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Enabling Delta Life

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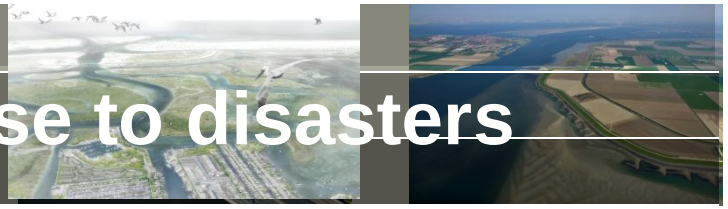
Coastal risk reduction: Converging approaches in the U.S.A. and the Netherlands?

Ap van Dongeren, Deltares, member NRC Committee

Herman van der Most, Deltares

A tale of two countries' response to disasters



The Netherlands

- 66 % of NL is flood prone
- Includes most major cities, ports, airports.
- Epic disaster is 1953 Flood
- Proactive response:
  - Codification and rationalization of flood risk based on CBA
  - Upscaling of governance.
  - Focus on flood prevention
- "Shared" responsibility
- Little flood awareness

U.S.A.

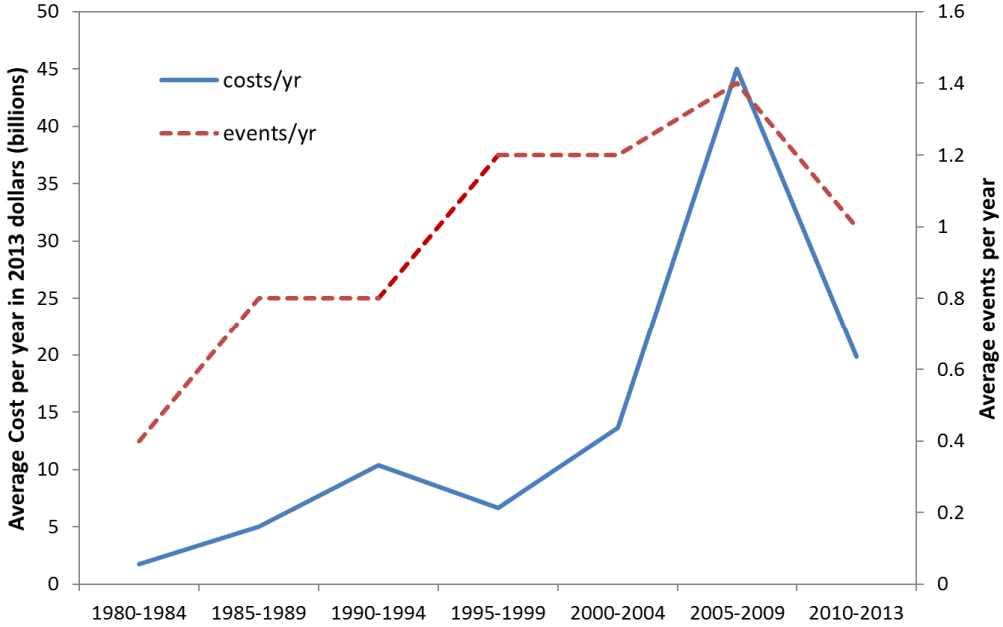
- Coastal zone (and river valleys) are flood prone
- Includes 8 cities of global top 20
- Epic disasters: Katrina and Sandy
- Reactive response:
  - Disaster relief, rebuilding
  - Limited preventive measures
  - Focus on flood mitigation and preparedness.
- "Personal" responsibility
- Episodic flood awareness

Common New Approach?:

Coastal risk management guided by benefit-cost analysis, acceptable fatality risk and socio-environmental aspects

A common threat: coastal risk is increasing

- Risks are increasing, because hazards AND consequences are increasing
- Hazards of flooding increase due to climate-change and land subsidence
- Consequences increase due to economic development



Coastal storm events/year

Costs per year

Data from: www.ncdc.nooa.gov/billions/events

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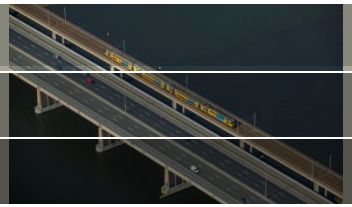
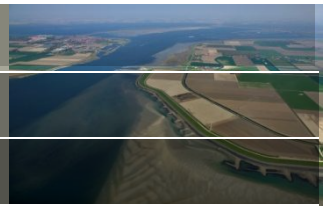
Case 1: The Netherlands



