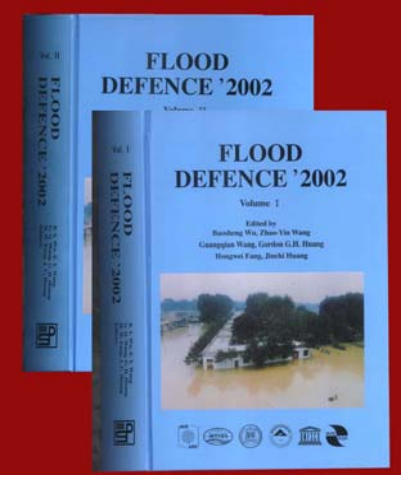

BARRIERS TO PREVENT SCIENCES AND TECHNOLOGY ACHIEVEMENTS TO PUT IN PRACTICE

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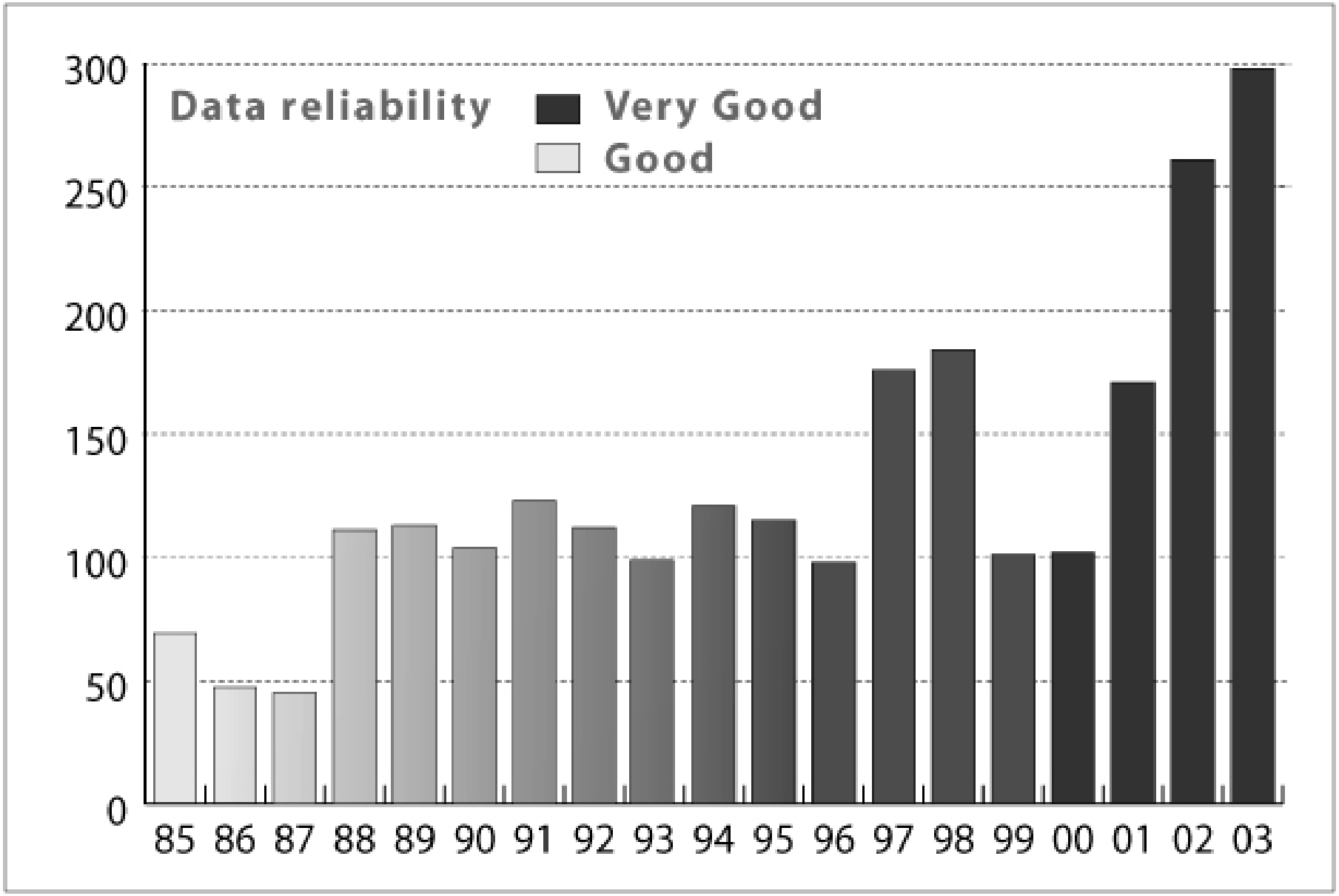
General Problems to put scientific results in practice

