Deltares
Enabling Delta Life

HKV LIJN IN WATER

Disaster management & Dealing with the response on flooding

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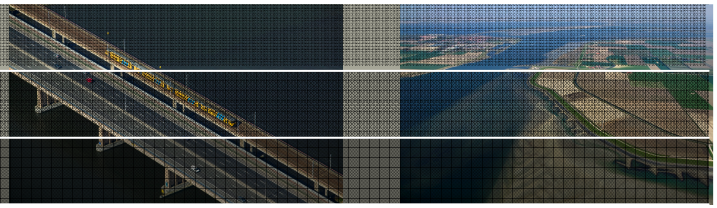
2010, May 25

Outline



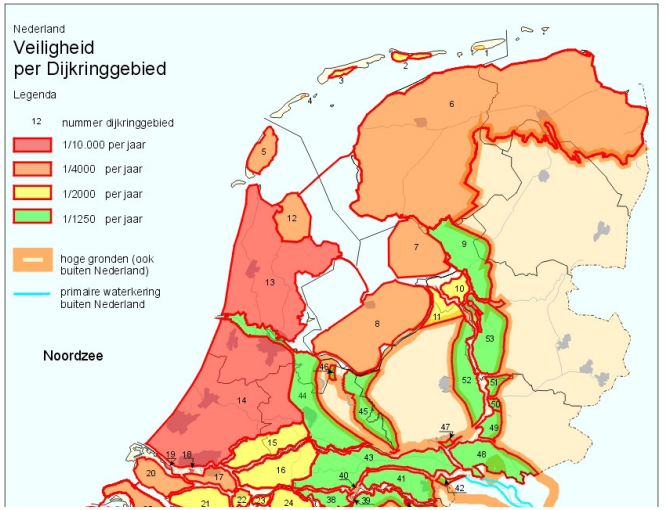
1. NL-Policy development
2. Chain of Safety
3. Lessons learned from TMO-Waterproef
4. Flooding scenario's and Human factors
5. Evacuation

The new approach to water safety: Complementing prevention with preparation

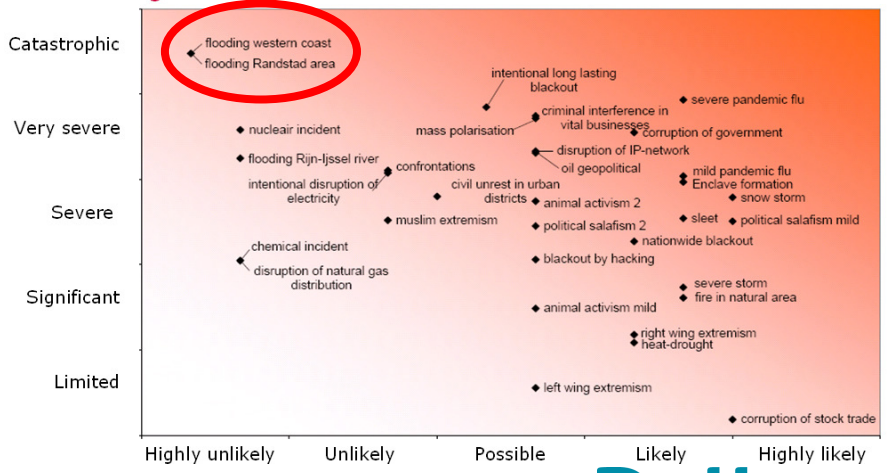
- Layer 1: Prevention of flooding; reduction of probability and consequences.
- Layer 2: Sustainable, flood proof spatial planning and building
- Layer 3: Emergency management, evacuation

Flooding in The Netherlands

1. International high safety level
2. Low probability, mass impact
3. Policy:
   - Spatial planning
   - Prevention (law)
   - Preparation (planning, forecasting)



