Deltares
Enabling Delta Life

Adaptive Water Management in the Netherlands

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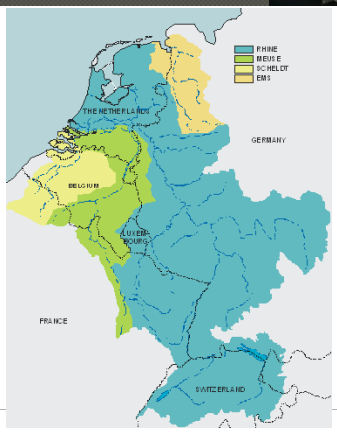
Deltares

Adelaide, 25 June 2012

The Netherlands: a delta with international rivers



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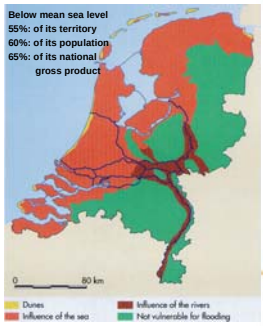
Flood control in the Netherlands



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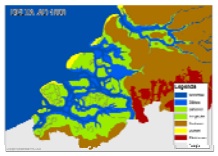
Age old struggle against water

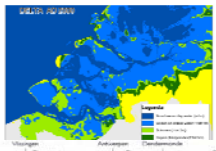
Example of flood risk increase (Dutch Delta)

Change in land surface above sea level

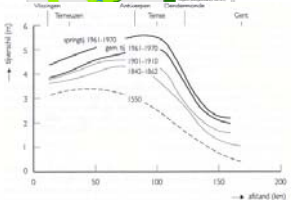
year 1000



year 2000



flood disaster in 1953



increasing water levels

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Wake up call: near flooding 1994 and 1995

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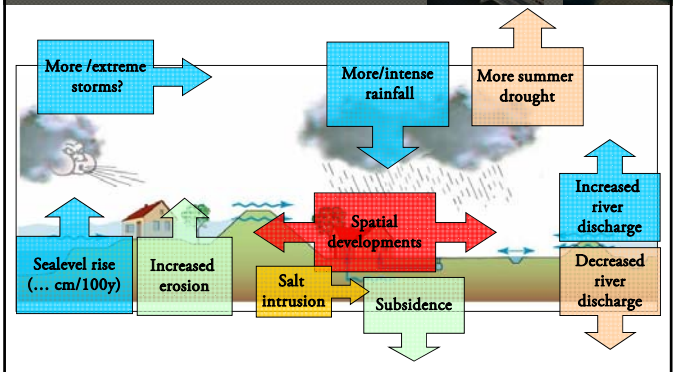
Wake-up call: Hurricane Katrina 2005

Drivers of change in the delta



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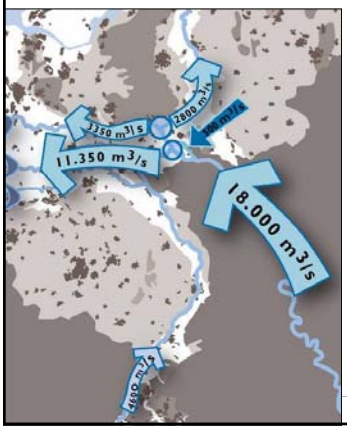
Higher peak river discharges expected



Summer:
1700 m³/s →
700 m³/s in 2100

Winter:
16.000 m³/s →
18.000 m³/s in 2100

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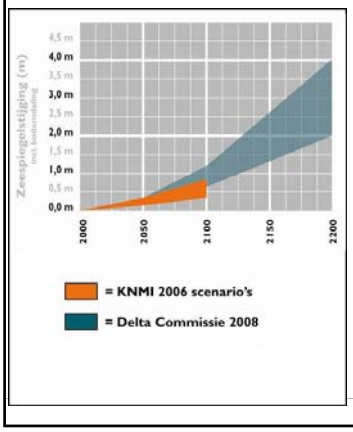
Accelerated sea level rise



Sea level rise:
2050: + 0.4 m
2100: + 0.65 up to + 1.30 m
2200: + 2 up to + 4 m

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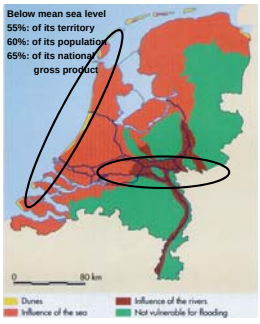
Best practices in the Netherlands

