Improving the flood management in Germany - Lessons learned from the 2002 disaster in the Elbe region

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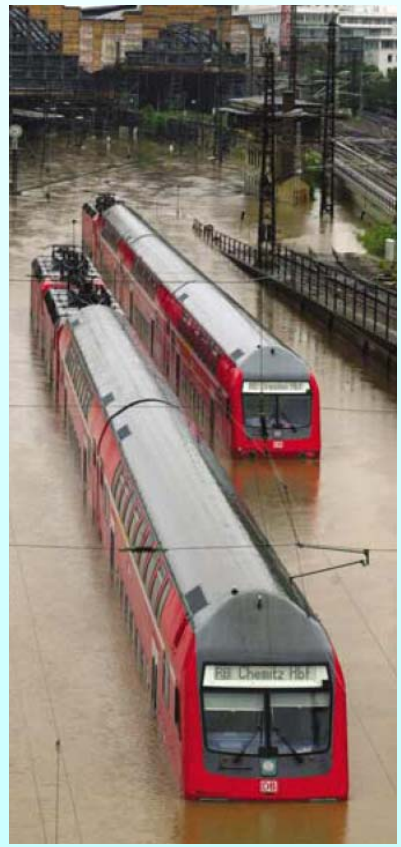

DKKV
German Committee for Disaster Reduction

Presentation is based on the DKKV Publication 29 (2004):

"Flood Risk Reduction in Germany"

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1 Overview about Elbe flood 2002

The floods of August 2002 in Central Europe..

- had a disastrous impact in the catchment areas of rivers Elbe, Vlatava, Danube
- destroyed confidence - not only amongst those directly affected – in the security of people‘s living conditions and in institutions responsible for flood protection
- clearly underlined how susceptible our highly technical and highly organised society is to extreme natural dangers

Elbe river basin

Length: 1100 km

Catchment: 148.000 km²

Population: 24,5 mio

Annual N: 630 mm (450 to 1700 mm)

Mean annual flow at border: 311 m³/s

Mean annual maximum flow: 1.440 m³/s

Peak / August 2002:

4.800 m³/s

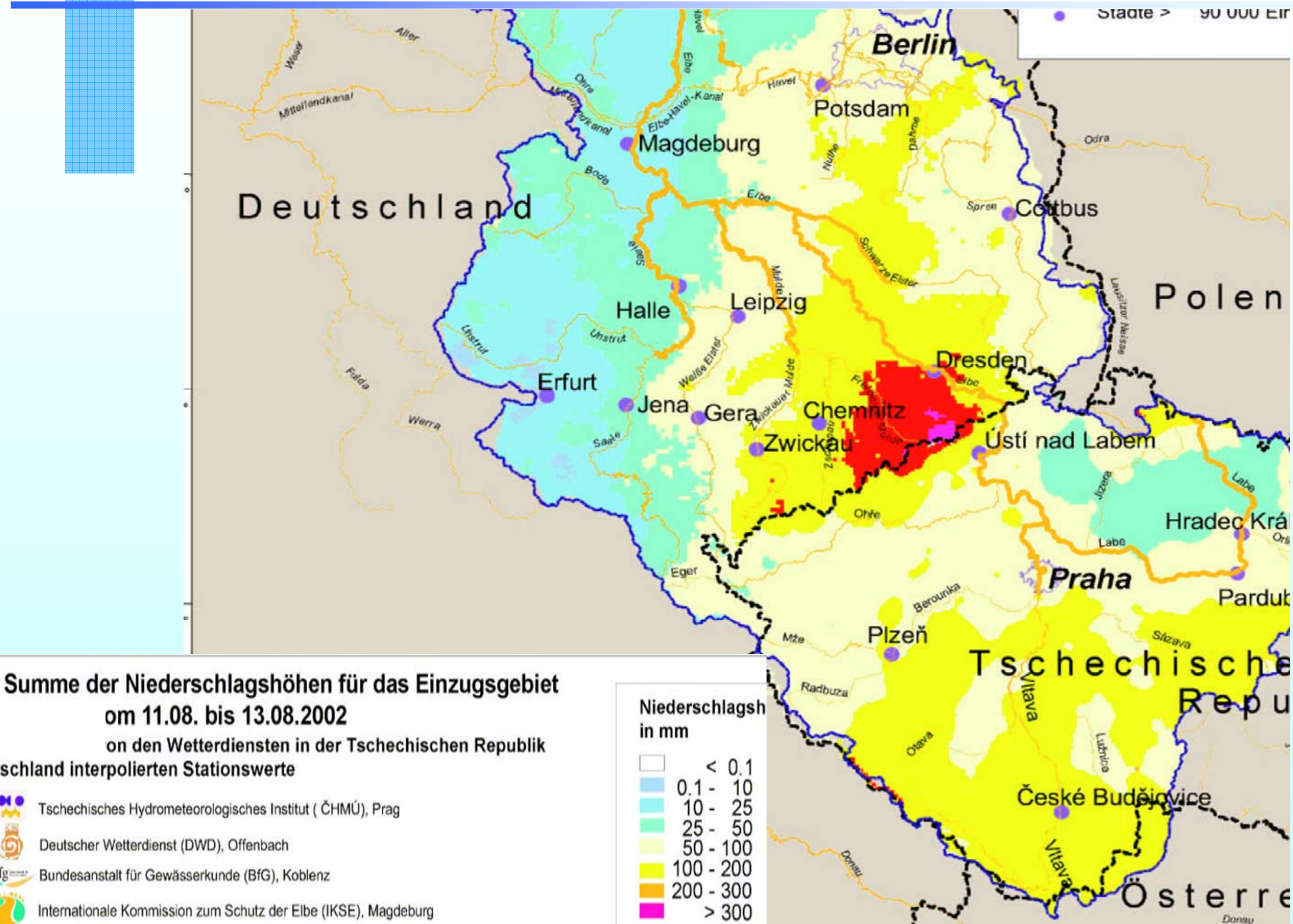
Land use:

