The Netherlands Live with Water
A Paradigm Shift

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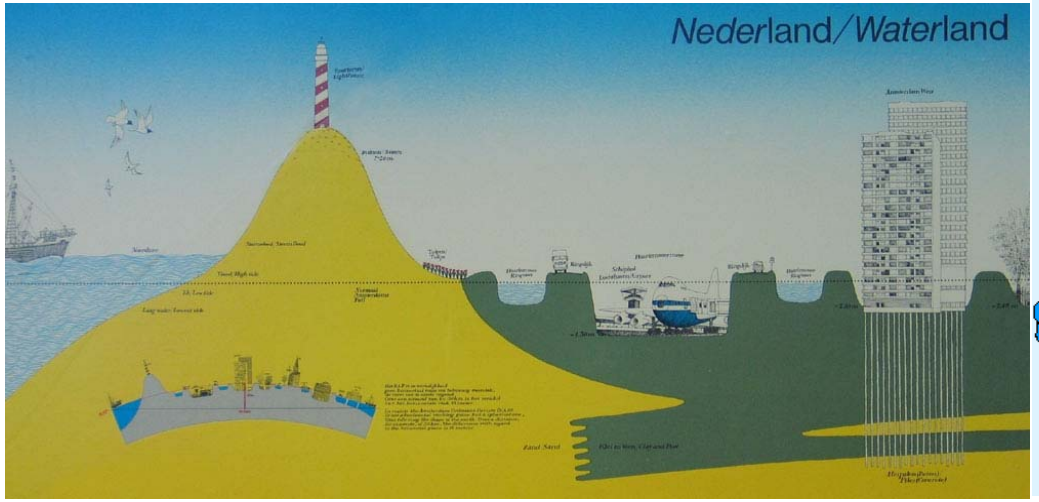
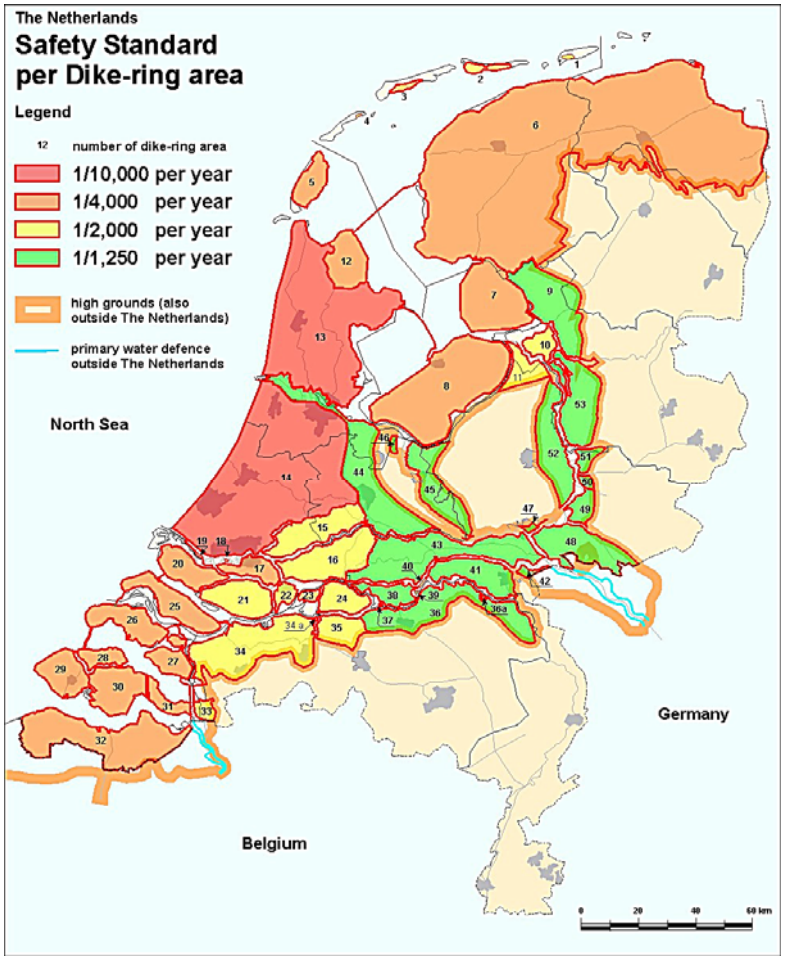
Introduction

