr.1, Annex 2 shows, that the anticipated area of the river bed, affected by the dredging and storage covers some 1,7 million m².

3.2.2. Dredging of sandbar

Ukr.1, Annex 2 also induces that the navigation channel in the sandbar area has a length of 3432 m, with a design width of 100 m, a depth between 7,6 and 8,3 m and slopes of 1:9, with a projected dredging volume of 1.684.000 m³ (Ukr.4, Annex 35). By October 2005 some 1.687.000 m³ has been excavated, which also includes the dredging for the retaining dam (90.000 m³, Ukr.4, Annex 35). These dredging operations are also suspended by October 1, 2005.

The spoil was dumped in the Black Sea at a circular site with an outline of 1 sea mile, almost 8 km offshore at a water depth of around 20 m (Ukr.2, Annex 15; Ukr.5, Annex 44). The projected volume of spoil to be dumped at the offshore site was in the order of 2,0 million m³ (Ukr.1, Annex 2).

Ukr.1, Annex 2 shows, that the anticipated area of the sea bed in the sand bar section and the access channel, affected by the dredging and storage, covers some 0,6 million m².

3.2.3. Construction of retaining dam

The main purpose of the retaining dam is to reduce the siltation in the excavated access channel as a result of the sand transport driven by strong winds from the Northern-North Eastern direction.

As indicated in Ukr.2, Annex 23 the construction of the seaward end of the dam was planned for Phase 1. In Phase 2 the remaining part is foreseen in shallower waters.

Ukr.2, Annex 27 page 4 shows the seaward access channel and that part of the retaining dam, that has been constructed in Phase 1.

At the moment of the suspension of the execution of Phase 1 the length of the completed section was 360 m or 1/3 of the Phase 1 design length (Ukr.2, Annex 25).

3.2.4. Maintenance

As could be expected and was confirmed by the data in Ukr.3, Annex 29 it is very difficult to present an estimate of the volume of maintenance dredging in the Lower Danube River. The reason is the great seasonal and yearly variability of the sediment load, associated with the variability in the river discharge.

According to Ukr.3, Annex 29 it is suggested that as a rough estimate up to some 10% of the total annual suspended load, carried via the Chilia arm is retained and deposited along the river section between Ismail and Vilkove. This results in estimated annual sedimentation rates ranging between 0,31 to 3,39 million m³, with an average annual rate of 1,31 million m³ over the period of 1980-2004. An unknown part of it will be deposited on the dredged rifts and have to be removed. However these figures suggest a yearly average volume of maintenance dredging in the order of magnitude of several hundred-thousands m³ (see also Ukr.5, Annex 43, table 4).

In addition Ukr.3, Annex 29 also indicates, that the estimated volume of river-borne sediments, deposited in the seaward access channel of the Danube-Black Sea Navigation route in 2005 was between 0,8 to 1,2 million m³. In Ukr.4, Annex 38 it is stated, that the average annual volume of sediments deposited in the sand bar section over the period 1980-2004 is 2,5 million m³. This applies to the whole sand bar area. The seaward access channel is only a part of the sand bar area. The annual volume of sediments, deposited in the access channel accounts for up to 20-30% of the total volume of sediments deposited in the sandbar area; thus some 0,5-0,75 million m³, in the absence of the retaining dam. In the presence of the completed dam (Phase 2) this volume is estimated to be reduced to some 0,25-0,35 million m³ (Ukr.4, Annex 38).

This points to a yearly average volume of maintenance dredging of the order of several hundred-thousands m³ in the access channel.

3.3 Phase 2.

3.3.1. Dredging of the rifts and the sandbar.

Ukr.4 Annex 40 learns that the design depth of the Navigation Route in the river part is 8,4 m and in the sandbar section 8,72-9,52 m. All other design parameters are similar to those of Phase 1. For Phase 2 this means an additional dredging of about 4,5 million m³ in the river and sandbar sections and some 1,2 million m³ in the seaward access channel and some 0,03 million m³ along the retaining dam. In total 5,73 million m³. For comparison the total dredging volume for Phase 1 was 3,65 million m³.

3.3.2. Construction of the retaining dam

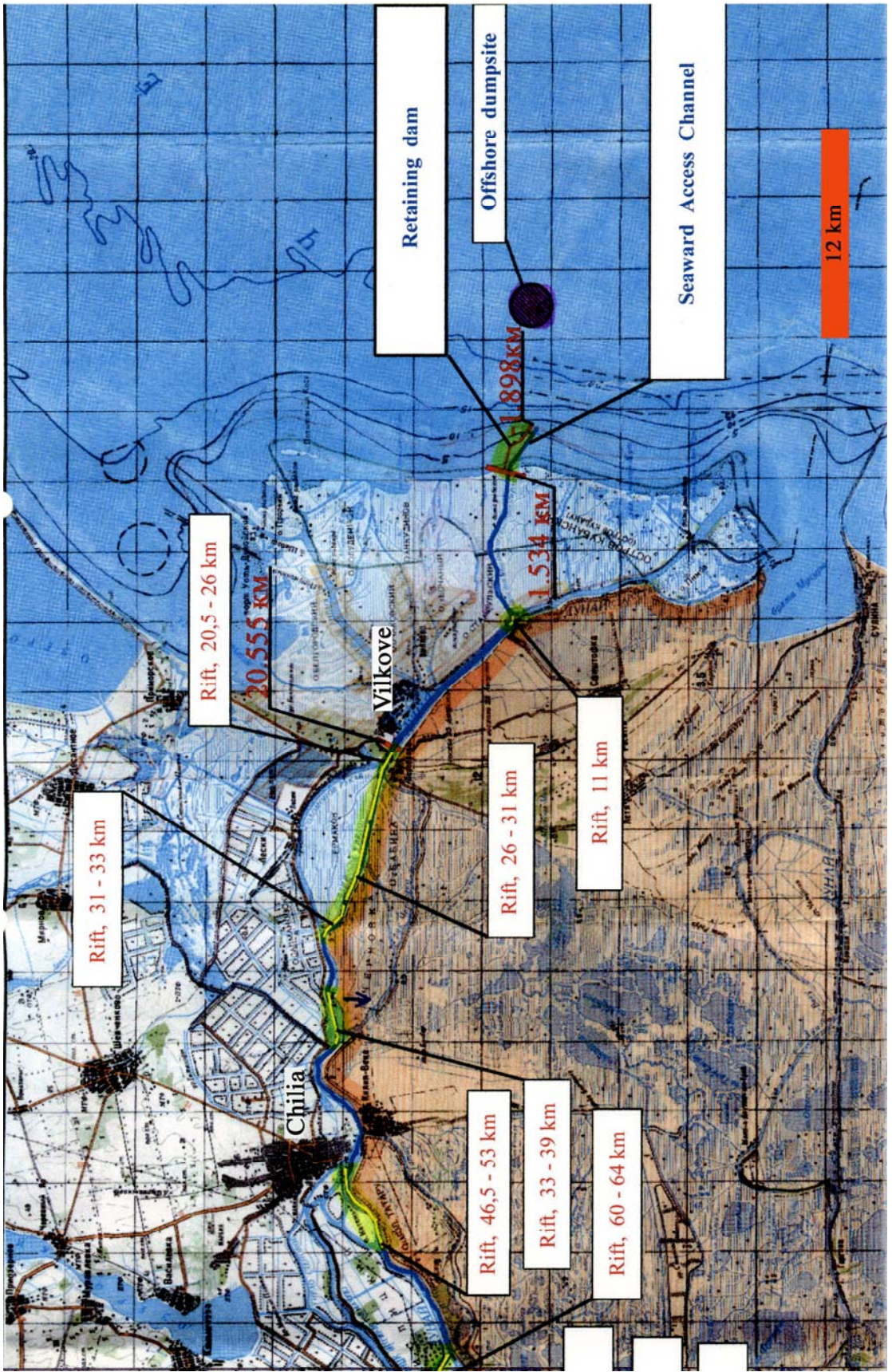
In Phase 2 the remaining part of the retaining dam is foreseen in shallower waters (see Ukr.2, Annex 23; Ukr.4, Annex 40). The total design length of the dam is 2830 m. Of this 1040 m were foreseen in Phase 1, of which 350 m is completed yet.

3.3.3. Maintenance dredging in the seaward part

As stated in Ukr.1, Annex 8 it is anticipated that in Phase 2 some 1 million m³/year maintenance spoil will be dumped at the offshore site until it reaches its design capacity of some 5,4 million m³.

Annex 15





4. STATEMENT OF THE CONTROVERSIES

4.1 Introduction.

The construction of the Danube-Black Sea Deep Water Navigation Route, partly in the Ukrainian part of the Danube Delta and partly in the Danube River, which forms the boundary between the Ukraine and Romania, created a dispute between both countries concerning the likely significant adverse transboundary environmental effects.

In the first meeting of the Inquiry Commission the representatives in the Commission of both countries were invited to identify the controversial problems and to present their views on these problems in the form of statements. These problem definitions and views are incorporated in the Ukr.1 and Rom.1 Reports. The Chairman of the Commission presented a summary of these statements, which were discussed and agreed in the Commission meeting on February, 24, 2005. Additional information was provided by the members of the Commission: Rom.2, Rom.3. Rom.4 and Ukr.2, Ukr.3, Ukr.4. Ukr.5 and Ukr.6.

The following subjects are identified in the statements as being controversial:

1. transboundary impact on the hydrology of the River Danube
2. transboundary impact on sediment discharge and the storage and dumping of dredged material in the coastal zone
3. transboundary impact of dredging on pollution of the coastal waters
4. transboundary impact on fisheries
5. transboundary impact on biodiversity, because of loss of habitat of protected migratory birds
6. transboundary social-economic impact.

These subjects are treated in the next sections.

On the basis of this identification, four experts have been selected to advise the Commission in the following fields of expertise:

- * hydrology, sediment discharge, siltation and erosion, water and associated sediment movement in the coastal zone including the fate of the dumped spoil
(*Jos van Gils*, WL/Delft Hydraulics, Delft. The Netherlands)
- * pollution of water and sediments and the input of pollutants during the dredging and the storage or dumping of dredged sediment
(*Nico de Rooij*, Geochemistry consultant, The Netherlands)
- * changes in fishery habitats due to engineering works in the river and the coastal and estuarine zone and the effects on the migration routes of commercially interesting fish species
(*Stefan Schmutz*, University of Vienna, Austria)
- * changes in the bird habitats due to engineering works in the coastal and estuarine zone and the effects on migration routes of birds
(*Mark O'Connell*, University of West of England, Bristol, UK).

All experts have a great experience in their specific field and are internationally renown by their publications in high ranking international refereed journals and their contributions in congresses, symposia and scientific institutions.

4.2 Transboundary hydrological impact

Romania: *unlikely* for Phase 1, *likely* for Phase 2. Satisfactory calibrated (Sobek) model studies for Phase 1 revealed that the changes in the water flow of the Chila branch, due to the lowering of the rifts upstream and downstream of Bystre, will be insignificant.

However it is anticipated that the further lowering of the rifts in Phase 2 will result in an increase of some 7% at low water discharges and some 6 % at flood discharges (Rom.1, Annex 1, point 1). It is feared that this will change the hydrology and water distribution between the Danube branches systematically, which may have a potential significant impact on the water distribution inside the Romanian delta. In Rom.3 attention was given in this respect to the Cernovca Branch of the Chilia River.

Ukraine: *unlikely* for Phase 1, based on measurements March-December 2004. (Ukr.1, Annex 6, point 2). No detailed account of these measurements has been presented to the Commission yet.

The increase in discharge, due to the dredging of the rifts in Phase 2 will be only 10% of the value deduced by the Romanian party. Therefore it is stated that no indication of increase in flow discharges has been found, due to the dredging activities in the Bystre Branch.

