



Ministerie van Verkeer en Waterstaat

Integrated River Basin Management and Climate Change Adaptation in the Netherlands

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26 March, 2009



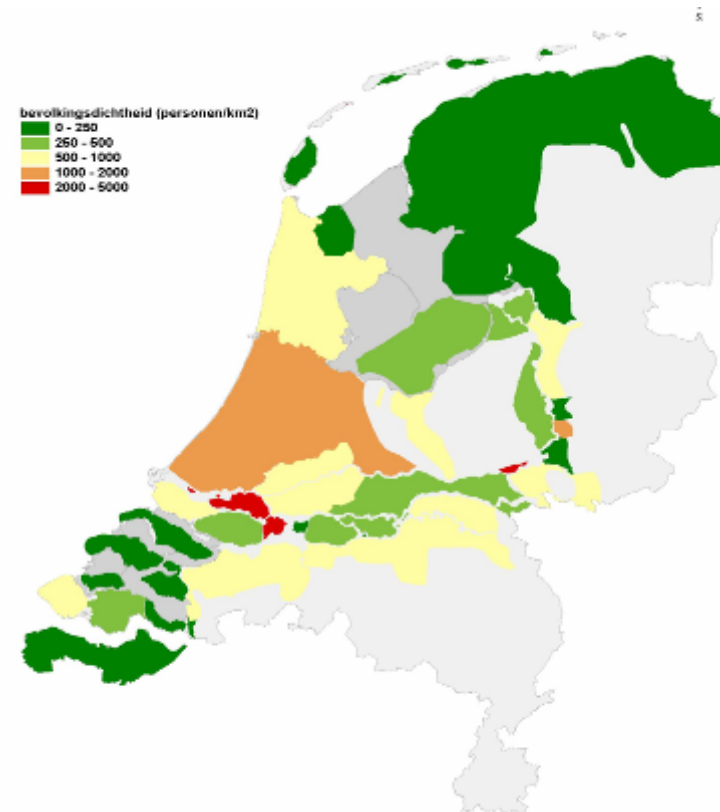
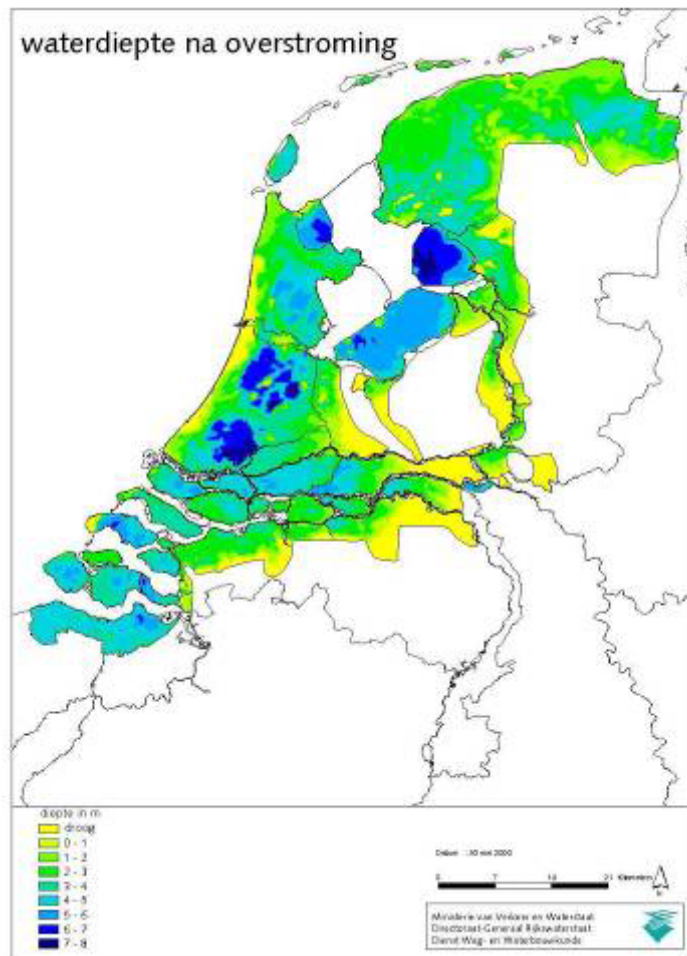
1 The Netherlands as river-delta