- Unknown or unsatisfying cost-benefits ratios,
- Insufficient communication between scientists and practitioners,
- Initial and boundary conditions in practice which differ from assumptions used by scientists

Specific Problems of Flood Risk Management

- depends on complicated interactions between politicians, experts and the public,
- has to be based on complex risk assessments. It demands handling of low probabilities (or high uncertainties).
- has to bridge different spatial and temporal scales



Number of flood disasters

Dartmouth Flood Observatory

Number of scientific publications (IAHS Publication Database)

HYDROLOGICAL SCIENCES JOURNAL
THE INTERNATIONAL JOURNAL OF RIVER BASIN MANAGEMENT
Red Books

Published since 1951 with the word „**flood**“ in title:

945 references

In 2007: 89 publications

In 2006: 82 publications

18 percent of all publications, which were mainly dedicated to floods **since 1951** were published in the last 2 years

(6 times more activities than in average within two years

„**Flood management**“: Only 59 publications in total, the first one was published in 1985

Barriers to prevent sciences and technology achievements to put in practice

- Political Barriers
- Problems to communicate risk
- Differences between developed and developing countries

Political barriers: Economic Interests

Strong economic interests may prevent implementation of flood protection measures:

- Using floodplains can be profitable.
- Economic benefits of locating in hazard–prone areas may outweigh the losses incurred by occasional floods

In many cases cost-benefit relationships are not known or impossible to specify:

  - The low and uncertain probabilities of flood occurrence within the lifetime of an investment, but also immaterial costs cause problems.
  - Cost – Benefit – Relationships could give preferences to the part of population with high income instead to people who are not able to bear the consequences of flooding.

When a disaster is prevented, it becomes often not obvious how much worse the impacts of the flood had been had without flood protection measures:

The return of investments stays unknown.

Political barrier: Flood Publicity

- Flood protection measures have low visibility in the public or the media. They can be politically risky with regard to short term rewards.

- The costs of flood management are certain, whereas the benefits are mostly uncertain. There is no guarantee of tangible rewards in the short term.

- Disasters make headline news and prompt politicians to react in hazard-prone areas, which is associated with the fact that disaster response yields fast political returns.

Political barriers: Environmental Concerns

- Often the natural and ecological dimensions of floods were not considered sufficiently in the past (channelization of landscapes)

- Benefits of floods and floodplains e.g. with regard to the biodiversity or to the sustainability of landscape should be integrated into flood management planning.

Barriers to prevent sciences and technology achievements to put in practice

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The general problem to communicate risk

Bertrand Russel in his contribution about the “Theory of Knowledge” for the Encyclopaedia Britannica, published in 1926:

“*All knowledge is more or less uncertain and more or less vague: These are, in a sense, opposing characters: vague knowledge has more likelihood of truth than precise knowledge, but is less useful.”*

Scientists are interested to maximize their likelihood:

- Many analyses specifies sources of uncertainties (e.g. in data, models or even uncertainties of uncertainties).
- Scientific studies about uncertainties should result in conclusions, how to reduce these uncertainties

End-users are not interested in the uncertainties of data or models or parameters, they are interested in the uncertainties of forecasts or planning.

Problems to communicate risk: Safety-oriented designs?

1993 flood's record stage the St. Louis gage was just two feet shy of the top of the floodwall.

Structural measures provoke the false believe of protected people, thinking they are not at risk.

It is difficult to explain that we have to handle the the remaining risk of failures.

If structural measures are reactions on a known increase of risk it is difficult to explain that an improvement of the safety level can not be reached.