4.3 Transboundary impact of sediment discharge and dumping of spoil in the coastal zone

Romania: *likely significant* by movement of sediments and pollutants affecting littoral fauna (Rom 1, On Annex 1, point 2). Although there is no information available on changes in water quality or enrichment in sediments in the Romanian territory it is anticipated that there is a risk and probability of a significant impact on the littoral fauna by sediment delivery alongshore to the south. It is further anticipated (see Rom 3, Annex 27) that the retaining dam will favour the accumulation of sand and that the siltation at the mouth and access channel will increase. In addition the erosion process at Ptichiya Island (see also Ukr. 2, Annex 27) will be stronger.

Finally it is stated, that the habitat of the sea bed at the dump site of the spoil will be detrimentally affected (Rom. 4, On Annex 30).

Another matter of concern is the measured oxygen deficit in the bottom water layer at depths below 18m, which may perhaps be associated with the dumping of the spoil and the "destruction of the bottom biocenosis, worsening of oxygen conditions, increase in trophic structure and toxic action of hydro-biotones" (Rom. 4, On Annex 30)

Ukraine: *unlikely:* the dredging activity has led to an increase in the Suspended Solids Concentration (further SSC) but only in a small area in the sandbar area in the order of 1 km (Ukr.3, Annex 30). A rapid decrease in SSC was observed away from the dredging site (3-5 times lower at about 1 km up- and downstream of the dredging site). The SSC from the dredging site is incorporated in the SSC from the river outflow (Annex 6, point 6). The dumpsite of the spoil is located 8 km offshore at a water depth of 20 m. It is stated that this is too far away that the spoil can add sediment to the coastal flow or the contaminated water flow from the dump site can enter and influence the coastal zone (Ukr.1, Annex 8).

It was furthermore stated (Ukr.3 Annex 30) that no elevation in the SSC was found in the location of the marine dump site and that the spoil was "conventionally clean and is allowed to be disposed at the marine dump, since it does not pose threat to the marine environment".

Ukr.4, Annex 38 stated that "there is no indication that the impact of dumping operations extends beyond the area of offshore dumping site".

The oxygen deficit in September 2005 in the bottom water layers of the Black Sea, below the halocline at 18 m depth developed regardless of their proximity to the offshore dumping site and therefore there are "no reasonable grounds for attributing this natural phenomenon to be the result of dumping operations (Ukr.4, Annex 38)

4.4 Transboundary impact of dredging on pollution of the coastal waters

Romania: *likely:* in Rom 1, page 2 mention is made of an impact study by the Ukrainian Academy of Science indicating the weight of various pollutants contained in the total dredged river sediment (5,14 million m³) to which should be added the pollution of 2,33 million dredged in the bar area and 1,17 million m³ of annual maintenance dredging, illustrating this concern.

Ukraine: *unlikely:* In Ukr.1, Annex2 it is mentioned that the total projected volume of dredged spoils is about 3,66 million m³ of which about 1,73 million m³ will be placed at the riparian storage site on the left bank of Chilia Arm and some 1,93 million m³ will be delivered to the offshore dump site.

The contamination of water and soil in the location of the offshore dump site for dredged spoil should be considered as a local and short-term impact. The monitoring data of 2004 provide no indication of a transboundary impact of dumping activity on water quality (Ukr.1, Annex 6; Ukr.2, Annex 26).

Monitored water quality parameters in the second half of 2004 revealed that 90 % of the parameters correspond to Water Quality Class III (i.e. moderately polluted water). On relatively frequent occasions the level of COD and nutrients were also within the limits set for water Quality Class III.

The observed mean concentrations of contaminants in the second half of 2004 are not higher than their respective average historical values. The same holds for the relatively higher concentrations of COD, BOD₅, and some heavy metals (point 7 and 8 of Ukr.1, Annex 6, see also additional information in Ukr.4, Annex 33).

During dredging activity, in the sandbar section, no significant changes in the concentration of phosphorus, nitrogen and silicon as well as oxygen and soluble organic substances have been recorded over the monitoring period. The same holds for the 2005 monitoring period (Ukr.2, Annex 26).

In the Bystre Branch mouth high levels of organic substances were recorded; the content of ammonium nitrogen appeared to be highest.

It was concluded, that there is no transboundary impact on the marine water quality and littoral fauna (Ukr.1 section 2.1), because of dispersion and sedimentation, mixing and self-purification of discharged suspended and soluble matter in the mouth of the Bystre channel and in the adjacent coastal area.

4.5 Transboundary impact on fisheries

Romania: *likely:* citing several sources (Rom 1, Annex 1, point 3) it is stated that the major impacts might be the "changes in migration pattern of sturgeon species and Danube herring, disrupting fish migration routes, decrease in biodiversity, impact on threatened species and changes in species composition". In addition "the adverse effects of penetration of the salt water on living conditions of fresh water biota" are mentioned. Finally it is stated that

"dredging and filling disturbs benthic fauna, eliminate deep holes and alters substrate, all important for sturgeon" (Rom.1, Annex 1, point 3). It is further stated that "the protection dam of 1040 m length could act as a barrier for adult sturgeons and Danube herring coming from the main feeding area, located N-W of the Black Sea for spawning migration in the Danube River" (Rom.1 page 3).

It was further stated that an impact of the dredging on migratory fish species in most cases cannot be inferred immediately, but after a certain time span and therefore required long term systematic monitoring (Rom. 3, Re point 13-14).

Ukraine: *unlikely:* in the vicinity of the dredging sites the concentration of pollutants was above MAC values (maximum admissible concentration) used for fishery. The same holds for oil products and heavy metals Fe, Mn, Cu, and Zn. However the area involved was small and the concentrations drop away from the site to mean background values. (Ukr.1, Annex 6, point 10; Ukr.2, Annex 26).

In addition bio-tests indicated that "none of the samples taken contained toxic substances at concentrations capable to produce acute toxic effects". (Ukr.1, Annex 6, point 11). Bio-tests on river molluscs for accumulation of heavy metals and arsenic as well as monitoring data on concentrations of DDT, lindaan, attrasine and chlorinated organic pesticides in 2004 are comparable with those measured during the Joint Danube Survey in 2001 (Ukr.1, Annex 6, point 13 and 14). Thus it was concluded, that "there have been no significant changes in the community structure and pollution levels in the Danube since the commencement of operation of the Danube-Black Sea Navigation Route. The only exception relates to the dredging sites in the Bystre Branch, where invertebrate fauna was found to have depleted significantly within a limited area....and the community structure of bottom species has been disturbed" (Ukr.1, Annex 6, point 15). The same conclusion appeared from the monitoring data of 2005 (Ukr.2, Annex 26)

It is further stated, that the "impacts on reproduction conditions for fish stock.... is *forecast* to be not significant in the transboundary context" (Ukr.1, page 3). This conclusion resulted also from the 2005 monitoring (Ukr.2, Annex 26).

In addition it is revealed that the retaining dam at the North side of the seaward access channel, which will extend to a depth of 7 m will have no impact on the "migration of sturgeons to their spawning areas because adult individuals usually travel at depth larger than 10 m" and "fish shoals will move around the outward face of the dam" (Ukr.1, page 3 and 4).

4.6 Impact on biodiversity because of loss of habitat of protected migrating birds

Romania: *likely;* The main effect may be the loss of habitat for feeding and nesting of birds because of the dredging in the sandbar and for the access channel. According to Rom. 1, Annex 1, point 5, 245 bird species are affected by the new Bystre Canal and up to 5600 couples of birds nest in the Bystre Canal area. Valued and strictly protected migratory birds nest on the Ptichiya island located in the area of dredging. Several protected birds nest on the small islands in the mouth of the Bystre Canal and the main feeding area of Pied avocet is located in this mouth. In Rom.3, Re point 13 and 14, it is stated that ornithologists reported disturbance of the bird population due to dredging. Dredging has an impact on benthic fauna, the basic food source of some species. Bird colonies in the influenced area are sensitive to noise disturbances. Therefore bird colonies are destroyed during dredging (Rom. 1, Annex 1, point 5).

Ukraine: *unlikely:* according to Ukr.1, Annex 6, point 21, no significant changes in vegetation cover have occurred in the vicinity of the construction site near the Ptichiya Spit. The population and structure of nesting bird community of the Ptichiya Spit remained the same after dredging.

However the level of disturbance increased significantly during the dredging activity in the sandbar section of the Bystre Canal, resulting in a reduction in successful reproduction rates in 2004, especially in the vicinity of the Navigation Route: from historically recorded 50-70% to 3-5% in speckled tern and from 60-80% to 7-10% in river tern.

In the Bystre Canal area, the post-dredging nesting community showed an increase in proportion accounted for by cormorant birds, due to their greater tolerance to noise and increase in area available for their rest and a decrease in proportion of waterfowl species showing lower tolerance to noise. The seasonal patterns showed an increase in proportion accounted for by pelicans, herons and sandpipers.

It is stated that "generally the 2004 monitoring results show that actually observed trends in the environment quality, caused by the channel reopening activity were well within, or often below the forecasted changes" (Ukr.1, Annex 6, point 22).

4.7 Social and economic impacts

Romania: *likely:* According to Rom.1, page 4, "the regulation and intense navigation of the Sulina branch reduced the importance of its fisheries based on anadromous sturgeons and Danube herring, but the Chilia and St George branches remains important". "Similar to the Sulina Canal, shad and three sturgeon species will lose one of their migration ways in short term. Romanian fisherman who use to fish on the Chilia branch and upstream will be affected".

Ukraine: *unlikely:* " the analysis of fish samples taken for research purpose, prior to and during the reopening of the deep water navigation route shows that there was no significant impact on the commercial fish fauna inhabiting the outer delta of the Bystre Branch" (Ukr.1, Annex 6, point 20).

4.8 Summary of statements by both Parties

1. Transboundary hydrological impact from Phase 1 and Phase 2
Romania: *unlikely* for Phase 1, *likely* for Phase 2, (Rom.1, Annex 1, point 1)
Ukraine: *unlikely* for Phase 1, (Ukr.1, Annex 6, point 2).
2. Transboundary impact of sediment discharge and dumping
Romania: *likely significant* by movement of sediments and pollutants affecting littoral fauna (Rom 1, Annex 1, point 2; Rom.3,Annex 27); the effects of the retaining dam (Rom.3,Annex27) loss of habitat at seaward dump site (Rom.4 Annex 30).
Ukraine: *unlikely:* (Ukr.1, page 3; Ukr.1, Annex 6, point 6; Ukr.1, Annex 8; Ukr.3, Annex 30; Ukr.4, Annex 30).
3. Transboundary impact of dredging on pollution of the coastal waters
Romania: *likely:* (Rom.1, page 2)
Ukraine: *unlikely:* (Ukr.1 page 3; Ukr.1, Annex 6; Ukr.2, Annex 26; Ukr.4 Annex 33).
4. Transboundary impact on fisheries
Romania: *likely* (Rom.1, page 3; Rom.1, Annex 1 point 3, page 14).
Ukraine: *unlikely:*. (Ukr.1, Annex 6, point 10, 11, 13, 14, 15; Ukr.1. page 3 and 4; Ukr.2, Annex 26).
5. Transboundary impact on biodiversity because of loss of habitat of protected migratory birds.
Romania: *likely;* (Rom 1, Annex 1, point 5; Rom.3, point 13 and 14).
Ukraine: *unlikely* (Ukr.1, Annex 6, point 21 and 22)
6. Transboundary social economic impact
Romania: *likely:* (Rom.1, page 4)
Ukraine: *unlikely:* (Ukr.1, Annex 6, point 20).



