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MONITOR II – WP3_3.2: Analysis of best European practices for flood risk management and risk assessment



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1 Swiss model of spatial planning through risk maps

1.1 Bern canton project

The canton has the leading role in the development of risk maps. It assists municipalities in the announcement of the public tenders for their project preparation, prepares a handbook of the inherent dangers in the country.

The three basic questions and ideas set out in the project are:

- What and how we could build in the past affected areas**
- Use of the spatial planning as prevention**
- Spatial planning is prevention, infrastructure facilities-decision**

Threats maps, risk maps and manuals of hazards shall be made for the towns and villages in the Canton and they are related to the study of floods, landslides, avalanches and other natural disasters typical for the region. The project started in 1998, and it received a special actuality after the floods in 1999 and 2005.

An integrated risk management approached was used that's mean all the natural disasters were taken into account as well as the allocation of responsibilities.

On the basis of the natural disasters each municipality makes a risk map of the threats. Where is possible the problems are solved by town-planning measures. Certain areas are converted and for them specific arrangements for the construction works are introduced or the construction is completely prohibited. As a compensation new zones for construction and future city development are defined (some of them old industrial spaces with new purpose). If these measures are not feasible the municipality designs dykes.

Requirement of the canton is the maps for each region to be available to property owners, thus they can check the protection level of the areas and types of construction which is accepted to build. This ensures public transparency.

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For preparation of the maps, all possible disasters for the area are examined and each of them should be verified for several indicators.

The first is the probability of disaster occurrence.

If it could happen in the period from 0 to 30 years the probability is defined as large.

In the range from 30 to 100 years the probability is average and from 100 to 300 years the probability is small. Verification of the disaster strength is in three stages- strong, medium strong, weak.

When comparing the flood high water from 90 cm is considered weak threat. From 90 cm to 2 m is considered to be a medium threat and strong for higher than 2m. In the map are shown areas with various hazards from floods, landslides, avalanches and other possible hazards. If the layers with the natural disasters are overlapped that's mean the area is very risky. Normally they are arranged like red, blue and yellow zones.

In the red zones construction is forbidden. If something is built, it is mostly protection facilities. In the medium blue risk zones may undertake certain construction activities in relation with consolidation works. All areas are divided into sub-areas.

The third type is so called "saved areas" for which the territory management rules are elaborated.

In case of disagreement by people with the new rules, they could object them. The reasons for objection are normally in the limitations on or prohibition of the construction works. As a decision of the objections, the maps and spatial plans appear on the public discussion. This is the way to reach the optimal solution for everybody.

Risk map of the threats is an obligation of each municipality. The spatial town plan could be corrected according to the risk maps.

The preparation methodology for these maps is uniform throughout Switzerland. The costs for the preparation of the maps are paid primarily by the Canton (10%) and the Federation (90%).

The floods in 2005 have shown how usefull and necessary are the maps. After the flood the maps are required to be updated and improved.

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1.2 Emme river project

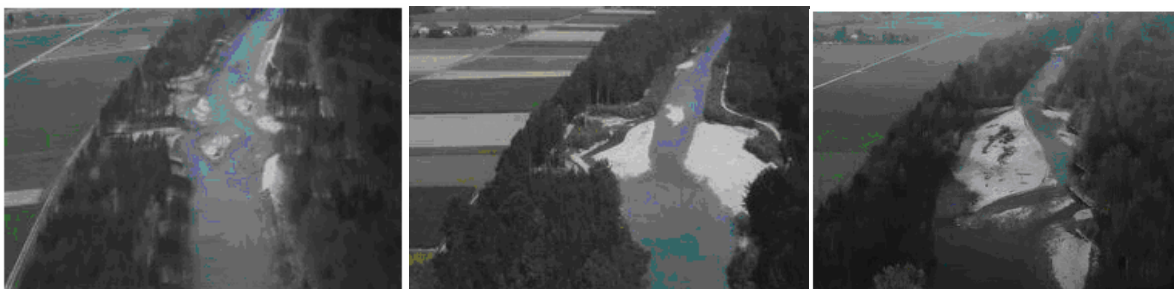
The project for the embankment of Emme River has received the prize for architecture, technology and ecology of the Bern Canton.

The start of the project poses the following three questions:

- whether the extension of the river bed have to be on the whole river stream
- whether to be made the Islands and extensions on certain places
- whether to be made meanders of the river, where and how .