Problems to communicate risk

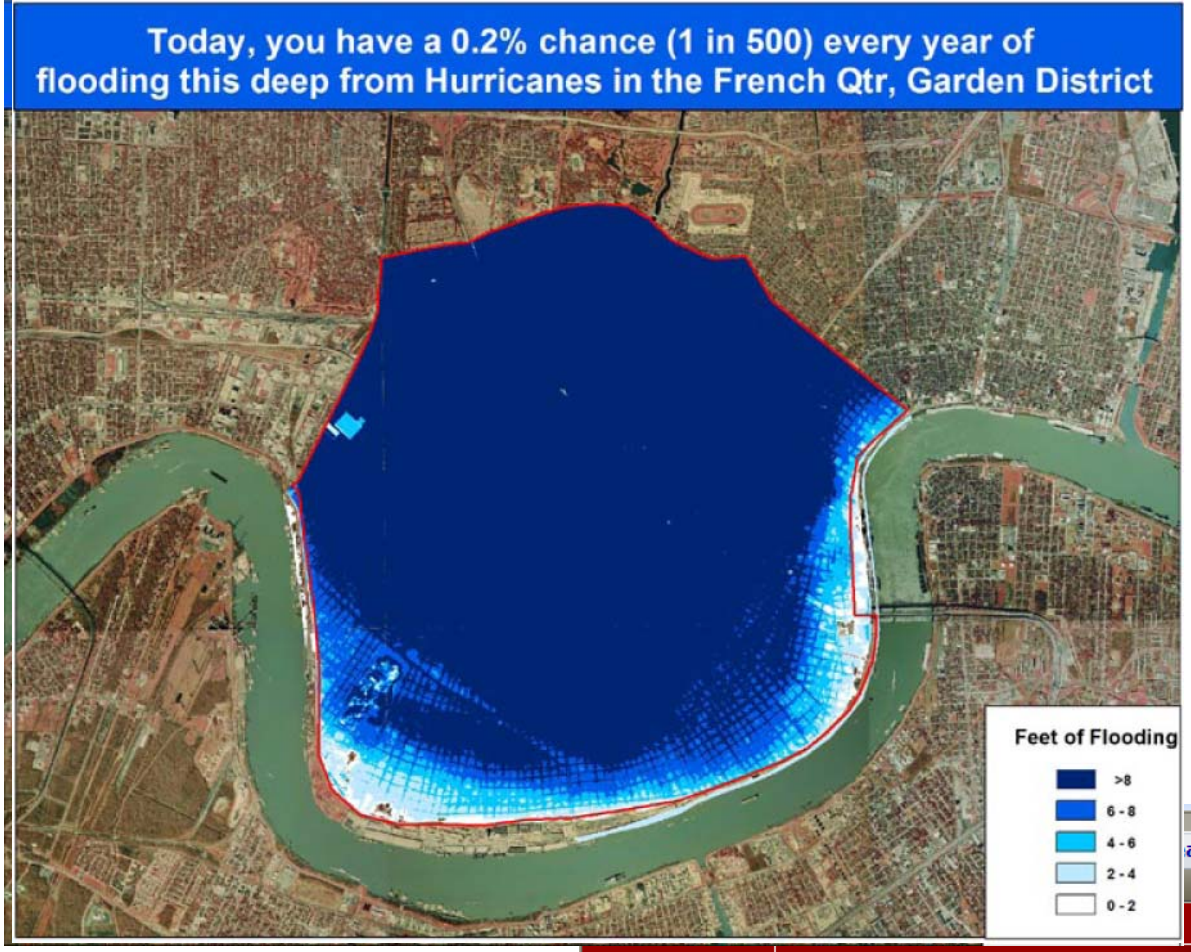
- People have often no knowledge of the flood threat as the half-life of the memory of a flood is very short.

- People neglect the risk, hoping that severe flooding would not happen in their lifetime (a misunderstanding of the often used term “return period”).

- As a result of globalisation we are informed immediately about large natural catastrophes which happen occasionally in different parts of the world. As a result of this information policy we get the impression that disasters are rare in any given place and, if they do occur, they are of such a magnitude that little could be done to mitigate their impacts. (DFID, 2006).

- Probabilities are difficult to handle.

