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THE MEASURES OF THE ECOLOGICAL AND DREDGING OF THE BEGA CHANNEL

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Abstract: Over time, due to stopping navigation on the channel and thus stopping the maintenance of good water status, the clogging phenomenon has increased. This determines the decrease of the floodlighting potential in the Banat area. Sludge deposited at the bottom of the channel contains significant amounts of pollutants and its dredging may cause new chemical reactions harmful to the aquatic environment. The main objectives of this work are the rehabilitation and protection of the ecosystem, the defense against floods, the satisfaction of water demand for various uses from the Bega - Timis hydrotechnical system, both in quantitative and qualitative terms. In order to revitalize the Bega Channel, it was proposed to reconstruct and protect the aquatic ecosystem first. This is to clear the channel by evacuating a significant amount of deposits, which is to be stored in specially arranged places to prevent the exchange of dangerous substances with environmental factors: water, air, soil, flora, fauna and the population.
Consequently, the conditions for achieving the objectives and the appropriate manner in which they can be achieved are analysed.
Keywords: maximum flow, river bed, pollutants

1. INTRODUCTION

The study area is located in Banat, Timis County, along the Bega Channel, on a 43 km stretch of U.H.E. existing in the upstream area of Timisoara and the border with Serbia. (Figure 1)

Over time, due to stopping navigation on the channel and thus stopping the maintenance of good water status, the clogging phenomenon has increased. This determines the decrease of the floodlighting potential in the Banat area. Sludge deposited at the bottom of the channel contains significant amounts of pollutants and its dredging may cause new chemical reactions harmful to the aquatic environment.

The main objectives of the Bega Channel Greening Project are to rehabilitate and protect the ecosystem, to protect against floods, to meet the demand for water for various uses in the Bega - Timis hydrological system both in terms of quantity and quality.

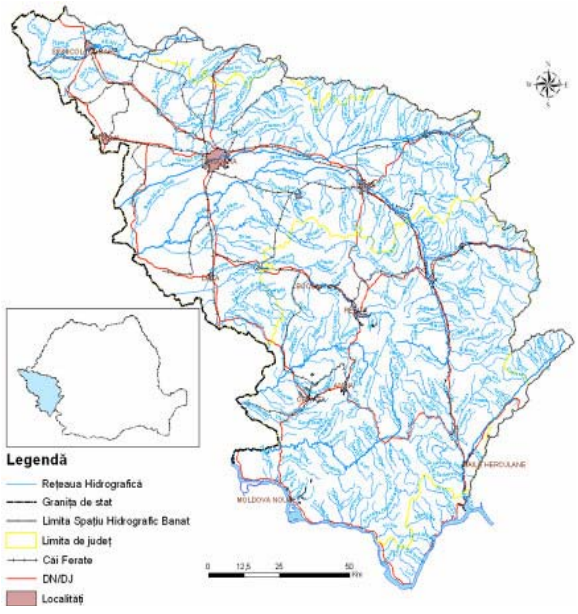

Figure 1. The Banat Hydrographic Area

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2. DESCRIPTION OF THE STUDY AREA

The Western Plain of the country is a characteristic flood area due to a set of unfavourable natural conditions: the lack of natural drainage caused by very low slope, shallow groundwater and the heavy texture of soils, plus the torrential regime of the waters that emerge from the Apuseni Carpathians. Density of watercourses, sinuous whales, slow flow of water in the plains, frequent rains and abundant snowfalls in neighboring mountainous areas that form the river's catchment basin make the waters frequently

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to reverse from their habitats and flood large areas of land.

Over time, due to floods, the rivers have turned the Banat Plain into marshy lands. They expanded particularly during the Ottoman rule, when the repeated wars and indifference of the provincial governors greatly contributed to the expansion of these unproductive areas.

The Bega Channel navigable sector, between Timisoara and the border with Serbia, measures a length of approx. 43 km, with the ground level being between 88 mdMN in Timisoara and approx. 77 mdMN in the border area.

The Bega River springs from Poiana Ruscăi Mountains and crosses the Timiş County from East to West.

The Bega Channel belongs to the lower course of the Bega River. The navigable part of the channel starts from the city of Timisoara; the first 43 km belong to Romania, the next 75 km being on the territory of Serbia where it flows into the Tisa River.

The slope of the Bega Channel, on the route between Timisoara and the border, is below 1 ‰. The channel carries an important solid flow, a situation due to both natural causes and anthropogenic causes.

Upstream of the Chizătău locality, the Coşteiu-Chizătău deviation flow channel out of the Timiş River into the Bega River. The river then passes through the localities Chizătău and Topolovăţu Mic. Immediately downstream of Topolovăţu Mic, the large beaches of the Bega River are diverted to the Timiş River by the Topolovăţ-Hitaş branch. On a 1.9 km stretch the river marks the Romanian-Serbian border.