Risk diagram



Largest Known Threat

Loss of life 0,1 – 1 %

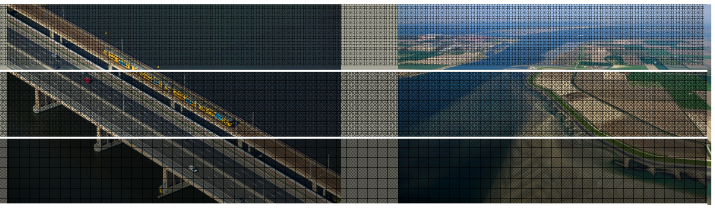
1953: Storm Surge Disaster

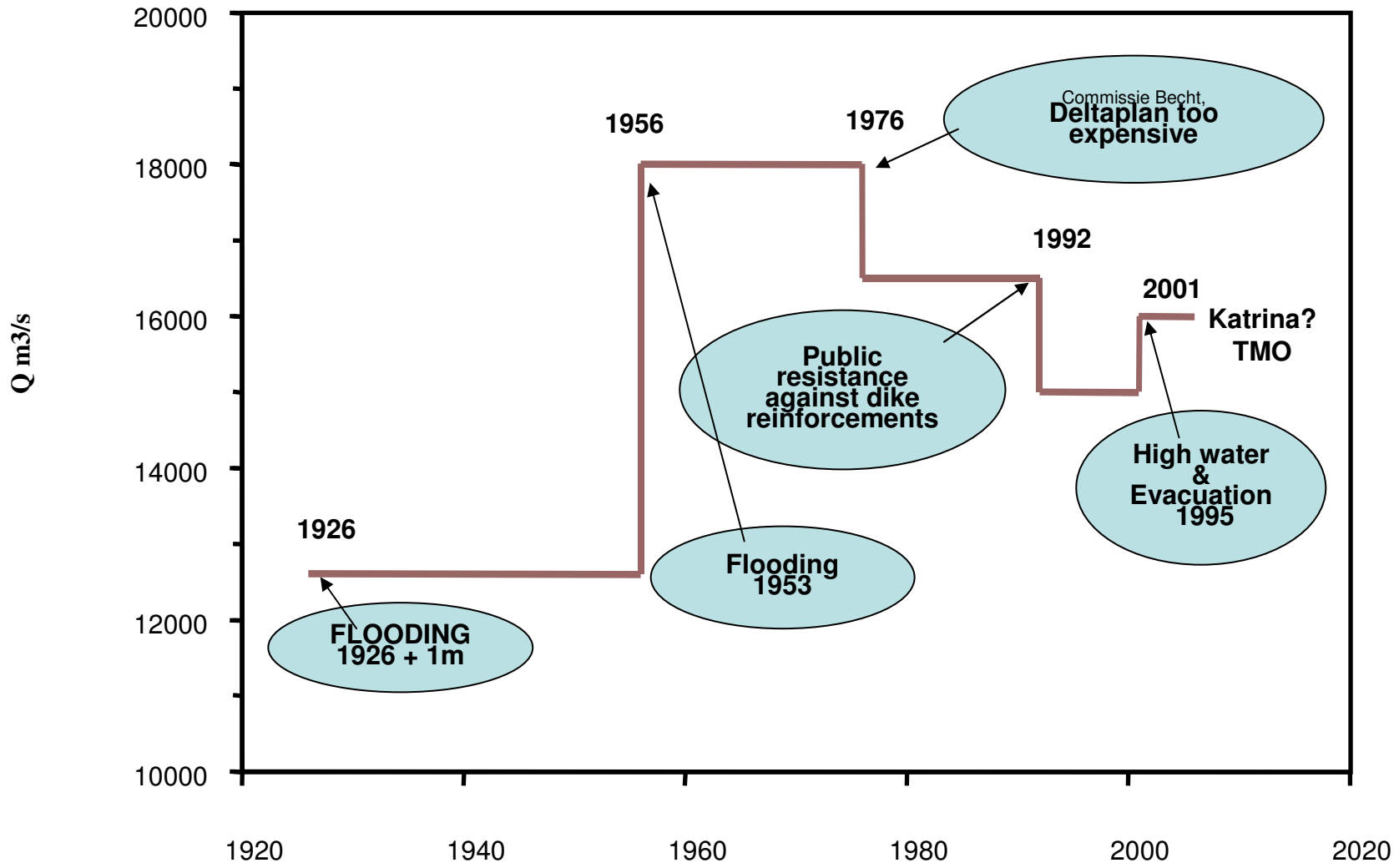
Substantial effects

Prevention measures & River Floods 1993/1995

Nightmare for professionals

Policy adaption



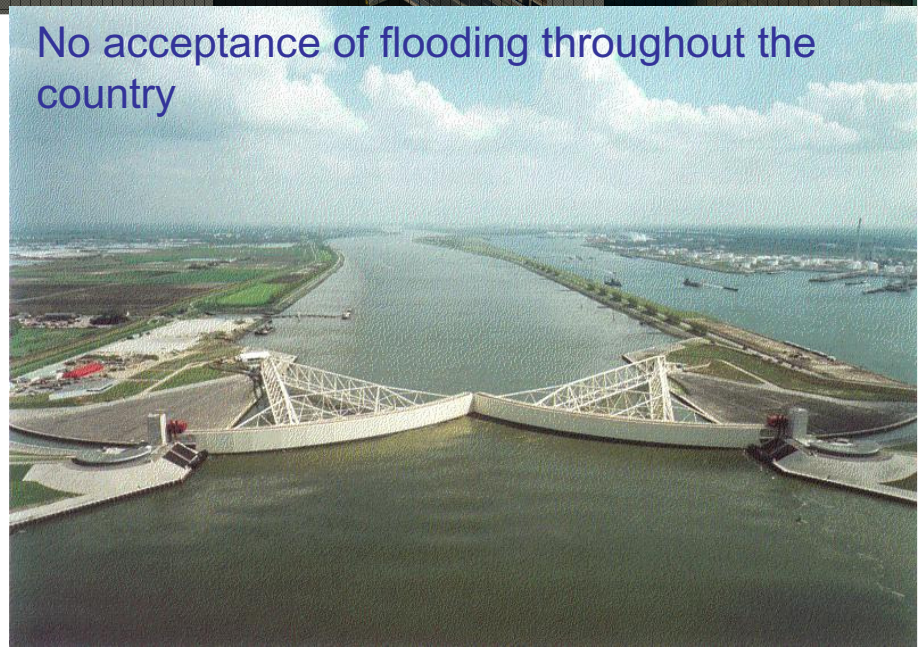


Change in society / values below Sealevel

Flooding was an integral part of living in the Dutch delta

←1953

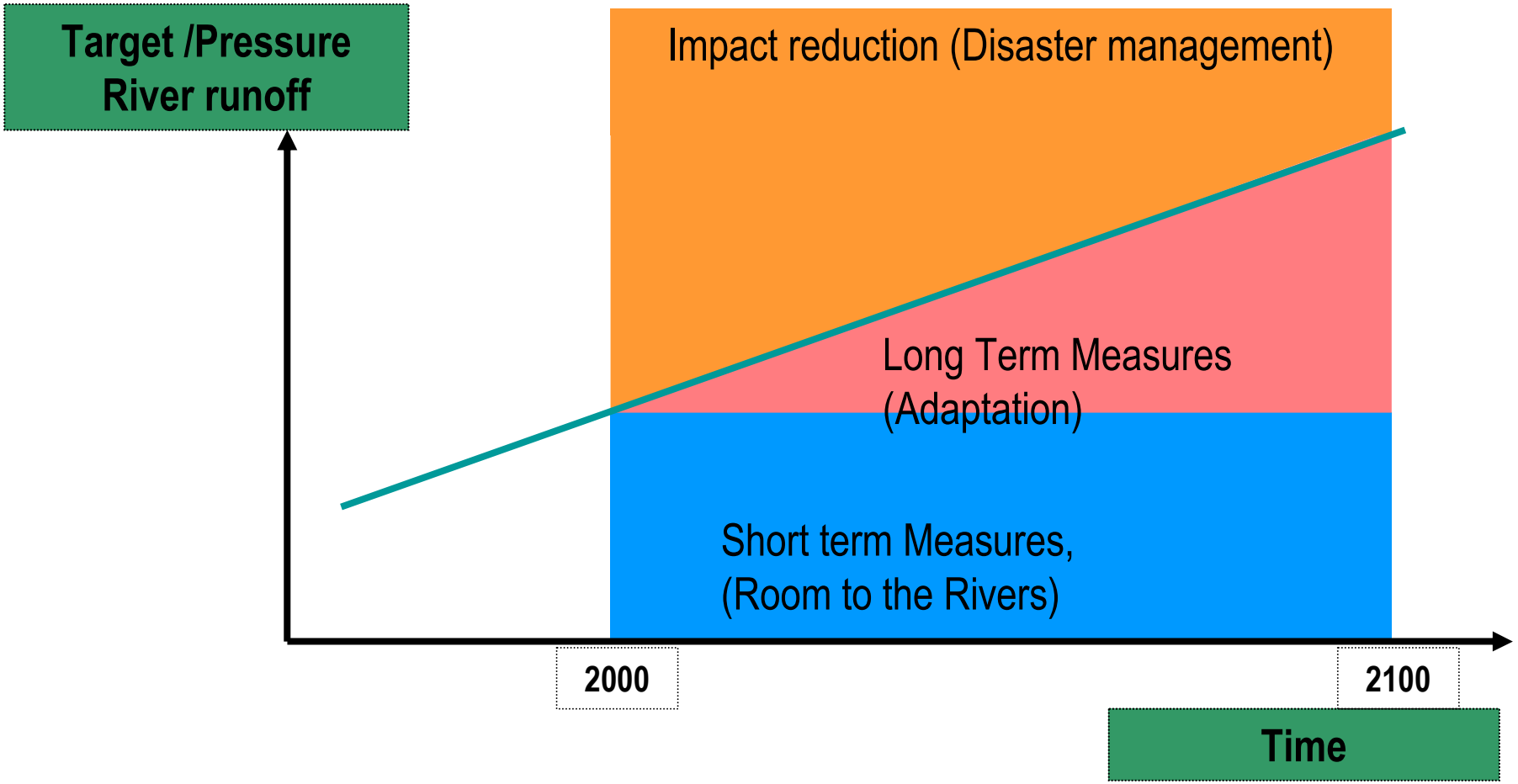
No acceptance of flooding throughout the country



1998→

De Nijverheidstraat. Het water is ongeveer 1 meter gezakt. Op deze foto ligt de roeiboot voor het huis van de familie Koolmees. Links daarvan, het eerste huis van het volgende blok woningen, werd bewoond door de familie C. Vogelenzang-de Jong.

Reduce Impacts of Flooding i.r.t. Climate change



Is there no better solution???

From flood prevention to risk management

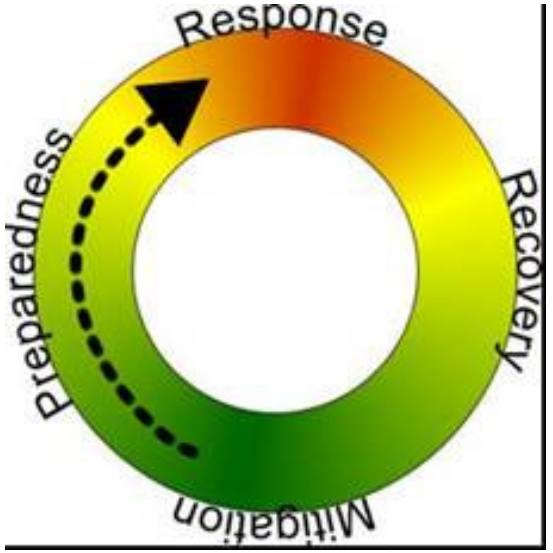
From risk awareness to creeping disaster?

- Flooding fades from the collective memory and so does risk awareness
- Failures of foresight + the element of surprise = disruption
- The political and social agenda

→ **Focus on Prevention can result in Mega-Crisis**

Chain of Safety

- Preparation: disaster management plans, exercising
- Response: stabilize/in controll of the incident/crisis, Evacuation
