

Review of flood risk management from lens of sustainable development

 Jianting CAO

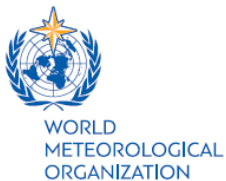
 General Institute of Water Resources and Hydropower Planning and Design, MWR

Content

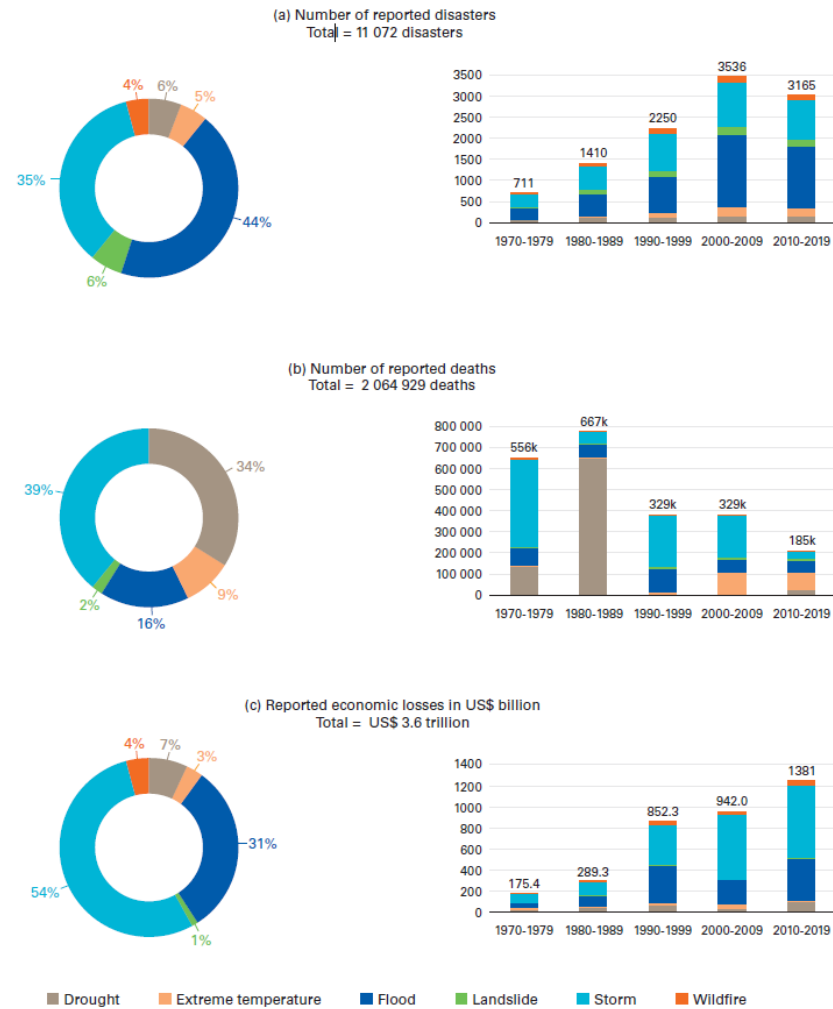
- **Flood Losses status**
- **Review of Flood risk management**
- **Trends and Implication**

Flood Losses status

WMO ATLAS OF MORTALITY AND ECONOMIC LOSSES FROM WEATHER, CLIMATE AND WATER EXTREMES (1970–2019)



WMO-No. 1267



- ✓ Worldwide, 44% of disasters have been associated with floods
- ✓ 16% of deaths caused by flood.
- ✓ In terms of economic losses, floods account for 31%, among which mainly riverine floods.
- ✓ Number of reported disasters and economic losses increase, while the reported deaths decrease.