- **Flood protection is vital for the Netherlands:**
- 60% of our country is threatened by floods
- 70% of our GNP (450 billion €) is threatened by floods
- large cities like Amsterdam and Rotterdam are below sea level



Flood protection structures (I)

- Approximately 2000 miles primary flood protection structures with legally prescribed safety standards
- Largely (90%) managed by water boards; maintenance costs (150 million €/year) are raised by local taxation
- Rijkswaterstaat manages large, complex and costly (100 million €/year) structures
- Secondary flood protection structures are the responsibility of provinces and water boards



Flood protection structures (II)

⇒ rural flooding ≠ urban flooding

⇒ evacuation not a local problem

Geredde inwoners van Wolphaartsdijk worden aan de Noorddijk aan wal gebracht.

Coastal management (I)

- Coastal management policy is based on holding the coastline of 1990 and compensating for sand losses in the foreshore
- Holding the line (in red) takes about 6 million m3 sand per year; compensating sand losses (in blue) in the foreshore about the same
- Rijkswaterstaat carries out a coastal management program of 12 million m3 per year (43 million €/year)
- If sea level rise increases from 20 to 70 cm/century, the nourishment volume increases from 12 to 30 million m3 per year

Coastal management (II)

- Coastal management is based on beach and foreshore nourishment

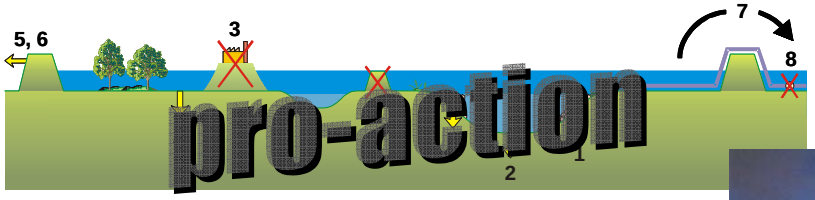
Coastal embankments

Typical crest level of 12-14 meters above MSL

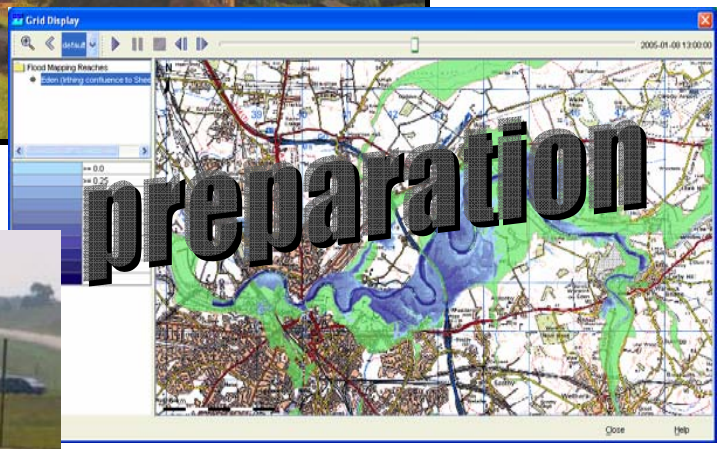
Reinforcing coastal embankments

- Continuous research and monitoring lead to new design codes
- Example: revetments of coastal embankments are being reconstructed (due to more knowledge of hydraulic loads and structural behavior)

LESSONS FROM KATRINA



1 - lowering of groynes
2 - deepening low flow channel
3 - removing hydraulic obstacles
4 - lowering flood plains
5 - locally setting back dikes
6 - large-scale dike setback
7 - detention reservoir
8 - reduction lateral inflow