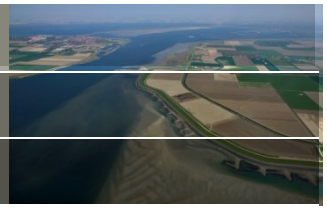


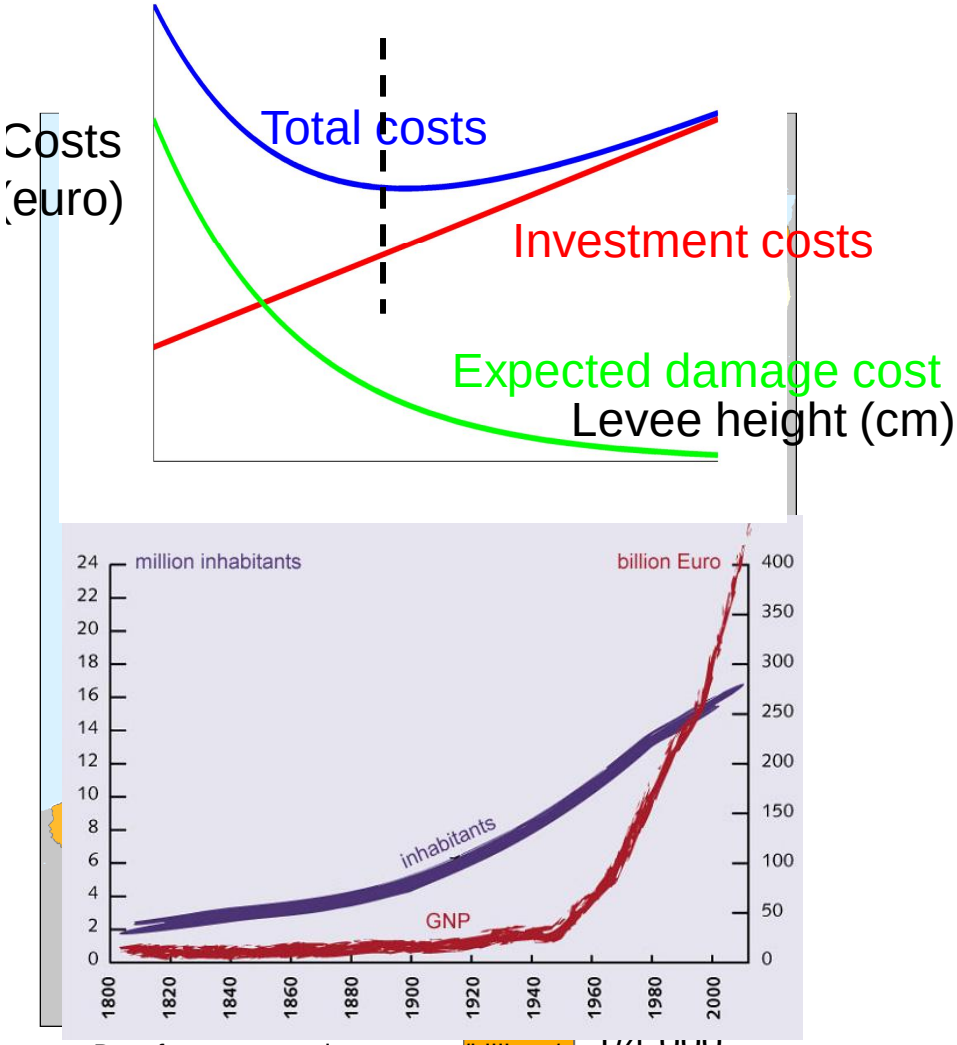
- Epic coastal floods 1825, 1916, 1953
- After 1953:
  - Codification of risk assessment
  - Dedicated governance by water boards and national government

1953 Flood

Sources: beeldbank, Deltares

Current Flood standards (1960-2017)





Data from: www.ncdc.nooa.gov/billions/events

Deltacommission 1960:

- Standard expressed in probability of exceedance of water level
- Standard only calculated by CBA for Central Holland
- Regional differentiation: standards tuned on expected impacts
- Not up to date due to increase of population and wealth since 1960
- SLR, higher runoffs, changing wind and wave climate, land subsidence

Sources: Deltaprogramma, Deltares

1/10.000

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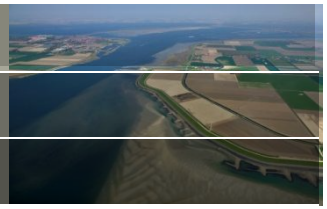
Future Flood standards (2017 -)