FLOODED LOWLAND



FISHERMAN'S SETTLEMENT

5. EXPERT VIEWS ON THE CONTROVERSIES

5.1 Introduction.

All relevant information, which was provided by the Members of the Commission was forwarded to the Experts. Two sessions were organised between the Commission and the Experts viz. in mid December 2005 in Amsterdam and end May 2006 in Geneva.

The reports of the Experts are integrally included as Appendices to this Report. In this chapter the conclusions of the findings of the Experts are presented.

Reference is made here to the constraints in evaluating the likely significant adverse transboundary impacts as described in chapter 2.

5.2 Impact on the hydro-morphology, sediment discharge and dumping of spoil.

The Report of the hydro-morpho-dynamics expert (further HM-expert) addresses the following major controversies (see chapter 4):

1. transboundary impact on the hydrology of the River Danube,
2. transboundary impact on sediment discharge and the storage and dumping of dredged material in the coastal zone.

From these impacts only the likeliness of the significance is treated in the report. The judgement whether the impact is adverse is not presented, because this requires an ecological or socio-economical assessment, which is outside the scope of the HM-report.

As to the first subject the HM-expert identifies the following relevant issues as to the impact of the dredging of the Navigation Route, which essentially consists of a lowering of the rifts:

- the impact on the discharge distribution over the various Danube and Chilia branches
- the impacts on the water level dynamics and sediment transport in the different branches

As to the second subject:

- the impact on sediment discharge in the river and from the river mouth to the coastal waters;
- the impact on the littoral system and the coastal morphology
- the impacts from protective structures.

This also includes the effects near dredging areas, hydro-engineering constructions and spoil storage sites on the formation of a turbid cloud, or plume, which may have an impact on aquatic organisms and fish stocks.

Based on the available information, which was sometimes incomplete or unverifiable, the HM-expert came to the following conclusions:

1. *Effects of the dredging of the deepening of the rifts* on the distribution of the flow discharge between the Chilia and the Tulcea Branches, the HM Expert came to the conclusion that the project implementation will have a **transboundary effect** on the discharge distribution between the Chilia and the Tulcea-Sulina Branch, but the effect is **unlikely significant** if it is judged against the background of the autonomous development of this distribution.
2. *Dredging in the sandbar section* of the Bystre Channel: **no impact** is expected regarding the flow distribution between the main branches Chilia and Tulcea in Phase 1. On the basis of the available information regarding Phase 1, the expert does expect an **insignificant impact**

of the further deepening of the sand bar section in the Bystre Branch mouth during Phase 2 on the discharge distribution between Chilia and the Tulcea Branch.

3. *Flow distribution between the Bystre and the Starostambulski branches*: it turns out that in Phase 1 an increase of the discharge in the Bystre branch will be 12% and the HM-expert concluded that this represents a **likely significant transboundary** effect.

It may be noted that this conclusion was criticized by the Ukrainian side on the basis of an alternative mathematical modelling exercise (Ukr.5, Annex 47). The HM-expert re-evaluated his findings on the basis of this new information. He arrived at the statement that: "on the basis of our perception of the Delta geomorphology and the sandbar section before and after deepening and our experience in river hydraulics we consider it *highly unlikely* that the removal of the Bystre mouth sandbar would have *no* impact on the discharge through the Bystre branch." The HM-expert came to the final conclusion that he sees no reason to adjust the original conclusions in his report. (see Addendum to this Report, dated 23 June 2006 of WL/Delft Hydraulics Z3975/23062006).

4. *Dredging of the rifts on the water level dynamics* (riparian water bodies and flood plains, relevant for the fish and bird fauna) the expert concluded on the basis of a modelling study that for the *Chilia* branch the impact is **unlikely significant**. For the *Bystre* branch however the impact is of the same order as the natural variation and therefore it is a **likely significant transboundary** effect. It is noted here that the water level dynamics are closely related to the discharge alterations and thus to the change in flow distribution (point 3).
5. *Turbidity of river water and marine waters as a result of dredging operations*: the HM-expert states that it is not possible to assess this impact in detail without having access to relevant information regarding the dredging works, the local river geometry and the environmental conditions. From the Ukrainian side it is reported, based on modelling that the average increase in the background concentration of suspended matter will be about 0.4 mg/l and that in the centre of the plume the increase in concentration of suspended solids will be about 10-25 mg/l.

In addition in view of the fact that the state border between the Ukraine and Romania is situated along the Chilia Branch, exactly where the dredging is taking place, the impacts are of a **likely transboundary nature**. However the natural variability of the suspended matter concentrations in the river is very large (typically between 20 mg/l and several hundreds of mg/l). The concentration increase needs to be in the order of 100 mg/l in order to be significant. On the basis of the available data the HM-expert cannot estimate the extent of such impact. Therefore he qualified them as "**hardly likely significant** (inconclusive)". The final conclusion of the HM-expert is that there is **insufficient information to judge the significance** of the local and temporal transboundary impact on the turbidity of the river water in the vicinity of and during the dredging operations

6. *Impacts over larger distances and time scales* the HM-expert concludes, that the extra load of sediment, evaluated against the background of the total river sediment load and variability therein, the transboundary impacts of dredging operations on the turbidity of river waters and marine waters over larger distances and time scales are considered **unlikely significant**.
7. *Turbidity of marine waters as a result of dumping of dredged spoil* the HM-expert came to the conclusion, that during the dumping operations under conditions with southbound currents, the increase of the concentration of inorganic suspended matter at the Romanian state border is of the same order as the existing background and that the impact of such activities must therefore be characterised as **likely significant transboundary**.
8. *Coastal morphology* the HM-expert came to the conclusion that the transboundary morphological impacts of the project on the Chilia-Bystre coast are restricted to the Romanian coastal section between the Chilia and the Sulina Branches (in the order of 10 km long), because the 8 km long Sulina jetties effectively prevents North-bound sediment

transport. This section will probably receive a smaller sand input. Although the Bystre branch may deliver somewhat more sediment, because of the increasing water discharge, the retaining dam may, (like the Sulina dam) act as a sediment trap, reducing the South-bound net sediment flux along the coast. However this aspect cannot be evaluated because of lack of data on the sediment fluxes from the North. In addition the maintenance dredging in the Bystre mouth and sand bar section and the subsequent dumping at the offshore dump site will remove an amount of sediment from the littoral system. The result of both effects may be, that the coastal section between the Bystre and the Sulina may receive less sediment. However a quantification is not possible on the basis of the available information. Therefore the HM-expert concludes that there is **insufficient information to judge the significance** of any transboundary morphological impacts on the Romanian coastal section between the Chilia and the Sulina Branches.

The findings of the HM-expert are summarised in the following table.

Summary of findings

Operations	Possible impact	<ul style="list-style-type: none"> • Transboundary impact? • Likely significant? • Impact duration • Impact spatial extent
Widening and deepening shipping channel (phase 1 and phase 2 of construction)	Modification of discharge distribution over main Danube branches (Chilia – Sulina)	<ul style="list-style-type: none"> • Transboundary impact • Phases 1 and 2: unlikely to be significant in view of natural variability • Permanent impact • Affects whole delta
	Modification of water level dynamics in main Danube branches (Chilia)	<ul style="list-style-type: none"> • Transboundary impact • Phases 1 and 2: unlikely to be significant in view of natural variability • Permanent impact • Affects whole delta
	Modification of sediment transport distribution over main Danube branches (Chilia)	<ul style="list-style-type: none"> • Transboundary impact • Phases 1 and 2: unlikely to be significant in view of natural variability • Permanent impact • Affects whole delta
	Modification of discharge distribution over Chilia Delta branches (Bystre, Starostambulski)	<ul style="list-style-type: none"> • Transboundary impact • Phases 1 and 2: likely significant in view of natural variability • Permanent impact • Affects Ukrainian Chilia delta
	Modification of water level dynamics in Chilia Delta branches	<ul style="list-style-type: none"> • Transboundary impact • Phases 1 and 2: likely significant in view of natural variability • Permanent impact • Affects Ukrainian Chilia delta
	Modification of sediment transport distribution over Chilia Delta branches (Bystre, Starostambulski)	<ul style="list-style-type: none"> • Transboundary impact • Phases 1 and 2: likely significant in view of natural variability • Permanent impact • Affects Ukrainian Chilia delta

Operations	Possible impact	<ul style="list-style-type: none"> • Transboundary impact? • Likely significant? • Impact duration • Impact spatial extent
Dredging operations during construction or channel maintenance	Strong increase of water turbidity near dredging works due to sediment losses during dredging	<ul style="list-style-type: none"> • Transboundary impact • Significance can not be assessed • Temporary (during dredging) • Local (vicinity of dredging sites, area can not be quantified)
	Overall increase of turbidity in riverine and marine waters due to sediment losses during dredging	<ul style="list-style-type: none"> • Transboundary impact • Unlikely to be significant in view of natural variability • Permanent (due to channel maintenance) • Affects Chilia branch, Chilia Delta and adjacent marine waters
Offshore dumping of dredging spoil	Increased turbidity in marine waters due to sediment losses during dumping	<ul style="list-style-type: none"> • Transboundary impact if marine currents are southbound • Likely significant in view of natural variability • Temporary (during dumping) • Affects marine waters over larger distances
Maintenance dredging of sandbar section in Bystry mouth, and subsequent offshore dumping of spoil	Transboundary changes to coastal morphology due to removal of river sediment from littoral system	<ul style="list-style-type: none"> • Transboundary impact • Significance can not be determined • Permanent • Restricted to the appr. 10 km long Romanian coast section between the Chilia and Sulina branches long Sulina jetties
	Local changes to coastal morphology due to removal of river sediment from littoral system	<ul style="list-style-type: none"> • Not directly of a transboundary nature¹ • Significance can not be determined. • Permanent • Affects Chilia Delta coast (Ukrainian coastal section)
Construction of seaward retention dam	Transboundary changes to coastal morphology due to change of littoral sediment transport fluxes	<ul style="list-style-type: none"> • Transboundary impact • Significance can not be determined • Permanent • Restricted to the appr. 10 km long Romanian coast section between the Chilia and Sulina branches long Sulina jetties
	Local changes to coastal morphology due to change of littoral sediment transport fluxes	<ul style="list-style-type: none"> • Not directly of a transboundary nature² • Significance can not be determined. • Permanent • Affects Chilia Delta coast (Ukrainian coastal section)

¹ Indirect transboundary impacts could be the result via an impact on birds and/or fish.

² Indirect transboundary impacts could be the result via an impact on birds and/or fish.

5.3 Water and bed pollution

There are two main types of pollution viz. overdose of nutrients and toxicity of metals and organic micro-substances.

In the case of dredging especially the toxicity is of concern. This toxicity is caused by the adsorption or uptake of toxic compounds by living organisms in an amount that disturbs the normal biochemical processes. These compounds may occur dissolved in water or adsorbed to the suspended or bed sediment. Not all of these occurrences of toxic compounds are toxic to organisms. The major problem is to define standards above which the concentration of these compounds is toxic for organisms. Under geochemists there is much debate as to these standards. At the moment there is not a generally accepted European standard.

In the report of the geochemical expert it is stated that the Danube River in geochemical sense may be compared with the River Rhine and therefore the Dutch standards, which are in compliance with the EU guidelines and those of the International Commission of the Danube River: JDS (Joint Danube Survey) and TNMN (Trans National Monitoring Network) are used as reference.

From the data, gathered by the geochemical expert, he concludes that there are 3 problematic heavy metals: viz. Copper, Zinc and sometimes Cadmium, which exceed the JDS and Dutch standards, but that the exceedance, except for Cadmium and Copper in mussels, is rather small. He further concludes, that the concentrations of organic micro-pollutants in bottom sediments are below all standards.