- **45% agriculture**
- **29% forest**
- **11% meadows**
- **15% else**

Damage caused by the August 2002 floods in Germany and the Czech Republic

Germany	Czech Republic
Fatalities: 20	Fatalities: 15
Total damage approx. 9 to 10 billion Euro	Total damage approx. 3 billion Euro
337,000 people directly affected	Approx. 220,000 people evacuated
Approx. 35,000 evacuated in Dresden alone	Approx. 50,000 in Prague alone
Many cultural assets badly affected	All three Metro lines badly hit

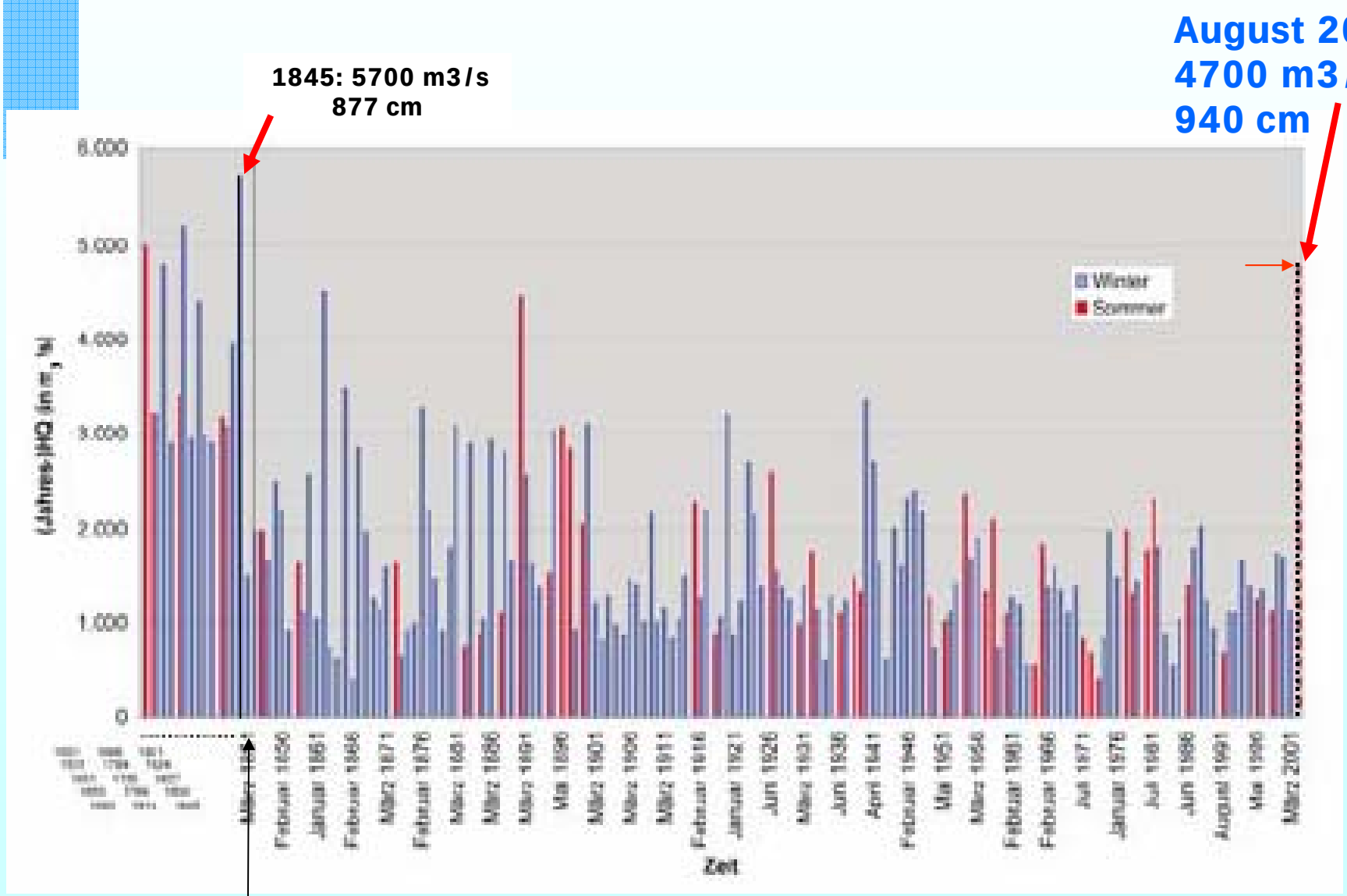
Total rainfall depth from 11 to 13 August 2002



Tributary of river Elbe after flood disaster 2002

Abbildung 4-2: Aufräumarbeiten in Tharandt am 18.08.2002 (Foto: Rainer Elze, 2002)