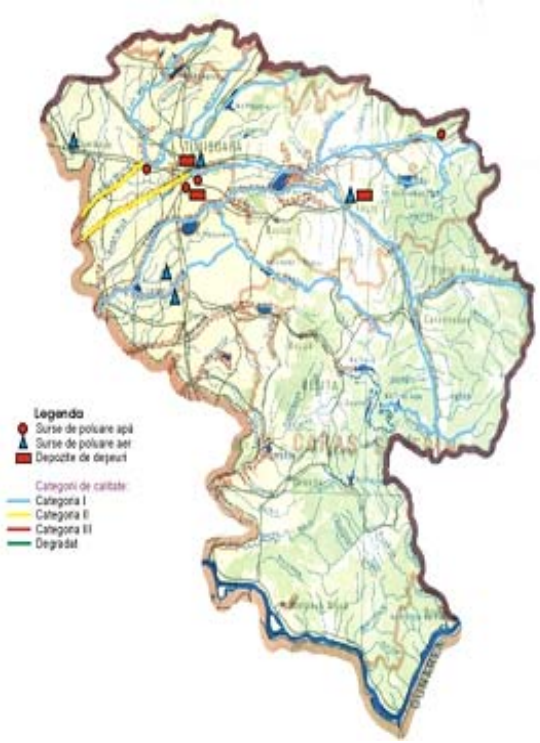

Figure 2 .Infrastructure of water management works in the Banat Hydrographic Area

On its way, the channel passes through a low meadow area - the low plain of Timis - with a relief dominated by abandoned arms, meanders and marshlands. The low plain of Timis was formed by the recent excavations of the Bega, Timis and Bârzava rivers, attracted by the lower areas of Lower Timiş. Current geomorphological processes, the most active, are alluvial and landslide processes, land degradation being linked to excess humidity.

In the low plains there are meadow deposits made up of recent alluvial Holocene age, mainly represented by clays, slurry clay, sandy clay, clayey sands, gravel sands, alternating in layers of different thicknesses.

Average annual temperatures are 10.7 - 10.9 ^{0}C, and the coldest (January) average temperatures are between -1.2 ^{0}C (-1.5 ^{0}C). The average number of days with frost is less than 100. The average annual precipitation amounts are 570 - 630 mm. The predominant winds in the area blow from N and E.

On the Bega Channel, access to the maximum flows from the upstream basin is calibrated through the Topolovat Hydrotechnical Node, part of the Timis-Bega double connection. The contribution of the main tributaries from the basin downstream of Topolovăţ is controlled by the Giarmata, Ghertoamoş, Recaş, Suştra, Topolovăţ and Iosifălău accumulations so that the 5% and 1% floods are controlled and the floods excluded.

On the Bega Channel, there are two hydro-technical nodes (Sânmihaiu Român and Sânmartinu Maghiar) with the purpose of maintaining controlled levels for channel navigation (initially for vessels of 500t) to ensure water outlet levels for water users from the channel and for other uses in the city of Timişoara (recreation, evacuation of sewerage systems, etc.).

The maximum flow rate in the border section is limited according to the agreements concluded with Serbia at 83.5 mc / s.

Table 1 - Groundwater levels

Zone	Terrain level	Level after MN 75
Deposit 1	< 3.00 m	< 83.56
Deposit 2	< 3.00 m	< 83.00
Deposit 3	-1.60 m	81.90
Deposit 4	-2.20 m	79.50
Deposit 5	< 3.50 m	< 75.00
Deposit 6	-1. 70 m	76.10

Underground free-range waters are cantoned into coarse alluviums (sand gravels) under the cohesive horizon of the surface. The aquifer is generally found

to be over 2 to 4 m deep and is free level, locally under pressure - ascending. The groundwater level is mainly influenced by the water level variations in the Bega Channel and is located at 1.50 - 4.00 m deep from the surface of the ground.

3. GREENING THE BEGA RIVER

Laboratory analyzes indicated the presence of the following pollutants in the sludge composition of the current riverbed of Bega Channel: organic matter resulting from the sewerage; aluminium sulphate; alluvia transported by natural floods on the river; etc.

Due to the deposition of some heavy metal compounds, exceedances of the admissible quantities were observed in the Bega sediment.

Table 2. Indicators measured upstream of Timisoara

Year	Measured indicators	Upstream Timişoara µg/l	Otelec µg/l
2002	Chromium6+	11,00	31,83
	Copper	12,75	32,25
	Zinc	22,80	53,17
	Arsen	0	0
2003	Chromium6+	6,00	10,00
	Copper	6,00	11,00
	Zinc	24,00	26,00
	Arsen	0	0
2004	Chromium6+	2,04	3,35
	Copper	1,94	2,15
	Zinc	20,36	24,35
	Arsen	0	0
2005	Chromium6+	2,41	5,14
	Copper	5,16	11,60
	Zinc	38,71	58,81
	Arsen	2,00	1,67
2006	Chromium6+	2,66	2,52
	Copper	4,29	7,76
	Zinc	24,31	28,89
	Arsen	2,00	2,00

It is clear that mud present in the channel waters is polluted, which involves a serious risk to the environment (humans, animals, birds, agricultural crops).