Dredging of bottom material may result in an increase in the suspended sediment concentration. Associated with this, an increase in nutrients concentration (phosphorus, nitrogen) will result, because the concentrations of these compounds in the pore-water is much higher than in the surface water, related to the decay of organic matter in the sediment. Also a drop in oxygen concentration may occur. As stated by the geochemical expert these effects are normally local and of short duration.

In addition, the heavy metal concentrations in the water column may increase. This is the result of the fact that in the bottom these substances are mostly bound in very insoluble sulphides, but when dredged they will be oxidised and released. However the oxidation of Iron Sulphides will create Iron Hydroxides (FeOOH) on which the metals will adsorb. The net effect will depend on the final macro-chemical behaviour.

The important question is if by dredging the concentrations of nutrients, oxygen content and heavy metal concentrations in the water column will exceed the standards.

The geochemical expert came to the following conclusions.

1. Dredging may result in a local and short-term (some days) increase in nutrient concentrations, which are **insignificant** for the overall nutrient conditions.
2. Zinc and Copper exceed the standard most. However in recent year it has become apparent, that the standards for these compounds need refinements. So it is **uncertain** whether these metals are really present in toxic quantities
3. The amount of sediment contamination are all well below the Dutch standards for dumping fresh water sediments in the sea. Thus according to these standard there will be **no toxic effects**.
4. But even if toxic effects at present may occur it is **unlikely** that as a result of the dredging and dumping these effects will increase, because the dredged material has more or less the same composition as the present suspended material. An increase in only suspended material will not change the toxicity..

5. In conclusion: based on the available data it is **unlikely** that **adverse significant** effects will occur as to the nutrients, heavy metals and organic micro-pollutants as a result of the dredging and dumping in the river as well as in the sea.

5.4 Fish stock and migration

The expert on fishery presented an assessment of the present state of fishery in the Danube delta. State-of-the-art assessment of the quality of surface waters in the European Union is regulated by the Water Framework Directive (WFD). For rivers, estuaries and coastal waters, fish is used as indicators for the ecological status. The information provided to the Inquiry Commission and additionally collected does not fulfil the requirements of the WFD. Hence, the level of precision in the final assessment does not comply with the WFD.

The fishery expert came to the following conclusions as to the present state of fishery in the Danube delta:

1. Although the Danube delta already has suffered under a variety of human pressures it still inhabits a very diverse and endangered fish fauna of high commercial value
2. As demonstrated by commercial catch statistics, the populations of sturgeon have severely decreased within the last decades due to over-fishing and other human impacts
3. There are no data on real stock sizes available. Comparison between the total commercial catches and fishing efficiency indicates, that the total stocks of rare Danube sturgeon (sub)populations e.g. Russian sturgeon and beluga are probably below or not far above minimum viable population levels of 1000 adults. As a result any further significant impact on these populations might increase the risk of their extinction.
4. Migratory and commercially important species i.e. sturgeons and Danube shad, use the Danube delta and its branches (e.g. Chilia, Bystre channel) for various purposes:
 - migratory route for adult fish, spawning in upstream parts of the Danube
 - partly spawning in the delta
 - nursery habitat for larval and juvenile fish in particular during the first year of life
 - pathway for adult and larval/juvenile fish migration to the Black Sea
5. Sturgeons migrate and are present in the Danube delta during the entire year
6. Any impact on migratory species in the Chilia branch and Bystre channel resulting from engineering activities affects the entire Danube populations
7. Besides migratory species, potamodromous species (river fish) support a valuable fishery, providing employment for several thousand fishermen.

The expert on fishery came to the following conclusions as to the effects of the dredging of the Navigation Route:

Dredging effects

Dredging activities might impose direct environmental impacts on fish because of direct removal/burial of organisms, turbidity and siltation, contaminant release and uptake, noise, disturbance and alteration/loss of physical habitat. Indirect harm to fish may be due to destruction of benthic feeding areas and of spawning migrations and deposition of resuspended fine sediments in spawning habitats. These impacts has been considered in the EIA for Phase 1.

After evaluation the expert on fishery concluded:

1. No data have been provided on the concentration of suspended sediments in and below the dredged area during operation. Therefore it is impossible to assess the likeliness of impacts due to suspended sediments based on data. However, comparing physical effects concentration with background concentration reflects that even a comparable slight increases might cause **(sub)lethal effects on fish at and in the vicinity of dredging sites.**
2. Effects are not only locally as migratory fishes are affected that pass the dredging area, use the area also temporally or shift between different habitats across the border between Ukraine and Romania within affected river sectors. Therefore the conclusion is that dredging activities during construction have **likely transboundary impacts** on the fish fauna. Due to missing monitoring data we are not able to quantify the transboundary effects.
3. During maintenance dredging the area affected by dredging continuously will be increased as recovery processes of affected areas takes several years. Therefore, it is **likely** that cumulative effects of Navigation Route construction and maintenance **will significantly affect the fish fauna and fishery** in the long term.
4. Morphological modifications resulting from dredging activities cause more uniform and degraded habitat conditions at a larger scale. No data have been provided on the expected morphological alterations and consequences for the fish fauna. Therefore it is impossible to quantify these effects. Channel fixation contradicts necessary side arm constructions to improve habitat quality in accordance with the Water Framework Directive. Based on the existing information it **is likely** that morphological changes will have **transboundary impacts on the long term.**
5. Alterations of hydro-morphological dynamics can have significant effects on flooding magnitude and frequency. It is **likely** that floodplain habitats, important for fish spawning and nursery, might be lost, causing **transboundary effects on fish and fisheries.**
6. Cumulative effects of increased suspended sediments, habitat loss, behavioural impacts, water quality deterioration, habitat modification and unknown effects make it even more **likely** that dredging activities have **significant transboundary effects on fish and fishery.**

Effects of penetration of salt water into the Bystre channel

Construction of the Navigation Route will increase the salinity at the inlet into the arm by about 1,5 2 times the length of salt field. This will result in significant local effects on the fresh water biocoenoses. No monitoring data on fish have been provided to assess the effects. Predictions of the change of the salinity indicated that affected area is lost for juvenile sturgeons and Ponty shad during their freshwater development. This represents a significant local impact in the Bystre

channel on Ukrainian territory. However, the affected area, compared with the entire available freshwater habitat available for juveniles in the Danube Delta is small. Therefore the **transboundary effect** of increased saltwater intrusion is supposed to be **hardly likely**.

Effects of dredging the sandbar and constructing the retaining dam

The mouth of the delta branches are by nature very dynamic features that change their complete appearance within comparable short time frames. Cut off and filling of branches and creation of new braches is a typical phenomenon. It has to be anticipated that sturgeons and shad evolutionarily have developed strategies to react to these dynamic processes at delta entrances. They might find branch entrances even under changed conditions or are very flexible in using alternative braches to get into the river. Therefore, based on existing information, it is assumed that effects on the migratory behaviour on sturgeon and shad are **hardly likely**.

Effects of the dump sites in the Black Sea

Dumping dredged material in the sea causes similar effects as the dredging, i.e. sediment deposition in the vicinity of the dump site, changes in composition or size of bed materials, dispersal and settlement of suspended sediments, alteration of bottom habitat. Groups of aquatic organisms susceptible to dumping in marine and estuarine environments include fish and fish food organisms (shrimps, crabs, shellfish, benthic assemblages). Biological effects of dumping includes burial of organisms, habitat disturbance and habitat loss, Recolonization of spoil areas takes place only at the long term (years). Such effects my certainly occur at the dump site, but the question is: are these effects transboundary? This might be the case if, during dumping operations with southbound currents the increase of the concentration of inorganic suspended matter at the Romanian state boundary is in the same order as the existing background. The hydro-morphology expert indicated that even a doubling of the existing concentration would result in a concentration of less than 20 mg/l. Such a concentration is not supposed to cause any damage to fish. Consequently it is **not likely** that there is a **transboundary** effect on the environmental conditions for fish and the benthic biocoenoses outside the dump site over the Romanian border.

Effects of navigation

There have no data been provided on potential effects of navigation on fish for the DNC project. Effects may occur during channel constructions and maintenance work caused by dredging and supportive vessels. However the main impact might occur during the use of the channel as a navigation route. Information on types and frequency of vessels passing would be necessary in combination with estimates of hydraulic impacts caused by propellers and waves. Due to the lack of information it is **not possible to quantify likely effects**.

General conclusions

Due to the migratory behaviour of fish, significant impacts on the fish populations of the Chilia branch, Bystre channel and coastal area at the Ukrainian territory may have **transboundary effects** on the fish fauna and fishery at the Romanian territory.

As summarised in table below two of the six identified operational activities, viz. dredging and maintenance of the Navigation Route, have **likely transboundary effects** on fish and fishery. Effects of navigation can be significant or not, depending on shipping traffic. Cumulative effects of the entire project are **likely to be significant**.

Summary of operational aims and activities and their consequences and impacts on fish

Operational aim	Operational activity	Consequences for fish	Impacts on fish	Level of significance
Construction of the navigation channel in the Chilia arm downstream to the sea	Dredging of sills	Increased turbidity at dredging sites	Fish kills at dredging sites	Severe effect, but at very small scale ⇒ Unlikely significant
		Fish and fish food entrainment by dredging machines	Lethal	Severe effect, but at very small scale ⇒ Unlikely significant
		Increased turbidity downstream of dredging sites	Behavioural and physiological changes in the plume – chronic effects	In total a significant area chronically affected ⇒ Likely significant
		Reduction of flooding magnitude and frequency	Potential loss of spawning and nursery floodplain habitat	Potentially large areas are affected at long-term ⇒ Likely significant
		Deterioration of water quality parameters incl. toxics	No significant exceedance of standards	No effects ⇒ Unlikely significant
		Saltwater intrusion	Loss of freshwater habitat	Long term, severe impacts but spatially limited ⇒ Unlikely significant

Operational aim	Operational activity	Consequences for fish	Impacts on fish	Level of significance
Channel maintenance	Maintenance dredging	The same effects as above but for longer time and larger space	The same impacts as above but cumulated across longer time and larger space	In total a significant area acute and chronically affected ⇒ Likely significant
Channel dredging and maintenance	Dredging riparian enforcement	Homogenisation of channel morphology and riparian habitat alteration	Channel and riparian habitat deterioration	In total a significant area affected at long time scale ⇒ Likely significant
Sea entrance	Dredging of sandbar and construction of retaining dam	Altered habitat and flow conditions	Disruption of migratory behaviour	⇒ Hardly likely significant as delta entrances are very dynamic by nature
Spoil dumping	Dumping in the sea	Sediment deposition, increased turbidity	Habitat loss at dump site	Severe effect, but at small scale ⇒ Unlikely significant
Navigation	Ship traffic	Hydraulic disturbances (waves) propeller ship accidents	Behavioural changes riparian habitat disturbance Injuries to fish fish kills	Large scale, long-term effects depending on intensity of ship traffic ⇒ (Un)likely significant
Entire project	All activities listed above	Cumulative effects	Cumulative impacts	Large-scale, long term effects ⇒ Likely significant

5.5 Bird life and migration

The report of the birdlife expert indicates the following tasks as to the adverse transboundary impacts on bird life as a result of the reopening of the Navigation Route:

1. To review the contributions of both Parties in relation to the consequences for bird habitats and populations arising from the Bystre Canal developments
2. To provide an overview of relevant research findings that have characterised and quantified bird responses to human activities
3. To evaluate the consequences for bird habitats and populations arising from specific actions within the Bystre Canal development.

As already stated in Chapter 2 an evaluation of the effects of human activities on bird habitats and populations is difficult because of the great natural variability of these populations.

Therefore the birdlife expert first provides a theoretical framework which allows the identification of the human activities within the natural variability. This framework is based on a clear definition of the terminology.