- Recovery: return to normal situation, responsibility for citizens effected, lessons learned
- Mitgration: Structural messures to prevent for this risk.



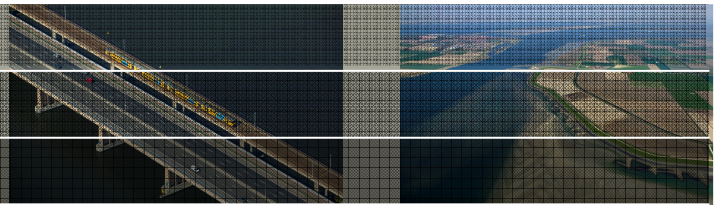
Disaster management in national exercise

TaskForce Management Overstromingen (TMO):
Planning and exercising a worst credible flooding

Best practices:

- Regionalization
- Flexibility
- Disaster planning over the past two years
  - > Increasing knowledge, risk awareness, preparedness and improved networks
  - > Exercise, exercise, ..Waterproef was a first step…

Disaster management



Challenges:

- Available time and early warning
- Lack of experience
- Bottom-up approach
- Working with scenario's
- Dealing with uncertainty:
  - > where and when storm surge hits the coast (affecting 3 million people, evacuation strategies)
  - > behaviour of citizens (self reliance, movement to the safest places,..)
  - > available infrastructure (evacuation road capacity, traffic jam..)
  - > anticipation of possible future effects
  - > Incorporating uncertainties into plans

Relevant Research Issues Identified

- Safety paradox
- Risk awareness
- Warning process as social process
- Bureaucratization of human factors
- Capabilities and capacity: evacuation…
- Dealing with uncertainty
- International cooperation

Knowledge input from US-Disaster institutes:

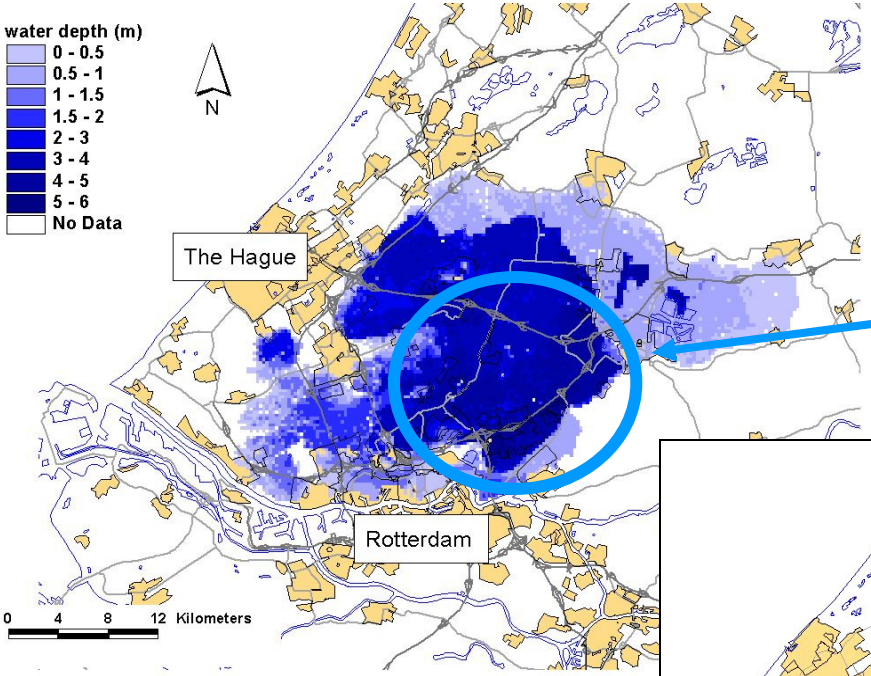
- DGW-Project NL-US Water Crisis Research Network (NUWCReN)

From Industry, Companies, R&D institutes:

- Project FloodControl 2015

Dutch Dilemma in coastal flooding

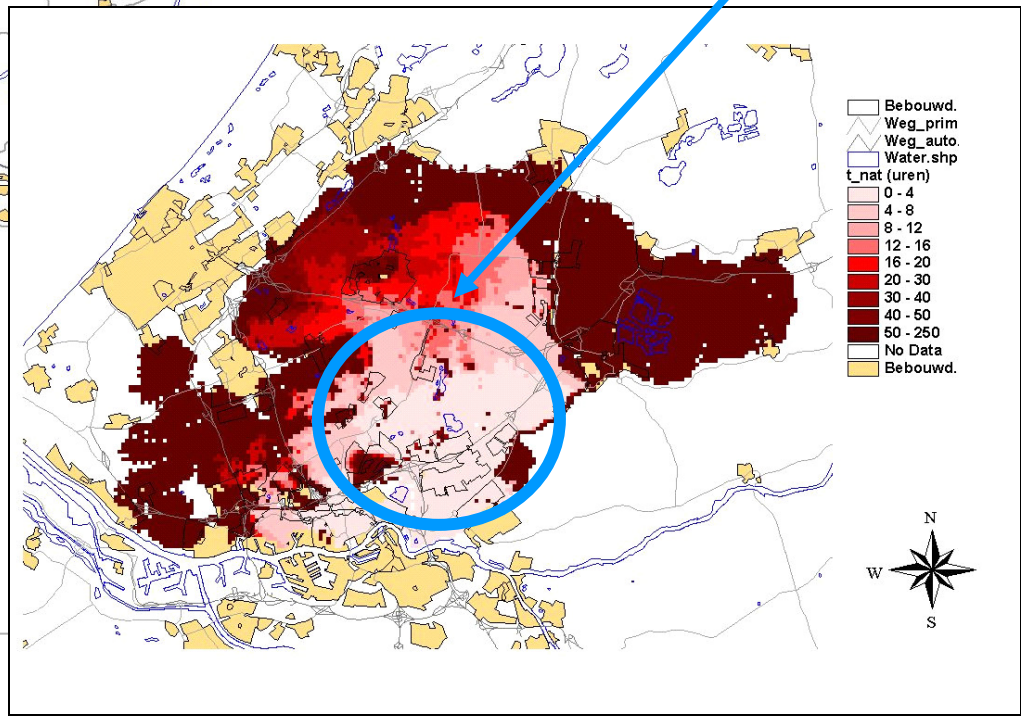
Water comes fast, ends deep and with short notice