Standards expressed in terms of flood probability (impact)

Result of National Vision in "Delta Program"

Standards based on three criteria:

Societal cost-benefit analysis:

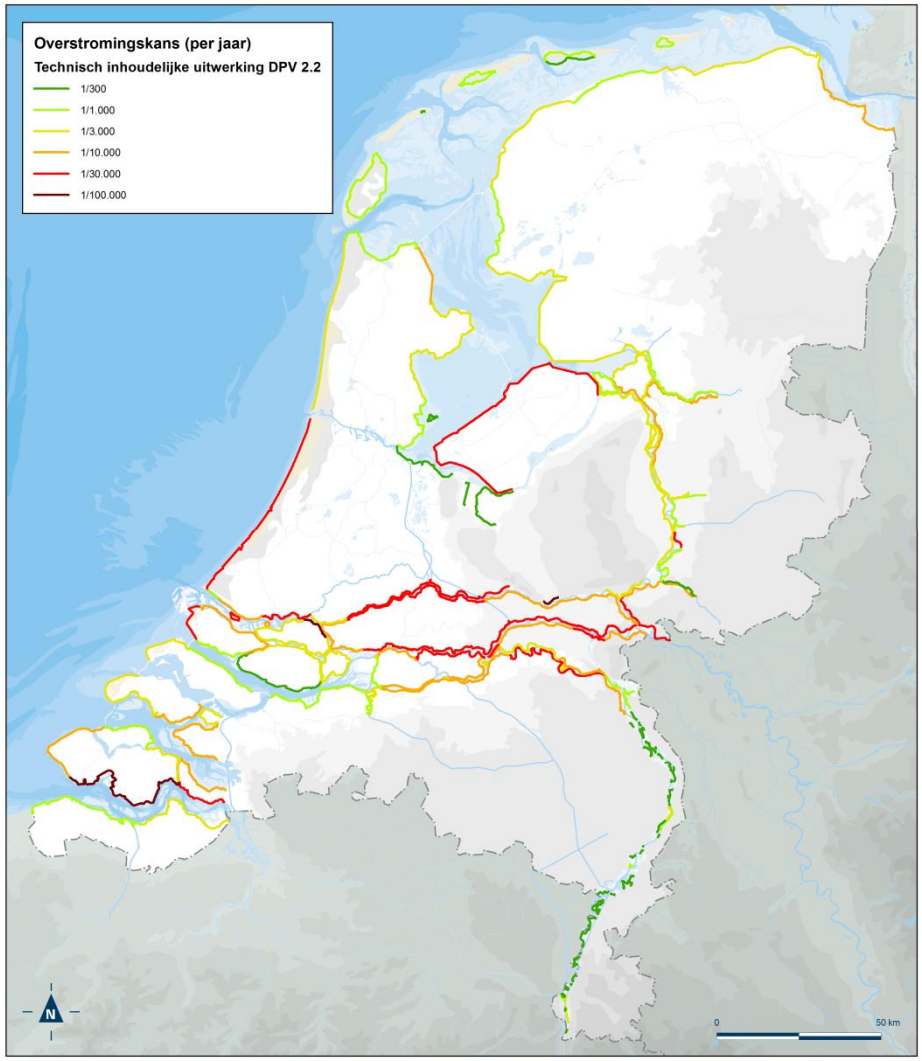
- Investment costs
- Direct and indirect damages, including value of human life (VOSL)

Local Individual Risk (LIR):

- Base level of safety

Societal/Group Risk:

- Prevent social disruption of large-scale events.



Sources: Deltaprogramma, Deltares

Case 2: The U.S. Eastern & Southern Seaboard

- 8 U.S. cities in global top 20 of estimated potential annual losses from coastal storm flooding