The following definitions have been presented (for the in-depth clarification see the original expert report):

- *ecological effect and ecological impact.* Ecological effect: any noticeable change in behaviour, physical or chemical state brought about by an external influence. Ecological impact: a measurable change in an individual's survival or breeding output as a result of an external influence. This concept has particular relevance to migratory species as the ESPOO convention clearly refers to "activities that can make long term impacts in transboundary context includes activities potentially affecting migratory species".
- *bird population.* A distinct assemblage of individuals which does not experience significant emigration or immigration. Population can be considered at a number of scales, e.g. large spatial extents (flyway) and smaller scales "contained within landscape boundaries". The assessment of human impacts are based on impacts on populations of various scales.
- *significant impact.* In the biotic world predictions are more difficult because relationships are complex and the speed of adaptation is variable for different organisms. Normally a reduction or extension of areas of habitats may be a qualitative indication of the order of magnitude of the change due to human interference, but a quantitative prediction is extremely difficult. In addition in some cases it may be possible to establish generally accepted criteria on significance, but in most cases the decision that an adverse transboundary impact is likely to be significant would be based on a comprehensive consideration of the characteristics of the activity and its possible impact. An element of judgement is always present. This judgement implies an undefined uncertainty and is based on experiences from other more or less similar areas or phenomena.
- *site.* The site is spatially referenced to: "the habitats and ecosystems of any area within Romanian territory where ecological impact can be shown". However, for wintering populations a transboundary impact might affect birds from other countries. It has also been assumed that all biological systems have a certain "**buffer**" in terms of their resilience to changes that can occur before integrity is compromised.
- *ecological integrity.* The term integrity is used to describe the coherence of a site's ecological structure and function, that enables it to sustain the complex of habitats and levels of populations of species considered to be at a 'baseline' level. Any changes to a site or

population arising from a proposed human activity that is likely to move the baseline conditions further from that which constitutes 'integrity' for that system is said to have altered the site's or population's 'favourable condition'.

- *favourable condition*. This means: "no further departure of the site or population from current species diversity, abundance and distribution, or ecosystem processes as a result of the activities associated with the canal development". It is however, accepted that some ecosystem elements (including birds) may already be declining for reasons other than the canal development. It is also assumed that in cases of reasonable doubt about the potential impacts of human activities on biological systems, that a "**precautionary**" approach will always be taken.

On the basis of this conceptual framework the birdlife expert comes to the following characterisation of the influence of human activities on birds:

The consequences of human activities on birds can be **direct** (e.g. noise causing individuals to seek cover), or **indirect** (e.g. siltation changing prey availability), and the severity of the perturbation determines whether it causes an ecological effect or impact. Additionally, the consequences of human activities can be classified into four broad areas:

Habitat loss

- Loss of habitat in a single large area.
- Loss of habitat in a many smaller areas (fragmentation).

Habitat degradation

- Structural changes e.g. availability of sites for breeding, feeding, roosting, *etc.*
- Changes in biotic quality e.g. food density and range.
- Changes in a-biotic quality e.g. water levels and regimes.
- Addition of materials and chemicals e.g. siltation, pollutants, nutrients, *etc.*

Disturbance

Although classified separately in this report, disturbance can also be regarded as a special transient case of habitat degradation or loss. Habitat loss through disturbance occurs where a habitat (or site) remains physically suitable, but cannot be occupied or utilised because of the disturbance. Some bird species will ameliorate their response to disturbance if it is presented frequently and for prolonged periods. This phenomenon is known as habituation.

There are three main classes of disturbance:

- Visual e.g. proximity of humans, or moving mechanical object (vehicle, boat, *etc.*)
- Noise
- Physical e.g. wash from boat.

Lethal removal

- Hunting or sport shooting

Evaluation.

The birdlife expert give a detailed account of the positions of both Parties with respect to the human influence of the dredging and deepening of the Navigation Route, especially at the seaward part of the Danube Delta (Chapter 4 of the birdlife expert's report).

Applying this conceptual framework the birdlife expert recognised, that there is sufficient knowledge from a wide variety of cases around the world to permit valid broad-brush judgements of the likely response of birds to the human activities proposed in relation to the Bystre Canal.

The birdlife expert formulated three key evaluation questions:

- **Evaluation question 1**
Will the Bystre canal development move Romanian bird habitats from favourable to unfavourable ecological condition ?
- **Evaluation question 2**
Will the Bystre canal development induce changes to the size, extent and viability of bird populations associated with Romanian (and/or other) territories ?
- **Evaluation question 3**
What is the likelihood of these changes occurring ?

The outcome of the evaluation of the birdlife expert was summarised in a table (see below).

The following conclusions were presented:

- the breeding and wintering populations of birds in the Danube delta (refer to definitions in Section 3.3), are of international importance.
- there is a considerable body of research-based evidence in relation to the consequences of habitat loss, degradation and disturbance to birds. Although not obtained directly from research in the Bystre canal area, this type of knowledge nevertheless permits a general evaluation of likely consequences of the proposed human activities in the Bystre canal development, as well as an assessment of their likelihood of occurrence.
- this knowledge of the bird-related consequences of human actions, has been integrated with the underlying principles of EIA, to construct a ‘conceptual framework’ for the assessment made in this report. Using this framework, it is suggested that the operational activities associated with future development and ongoing canal maintenance will have a **high likelihood** of resulting in the following:
 1. A change to the favourable status (as defined in Section 3.5) of Romanian and Ukrainian bird habitats, and thus a significant transboundary impact (as defined above). However, this will only occur over wide spatial extents and in the long term *if* further canal developments cause major hydrological changes. If changes to hydrology are predicted, there should be consultation with wetland habitat, fish and invertebrate experts to evaluate the specific likely impacts, and then this can be linked to the bird impact assessment.
 2. A changes to the size and viability of some breeding bird populations (and thus by definition a significant transboundary impact). However, this will only effect a wide range of species over a wide spatial extent if the canal causes major hydrological changes. Nevertheless, in the case of *tern* species, a **significant impact** has already occurred and continued development activities are extremely likely to worsen the previously inflicted impact. Any mitigation measures for changes to the sandbar spit (i.e. to undertake measures to increase the area of the reserve), should be tested **prior** to further development i.e. work to increase the spit’s area could be undertaken *before* commencing canal development, to see if birds will occupy newly ‘created’ area.

3. Result in changes to the current availability of habitats and food resources for wintering bird populations (and thus by definition have a significant transboundary impact). However, this will only effect a wide range of species over a wide spatial extent if the canal causes major hydrological changes.
- Given the international importance and known sensitivity of birds breeding and wintering in the Danube region, a precautionary principle must always be invoked within all decision making processes.
 - With specific reference to activities causing noise or visual disturbance (see table above), the main period of disturbance-sensitivity for breeding bird is from the beginning of April to mid-June, and for wintering birds from mid-October to mid-February. Activities causing noise or visual disturbance during these times should avoided.

These conclusions must be linked to the Inquiry Commission's hydrological report, to assess the potential spatial extent of changes to water regimes, water volumes, and sediments arising from the Bystre canal development. This is key to evaluating the potential extent and significance of the bird impacts resulting from by the component development activities. This linking will be presented in chapter 6.

EVALUATION OF TRANSBOUNDARY IMPACT ON BIRD LIFE

OPERATIONAL AIM	OPERATIONAL ACTIVITY	POTENTIAL CONSEQUENCES FOR BIRDS AND/OR BIRD HABITATS	<ul style="list-style-type: none"> • IMPACT DURATION • DIRECT or INDIRECT • TRANSBOUNDARY IMPACT ? 	<ul style="list-style-type: none"> • IMPACT LIKELIHOOD • IMPACT SPATIAL EXTENT • IMPACT SIGNIFICANCE • COMMENTS
1. Dredging & widening of canal	Removal of sandbar material, rifts and river edges, construction of bank protection measures	Habitat loss by physical removal	<ul style="list-style-type: none"> • Permanent • Direct • Transboundary 	<ul style="list-style-type: none"> • Probable • Local and restricted • Significant • Impact largely restricted to immediate vicinity of river banks. Further direct or indirect (siltation) removal of material from offshore sandbar will have major impact on a large number of breeding individuals of International, but involving only a few species (mainly terns). These ecologically utilise both Ukrainian and Romanian habitats (i.e. feed over wide area) and the issue is therefore transboundary. This will also have potential for impact on migratory wintering water birds in terms of a reduction in habitat availability. However, see Section 4.7 and 6 (below) in relation to mitigation measures.

		<p>Habitat loss by hydrological changes (water levels, regimes, volumes)</p>	<ul style="list-style-type: none"> • Permanent & transient • Direct • Transboundary 	<ul style="list-style-type: none"> • Probable - <i>if</i> conditions realised (see comments below) • Widespread • Significant • This is perhaps the impact of greatest concern to the wider DBR. However, it will only occur if the dredging activity results in major hydrological changes over wide areas. This is something that must be referenced to the hydrological evaluation found elsewhere in this report. The impact would transboundary and impact both breeding and migratory wintering birds of international importance.
		<p>Reduction in food availability by changes to invertebrates or fish communities</p>	<ul style="list-style-type: none"> • Permanent & transient • Indirect • Transboundary 	<ul style="list-style-type: none"> • Probable - <i>if</i> conditions realised (see comments below) • Widespread • Significant • This is perhaps the impact of second greatest concern to the wider DBR. However, it will only occur if the dredging activity results in major hydrological changes over wide areas. This is something that must be referenced to the hydrological evaluation found elsewhere in this report. The impact would transboundary and impact both breeding and migratory wintering birds of international importance.

		Exposure to terrestrial predators resulting from siltation of the area between the spit and the 'mainland'.	<ul style="list-style-type: none"> • Permanent • Direct • Transboundary 	<ul style="list-style-type: none"> • Probable - <i>if</i> conditions realised (see comments below) • Significant • There are conflicting views as to whether this will occur as it depends on the siltation of the area between the spit and the 'mainland'. The matter needs to be referred to the relevant hydrology expert. A view should also be sought as to whether natural 'background' siltation rates will be enhanced (Romanian view) or impeded (Ukrainian view) by the proposed development works.
	Operation of machinery i.e. disturbance by noise, visual, physical means	Exclusion from habitats resulting in reduction in feeding intake, breeding output, change in moulting and loafing areas	<ul style="list-style-type: none"> • Transient • Direct • Transboundary 	<ul style="list-style-type: none"> • Probable • Local and restricted • Significant • Distance over which direct disturbance will cause exclusion is likely to be small, restricted to a small number of species, and some bird groups may display a degree of habituation in the longer term. However, for terns on the sand spit, the population level impacts will potentially be severe. The impact would transboundary and impact both breeding and migratory wintering birds of international importance.

		Increased density at alternative sites	<ul style="list-style-type: none"> • Transient • Indirect • Transboundary 	<ul style="list-style-type: none"> • Probable • Local and restricted • Significant • For most breeding species this will not be an issue, as it will impact only a small number of individuals (relative to total DBR population), and most habitats will have some scope for increased bird densities. However, particularly for terns on the sand spits, movement away from area to other colonies could be a potentially negative impact if those colonies are approaching carrying capacity. It is also potentially more serious for wintering waterbirds.
2. Terrestrial accommodation of dredged spoil (21ha of land)	Placement of material at designated sites	Habitat loss by covering	<ul style="list-style-type: none"> • Permanent • Direct • Transboundary 	<ul style="list-style-type: none"> • Probable - <i>if</i> conditions realised (see comments below) • Local and restricted • Significant • Likely to result in very small decrease in local breeding species – need for surveys to find out which species involved and to ensure that it does not include rare, endangered or sensitive protected species. The Ukrainian texts suggest that the dump sites are on 'degraded' land. This will need to be confirmed.
	Operation of machinery i.e. disturbance by noise, visual, physical means	Exclusion from habitats for feeding, breeding, moulting, loafing	<ul style="list-style-type: none"> • Permanent • Direct • Transboundary 	<ul style="list-style-type: none"> • Probable • Local and restricted • Significant • Likely to result in exclusion for very local breeding species – need for surveys to find out which species involved and to ensure that it does not include rare, endangered or sensitive protected species.