Simulation of flooding depth due to dike breach

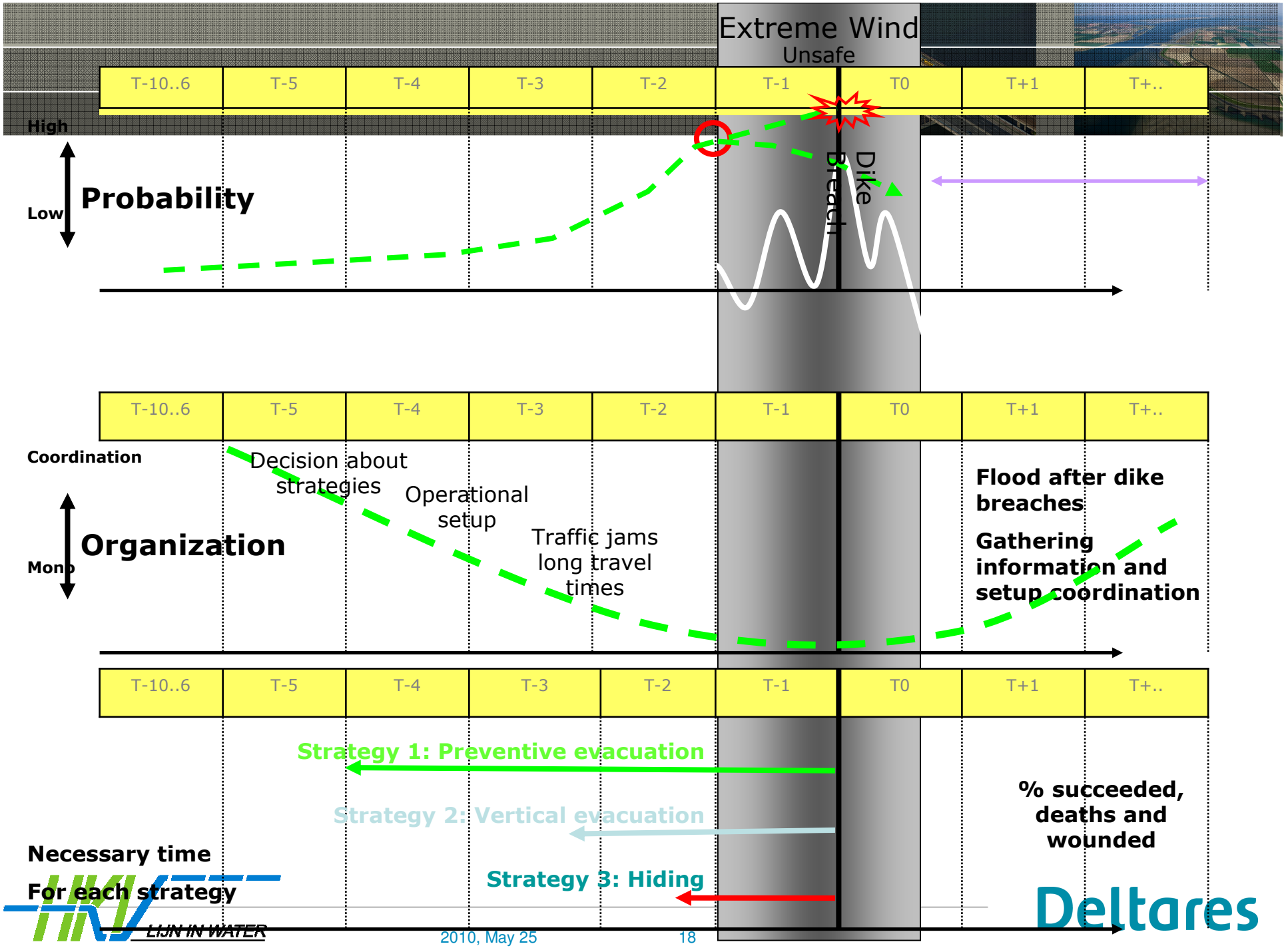
5-6 meter depth

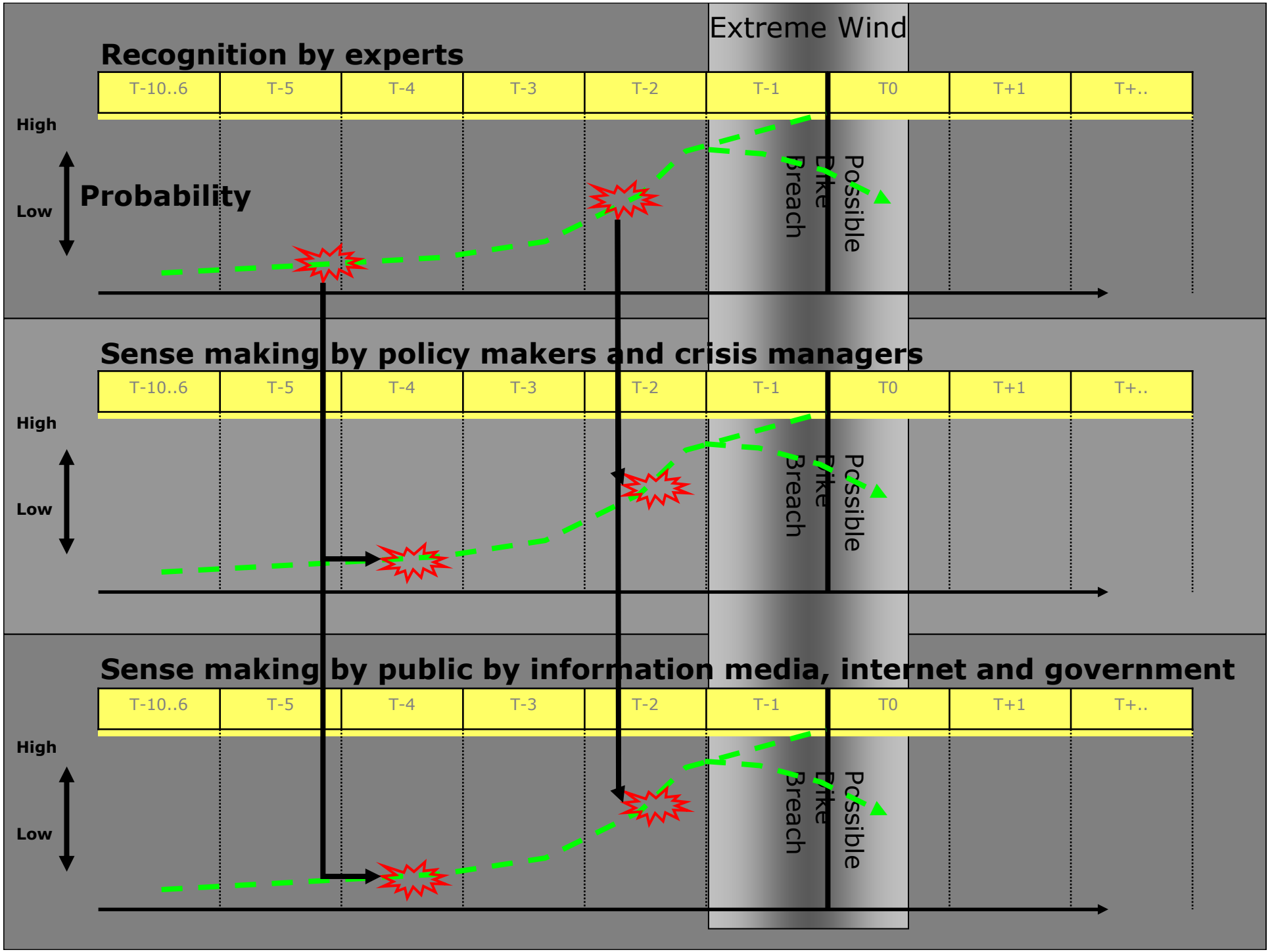
0-4 h (waterfront)