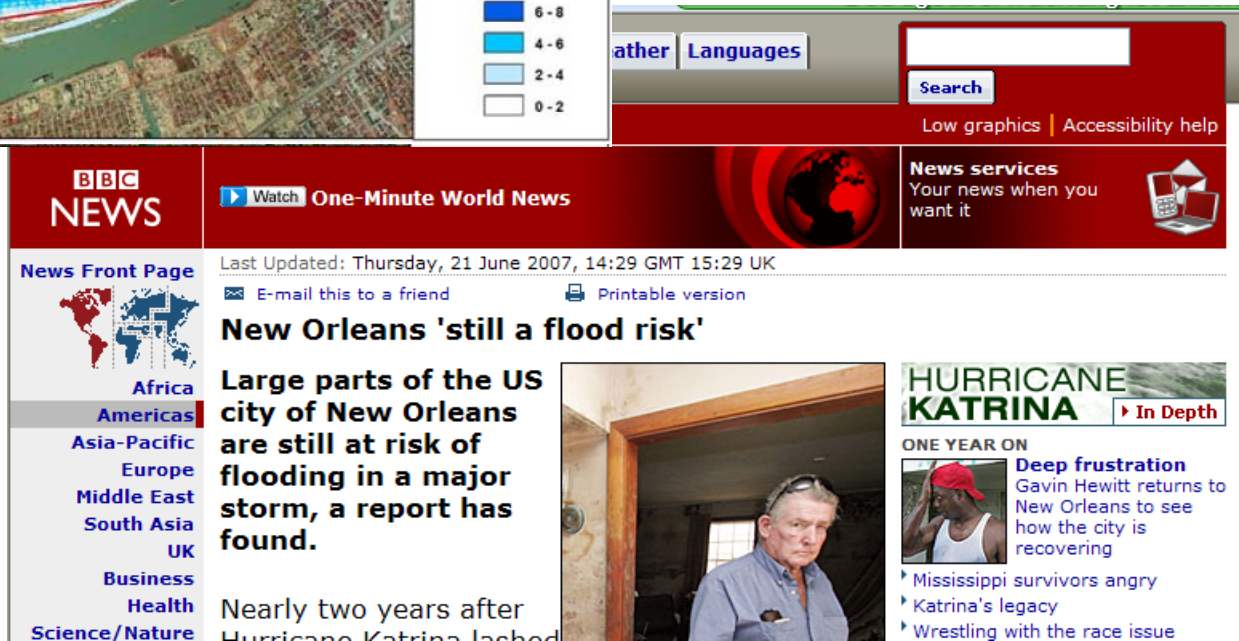
  “A probability is a numerical summary of a person’s state of knowledge about a proposition: it is inherently subjective” (Rougier, 2007).



Interactive Flood Risk Map New Orleans, 2007

"Your risk to be affected by a 100 (500) yrs. flood within the next 25 years is 22 (5) %"

To compare: the average individual risk to die from cancer within these 25 years is 6%



