

ALTERNATIVE SOLUTIONS ON THE APPLICATION OF CURRENT CONCEPTS BY DEFENCE AGAINST FLOOD ON THE CATCHMENT AREA BARZAVA

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Abstract

In the first part of the work is described the system of arrangement to the high waters of the catchment area Barzava Superioara with the suitable arrangement scheme, after which is made the analyze of the flood and inundations produced in the last years.

To diminish the effects of the negative of flood produced now is need the proposal certain structural measures of defense, but especially non-structural among which: removing and distribution of the stock of defense against flood; supervision of hydrometeorological phenomena by ensuring unrolling flux of information – decisional; assurance of the accumulation exploitation in accordance with the regulations of exploitation, pre-empting of them in order to create the additional protection volumes.

Keywords: flood, structural and non-structural measures, accumulation, flood wave

1. INTRODUCTION

Barzava river basin (fig.1) drains a relatively small area in Banat Hydrographical Area. The area drained by Barzava River and its tributaries on Romanian territory is 1202 km². Barzava, whose spring is in Semenic Mountains placed at 1190 m altitude, has a general SSV-NNE flow direction, presenting a narrow valley, deep, lacking of flood channel and with an average slope of 15 m/km. Downstream of the confluence with rill Gropos, the river changes the direction of flow towards west by town Resita, after which in piemontana area and low areas flows generally in the direction SE-NV.



Figure 1 – Barzava River Basin

Downstream of the town Bocsă, river enters the plain area (Plain Moravita) in which the flood channel is well developed, reaching until the width 3-4 km, slope drops below 1 m/km., the water course becomes meander, reason for which it has been embank.

From its spring to the Romanian-Serbian border, Barzava flows through all forms of relief from mountain to plain.

The river crosses Semenic Mountains modelled on folded structures in crystalline slates, Aninei Mountains with their lime plateaus, Dognecei Mountains and Hills, sector in which the water streams overlay on mountain crystalline lithology and also on friable piedmountain ones in order to enter then in the lowlands where the river bed is getting wider in the alluvial deposits and the groundwater level is very close to the surface.

The climatic regime constitutes another basis element when characterizing water resources. Barzava River Basin benefits from a moderated continental temperate climate with Mediterranean influences that confers to the temperatures a moderated regime and implies the presence of a second pluviometer maximum at the beginning of the autumn. The average annual temperature are framed between 6-9°C, the average rainfalls have values of 600 mm/year in the lowlands and 1000 mm/year in the highlands, and the average evapotranspiration is about 580 mm/year.

On Barzava stream were executed tree reservoirs (Gozna, Valiug, Secu) placed in cascade, having as main purpose the flood attenuation, the water supply of Resita and energy supply. Their role is therefore multiple and they are perceived as a valuable element for society. An important role in flood attenuation has the hydro technical system from Barzava.

At the beginning of 1904 was build to assure the water supply necessary for the CSR and the population in the area, the system was completed in the period 1950 -1963 and today it has: a bypass channel; an interior channel; the reservoirs: Gozna

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($V_t = 12,4$ mil. cubic meters); Valiug ($V_t = 9$ mil.cubic meters); Secu ($V_t = 11,1$ mil.cubic meters). The floods formed in natural condition on the Barzava stream had a strong impact on Gozna and Secu reservoirs, so that downstream of the Secu reservoir, the floods registered were the result of the reservoir outflow over posed onto the existent flood wave. The construction of the reservoir (figure 2) finished in 1963 and worked to assure a flow of 2.2 mc/s, from which 0.4 c m/s for the drinking water supply of Resita and 1.8 c m/s for industrial water needed by CSR and for flood wave attenuation on Barzava.