In order to make the correct decision was commissioned at the Technical University of Zurich and the University of Bern to make hydrologic and hydraulic river model.

The model shows that on certain stream section the river must be extended, on the other – there is a need to make a meanders, and these two are usually combined with the appearance of the small river island.



Different river models before start of the project

As a result there was an estimation that with using the new approach for flood management 1.3 million Swiss francs should be spent. The traditional method by the construction of protection facilities needs 1.5 million francs. The new method is cheaper, environmentally friendly, better for fishermen and for the habitants.

Prior to the implementation of the project many discussions have been made. The opinion of the fishermen have been taken into account. The river thresholds does not exceed 70 cm in order to allow fish to pass.

Series of interviews with owners of agricultural land , who wanted to retain the fields and the harvest, were made. The taken decision was – part of the land to be only with grass in order the water to have the possibility the drain. For this purpose, the municipality paid to the owners for the harvest loss.

2 Austrian/Lower Austria/ risk assessment and risk management model



Floods, April 2006

Consultation of experts in Lower Austria with the following scheme

Experts for:

- flood protection
- prognosis models
- simulation models
- disaster management
- communication systems

Phase 1: Risk assessment and analysis (risk identification)

1.1 Risk analysis

a) Terrain surveying

- 3D laser scan
- Ortho photos

b) Preparation of a 3D terrain model



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c) Simulation models

- Hydraulic model with HYDRO AS 2D
- DHI Model Mike 11

d) Designation of hazard zones

e) Consideration of residual risk

- dam break simulation

1.2 Prognosis models

a) Monitoring of Open Waters and Weather:

- Telecommunicating Water Gauges
- Telecommunicating Precipitation Gauge
- Telecommunicating Weather Stations
- Weather Radar
- Satellite Data

b) Weather forecast models:

- Aladin Vienna (Short Range Prognosis Model of ZAMG)
- GME (Global Model of German Weather Service)
- GFS (Global Forecast System of US National Weather Service)
- ECMWF (Global Model of the "European Centre for Medium-Range Weather Forecasts,,")

c) 48 h Flood-Prognosis Model (Precipitation and Runoff Model)

- Integration of Numeric Weather Prognosis (Connection of Radar Data with Spot-Precipitation Measurements and Precipitation Forecasts)

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Telecommunicating Monitoring Stations

- ❖ 48 Water-Gauges (W/Q) - incl. historical data
- ❖ 33 Precipitation Gauges - incl. historical data
- ❖ 18 Ground Water Gauges - incl. historical data

When threshold values are exceeded the „Alarm Manager" gives alarm messages via:

- ❖ SMS (text messages)
- ❖ e-Mail
- ❖ Fax

Messages are automatically dispatched to different Receivers (Warning Alarm Centre, Police and Experts)

All 23 centers are cross-linked with a multiple redundant host computer (GIS supported)

- ❖ at present 2.350 sirens und 18.000 pager can be triggered nationwide with this system.
- ❖ 70cm directional transmission technique as feeder to the relais stations
- ❖ 2m alarming frequency for pagers and sirens

Disaster warning and alerting signals:



Continuous steady tone for three minutes:
Approaching danger- public is informed about the danger via radio



Ascending and descending whine for at least one minute: Imminent danger – public to retreat to their homes and wait radio information about the danger



Continuous steady tone for one minute: End of danger



Testing of operability of sirens, 15 seconds

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a) Emergency Procedures – contingency plans in digital form contain measures for Disaster Management

b) Training:

- Implementation in existing training concepts or preparation of new training modules

Integrated Approach: Integration of all involved Authorities, Experts, Civil Engineers, Fire Service, Ambulance Service, Army, etc.

c) Training (checking the operability of the procedures and plans)

