



World Meteorological Organization
Working together in weather, climate and water

**Side Event: Cities and Flooding in the 21st Century –
Trends, Impacts and Policy Implications**

Urban Flood Management : an Integrated Approach

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The outline

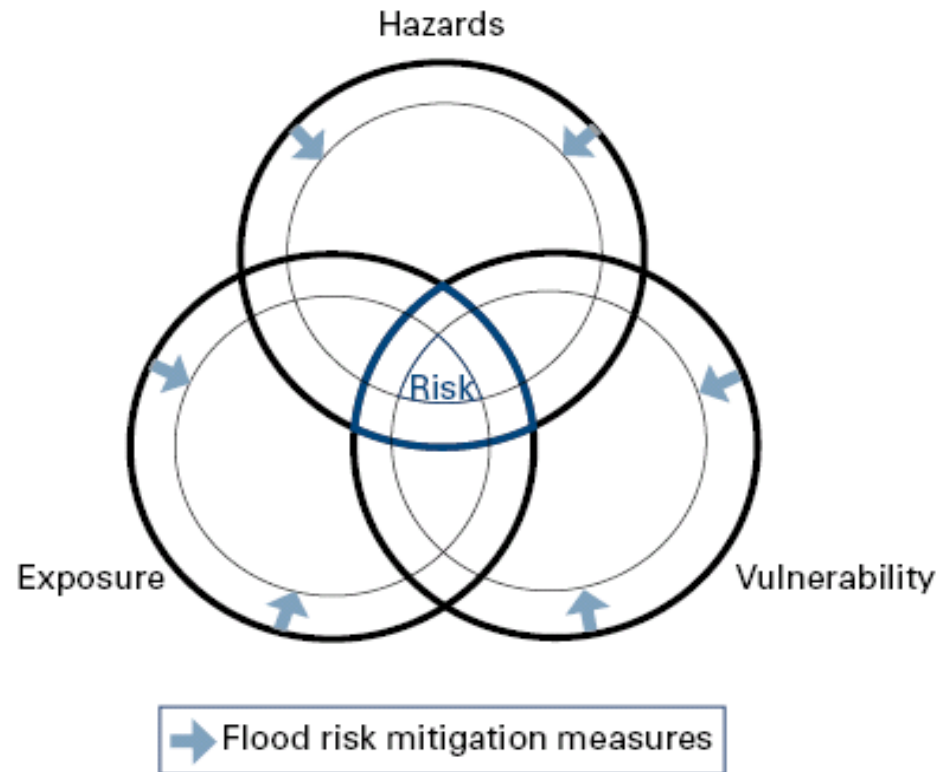
- **Integrated Flood Management: the concept**
- **Why are urban floods different?**
- **Urban flood management: an integrated approach**
- **Who pays for whose risks?**





Integrated Flood Management: Objectives

- **Sustainable development:** balancing development need and flood risks
- **Maximising net benefits:** ensure livelihood security and poverty alleviation thereby reducing vulnerability
- **Minimising loss of life:** in particular through preparedness planning for extreme events
- **Environmental preservation:** ecosystem health & services





Integrated Flood Management: A Holistic Approach

■ Integration of

- Land and Water management
- Structural and Non-structural
- Upstream and Downstream
- Local and basin level measures
- Short term and Long-term
- Top down and Bottom up decision making
- Development needs with ecologic and economic concerns
- Functional Integration of Institutions





IFM principles

- **Employ a basin approach;**
- **Treat floods as part of the water cycle;**
- **Integrate land and water management;**
- **Adopt a mix of strategies based on risk management approaches;**
- **Enable cooperation between different agencies; and**
- **Ensure a participatory approach**