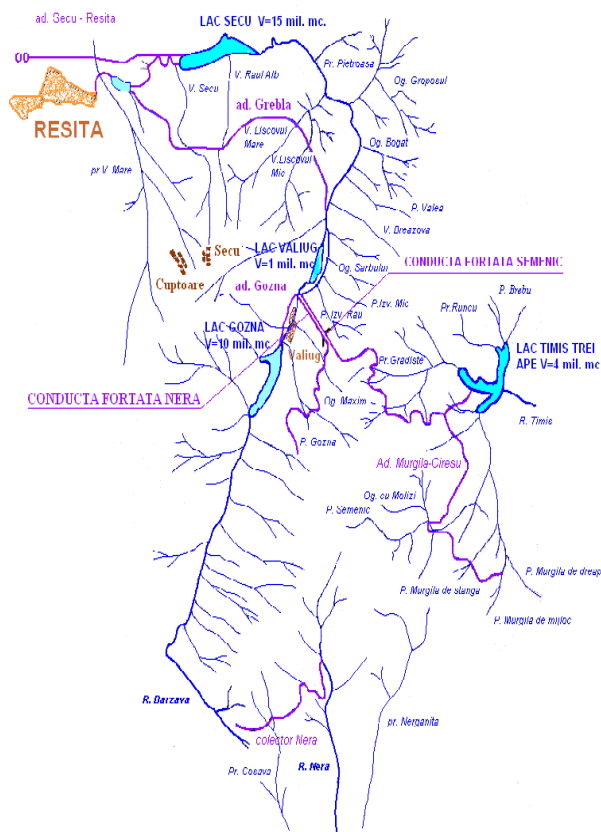


Figure 2 Hydropower system of Barzava River

The Barzava stream has as tributary Bogatu, Ciresana, Gropasu, Pietrosu on the right bank and Stalnicul, Raul Alb, Crainicul, Liscovul Mare on the left bank of the river.

2. CONDITIONS OF FORMATION OF THE MAXIM RUNOFF

The climatic specific of Banat is to overlap over circulation of the Atlantic air masses of the some sub-tropical air masses, brought in their movement toward the north and north-east of the depression areas situated in the Mediterranean Sea or Adriatic Sea. These invasions of air generates the moderate character of the temperatures regime, of the periods of heating during the winter, early starting of spring and the average annual rainfall relatively highs between 600-1400 mm.

It must be noted that the highest quantities of precipitaii shall be recorded in Banat, when the

weather conditions lead to a maintain on longer periods, in that contact between artic cold air and warm subtropical air, and motion of the depression area shall be made in the direction SV - NE , on that account, mountains Banat determines dynamic convection of the cold fronts which causes rainfall.

Because of the local peculiarities of the climate, generated of dynamic factors, of physico-geographical and human factors, was imposed the requirement of measurement in as many points of the climatic elements, such is arriving to the existence in this area at 16 meteorological stations and 110 raingauges.

For a better knowledge of the runoff in Table 1 are presented the hydrometric stations on the river Barzava and the their morphometric elements.

Tabelul 1

Nr. crt.	River	Hydrometric station	Surface S (km ²)	Average Altitude H (m)	Length L (km)
1	Bârzava	Crivaia	42,0	970	14,0
2	Bârzava	Secu	140	604	39
3	Bârzava	Reșița	191	574	47
4	Bârzava	Moniom	309	570	66,0
5	Bârzava	Gătaia	721	359	112
6	Bârzava	Partoș	933	293	141

Another important characteristic of relief is its position in the form of amphitheatre, altitude increasing in steps of the V to E.

Vegetation and soils play an important role in the formation of maximum runoff through the phenomena of intercept, infiltration and evapotranspiration, as well as through the increase of the rugozitatii, reducing so water velocity on the slope, thus will increase the capacity of erosion. As a result of the relief characteristics and in particular due to its placing in the higher steps from west to east, vegetation and soil, presents these multistage.

A very great influence on hydrological regime of the maximum flow, one have human activities, of which the greatest weight, one have the hydrotechnical constructions, afforestation and defforestations, hydroameliorative and hydroedilitare arrangement. All of these arrangements are in fact the interventions which modify hydrologic regime of the water course.

The dikes have been performed on medium and inferior water courses of all main collectors from the area, and the polders were located at the entrance to plain area: Ghertenis on river Barzava.

3. SYSTEM AND THE SCHEME OF ARRANGEMENT AT HIGHT WATER

The main parameters that characterize Barzava River Basin are: the river length = 154 km, the catchments' average width = 7,5 km; the catchments' maximum width = 18 km; the coefficient of catchment's development = 0,15; the coefficient of catchment's asymmetry = 0,8; average elevation = 289 m; average slope = 7‰; average discharge = 5,28 m³/s; 0,1% probability discharge m³/s =180 m³/s and 1% probability discharge = 95 m³/s; 80% assurance discharge = 1,66 m³/s, the 95% assurance discharge = 1,26 m³/s and the 98% assurance discharge = 1,09 m³/s.

Barzava river bed was regularized on relatively small sector, totalizing 66 km, and from its tributaries,

Barzavita has regularization works on 3 km. 79 km of dikes on the right shore and 76 km on the left shore have been built for flood protection. These embankments protect against flood 24 524 ha.

From the intakes point of view, the main water uses in Barzava River Basin are the hydropower plants (Crainicel, Breazova and Grebla), the industrial users (C.S.Resita, U.C.M.Resita, C.M.Bocsa – mainly heavy industry) and water companies (Resița, Bocsa, Deta, Gataia – the main localities in the river basin). Relatively small water volumes have been withdrawn for agricultural use, fishery or irrigation.