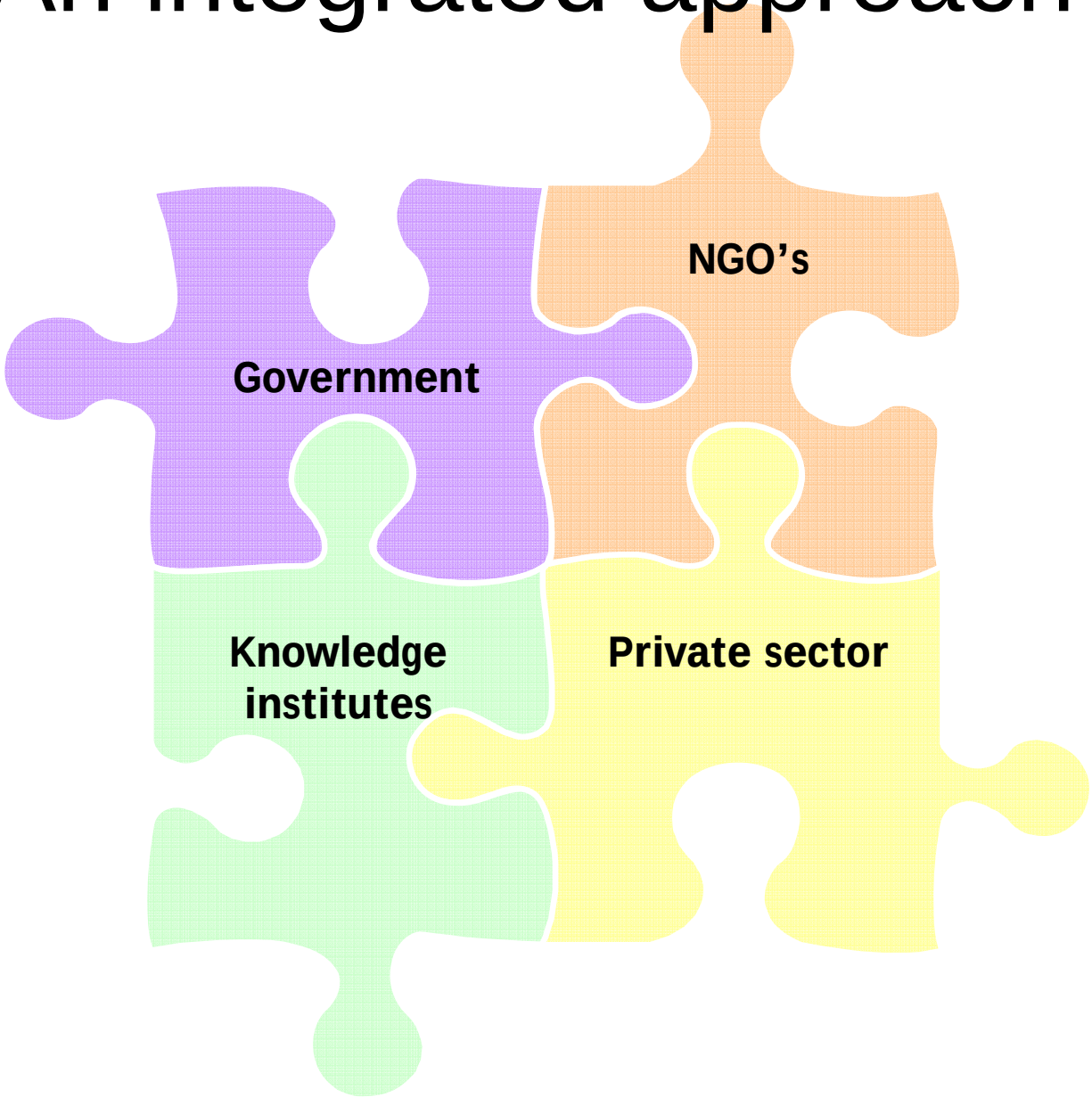


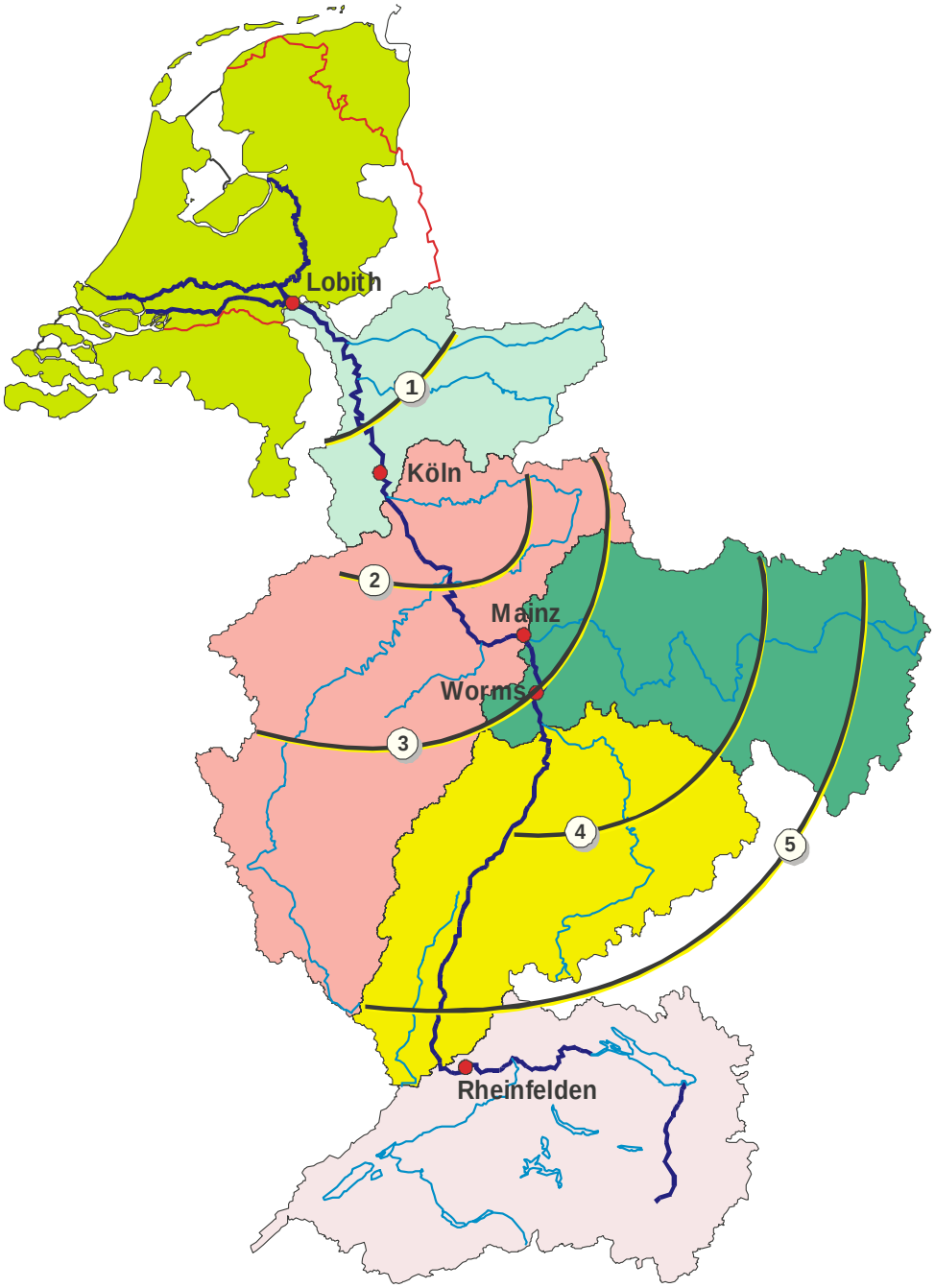
Consider the entire safety chain

The Netherlands and Louisiana

- Spatial planning is needed for integrated water management
- Comparable spatial issues
  - Rebuilding flooded area's is comparable with building in deep polders. Where to build, how to build? Which safety level?
- Time span is different