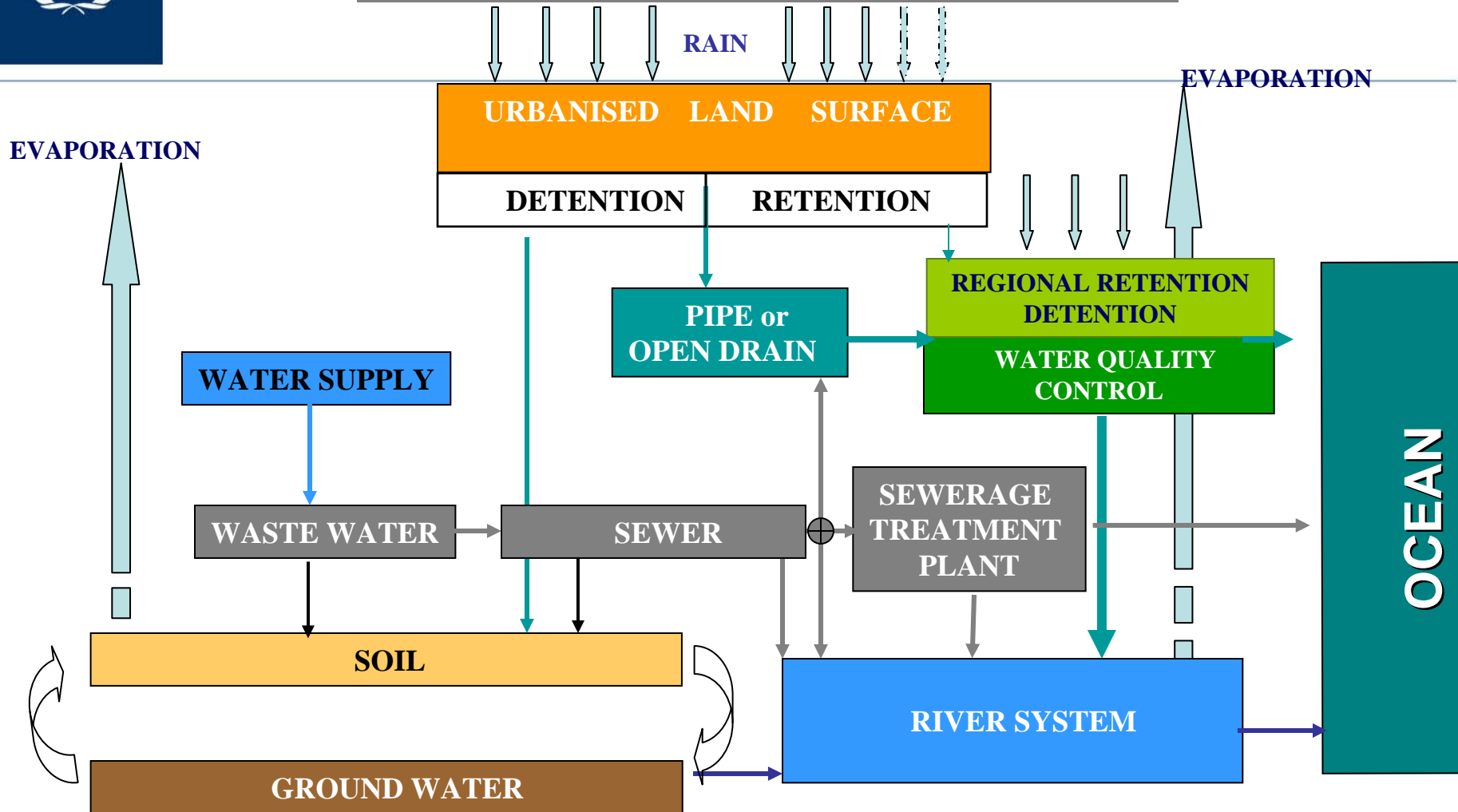
Urban Floods

- **Flash Floods**
 - intense precipitation in mountainous areas:
 - intense precipitation within urban areas:
- **Riverine Floods**
 - Upstream basin drainage
 - Storm surge
- **Pluvial Floods**
 - Inadequate drainage capacity: due to land use planning
 - Inadequate drainage capacity: due to congestion of drainage systems



