EARLY WARNING

METEOROLOGICAL FORECASTS – A CHALLENGE FOR AN EFFECTIVE RESPONSE

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HYPOTHESIS

Early warnings concerning intense precipitations or discharge have reached a high scientific standard. Nevertheless, their application in local alert systems are often more likely to create problems rather than solving them. The main problem is the lack of precision in meteorological forecasts yet. Thus the responsibility of all parties involved must be defined on an early warning flowchart.

WARNINGS IN A SYSTEMIC ENVIRONMENT

The Canton of Lucerne is situated in Central Switzerland. Its area characterized by frequent intense precipitations and a weak geology (flysch). Floods and landslides in different scales are common events, engaging fire brigades and causing damage every year in different parts of the Canton. Therefore, an effective early warning system would be of great use. Actually different actors diffuse meteorological or hydrological warnings: the federal administration, mass media, private services which can be subscribed to by anyone, and even private persons that make an observation or call the police. On the other side there is a large number of recipients: different boards of the cantonal administration, fire brigades, police stations and local administrations. The system involved with meteorological early warning can be characterized as follows: Its boundaries are permeable. There are many actors, some of them acting as sender as well as recipients. The flows of information can hardly be controlled. Information reaches the recipients on demand or autonomously, pass through.

A MEANDERING ALERT

An example of how this system works was given in June 2006. On a cloudy day, the Federal Board for Hydrology sent a warning to the Cantons of Aargau and Zug saying that the same evening the river Reuss could carry a discharge which would be about 10% higher than during the devastating floods of August 2005. As the most relevant part of the catchment area lies in the Canton of Lucerne, the responsible wanted to know what was going on and called two boards of the Canton of Lucerne. For their part, the administration of Lucerne called back to the federal board which originally had emitted the warning. Unfortunately it was not possible to get in contact with them. A glimpse out of the window showed dry weather, and the weather forecast predicted only 1-5 millimeters of precipitation for that afternoon. All the same: Left alone with these contradictory information and with the impressions of the 2005 event still in his bones the responsible inspector of the fire brigades alerted the local fire brigades, telling them to be aware of an event and to monitor the level of the most important

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rivers. Based on that information, a few fire brigades even started to fill sandbags. At eight o'clock in the evening still no rain had shown up, and the cantonal inspector of the fire brigades gave the all-clear. – In many mountainous regions, watersheds of important rivers meet within a distance of a few kilometers. This situation applies to the up most part of the catchment area of the river Kleine Emme. If a precipitation cell intrudes such an area, the rain can fall either into one basin or into another one, which in this case means that its discharge can either hit the Canton of Lucerne or a completely other region like Obwalden or the Bernese Oberland.

The precision of a forecast for an intense rainfall today is around some kilometers, depending on the applied model. This is quite a good standard for a countrywide overview, but not sufficient for an operative application on a regional or even local level. Another argument is the interdependence of the geographical precision and the forecast's time span: Each response needs a certain lead time, which differs according to the character of the intervention. In a region where floods are caused by rivers with small scale catchment areas the lead time often is too short – or it is long enough, but the spatial precision is not exact enough to define, where the intervention has to take place.

LESSONS LEARNT

- The interpretation of small scale forecasts or the interpretation of large scale forecasts for a local application is precarious.
- False alarms erode the credibility of all concerned.
- The interpretation of a warning message premises sound knowledge in meteorology, hydrology and intervention techniques, of the mechanisms of the potential reactions.
- The flow of information and the responsibilities of the persons in charge must be strictly defined.

For the latter, the efforts, that the Canton of Lucerne undertakes, to assure the quality of the monitoring, warning and alert in case of geological hazards, can serve as a model. To get subsided, each monitoring project must be certificated by the cantonal authorities. A documentation has to be established, answering a great number of questions like: Place of the monitoring? Objectives and scientific parameters? Purchaser? Mandatory? Tasks? Time parameters? Duration of the monitoring? Ordinary reporting? Alert triggers? Alert scheme? For his part, the purchaser has to establish a contingency plan which regulates the proceedings to be activated in case of an alert.

But there still remains an important difference between a geological and meteorological monitoring and early warning scheme: The system of a rock fall or landslide hazard covers an area which is strictly defined by its topography. The number of involved people is restricted, and the role of the mass media and private alert services is restricted. As for meteorological early warning systems, two main challenges can be identified: the fuzziness of the forecast and the social system, which has to respond to the warning and which is characterized by chaotic features.