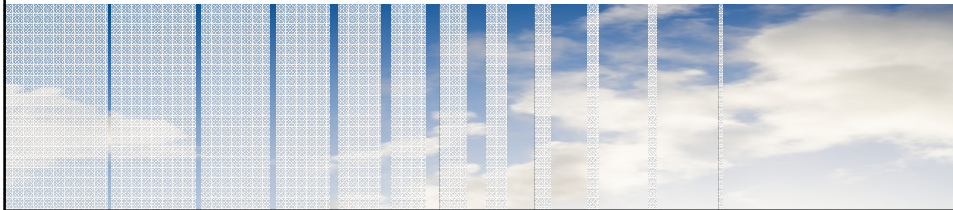




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Costs and effects of flood protection policies in the Netherlands

Joost Knoop in collaboration with Frans Klijn



Flood protection policies



- the role of risk approach
- origin of the Dutch strategy
 - two historic examples
- options for the future

From dwelling pounds to levees



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From dwelling pounds to levees



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From dwelling pounds to levees



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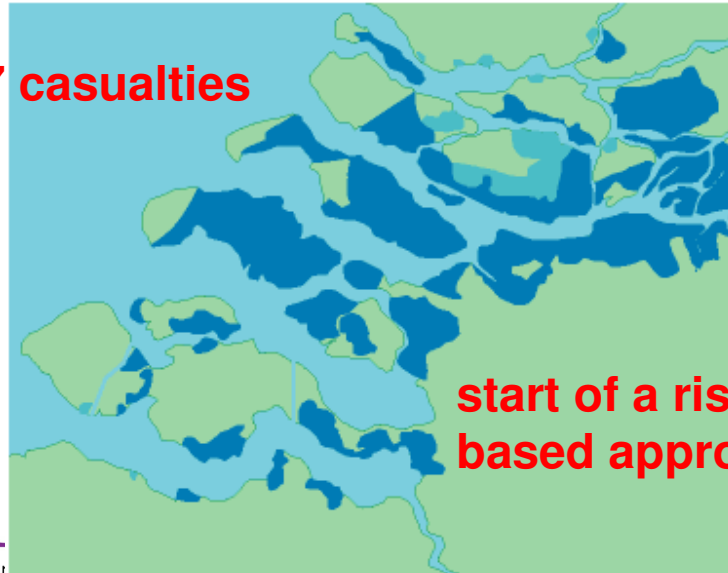
Why a change in strategy

- dealing
- preventing
- risks
 - (economic) balances
- boundaries
 - avoiding at all costs

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1 februari 1953

1787 casualties



start of a risk based approach

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Hazard



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Exposure



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Effects



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Dutch defense against flooding

- based on CBA
- yet, prevention as first pillar



Risk

- risk = hazard (chance) * potential impact



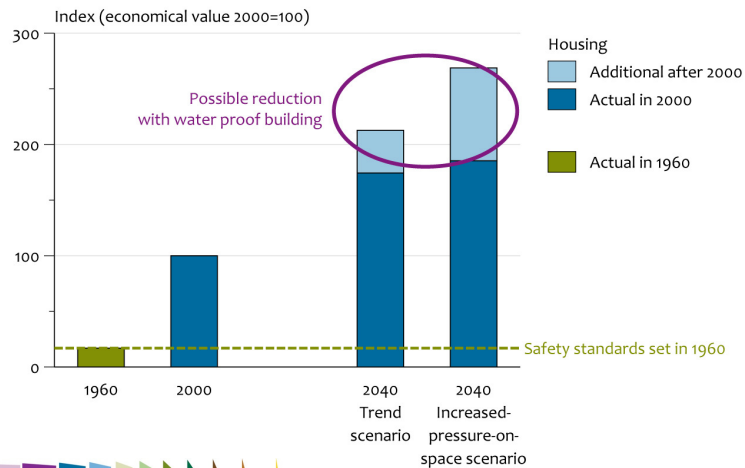
climate change



population and economic growth

Risk increase 1960 - 2000

Potential damage in areas at risk of flooding



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Outlines of the future Dutch flood protection policy

- adaptation of the standards
- 3 layer approach (= risk approach)
 - prevention (**remains the primary pillar!**)
 - spatial measurements
 - emergency action plans
- avoiding of catastrophes (social disruption)
- option: breach free levees

