

Points of view expressed by the Romanian authorities and scientific research institutes on the Ukraine's document "Annotated Report on Scientific Research - Complex Environmental Monitoring Program for the Danube – Black Sea Deep Water Navigation Canal operation in 2017-2018. The Sea Approach Canal Zone".

General remarks

The report is a very succinct summary of the monitoring of environmental factors.

It does not provide concrete data and information that could allow:

- analysis of the evolution of hydrobiological and hydrochemical elements in the context of water quality in relation to the works foreseen in the project, as well as their possible impact;
- Confirmation or invalidation of statements in the report.

The report analyzes the volume of water transited on the Bâstroe arm, related to the volume of water entering the Danube Delta (19.7%), but it is necessary to refer to the debit of the Chilia arm, in which case the ratio would reach approx. 40%, which could lead to deterioration of the hydrological regime on the Chilia arm. The hydrological regime evaluated by the Romanian authorities on the Kilia arm was "in good state" in the updated National Management Plan for 2015.

Therefore, we believe that the report could be conclusive and credible when data comparability and monitoring by both Parties can be performed in sections and for commonly agreed parameters over a longer period of time.

Regarding the hydrological regime

The report does not present hydrological aspects and evolution of hydrological parameters in the period before the construction of the Danube-Black Sea Canal. We appreciate that only a "mirror analysis" of hydrological parameters for the period **before and after** the construction of the Canal can help to clarify the impact of works on the hydrological regime.

According to the National Administration "Apele Romane" monitoring program, the hydrological regime of the Danube River, at the entrance to the Delta, falls for the year 2017 in the medium water drainage regime ($Q_{med\ 2017} = 5192\ m^3 / s$, $Q_{med} = 6546\ m^3 / s$, calculated during 1970 - 2015). As the impact on liquid and solid leakage is differentiated according to the hydrological regime, we consider it there is need to monitor the hydrological parameters also for the regime of deep waters and shallow waters.

Regarding the hydrological values presented in the Report, they are close to those obtained at hydrometer stations within the Romanian Waters Administration for the period April-November 2017 as follows:

Parameter	Romania Measurements	Ukraine's Report
Q_{max} at the entrance to the Danube Delta	8260- m^3/s (s.h. Ceatal-Izmail-fl. Dunărea)	8400- m^3/s

Q_{med} at the entrance to the Danube Delta	4717 m ³ /s (s.h. Ceatal Izmail fl. Dunărea)	4860 m ³ /s
Q_{med} at the entrance to the Kilia arm	2141 m ³ /s (s.h. Ceatal Izmail br. Chilia)	2390 m ³ /s
Q_{med} (range of variation)	3625 - 7252 m ³ /s (s.h. Isaccea, km 103)	3680 - 7370 m ³ /s (Mila 54)

The report mentions that the volume of water transited by Bâstroe arm is 19.3% (19.7 km³ / 102 km³) of the volume of water entering the Delta. Although at first sight it seems that a small amount of water reaches the Black Sea through the Bystroe arm, however, from the volume of water transited on the Chilia arm, the one transported by Bâstroe arm represents a significant percentage of 39% (19.7 km³ / 50.4 km³), which may contribute to a change in time of the hydrological regime of water leakage on the Chilia branch. That is why we think there is need to analyze liquid and solid leakage on Batroc arm versus the Chilia arm and not in relation to what is recorded at the entrance to the Danube Delta.

Regarding the liquid and solid leakage on the Bâstroe arm, we mention that in the analyzed area, respectively Bâstroe arm, within the National Administration "Apele Romane", measurements are made at s.h. Periprava (km 20 on br. Chilia) and at s.h. downstream Bâstroe (km 10 on br. Stambulul Vechi), approx. 900 m downstream of Bâstroe arm. Also, in 2014, an automatic station was installed at km 12 on Chilia arm (immediately upstream of the bifurcation with Bastroe) with sensors for measuring the water level and temperature. In 2017, for the period April-November 2017, the following hydrological values were recorded:

Parameter	s.h. Periprava	s.h. Av. Bastroe
Q_{med}	2164 m ³ /s	899 m ³ /s
R_{med}	91,2 kg/s	39,5 kg /s
R_{max} (recorded on 13 May)	445 kg/s	116 kg/s

According to the report, 1.45 million tons of sediment are transported during the period mentioned above. This corresponds to a solid flow rate of about 68.78 kg / s, i.e. 75.4% of the average slurry flow rate, determined at s.h. Periprava, for the period April - November 2017.

As regards the monitoring of other hydrological parameters, we consider it necessary to follow the evolution of the average water flow rates, which can influence the deposition and/or erosion phenomena in the Danube riverbed. Also, in order to track the future hydromorphological modifications in the Danube riverbed, repeated topobatimetric measurements (for different phases of hydrological regime) are required and the comparative analysis of the current profiles, obtained from the measurements, with the historical ones (before the construction of the Canal).

The report presented by the Ukrainian side finally states that the environmental impact is non-existent, although the monitoring was carried out over a short period of time (8 months). The hydrological values obtained in 2017 and their analysis are not presented, especially in relation to the historical period before the Danube-Black Sea navigation route was completed.