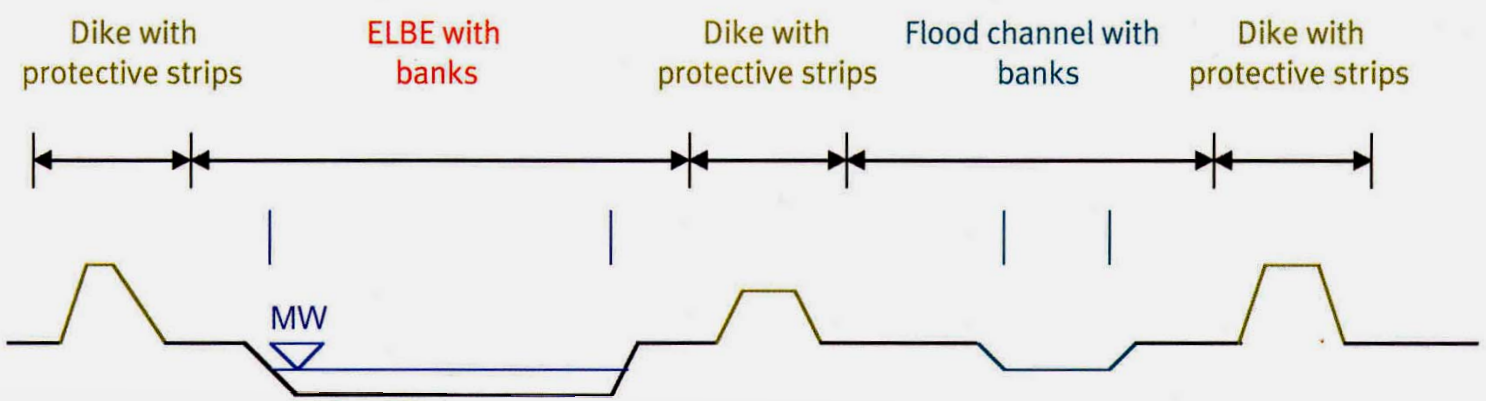
Maximum annual floods of river Elbe at Dresden



2 Lessons learned from evaluation of the Elbe Flood

- Extreme precipitation of great intensity and concentrated on a specific area in the basin of the river Elbe together with almost saturated soils led to extreme discharges in August 2002
- In the past comparable extreme floods occurred in the Elbe river basin
- The unprecedent water level of 9.40 m in the urban area of Dresden was encouraged by a reduced flood water transfer potential. This was caused by combined adverse effects of alluvial deposits, vegetation cover in flood profile, constructions in the flood channel.
- Flood profiles, forelands, water channels under bridges etc. have to be more consistently designed.
- The splitting of responsibilities between the Federal Government, State Government and local authorities and the partly unclear competence along river reaches and catchments must be overcome.
- Clearly defined objectives and clear definitions of priorities are required.

Responsibilities for the Federal Waterway Elbe



Responsible:

Elbe (Federal Waterways) Federal Government	Flood channel City	
Saxony (LTV)	Saxony (LTV)	Saxony (LTV)
Area along banks of the Elbe Generally Federal Government	Area along banks of the flood channel Generally the city	

Broken dikes, Elbe flood disaster 2002

Abbildung 7-2: Abfluss durch die Dammscharte um 16:10 Uhr (Foto: LTV, 2002)

Abbildung 7-3: Abfluss durch die Dammscharte um 16:20 Uhr (Foto: LTV, 2002)

Abbildung 7-4: Grundriss und Schnitt durch den gebrochenen Damm (BORNSCHEIN und POHL, 2003)

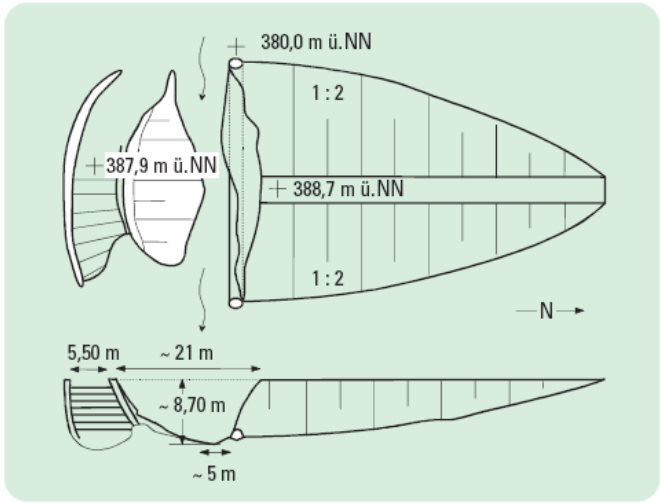


Abbildung 7-5: Dammbruchstelle nach dem Hochwasser (Foto: LTV, 2002)