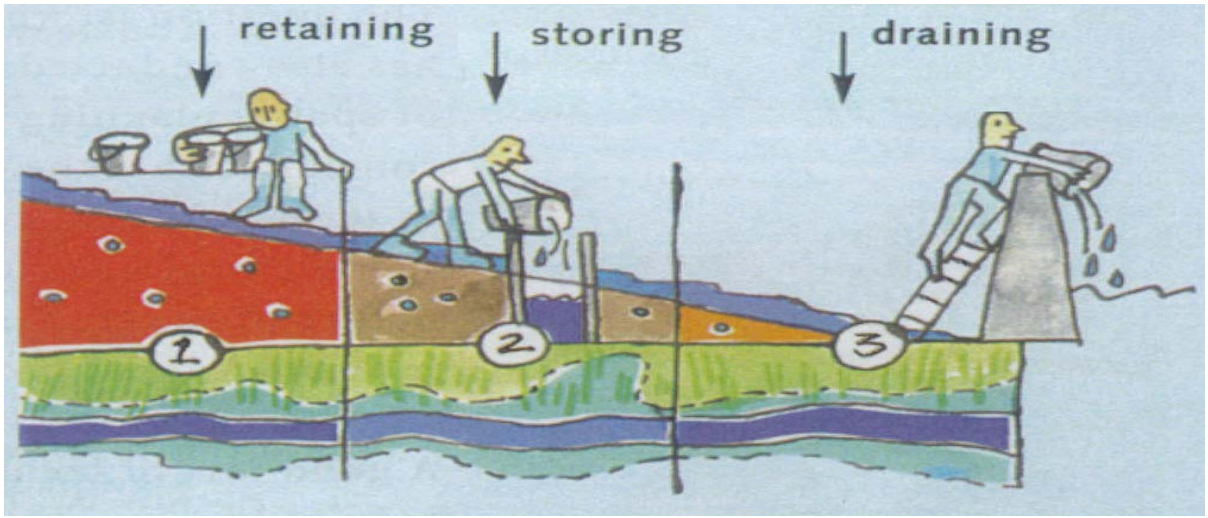
An integrated approach




Lobith
1
Köln
2
Mainz
Worms
3
4
5
Rheinfelden

An integrated approach: How to get there?

- Policy
  - More space for **retaining**, **storing** and **draining** of water
    Examples are: room for rivers

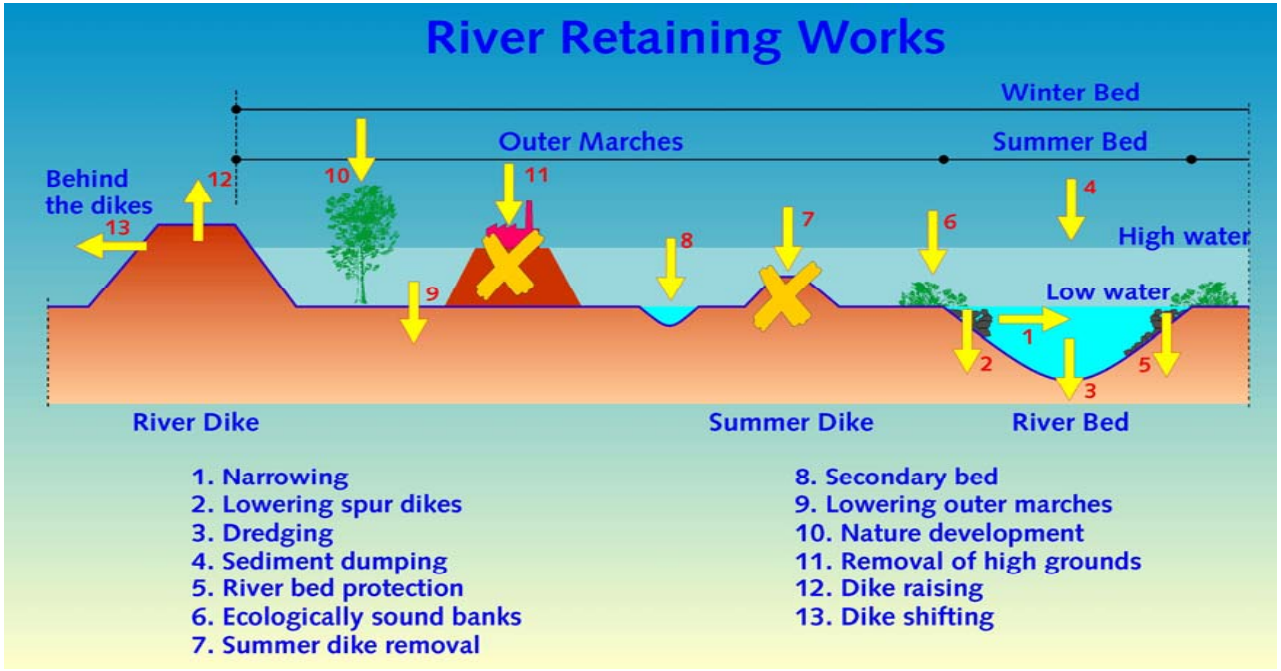


  - Water (level) is leading for spatial planning

River management

- Increasing design discharges would lead to another heightening and reinforcement of river embankments
- Widening, deepening and smoothening the river bed accommodate increased discharges