Room for the River Programme: 2.3 billion euros

Sand nourishment: 65 million euros/year

Sand engine: 70 million euros



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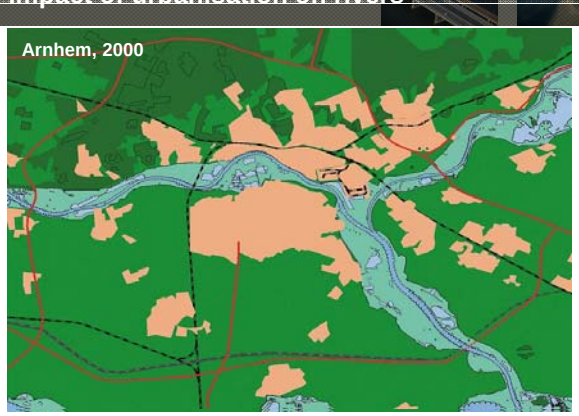
Impact of urbanisation on rivers



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Best practices: Room for the River

Objectives:

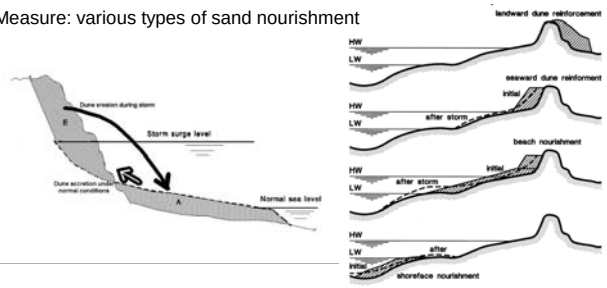
- Safety: accomodate 16.000 m3/s without flooding
- Enhance nature, landscape amenity, transport over water

Selection of 700 local measures (consisting of 8 measure types);
Planning Kit (DSS) prepared by scientists, used by locals

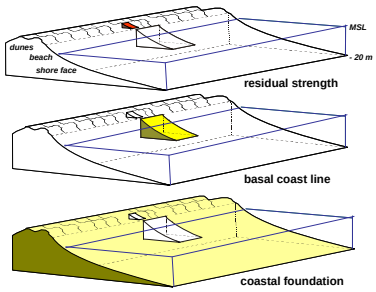
Best practices: Sand nourishment / sand engine

Objectives:
1. Guarantee safety from flooding (dune strength)
2. Maintain coastline position of 1990
3. Preserve coastal foundation

Measure: various types of sand nourishment



Coastline management in 3 scale levels



Days / metres

Years / km

Century / 10-100 km

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Sand Engine: mega-nourishment for 20 years

Sand redistribution by nature itself
- Less disturbance of sea floor from dredging
- Recreational space
- Nature development

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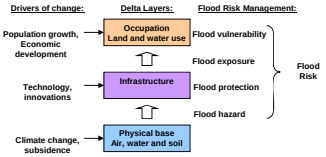
Some theoretical background

Simple Delta model:

Applied to flood risk management:



Flood risk = Hazard x Vulnerability x Protection

Changes in flood risk = Σ(climate change, subsidence, pop.growth, econ. development)

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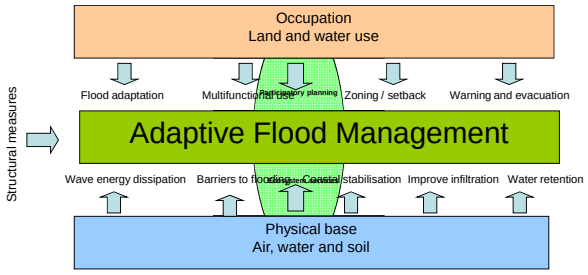
Theory of Green Water Defense



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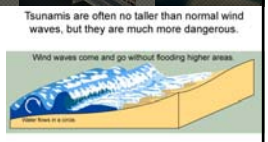
The Hazards