Flood Losses status

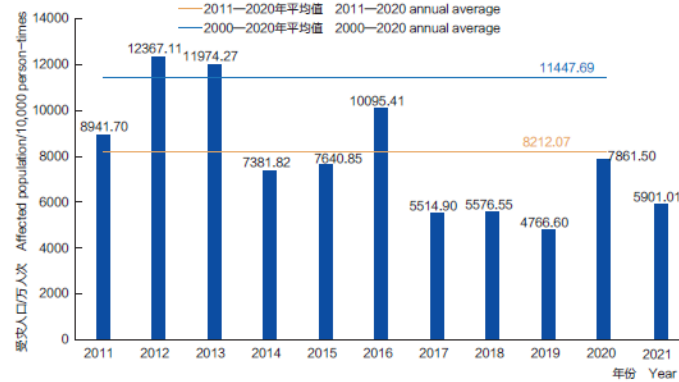
中国水旱灾害防御公报

China Flood and Drought Disaster Prevention Bulletin

2021

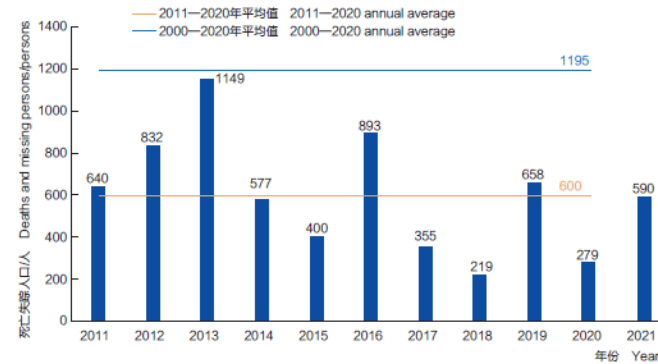
中华人民共和国水利部

Ministry of Water Resources of the People's Republic of China



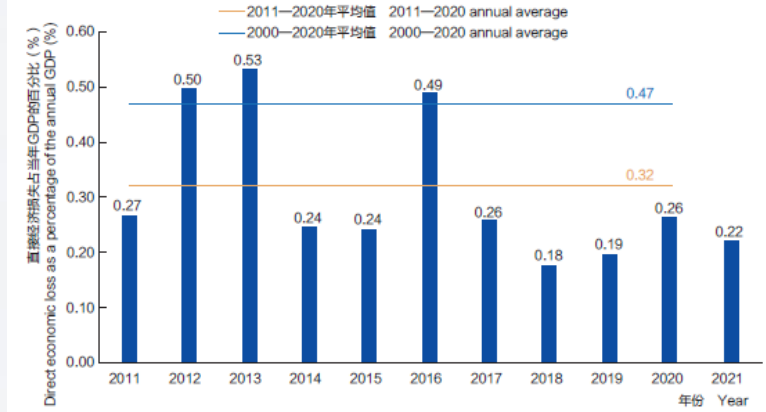
注: 2019—2021年数据来源于应急管理部。
Note: Data for 2019—2021 are from the Ministry of Emergency Management.

图 2-6 2011—2021 年全国因洪涝受灾人口统计
Figure 2-6 Population affected by floods during 2011—2021



注: 2019—2021年数据来源于应急管理部。
Note: Data for 2019—2021 are from the Ministry of Emergency Management.

图 2-7 2011—2021 年全国因洪涝死亡失踪人口统计
Figure 2-7 Deaths and missing persons attributed to floods during 2011—2021



注: 2019—2021年数据来源于应急管理部。
Note: Data for 2019—2021 are from the Ministry of Emergency Management.

图 2-10 2011—2021 年全国因洪涝直接经济损失占当年 GDP 的百分比
Figure 2-10 National direct economic losses attributed to floods as a percentage of GDP during 2011—2021

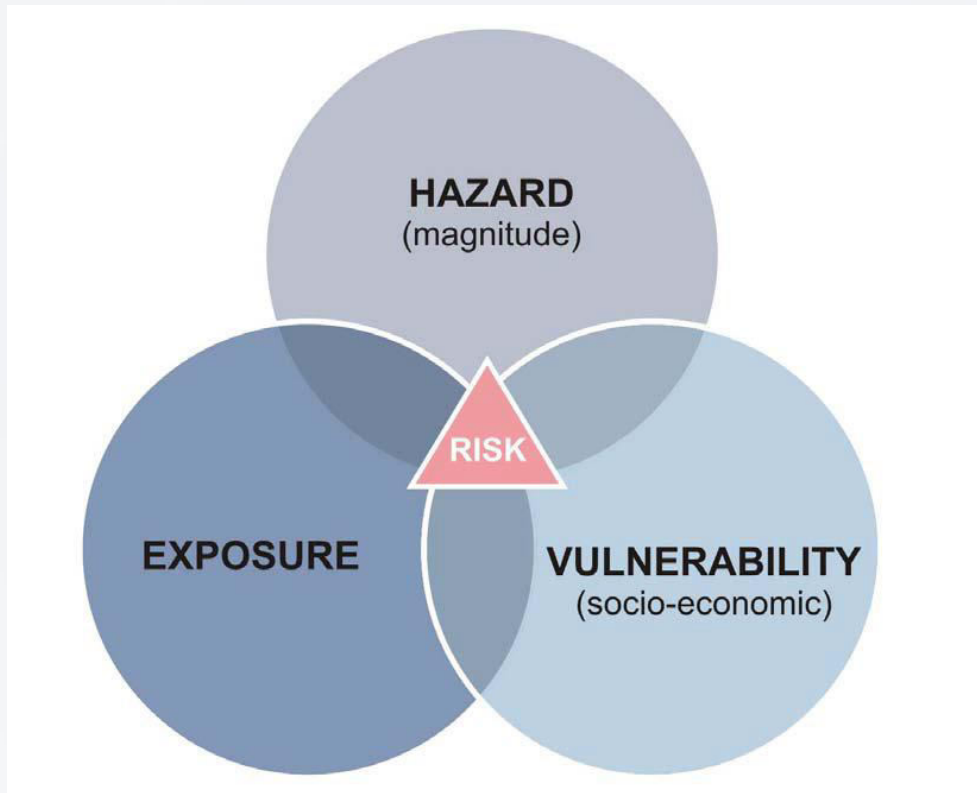
China Hit hardest with losses of US\$ 598 billion, flood in 1998 was the costliest event in Asia.

