"THE CAUSE AND THE MECHANISM OF THE FLASH FLOODS ON 7–8 OCTOBER 2006 AT STAVROS THESSALONIKI (NORTH GREECE)"

Panagiotis Stefanidis[1], Ioannis Kalinderis[2], Fani Tziaftani[3],

ABSTRACT

The Stavros region in North Greece is one of the oldest summer resorts of the residents of Thessaloniki as well as of the foreign tourists that visit Greece.
It is situated on Orfanos gulf 85 Km North – East of Thessaloniki. Stavros is built on the corner of a long sandy beach and is surrounded by evergreen mountains. There are two major torrents that run through the residential area (lowland) of Stavros. The torrent of eastern Stavros with a total basin extent of 4,68 Km^2 and the torrent of western Stavros with a total basin extent of 3,18 Km^2.
These two torrents spring of the North – East slopes of Holomontas Mountain and outfalls in the Orfanos gulf.
The area has been hit many times by extreme weather conditions (storms) with disastrous torrential and flood phenomena (October 2000).
On October 7 – 8, 2006 a rather intense storm occurred in the area of Holomontas Mountain and due to the heavy rainfall severe flash floods were produced along with debris flow, at the outlet of the draining stream.
In this paper study, the cause and the mechanism of the flash floods on October 7 and 8 is being analyzed.
For the accomplishment of the goals of this research, the following methods were applied. The research area was mapped using a Geographic Information System (GIS), (mountainous area scale 1:50.000, plain area scale 1:5.000).
The morphological and torrential characteristics were determined. Furthermore the basic torrent factors (climate, geologic support, relief and vegetation – land cover) were analyzed and the torrent environment (potential) of each torrent was defined. The meteorological data of the existing weather stations (Taxiarhis, Arnaia, Meg. Panagia and Polygyros) were collected, interpreted and revised.
The water discharge carried by the two torrents, along with the bedload transport, was estimated by tracking runoff marks. Moreover the damages that were caused both in the main course of the torrents and at the outlet of the draining streams were recorded.
Meteorological data collected from the meteorological station in Meg. Panagia has shown that the maximum rainfall depth has reached 236mm in 24h (7 – 8 October 2000).

[1] Associate Professor and Chairman, Institute of Mountainous Water Management and Control, Faculty of Forestry and Natural Environment, Aristotle University of Thessaloniki, P.O. BOX: 268, 54124 Thessaloniki, Greece, Email: stefanid@for.auth.gr
[2] Dr Forester
[3] Forester, Msc

Rainfall height that was recorded on 7 and 8 October 2006 reached 100mm in 4 hours at the meteorological station of Polygyros, 105mm in 3,5 hours at the station of Taxiarhis and 150mm in 6 hours at the station of Meg. Panagia.
According to our research, the duration of the rainfall exceeded the maximum concentration time and as a result severe damages were caused in the plane area.
Although the two watersheds have a really good amount of vegetation and especially forest cover that reaches almost 90 – 95% of the total extent of the basins, the torrential problems that occurred especially in the main course of the waterbeds were pretty harsh.
The main reason for this was the geologic structure of the water beds, which consists of old alluvial fans with outsized conglomerates that were removed, transported and deposited in the plain areas ($D_{rock\ max}$ = 1,7 - 2,20m).
The National forest service has constructed many years ago three dams in each torrent in order to manage the runoff and protect the residential area. However, the constructions were able neither to avert nor to mitigate the impacts of the phenomenon due to their small number. Moreover, much anthropogenic interference especially in the waterbeds of the two watersheds has produced more sediments that contributed to the problem.
In conclusion what was attained are the following:

- When the duration of the rainfall exceeds the runoff accumulation interval and especially when the depth of rainfall is very intense ($i \geq 30$mm/h), then flash floods occur particularly in small watersheds.
- Vegetation and forest can have a protective role against erosion when mild phenomena occur (rill erosion, sheet erosion, small gully erosion), but cannot provide any protection when severe and intense phenomena (deep gully erosion, bank erosion) take place and great amounts of water discharge flow in steep slopes.

Keywords: Intense rainfall, flash floods, debris flow