About 600 km of rivers
International catchments
About 350 km coastline
About 9 million inhabitants below flood level
Invested value 1800 10^9 euro, 65% of GNP
Safety level: 1:10.000 – 1:1250
3500 km of flood defences, hundreds of locks, sluices, pumping stations



Flood prone and densely populated





River Rhine

Catchment: 185.000 km²

Length: 1320 km

4 countries

melt- and rainwater

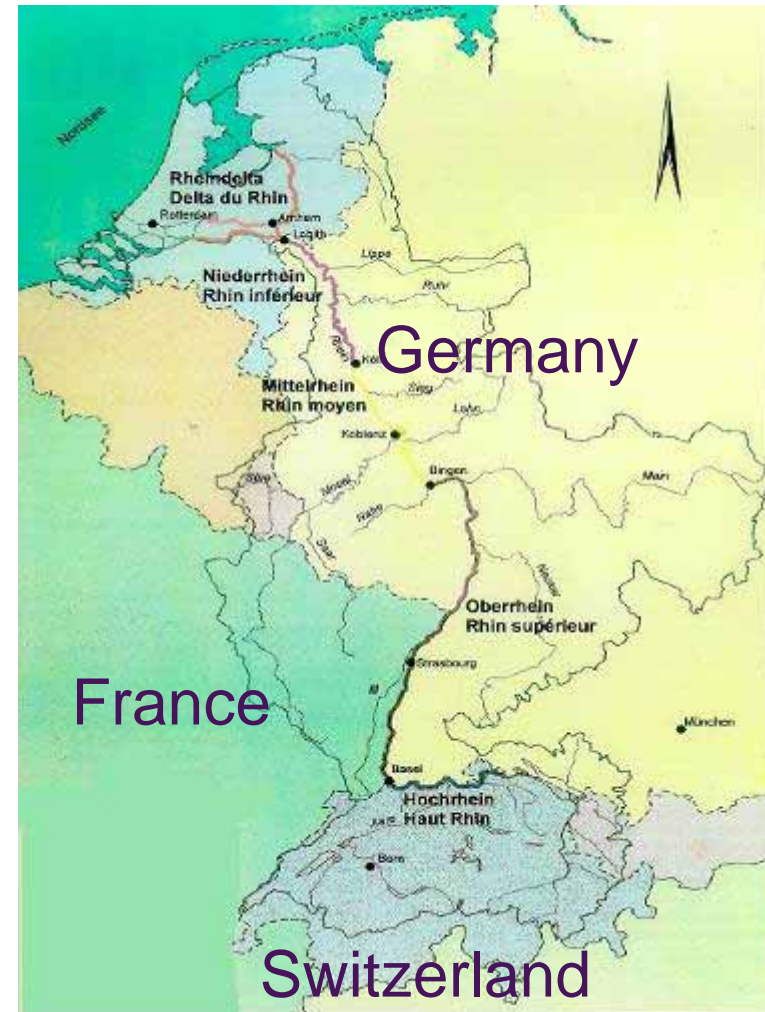
Precipitation: 700 –1200 mm /y

Q_{Min} : about 700 m³/s

Q_{Av} : about 2.200 m³/s

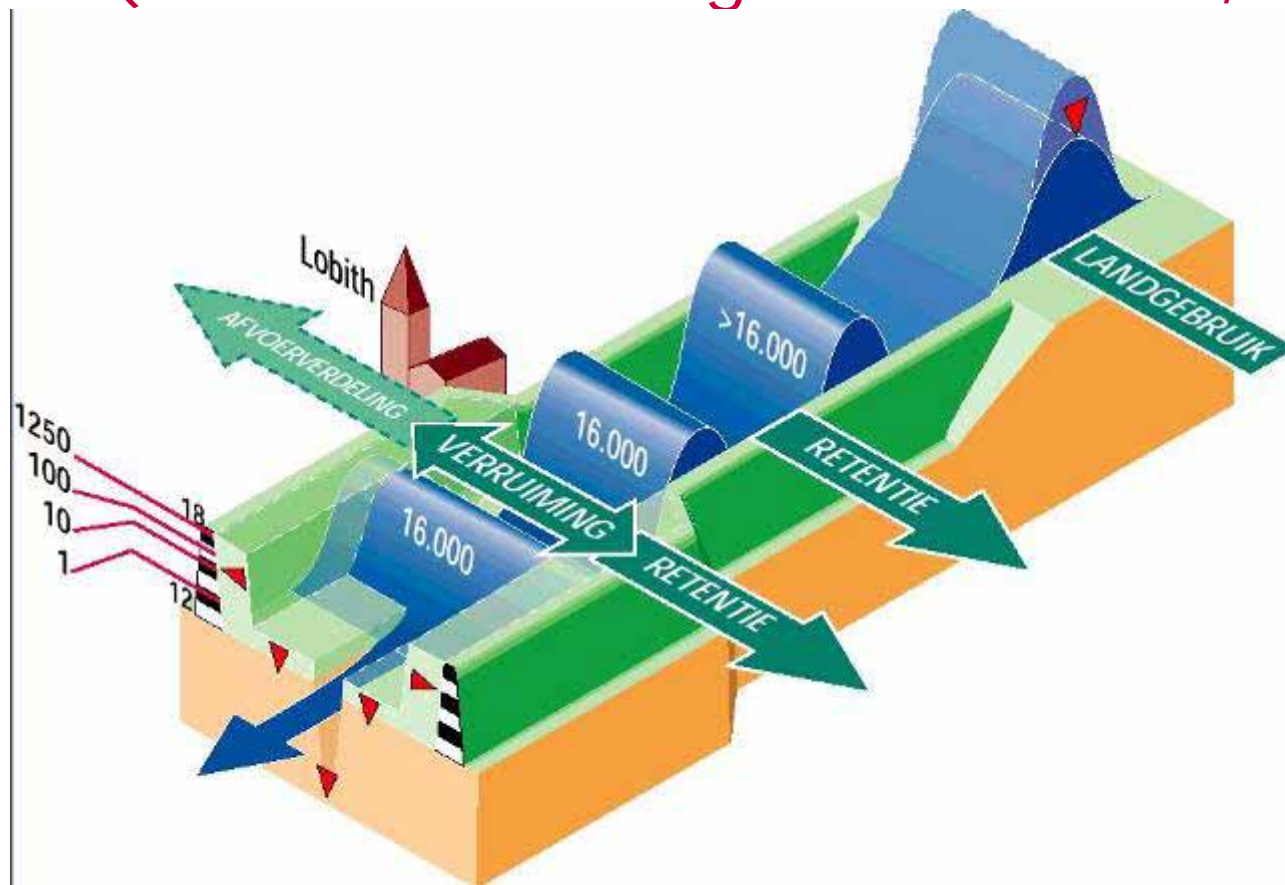
Q_{Max} : about 12.000 m³/s

Q_{Design} (1/1250): 16.000 m³/s
(→ 18.000?)