  - Hurricanes Sandy and Katrina highlighted vulnerability

Sandy, NY

Photograph by Master Sgt. Mark Olsen/U.S. Air Force

Image source: NRC committee

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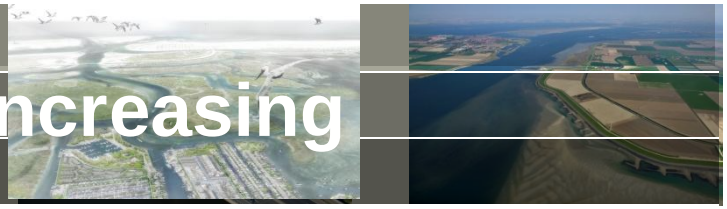
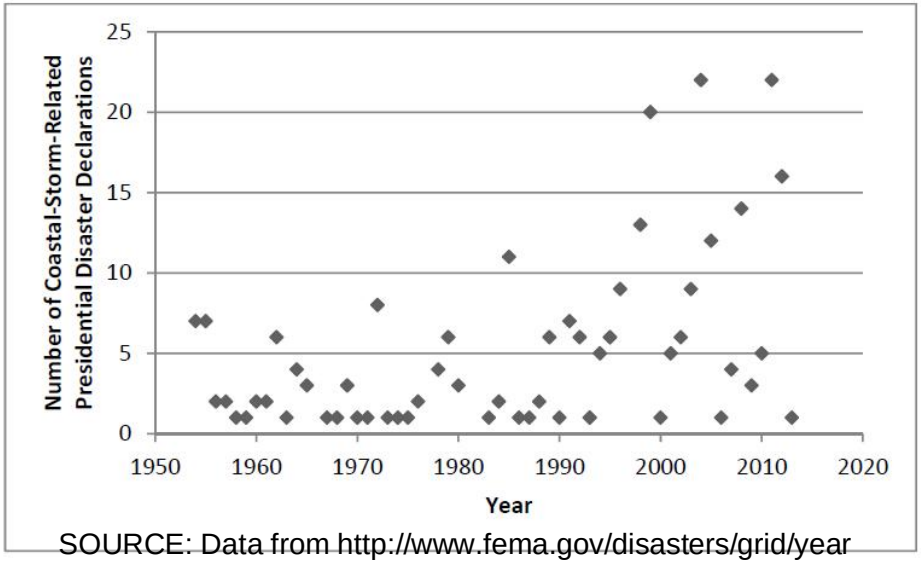
(Federal share of) Damages increasing





SOURCE: Data from http://www.fema.gov/disasters/grid/year

- Number of federally declared disasters increasing

Disaster	Federal Aid as a Percentage of Total Damage
Hurricane Sandy (2012)	>75
Hurricane Ike (2008)	69
Hurricane Katrina (2005)	50
Hurricane Hugo (1989)	23
Hurricane Diane (1955)	6

SOURCE: Michel-Kerjan (2013).

- Share of federal aid increasing.

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Challenges

- Misalignment of risk, reward, resources and responsibility
  - Federal government pays, local incentive to build into vulnerability.
- Governance:
  - Responsibility spread over federal, state and local authorities
  - Multiple agencies and departments: FEMA, USACE, HUD, NOAA, USGS.
  - No national or even regional vision
- Disaster Risk Reduction Approach:
  - Reactive, rather than proactive: funds allocated for response, recovery and rebuilding, little for mitigation.
  - Positive exception: "Rebuild by Design"

Image source: NOAA

Image source: NOAA

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Recommendations from the National Academy of Sciences

- Develop a national vision of coastal safety
  - Pro-active role: use federal resources to reduce coastal risk vs enabling it to increase
- Construct a coastal risk framework based on a benefit-cost analysis constrained by
  - acceptable individual fatality risk and
  - social and environmental aspects
  - group risk of mass casualties
- Consider full array of risk reduction strategies

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Array of measures: Hazard reduction

- Hard structures
  - Urban areas, confined space
  - Environmentally-friendly design
- Dune and beach nourishment
- Nature-based: Saltmarsh, seagrass, mangroves, oyster reefs, etc.
  - Spatial demand
- Combinations of the above

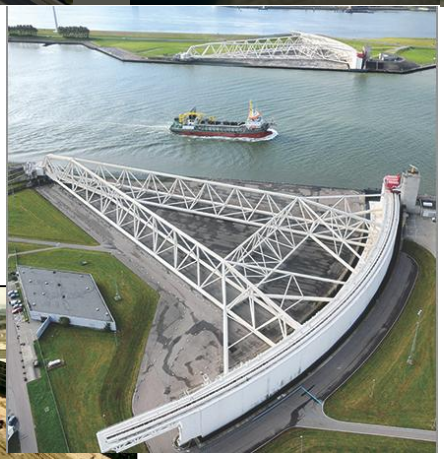

Image sources: Wikipedia,

Image source: NOAA

Image sources: NRC committee,

Image source: NOAA

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A mix of measures: vulnerability reduction