Examples of restricted flood water transfer potential in Dresden

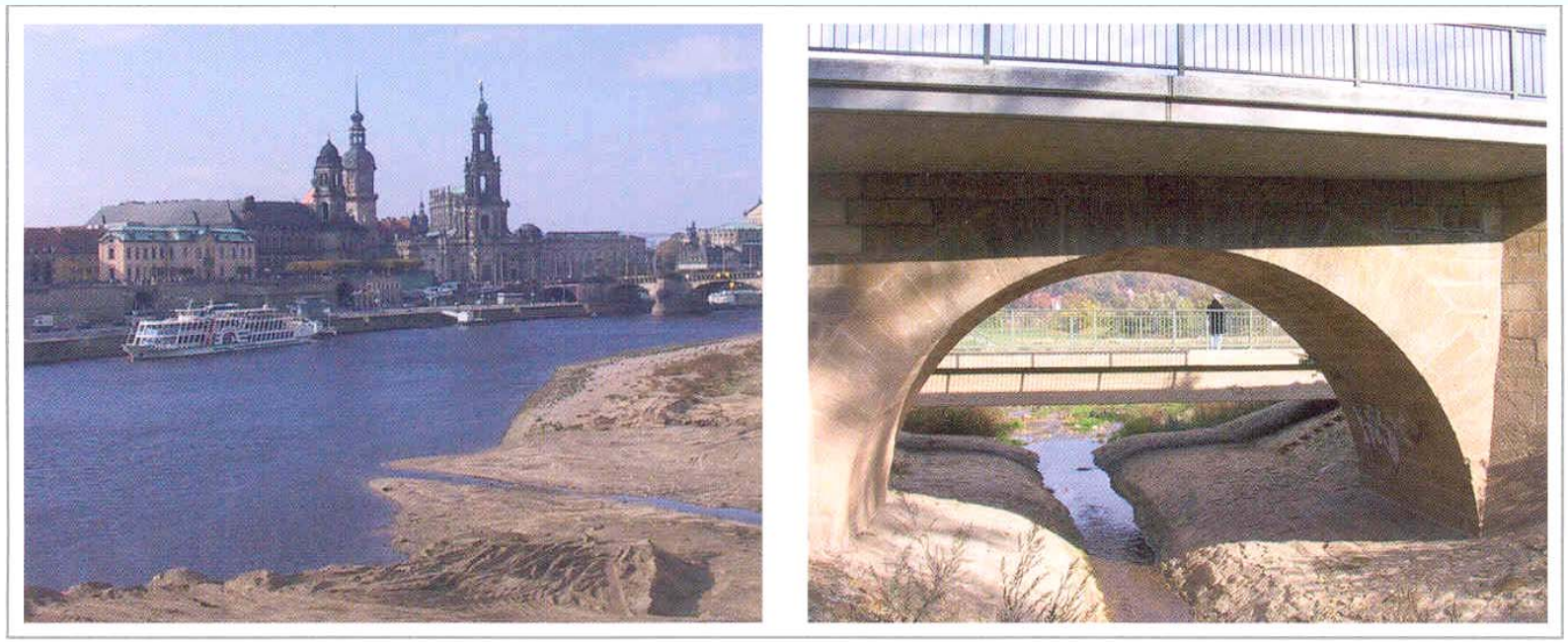


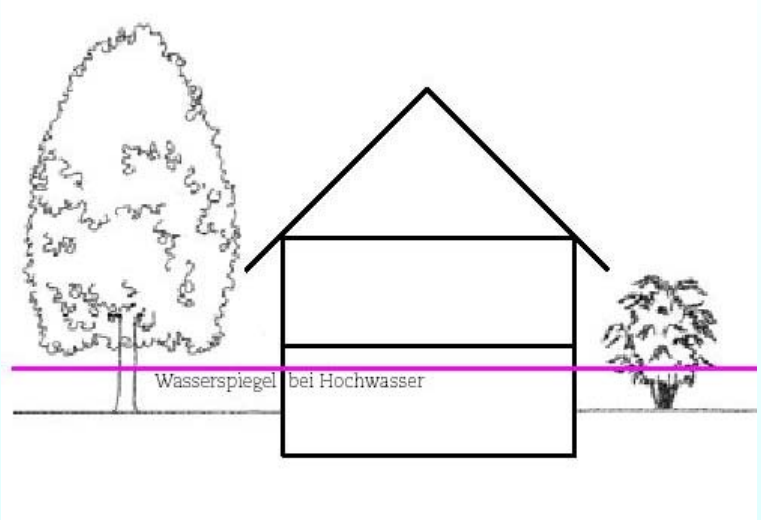
Fig. 5: Examples of restricted flood water transfer potential in the urban area of Dresden: alluvial deposits in the city centre, bridge narrowing cross section on Lockwitz brook (photos: U. Grünewald 2003)

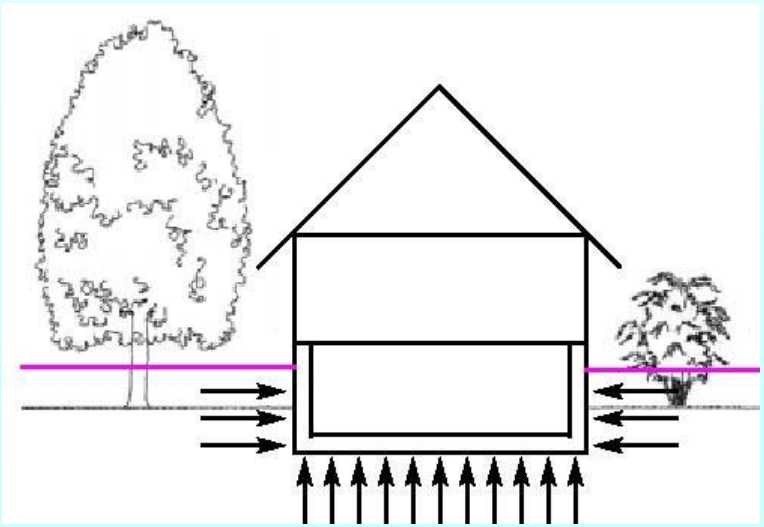
Tributary of river Elbe after flood disaster 2002

