Risikomanagement extremer Hochwasserereignisse

URBAS

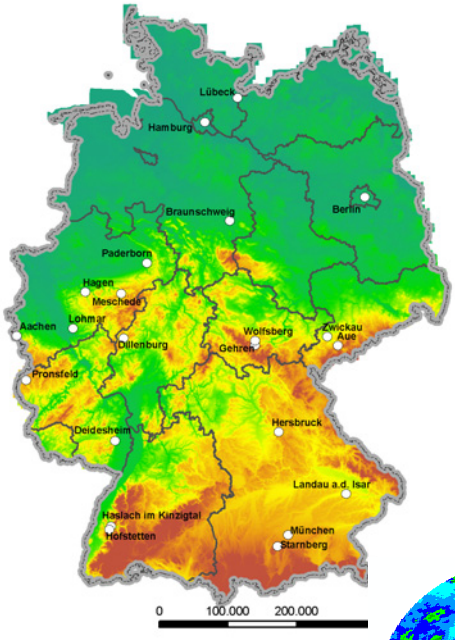
Prediction and management of flash-floods in urban areas

Background

Recent studies on climate change indicate growing frequency and intensity of flash floods in Western Europe. Flash floods are caused by extreme local precipitation and are accompanied by thunderstorms, hail and wind gusts.

Precipitation of these events exceeds values of design storms for sewage water systems and surface hydraulic structures in towns. These events may cause an overflow of domestic drainage, sewage and stormwater systems as well as small urban rivers and may trigger severe flooding in urban areas.

Traditional instruments and methods of flood management and precautionary measures used in big river basin systems cannot be applied to this flash flood events without modification.



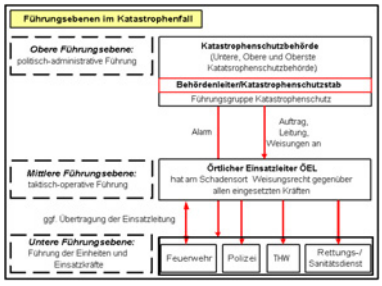
Objectives

Better knowledge of:

- general nature of flash floods (types, frequency, decisive parameters for their development)
- regional distribution of hazard and risk in Germany
- practiced methods of forecasting and warning

Product development

- improved forecast tools, especially KONRAD – a radar based cell tracking tool of German Weather Service
- new methods to estimate damage
- methods for hazard and risk analyses for municipalities, design of prototypes of hazard and risk maps
- areas with high flash flood risk in Germany
- guidelines for measures (precaution, warning, protection, disaster management)



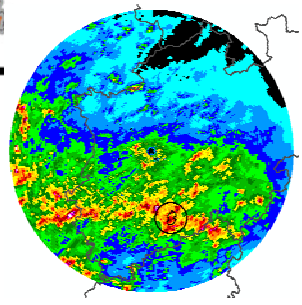
Responsibilities in disaster management

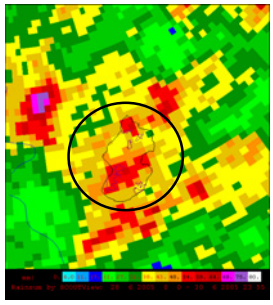
Case studies

Using criteria such as storm type, season of the year, size of the municipality, region etc. approximately 45 candidates have been pre-selected from the URBAS data base. In a second step 15 towns have been chosen for case studies. These municipalities are located all over Germany. Each case study focuses on a different aspect of flash flood management.

Case study: City of Lohmar, North Rhine-Westphalia, Germany

The city of Lohmar was struck twice by a flash flood on two consecutive days. Cells of heavy rain developed in areas of strong convergence embedded in a low-pressure area, which moved from the Benelux states eastwards over Germany.





Thunderstorm cells over the state of North Rhine Westphalia and Lohmar, as seen by the Radar in Essen (measured values are not calibrated)

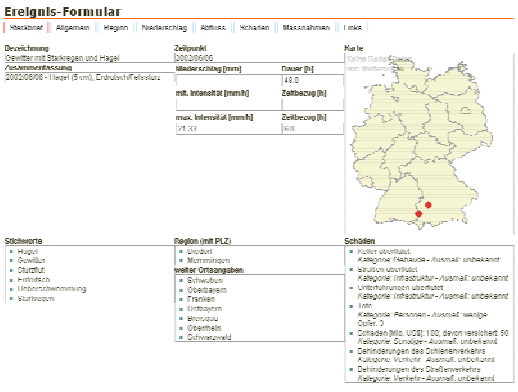
Date	29. June 2005	30. June 2005
24h precipitation [mm]	60-80	40-50
return period [years]	100	20
max. precipitation. [mm]	51,6 (in 3 h)	31,2 (in 2 h)

Approach and methods

- standardized collection of events in Germany (database)
- case studies in 15 municipalities with recorded flash flood events
- analyses of meteorological situation, precipitation and runoff
- assessment of potential damage at micro scale
- ex-post-analysis of applied patterns of action
- methods of hazard and risk analysis for municipalities
- best practice for flood preparedness and flood protection, evaluations cost-benefit-ratios
- exchange experience, publication and diffusion of results

Database

385 storm events of the past 20 years have been collected and published via an internet based database.

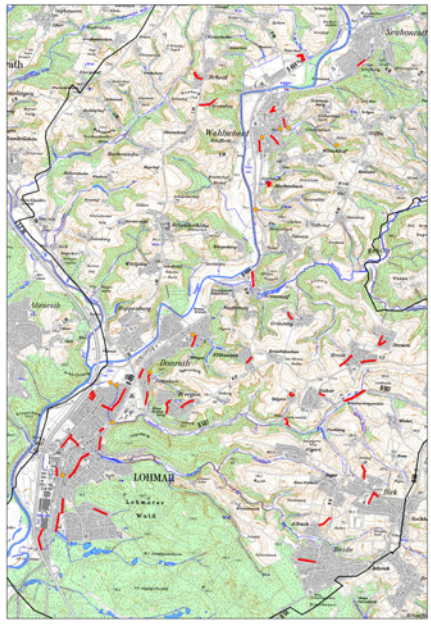


Survey in the case study Lohmar focuses on the one hand on possibilities how to improve the forecast of extreme rainfall. On the other hand development and testing of recommended patterns of action to increase flood preparedness and to prevent and minimize flood damage are additional tasks to be performed.

Results

Applied research and development of applicable products for daily use by municipal authorities is the most important aim for the URBAS team.

The results are usable not only by municipalities and affected citizens struck by flash floods, but also by insurance companies, urban planers, municipal water and waste water authorities, rescue and fire brigade units.



Fire service operations due to surface flooding on roads (red polygons) and flooding from water courses and sewers (orange dots) in the city of Lohmar

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