

# FINANCING OF THE FLOOD DEFENSE IN DABULENI- CETATE AREA

Case  
study

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Dams,  
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## Abstract

*Danube River Basin has been frequently affected by floods in the last decades which often gained historical meanings, the latest being recorded in 2006 and 2013. The material losses were very high and on the Cetate-Dabuleni sector of the Danube river, after the floods of 2006 the dikes have been damaged and partially destroyed. In the end the Rast locality was almost total relocated. Following these events, we need to rebuild the flood defense infrastructure in the Lower Danube, but after the first assessment the costs are very high. With this paper we propose the ways of funding the flood protection works on the Lower Danube, research being done on the Cetate-Dabuleni Danube's sector.*

## INTRODUCTION

Among the natural disasters affecting severely the development of the regions in the European Union, the floods have been the most harmful. These may cause human victims, may lead to relocation of the population, can negatively affect the agriculture, the environment and the regional economic development.

In Romania the protection against floods along the Danube is ensured by a system of dams along the river which represents the main line of defense for the localities situated in the floodplain. The damming system was built in the early 70s, and during time, because of the weather and climate changes from the past decade, it has significantly reduced the function for which it was designed, the degree of insurance has fallen below 1%, the value for which this system has been designed in the first place.

The floods from 2006 caused serious damage on the lower sector of the Danube, which is why flood protection became highly necessary, and the restoration of the damming system is a major problem that needs urgent investigations. Thus, according to the A.N. Report Romanian Waters [1] regarding the floods from April 2006, in the district Dolj there were evacuated 7440 people, 340 houses were completely destroyed, 197 homes affected, 1113 households were flooded, 3 km from the district road was severely affected, and 4,500 ha agricultural land has been compromised.

## Material and method

The material on which the research is based is represented by the statistical data related to the phenomenon of floods in Europe and also in Romania, financial data and technical information regarding how to restore defense structure of the investigated area, internal and external financial resources that can be accessed to reduce flood risk and its mitigation. The research method is combined and combining fundamental research with applied research with the development, all of which contribute to achieve the goal.

## Presentation of the researched area

The Danube River, on the sector Cetate-D buleni, is under the administration of AN Romanian Waters and Administration of the Water Basin Jiu and represents 147 km of river. The area investigated for this study is represented by the floodplain, the area bordering the river and corresponding to "The Green Corridor of the Danube", the area considered to be the most vulnerable to flooding. Administration of the Water Basin Jiu is located in the South West of Romania, has an area 16,734 sq Jiu-Danube (10080kmp, BH Jiu), 1,461,661 inhabitants (density of 77 inhabitants / square km), 56% of people in urban areas. 54% of the total area is the agricultural land

and 29 % forests. ABA Jiu manages integrally Dolj and Gorj districts and partially the district Hunedoara (Figure 1.1).

ABA Jiu administers the following infrastructure: 698.292 km damming system, 446.868 km regularization, 9 dams (two of them are non-perennial reservoirs, used only when the flood diminishes. (Source [www.abajiu.ro](http://www.abajiu.ro))

Some of the infrastructure is administrated by other organizations, such as Hidroelectrica, ANIF (district offices). The most important permanent accumulations are PFI and PFII (on the Danube), Tg. Jiu V deni, Turceni (on river Jiu) Tismana (on Tismana River), Great Valley (on river Motru) Vâja, Clocotis (on Bistrita river).

The research conducted led to the conclusion that on the sector Cetate-D buleni the following types of segments are found based on the presence of hydro technical works: dammed sections, natural sections with adjoining wetlands, sections with mixed arrangements polder having a role in flood protection (Figure 1.2.).

It should be noted that the research carried out for this paper led to the conclusion that the dams (shown in Table 1) had a different management since they were built, so in the period 1970-2010, the dams adjacent to the Danube were administered by ANIF – the branch from Dolj district, and in the early 2011, they went under the administration of ABA Jiu located in Craiova.