Abbildung 7-12: Die Müglitz unterhalb des Schlosses in der Ortslage Weesenstein (Foto: Stefan Häßler, 2002)

3 Lessons learned regarding damage reduction

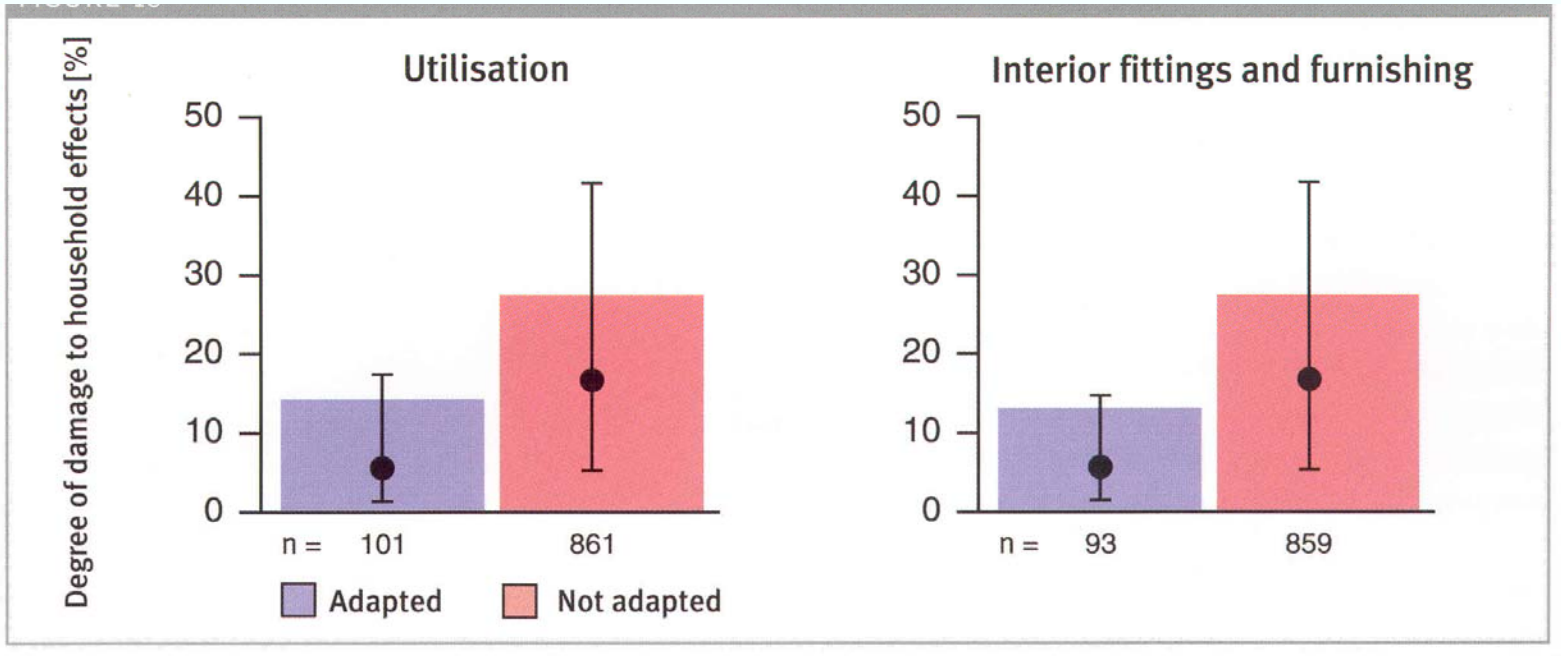
- Risk reduction through spatial planning has a chance if it is integrated in a comprehensive and convincing concept, and if precautionary measures against flooding are given more weight in comparison with other interests (land use).
- Flood hazard maps are needed, same standard all over Germany.
- A public debate is required on the possible extreme events.
- Precautionary building measures considerably reduce damage to houshold effects and buildings.
- Insurance companies currently provide too little encouragement or reward for (private) precautionary behaviour; in 2002 insured persons were better prepared than uninsured persons.
- Great need for information on how to provide protection against flooding in an emergency situation. Regular information events and thematic exhibitions heighten awareness about flooding.
- A concept for a more effective risk reduction must be worked out for Germany. A mandatory insurance is currently being debated.





