

Contribution “Developments in flood risk management in the Netherlands”

By Bas Jonkman Professor of Hydraulic Engineering at Delft University, the Netherlands

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A short introduction on flood management in the Netherlands will be given, based on a set of slides provided as a handout. Flood (risk) management is a national priority in the Netherlands, since the majority of the country is flood prone and consequences of flooding will be catastrophic. Over the centuries a comprehensive approach for the management of flood defence system has been developed with clear roles and responsibilities and funding arrangements. Over the last decade a more risk-based management approach of the flood defence system has been developed and implemented. Some key lessons / messages:

1. For successful flood management a strong organizational and funding structure is required: in the Netherlands a Delta fund (900 Million euros per year), clear organizational roles and responsibilities
2. The recent nationwide risk assessment has provided novel insights and has been used for an update of the new safety standards as of 2015. (A further) differentiation of protection levels is proposed based on flood risk. Investments in reinforcements are being prioritized based on risk reduction.
3. Reliability requirements for subsystems and components have been derived; also for movable storm surge barriers and temporary flood defences (e.g. technical and organizational failure). Various uncertainties, including sea level rise are included in the design and management arrangements.
4. In meeting the challenges of higher safety standards, rising sea levels and implementation in densely populated areas, well implemented and sometimes innovative solutions are required. The Netherlands is actively investing in innovative solutions such as the sand engine, and new (hybrid) concepts of embankments / defences. Innovations cannot be copied to other regions, but need to be tailored to the local conditions.

There are plenty of things the Netherlands can learn from the UK, in particular dealing with floods that actually happening; dealing with flood risks in multiple (independent) catchments and regions, community engagement and maximising return on investment / prioritisation.

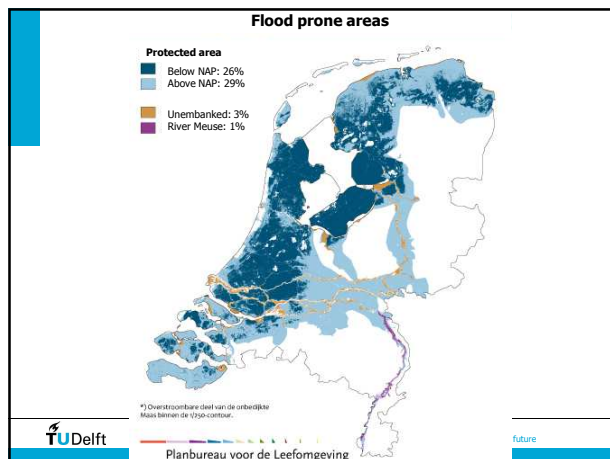
Acknowledgement; Jaap Flikweert of RHDHV is acknowledged for his help in preparing this contribution.

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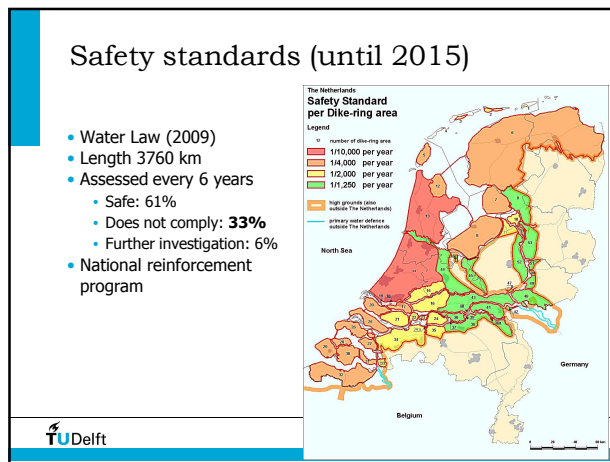
Prof. dr. ir. S.N. (Bas) Jonkman
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Tour of the flood management system

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Organization of flood management

