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# FLOODLOG as the project on the use of GIS in the security practice and flood crisis management education

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## Introduction

Floods are among the most frequent and costly natural disasters in terms of human and economic loss. Most floods are caused by storms in which a lot of precipitation falls in a short period of time, of both types of rainfall, convective and frontal storms. Intensity and duration of the rain are the most influencing factors for flood hazards. In the recent years, remote sensing and in the Slovak Republic [Blažek, Kelemen et al. 2013] Property damage caused by the floods increases every year. Problems related to flooding have greatly increased, and there is a need for an effective modelling to understand the problem and mitigate its disastrous effects.

## 1. Problem description

Efforts of specialists are generally focused on the finding solutions to crisis situations with emphasis on the protection of life and health of persons and property protection. We often forget the comprehensive protection of emergency workers during activities in emergency situations by identifying, analyzing and assessing risks that may endanger the lives of rescuers in the changing conditions of crisis. Modelling and simulation tools can be used for early risk assessment and management during rescue operations. An example might be in terms of tackling floods in a selected area of the river basin.

## 2. Basic information and the methodology of project FLOODLOG

The overall goal of the project FLOODLOG [Dobos et al. 2014] is to support the Disaster Management Directorate / Crisis management Authorities by providing them with a toolset for flood modelling, forecasting the size and location of the affected area and the affected population, identifying relevant objects and human infrastructure in risk, or objects needed for handling the crisis, and to develop the logistics framework to better manage the human and natural resources for the crisis management. The specific goals are: Development of a framework and a pilot database for flood modelling in support of the crisis management authority. The project has a total of 6 partners and leading partner is University of Miskolc.

## 3. Results of project

Project is divided into 7 activities:

**Specification of the model details:** Specification of the model details based on the needs and requirements of the Crisis management authority and on the feasibility of the planned system. This activity will result a framework criteria system that the model outputs has to fulfill for both the flood modelling description and forecasting and the logistics modelling. Based on the targeted outputs of the models the input data need for supporting the flood modelling and logistics activities have to be specified as well. This will result the list of data layers and their specification by content, scale and informatic standards. The layers needed for the operational work of the crisis management and its logistical planning are defined by the Crisis management authorities and the Lead partner of the two sides.

**Specification of the input data need:** The result is the list of data layers and their specification by content, scale and informatic standards. Partners: lead partner and the Technical university Kosice (TUKE) and the Crisis management authorities.

**Development of the data layers:** The results of these activities will be the complete set of harmonized data layers covering the whole Bodva catchment. Bilateral scientific teams for all thematic layers will be set up to survey the available national data and develop the harmonization strategy for the common, harmonized database, covering the two sides. The results of these activity will be the complete set of harmonized data layers covering the whole Bodva catchment.

**The modification and completion of existing cross-border databases for testing the tools and models**: The modification and completion of existing cross-border databases to provide the information for testing the tools and models. There are two cross-border data sets developed by the partners. The first one covers the whole Bodrogköz area and having several physical and human geographical layers in a harmonized, consistent content representation, organized into a GIS database. The second dataset covers the whole Ipoly catchment of the two sides. The major partners will be the University of Miskolc and the Cholnoky.

**Development of an integrated, operational WEB-based, and desktop-based GIS database:** Development of an integrated, operational GIS database having all three datasets in the same data structure, and a WEB based data dissemination system, where the users can discover, view the data layers and the model results. A specific workstation based system will be set up to support the Crisis Management Authority with more, not necessarily public data and models. The output of this activity will be a WEB portal with a map server and interactive modelling tools. The responsible partner is the Cholnoky kft.

**Environmental Impact and Risk Assessment of the floods:** Environmental Impact and Risk Assessment of the floods. The major partners will be the

Lead partner and TUKE. This activity will study the impact of the flooding water on the soil quality and on the groundwater system. An environmental and flood based landscape classification will be developed and the potential risk types are going to be testes and summarized.

**Logistical modelling:** The responsible partners are the Lead partner and the Univesrity of Security Management. A logistical pilot framework will be developed and tested on the Bodva catchment supporting the flood crisis management activities lead by the Crisis Management Authorities.

The interested area is the area of Bodva River. Bodva River is a 116 km long river in Slovakia and Hungary. In Slovakia part is situated in SW part, 20 km from Košice city. The river flows through seven villages, through populated parts, where makes each year property damage by floods. Near area of Hosťovce river Bodva leaving the Slovak territory of and continues to Hungary [Kelemen, Blišťanová 2013].

Flood modelling (dr. Cholnoky kft.)