Moment of inundation (hours after dike break)

LIJN IN WATER


Extreme Wind
Unsafe
T-10..6
T-5
T-4
T-3
T-2
T-1
T0
T+1
T+..
High
Low
Probability
Dike Breach
Coordination
Mono
Organization
Decision about strategies
Operational setup
Traffic jams long travel times
Flood after dike breaches
Gathering information and setup coordination
Strategy 1: Preventive evacuation
Strategy 2: Vertical evacuation
Strategy 3: Hiding
Necessary time
For each strategy
% succeeded, deaths and wounded


Extreme Wind
Recognition by experts
T-10..6
T-5
T-4
T-3
T-2
T-1
T0
T+1
T+..
High
Low
Probability
Dike Breach
Possible
Sense making by policy makers and crisis managers
Sense making by public by information media, internet and government

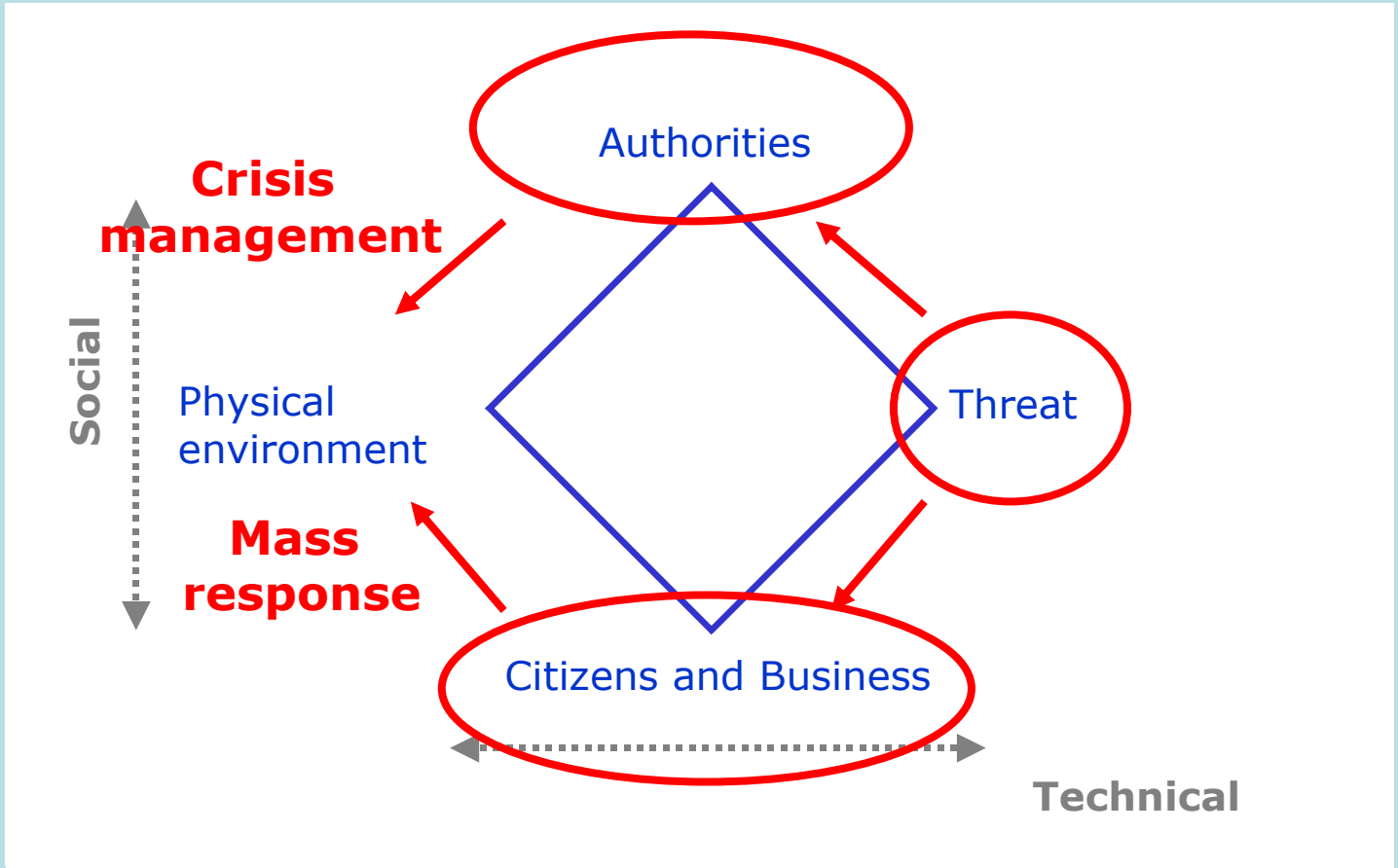
Aim of the work on Evacuation

Determine influence of road capacity for mass evacuation in case of a threat for large scale flooding

Available time

- Storm surge: 24 hours
- River areas: 72 hours

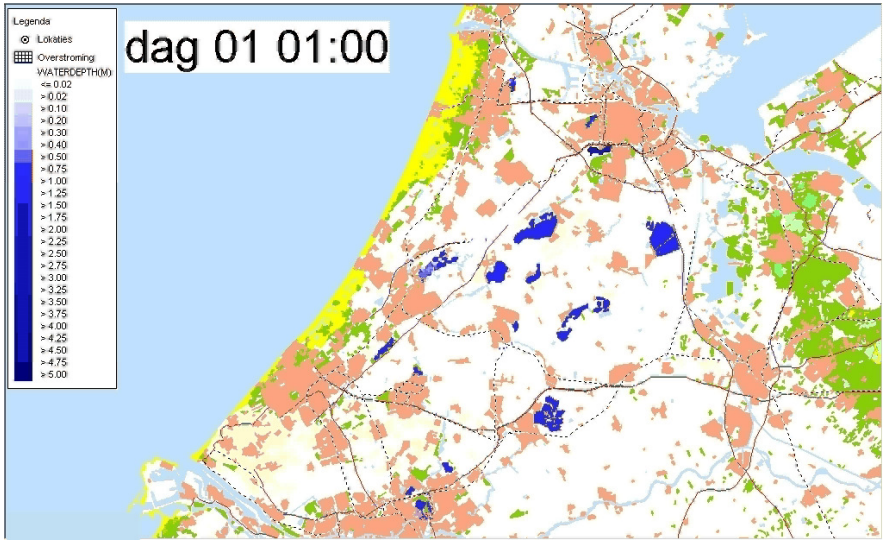
Evacuation: combination of social and technical science