Project costs for the ministry are €2,4 billion. Future management and maintenance is not yet estimated

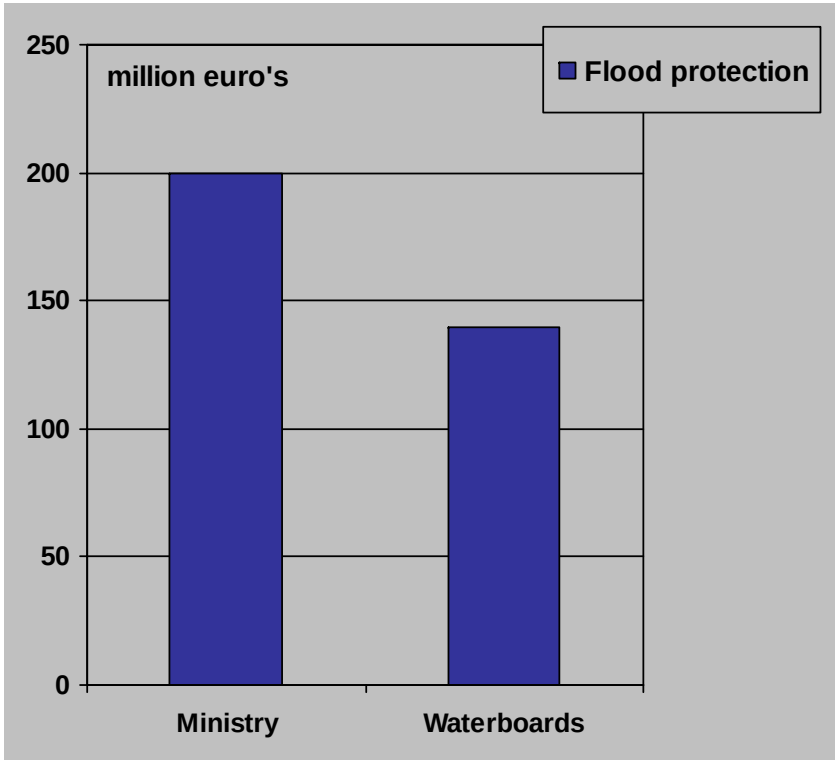


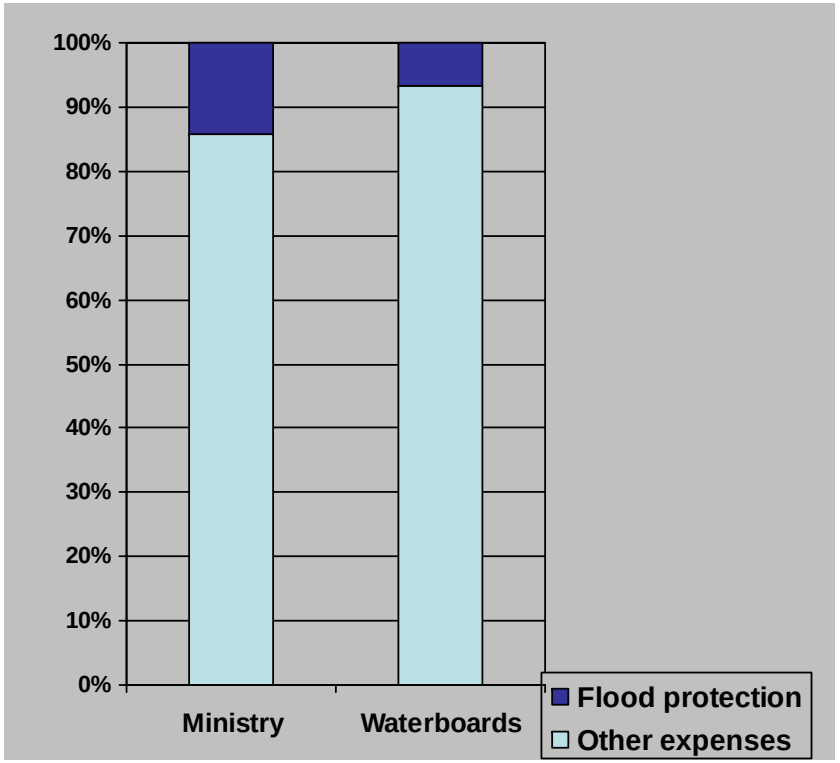
Information and Research

- Storm surge and flood warning services
- Guidelines for design and maintenance of flood protection structures
- Research program
- Largely financed by the Ministry: approximately €10 million/year

Finances in Flood Protection

Source: Water in Beeld (2004)





Water Boards

Water Boards

- Reasons for mergers

- • professionality (1953!)

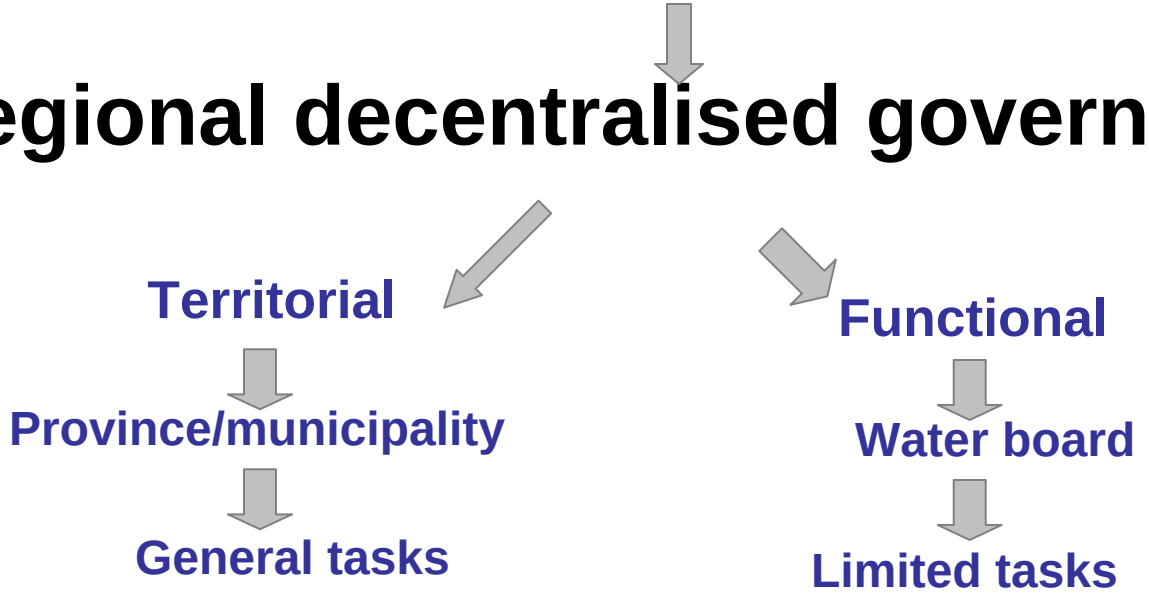
- • efficiency

- • new tasks

- • full dressed discussion partner

National Government

Regional decentralised governments



National Government

- Ministry of Transport, Public Works and Water Management
  - Directorate General Water
    - National policy on water management
  - Rijkswaterstaat
    - Rijkswaterstaat executes the national policy, maintains a knowledge infrastructure.
    - Rijkswaterstaat maintains water infrastructures
- Other Ministries (internal affairs, land use and zoning etc.) are also involved in water management

Lessons we learned

- **Sustainable flood defenses ask for harmonization with naturel and the goods and services of water**
- **Separation of water systems and reduced natural water exchange diminishes resilience for safety and ecology**
- **The best solution would be an open system with large barriers and culverts not disturbing daily natural dynamics**
- **It is wise to keep raising public awareness on our living with water and flood risks.**
- **It is wise to anticipate and innovate in order to prevent floods in future**

Attention for Flood Protection is and will be a continuous process