Barriers to prevent sciences and technology achievements to put in practice

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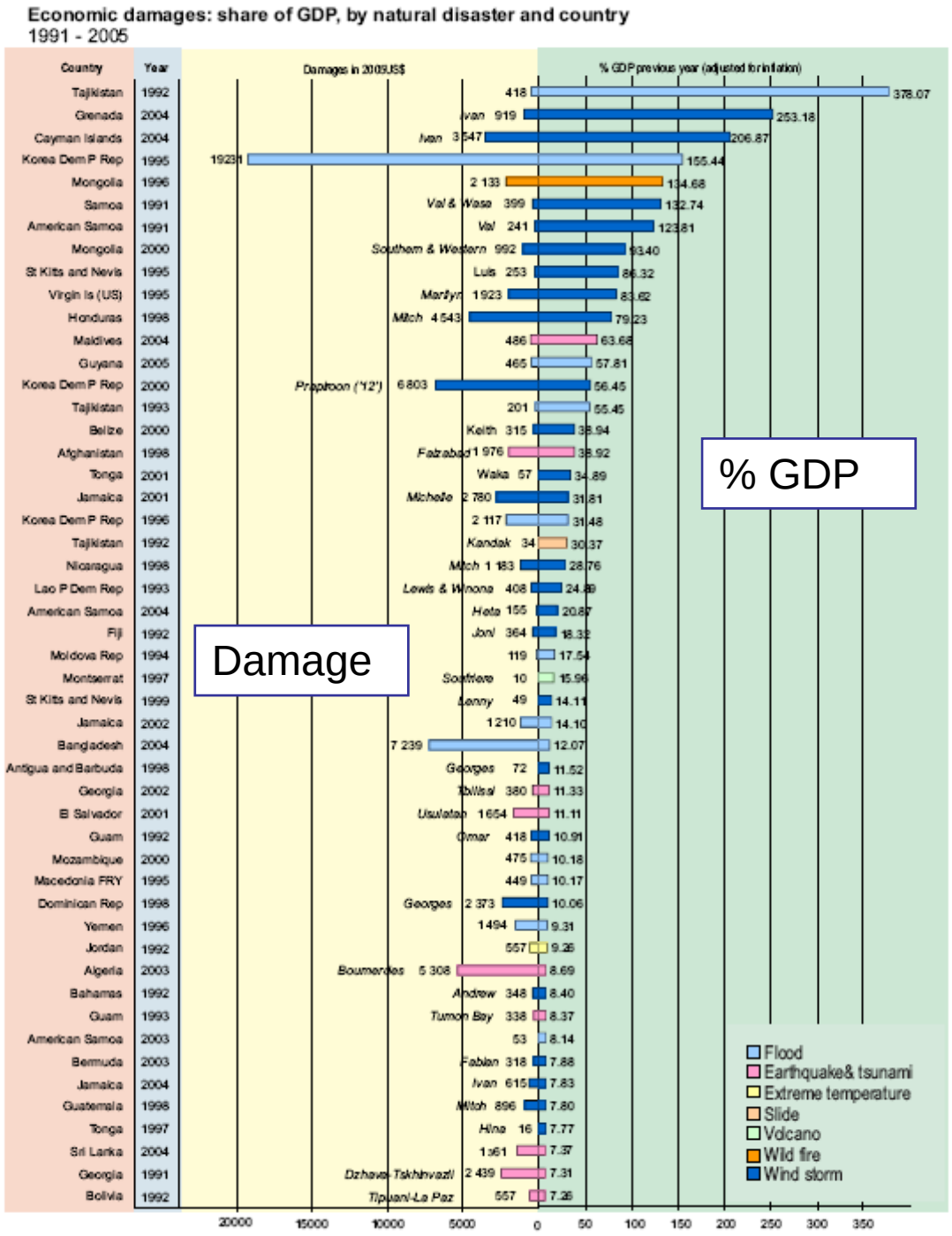


Differences between developed and developing countries

Disaster is

"a severe disruption of the survival and livelihood systems of a society or community, resulting from their vulnerability to the impact of one or a combination of hazards and involving loss of live and/or property on a **scale which overwhelms the capacity of those affected to cope unaided**".

UK Department for International Development (DFID, 2006).

Differences between developed and developing countries

Social aspects

In developing countries people are often forced to live at flood-prone locations due to social circumstances, whereas in other parts of the world people neglect the risk,

Technological achievements (e.g. radar-based flood forecasting systems) can not be implemented:

- comprehensive information systems do not exist,
- capacities for emergency response or medical care systems are not sufficient
- the regulatory framework to minimise disaster risk is weak or absent.
- political problems with neighbouring countries limit availability of data

INTERNATIONAL FLOOD INITIATIVE

Mission: The International Flood Initiative promotes an integrated approach to flood management, at the same time, reducing social, environmental and economic risks that result in and from floods and increasing the benefits from floods and the use of flood plains.

The specific **objectives** of the IFI are to enable the countries to:

- Improve data collection and analysis for flood management;
- **Enlarge the knowledge-base in respect to risk and benefits of floods;**
- Enhance the benefits of floods;
- **Develop and improve institutional frameworks for flood management;**
- **Develop area-specific adaptation strategies;**
- **Develop approaches to assess and reduce vulnerability;**
- **Improve floodplain management in rural and urban areas;**
- **Optimize a mix of structural and non-structural approaches;**
- Improve forecasting and early warning of floods for both rural and urban areas;
- Enhance effectiveness of forecast and people-centred early-warning systems;
- **Improve community response to flood hazards;**
- **Enhance capacity to cope with floods under climate change;**
- **Develop approaches to public participation that are appropriate for different problem contexts and cultural settings**;
- Enhance flood awareness and preparedness with a focus on rural settings;
- **Include flood management aspects in school and university education;**
- **Improve in-service training on all aspects of flood management; and**
- **Develop financial mechanisms for transferring the risks and sharing the losses from floods.**