Flood Losses status

- Increasing disaster loss and impacts continue to undermine efforts to reduce poverty and achieve sustainable development. Reducing disaster risk and building resilience are core aspects of the 2030 Agenda for Sustainable Development. Disaster risk reduction related to 10 of the 17 SDGs.
- It is urgent and critical to anticipate, plan for and reduce disaster risk in order to more effectively protect persons, communities and countries, their livelihoods, health, cultural heritage, socioeconomic assets and ecosystems, and thus strengthen their resilience.
- International organization, science and technology community, governments, and so forth explore new thinking and approaches.



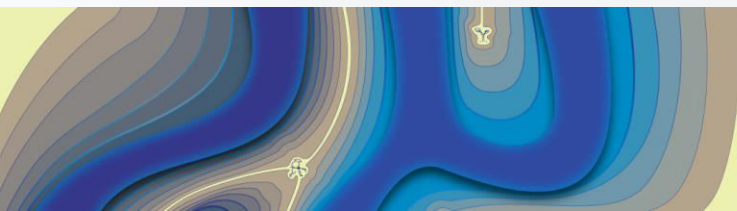
Review of Flood risk manage



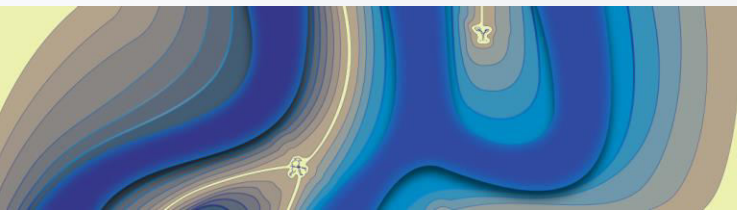
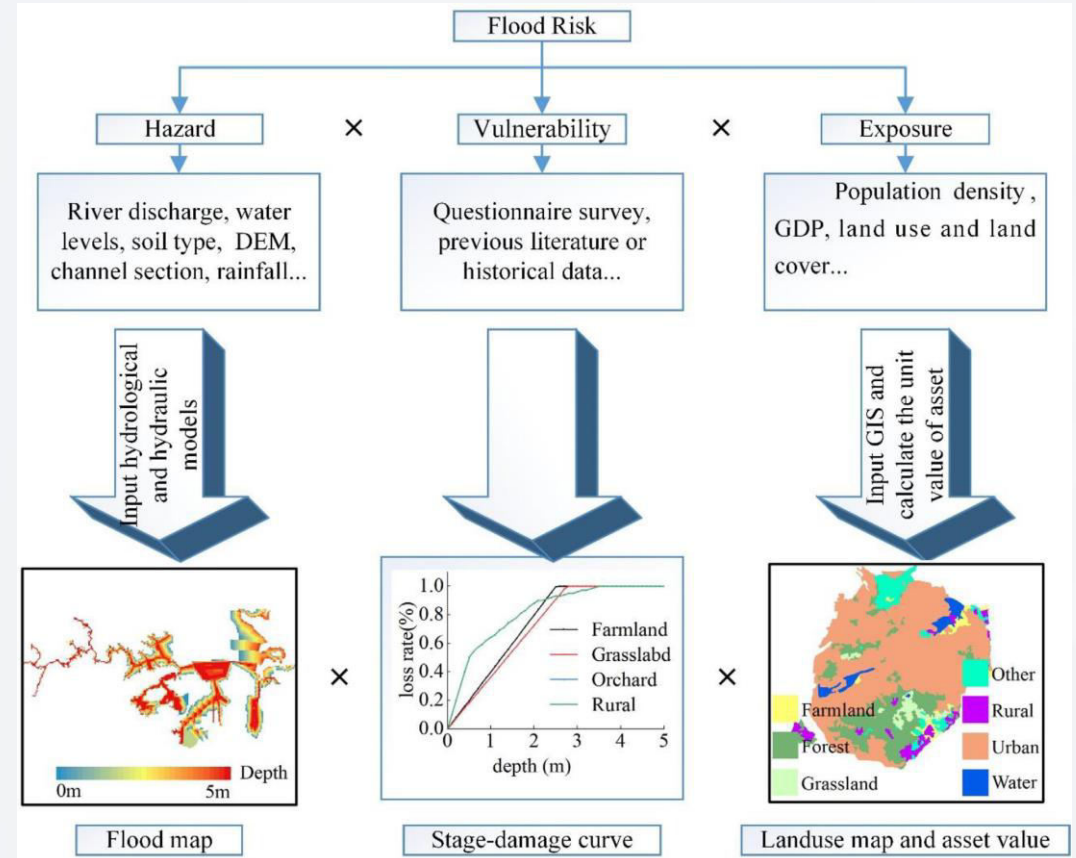
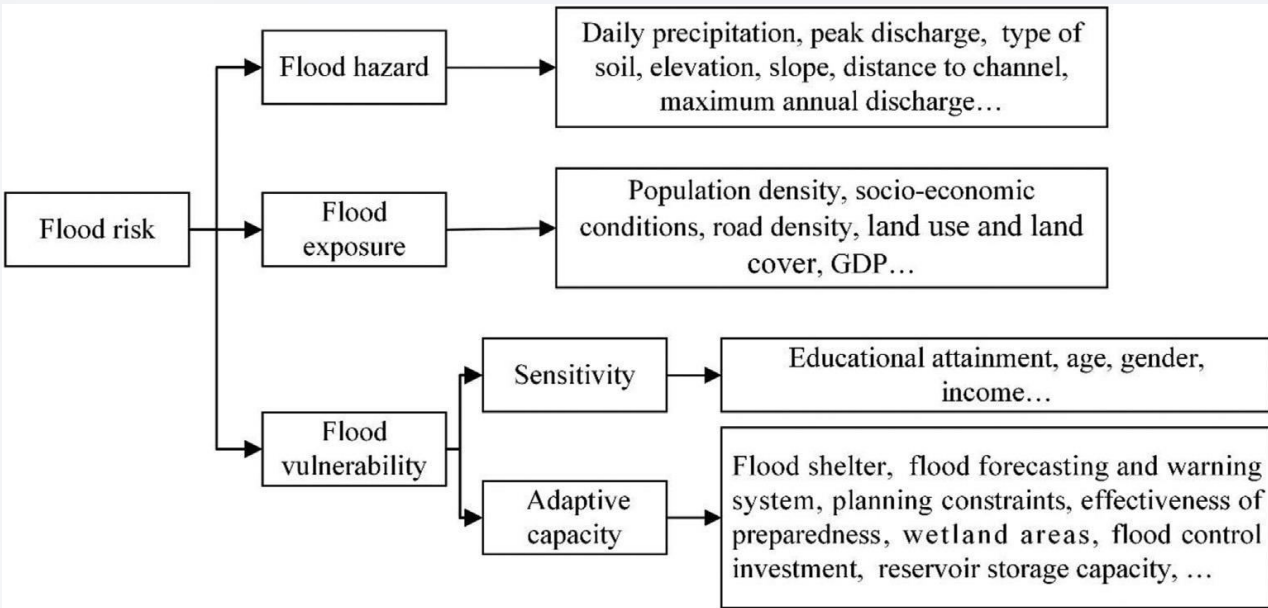
Hazard: A process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation.