		Reduction in breeding output and feeding intake	<ul style="list-style-type: none"> • Transient • Direct • Transboundary 	<ul style="list-style-type: none"> • Probable • Local and restricted • Significant • Likely to result in small decrease in output and feeding intake for very local breeding species – need for surveys to find out which species involved and to ensure that it does not include rare, endangered or sensitive protected species.
		Increased density at alternative sites	<ul style="list-style-type: none"> • Transient • Indirect • Transboundary 	<ul style="list-style-type: none"> • Probable • Local and restricted • Significant • For most species this will not be an issue, as it will impact only a small number of individuals (relative to total DBR population), and most habitats will have some scope for increased bird densities.
3. Shipping traffic	Low intensity (general) shipping pollution	Habitat degradation	<ul style="list-style-type: none"> • Transient • Indirect • Transboundary 	<ul style="list-style-type: none"> • Probable • Widespread • Significant • Large volume of scientific evidence to suggest general shipping activity causes some pollution, and shipping accident has already occurred. However, impact of normal background pollution will not have major impact on bird populations.
	High intensity pollution event (accident)	Habitat degradation	<ul style="list-style-type: none"> • Transient • Direct and indirect (i.e. long term effects) • Transboundary 	<ul style="list-style-type: none"> • Uncertain • Widespread • Significant • A single local pollution event (e.g. oil spill) could have major impact for species like terns where number of breeding sites are few, but numbers are large and close to Bystre canal operations.

	Boat noise, visibility & wash	Habitat degradation	<ul style="list-style-type: none"> • Permanent • Direct • Transboundary 	<ul style="list-style-type: none"> • Probable • Relatively small • Significant • Distance over which impact will occur is likely to be small, and some groups will probably display a degree of habituation in the longer term. However, for terns on the sand spit, the population level impacts will potentially be severe. The proposed Ukrainian mitigation measures suggest regulating boat speed in the Bystre canal area to a maximum of 7 knots. The true reduction in impact of this measure will need to be discussed with relevant riparian habitat experts. There will also be need to check that this will not increase likelihood of accidents resulting from low avoidance maneuverability by slow moving vessels.
4. Maintenance of canal	All of the above	All of the above	<ul style="list-style-type: none"> • All of the above 	<ul style="list-style-type: none"> • All of the above

5.6 Summary of Expert's findings

Hydro-morphology, sediment discharge and dumping of spoil.

- *dredging in the sandbar section* of the Bystre Channel, **no impact** on the flow distribution between the main branches Chilia and Tulcea in Phase 1. **Insignificant impact** of the further deepening of the sand bar section in the Bystre Branch mouth during Phase 2.
- *effects of the dredging or the deepening of the rifts* on the distribution of the flow discharge between the Chilia and the Tulcea Branches **likely transboundary effect** but **unlikely significant**
- *flow distribution between the Bystre and the Starostambulski branches* in Phase 1 **likely significant transboundary effect**.
- *impact of dredging of the rifts on the water level dynamics*: for the Chilia branch: **unlikely significant** and for the Bystre branch: **likely significant transboundary effect**
- *turbidity of river water and marine waters as a result of dredging operations*: **not possible to assess this impact** in detail without having access to detailed information. In addition in view of the fact that the state border between the Ukraine and Romania is situated along the Chilia Branch, exactly where the dredging is taking place, the impacts are of a **likely transboundary nature** but there is **insufficient information to judge the significance**
- *impacts over larger distances and time scales*: **unlikely significant transboundary effect** against the background of the overall sediment transport and variability
- *turbidity of marine waters as a result of dumping of dredged spoil* under conditions with southbound currents, the increase of the concentration of inorganic suspended matter at the Romanian state border is of the same order as the existing background.; the impact is characterised as **likely significant transboundary**.
- *coastal morphology*: **insufficient information to judge the significance** of any transboundary morphological impacts on the Romanian coastal section between the Chilia and the Sulina Branches, but **locally significant morphological impacts** on the Bystre-Chilia delta coastline from the construction of the retention dam and from the maintenance dredging of the Bystre sandbar section.

Water and bed pollution

- local and short-term (some days) increase in nutrient concentrations, by the dredging, which is **insignificant** for the overall nutrient conditions
- zinc and copper exceed the standard most, but in recent year it has become apparent, that the standards for these compounds need refinements. So it is **uncertain** whether these metals are really present in toxic quantities
- amount of sediment contamination are all well below the Dutch standards for dumping fresh water sediments in the sea; thus according to these standards there will be **no toxic effects**
- even if toxic effects may occur at present it is **unlikely** that as a result of the dredging and dumping these effects will increase, because the dredged

material has more or less the same composition as the present suspended material. An increase in only suspended material will not change the toxicity

- in conclusion: based on the available data it is **unlikely** that **adverse significant effects** will occur as to the nutrients, heavy metals and organic micro-pollutants as a result of the dredging and dumping in the river as well as in the sea.

Fish stock and migration

1. *Dredging effects*

- slight increases in the concentration of suspended sediments might cause **(sub)lethal effects on fish** at and in the vicinity of dredging sites.
- dredging activities during construction have **likely transboundary impacts on the fish fauna**.
- effect of reduction of flooding magnitude and frequency and potential loss of spawning and nursery floodplain habitats have **likely adverse transboundary impacts**
- cumulative effects of the Navigation Route construction and maintenance **will significantly affect the fish fauna and fishery** in the long term.
- based on the existing information it **is likely** that morphological changes will have **transboundary impacts on the long term**.
- although some losses from fish entrainment into the dredges would likely occur, it would probably be limited to a small percentage of the total number of fish living in and moving through the area. Therefore, based on the information available it is **unlikely that a significant transboundary effect** due to entrainment will occur.
- cumulative effects of increased suspended sediments, habitat loss, behavioural impacts, water quality deterioration, habitat modification and unknown effects make it even more **likely that dredging activities have significant trans-boundary effects on fish and fishery**.

2. *Effects of penetration of salt water into the Bystre channel*

- the transboundary effect of increased saltwater intrusion is supposed to be **hardly likely**.

3. *Effects of dredging the sandbar and constructing the retaining dam*

- effects on the migratory behaviour on sturgeon and shad are **hardly likely**.

4. *Effects of the dump sites in the Black Sea*

- transboundary effects on fish is **likely significant**.

5. *Effects of navigation*

- due to the lack of information it is **not possible to quantify likely effects**.

Bird life and bird migration

The operational activities associated with future development and ongoing canal maintenance will have a **high likelihood** of resulting in the following:

- a change to the favourable status (as defined in Section 3.5) of Romanian and Ukrainian bird habitats, and thus a **significant transboundary impact**. However, this will only occur over wide spatial extents and in the long term *if* further canal developments cause major hydrological changes.
- a changes to the size and viability of some breeding bird populations and thus by definition a **significant transboundary impact**. However, this will only effect a wide range of species over a wide spatial extent if the canal causes major hydrological changes. Nevertheless, in the case of tern species, a **significant impact** has already occurred and continued development activities are extremely likely to worsen the previously inflicted impact. Result in changes to the current availability of habitats and food resources for wintering bird populations (and thus by definition have a **significant transboundary impact**). However, this will only effect a wide range of species over a wide spatial extent if the canal causes major hydrological changes.
- given the international importance and known sensitivity of birds breeding and wintering in the Danube region, a precautionary principle must always be invoked within all decision making processes.
- with specific reference to activities causing noise or visual disturbance (see table above), the main period of disturbance-sensitivity for breeding bird is from the beginning of April to mid-June, and for wintering birds from mid-October to mid-February. Activities causing noise or visual disturbance during these times should avoided.



BANK



RIPARIAN DUMP SITE

6. FINDINGS OF THE INQUIRY COMMISSION

6.1 Introduction

The evaluation by the Inquiry Commission should be based on sound definitions and criteria. In chapter 2 an overview was presented of the definitions of the terms "likely"- "significant"- "adverse" and "transboundary"- "impact", as have been included in the texts of the ESPOO Convention and ESPOO publications.

In that chapter it was also mentioned that there is a difference between evaluations/predictions of the a-biotic effects and those of the biotic effects. In the a-biotic world there is a lot of knowledge, which may be systemised into models, the results of which may be confronted with real world measurements or observations. It is often possible, by the application of statistical techniques, to evaluate the significance of the impact. The a-biotic analysis is directed to detect traceable changes in the environmental boundary conditions, but do not give clues whether these changes are *adverse* or *favourable*. That judgement comes from the biological/ecological analysis.

In the biotic world such predictions are much more difficult because the ecosystem relationships are very complex and not yet fully understood. In addition the speed of adaptation is variable for different organisms and particularly migratory species have a large spatial realm, using habitats over the whole delta, making state boundaries irrelevant. Finally some impacts may interfere and cumulative impacts may occur. For migratory organisms the problem is even more complex. It is hardly possible to assess the significance of impacts in a statistical sense and the word "significant" then seems inappropriate and will therefore not be used in the evaluation by the Inquiry Commission. As quantitative predictions, such as in the a-biotic world, are often impossible, qualitative assessments by experts may prevail, based on expertise and experiences from other similar areas.

For sessile organisms the impacts of the dredging of the Navigation Route may be judged by comparing the area influenced by the dredging to the unaffected area. Thus the reduction of habitat may be a measure.

This is shown in the contributions of the birdlife and fishery experts. The birdlife expert developed a theoretical framework for assessing the impact of the Navigation Route on birdlife (see chapter 5.5 and Appendix 5). This framework is based on a definition of the terminology of: "ecological effect and ecological impact"; "bird population"; "significant impact"; "site"; "ecological integrity" and "favourable condition". The developed framework can be applied to characterise the significance of ecological effects/impacts of human activities on bird populations. The *adverse* consequences of human activities were classified into four broad categories: loss of habitat, degradation of habitat, disturbance and lethal removal. This theoretical framework appears to be a valuable instrument to evaluate the impacts of the Navigation Route on birdlife.

This framework may also be used for the evaluation of the fishery aspects. For birds the habitats are used for feeding and nesting and for fish for feeding and spawning. Loss or degradation of habitats, disturbance (e.g. of tracking routes) and lethal removal therefore are also considered as the major indications of the *adverse impacts* of human activities on fish like the construction of the Navigation Route.

The *degree* in which an impact is *adverse* depends on the surface area of the habitat and/or the disturbance involved and on the environmental quality of the habitat. This quality may be judged by the number of species, the abundance of species and the complexity of the ecological relations. Evaluations in this respect should be performed with great caution, because of the complexity of ecosystems and the gaps in knowledge. But rough indications might be possible.

The Inquiry Commission fully acknowledges the problems, solutions and constraints sketched above in evaluating the likely (significant) adverse transboundary impact of the construction of the Navigation Route. The Commission has adopted the theoretical considerations presented above for their evaluation of the impacts of the Navigation Route.

A very important factor for the habitats for birds and fish is the water quality. For many years worldwide a huge amount of research has been devoted to develop standards for water quality (see the contribution of the fishery and geochemical expert, chapter 5.3 and 5.4 and Appendix 3 and 4).

The state-of-the-art assessment of the quality of surface waters in the European Union is regulated by the Water Framework Directive (WFD). For rivers, estuaries and coastal waters, fish is used as indicator to assess the ecological status. For example, for rivers the species composition, abundance, sensitive species and the age structures of the fish communities are taken into account. The high status (class 1) is the reference condition and reflects the situation normally associated with that water body type under undisturbed conditions and show no, or only very minor evidence of distortion.