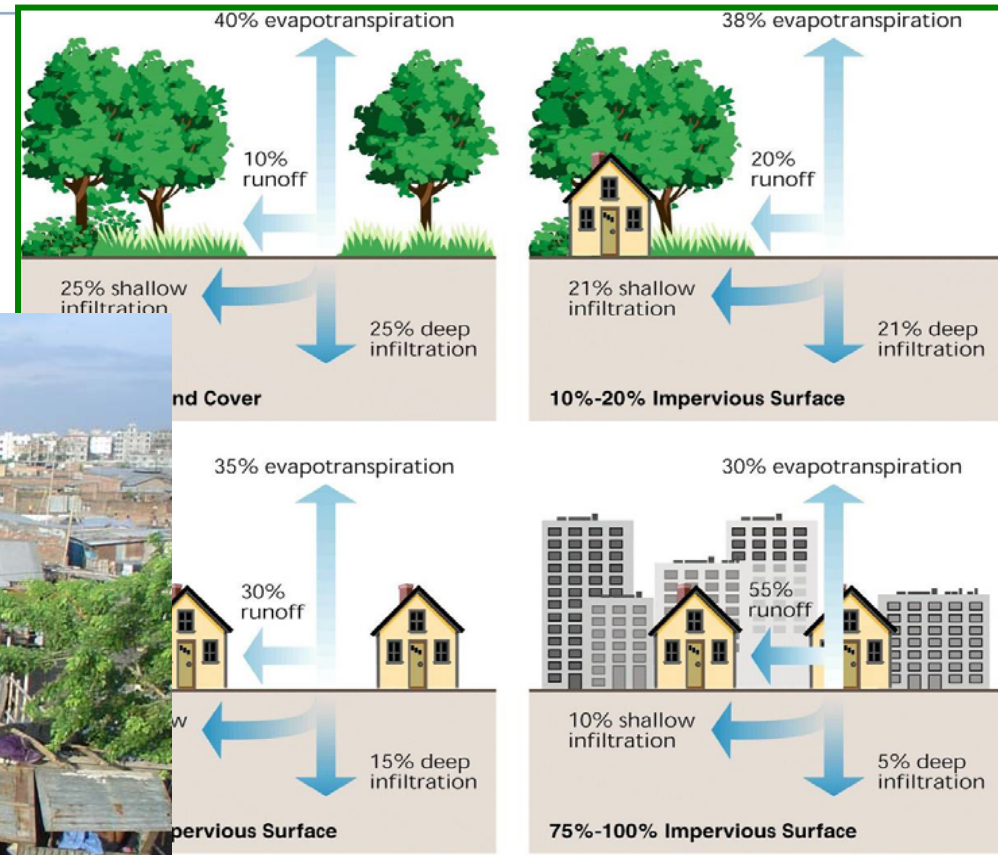


Urban Hydrologic Cycle





Urban floods: some special issues





Urban floods: some special issues

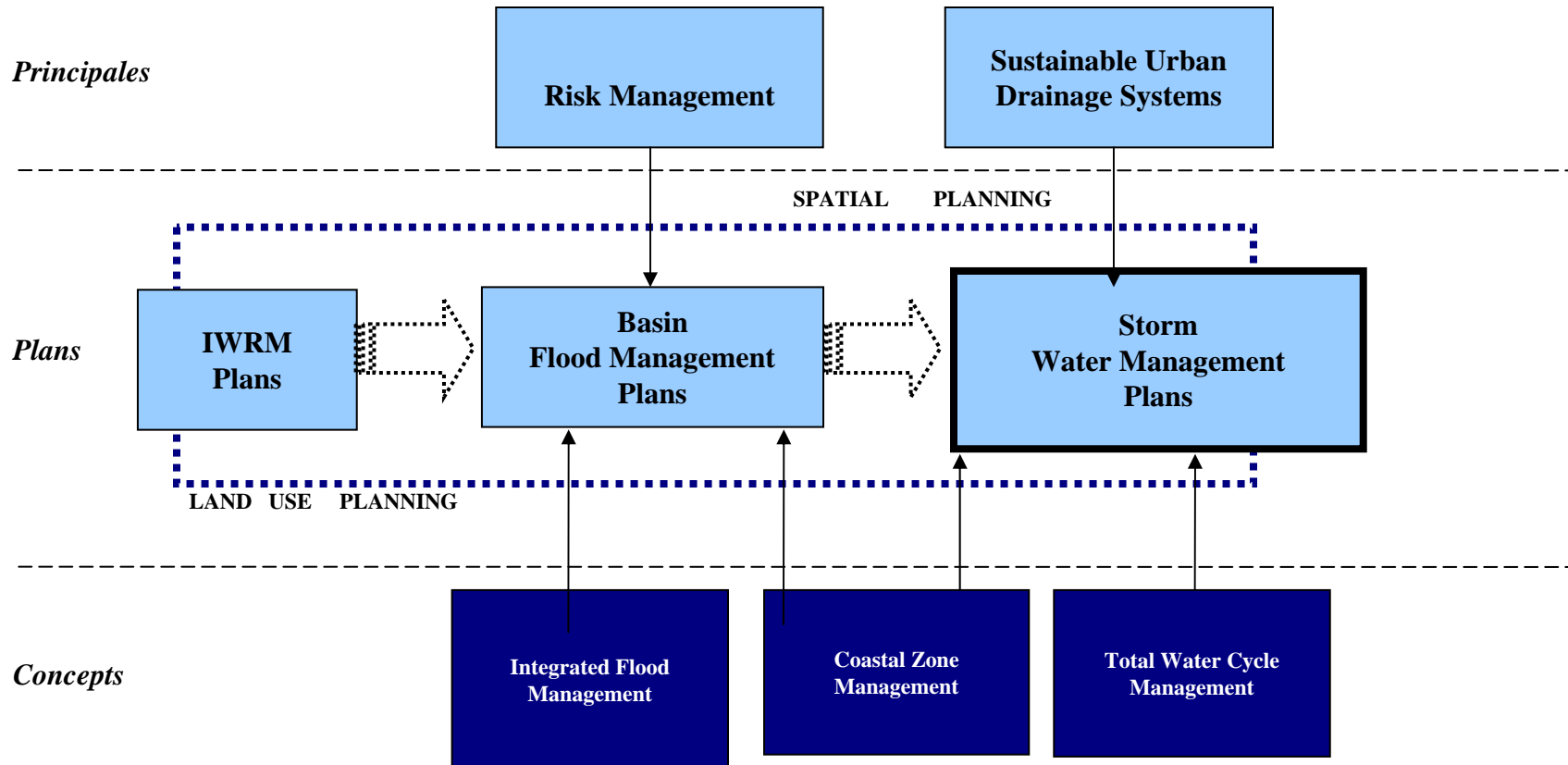
- Urban development: too rapid and **unpredictable**;
- Urbanization in periurban areas are **unregulated**
- Periurban and flood risk areas (flood plains and hill slopes) are occupied by **low income groups**
- **Lack of appropriate refuse collection** and disposal effects water quality and clogging of the drainage network.
- Municipality have **insufficient funds**;
- The administrative bodies of cities and states have **insufficient knowledge** to manage floods;
- **Lack of institutional collaboration** in urban water and drainage management and flood management;