In the dynamics of the surface water intakes for each water use and also in the dynamics of the groundwater intakes for each use one can notice a decreasing trend for the water demand for each water use. The enormous decrease is mainly caused by the decline of the industrial activities in the big factories that were the major water users. At the same time the population demand is getting lower due to the fact that the inhabitants have begun to use the water meter system.

On the left bank of the river Barzava, downstream of the confluence with rill Fizes, beside Ghertenis locality is located the nonpermanent accumulation Ghertenis (figure 3), with a total volume of 17.7 million cubic meters.

The accumulation has role to attenuate flood wave on the river Barzava and has two compartments: first compartment has the role to attenuate flood wave up to 5 % and the second compartment has the role to attenuate flood wave between 5% and 1 %.

Between the two compartments is an overflow of concrete with a length of 123 m with trapezoidal cross section. Each compartment has a dewatering conduit in the bottom and a gate with the tower of maneuver to accumulation.

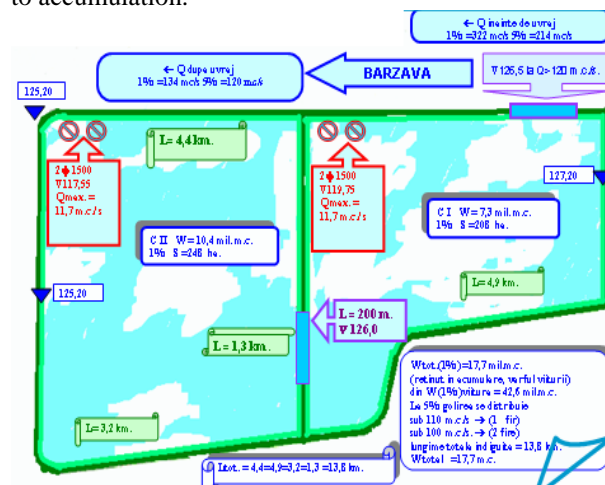


Figure 3 – Ghertenis non-permanent accumulation

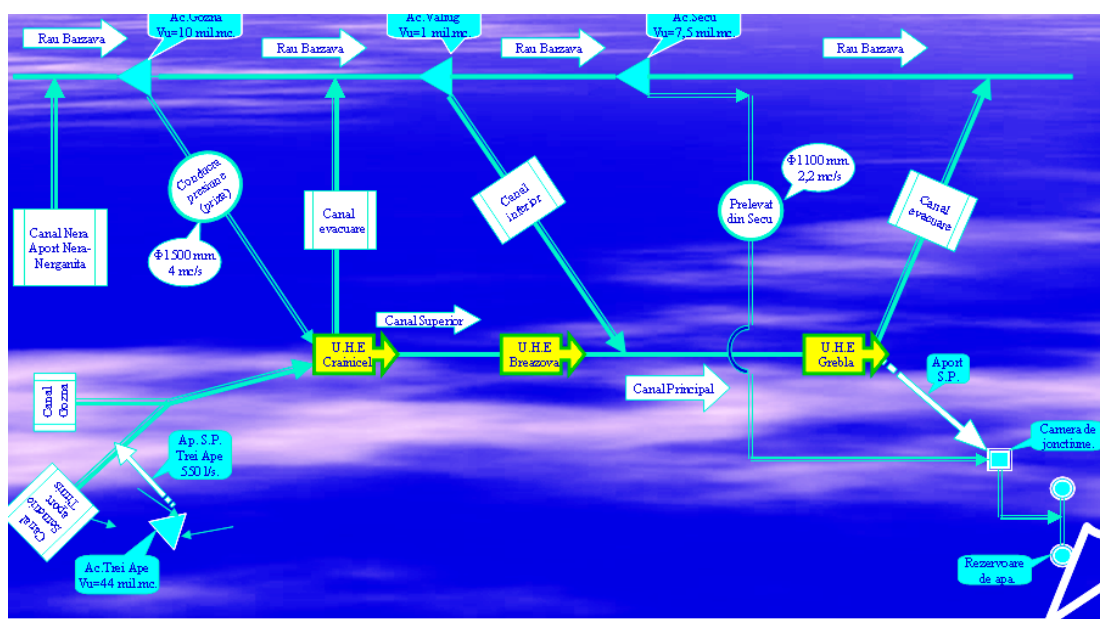


Figure 4 – The arrangement scheme for "Barzava Superioara" River

4. FLOODS PRODUCED IN RECENT YEARS

Due geographical particularities of the county, with the mountains Banat in the center, the lengths of rivers relatively small, snowfalls in the winter period and spring the debacles sudden because of Mediterranean climate, the floods on watercourses have a rapid evolution and most of the times simultaneous on all main courses.