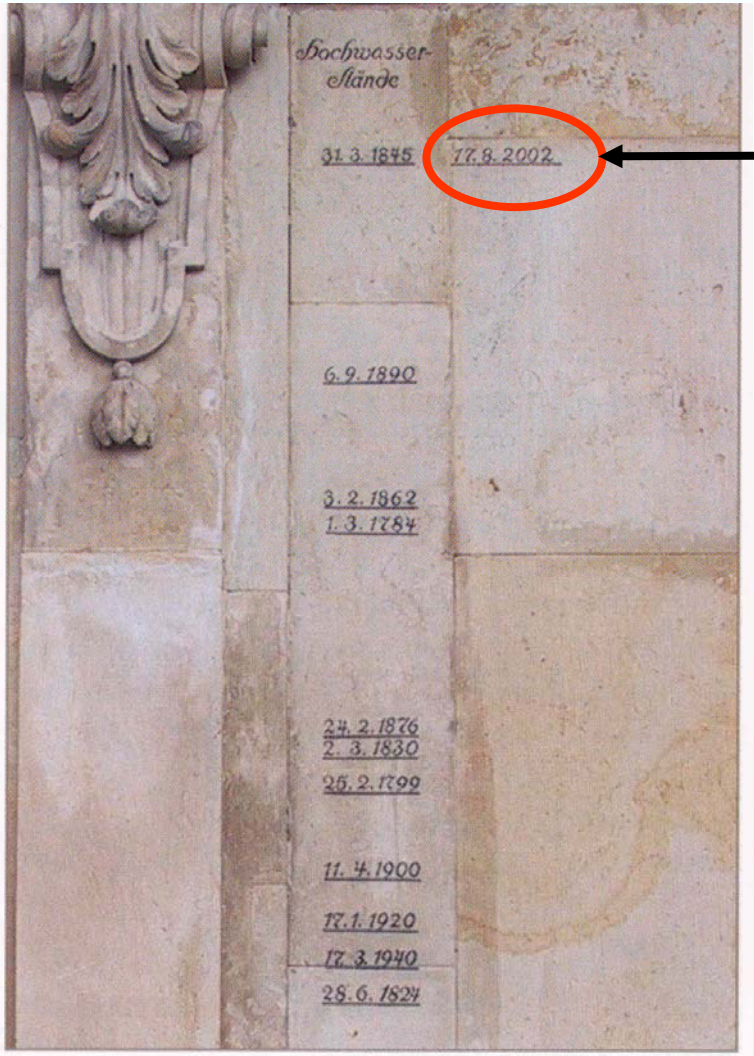
Type of Construction for the basement

Reduction of household damage by flood adapted utilisation and interior fittings



(Based on survey of 1.248 private housholds next to Elbe river, DKKV 2004)

High water marks in flood prone areas



Aug 17, 2002

Fig. 11: High water marks on the Water Palace of Schloss Pillnitz, Saxony (photo: U. Grünewald 2003)

4 Lessons learned about reduction of runoff

- Decentral natural retention measures compensate the water balance to some extent. However, it only has a limited significance regarding flood risk reduction for extreme events.
- Dams, flood water retention basins and controllable polders are particularly suitable for reducing peaks of extreme floods, and hence also for securing major protection objectives.
- Agricultural land use on polders should be designed to suit the requirements of flood protection and keep subsequent damage to a minimum.
- Time-consuming and expensive repairs to dikes should be supplemented by consistent dike maintenance and preventative planning and management, taking into consideration disaster reduction aspects.
- Further accumulation of damage potential behind higher and „safer dikes“ should be avoided.
- The implementation of the popular motto „More room for rivers“ requires a „Round table for flood risk reduction“ including ecologists, but also socio-economists, landscape planners and **water engineers**.

Construction site for new flood retention basin

Fig. 13: Construction site for the flood water retention basin above Lauenstein (photo: S. Schümberg 2003)

Reduced forest stand in upper catchment of river Müglitz (tributary of Elbe) → reforestation!

Fig. 12: View across the highlands in the upper catchment area of the River Muglitz (photo: S. Schümberg 2003)

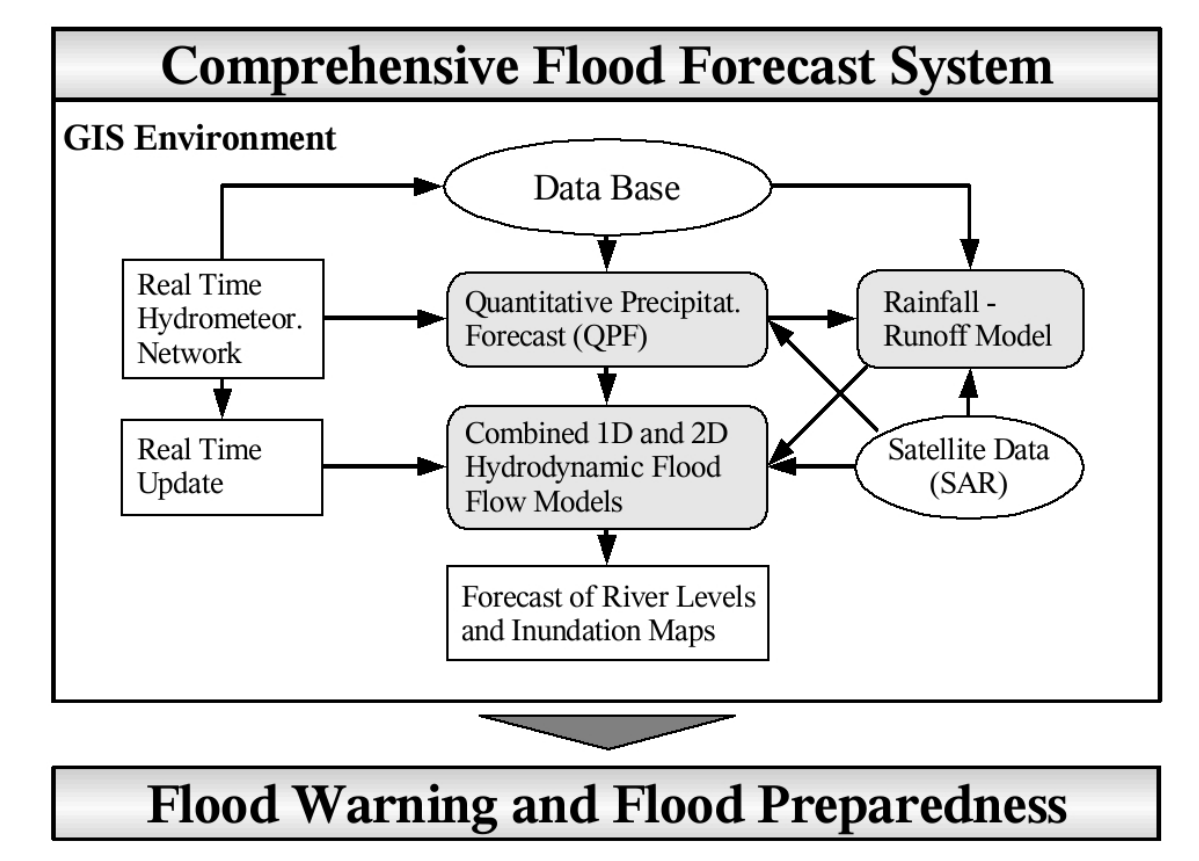
5 Lessons learned about flood warning and early warning systems 1 / 2