Consequently, the National Administration "Apele Romane" consider the conclusions of the Report on hydrological aspects as unfounded and poorly justified by the material presented by Ukraine, the report being unconvincing.

Regarding the hydrometeorology and hydrochemical monitoring

The hydro-meteorological conditions in the report are poorly analyzed, lacking the reference period for the weather conditions, water levels, water and sediment run-off, but also the location expressed in degrees, minute and second coordinates. The reference period is an important element for highlighting climatological norms, setting trends and determining a minor or major impact from natural or anthropogenic sources.

The location of the air temperature measurements, the type of apparatus, the altitude (2m or 10m) are not shown or described.

The average temperature value for April-November 2017 registered in Sulina is 15.32 °C (Romanian data extracted from the AFDJ Galati site) is below the average value presented by Ukraine in the report, + 19.7 °C (Ukraine).

The flow values and the Danube level presented in the report are appropriate for the period April-November 2017 but they can't be analyzed: the reference period is missing (in this case, the reference is the period prior to the construction of the Bastroe Canal) to determine changes in the water flow on the Kilia branch and Bastroe canal and to delimit the natural influence from the anthropic one.

Regarding chemical parameters and contaminants, the report presents concrete results, quantifiable only for the Danube waters, reminding that in the marine area, 2 expeditions and measurements were carried out using standard methods. Thus, no data is communicated confirming or not the impact on the marine area.

The report presents information on petroleum hydrocarbons found in the Danube waters with values exceeding the maximum admissible concentrations in surface waters in Romania (0.2mg/dm³ according to the Romanian Ministerial Order 161/2006), respectively 178mg/dm³ in July 2017 and 220mg/cm³.

Moreover, DDE concentrations ranged from 0.005-0.022mg/dm³, as compared to the maximum admissible level in Romania for total DDT (DDT+ DDD+DDE) of 0.000025mg/dm³, according to the same Romanian Ministerial Order 161/2006.

Taking into account the exceeded values presented above, we believe there is a possibility that the admissible values may be exceeded in the marine area, as well. This can't be evaluated, as no marine data is provided.

Other monitored pollutants are phenols, surfactants, toxic metals, petroleum hydrocarbons found in marine and dredged materials - but no concentration levels are indicated for these pollutants.

The report mentions a short-term increase of the solid suspensions content in water, providing satellite images that confirms this. The analysis of these images highlights the transport of solid suspensions to the south, to the Romanian seaside. Pollutants present in marine waters are most often associated with particulate matter and sediment accumulation where they can persist for a long time. They can accumulate, re-suspend and be taken over by marine organisms, continuing to threaten the health of the marine environment.

No clear information is provided on the quality and place of storage in the Black Sea for the dredged material.

For the hydrological measurements, the hydrological method and station placed on the Kilia and/or Bastroe arm were not described (the station type, the benchmark coordinates, and the limnometric key were not described).

Granulometric analyzes of bottom sediment and suspended sediment composition were made in the area studied between April and November 2018. The report shows how many tons of suspended sediment received the Black Sea from the Danube, and how many of these came from the Bastroe arm.

However, the report does not show that granulometric analyzes of bottom sediments have been made in the bay area of Bastroe branch.

For the assessment of coastal dynamics, we believe that systematic measurements on sediment granulometry, sedimentary transport, wave regime, and currents in the marine area of Bastroe canal up to the Sulina arm would have been required. These data would contribute to the proper assessment of the impact on geomorphology of coastal and marine relief in the cross-border area. The report does not analyze the coastal morphodynamics in the sinking area of the Chilia arm into the Black Sea.

In this regard, we recommend a detailed study of the morphological changes both at the shoreline (shoreline, beach profile) and the submersible shore (bathymetric profiles) both in the Ukrainian and Romanian (Musura Bay) with reference to the period before the construction of Bastroe Canal. It is also necessary to analyze coastal morphodynamics of the coastlines south of Kilia mouth, in the Romanian area, in direct relationship with the modification of liquid and solid flow on the Danube's arms, of the currents and sedimentary transport in the shore area, as a follow up to the construction the Bastroe Canal.

Regarding phytoplankton and zooplankton studies

With regard to planktonic communities, the report does not provide clear information on the collection and analysis of samples, although reference is made to an expedition in the marine area (6-20 November 2017).

We consider that aspects related to the hydrobiological status of water (phytoplankton, zooplankton) can not be inferred from a one month monitoring data (November 2017). Chemicals reported such as Ca, suspended substances, organic substances, hydrocarbons are not sufficient to define physico-chemical water quality; hydrocarbons and suspended substances could be related

to the traffic on the Danube. Neither the hydrological and morphodynamic factor, or the sediment and the water velocity have been studied closely, and the zoobenthos has not even been referred to in the report. In the report, rare fish are mentioned: carp and migratory fish, especially small size fish.

The report does not provide information on the qualitative and quantitative structure of the phytoplankton community, the component of the ecosystem that responds rapidly to changes in water transparency that can be modified by sediment particles transferred by current to areas adjacent to the work area.

