

Extreme flash floods in October 2014 and neglected torrent control - case study of the Hotovlja valley, Slovenia

Jošt Sodnik, MSc¹; Pavel Debeljak, Univ. Diploma in WMCE¹; Jure Bogataj, Univ. Diploma in WMCE¹; Urška Petje, MSc¹

INTRODUCTION

In October 2014 an extreme rainfall event occurred in W Slovenia. Due to very high rainfall intensities numerous torrential floods caused damages in river and torrent channels, on roads and other infrastructure. The Hotovlja valley is a small and narrow valley (2.2km in length) located in Gorenja Vas - Poljane municipality in NW Slovenia. In the past years, torrent and erosion control aspects were neglected when planning settlements and accompanying infrastructure in the valley. Due to persisting low financing, torrent maintenance works were not carried out in a sufficient extent. In 2014, extreme torrential flood exposed all weaknesses of the status quo situation and the flood consequences are calling for changes in our attitude towards torrent control.

RAINFALL AND FLASH FLOOD EVENT IN OCTOBER 2014

October 2014 was the warmest October since measurements of climate parameters were introduced in Slovenia in mid 19th century. Average daily temperatures were from 16°C to 19°C, which is normal for the end of August or the first half of September. In the period from October 21 to October 24, 2014, a cold weather front came from the north and in the night from October 21 on October 22, local thunderstorms and heavy rain occurred. The total amount of precipitation did not exceed the maximum values measured in the past, but the short-term intensities were extreme and have exceeded values with 100-year return period in many areas (ARSO 2014a). This meteorological situation led to local torrential outbursts. A combination of high discharges, sediment-laden flows and woody debris led to catastrophic consequences with high damage (ARSO 2014b).

CONSEQUENCES - A HANDBOOK OF BAD PRACTICE EXAMPLES

With this extreme event, all the mistakes in spatial planning, bad decisions in the past and at most, lack of regular field inspections and sufficient water management activities such as regular executing of maintenance works in the past decades, came with the price. In the Hotovlja valley, the damage on water infrastructure only was estimated at 1.6 million € and the restoration costs are estimated at 2.94 million €; to this sum the damage on other infrastructure (drinking water supply system 90,000€, local road 320,000€, private property 200,000€) should be added. During the last two decades, population in the valley was growing hence the narrow topography of the valley led to the fact that the Hotovlja torrent channel was narrowing and the channel banks became very useful area for building different kinds of structures, such as courtyards or parking lots. There are two cases where garage and one auxiliary facility are actually built over the watercourse. There are many small private bridges which were built without any expert opinion or proper design on the basis of a hydraulic analysis. Most or all of these bridges and footbridges do not have sufficient opening for real flash flood peak discharges. In a combination with woody debris this is a winning combination for a disaster. Woody debris has become even a more important factor because of very extreme sleet event in Slovenia in February 2014, when over 50% of the Slovenian forests were damaged to a certain degree. Due to slow countermeasures in forest restoration, a lot of fallen trees and dead wood is still in headwaters and torrential channels. These conditions in a combination with an extreme rainfall event led to local but massive torrential flood disasters.

IMPROVEMENTS; ANALYSIS, MODELING AND DESIGNING

Due to high damage on different infrastructure, a holistic approach was applied. For the first time national and local officials decided to solve this problem together. All aspects (drinking water supply system, sewer, road, torrent channel, private structures) were taken into account when planning restoration works. In the first step, an extensive hydraulic analysis using mathematical modelling was carried out, and a conceptual design of the Hotovlja torrent channel was prepared. A design for road reconstruction was prepared based on the hydraulic analysis. A conceptual design was presented to local community and other stakeholders. A new sewer system was planned and the restoration of drinking water supply system was implemented according to this conceptual design. After the consent of the owners of critical structures and bridges, implementation designs for torrent reach by reach were prepared. Majority of the Hotovlja channel (incl. bridges) will be reconstructed and in the upper part of the valley sediment retention dams are planned. The proposed restoration and reconstruction measures will be implemented only if the finances will be secured, which might not be the case.

CONCLUSIONS

The presented study case of the Hotovlja valley has showed to which extent the Slovenian water

management and torrent control have been neglected for over 20 years now. Only in 2008, national flood legislation was adopted that includes hazard mapping and restrictions for interventions/building activities in flood areas. On the other hand, maintenance budget is shrinking from year to year and the state of the Slovenian water infrastructure is rather bad. More than five extreme floods in the last decade have proven that Slovenia must recognize this problem on the national level and set up an effective water management system that will lead to improved conditions in Slovenian watercourses and will substantially reduce flood and erosion hazard.

REFERENCES

- ARSO (2014a). Hidrološko poročilo po poplavih 22.oktobra 2014 (Slovenian National Environmental Agency; Hydrological Report on October 22nd flooding in Slovenia)
- ARSO (2014b). Neurja v noči z 21. na 22. Oktober 2014 (Slovenian National Environmental Agency; Thunderstorms in the night from October 21st to October 22nd, Report of Meteorological service)
- VGP Kranj (2014). Prvo poročilo o posledicah visokih voda dne 22.10.2014 (Water Management Company Kranj, First report on October 22nd Flooding)



Figure 1. Map with damaged areas

KEYWORDS

torrential floods; restoration; maintenance; flood protection; spatial planning

1 Water Management Company, Kranj, Kranj, SLOVENIA, jost.sodnik@gmail.com