Disaster: A serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts.

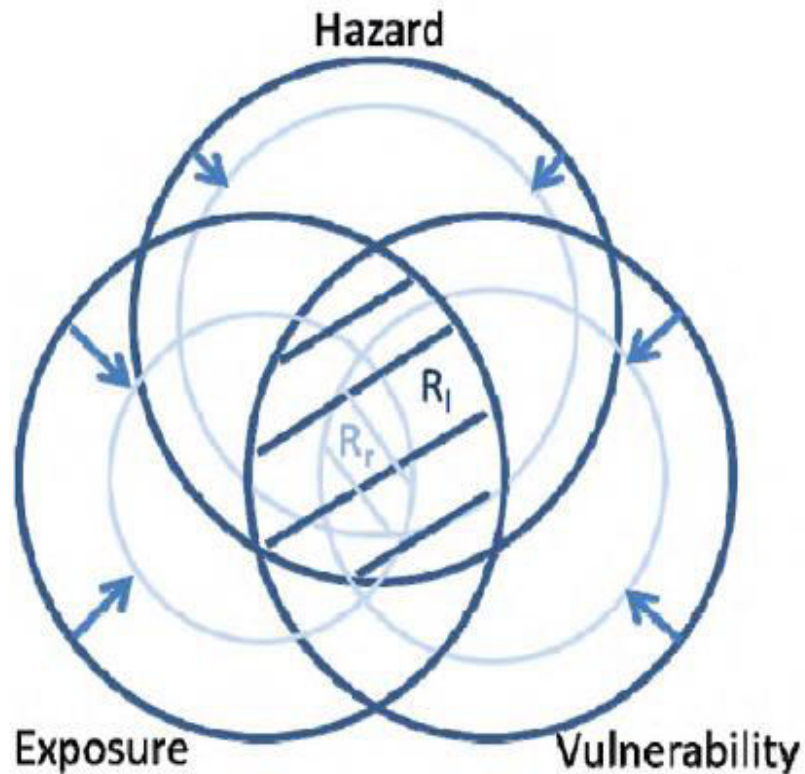
Disasters are not natural. **What turns a hazard into a disaster is the consequence of human decisions:** where and how we build, how we access and share resources, how we protect and restore healthy ecosystems.