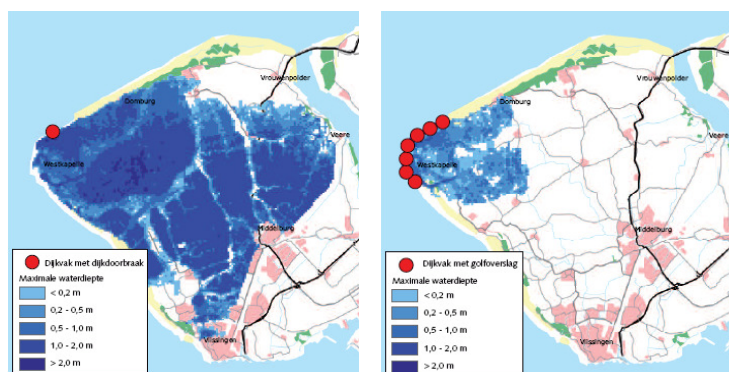
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Flood protection policy - options

1. Current policy – current standards
2. id – adapted standards (based on CBA)
3. id – standards * 10
4. Policy based on breach free levees
5. id + controlled flooding + spatial planning

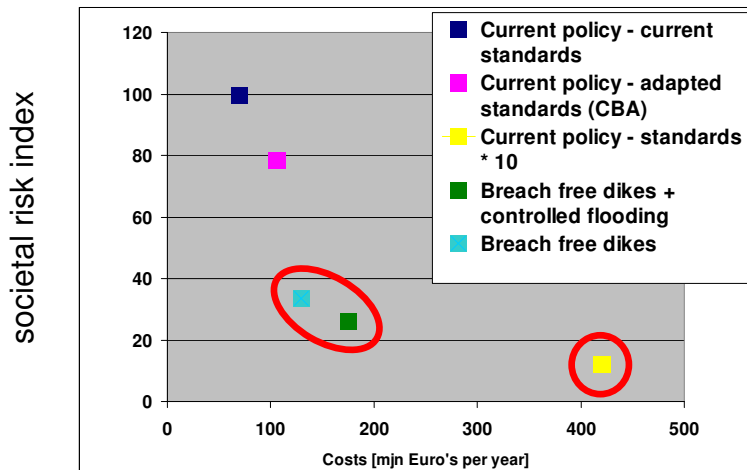
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Adaptation option: breach free levees



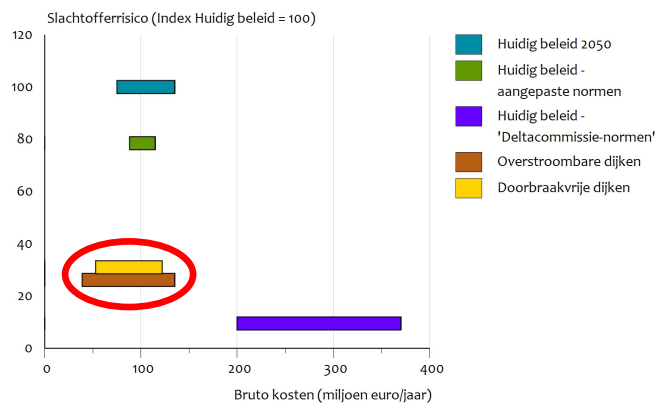
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Cost efficiency



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Cost efficiency – avoided damage included

