Analyze of the Runoff in Gilort Watershed

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Abstract. In recent years, the climate changes have determined the increase of the frequency flooding, and concurrently, the negative effects of these weather phenomena were amplified by other factors (the deforestation, needs of the hydrotechnical works, etc.). Floods represent a natural phenomenon that cannot be prevented. However, human activities contribute to the probability and the magnitude of the negative impact of floods. In the first part of the paper the catchment Gilort is characterized, from the point of view of the hydro morphological and morphometric. Further, the paper presents the hydrologic analysis of atmospheric precipitation and liquid runoff in the catchment for 2007. Finally, the paper presents the conclusions and some considerations on the water resources management from the catchment Gilort.

1. Introduction

The Gilort River springs from the Parâng Mountains, namely from the Parangul Mare Peak (2519 m), through two main springs, situated at an altitude of 2350 m, being flanked immediately on the right by Mândra Peak, and on the left by Gruiu Peak. [1]

It crosses the West part of the Olt Sub-Carpathian region, and drains an area of over 1348 sq km with an average altitude of 544 m and an average slope of 103 m/km. (figure 1) In the upper stream course, until the exit of the Parâng Mountains, the river has a typical mountain valley with accentuated slopes of over 65%, a V shape bed river profile and on a small portion of limestone deposits, it forms gorges. [2]

Figure 1. The River Basin Gilort [3]
The lower course of the river, crossing from north to south, the central part of the Getic Piedmont, the average slopes drop to 16 ‰, and the meadow area widens to 1.5-2 km.

2. Database and methodology

It makes an analysis of the hydrological regime, using measured data from the gauging stations from the drainage basin of the river Gilort. For this paper, it is used 6 hydrometric stations from this catchment area. Observations made over time show that in smaller basins, floods occur due to torrential rains (and very rarely because of the sudden melting of the snow layer), and in large basins, the main role is played by the melting of snow and general long rains or short-lived.

Therefore, maximum flows may have a pluvial, floating or mixed origin. [4]

The frequency of floods at the six hydrometric stations in the Gilort basin is as follows:

- the spring has a share of 29% of the total floods produced annually at Baia de Fier on the Galbenuşi River 46% at Săcelu on the Blahniţa River;
- the number of floods registered in the summer has weights between 25% in the case of Tg. Cârbuneşti on the Blahniţaşi River 37% at Baia de Fier on the Galbenu River;
- autumn the recorded weighs are: 11% at Săcelu on the Blahniţaşi River and 23% at Tg. Cârbuneşti on the Gilort River;
- for the winter season, the recorded floods have a weight of 12% at Baia de Fier on the Galbenuşi River, 24% at Tg. Cârbuneşti on the Blahniţa River.

The graphical representation of the relationship between the total flood time and the length of the water course for each hydrometric station highlights the general trend of increasing the total flood time directly proportional to the length of the water course. [3]

In the case of the graphical representation of the relationship between the flood growth times and the length of the rivers, we can observe the tendency for this parameter to be increased, often influenced by other factors (rain intensity, slope of the relief, river slope, anthropogenic influences, etc.), (Figure 2).

![Figure 2. The correlation between the total flood time and the length of the watercourse](image-url)
3. Result and discussion
Determining the maximum flow is important in order to calculate the maximum specific leakage of the
floods occurring in the Gilort catchment area.

For the analyzed period, the highest recorded maximum flow was 469 m³/s at Tg. Cărbunești on the
Gilort River in August 1999, and the lowest maximum flow was 1.48 m³/s produced on the Blahnița
River to Săcelu in May 1988.

Because the runoff is routed through the basin along the flow paths determined by the topography, this
study uses the digital elevation model (DEM) both for viewing the altitude variation in the Gilort
hydrological basin, and for the hydrological analysis of the studied area.

The digital model of the Gilort basin was obtained using the Global Mapper software, after which
DEM processing is done in ArcGis (Figure 3).

Once the file has been configured appropriately, the file may be rasterized and exported as a DEM file.
From the File menu, select Export Raster and Elevation Data, then Export DEM.

![The digital elevation model (DEM)](image)

**Figure 3.** The digital elevation model (DEM)

The raster structure of this elevation model is usually used to derive topographic data for distributed
hydrological models. So on the basis of the DEM, we determined the water flow direction and
accumulation in order to delimit the hydrological basin analyzed.

In Digital Elevation Model (DEM), the Flow direction (figure 4-9) operation determines into which
neighboring pixel any water in a central pixel will flow naturally. The calculating flow is one of the key
steps in the hydrological analysis. Hydrological analysis functions based on the flow grid are for example
the cumulative water, the flow length and watershed.
Figure 4. The flow direction

Figure 5. The stream

Figure 6. The slope of Gilort catchment

Figure 7. The hill shade of Gilort catchment
The floods produced in the Gilort River Basin in October 2007 were generated by the precipitation of a cyclonic nucleus displaced from the Mediterranean Sea.
On October 19 and 20, in the Piedmont and Sub-Carpian area, an intense rainfall had been taking place, and in the Parang Mountains, at over 1500 m altitude, the snow layer has exceeded 25 cm. The warming process continued, the abundant rainfall also occurred at Tg. Cârbunești recorded 94.5 mm within 24 hours. On 22, 23 October, as the temperature of the air and the liquid precipitation increased, the snow layer melted, contributing significantly to the increase of the flows. Monthly precipitation values, recorded in October 2007 at the Gilort Basin hydrometric stations, were 123.6 mm at Saceluși and 213.2 mm at Tg. Cârbunești.

These precipitations, with high intensity on October 23, generated the highest flows from 1982-2009 to Tg.Carbinești / Blahnița (111 m³ / s) and to Turburea (436 m³ / s). The flow was characterized by the production of two peaks at the same day (Figure 10).

4. Conclusions

The specific maximum flow rate was 404 l / s.km² at Turburea and 505 l / s.km² at Tg-Cârbunești / Blahnița. The maximum level reached during the flood exceeded the level of attention by 17-60 cm, and at Turburea the flood rate was exceeded by 162 cm. However, no particular damage was recorded.

Observations made over time show that floodplains in smaller basins are due to torrential rains and in large basins the main role is the melting of snow and general rainfall over long or short duration. There have been no significant floods and damage, but it must be stressed that due to the large riverside slopes in some sub-Carpian areas, there is a descent of the trellis and strong shore erosion that affects some constructions and land surfaces.

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