The information provided in the report regards mostly the terrestrial vegetation of the area, the phytobenthic component being presented very little information. There are missing: the list of species identified in the area, fresh biomass values, type of dominant species, respectively perennial or opportunistic species. From visual observations it is known that the area is dominated by opportunistic microalgae, species with a rapid development cycle (*Ulva* species, *Cladophora* species) and a high regenerative capacity after an impact. Therefore, in-depth studies are required in order to know precisely the qualitative composition of the phytobenthic associations in the area and to actually assess the impact on this environmental component.

The report proposes to use the ecological index provided by the Minicheva method to establish the ecological status of the area, based on the microalgal biologic element. In Romania, another ecological index applies to the Romanian coastal area (Ecological Index) - an integrated index based both on a qualitative (type of species -opportunistic or perennial) and quantitative (values of fresh biomass) analysis of the microphytes.

Regarding the macrozoobenthos, our conclusions are:

- the monitoring stations network on map3.1 is well established;
- no conclusions can be drawn regarding the efficiency of the working method because it was presented very briefly;
- to assess the impact of anthropogenic activities on zoobenthos communities, at least three monitoring campaigns (before, during and after the works) should be made so that changes can be observed.

Regarding the ichthyological monitoring, our conclusions are:

The coordinates for the locations where the experimental fishing took place and the technical characteristics of the gears used are missing.

The drifting nets that were used can't capture all the fish species present in the area, the use of electric fishing in the coast area could have highlighted species of very small size and their evolution-in-time.

The enumeration of the captured species shows only the dimensions in which they were framed, without presenting the number of captured specimens, the abundance and the biomass of each species, nor the total biomass in order to estimate the evolution of the ichthyofauna in the area. Scientific names of the captured fish are missing, as well.

Regarding the analysis of the ecological processes in the DD and the coastal area based on satellite images

A Landsat 8 image collection was presented without showing the method of analysis and its results. The study of freshwater feather dynamics, its extension to the coastal area of the Danube Delta as well as the potential impacts were limited only to a qualitative description of suspended sediment distributions. No attempt was made to determine the turbidity and the average particle size of spectral and backscattering indicators.

The overall conclusion of the "National Research Institute for Marine Area (INCDM) Grigore Antipa" is that the "Annotated Report on Scientific Research" carried out in the framework of the Environmental Monitoring Program for the Ukrainian project "Renovation of the deep water Danube - M. Neagră (Băstroe Channel)" is extremely succinct, the methods of work and the monitoring network for the adjacent marine area are not presented. Also, there is no comparison between the current situation and the situation before starting the works, this would have been very interesting in order to assess the impact, so that the final conclusion of the report, "...monitoring studies conducted in 2017 indicates that there is no significant transboundary impact" is rather an assumption than a conclusion based on scientific arguments resulting from effective monitoring.

The conclusion is that the report is only a summary of all the observations and analyzes carried out by the Ukrainian side within a limited period of time and therefore a multi-year analysis undertaken by both sides is needed in order to have a symmetrical and standardized monitoring system. Harmonization of the two countries' hydrobiological methods has to be done.

The hydro-meteo conditions in the report are poorly analyzed, lacking the reference period for meteorological conditions, hydrological levels, liquid and solid flows, floods, lacking also the location (expressed in coordinates: degree, minute, second).

Regarding birds

For a better analysis of ornithological data, it would have been necessary to attach the field record with the ornithological observations in comparison with the data from the previous years in order to identify the qualitative and quantitative evolution of the ornithofauna in the area of the Chilia branch.

Having regard to the fact that the works on the renovation of the deep-sea waterway on the Chilia and Băstroe arms have affected or are likely to have affected the colonial aquatic birds, it would have required presenting up-to-date/current information on the colonies of the aquatic birds in the area.

It would have required presenting current information on colonies of the birds in the area to determine whether colonized aquatic birds were affected. In this sense, it would have been

necessary to have/to see the ornithological monitoring data in the area, gathered by the field staff of the Danube Delta Biosphere Reserve (Vilkovo, Ukraine)

The assessment of a negative impact on birds should be done by analyzing the ornithological monitoring data and correlating them with data and interpretations of hydromorphology and water and sediment chemistry and not by assuming that there were no negative consequences on ornithofauna.

The report does not establish the existence or absence of an impact determined by the project work, because no investigations were carried out during the nesting/wintering periods of the birds, or in both situations.

Regarding the bottom sediments

The study states that the sediment discharged area in the waterway was monitored. The sampling points, both in the waterway area and in the dumping area are, in GeoEcoMar's opinion, too rare and the coordinates and depth of the water in these locations are not indicated.

The report does not provide enough concrete data to support the conclusions presented by the Ukrainian side. The action of the Ukrainian side to monitor the Chilia Delta, the Bastroe Channel area and the discharged area of the dredged material on the navigable canal is positive. However, it is necessary that the monitoring reports contain all the primary data, as well as the historical data on the same locations in order to be able to track the environmental impact of the works carried out in the area.