## Table 1.

The most important dams in the researched area are: Cetate-Basarabi, Ghidici- confluence Balasan, Bistretu Nou- confluence Desn ui, Desn ui – Nedeia, Li teava (Jiu- confluence Jiet), Bechet-D buleni. The dammed length is 168.22 km, including also the subdivision dams that contribute to polders, having a role in the defense against the floods.

**The Section Basarabi-Rast** is a natural, free of dams area, where the unspoiled wetlands are connected to the European network Natura 2000. This sector did not have serious problems during the floods, because the villages are outside the areas with a high risk of this phenomenon, and a large part of the territory is considered a special area: ROSCI0039 Ciuperceni-Desa and ROSPA0013 Ciuperceni-Calafat-Danube. In the researched sector there are 24 natural lakes and ponds, which form the Danube River floodplain and create unique ecosystems, similar to wetlands.

## The current situation on funding the defense activity against floods

Currently, there is no special financial system to recover the money from the expenses used for the protection against floods. The National Water Management Authority approved the budget and set the prices for water users and for the drainage of the wastewaters in reservoirs (the polluter pays for

exceeding pollutant limits established by the current law). For the investment projects, the Romanian government allocates an annual budget from different sources. After being constructed, the works are transferred to the Romanian Waters - the national water management authority – for operation and maintenance.

The investments from the past years in the infrastructure for protection against the floods are transmitted through water administrations and financed from different sources: state budget (21.36%), EBRD loans (grant + budget), co-grants (47.24%), Fund for the Environment (19.77%), Solidarity Fund (1.76%) and European funds (9.87%). The main part of these funds was directed to creating the flood risk maps (grant from SOP Environment, Priority Axe 5, about 25 millions of Euros) and rehabilitation of the large dams.

#### **Develop modalities of the flood protection system in the Danube Valley**

The study conducted in the researched area showed that flood defense problems can be solved by ascension and / or strengthening the existing dams, but this assumption is not generally valid. Protection against the floods is highly necessary and the level of protection is still an urgent problem that needs investment. Given the nature of the service, flood protection is considered primarily a governmental task (responsibility) embedded in an extensive legal framework (security, water, environment), which was strongly affected by the European legislation (especially the Framework water Directive).

The problem of the floods could be also solved by decreasing the critical water levels which can be achieved by extending the river and increasing the flow discharge capacity in extreme conditions, as such. In other words, we shall give to the Danube and to other rivers more space. This concept has been successfully applied in the Netherlands and elsewhere in Europe. The concept *More space for rivers* the focus is moved from the dams (seen as investments), towards the river. Creating additional “rooms” for the streams can be achieved by creating a series of side channels in the floodplain (similar to passages), deepening or extending the river bed, reducing the major floodplain, removing some barriers and relocating dams (changing the land configuration). All these options for increasing the level of flood protection involve very high costs and expenses.

#### **Rearranging the floodplain through wetlands extension**

The Dutch companies *Eurodite, HKV Consultants*, in collaboration with the Romanian Waters reviewed the possibility of restoration of the floodplain in this area. The project was a study of pre-feasibility, after which there were two solutions

that promote the naturing of the investigated areas, as follows:

Solution 1 - building a side channel to reduce flood risk and conservation of the sites Natura 2000 in the area Ghidici-Zaval, with a total value of 195 million Euros

Solution 2 – renaturing the floodplain of the Danube River by applying the principle “more room for the river” with a total cost of 91 million Euros.

Because the costs proposed by the Dutch companies for a relatively small area were very high and unbearable to the local administration, the implementation of the two solutions is still in question, because the Danube River should have an integrated approach along all its lower sector.

#### **Restoring the damming system in the Danube Valley, sector Cetate-D buleni**

The research conducted on the sector Cetate-D buleni, led to the conclusion that the best option for defense against floods, taking into consideration the cost-effectiveness analysis is heightening the existing dams, which will increase the safety level and protect the area against floods. In the Danube Valley, on the sector Cetate-D buleni, researches were made by Dutch experts in flooding defense with the purpose of rehabilitating the area affected by floods on the Danube River in 2006. Based on this model, for the sector Cetate-D buleni, the research made went towards rehabilitation of the existing dams, bringing them back to the level of importance and level of insurance similar to that for which they were designed and built in the 70s. The research has led to the fact that for the length of 168,22 km of dams, it is necessary a volume of 3.93 million m<sup>3</sup> of material (clay), that can be taken right from the area, without the need of its transportation from long distances. Table 2 shows the total costs in case the necessary material is taken right from the neighboring area of the dams, because the local soil is suitable for strengthening it.