In this case, it is absolutely necessary that the chemical contaminated sludge be dredged from the Bega Channel riverbed and transported in ecological storage areas to ensure a perfect and safe isolation from the environment (air, water, vegetation, animals, birds).

Photo 1.Dredging on upstream Bega channel

Initially, in order to be able to excavate the sludge by absorption, it is necessary to clean the channel to remove the reed vegetation layer increased on the deposits of both banks but also of the objects thrown over time by the population.

Photo 2. Dredging on middle course of Bega channel

The underwater excavation of the sludge in the channel section will be done by two dredges with absorption and discharge of 1.5 - 2.00 km, equipped with mills suitable for the respective materials (mills with various components and various consistencies, alluviums from floods, possible objects thrown by the inhabitants in the riverbed), which are in the endowment of the contractor.

On both sides of the Bega Channel, at widths of approx. 2.5 ÷ 7.50 m and even 12.50 m there is the presence of the deposits of solid materials on which aquatic vegetation has developed (reed, sail, arboretum and underwater vegetation existent on the whole route - the length "shed" type, including roots, 1 ÷ 2.5 m).

The following applicable field technologies:

- dredging with floating grappling with floating platforms and shipping by ship through this platform to the warehouse area;
- unloading platform with a grapple and loading in the car;
- local car transport to final deposits;

Photo 1. Vegetal wastes from channel

The dredged plant material will be stored temporarily in the area of the ecological deposits and will be used as a vegetation layer for their closure, with no additional land areas required for their storage.

The transport of the dredged sludge from the Bega channel is done through discharge pipes and by means of pumping equipment.

Absorbing drainage dredges with thermal motor operate on a working technology based on the use of the hydro-mechanical process, respectively, on the pumping and discharge through the metallic pipes of the extruded material from the channel section. The pipes will have a diameter of 250 mm and will be installed on the banks of this channel to the ecological deposits.

The main functional element of the reluctant dowry is the sludge pump, which performs the mechanical work of pushing the dredged material on the dredging circuit to the deposition. For operation of the sludge pump, on the dagger is a Diesel engine group (avoiding the need for connections with the temporary electrical lines needed for electric motor groups). The floating assembly is the body of the dagger and is self-propelled.

The machines are designed for the transport of the dredged material to the shore and consist of floating pipelines, supportive floats of floating pipelines, oscillators, joints and of hydromass repumping groups to the ecological deposits.

Upon completion of the work for each deposit, these surfaces will be rendered to the natural framework by levelling, restoring the vegetation layer and blooming. According to the Feasibility Study, the total area occupied temporarily by works is estimated at 2.5 ha, used as pasture.

The permanently occupied lands are those areas on which the ecological sludge deposits are installed. They are enclosed by fence-fenced enclosures and tree plantations in enclosures, protected from pedestrian access and traffic.

The sealing system of the deposit is the final mandatory disposal of the ecological deposit from the environment: water, air, soil, fauna, and man. It can only be executed once a relatively dry surface of the upper sludge has been created and only when the discharge from the central evacuation pump with the motor pump drops to an average value of 2 l / s.

The realization of the final sealing system consists in the first phase of laying over a reinforced sludge of a high strength geocomposite having the role of separation and reinforcement; over it another bentonite geocomposite sealing and a geotextile to drain the entire surface of the roof to collect rainwater and transport it to the perimeter gutters.

Then lay a layer of vegetable soil of approx. 40 cm thick to be grassy. This ensures that materials are stored on the roof of the ecological deposit and protecting them from environmental factors. Mounting the protective caps is made at the top of the 250 mm diameter vertical pipe ends to protect against rainfall.

In order to protect the deposit of intruders and to preserve a natural aspect, a plantation of trees forming a closed enclosure is made in the fencing area of the deposit.

CONCLUSIONS

For the ecology and dredging of the Bega Channel, in the Timişoara-East, Sânmihaiu-Român, Uivar-Răuţi and Otelec were designed in the right bank of the Bega Channel - five ecological deposits.

The studied sectors belong, from a geomorphologic point of view, to the low plain of Timis and are found in the Bega meadow - in the right bank. The land where ecological pits are located it is flat and is approximately at the same level as the right bank of the Bega River.

The Bega River carries a significant amount of sludge in suspension and has a rectilinear route.

According to STAS 4273/83 and 4068/87, the construction works fall into the third class of importance - medium-sized constructions - hydrotechnical constructions whose damage endangers social economic objectives.

Through these measures, the Bega Channel is unclogging over the entire section of approx. 43 km, the dredged material being stored in 5 ecological deposits, being respected the capacity of 700,000 cubic meters.

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