The main characteristics of flood model:

- Water level meter and flood embankment cut-off location (GPS), size, fast input.
- Correct positioning can be achieved by helping the air and land navigation, air and satellite imagery integration.
- The flood disaster's 4D matematics model consist of digital map (1:100000, 1:50000, 1:10000, 1:2000) special databases, e.g. hidrology, soil, meteorogy, geology, vegetation, flora, infiltration, evapotranspiration, etc.

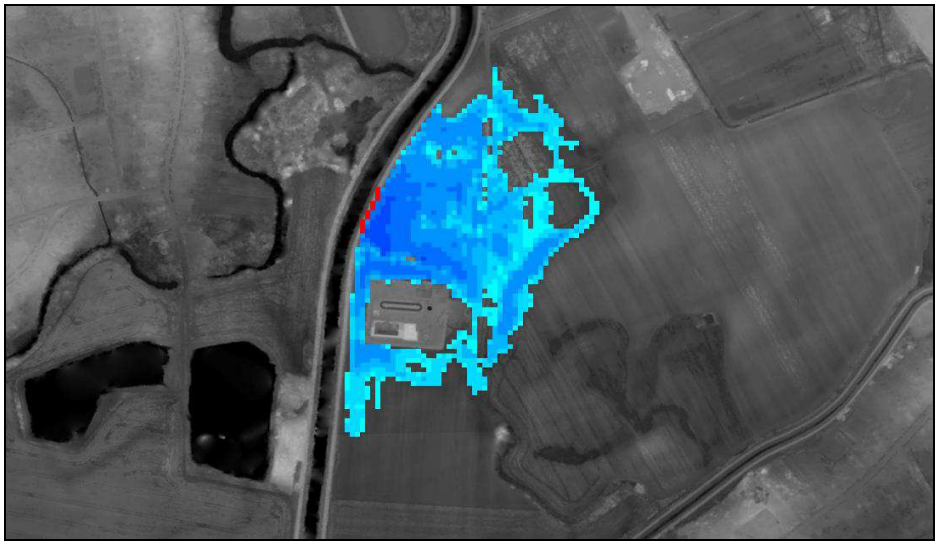

**Fig. 1. Flood modelling – Example of First hour** [Verrasztó, Németh 2014]

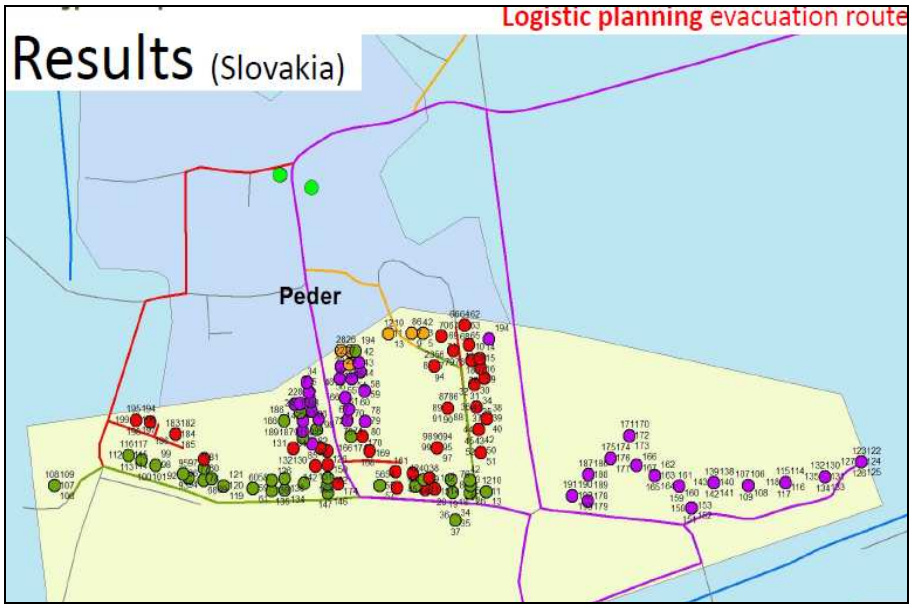


**Fig. 2. Logistic planning of evacuation routes** [Chrabák et al. 2014]


## Summary

Effective crisis management systems require precise planning in order to minimize the response time for rescue and protection of persons and property. This need for precision in planning becomes even more crucial when the emergency management system involves human lives, such as in situation of disruption to the usual function of services in organizations and the environment. Managers have to allocate the available resource to places or people in order of priority, considering disaster supply chain management and they need to much information at the right time.


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**Abstract**

The aim of this paper is the idea of using ArcGIS systems at the platform of results within the international cross-border project HUSK: Flood modelling and logistic model development for flood crisis management, as the tool in the security practice and crisis management education. Planning is an important element in each process separately and is particularly important in protecting the health and property of the population. but also rescuers. Contribution emphasizes the importance of input data for each phase of crisis management and the protection of rescuers too.

**Key words:** rescuers, crises management, logistic support, decision making.