INTERMEDIATE ENVIRONMENTAL MONITORING REPORT AFTER WORKS nº 1

ČORTANOVCI – SUMMARY OF RESULTS

Introduction

The main objective of this environmental report after works is to address the base values of the main parameters identified during the elaborations of the EMRbW. These values were established during the Inception Phase and will serve as the base for evaluation of effects of river training and works to the environment.

According to the ToR, the first report will be submitted 6 months after the beginning of the DNP, covering effects of river training works. And second report must be submitted by the S&EM Services Contractor 12 months after the beginning of the DNP, covering effects of both river training and dredging works), identifying all changes in environmental parameters compared to the base values identified in the Environmental Monitoring Report Before Works, also arguing the reasons for these changes, as well as their long-term impact to the integrity of the affected areas.

Works begun at Čortanovci on April 23th 2019 and officially ended 30th January 2020. So that, after six months this report has the purpose of the environment status during the Defect Notification Period. The Environmental Monitoring Report after works nº 1 covers the following fields:

- Hydromorphology
- Sediment and water quality
- Waste
- Biology
  Phytoplankton
  Macrozoobenthos
  Vegetation (*Limosella aquatica)*
  Birds *(Charadrius dubius and Riparia riparia)*
  Fish *(Acipenser ruthenus)*
- Development of vegetation and riparian areas
- Protected Areas and Ecological Networks

The table below shows the works to be carried out in the critical sector Čortanovci and their exact location according to the Final Design:

Nº	Name of critical sector	Type of works	Chainage from	to	Executed
	Čortanovci	Sill 22.1	1237+700		yes
		Sill 22.2	1237+150		yes
		Sill 22.3a	1236+150		yes
		Sill 22.3b	1236+000		yes
		Dredging	1240+300	1239+350	no

The report shows the status of environment once completed six months since the finalization of works, according to ToR statements.

Description of work site

Construction works have been performed on two locations Sill 22.2 and sill 22.1.

Construction works were started at the downstream location (sill 22-2), and just after approximately three weeks (May 15t^{h} they were started at the upstream location, sill 22.1).

Floating barge with construction material was used as a temporary storage for solid material like steel armature (reinforcement bar) and new rolls of geotextile are into the foil Floating office.

Figure 1 Čortanovci critical sector

Status of the works after 6 months (January 2020 – July 2020)

As works ended last December 2019 (DNP officially begun January 2020), there is not any activity associate to the project in this sector.

Project context

River stretch Čortanovci is located downstream from gauging station Novi Sad.

Hydromorphology

Downstream of Vojvodina capital – Novi Sad between km1241+600 and km1235 has been situated stretch Čortanovci. It is characterized by a typical hourglass shape, with approximately 350m width at the narrowest section. Riverbed are tapering from the width of 600 m to 350 m in contraction and spreading on 840 m downstream. Such morphological characteristics are favorable for bed load deposition downstream of contraction where water current slowing down and provides conditions for sedimentation. Water flow is divided into two currents, where one of the branches is dominant and attracts more water flow.

Experience from previous analysis addressing us on two most dynamic locations on the Čortanovci stretch. First one is the area along the right riverbank where was massive depression envisaged initially for the deposition of dredged material. The second one is on the peak of the most downstream river island, which has started to grow and to suppress the navigation fairway towards the left riverbank.

The most upstream part of the Čortanovci stretch is characterised with intensive morphodynamic from April 2019 and April 2020. Observed sandbank gained some deposits and its height was increased. Relative position in relation with the cross-sections remain unchanged. The water depths in the navigational channel was not changed. The most significant transformation may be noted between the right riverbank and sand deposit where is the gap between the riverbank and river island filled in.

The central part of the stretch is the same. There is some morphological transformation, but these transformations are part of the organic development and they do not affect navigation, or they don't cause significant morphological transformations. Therefore, this part will not be considered through the time.

The most downstream part of the stretch is concurrently the most significant part due to implemented training works. On this part of the river are constructed 3 submerged sills. One of the sills is specially designed to allow a passageway for the water and fishes.

The first construction (Sill No 1) is located far from the river island, and its effect is local. Consequences of its existence are visible on the Figure 9. Broader impact on the navigational conditions from this construction are not realistic, but it could be expected that small sediment deposit will be formed around this location

Sills No 2 and 3a and b have a positive effect on a navigational fairway. Layout captured in April 2019 are showing that river island is spreading much more upstream and its outer edge is rugged. Problems with navigational fairway outlines are a consequence of the river island physical shape. After implementation of the sills, from April 2019 to April 2020, the situation has been significantly changed. The river island becomes shorter and thinner, which has a positive effect on navigation conditions. Sedimentation process in the vicinity of the sills is active. The traces of the sedimentation are visible on the layouts from April and July 2020, which confirms its positive effects

Water quality monitoring

Detailed Monitoring plan for both water and sediment quality was created in accordance with monitoring plan from the Inception Report but also in accordance with currently valid dynamic plan and prediction that working period are going to be longer than it was planned.