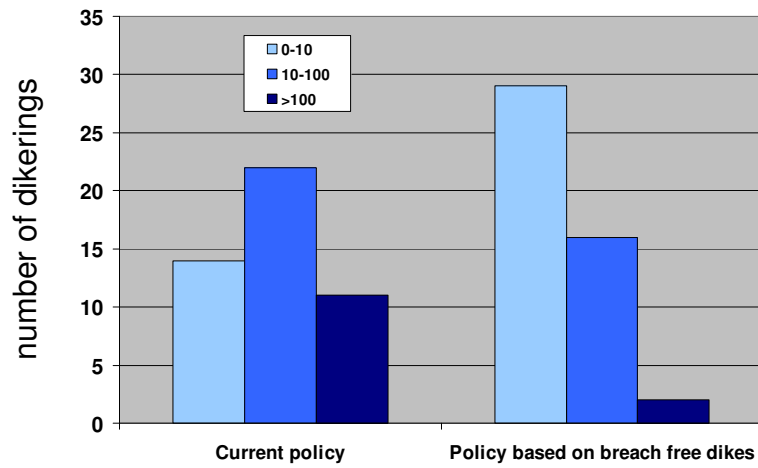


Grafieknummer: Overstromingsrisico's v3_5_figuren_min_max
Datum: 28-sep-2010

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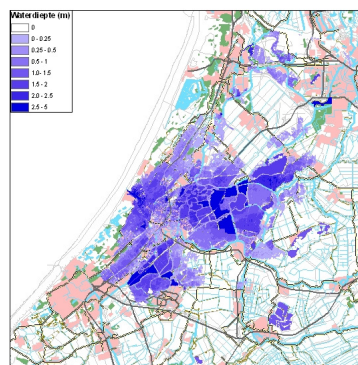
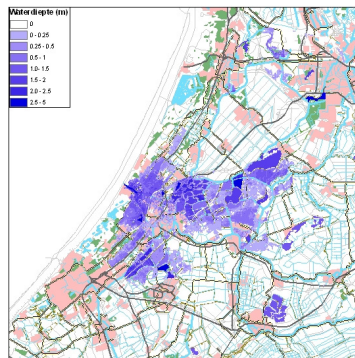
Avoiding disasters

Frequency distribution of casualties



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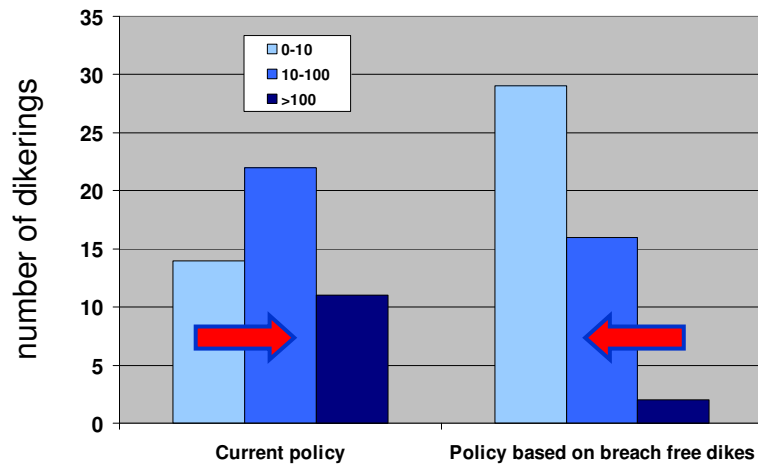
Impact of sea level rise



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Avoiding disasters

Frequency distribution of casualties

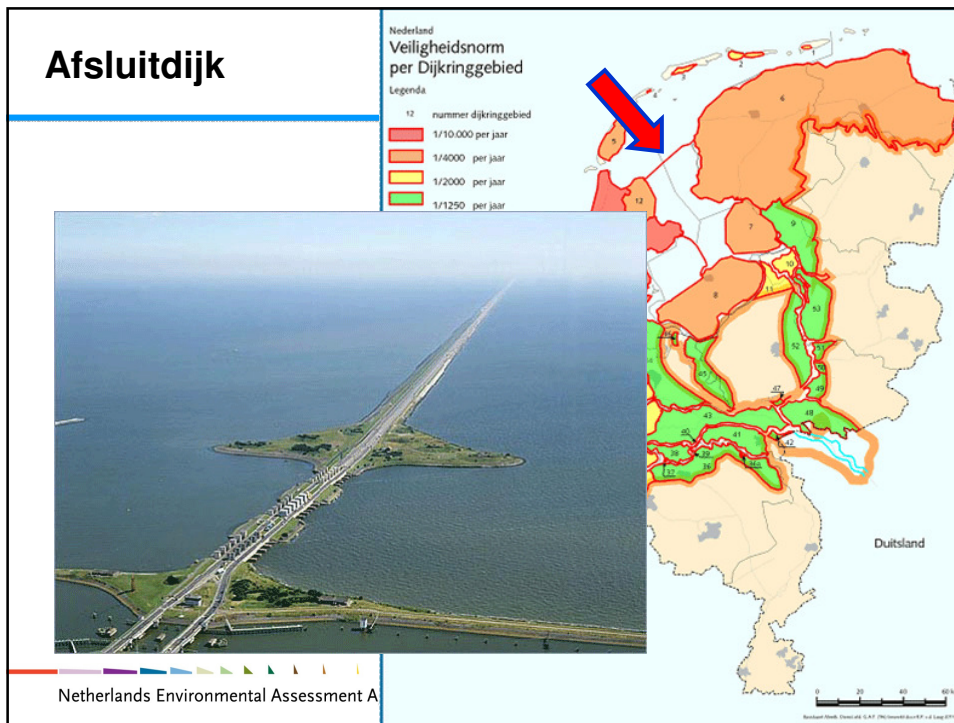


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Examples of the benefits of a risk approach