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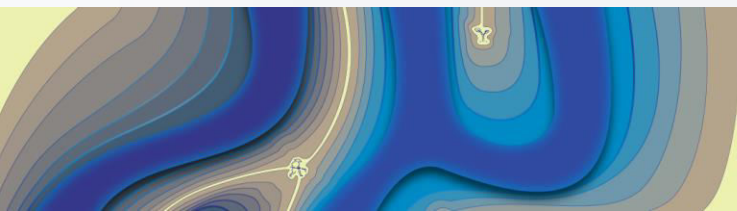


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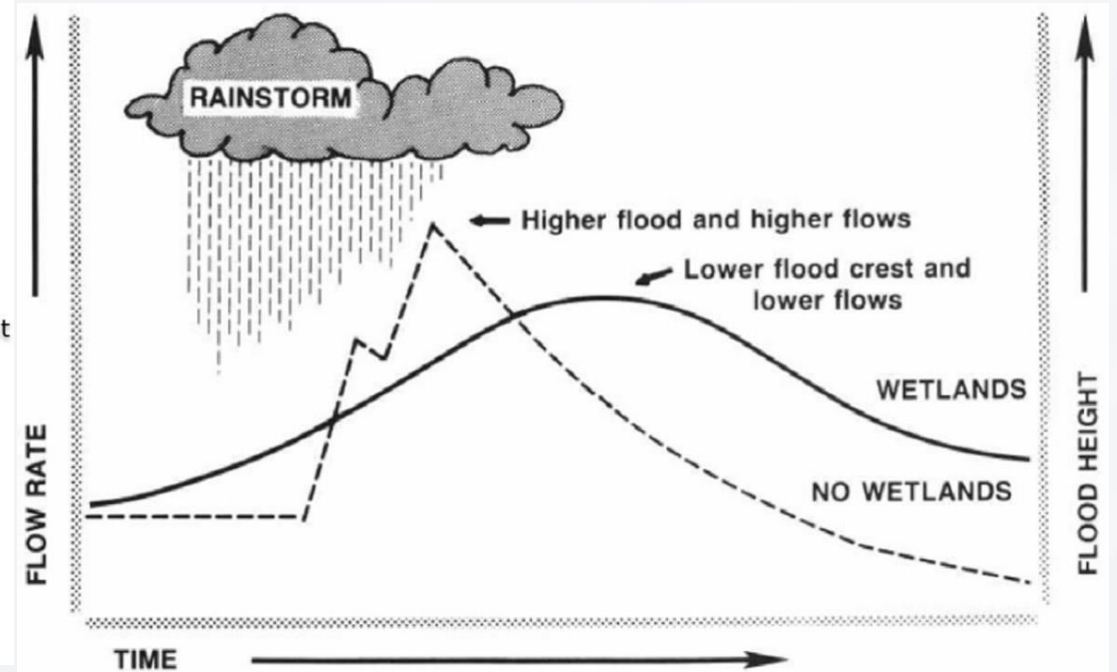
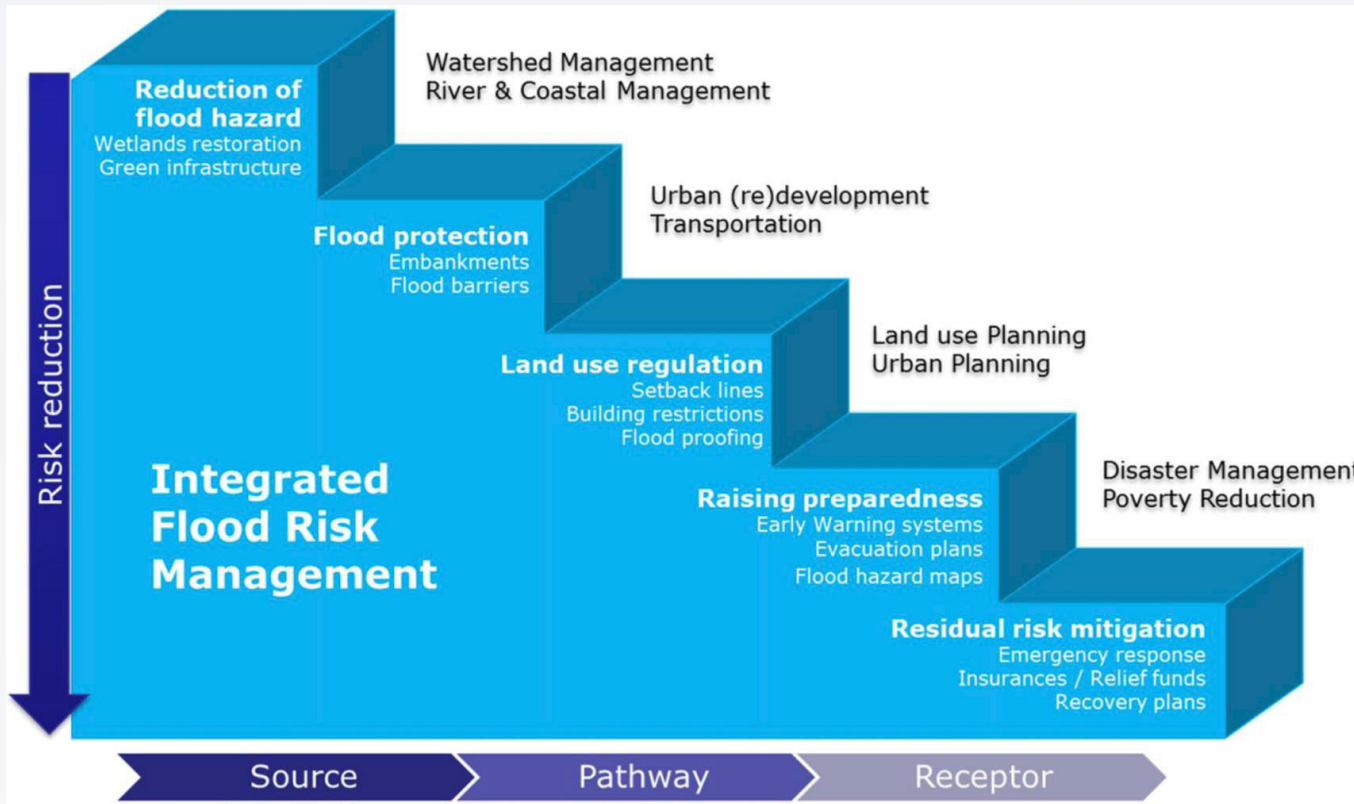