During the works execution phase, regular monitoring campaign was carried out on the section Čortanovci, in mid-August (16/07/2019) and at the beginning of November (01/11/2019). During these campaigns, samplings were performed at the position located about 100 m downstream from the works. Sampling and further analyses were performed by accredited laboratory Anahem from Belgrade.

In the meantime, 6 water samples in three campaigns were taken for additional screening analyses. Samples were taken downstream of the construction sites on 13/05/2019 (just downstream second sill) and upstream and downstream of the construction sites, as well as between them, on 16/07/2019 (one upstream the first sill, one downstream the second one, and one between sills), and also on 29/08/2019 (one downstream from the first sill and one downstream the second one).

After works execution was finished, in phase of monitoring state on the location after that, and until now, it has been performed one regular sampling and analyses campaign of the Danube River water onČortanovci location, in accordance with the Intention Monitoring Plan, as well as the ToR. Water sampling at the location Čortanovci 2 has been performed on 09th July 2020, downstream from the second sill.

Sediment monitoring

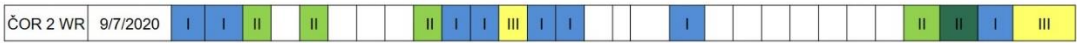
After works execution was finished, in phase of monitoring state on the location, after that and until now, it has been performed one regular a sediment sampling and analyses campaign on Čortanovci location, in accordance with the Intention Monitoring Plan, as well as the ToR. Sampling at the location Čortanovci 2 has been performed on 09th July 2020, downstream from the second sill.

Review of water and sediment quality results

Results obtained within the first sampling campaign carried out on 09th July 2020, show that quality of water sample predominantly corresponds to the quality of water I class, except for the parameters dissolved oxygen, total nitrogen and BOD, that correspond to quality water of the II class and ammonium ions, which corresponds to class III water quality.

In terms of the microbiological classification of the quality of this sample, it can be concluded that the Danube waters at the site of Čortanovci belong to the class I for intestinal enterococci, while for total coliform coliform bacteria of fecal origin it corresponds to class II and for aerobic heterothrophs to class III surface waters.

AFTER WORKS EXECUTION



Overview of the first regular monitoring campaign results obtained after works executed – Čortanovci, 09/07/2020

Results of the sediment quality obtained during this monitoring campaign show that all parameters values are below target values and most of them are not even detected.

Waste

During this period there has been no activity on the sector, therefore it has not been necessary to control whether there were discharges into the river from the boats.

Phytoplankton

This is typical phytoplankton community structure for this season, characterized by low primary production. Community structure was uniform along depth gradient and among localities

Macrozoobenthos

Mussels were represented by four genera and five species. Due to previous high-water level, part of right riverbank, downstream of position of upper sills, is covered by many individuals of mussels. Corbicula and Dreissena species dominated there, with some Anodonta and Unio individuals. Unio species are recorded by Unio tumidus, 8-10 individuals, and Unio pictorum, three individuals, with dimensions of 3,5-4,5 cm in width and 8,5 in length. Corbicula fluminea was with average dimensions 2,0 x 2,0 cm, Dreissena polymorpha with 1,5-2,0 cm in width and 0,5-0,7 cm in length and Anodonta woodiana with 10 x 15 cm. In sediment upstream of upper sills three individuals of Dreissena and three individuals of Corbicula were found. Below the lower sills four individuals of Dreissena were found.

Sector	***Unio* sp.**	***Other species***
Sector 22 Čortanovci	*Unio tumidus* *Unio pictorum*	*Anodonta woodiana* *Corbicula fluminea* *Dreissena polymorpha*

Birds

For the first time, one individual of Black stork (*Ciconia nigra*) was recorded on the sand bar behind island. One individual of White stork (*Ciconia ciconia*) was recorded on right riverbank. Several individuals of Little egret (*Egretta garzetta*) were present in the shallow water and on the tree trunks on the right riverbank. One individual of Great egret (*Ardea alba*) was in flight, as well as one individuals of Grey heron (*Ardea cinerea).* One individual of Black-crowned night heron (*Nycticorax nycticorax*) was standing on the right riverbank. Population of Mallard (*Anas platyrhynchos*), around 25-30 individuals, floated on the water and was in flight. Two Great cormorants (*Phalacrocorax carbo*) were standing on the trunk in the water. One Lesser spotted eagle (*Clanga pomarina*) was in flight high over the water.