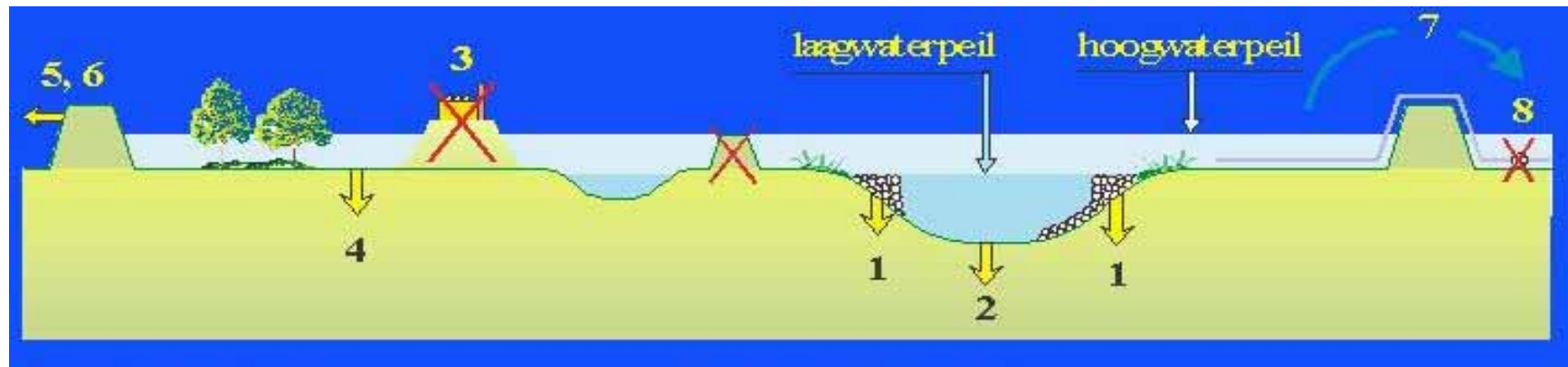
Specific measures in specific parts of the catchment (Flood Action Programme Rhine, 1998)



- Upstream:
retainment, land use
- Middle sections:
Temporary storage in
detention areas
- Downstream sections:
Increase the discharge
capacity



