Annex 30

Key Results and Findings of the 2005 Integrated Environmental Monitoring Programme for the Danube-Black Sea Navigation Route Project

1. Over the first nine months of 2005, the average flow discharges were at 133% of levels recorded over the first nine months in 1998-2004, and 178% of flow discharges recorded in 1971-2002 and 1921-2002. The total river flow, recorded at the end of the 3rd quarter of 2005, was within the flow level recorded over the same period in 1999.

2. The total suspended solid flow over the first nine months of 2005 represents 271% of the average suspended solid flows recorded in 1998-2004, and 111% of the 1964-1970 suspended solid flows (i.e. prior to the construction and filling of the Iron Gate reservoir chain). It should be noted that the 2005 suspended solid flow is significantly lower than the 1988 and 1991 flows. Despite a general decrease in average volumes of suspended solids after the construction and filling of the Iron Gate reservoir chain (1971-1985), the range of variation in the suspended solid flows from year to year remains very broad. It is therefore highly probable that such a broad range of the suspended solid flow variation as the one recorded in 2005 will remain in the future. Since this issue is very significant in the context of completion and sustainable operation of the Danube-Black Sea Navigation Route, the Final Report under the 2005 Environmental Monitoring Programme will provide the detailed analysis of the temporal changes in the relevant parameters. From the operational point of view, the need for adequate engineering/economic provisions that would enable the timely implementation of required maintenance works is obvious even at this stage.

3. The changes in water quality in the Danube River, recorded in the 3rd quarter of 2005, were triggered by changes in the hydrological regime. The dissolved oxygen concentrations in the Danube River and its arms ranged between 5.32 to 8.82 mg/l in the 3rd quarter of 2005, whereas the average dissolved oxygen levels in July and August were within the range of 6.10-6.25 mg/l. Lower levels of dissolved oxygen appear to be the result of higher turbidity levels – an increase in the suspended solids concentrations leads to a decrease in dissolved oxygen levels, which may be the result of slowed down photosynthesis process. During the 3rd quarter of 2005, the Danube River water contained oil products and surfactants in concentrations which were within the admissible MAC levels. The average concentrations of phenols have exceeded the MAC limit by 6 times.

4. The total amount of soil dredged during the 3rd quarter of 2004 within the in-stream section of the navigation route was 294,300 m^3. During the dredging activity within the in-stream section of the navigation route, the water and bottom sediment quality was sampled and measured by: a) Ukrainian Scientific Research Institute of Ecological Problems (65-68 km, 25-26.08.2005, as part of the integrated field survey); and b) the Odessa Oblast State Department of Environment and Natural Resources (36.6 km, 27.09.2005).

   The water quality measurements indicate that there was a slight increase in the suspended solids concentrations in the downstream direction. These measurement results confirm the previous findings, suggesting that the impact of in-stream dredging operations is likely to be insignificant, i.e. within the limits set in the relevant design documents. In the context of a general increase in the suspended solids load carried with the Danube flow in 2005, this impact can be considered as marginal.

The results of analysis of dredged soil sampled in the river sections between the 64-66th km and 67-68th km indicate that the levels of such contaminants as mercury, cadmium and lead are significantly below the MAC limits set for agricultural land use. The levels of oil products were 1.3-1.5 times higher than the admissible limits (the 67-68th km section), copper concentrations were 1.8-12 times higher than MAC limits, zinc concentrations were 21-51 times higher than MAC limits. The concentrations of chlorinated organic pesticides in the samples were below the detection limits.

The concentrations of all contaminants determined in the bottom sediments sampled in the river sections between the 64-66th km and 67-68th km were significantly lower than the levels measured in May 2004 (prior to the commencement of the navigation route project). Such reduction in concentrations of monitored contaminants is attributed to be the result of the ability of the initially dredged upper sediment layer to take up and retain the contamination. The adsorption ability of lower sediment layer (sand fraction), dredged at a later stage is not so high. These monitoring results were used to calculate the environmental pollution fee in accordance with existing legislation.

5. During the reporting period, the dredging operations in the sandbar section of the navigation route were carried out with the used of the Skadovsk dredging equipment. In the period from 31.07.05 through 25.08.05, the total amount of soil dredged and disposed of at the marine dredging spoils site was 97,3375 thousand m^3. In this section, the water and bottom sediment quality measurements were carried out by: a) the Noosphere Research Centre (on 6 and 27 August 2005, as part of the special measurement and litho-dynamic study programme, implemented in the seaward access channel area); and b) Ukrainian Scientific Research Institute of Ecological Problems and Odessa Institute of the Southern Sea Biology (on 27 August and 1-5 September 2005, as part of the summer field survey).

   On 6 August 2005, the bottom sediments were sampled during the operation of the Skadovsk dredge. The results of analysis indicate that the major proportion of suspended solids introduced into the water environment as a result of dredge operation was accumulated at the distance of 600 m from the dredging location. The potential impact zone for a dredging operation is about 1 km. No elevations in the suspended solids concentrations were found in the location of marine dump.

   The bottom soil sampled in the seaward access channel in August-September 2005 was classified into the Soil Quality Category I in terms of the integral pollution index. This soil can be described as conventionally clean and is allowed to be disposed of at the marine dump, since it does not pose threat to the marine environment. Soil, sampled at the marine dump site, was classified into the Soil Quality Categories A and I. These monitoring results were used to calculate the environmental pollution fee in accordance with existing legislation.