The total value of implementing the project is of 23.28 million of Euros and provides flood protection by restoring the dams and increasing the insurance level at 1%. This amount can have as a source a public-private partnership, or different external grant sources, such as SOP Mediu, or the European Regional Development Fund.

#### **Conclusions and recommendations for recovering the expenses**

In order to increase and ensure the necessary budgets for the measures of protection against the floods, on a medium and long term, there are three basic ways of financing:  
I. Resizing the state budgets and extending them  
II. Introducing a tax for protection against the floods

### III. Introducing a paid contribution by direct users

An important aspect is the fact that flood protection is linked to other complex problems for the calculation of risk. Taxation, as a source of money for the budget, should be based on the principles of the rule of law. We need a public awareness campaign to inform the public and stakeholders regarding the need to start paying for flood protection.

The EU support period for investment in flood protection category is guaranteed until 2020. It is important that financial resources are available in a long term. If possible, the flow of funding (money) for water management and for flood protection should be isolated from political interference. In the current system it is indicated that the management of government institutions should be political.

In the process of flood defense, prioritizing the interventions is made according to infrastructure exposure to flood risk. Firstly, the population is protected, then their homes and households.

Afterwards, it is made the inventory and constant monitoring of the critical sports that appear after the flood has passed.

### **Bibliography**

- [1] “Redevelopment of the floodplain of the Danube Valley in Romania” – Review regarding the development sceneries of the floodplain between Ghidici and Z val, Romania-Netherlands project, Eurodite, HKV Consultants, 2012
- [2] [www.abajiu.ro](http://www.abajiu.ro)



Figure 1.1. Administration of the Water Basin Jiu – general presentation (source ABA Jiu)



Figure 1.2. Map of the researched area (from ABA Jiu, 2014)



Fig. 1.3. The main polders with a role against floods on the sector Cetate-D buleni

**Table 1. The main dammed areas on the Danube River, in the sector Cetate-D buleni**

Nr. Crt.	Water Basin Administration	Name of the water body	Name of the dam	River	Length of the dam (km)	Distance between the dam and the shore(m)
1	Jiu	PF2-Chiciu	Cetate-Basarabi	Danube	12	200
2	Jiu	PF2-Chiciu	Ghidici- confluence Balasan	Danube	28	250
3	Jiu	PF2-Chiciu	Bistretu Nou- confluence Desn ui	Danube	5,4	250
4	Jiu	PF2-Chiciu	Desn ui -Nedeia	Danube	49,13	250
5	Jiu	PF2-Chiciu	Li teava (Jiu- confluence Jiet)	Danube	11,5	250
6	Jiu	PF2-Chiciu	Bechet-D buleni	Danube	18,65	250
<b>TOTAL</b>					168,22	

**Table 2 Costs for rehabilitating the dams on the sector Cetate-D buleni, on the Danube River**

Costs	Unit prices			Necessary material (clay)
	RON	Euro <sup>1</sup>	Unit	Unit
Strengthening the Danube dams	4,40	1,00	/m <sup>3</sup>	3,93 Mil m <sup>3</sup>
Excavation of land in the area where dams are built	11,40	2,59	/m <sup>3</sup>	3,93 Mil m <sup>3</sup>
Transporting the soil (inside)	7,95	1,8	/m <sup>3</sup>	3,93 Mil m <sup>3</sup>
<b>Sub-total</b>	<b>21,17</b>			
<b>Additional risks, execution costs etc. (10%)</b>	<b>2,11</b>			
<b>Total</b>	<b>23,28</b>			

1) exchange rate : 1,00 Euro = RON 4.40 (09.09.2014)