Academy

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Enabling Delta Life

# Flood Risk Management: general concepts

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## Flood risk management

Managing flood risk

Management = to *handle*, to *deal with* (not: to control, to reduce, to …)

Historical development (in developed world)

- from flood defense,
- via flood control,
- to flood management,
- to flood *risk* management

So manage risk, not floods!



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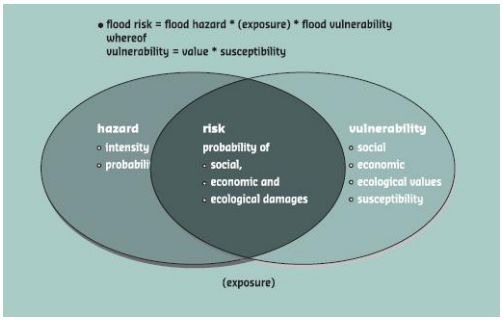
## Flood risk and its components



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## Without people no risk!

Hazard = potential to harm

you need something which can be harmed, i.e. something of value

- People
- Property
- Natural and cultural values



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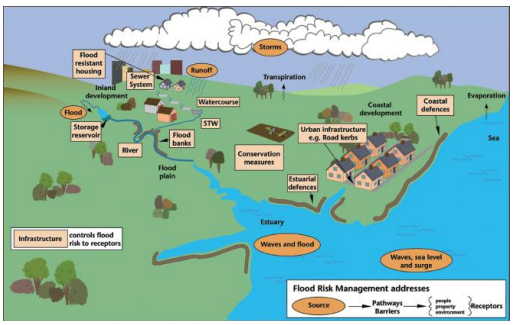
## Points of attack for management



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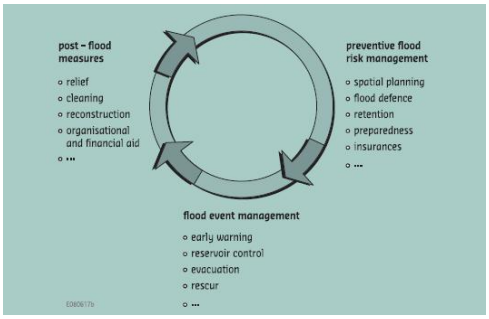
## Stages of attacfk for management: a cycle



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## Recurrent issue

Is Flood Risk Analysis part of Flood Risk Management?
or does it precede FRM?

Academic question, but be explicit about it!

Management without sound analysis is impossible: you need to define the key points of attack for your management actions



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## Flood risk management: what can we do?

Goal: reduce risk
- probability
- exposure
- vulnerabily

By means of:
- technical/ structural measures
- policy instruments



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## Focus on hazard/ probability

| goal | aim | character | name |
|---|---|---|---|
| flood probability reduction | 'flood abatement' or flood prevention | physical measures | ▪ conservation tillage<br>▪ dams/reservoirs<br>▪ reforestation<br>▪ restoring meanders in brooks and rivers<br>▪ retention in upstream catchment<br>▪ retention of water in cities<br>▪ wave breakers |
| | | regulatory instruments | ▪ wetlands conservation/rehabilitation<br>▪ coastal wetland protection |
| | Flood defence & control | physical measures | ▪ embankment construction/strengthening<br>▪ flood barrier<br>▪ mobile flood wall<br>▪ coastal sand supply<br>▪ bypasses<br>▪ connect rivers to existing lakes<br>▪ dredging rivers<br>▪ embankment relocation/realignment<br>▪ floodplain lowering<br>▪ removing obstacles to lower hydraulic roughness<br>▪ river bed widening |



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## Technical measures to reduce flood probability



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## Focus on exposure/ vulnerability

| | | | |
|---|---|---|---|
| flood impact reduction | control of flood patterns | physical measures | ▪ compartmentalisation of areas<br>▪ detention areas/calamity polders<br>▪ floodway<br>▪ ring dikes along villages/cities<br>▪ mounds |
| | adaptation & regulation of use of flood - prone area | physical measures | ▪ flood proofing |
| | | regulatory instruments | ▪ building restrictions<br>▪ land use zoning<br>▪ regulations on storage of toxics / chemicals<br>▪ adaptation of recreation functions<br>▪ adaptation of agricultural practices |
| | | financial instruments | ▪ fines for damage increasing behaviour<br>▪ subsidies for flood proofing or other measures |
| | distribution of flood impacts | financial instruments | ▪ damage compensation<br>▪ governmental relief funds<br>▪ insurances |
| | preparedness | communicative instruments | ▪ crisis management<br>▪ education of inhabitants<br>▪ evacuation plans<br>▪ flood forecasting<br>▪ flood risk maps<br>▪ flood warning systems<br>▪ radio/television information channel |



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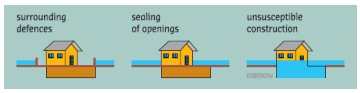
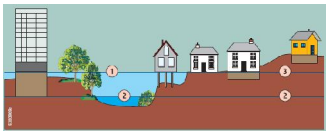
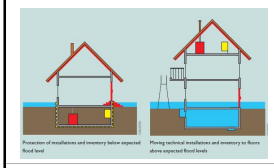
## Technical measures tot reduce vulnerability







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## Policy instruments

Three groups:
- Communicative (small talk)
- Financial (carrot)
- Regulatory (stick)

Try to persuade, stimulate or force

Aimed at 'other actors',
- not the decision maker or the engineers/buiders,
- but the landowners, the people (or 'lower' authorities)

When to apply?
- always in connection to physical measures,
- sometimes seperately effective



## EU 'Floods Directive': make a plan!

**Flood risk management plans (Article 7)**
Flood risk management plans are to be developed and implemented at river basin or sub-basin level to reduce and manage the flood risk where identified as necessary in the preliminary flood risk assessment. These plans are to focus on the reduction of potential adverse consequences of flooding for human health, the environment, cultural heritage and economic activity, and, if considered appropriate, with non-structural initiatives and/or on the reduction of the likelihood of flooding. They are to address all phases of the flood risk management cycle but focus particularly on:

- Prevention (i.e. preventing damage caused by floods by avoiding construction of houses and industries in present and future flood-prone areas or by adapting future developments to the risk of flooding),
- Protection (i.e. taking measures to reduce the likelihood of floods and/or the impact of floods in a specific location such as restoring flood plains and wetlands) and
- Preparedness (e.g. providing instructions to the public on what to do in the event of flooding).



## How to decide what to do?

Knowing what *could* be done does not solve the question what *should* be done.

We need criteria, e.g. on:
- Effectiveness (what works best?)
- Cost-effectiveness (what works best at the lowest costs?)
- Cost-benefit analysis (what yields more than it costs?)
- Societal cost-benefit analysis (all societal 'costs' and 'benefits')
- Full 'sustainability assessment' (also other criteria than efficiency, such as solidarity, long term ecological effects, quality of the living environment, etc.)



## The ultimate goal of FRM

Reduce the flood risk to a (societally) acceptable level
- Economic damage
- Fatalities
- Number of affected people
- Ecological/ cultural damage

At (societally) acceptable costs
- Investment and maintenance costs
- Social side-effects ('people'/ social equity)
- Economic side-effects ('profit' or 'prosperity'/ economic efficiency))
- Ecological and cultural heritage effects ('planet'/ ecological integrity)



## Way to proceed: a procedure for dedicated research