- Research is required for further improving the quantitative, area-special precipitation forecasts.
- Action has to be taken to work out reliable gauge-discharge ralations at flood forecast gauges.They are a decisive impact on the quality of forecasts and are the prerequisite for reasonably fixing design parameters.
- Simple reliable monitoring processes that can be quickly carried out have to be developed and used for discharge measurements during floods.
- Improving and expanding the existing flood forecasting models for the river Elbe and its tributaries as well as the development of new models must lead to an improvement of warning times, to a stable, user-friendly operation of models and thus to reliable forecasts
- Combining decentralised flood forecasting centres in one State Flood Centre concentrates competence and personnel.
- Flood warning should be issued in standard formulations, in particular in the neighbouring States and in the same river catchment area, and should contain appropriate recommendations for action for the recipients. It is easier to quickly issue “standard report texts”, and these are also more easily understood.

5 Lessons learned about flood warning and early warning systems 2 / 2

- The information channels should be kept short and should, for instance,lead directly from the flood forecasting centres to the subordinate disaster protection authorities.
- Redundant transmission possibilites should be provided for transmitting flood level warnings and reports.
- Official warnings should be clearly recognisable as such and should be issued via as many information media as possible.
- An initial warning of the population via sirens is above all recommendable for regions with short warning times.
- The reaction of all those involved, including the affected population, should be improved through appropriate behavioural precaution (for instance informing the public, training, practice and information).

Scheme of an ideal comprehensive flood forecast system for the Mekong basin



(Meon, 2002: "Models for flood forecast of large river basins with regard to the Mekong Region", MRC Conference Series No. 3

7 German perspective:
From safety mentality to risk culture ….

1. What can happen?

   → **Risk analysis**

2. What should not be allowed to happen?

   What safety for which price?