Flood of pluvio-nival regime resulted from precipitation in the form of rain in considerable

amounts that have fallen simultaneously with a sudden rise in temperature of the air and melting quickly of the snow layer. This phenomenon occurs as a rule twice a year, so: the first flood during the month of February and the second flood in the second half of the month of December. These floods are characterized through a special development of the flows on the medium sectors and the inferior sectors of the water courses, exceeding the capacity of the

hydro technical works with the role of defense and the damage them.

Starting from the year 2000 (fig. 5) there have been produced floods with the flows in rare values of occurrence, therefore have occurred and problems regarding of defense against floods, especially on embanked sectors.

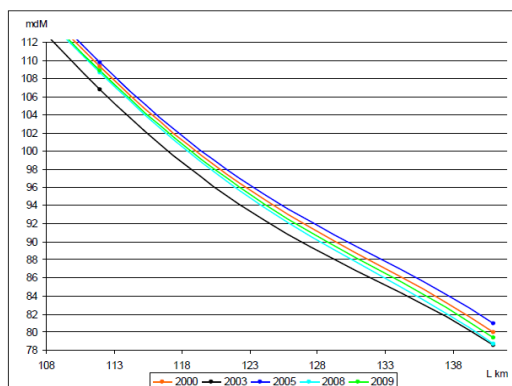


Figure 5 – The water level evolution on River Barzava, upstream Gataia

The rain dropped in the Barzava stream during April 14 -16, 2005, registered had values between 35.4 l/sq.m at Weather Station Semenic and 53.5 l/sq.m at the Valiug Station, forming a flood on Barzava stream, reaching the maximum capacity of the Gozna and Secu reservoir. For the emptying of accumulation has taken grown measure abstraction flow from as the capacity maxim of 4 cubic meter /s. In the Secu reservoir, to avoid the spill in 16 April 2005, were opened the both outlets of the dam, at the maximum capacity of 8 c. m/s, so till the beginning of flooding from 17 April 2005 were evacuated through the outlets 921.000 c m. During April 15-18 2005 were warnings about moderate rain. And in period April 17-18, 2005 rain dropped between 26.8 l/sq.m at Semenic, 37.2 l/sq.m at Resita and 48 l/sq.m at Moniom. Due to the increase intensity of the rain, the saturation of the soil and lack of vegetation, the discharge on Barzava increased highly. From April 18-19, 2005 the registered values of the amount of precipitations were higher than the anterior day, in Resita, of 48.2 l/sq. m, and at Moniom of 18.5 l/ sq. m.

For the reconstitution of the flood wave bell from 17-21.04.2005 what would be natural produced at the hydrometric station Moniom was proceeded as follows:

- the decomposition of flood wave recorded at the hydrometric station Moniom, subtracting from this wave flood recorded at the station Resita, resulted thus the natural flood wave of the rest of catchment area between the two hydrometric stations (140 km², 372 m average altitude);
- to compose the affluent flood wave at hidrometric station Resita with that of the rest of the catchement area, to result thus the affluent natural flood wave at the hydrometric station Moniom.

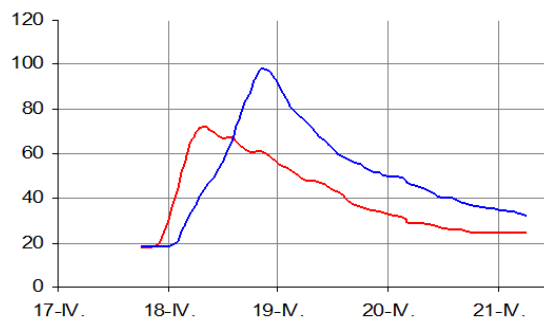


Figure 4 a– The natural affluent flood wave at Resita by composing the flood wave

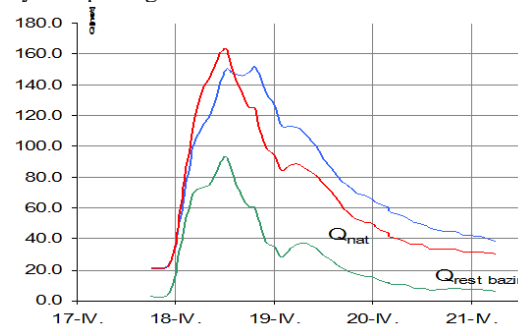


Figure 5a - The natural affluent flood wave at Moniom by composing the flood wave

5. CONCLUSIONS

Having regard to the foregoing is imposed a new system of defense against flood and is proposed following measures:

- removing and distribution of the stock of defense against flood
- supervision of hydrometeorological phenomena by ensuring unrolling a flux informational - decisional
- assurance of the accumulation exploitation in accordance with the regulations of exploitation, pre-empting of them in order to create the additional protection volumes
- free of the obstacles in the riverbed Barzava
- the reconstruction of defense line of the river Birzava
- the design and the arrangement of the non - permanent accumulation

6. REFERENCES

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