- Afsluitdijk
- Dordrecht - Voorstraat

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Afsluitdijk – challenging plans

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Natuurlijk Afsluitdijk

Monument in Balans integrale visie op de Afsluitdijk

Afsluitdijk 21^e eeuw

WaddenWerken

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Dordrecht



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Drawbacks

- Increase on investments in hard money benefits are 'soft' money (long term insurance)
- negative impact on the landscape



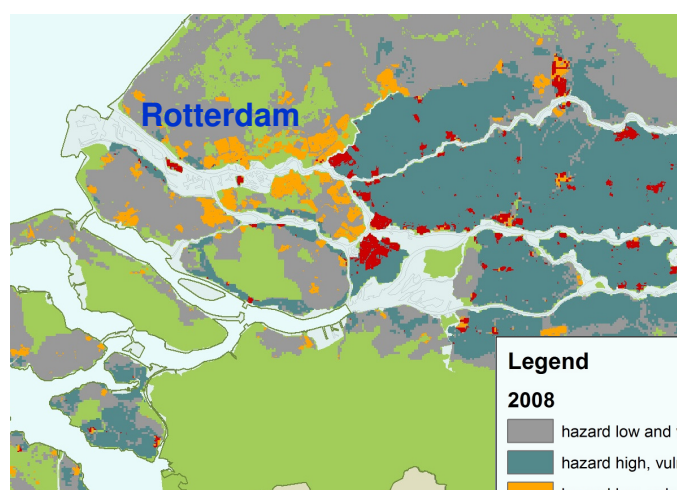
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Concluding remarks

- risk approach gives more room for solutions
- breach free levees make the precautionary principle less vital
- breach free levees seem to provide very cost-effective solutions
- policies based on breach free levees are less sensitive to climate change

Flood risk mapping

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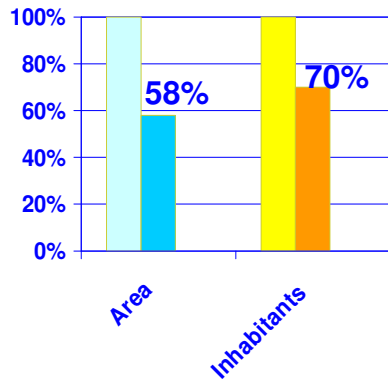


Legend

2008

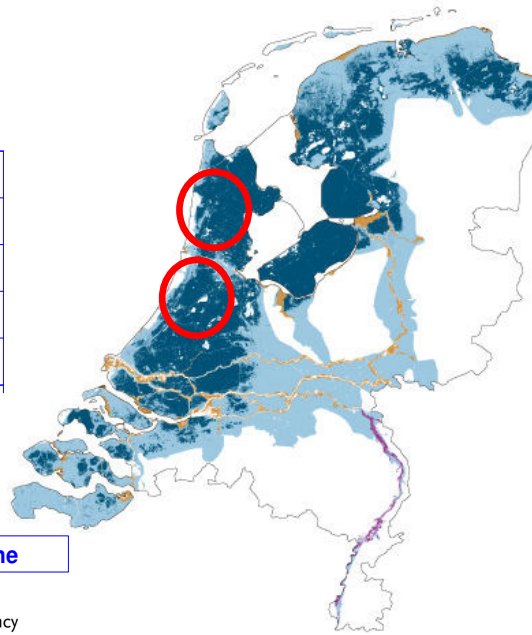
- hazard low and vulnerability low
- hazard high, vulnerability low
- hazard low, vulnerability high
- hazard high, vulnerability high