Not any individual of migratory birds *Charadrius dubius* and *Riparia riparia* have been found.

Sector	*Charadrius dubius*	*Riparia riparia*	*Other species*
Sector 22 - Čortanovci	--	--	*Ciconia nigra* *Ciconia ciconia* *Egretta garzetta* *Ardea alba* *Ardea cinerea* *Nycticorax nycticorax* *Clanga pomarina* *Anas platyrhynchos* *Phalacrocorax carbo*

Fishes

In standing net closer to position of upper sills one individual of Tench (*Tinca tinca*) was found. In standing net closer to position of lower sills no one fish individual was found. In pulling of net between upper and lower sills one individual of White-eye bream (*Ballerus sapa*) and Vimba bream (*Vimba vimba*) was found. Other species have been caught in electrofishing. During fishing total 35 individuals from 8 species were found. No one individual of Sterlet was found

Sector	*Acipenser ruthenus*	*Other species*
Sector 22 – Čortanovci	--	*Tinca tinca (1 individual)* *Ballerus sapa (1)* *Vimba vimba (1)* *Aspius aspius (7)* *Alburnus alburnus (18)* *Leuciscus idus (5)* *Scardinius erythrophthalmus (1)* *Perca fluviatilis (1)*

Macrovegetation

Vegetation is fully developed by floors. Highest floor is characterised by genera *Quercus, Acer, Tilia, Populus, Salix, Fraxinus* and *Morus.* In floor of shrubs, False indigo bush (*Amorpha fruticosa*), in the phase of late flowering, and Blackberry (*Rubus* sp.) are abundant in number of individuals. In floor of herbaceous plants dominate family Poaceae.

Sector	*Species: Limosella aquatica*	Other species
Sector 22 Čortanovci	--	*Populus euroamericana* *Populus alba* *Salix alba* *Quercus sp.* *Tilia sp.* *Morus rubra* *Fraxinus americana* *Ulmus sp.*

		Acer negundo *Acer campestre* *Amorpha fruticosa* *Erigeron annuus* *Xanthium strumarium* *Bidens frondosa* *Bidens bipinnata* *Plantago major* *Rubus caesius* *Typha latifolia* *Rumex sp.* *Phragmites sp.* *Helianthus sp.* *Chenopodium rubrum* *Chenopodium ficifolium* *Corylus avellana* *Hedera helix* *Chelidonium majus* *Cornus sanguinea* *Rosa canina* *Crataegus monogyna* *Sambucus ebulus* *Ambrosia artemisiifolia* *Aristolochia clematitis* *Vitis sp.* *Ranunculus sceleratus* *Epilobium sp.* *Physalis alkekengi* *Lycopus europaeus* *Stellaria media* *Urtica dioica* *Calamagrostis sp.* *Arctium lappa* *Taraxacum officinale* *Heracleum sphondylium*

Plants

Not any individual of species *Limosella aquatica* and *Lindernia palustris* have been found.

Sector	**Species*: Limosella aquatica*** **Species*: Lindernia palustris***
Sector 22 **Čortanovci**	No results

Development of vegetation

Some herbaceous plants are still in flowering, and some are in phase of fruit formation, and consequently large number of pollinators are present. Herbaceous plants are represented by species from families *Aristolochiaceae, Ranunculaceae, Onagraceae, Cyperaceae, Caryophyllaceae, Asteraceae, Plantaginaceae, Polygonaceae, Lamiaceae, Rosaceae, Vitaceae, Typhaceae, Oleaceae, Poaceae, Amaranthaceae, Sapindaceae, Salicaceae, Cucurbitaceae, Ulmaceae, Urticaceae, Betulaceae, Moraceae, Araliaceae, Papaveraceae, Cornaceae, Solanaceae, Apiaceae, Brassicaceae, Celastraceae* and *Adoxaceae.*

Riparian areas

Vegetation shows regularly seasonal and spatial development by floors. Some plant species are very abundant and, in general, flora in this area has high species diversity due to favourable habitat conditions. In bird's population, Mallard dominates in number, but the most important and interesting finding is occurrence (first finding) of strictly protected species Black stork on the temporary sand bar behind the island, as well as White stork (also strictly protected species, second finding). Other bird species are common for this sector and frequently seen from spring till autumn in previous periods. Invertebrate animals are represented by Mussels (families *Unionidae, Dreissenidae* and *Cyrenidae*) and Insects (families *Formicidae, Apidae, Vespidae, Sphecidae, Calopterygidae, Lestidae, Libellulidae, Lycaenidae, Nymphalidae, Pieridae* and *Panorpidae*). Vertebrata animals are represented by Aesculapian snake (recorded in the wider area, not in riparian habitat), Dice snake, European mole, Pool frog and Marsh frog. Variable water level strongly influences on mussel population.