Room for the River, possible measures

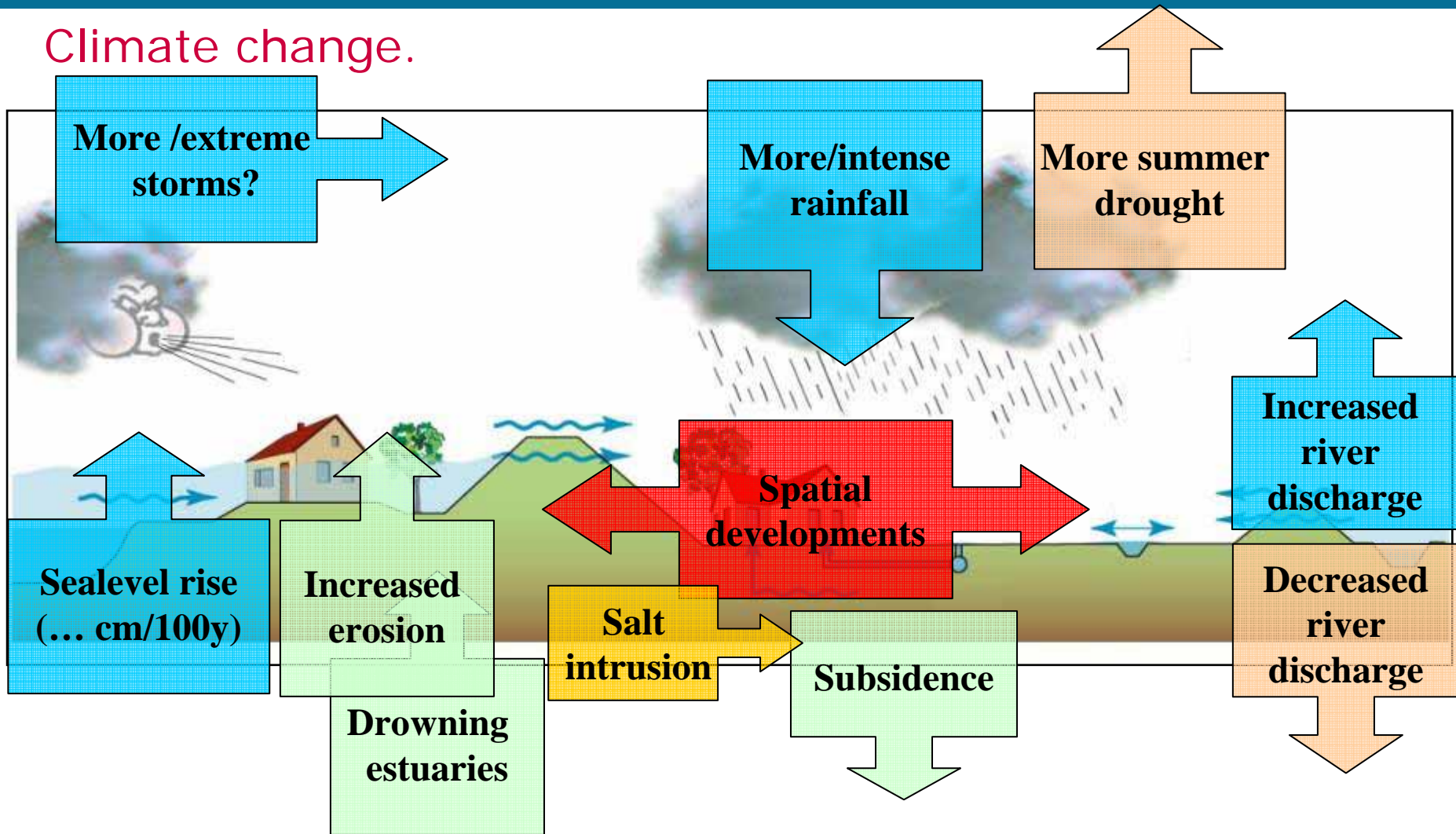


- 1,2 Groyne lowering, channel deepening
- 3 Removal of obstacles
- 4 Floodplain lowering
- 5,6 Dike enforcement / relocation
- 7 Retention
- 8 Reduce inflow from tributaries





Climate change.



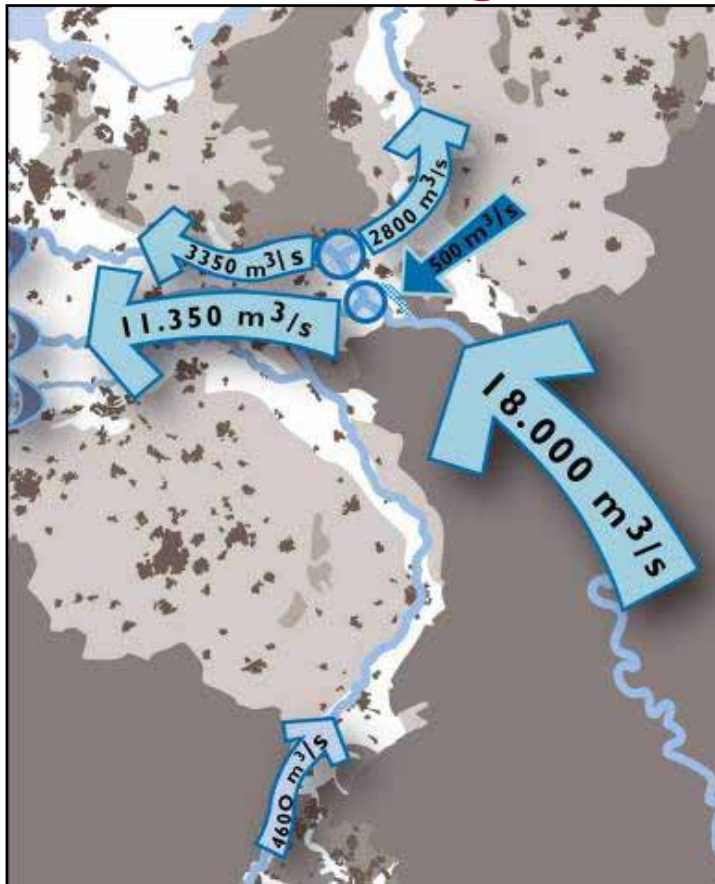


2. Delta Committee (sept'07-'08)

- Advice on protecting the coast and the entire low lying part of the Netherlands against the consequences of climate change on a time scale of 2100 –2200 (floods and fresh water supply)
- Interaction with rivers
- Wider scope than only safety, multifunctional approach
- Independent, established by Cabinet