Reduce hazard	Reduce Exposure	Reduce Vulnerability
<ul style="list-style-type: none"> Retaining water where it falls (increasing infiltration, rooftop storing). Retention basins (natural wet lands or depressions, human constructed such as school play grounds, household underground tanks). Dams and reservoirs. Diversion channels. Land use management (e.g., house building codes in urban areas, infrastructure building practices, appropriate landscape planning). 	<ul style="list-style-type: none"> Structural measures on the river (dykes, river training work such as channelization, flood walls, raised infrastructure such as roads and railways). Structural and non-structural measures/actions by individual (flood proofing). Land regulation. Flood emergency measures (flood warning and evacuation). 	<ul style="list-style-type: none"> Physical: by improving the infrastructure, well-being, occupational opportunities, and living environment. Constitutional: by facilitating equal participation opportunities, education and awareness, providing adequate skills and social support systems. Motivational: by building awareness and facilitating self organisation.

Flood Management Tools Series

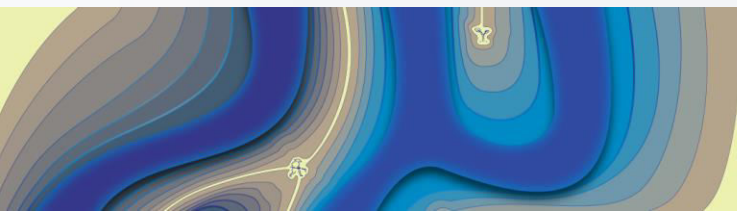


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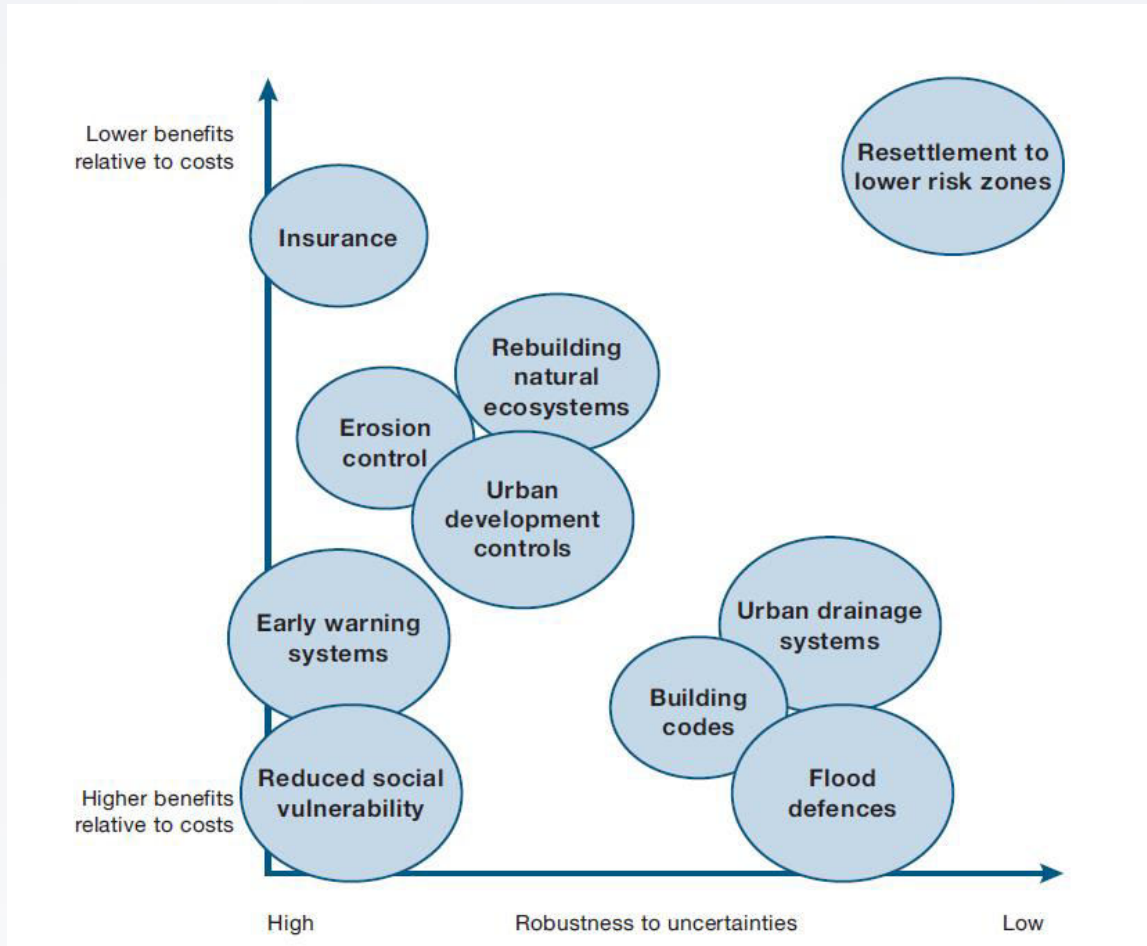