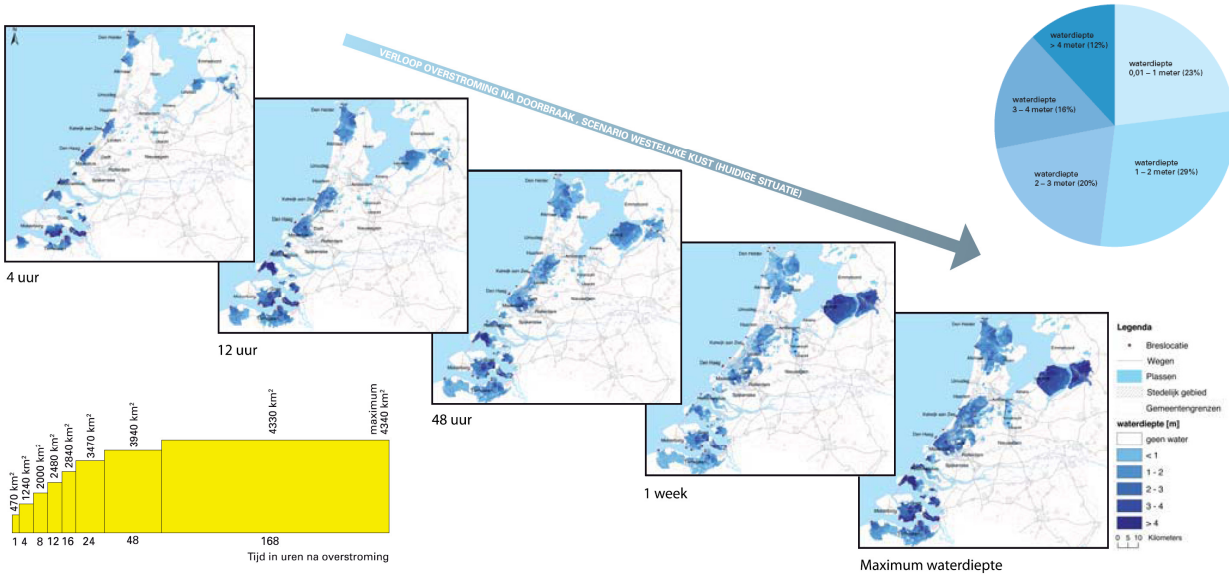


No system is designed for mass evacuation

Possible flooding scenarios

1. Size
   (safety standards, worst case)
2. Lead time
   (early, late)



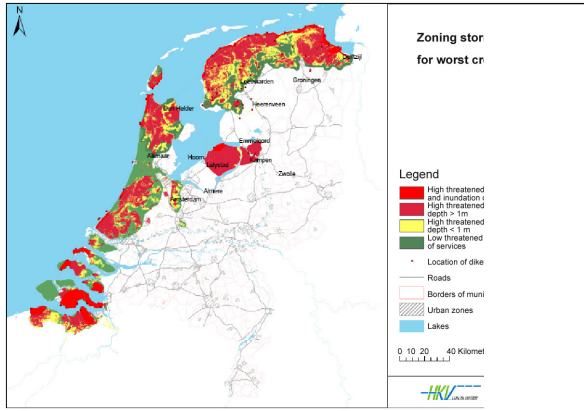


'Safety Standards' Rotterdam

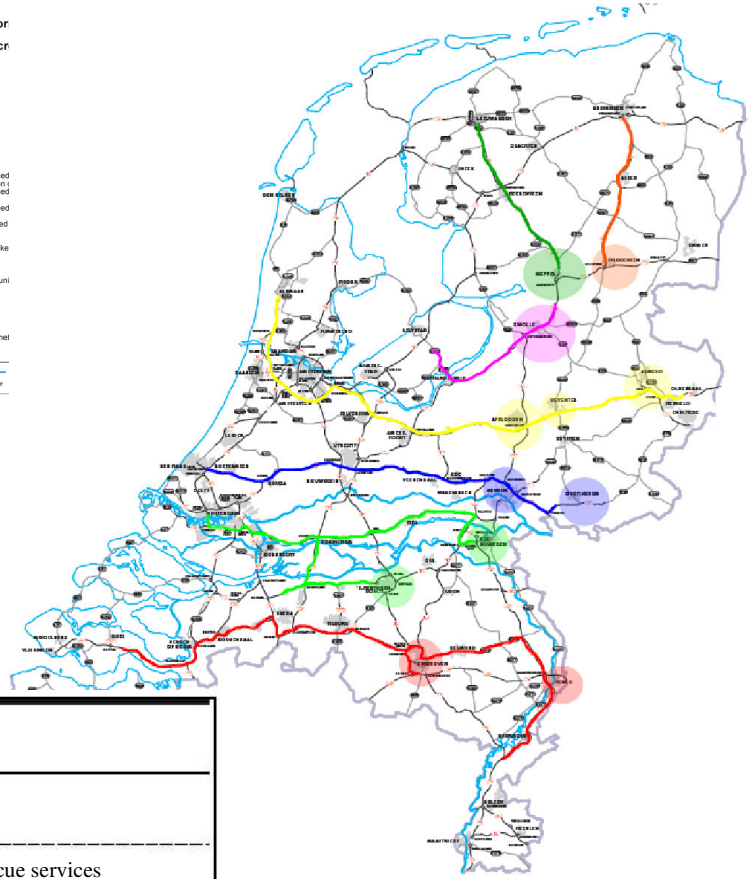
4300 square km
120 Mld Euro
10.000 casualties