River discharge in 2100



Summer:

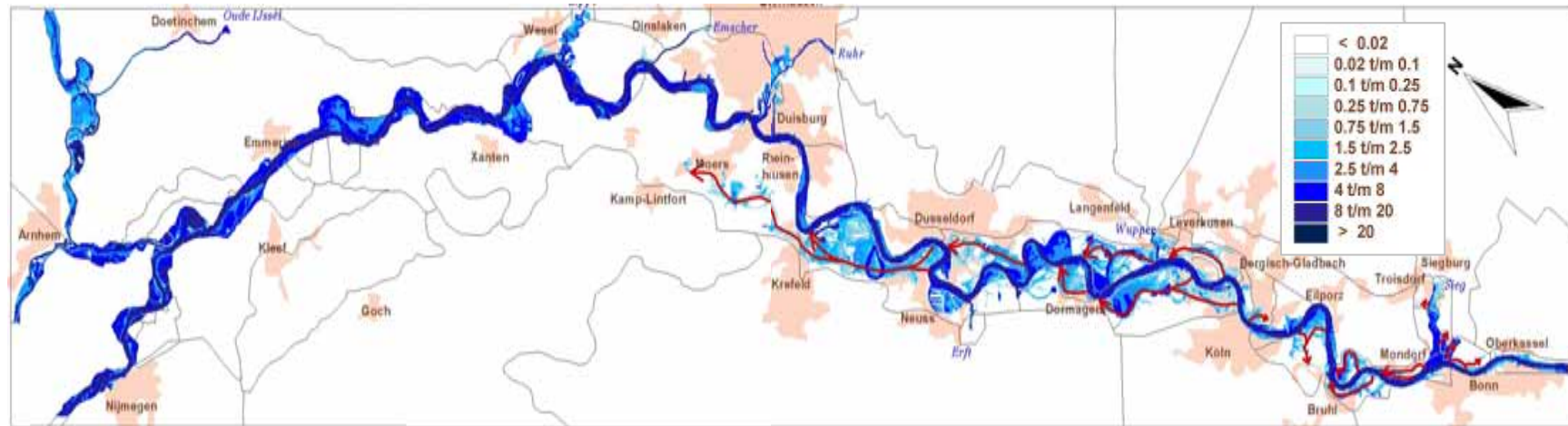
1700 m³/s → 700 m³/s

Winter:

16.000 m³/s → 18.000 m³/s (20.000?)



International cooperation



Floods in Germany

EU directive on Assessment and Management of Flood Risk (2007)

- Solidarity among downstream and upstream states
- Flood maps (2013) and Flood risk management plans (2015) → Internat. Rhine Commission



FRM objectives, examples from river Rhine ('98)

- Reduction of flood risk with 10% in 2005 and 25% in 2020
- Reduction of extreme flood levels with 30 cm in 2005 and 70 cm in 2020
- Increased flood risk awareness by publication of flood risk maps of 50% of flood prone areas in 2000 and 100% in 2005
- Improved early warning system, resulting in increased flood prediction time by 50% in 2000 and 100% in 2005



A vision, basic elements

- We stay in the (floodprone) part of the Netherlands,
- Safety against flooding based on risk management and wider scoped than damage
- Solidarity among inhabitants and generations
- Work with natural processes (“building with nature”), watersystem approach
- Uncertain future → scenario’s not as design criteria, “corner flags” → flexible strategy (“No regret”, framework, no blueprint)
- Multifunctional design of measures



Avoid uncontrollable breaches and long/deep flooding → Failure-proof dikes, by height, width or internal construction. Tailor-made design and implementation.