(adapted from Marchand et al., 2012)

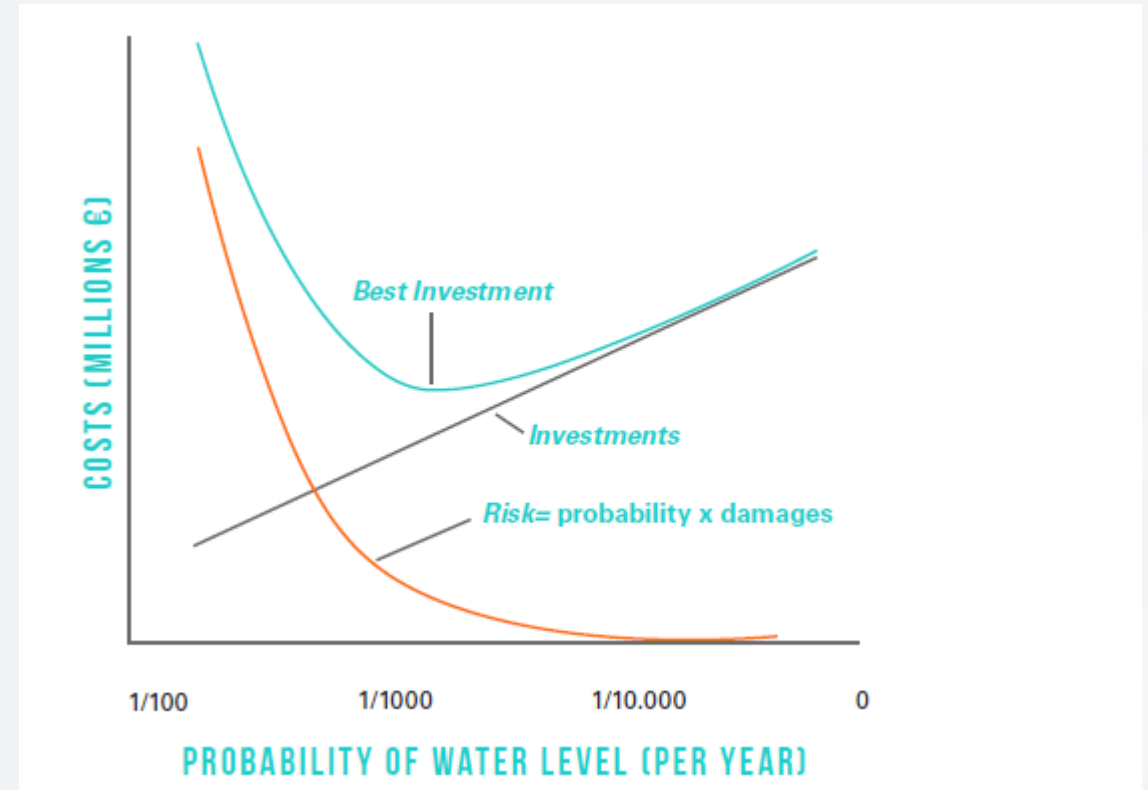
Impact of wetlands on flow regime after a rainstorm



Review of Flood risk manage



Relative costs and benefits of flood management options. Source: Adapted from Ranger and Garbett-Shields 2011



Relationship Between Cost And Benefits Of Flood Risk Management Investments. From Rijnland Water Control Board,



trends & Implication

Trends:

- Nature based solution for sustainability: resilience
- Early Warning system (Integrated Flood Prediction and Response Systems)
- New technology application
- Measures Feasibility: Technical, Economic, Social, and Environmental