Urban Flood Management

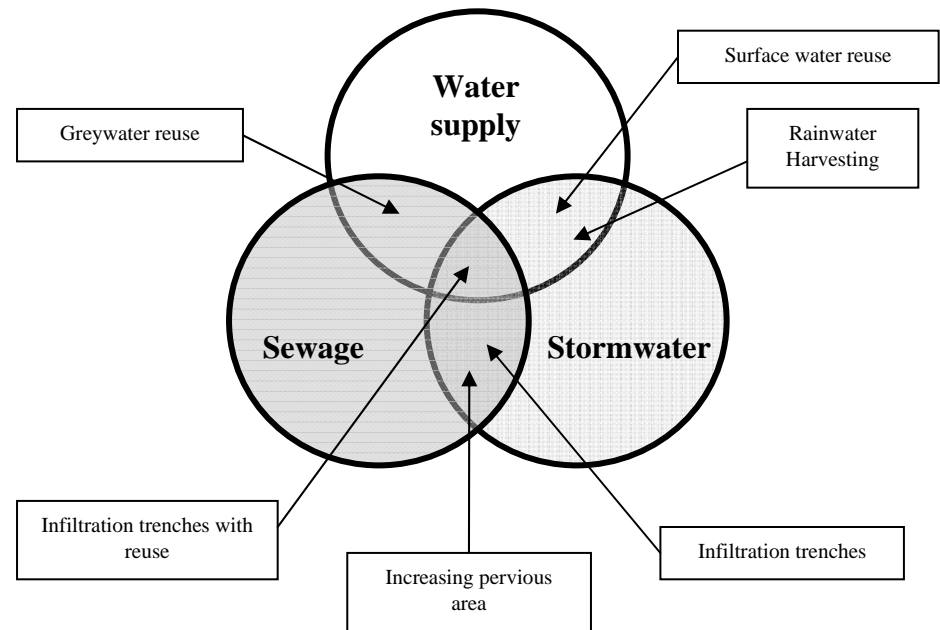
Integrated with River Flood Management





Sustainable Urban Drainage System (SUDS)

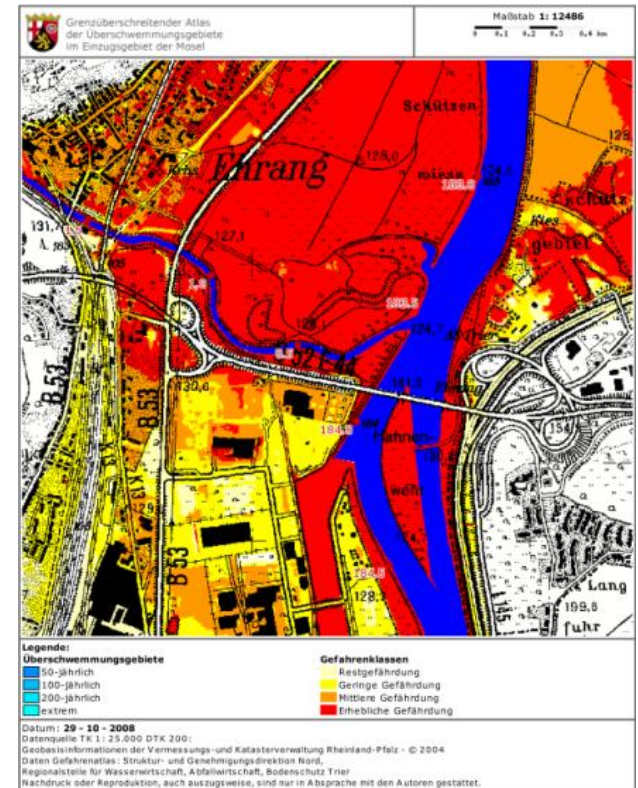
- **SUDS aims to reduce flood risk, improve water quality, recharge groundwater and enhance the potential for biodiversity.**
- **SUDS deal with the quality of run-off polluted by the urban chemicals at the time of overland flow.**
- **Run-off prevention**
- **Source Control**
 - Local, and
 - Regional Flooding.