Costs



< 2050:
1,2 tot 1,6 billion euro /yr

2050 – 2100:
0,9 tot 1,5 billion euro /yr

(0.5 % of GNP)



Prerequisites for future-proof implementation

- Ministerial steering committee, chaired by PM
- Delta Director, supervising adequate execution
- Regional administrators, responsible for implementation and execution
- Deltafund, supplied by natural gas revenues and long-term loans
- Delta Act, anchoring Delta-director, programme and fund



“Working together with water”

- The Netherlands can be kept a safe and good place to live the next centuries, even under worst case climate change scenarios.
- (structural) adaptation costs about 0.5% of GNP
- Flexible approach, start now with “no regret” (reservation of space, sand and money)
- Guarantee implementation → Delta-Act 2009!



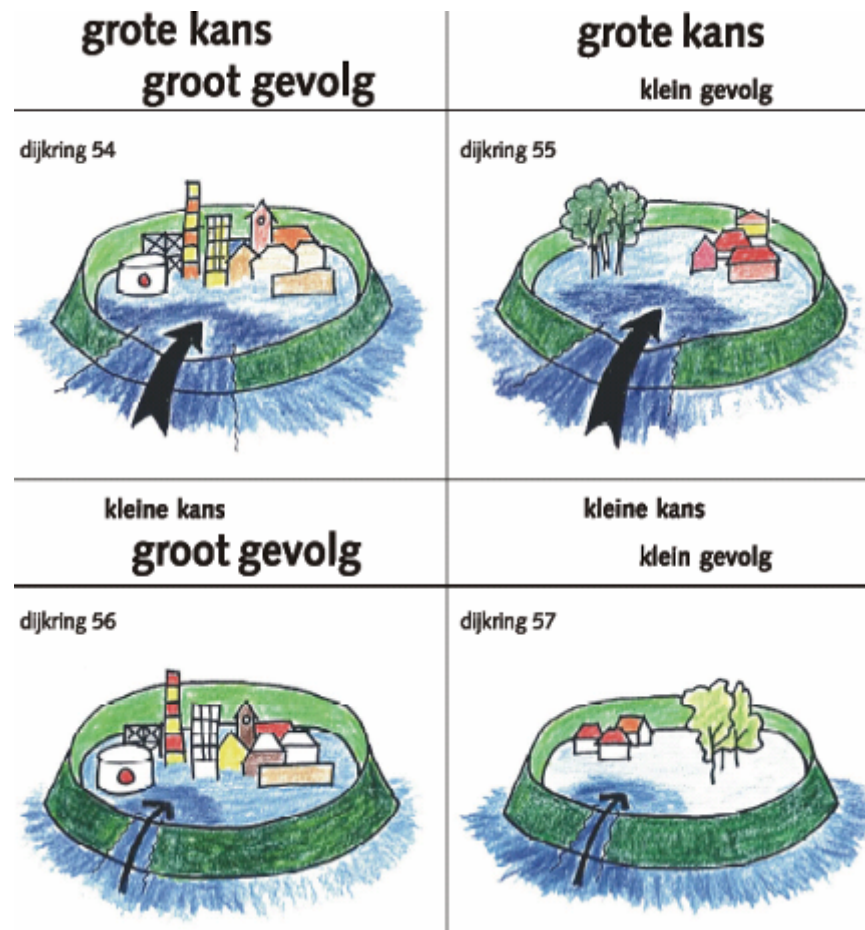
Thank you for your attention



www.deltacommissie.com

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Risk based approach



- Calculation of the **probability** of dike ring flooding
- Estimation of potential **damage** (as function of flood depth)
- Calculation of **flood risk** ($p \times d$) per dike ring