RUHR-UNIVERSITÄT BOCHUM

IGSH INTERNATIONAL GERMAN SUMMERSCHOOL ON HYDROLOGY
RUHR-UNIVERSITY BOCHUM, GERMANY

Annual Short Courses on Hydrology
11. - 22. August 2008, Bochum, Germany

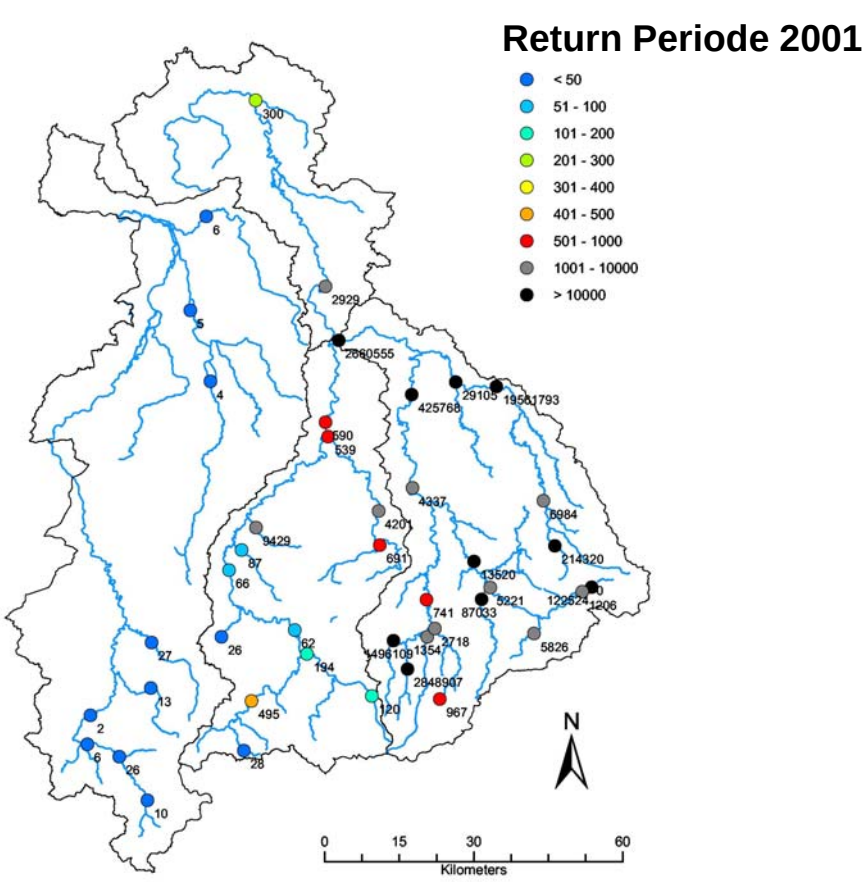
Modern components to flood management (18. - 22. August 2008)
In cooperation with the **RIMAX – Research** Project
Scientific coordination: Andreas Schumann

