

# LOCAL WARNING SYSTEMS IN SLOVAKIA

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## Abstract

*Two pilot local warning systems, based on the information from terrestrial stations, have been established within the POVAPSYS project in Slovakia. Upon the continuous monitoring of changes in precipitation activity development and state of the respective water flow level, the local warning system will transmit warning messages in case of exceeding the advanced setting limits. These messages are intended to a special group of authorized people. The early sending of the warning messages to competent authorities forms condition for initiation of securing and rescue works in terms of the Municipal Flood Plan and other related directives, which result from the Flood-Protection Act No. 666/2004 Coll. of Laws of the Slovak Republic.*

*The terrestrial stations are established after exhaustive terrain research, analysis of previous flood situations, and information from local inhabitants. Localized terrestrial monitoring stations constantly record data from rain gauge sensor and water level sensor into a local memory of a monitoring unit and these data are continuously evaluated. In case the previously set limits are exceeded, the local station sends warning message to a central station (CS) and to a personal communication terminal (a cell phone or a pager). Responsible people can analyse the situation through the CS or by direct queries for current values on the monitoring rain gauge and water level sensors through the Communication terminal KTO.*

*The subject of this paper is to present our experience with the operating of the LWS, as well as other activities, like public relations, practical exercises, etc. The aim of piloting the LWS is to meet the needs of those who are interested in carrying out local warning systems (not only municipalities) and the SMHU is ready to offer expert advice and help select localities for monitoring stations, set limit values and solve other problematic situations.*

**Keywords:** *flood warning system, local authorities.*

## 1 INTRODUCTION

Flash floods especially in under the mountains areas are always accompanied by great property damage and also often inflict casualties. Many countries are dealing with the problem of protection and/or early-warning system for areas which are vulnerable to flash floods. There are several approaches to solving this question and they depend on flood-legislation, financial possibilities of the state or municipality to invest Money into this kind of precautions. The problem can be caused by a non-professional discussion concerning the investment's legitimacy of these projects. The point is that the floods and especially flash floods occur irregularly and several years of the absence of this phenomenon fall into oblivion. So, how to make compromise

as not to invest more than the estimated flood damages require, otherwise the financial question for municipality would be unbearable. To find an optimal limit for investment, training, operating expenses is the main problem of the flood prevention against the flash floods.

## **2 LOCAL WARNING SYSTEM**

### **Objectives**

Within the project Flood Warning and Forecasting System of Slovakia, SHMU wanted to establish two pilot local warning systems in Slovakia. The basic idea was to make system, which is simple but reliable and as low-cost as possible. Both systems should be based on the same principle, they differ only in data transfer type. They are based on information from terrestrial stations. On the grounds of the continuous monitoring of changes in precipitation activity development and state of the respective water flow level, the local warning system (LWS) transmits warning messages in the case of exceeding the advanced setting limits. These messages are aimed at a special group of authorized people. The early sending of warning messages to competent authorities constitutes conditions for initiation of security and rescue works in terms of the Municipality Flood Plan and other related directives, which result from the Flood-Protection Act No. 666/2004 Coll. of Laws of the Slovak Republic.

After setting the objective of the LWS philosophy we tried to find an appropriate municipality for LWS installation. First we re-evaluated under the mountains river basins from the aspect of vulnerability by flash floods, and then we were looking for a municipality or municipality authorities who would be able to cooperate with the LWS testing. As it proved later, it was the municipality cooperation, mutual understanding and the municipality identifying with this kind of solving the flood-prevention that seemed to be crucial.

### **Realization**

After an exhaustive terrain research and analysis of previous flood situations (Figure 1 and Figure 2) as well as information acquired from local inhabitants we built the LWS Vrbovce on the Upper Myjava River basin and Čierny Balog on the Upper Hron River Basin. During the realization process of the monitoring network the municipality authorities were notably active. They had to solve the building permits and contracts of the land, on which the LWS should have been built.

After activating the systems, the terrestrial stationary monitoring stations (water level and raingauge) continuously stored data from the raingauge sensors and the water level sensors to the local memory of the monitoring unit. The data were continuously evaluated. In case the previously set limit was exceeded, the local warning system had sent warning messages to the central station (CS) and to personal communication terminal PCT (mobile phone). After receiving the warning message, competent people were able to analyze the situation on CS or by direct questions on actual values of measured data from water level and raingauge sensors using the

PCT. The next activities of the mayor depended on evaluating the situation and the rules of the Municipality Flood Plan.