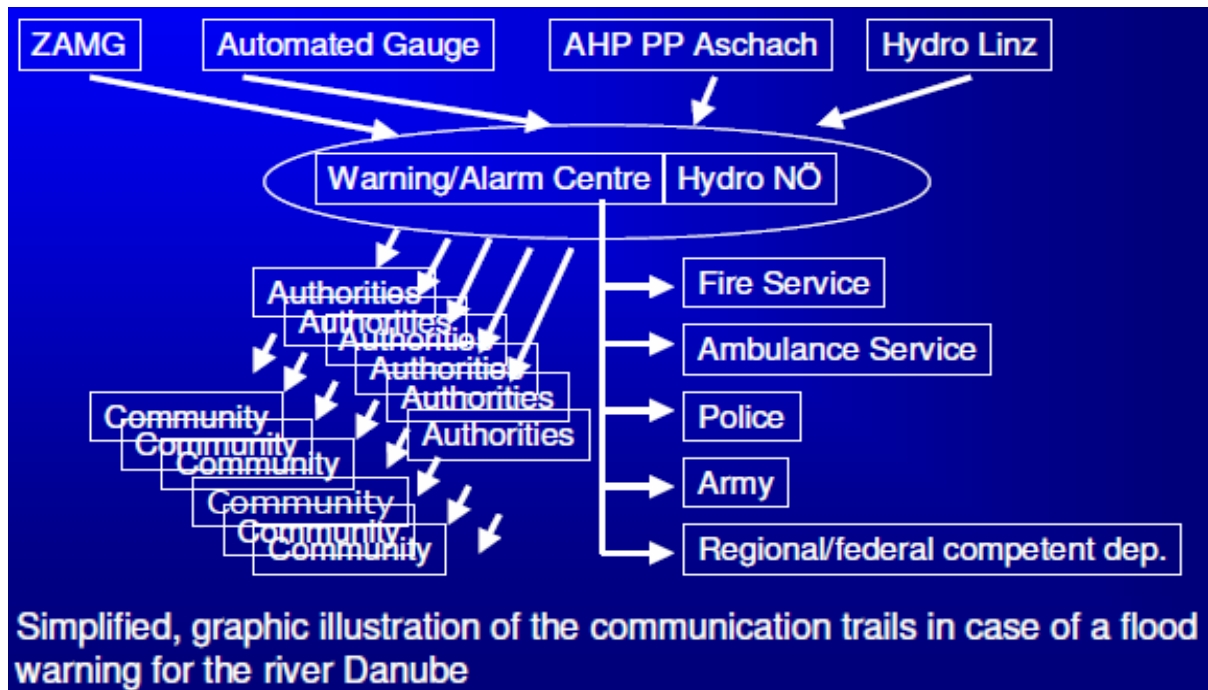
- Table top exercises

- Live training

- Computer-aided training simulations (Simulations Operation Centre)



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Phase 3: Respond

Stage 1

a) Usage of the permanent monitoring

- water gauges
- precipitation gauges
- weather stations

b) Prognosis Models

- Now casting (Weather, rainfall)
- 48 h Flood Prognosis Model

c) Other Monitoring Systems

- visual Observation through Experts
- Fly Over
- Satellite Data
- Infra-red Cameras (to check quality of dams)



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Stage 2

d)Communication

Intern communication

- telephone, fax, email, internet
- Paging system (satellite based paging)
- radio system (e.g. TETRA - terrestrial trucked radio,extern communication
- Warning system (2350 sirens)
- loudspeaker
- press, Radio, television (teletext)
- Internet (info homepage)
- call center (info-Hotline)
- SMS information, email-newsletter

e)Documentation

- Computer-aided Incidence Documentation's (e.g. GUSTAV)
- Electronic Incidence Reporting/Documentation (e.g. Austrian Map)
- Photo Documentation (Photos, Videos)

Phase 4: Regeneration - Evaluation Phase

Installation of thematic Working Groups (focus on disaster management)

- collection of reports and documentations from several organizations
- to proof the effectiveness of protective measures
- reviewing the operational structure
- to proof the availability of staff
- to proof the availability of resources
- quality of the cooperation of the organizations
- training adoption etc.

Target: Adoption of the above named preventive and defense measures



3 General recommendation regarding practical use of the risk maps

- There is a need from common clear terminology and precisely regulated rules and requirements for the risk maps preparation.
- For the preparation of flood risk maps and risk management plans is necessary the participation of all stakeholders, authorities and ordinary people, to cover the maximum of all interests.
- From the examples of EU practices is obviously that the complex and environmental water management, leads to results, satisfying all concerned and participators in the risk management. This will lead to effective measures for the prevention and protection from natural disasters.
- All proposed measures and concepts must be designed by experts in the various scientific and technical fields.
- Prepared risk maps should be taking into account in the future Municipal plans.
- The Administration should have the capacity to work with such maps and the appropriate technical software.