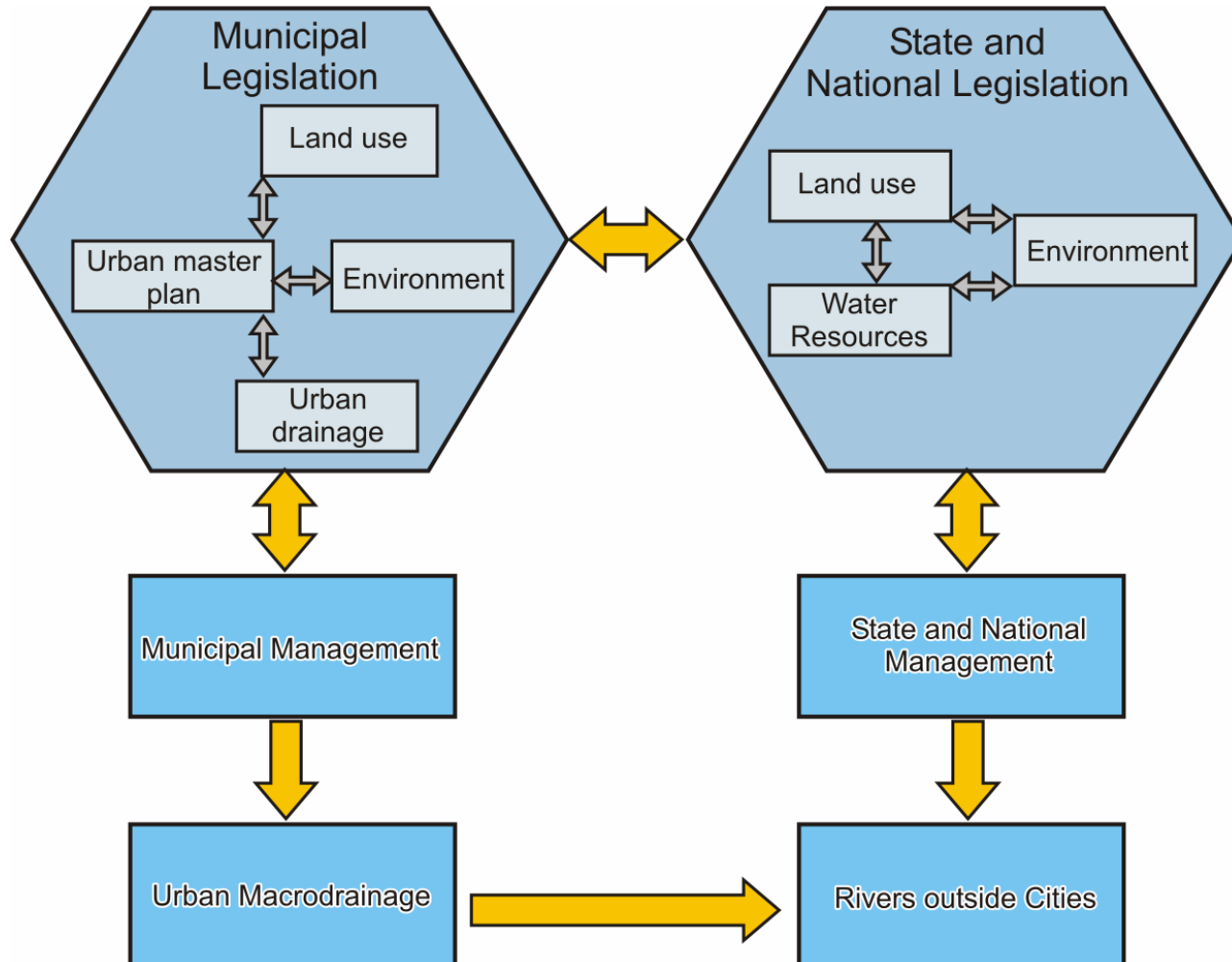
Integrating Flood Risks and Urban Planning

- Delineation of risk zones
- Definition of land-use for different risk zones
- Implementation of land-use regulations through:
 - restrictive regulation (prohibitions, penalties, resettlement)
 - economic incentives (preferential taxation for desired land-uses, extra taxation for undesired land-use)
 - public investment (purchase of property)
- Knowledge enhancement
- Communication: necessity for regulations, awareness campaigns