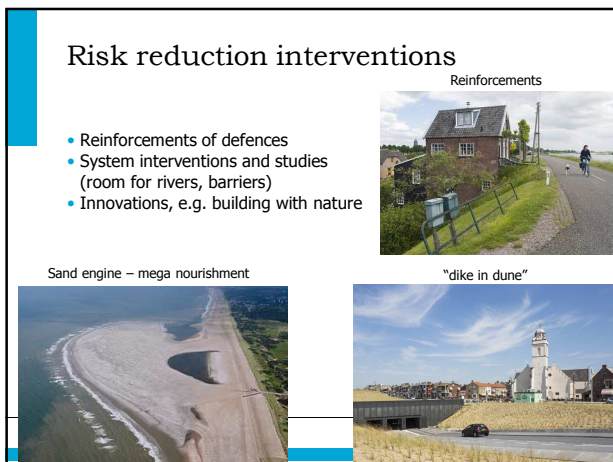
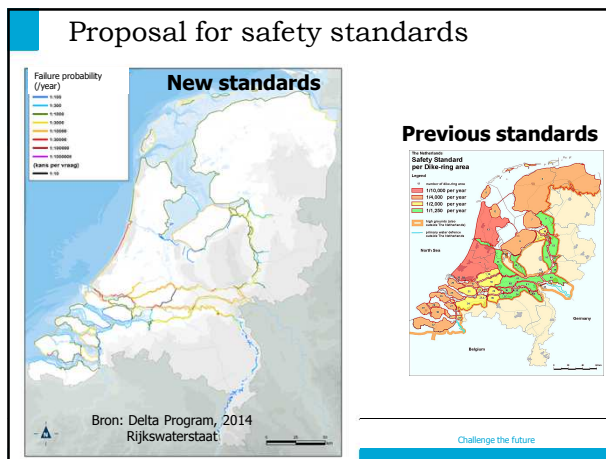
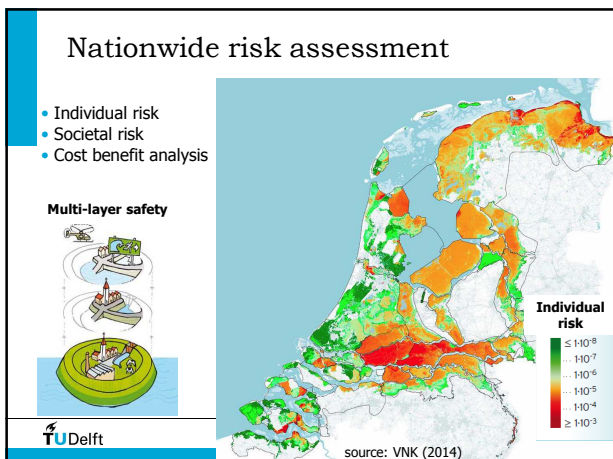
- Water boards:
 - Safety assessment, inspection, maintenance
 - Implementation of reinforcements
 - Funding from local taxes
- National government
 - Safety standards & hydraulic boundary conditions
 - Guidelines for design and safety assessment
 - Operation and management of storm surge barriers, rivers
- Jointly: funding of dike reinforcements
- Delta Fund: 900 Million Euros per year

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Introduction of risk-based approach

- Nationwide risk assessment
- Flooding probabilities:
 - Dike ring systems
 - Multiple failure mechanisms
- Consequences: Life loss, economic

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Comparison the Netherlands – England

	The Netherlands	England	Australia
Population (million)	16.9	53	23.8
Flood prone area (%)	60%	10%	?
Pop. Density (km ⁻²)	407	255	2.8
GDP (US \$/capita)	48,000	39,826	47,600
Expenditures flood management	1 billion Euro	860 million Pound#	200 million AUS \$*
Focus on:	Prevention	Prevention, response and recovery	Emergency response, recovery

- presentation by John Curtin (EA) - <http://floods.org.au/2015-brisbane/keynote-john-curtin/>
* - suggested number for all natural disasters by Australia's Productivity commission