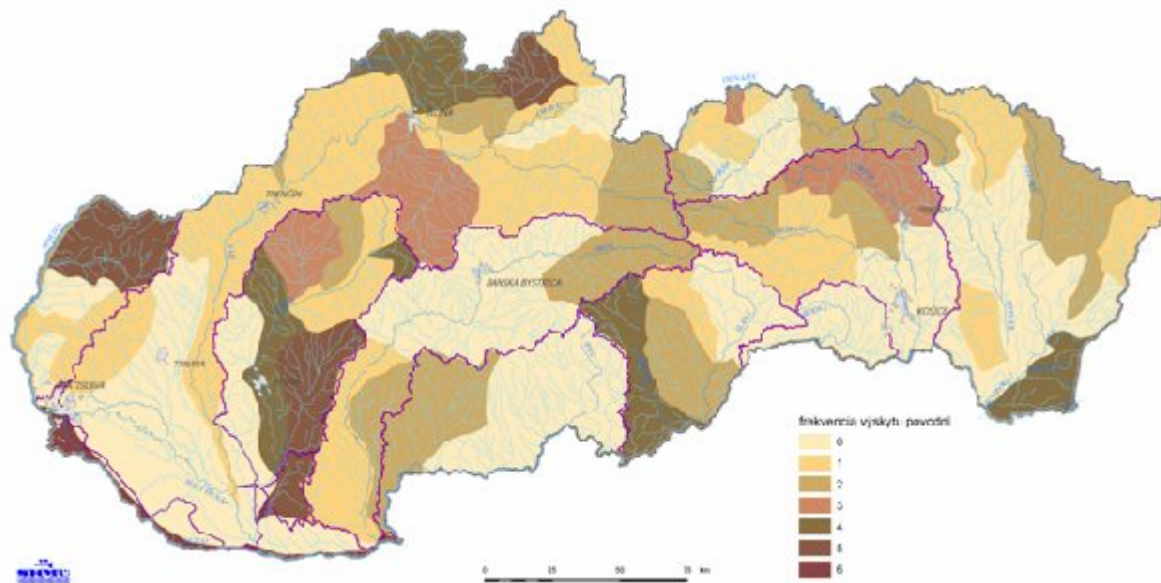


Figure 1. Localities with the flood appearance frequency

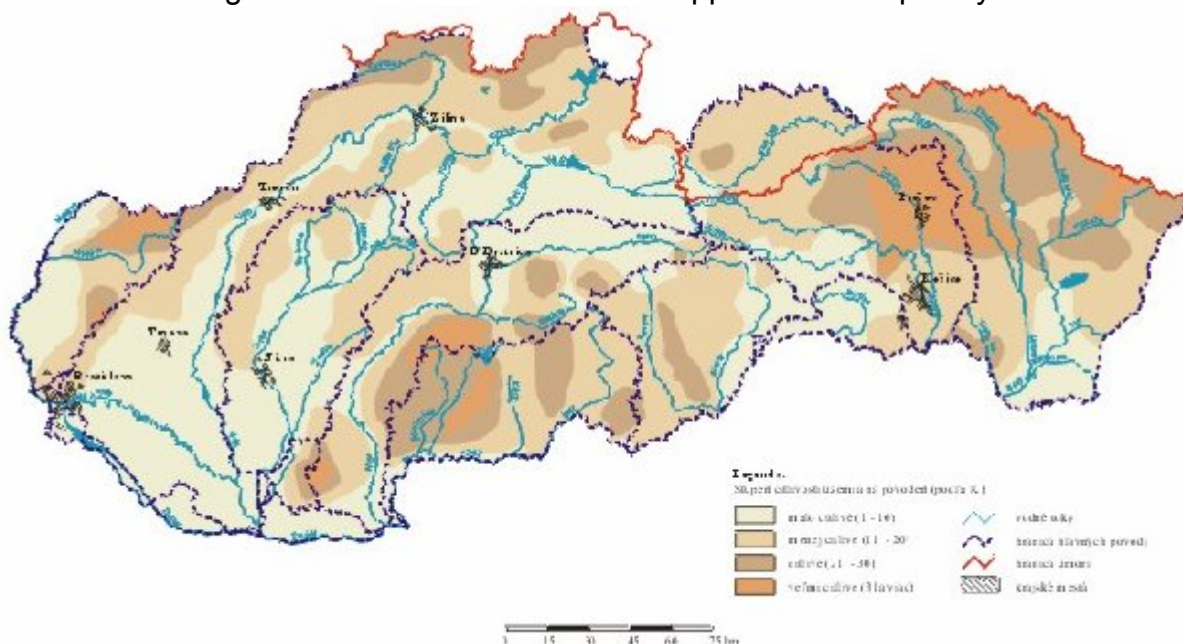


Figure 2. Territory sensitivity level to floods according to flood index (K)

The first piloting has been carried out in Western Slovakia in the Upper Myjava River Basin and its confluence, focusing on the GSM data transmission. The second piloting has been carried out in the Upper Čierny Hron River Basin and its confluence, focusing on the radio data communication. Both LWS are run by municipalities, while the SHMU has only a supervisory and advisory function. After testing and expiration of the warranty terms, the LWS will be transposed to the municipalities without payment.

We continued developing the LWS Vrbovce for the work with municipality authorities and the public. In March 2006 the SHMU arranged training for municipality representatives and the department of river authority for the Teplica River (Figure 3). The goal of the training was to supply the trainees with the hydrometeorological information, which the SHMU provides on its web sites before and during flood situations. These can be useful for security and rescue works during floods.



Figure 3. Pictures from the training for the municipal authority, department of river authority, civil defence and rescue team at the beginning of the flood situation

The training proceeded exactly during the spring flood period, when the LWS played a positive role. The water flow level station reported at regular intervals the behaviour of the water situation and thus informed the mayor and the flood committee about the hydrological situation. The flood situation continued 48 hours and the municipality authorities evaluated this kind of information system very positively. In spite of the LWS is intended for flash floods, it plays its role during the spring floods too.

The next activity in Vrbovce was the flash flood practical exercise with the participation of the local authorities, the fire department, the rivers authorities, SHMU, the District and Regional Environment Offices, i.e. all active flood units and the non-profit organization of the Global Water Partnership (Figure 4). The goal of the exercise was to make a time stamp about spreading the warnings and next