Sector	***Species***
Sector 22 Čortanovci	Mammalia – *Talpa europaea* Reptilia – *Zamenis longissimus, Natrix tessellata* Amphibia – *Pelophylax lessonae*, *Pelophylax ridibundus* Crustacea (unidentified species) Insecta: *Hymenoptera - Formica rufa, Apis mellifera, Vespa* sp., *Sphecidae, Odonata - Calopteryx splendens, Lestes sponsa, Sympetrum sp., Lepidoptera – Lycaena dispar, Argynnis sp., Pierris sp., Polyommatus sp., Colias croceus, Mecoptera – Panorpa vulgaris*

Protected areas

The selected quarry is located inside the National Park Fruška Gora. The mentioned EIA concluded that not any impact could be expected in the National Park due to the fact that the quarry is currently active for some other uses. During this period, negative effect over the National Park of "Fruška Gora" due to the activities of this project have not been observed.

Ecological network

One area, which is near to work zone, is mentioned in Decree on Ecological Network ("Official Gazette of RS", No. 102/2010). This is "Kovilj-Petrovaradin marsh", on left riverbank. This area is not affected by the works because all planned activities took place in the river closer to the right bank.

Summary of results

After field surveys during November 2017, February, March and August 2018, January, May, June, July and October 2019, and June 2020, the following target species have been found **in sector Čortanovci**:

Period	Macrozoobenthos (*Unio* sp.)	Fishes (*Acipenser ruthenus*)	Plants (*Limosella aquatica*)	Plants *Lindernia palustris*	Birds *Riparia riparia*	Birds *Charadrius dubius*
November 2017	-	-	Two individuals	-	-	-
February 2018	-	-	-	-	-	-
March 2018	-	-	-	-	-	-
August 2018	*Unio pictorum* (several) *Unio tumidus* (several)	-	-	-	-	-
January 2019	Unio tumidus (1)	-	-	-	-	-
May 2019	*Unio tumidus* (1)	-	-	-	-	-
June 2019	*Unio tumidus* (1)	-	-	-	-	-
July 2019	*Unio tumidus* (10) *Unio pictorum* (5-7)	-	-	-	-	-
October 2019	*Unio pictorum* (a few dozen) *Unio tumidus* (a few dozen)	-	-	-	-	-
March 2020	--	--	--	--	--	--
June 2020	*Unio tumidus* (8-10) *Unio pictorum* (3)	-	-	-	-	-

Summary of main impacts in the sector during this period

In this sector was defined the construction of some river training structures and dredging works. These activities included dredging in the central part of the river between km 1240+300 and km 1239+350 and the construction of two sills and one sill with the opening, located between km 1236+000 and 1237+000. Training structures have been built in the defined location, however, technical decision after several analysis concluded that dredging works were not necessary at this moment.

Several monitoring has been executed during construction phase, which results have been compared with surveys carried out in June and July 2020 in order to compare the status of environment six months after works finalization.

Regarding water and sediments, after this period it is possible to conclude that there are no significant effect over these parameters. The obtained results during field surveys in May are significantly similar to the previous ones. This can be interpreted as the works have not been affected the quality of water and sediments in the vicinity of critical sector of Čortanovci.

From the point of view of biology, the results show that the nature has not been affected by the works, which confirm the conclusion obtained in previous reports.

Bearing in mind that works were being executed from the water, the riparian vegetation existing in the riverbanks do not suffered any impact except a little dust deposited on leaves. This impact cannot be avoided because mainly depends on wind direction. However, it is not significant and the general status of riparian habitat remains in good conditions.

None of individuals of protected species of plants had been affected during those months and wildlife seemed not to be impressed by the presence of machinery and workers. Protected species of birds have not been detected in Čortanovci in any of the field surveys.

This first survey after six months without works disturbances shows how the environment in vicinity of structures remains in the same conditions as was addressed in monitoring made before works.

Protective and corrective measures

As works in critical sector Cortanovci finished in December 2020 (DNP officially begins 30th January 2020), there is no need to apply protective or corrective measures.

Conclusions & Recommendations

It is necessary to monitor the same parameters after six months to complete one year after works finalization.

Works that are being executed in another sector will be assess in different report.