Worst cases

National concept evacuation

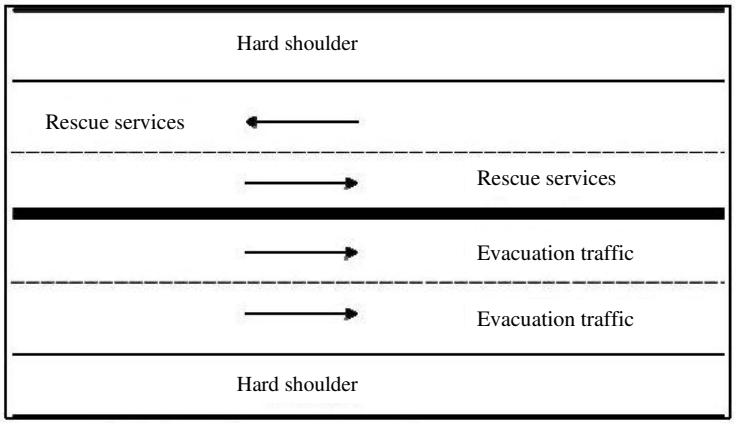


Threatened area



Road map of Concept National Traffic Management

Number	Name	Main corridor
1	Groningen	A28
2	Fryslan	A7, A323, N31, N331
3	Drenthe	-
4	IJsselland	N302, A28
5	Twente	-
6	Noord- en Oost Gelderland	-
7	Gelderland Midden	-
8	Gelderland Zuid	-
9	Utrecht	A2
10	Noord-Holland Noord	A7, A10 oost, A1
11	Zaanstreek-Waterland	A7, A10 oost, A1
12	Kennemerland	A2
13	Amsterdam-Amstelland	A2
14	Gooi en Vechtstreek	A1
15	Haaglanden	A12
16	Holland Midden	A12
17	Rotterdam-Rijnmond	A15, A29, A59
18	Zuid-Holland Zuid	-
19	Zeeland	N59, A17, A59, A58



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Results: Inside bottle necks

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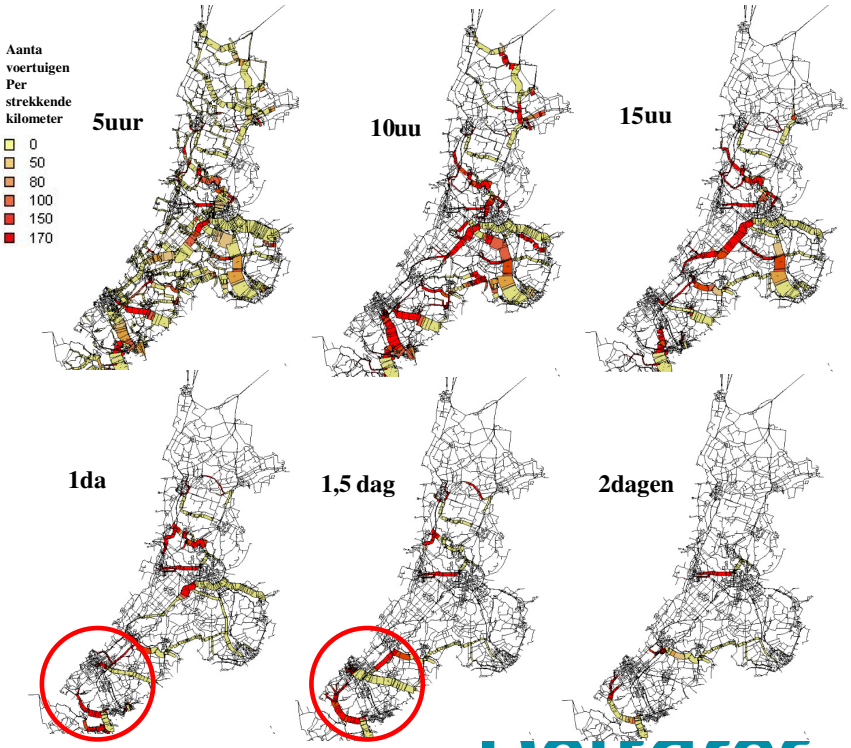
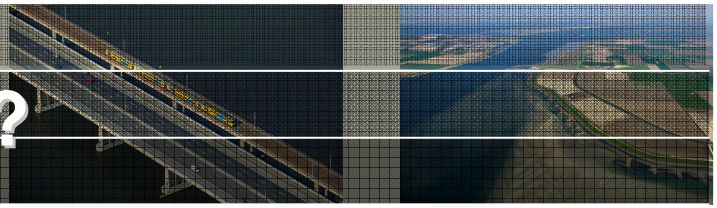
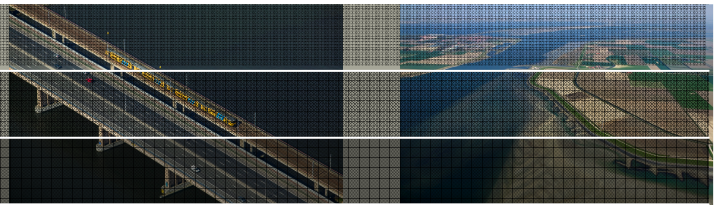


Moving forward...what's next?



- Artificially produced risk awareness?
  - Risk communication, training, exercises, education
- Planning, training, exercising
- ICT, tools
- Policy development: wait for a disaster?
- Knowledge development
- International cooperation
  - When lacking experience, learn from other people's experiences

Conclusions



- **Scenario's:**
  - **Build in flexibility by execising**
- **Planning:**
  - **Dealing with time and space and limited resources**
- **Risico Communication:**
  - **Raise awareness**
- **Crisis Communicatie:**
  - **Self relience and operatability of citizens**
- **Role of Watermanagers:**
  - **Manage the response in interaction with common actual operation piture**
- **Expertiseteams:**
  - **Build expertise- and R&D-networks to do better**

Lesson learned (FRANCE, February 2010)