The Inquiry Commission adopts the standards of the WFD, because these are based on a wealth of research and thorough international scientific debate and are in compliance with the latest international achievements of knowledge in this respect.

The birdlife and fishery experts have indicated that on specific points their evaluations has to be linked to the findings of the hydro-morphological and geochemistry experts. This linkage is incorporated in the final evaluations of the Commission in paragraph 6.8.

6.2 Controversial positions of both countries of the transboundary impact of the Navigation Route

In chapter 4 the following subjects are identified in the statements as being controversial:

1. Transboundary impact on the hydrology of the River Danube
2. Transboundary impact on sediment discharge and the storage and dumping of dredged material in the coastal zone
3. Transboundary impact of dredging on pollution of the coastal waters
4. Transboundary impact on fisheries
5. Transboundary impact on biodiversity, because of loss of habitat of protected migratory birds

6. Transboundary social-economic impact.

The transboundary social-economic impact as indicated by the Romanian side, solely addresses the impact on commercial fishery. It will be treated in the paragraph on fishery.

The Inquiry Commission after careful evaluation of the information provided by the Members of the Commission and of the Experts views and considering the problems outlined in paragraph 6.1 came to conclusions as described in the following paragraphs. In general the conclusions of the experts are adopted.

The conclusions of the Commission are unanimous.

Paragraph 6.3-6.8 address Phase 1 and paragraph 6.9 gives an outlook to Phase 2. In paragraph 6.8 the final integrated evaluation of the Inquiry Commission is presented.

6.3 Transboundary impact on the hydrology of the River Danube

1. *impact of the dredging or the deepening of the rifts* on the distribution of the flow discharge between the Chilia and the Tulcea Branches: **likely transboundary effect** but **unlikely significant**
2. *flow distribution between the Bystre and the Starostambulski branches* in Phase 1: **likely significant transboundary effect**.
3. *dredging in the sandbar section* of the Bystre Channel: **no impact** on the flow distribution between the main branches Chilia and Tulcea in Phase 1. **Insignificant impact** of the further deepening of the sand bar section in the Bystre Branch mouth during Phase 2.
4. *impact of dredging of the rifts on the water level dynamics* for the Chilia branch: **unlikely significant** and for the Bystre branch: **likely significant transboundary effect**

6.4 Transboundary impact on sediment discharge and the storage and dumping of dredged material and on the morphology of the coastal zone

1. *increase in turbidity of river water and marine waters during the dredging operations*: **likely transboundary effect** but **insufficient information to judge the significance**
2. *impact over larger distances and time scales*: in the river waters: **insignificant transboundary effect** against the background of the overall sediment transport and variability
3. *increase of turbidity of marine waters as a result of dumping of dredged spoil*: **likely significant transboundary**, under conditions with southbound alongshore currents, the increase of the concentration of inorganic suspended matter at the Romanian state border is of the same order as the existing background
4. *changes in coastal morphology*: **insufficient information to judge the significance** of any transboundary morphological impacts on the Romanian coastal section between the Chilia and the Sulina Branches, but **locally significant morphological impacts** on the Bystre-Chilia delta coastline from

the construction of the retention dam and from the maintenance dredging of the Bystre sandbar section.

- 6.5 Transboundary impact of dredging on pollution of the river and coastal waters
1. *impact of dredging on the increase of nutrient concentrations*: **unlikely significant transboundary effect**
 2. *presence of toxic concentrations of Zinc and Copper*: **uncertain** if these exceed the standards
 3. *impacts of toxic sediment contamination*: **unlikely significant transboundary**
 4. *overall increase of nutrients, heavy metals and organic micro-pollutants*: **unlikely significant transboundary**
- 6.6 Transboundary impact on fisheries
1. *impacts of increase of suspended sediment concentration and fish and fish food entrainment at the dredging site*: **unlikely adverse transboundary**
 2. *impacts of increase of suspended sediment concentration downstream of dredging site*: **likely adverse transboundary possibly (sub)lethal effects on fish**
 3. *effect of reduction of flooding magnitude and frequency and potential loss of spawning and nursery floodplain habitats*: **likely adverse transboundary**
 4. *impacts of deterioration of water quality*: **unlikely adverse transboundary** (see also 6.5)
 5. *impact of repeated maintenance dredging, hampering the recovery processes of affected areas in the long term*: **likely adverse transboundary**
 6. *impact of morphological modifications (e.g. bank protection), resulting from dredging activities, causing more uniform and degraded habitat conditions*: **likely adverse transboundary** on the long term
 7. *impact of increased salt penetration in the Bystre Channel*: **unlikely adverse transboundary**
 8. *impact of dredging the sandbar and sea access channel and the construction of the retaining dam on the migratory behaviour of sturgeon and shed*: **hardly likely transboundary**. This also excludes **adverse transboundary impacts** on commercial fishery
 9. *impact of the dump site in the Black Sea on the benthic fauna at and around the dump site in relation to the increased suspended sediment concentrations and deposition, loss of habitat and burial of fish food organisms*: **unlikely adverse transboundary**
 10. *impact of navigation*: **insufficient information** to assess likelihood of transboundary
 11. *cumulative impacts of increased suspended sediment, habitat loss and modification, water quality deterioration etc*: **likely adverse transboundary impact**, on a large scale and long term

6.7 Transboundary impact on birdlife

1. *impact of habitat loss by dredging and maintenance of rifts and bank protection*: **likely adverse transboundary**, but local and restricted
2. *impact of loss of habitat by dredging and maintenance of offshore sand bar*: **likely adverse transboundary**, especially for terns
3. *impacts of habitat loss by hydrological changes*: depends on character of these changes; see under 6.8
4. *impact of reduction in food availability*: depends on character of these changes; see under 6.8
5. *impact of siltation of the area between the spit and the mainland*: depends on character of these changes; see under 6.8
6. *impacts of disturbance on exclusion of habitats (noise, visual, physical)*: **likely adverse transboundary**, but local and restricted
7. *impact of increased densities of birds at alternative sites*: **likely adverse transboundary**, but local and restricted
8. *impact on riparian dump sites*: habitat loss by covering: **likely adverse transboundary**, but local and restricted
9. *impacts of disturbance due to shipping traffic (pollution, accidents, noise, ship waves)*: **likely adverse transboundary**, but local and restricted

6.8 Final integral evaluation and conclusions

For the final integral evaluation the Inquiry Commission selected those effects, which have been classified as "likely significant (adverse) transboundary impact". The unlikely impacts, the hardly likely (inconclusive) impacts and the impacts which could not be evaluated, due to lack of information, are left out of consideration.

It should be noted that a substantial number of potential impacts could not be assessed because of lack of sufficient and/or reliable data or information. These are "gaps in our knowledge". Therefore the present evaluation is of a *restricted value*, leaving open many important aspects. The evaluation concentrates on those aspects, which could be evaluated.

The Inquiry Commission came to the following final conclusions:

The **likely significant adverse transboundary impacts** are:

- impact of dredging or deepening of the rifts on the distribution of the flow discharge between the Bystre and the Starostambulski branches and on the water level dynamics along the Bystre branch, resulting in loss of floodplain habitats, important for fish (spawning and nursery) and birds (nesting, feeding)
- impact of habitat loss by coverage of riparian dump sites and dredging through the offshore sandbar and measures for bank protection on birdlife and fish
- impact on the increase of suspended sediment concentration, downstream of the dredging site on fish
- impact on the turbidity of marine waters as a result of dumping of spoil at the dump-site at sea, under conditions of southbound alongshore currents
- impact of repeated maintenance dredging hampering the recovery processes of affected areas for fish in the long term

- cumulative impact of loss and/or disturbance of habitats and by shipping traffic on fish and bird life on a large scale and long time

The Commission presents the following evaluation:

1. All impacts of the dredging of the Navigation Route in the Chilia Branch and the Starostambulski Branch are ipso facto transboundary, because the dredging is operated at and on the state boundary between Romania and the Ukraine. The question is whether the effects are likely significant and adverse.
2. The deepening of the rifts will not result in a significant effect on the distribution of the water discharge between the Chilia and the Tulcea branches and therefore on the frequency distribution of the water levels along the Chilia Branch. Hence it is unlikely that the frequency of flooding of the floodplains and riparian wetlands will change significantly. In addition the anticipated effects for fish and birdlife are unlikely.
3. As a result of the deepening of the rifts (sills) the discharge distribution between the Bystre and the Starostambulski Branch will change significantly. As a consequence the frequency of high water levels along the Bystre Branch will increase significantly, which has a likely adverse transboundary impact on fish and birdlife. In addition the dredging especially on the sand bar results in a loss of habitat of some 600.000 m², which has a likely adverse transboundary impact on birdlife, specifically on terns.
4. The discharge via the Bystre will increase by some 12 %. Thus more water and sediment will be discharged via the Bystre Branch into the Black Sea. The effect is particularly felt during high and extreme river discharges at the mouth and adjacent coastal waters. Then a sediment laden fresh water plume will be injected over the heavier saltwater. This plume may shift southwards under conditions of southbound wave- and wind driven coastal currents. Meanwhile sediment may "rain out" of the plume on the bed, contributing to the deposition rate in the coastal waters. As such it is incorporated into the nearshore accumulation and extension of the coast and the up- and outbuilding of the Ptichiya spit.
5. Besides the sediment delivery due to the increased discharge by the Bystre, the sediment transport in the coastal system will change by the effects of the retaining dam and the sediment injection at the sea dump site. At the moment there are insufficient data to quantify these changes, but a preliminary indication revealed that the effect might possibly be transboundary. The increase of the concentration of inorganic suspended sediments at the Romanian state border seems to be in the same order as the existing background.
6. Changes in sediment transport patterns may also influence the morfological developments of the area of the Ptichiya spit and the nearshore mud flats, but these developments are expected to be relatively slow, because of the rather low sediment concentrations and deposition rate. These shallow areas are very important as habitats for fish and particularly birds. However this supply of sediment to the nearshore system is not yet considered as adverse, because it is not anticipated that this will result in a rapid siltation of the area between the spit and the mainland or in a reduction in food availability for birds and fish.
7. Local and restricted likely adverse transboundary impacts on fish and bird life may result from habitat loss by dredging and maintenance of rifts and sandbar

and of bank protection measures; in the vicinity of and during the dredging operations; by covering of riparian dump sites and by shipping traffic (ship waves, noise, pollution, accidents etc). Especially the riparian areas are important habitats for fish and birds. In the case of migratory fish species, the cumulative impact is likely to be a large scale and long term effect.

8. It seems hardly likely, that the dredging of the sandbar and the construction of the retaining dam will have a significant adverse transboundary effect on the migratory behaviour of the commercially important sturgeon and shed. This excludes a transboundary social-economic impact. In addition it is unlikely that the dump site in the Black Sea will have an adverse transboundary effect on fish.

6.9 Outlook to Phase 2.

From the point of view of the hydro-morphological and the pollution aspects the conclusions for Phase 2 does not deviate from those for Phase 1.

As to the retaining dam the HM-expert expressed his concern that the length of the projected dam will reduce the sediment influx from the North and will also hamper the northbound sediment transport during southern wind conditions. It is anticipated that the delta section between the Bystre and the Sulina branches will receive a smaller sand input. than it does today, which may influence the developments of the Ptichya spit, which represents a very high ecological value. The expert also presented some mitigation measures (see page 23 and 24 of his report).

The deeper Navigation Route will require additional dredging of the sills, larger maintenance dredging, extended dump sites and possibly larger and longer bank protection measures. It is anticipated that the adverse transboundary impacts will at least be similar of those for Phase 1, but in some aspects even greater.

As larger ships can be accommodated in the deeper Navigation Route also the disturbance of fish and bird life may increase.