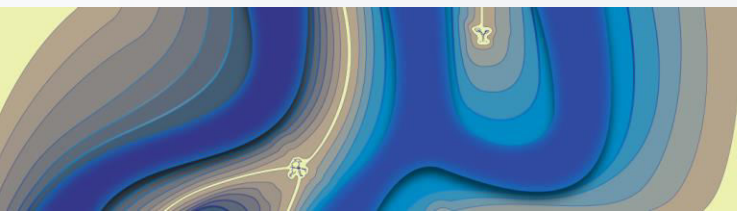
Early Warnings for All

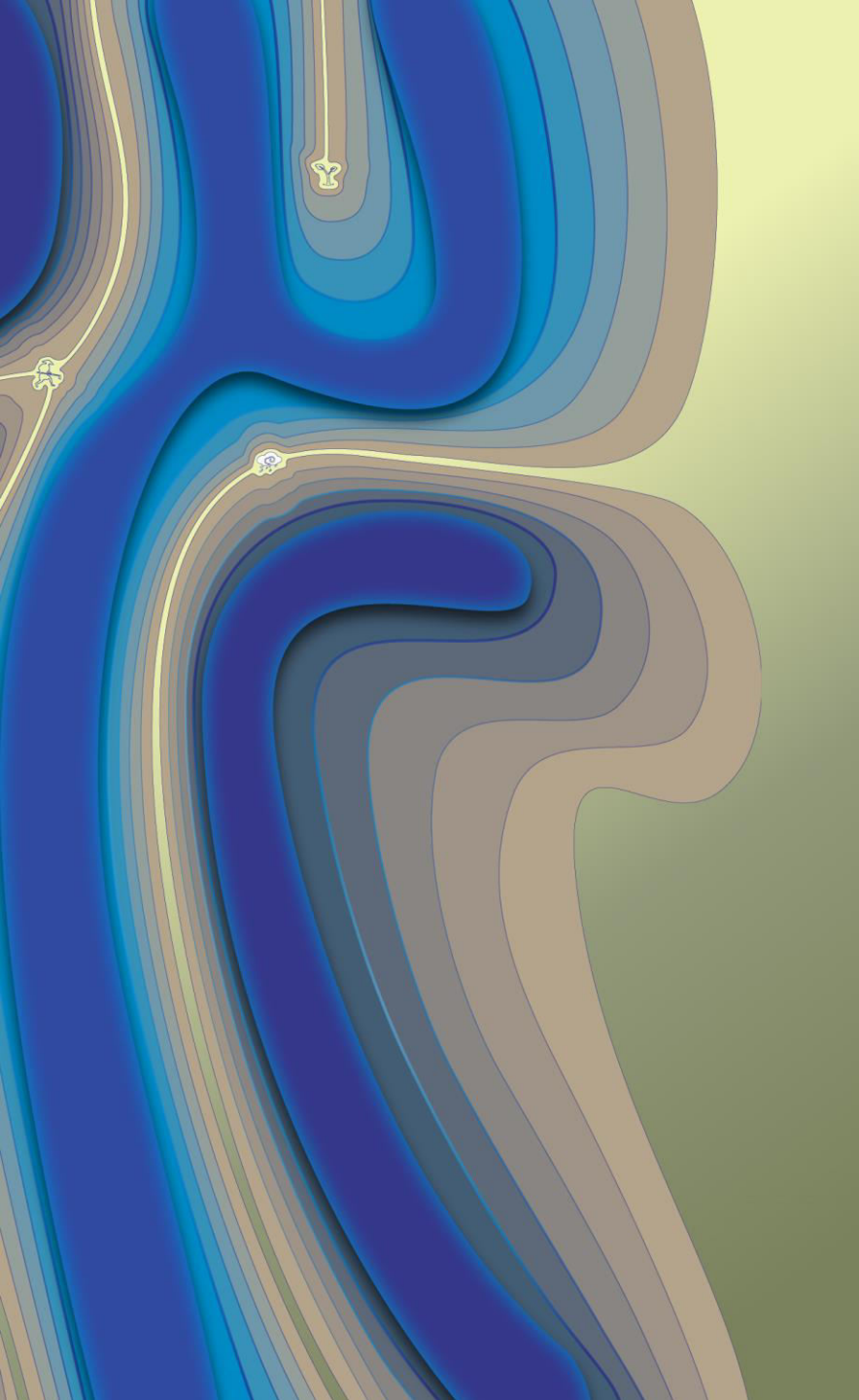


trends & Implications

Implications:

- It is impossible to entirely eliminate the risk from flooding: accepted risk.
- Every flood risk scenario is different: there is no flood management blueprint.
- Designs for flood management must be able to cope with a changing and uncertain future.
- An integrated strategy requires the use of both structural and non-structural measures: diverse strategies.
- Tradeoff : good metrics for “getting the balance right” for sustainable development.





Thanks