Flood-prone area

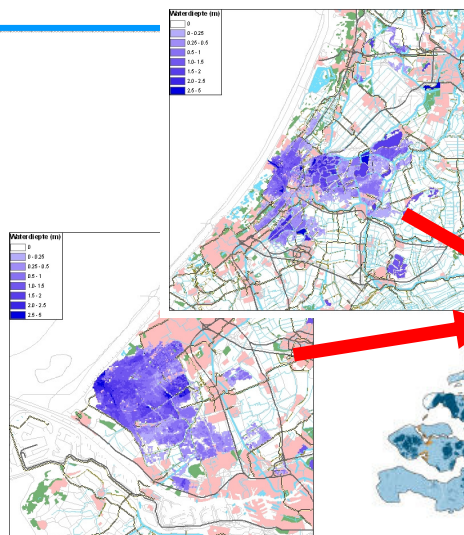


■ Holland ■ Flood-prone

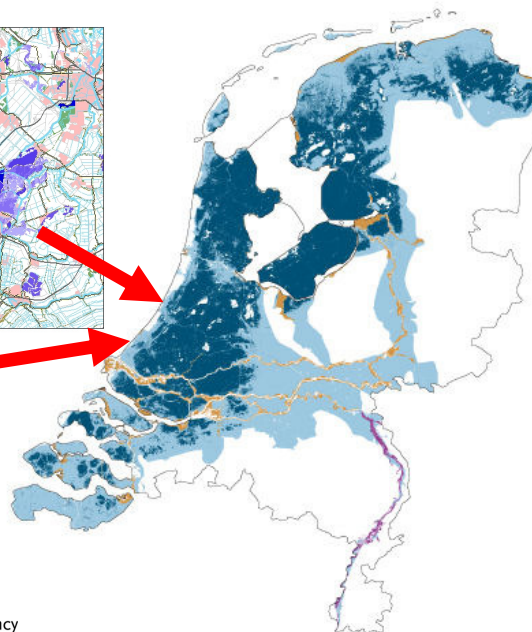
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Flooding scenario's

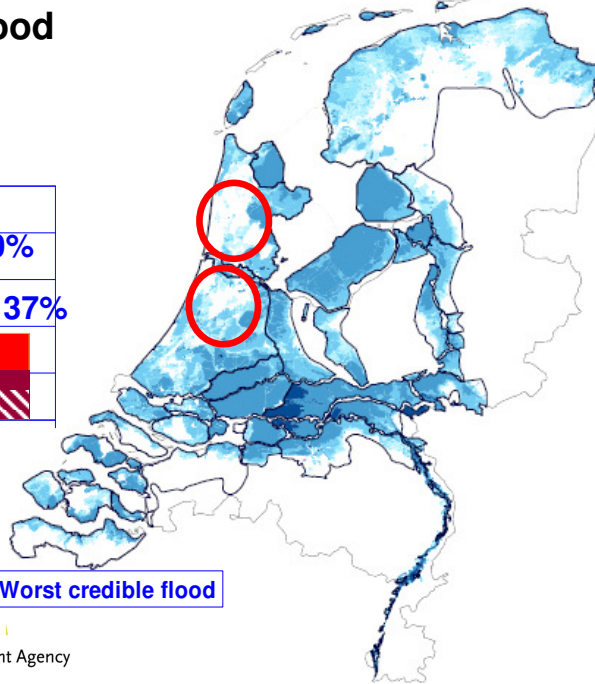
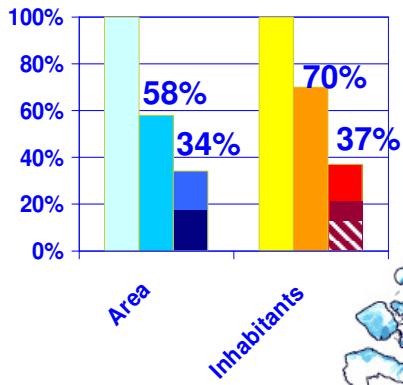


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Worst credible flood

Cultural heritage



■ Holland
 ■ Flood-prone
 ■ Worst credible flood

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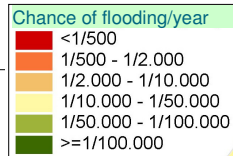
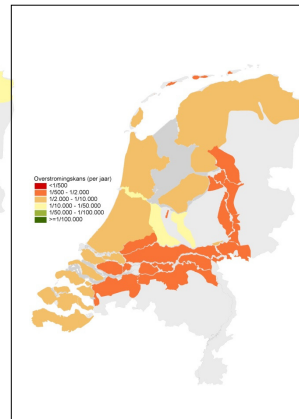
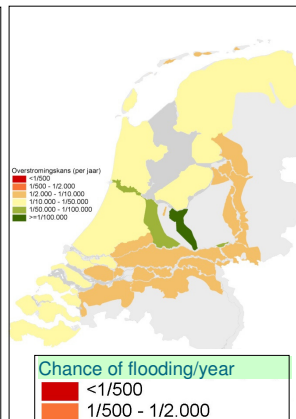
Chances of flooding in 2040 (current policy)

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Minimum

Expected

Maximum



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