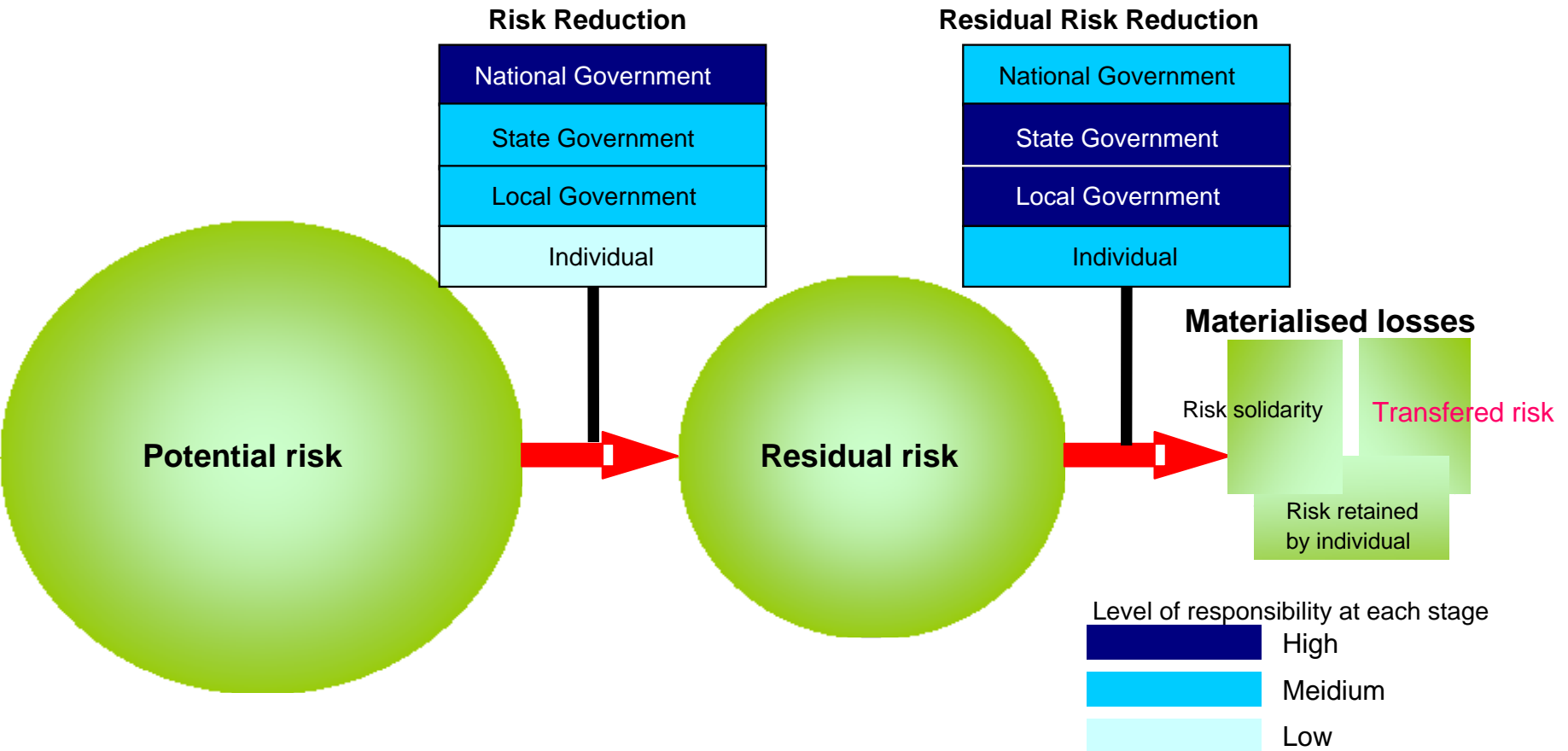


Who takes action?