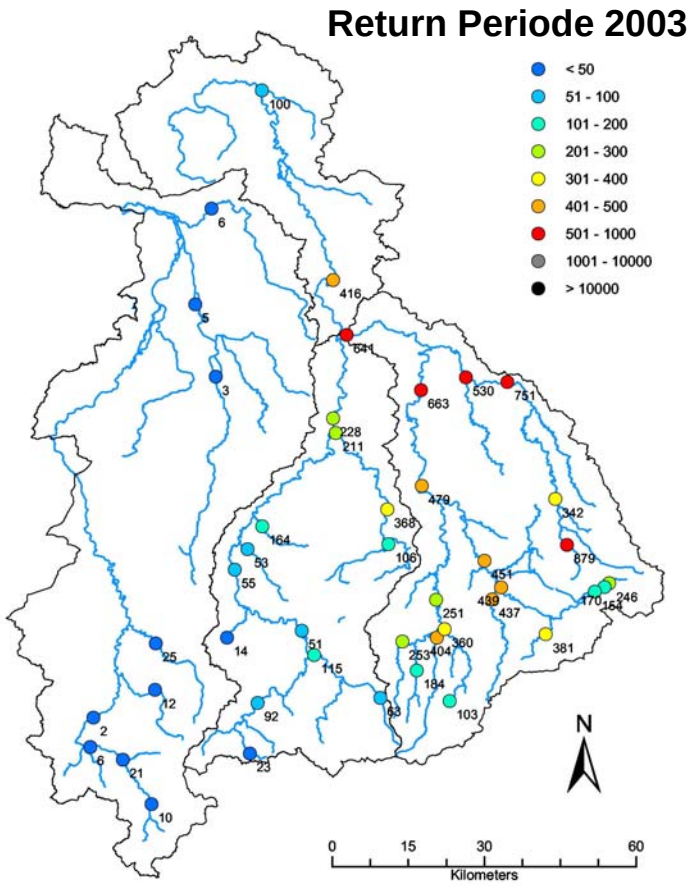
The lectures covers a wide field of topics:
-the meteorological reasons of floods
-deterministic and stochastic models for precipitation,
-the application of hydrological models for flood forecast and flood management planning,
-new aspects of hydrological design
-socio-economic aspects and their integration in flood risk planning.

Contact: **andreas.schumann@rub.de**

Thank you very much for your attention !

Problems to communicate risk:
Non-stationarity of hydrological knowledge





Sometimes the only reason for a change of risk values is a change of hydrologic data. Under the aspects of ongoing global and climatic changes this problem becomes worse. It can be more beneficial to discuss how certain our information is, instead of presenting the uncertainties of our assessments.

Differences in spatial and temporal scales

Temporal scales:

Combinations of land-use planning of flood prone areas and structural flood protection, which are long-term tasks, should be combined with effective forecasting, early warning and emergency management to avoid extreme damages if flood protection structures fail

Insufficient maintenance of flood protection structures increases flood risk considerably over long time scales.

Flood risk changes in time

Spatial scales:

Often the risk at one location is reduced but at the same time increased by the same measures at another one (e.g. by building levees).

Flood risk and its changes should be handled at large scales with options to focus on local hot-spots. Multi-hazard and multi-side analyses are needed to bridge different scales.

The seven rules for hydrologists and other researchers wanting to contribute to the water management practice

1. **Reflect on the nature and possible roles of research**
2. **Analyze the stakeholders and issues at stake**
3. **Choose whom and what to serve**
4. **Decide on your strategy**
5. **Design the process to implement your strategy**
6. **Communicate!**
7. **Consider your possibilities and limitations**

E. Mostert and G. T. Raadgever
Delft University of Technology, Delft, The Netherlands Hydrol. Earth Syst. Sci. Discuss., 5, 843-864, 2008

International Decade for Natural Disaster Reduction (1990's) (IDNDR)

International Council of Science (ICSU) in 2002:

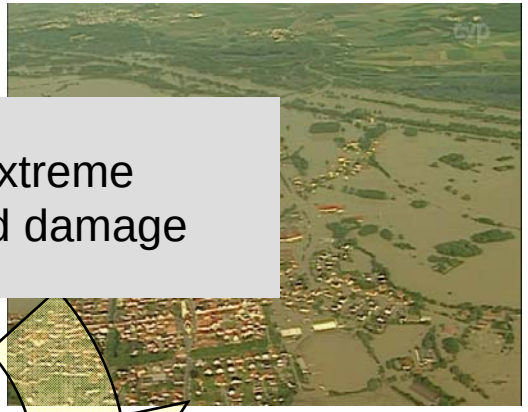
One result of this Decade was “increased emphasis of hazard impacts on communities rather than simply the geophysics of the hazards themselves”

Paradox of structural flood control measures:
Increased investment to reduce flood damage may in fact lead to an increase of damage caused by flooding

Natural variability

Extreme flood event

Extreme flood damage



Intensified usage of former flooding areas

Location advantage: „flood proof“

Structural measures to improve flood protection