Coastal floods
- Storm surges and typhoons
- Tidal waves
- Tsunamis

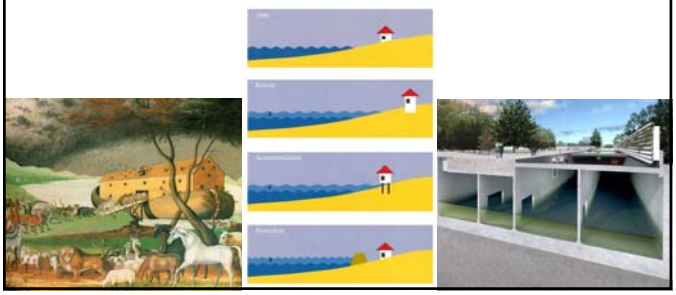
Fluvial floods
- Mainstream
- Flash floods

Pluvial floods
- Heavy rainfall
- Bad performance of drainage system

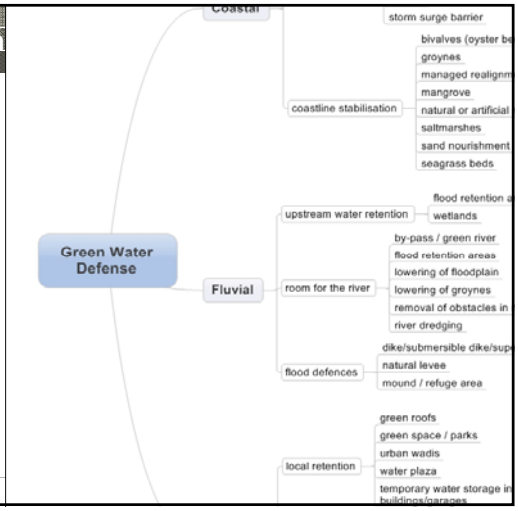


Non-structural measures (planning etc.)

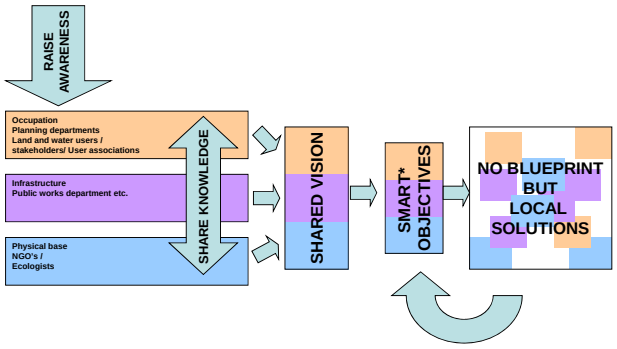
1. Flood adaptation
2. Zoning and coastal setback lines
3. Multifunctional use of infrastructure
4. Warning and evacuation



List of m



Lessons learned



*: SMART = Specific, Measurable, Acceptable, Realistic and Time-bound

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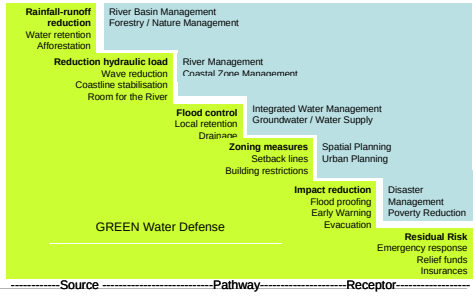
The GREEN Water Defense Cascade

- shows measures from upstream to downstream
- can be used for priority setting: prevention / mitigation / compensation
- mainstreaming: shows corresponding policy and management domains



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Conclusions Adaptive Flood Management…

- is **feasible and effective**, can be **cheaper** than traditional solutions, and is often more **cost-efficient** because it serves multiple purposes
- is a **paradigm shift** (soft versus hard engineering), requires flexibility in thought
- is more **adaptive**, but has also more uncertainty in end result (non-linearity in ecosystem services)
- is **soft** when possible, **hard** when required
- makes use of the **genius of the place**: best practices are not easily transplanted, requires tailor made approach

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Recommendations

- Use the GREEN Water Cascade for mainstreaming with other policy and management domains.
- Start a dialogue between: planning departments, land and water users in the occupation layer, public works and other infrastructure departments in the network layer and environmental departments, ecologists and NGO's in the base layer.
- Build a knowledge base and communities of practice – both internationally and locally – to promote a better flow of knowledge.
- Develop guiding principles, promote education and training and organise design workshops.
- Implement pilot projects as experiment sites to gain further knowledge and to learn from the field.

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