6. The riparian dredging spoils damps were inspected in the 3rd quarter of 2005. The levels of nitrogen, phosphorus, ash and carbon in the dumped soil material (storage sites 6 and 11б) changed insignificantly relative to the May 2005 levels. The levels of such contaminants as mercury, cadmium and lead in August were below the MAC limits set for agricultural land use. Copper concentrations were from 5 to 22 times higher than MAC limit, zinc concentrations were 21-64 times higher than the respective admissible limit. The levels of oil products in soil dumped at the storage sites 6 and 11б was 1.5 and 1.2 times higher than MAC limit. It should be noted that all recorded exceedences were near or below the levels recorded during the site inspections undertaken prior to the commencement of soil storage operation.

7. One of the key provisions that regulate the soil storage operations at the sites 3, 6, and 9 is the need for preventing/avoiding the elevation of groundwater levels. Special groundwater level monitoring programme was developed and implemented at this sites from the early 2005. During the site 6 inspection (7-8 August 2005), the special drainage flow control arrangement was in operation, involving the GK-2 collector and NS-2 intake chamber. The results of inspection indicate that the completed soil placement/storage operations with the subsequent pumpage of drainage flow have not caused any noticeable increase in the groundwater levels within the site perimeter. The analysis of drainage flow discharged from the storage site 6 at the distance of 500 m via the discharge outflow indicate that the levels of heavy metals were within the surface water quality guidelines, whereas the concentrations of oil products were 2-3 times higher than MAC limit. The concentrations of heavy metals and oil products showed a slight decrease 500 m downstream.

8. A special lithological study was undertaken in the 2^{nd}-3^{rd} quarters of 2005 in the area of the seaward access channel. The variations in the fine particle content in the bottom sediments in the area of access channel were found to be associated with changes in the river flow discharges.

   The results of survey undertaken in the mouth section of the Bystre Branch in May-June 2005 indicate that the decrease in depths within the access channel section (2 + 400 – 2 + 50) was caused by the sediment transport with river flow. The reduction in flow discharges between spring and summer affected the fine particle pattern in the bottom sediments, with the finer particles (>0.05 mm) accumulating near the Bystre Branch mouth. It should be noted that these finer particles have the 'cementing' ability, which should be taken into account in planning and implementing the maintenance-related dredging operations. Any delay in the implementation of planned dredging operations may result in the increased cost and stronger impact on the marine ecosystem.

   The survey results confirmed the positive effect of protective dam in terms of sediment trapping and reducing the sedimentation rates in the access channel. The sediment retained by the completed phase of the protective dam mainly represents the suspended solids transported with river flow, which are not affected by waves coming from the open sea.

9. The saprobe index, derived with the use of indicator species for the river section of the navigation route in August-September 2005, was mainly within the range that characterizes the β-mesosaprobe zone, which can be described as "fairly clean or slightly polluted" water. The TBI values were close to 4, corresponding to the "polluted water" category.

10. During the field survey in May and June 2005, the river flow pattern was a key factor shaping the water quality in the Danube Estuary. In September 2005, a significant decrease in the salinity levels was recorded in the upper water layer of the Danube Estuary.

11. In the early September 2005, the oxygen concentrations in the upper water layer of the Danube Estuary ranged from 6.3 to 8.5 mg/l at the 75.8–93.8% saturation. The concentrations of oxygen in the bottom water layer were lower, ranging between 0.8 to 7.6 mg/l at the 44.4–107.9% saturation. The anoxic conditions developed at the depths of over 20 m. The oxygen deficiency conditions in the bottom waters had been recorded in this area in the previous wet years as a result of stratification. In the absence of external oxygen inflow, the oxygen contained in the bottom waters is consumed to oxidize the organic matter, with resultant anoxic conditions.

12. Generally, the state of macrozoobenthis communities in the coastal area in September 2005 can be described as poor, mainly due to mass kills. In the majority of sampling locations, the composition of bottom macro-fauna was much poorer and population numbers were much lower when compared to the previous survey results. On the average, the population and biomass numbers were at 901 cells/m^{-2} and 67.3 g/m^{-2}, respectively. The recorded biomass number of benthos that provides the food base for fish was only 24.1 g/m^{-2} (35.9% of the average biomass). The reduction in the number and biomass of mollusks, recorded in September 2005, is an indication of deteriorated ecological status of the Danube Delta in July-September 2005.

13. The study of fish fauna, undertaken in the 3rd quarter of 2005, provided information on the state of migratory and indigenous fish species. The collected data on the sizes and weights of the Danube herring show close correspondence with the historical averages.

14. Due to the low intensity of vessel traffic and suspended dredging activities in the in-stream section of the navigation route within the territory of the Danube Biosphere Reserve, no direct nor noticeable impact on the local fauna has been recorded.

15. The number of breeding pairs of Caspian gulls (Larus cachinnans) at the Ptashyna Spit was close to the historical averages for this area. The breeding season was no less successful for the great black-headed gulls (Larus ichthyaetus), which set their nests in the territory of the Danube Biosphere Reserve for the first time. It is suggested that all 23 pairs produced nestlings.

    In 2005, the sandwich tern and common tern colonies set their nests in the less suitable (lowland) southern area of the spit, which might be attributed to be the result of disturbances occurred in 2004. The sea storm, which normally occurs every year during the nesting season, has nearly completely destroyed their nesting areas, with only one remaining. Therefore, the overall breeding efficiency of these species was at minimum in 2005 (i.e. not higher than 15%).

    Due to a relatively low construction/dredging activity associated with the Navigation Route Project, there has been no or little direct impact on the bird populations, both aquatic and riparian. This is confirmed by the results of the after-nesting bird count, undertaken in August 2005 in the outer delta area and the Ptashyna Spit itself. The number and distribution of bird colonies in the Ukrainian part of the Danube Delta (including the Bystre Branch mouth) were well within the historical averages.