VILKOVE, AFTER HEAVY RAINFALL



VILKOVE

7. RECOMMENDATIONS

7.1 General recommendations

In their contacts with scientists and NGO's the Commission has noticed that there was a general wish for more information and cooperation between the two countries with respect to the construction of the Navigation Route and other projects which have a possible transboundary impact. The Commission appreciate this common wish as an valuable step on the road for political cooperation of both countries in the sense of good neighbourship and the bilateral responsibility for the protection of the Danube Delta in the framework of the international conventions signed by both countries.

The Inquiry Commission also emphasize that several of the concerns of Romania with respect to the Navigation Route could be removed by a fully scientific appraisal of the feared impacts.

On the other hand it also appeared that several potential impacts could not be evaluated adequately because of the lack of substantial data. This means that even internationally renown experts were unable to judge the likely significance of transboundary effects on some subjects.

The Commission identifies the following important subjects for which no conclusive evidence was available to judge the transboundary consequences of the Navigation Route.

- effect of dredging on the turbidity of the river and marine waters
- effects of increase of suspended sediment concentration at and near the dredging site
- effects on the Chilia delta resulting from the construction of the retention dam and the maintenance dredging in the Bystre Channel
- effects on the coastal morphology of the Romanian coastal section between the Chilia and the Sulina Branches
- the presence of toxic concentrations of Zinc and Copper in relation to the standards
- effects on migratory fish, passing the dredging area and/or shifting between different habitats across the border during dredging operations
- effects of morphological modifications (e.g. bank protection), resulting from dredging activities, causing more uniform and degraded habitat conditions
- effect of the dump site in the Black Sea on the benthic fauna at and around the dump site in relation to the increased suspended sediment concentrations and deposition, loss of habitat and burial of fish food organisms.

Bilateral Research Programme

The Commission, realising that the Navigation Route is and will be an political issue, recommends to organise a Bilateral Research Programme related to activities with transboundary impacts in the framework of the bilateral cooperation under the ESPOO Convention.

The Commission recommends further that this research programme is started as soon as possible, addressing the gaps in scientific information and knowledge related to the general problem of dredging a Navigation Route at and in the vicinity of the Romanian-Ukraine boundary.

This Bilateral Research Programme may be connected with other more general national and international research activities e.g. the International Commission for the Protection of the Danube Delta (ICPDR); the bilateral Monitoring Programme; The Transboundary Co-operation Programme RO-UA 2007-2013: "Transboundary bilateral network for environment monitoring in the Danube Delta and adjacent coastal areas" and other EU-programmes.

International funding and assistance for the start of the proposed research programme may be organised via the Secretariat of the ESPOO Convention.

An elaboration of the Bilateral Research Programme has been included as addendum to this chapter.

7.2 Mitigation

In the EIA for Phase 1 (Ukr.6) several measures are described to mitigate the adverse environmental effects of the Navigation Route.

In addition, the Commission, following the suggestion of the hydro-morphological expert, recommends also the shortening of the retaining dam and to locate the sea dump site nearer to the shore.

Mitigation of the morphological impacts could be achieved in two ways. Firstly, keeping the retaining sea dam relatively short (i.e. covering the surf zone only) would help to maintain a certain influx of sediments from the north. It is recommended that "lessons learned" from the Sulina example, where 8 km long jetties have been constructed, could help optimise the design. Secondly, dumping the dredged material elsewhere, on a carefully selected site inside the littoral zone would keep this material available for littoral processes.

Finally the Commission may indicate two more measures which possibly might mitigate the environmental impacts of the Navigation Route. The first measure is the artificial change (by technical means) of the discharge distribution between the Bystre and Starostambulski Branches to diminish the expected increase in discharge in the Bystre. Such measure should only be considered after thorough hydrological field and model investigations with particular attention to the high river floods. In addition the environmental impacts should be evaluated. The second measure is consideration of modern dredging and dumping techniques, which might reduce the adverse environmental impacts.

7.3 Recommendations for the functioning of the Inquiry Commission

The present Inquiry Commission was the first that has been established in the framework of the ESPOO Convention and therefore some learning experiences may be mentioned.

- it is recommended that *before* an Inquiry Commission is established, a budget is agreed and paid to a trust fund by the parties. The trust fund may administrative and financially be handled by the Secretariat of the UNECE, under special rules which reflects the independent and the specific nature of the Commission and which ensures a quick, adequate and alert handling of the financial matters and contracts.
- a site visit of the Commission and the experts is strongly recommended. During this visit consultations with the governmental and local authorities; the national and local NGO's and the local population may be organised. In addition an extensive field reconnaissance of the problem area is very rewarding
- a time limit of 4 months for the delivery of a final report is very tight. Especially the experts need time to familiarise themselves with the key points of the problem and the existing (sometimes detailed) information.

Addendum

Elaboration of the Bilateral Research Programme

The Bilateral Research Programme may cover a characterisation of the baseline situation, an assessment of the expected impacts of the construction and operation of the Navigation Route, the identification and assessment of measures mitigating expected adverse impacts and a monitoring plan to follow the actual impacts in the years to come .

Including the suggestions of the Experts, the Commission proposes the following main subjects for thorough field and model investigations for such Bilateral Research Programme:

Water, sediment, dredging

There exists a significant database and knowledge base on both sides of the border regarding the subjects river hydrology, hydraulics, sedimentology and coastal morphology. It is recommended to carry out a joint bilateral research effort to characterise the baseline situation and assess the project impacts. This effort should include modelling studies by bilateral research teams and could make use of international experts in a supportive role. It is acknowledged that many building blocks for such an assessment already exist.

In more detail a bilateral full scale mathematical model study concerning the discharge distribution over the various river branches and frequency distributions of water levels is recommended in order to diminish the existing uncertainties. Such studies should be accompanied by measurements of relevant parameters (e.g. bed

roughness) during high floods. International experts may be involved in a supportive role.

In addition there is a general lack of information on the spatial impact of the dredging e.g. gradients of suspended sediment concentration; bed deposition and habitat deterioration; nutrients and pollution gradients; effects on migratory fish during dredging etc. as a function of distance from the dredging site. The main problem is the interpretation of the existing and newly gained data. This can be achieved by collective and/or comparative modelling; existing models can be used.

The present available data sets about sediment quality do not contain any information about the vertical distribution within the sediment bed. Since dredging may occur up to a depth of about 3 meters, samples should be taken over the whole depth profile, to determine if older, more polluted sediment is present. The locations of these samples should be selected in such a way that a representative picture is obtained of all the material to be dredged.

In these samples not only the pollutants (in mg/kg of solid!) should be determined, but also the macro-chemical composition like grain size ($<2\mu$, $<16\mu$, etc) and the content of CaCO_3 , Fe, sulphide and organic material (percentage organic C). Without these macro-chemical analyses it is difficult to judge the toxic effects of micro-pollutants. It is also advisable to measure the same parameters in the suspended solids. Finally it is recommended to determine the Dissolved Organic Carbon (DOC) in the water column.

It is important that a bilateral framework for the methodologies for sampling, laboratory analysis, and data handling is developed. In addition it is recommended to take cores from the bed at dredging sites and conduct macro-chemical analyses of samples.

These mentioned cores can also be used for sedimentological analysis. This may produce information on the lowering and subsequent upbuilding of the river bed during the passage of a flood; the changes in bed forms and bed roughness, the grain size gradients and the lateral facies (sediment characteristics) and habitat variations.

A problem of particular importance is the sediment fluxes at the mouth of the Bystre in the vicinity of the retaining dam. This addresses the sediment discharge and spreading over the mouth bar; the alongshore input of sediment from the North and the south and the effects of the retaining dam on the sediment transport pattern and deposition rate and the relation with the accretion of the coast and the spit formation (see also the Report of the Hydro-Morphological Expert)

In addition there is also great uncertainty about the spatial impacts of the dumping site at sea. Similar investigations as mentioned above, including the modelling and coring exercises are recommended.

In order to evaluate the effect of the marine dumping of spoil on the general coastal sediment transport pattern the spreading patterns of the spoil should be established and even so the net sediment fluxes in the near-shore zone, especially in the vicinity of the retaining dam.

Birds

To get an insight of the variability of the bird populations, field surveys on a frequent basis throughout the year over several years are indispensable. This may be

accompanied by a biological monitoring of different habitats in a standardised way to establish the Danube-related food-habitat relations. GIS is a very valuable research and modelling measure, which may provide detailed habitat information maps. As the loss or deterioration of habitats is an effective measure of evaluating impacts, the main emphasis should be directed to this subject.

There are three main concerns in relation to hydrology from the bird population perspective. The first is whether changes to river flow volumes/speed may generate spatial and temporal changes to water regimes in wetlands related with the river. This could have major implications for habitat types and invertebrate/fish prey populations. The second concern is whether changes to river flow volumes will cause changes in the sedimentation in wetlands related with the river and in the Black Sea (sand spit), which might result in loss or deterioration of habitats area. The third point of attention is whether 'engineered' edges to the canal will be created, thereby preventing outflow of water from the river to associated wetlands.

Fish

A similar reasoning may be used for fish, however with another approach and scale. Here too the main problem is the migratory behaviour of fish species and the relations with and connections between habitats.

ACKNOWLEDGEMENTS

The Commission would like to express its gratitude to the authorities and institutions in Romania and the Ukraine for their cooperation, in particular those involved in the organisation of the site visit of the Commission.

The Commission has benefited very much from the determined, effective and indispensable efforts of the Executive Secretary of the Commission, Mr Wiek Schrage. The Commission is very grateful for the handling of the many organisational, administrative and financial matters.

The Commission is further indebted to Mrs Iryna Chernyshova, for her skilful Ukrainian -English translations.

APPENDICES (on CD-ROM)

Final reports Experts

Report of the Hydro-Morphology Expert	(Jos van Gils)
Report of the Geochemistry Expert	(Nico de Rooij)
Report of the Fishery Expert	(Stefan Schmutz)
Report of the Birdlife Expert	(Mark o'Connell)

Contributions by the Members of the Commission

Dr. Mircea Staras
Danube Delta National Institute, Tulcea, Romania.

- Rom. 1 Documentation on the likely significant transboundary impact of the Ukrainian Deep-water Navigation Canal Danube-Black Sea in the context of ESPOO Convention, 1991. February, 2005
- Rom. 2 Additional information requested for the third meeting of the Inquiry Commission on the likely significant transboundary impact of the Ukrainian Deep-water Navigation Canal Danube-Black Sea in the context of ESPOO Convention, 1991. October, 2005
- Rom. 3 Comments to Annexes no. 15-28, presented by the Ukrainian expert at the third meeting of the Inquiry Commission on the likely significant transboundary impact of the Ukrainian Deep-Water Navigation Canal Danube-Black Sea in the context of ESPOO Convention, 1991. December 2005
- Rom. 4 Comments on documentation presented by Ukrainian expert at 4th meeting of the Inquiry Commission (16 Dec. 2005)

Dr Lyudmyla Anischenko
Ministry of Environment Protection of Ukraine, Kharkiv, Ukraine,

- Ukr. 1 The assessment of transboundary impact of the navigation route reopening in the Ukrainian part of the Danube Delta
Report + Annex 1 - 14, February 2005
- Ukr. 2 Annex 15 - 28, October 2005
- Ukr. 3 Annex 29 - 32, December 2005
- Ukr. 4 Annex 33 - 40, April 2006
- Ukr. 5 Annex 41 - 47, May-June 2006
- Ukr. 6 Report on Scientific Research Work:
"Environmental Assessment (EA) within the framework of the project "Creation of the Danube – the Black Sea deep-water navigable passage in the Ukrainian part of the delta. Stage 1". Ministry of Environment Protection of Ukraine. Kharkiv, Ukraine, 2003