information, which SHMU issues and the civil defence distributes through their lines to all state authorities for flood defence from district clerks to municipality mayors. The valuable result of the exercise was the fact, that the municipality mayor received the warning in 10 minutes, but the district and regional offices received the information only on Monday morning after coming to work (The training warning was issued on Sunday at 10:00). The exercise was attended by education and local TV stations informed the general public about LWS, exercise, etc.



Figure 4. Pictures from the mayor activity during organizing the evacuation, information for the media, fieldwork

## Evaluation

After a 3 years period it is possible to partially evaluate the LWS realization, to set the vulnerability, entitle problems, however the positive experience with the LWS too.

The main principles of LWS:

- simple principle, to count on a non-professional hydrological attitude by municipal authorities
- modular principle, replacement
- simple maintenance of the station and system
- system with minimal maintenance (ombrometer-sometimes needs cleaning, water level station- after flood necessary to clean the profile)
- add the alarm to the system malfunction
- cheap realization, cheap maintenance
- energy-saving datalogger, efficient batteries, solar source
- ombrometer stations operation is sufficient in vegetation season only
- to set the alarm limits during the operation
- inevitable trainings for the municipal authority and the public are necessary

The risks of correct LWS operation:

- power failure
- changing the municipality authorities – local elections
- “getting cold“ the mayor in case of the several years flood absence
- damage to the monitoring objects (vandalism)

## 3 CONCLUSION

The subject of this paper is the experience with the LWS operation, as well as other activities, e.g. public relations trainings etc. The realization of piloting the LWS serves also for other persons interesting for establishing the LWS (not only the municipalities). SHMU is ready to contribute professional advice and help in selection the localities for situating measuring stations, setting limit values and solving other problematic situations.

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