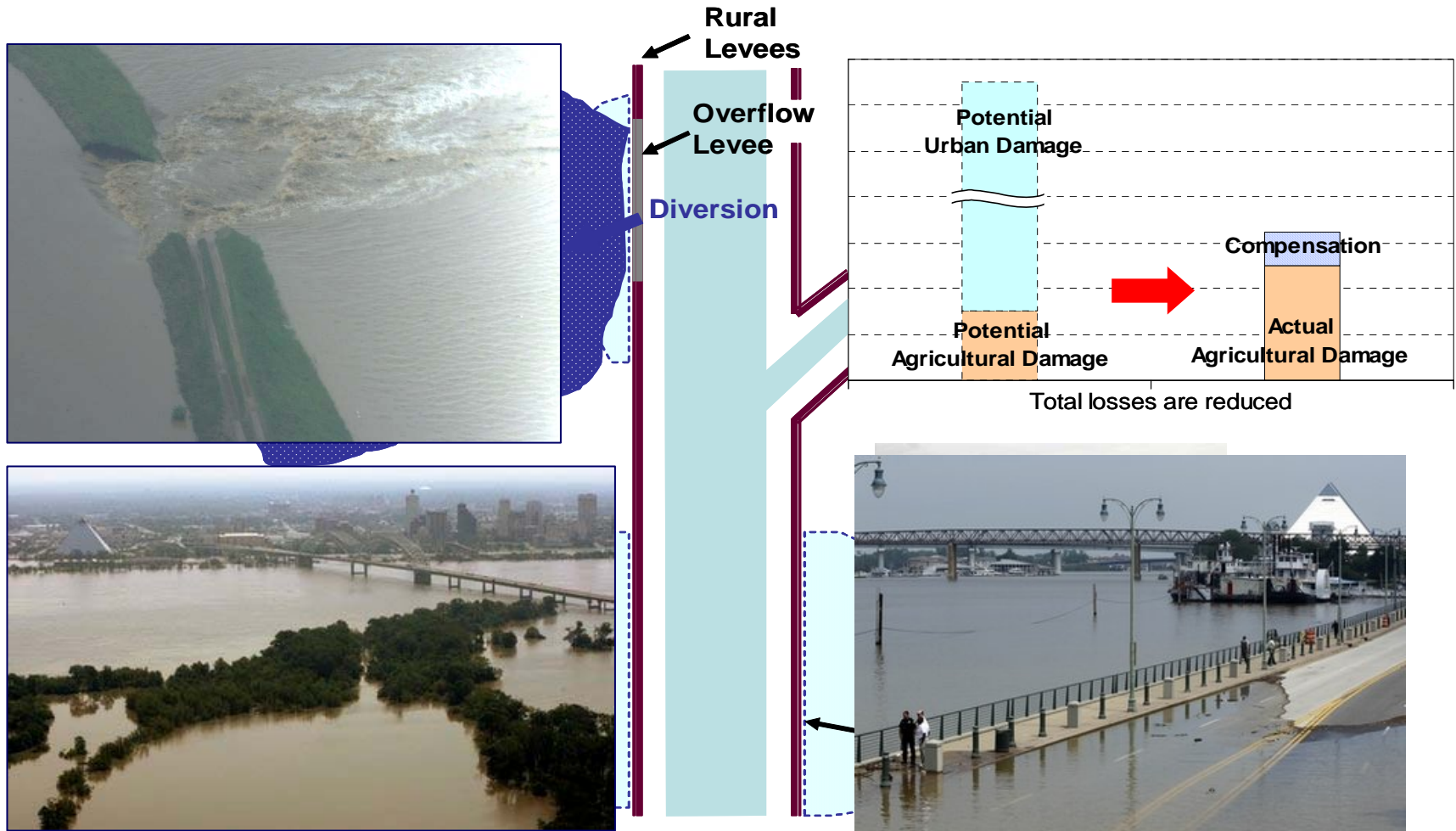


Who pays for whose risk?





Risk Transfer





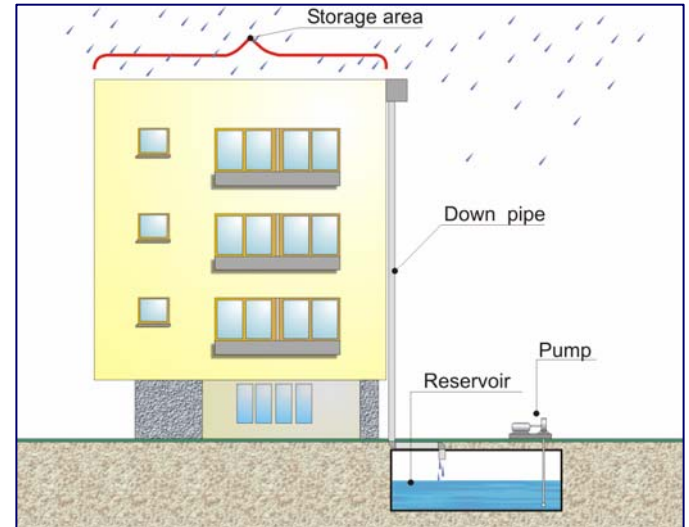
How are decisions made?

- **Municipal authorities;**
- **River basin organizations/authorities;**
- **Regional development authorities;**
- **Communities which are affected by the implementation or non-implementation of measures (on site as well as up- and downstream);**
- **Hydro-meteorological agencies**
- **Scientific institutions;**
- **Private sector; and**
- **NGOs**