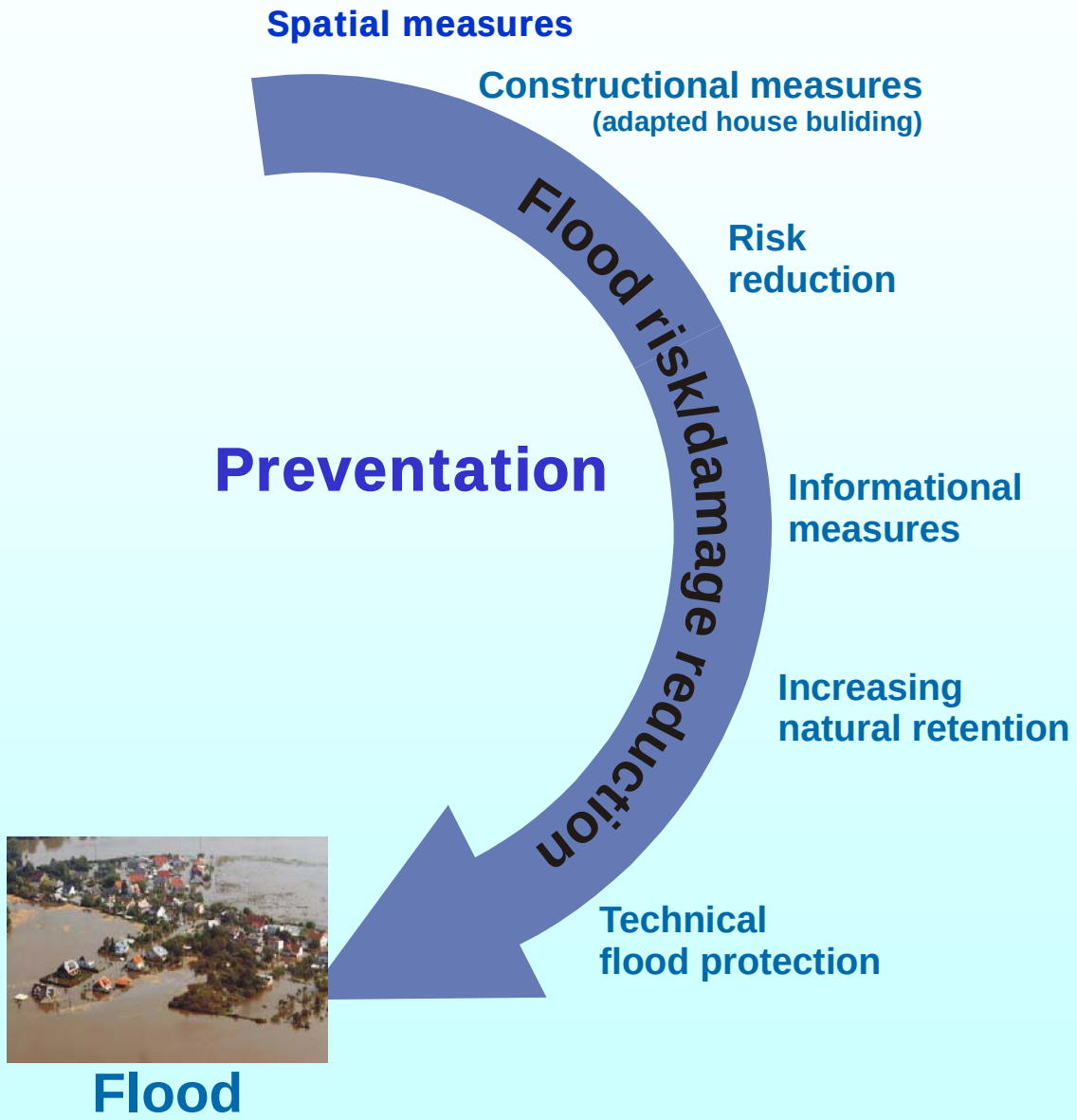
   → **Risk evaluation**

3. What is the best way to consider the risk?

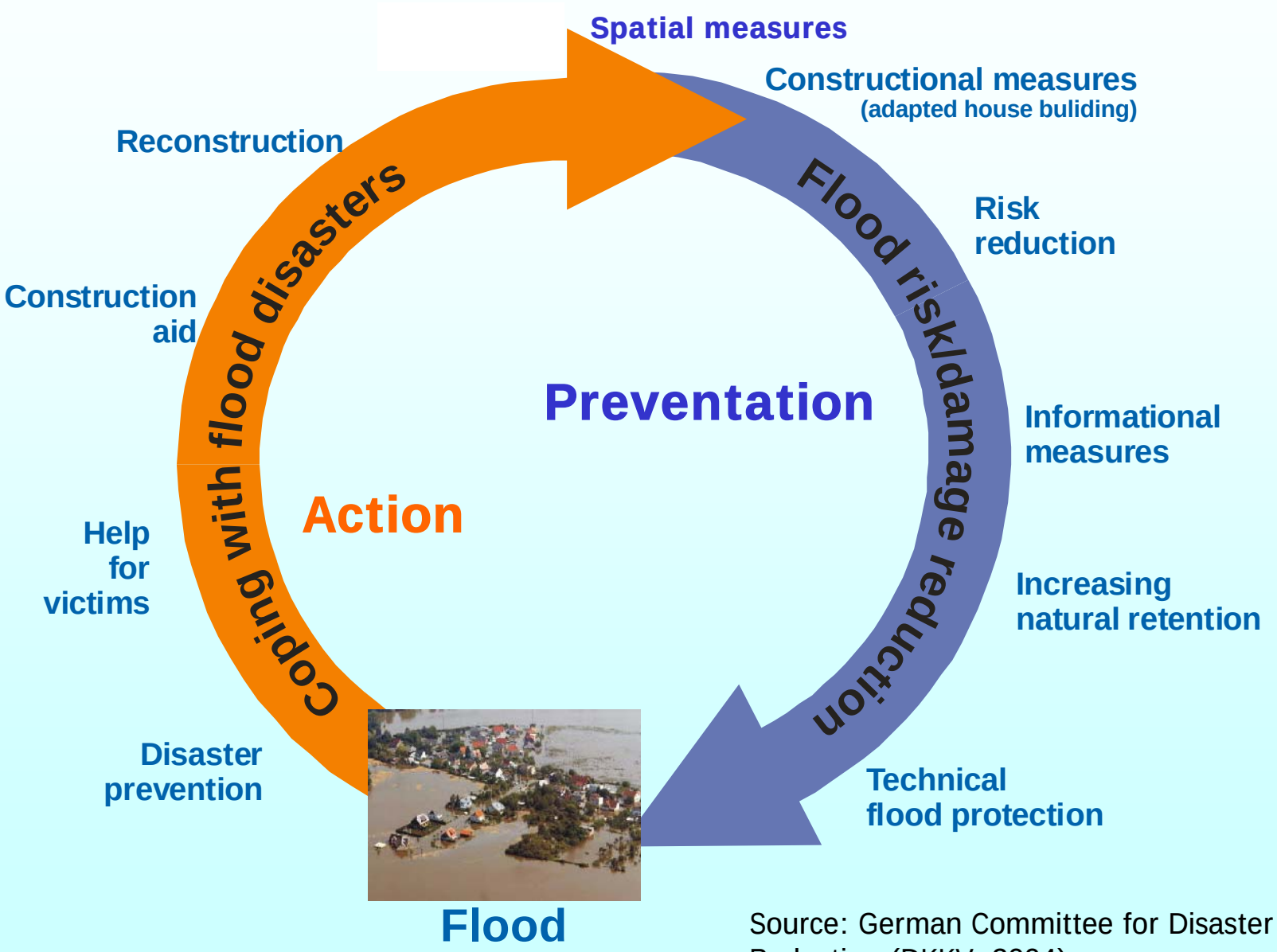
   → **managing the risk**

→ **Flood risk management**

Flood Risk Management



Flood Risk Management



Source: German Committee for Disaster Reduction (DKKV, 2004)