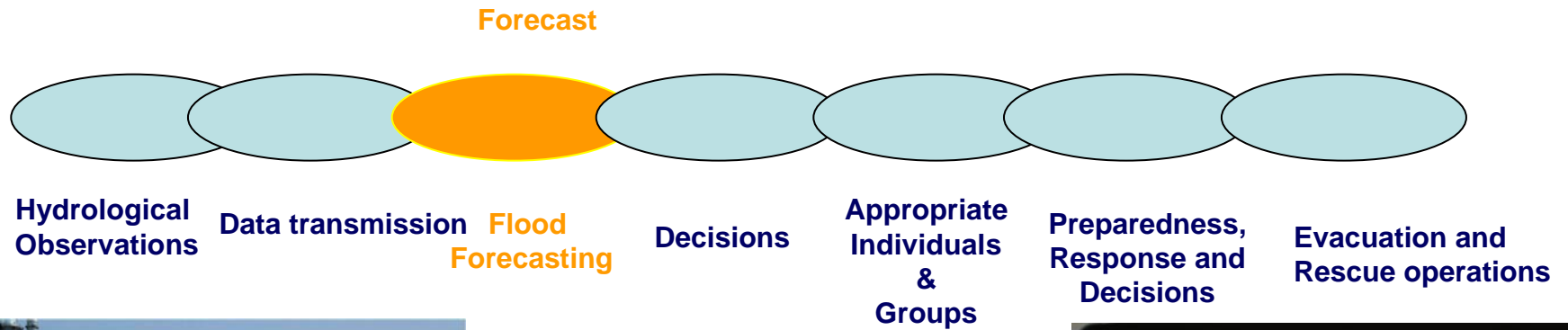
Flood risk reduction





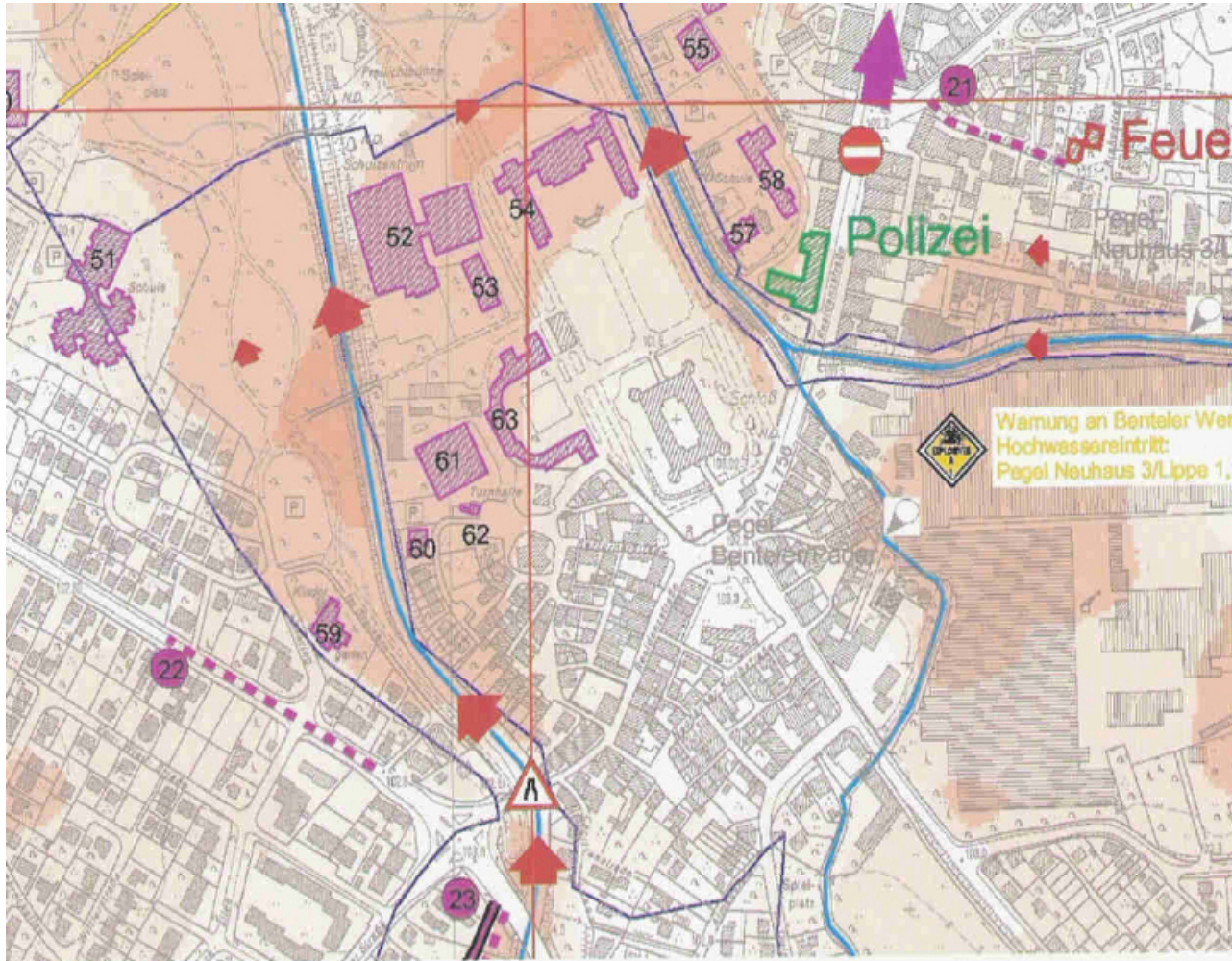
Flood forecasting, warning and response system

a Critical Chain of Events and Actions

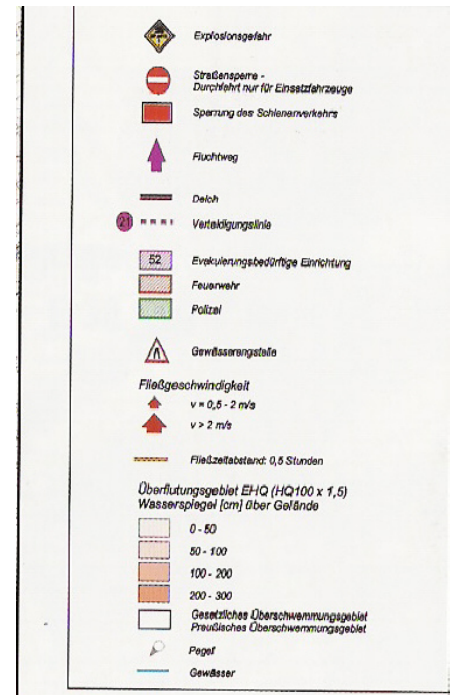




Emergency response



- water depths
- evacuations routes
- lane direction
- sensible buildings





Messages

- **A River basin approach is essential**
 - **Spatial planning helps to reduce exposures and attenuate magnitude of flood hazard.**
 - **Reducing hazard requires best mix of structural measures and non-structural measures.**
 - **Flood forecasting and warning play an important role.**
 - **Participatory approach enables local communities to be aware of flood risks**
 - **Legal and institutional framework is necessary to achieve above strategies.**
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Thank You

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