- Land use restrictions
- Building elevation
- Training for evacuation
- Awareness-raising
- Build-in resilience
- Suppress cascading effects
- **High documented benefit-cost ratios (5:1 to 8:1) but difficult to achieve**

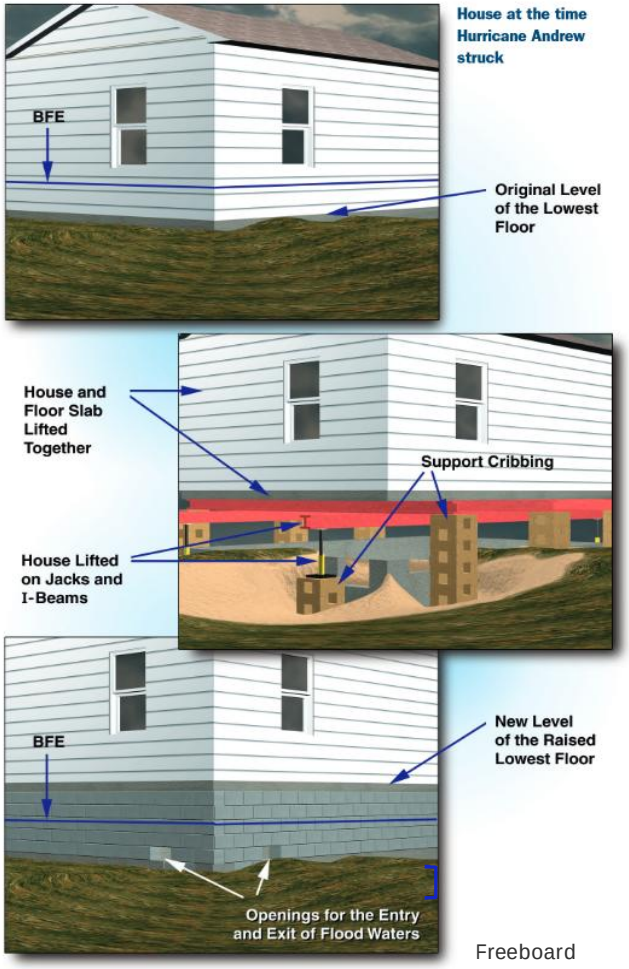
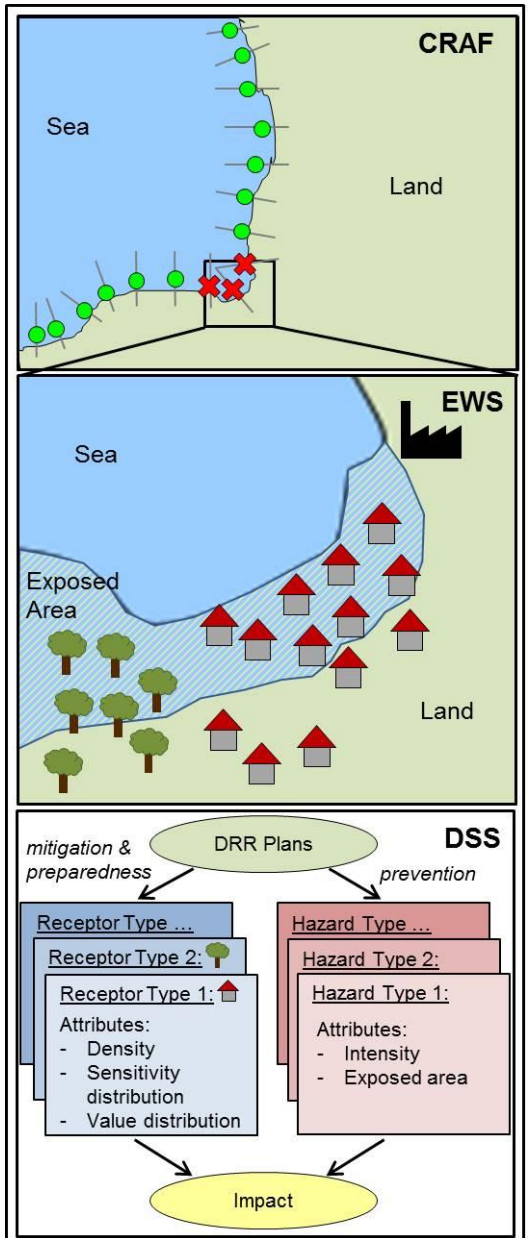


Image source: FEMA

In Europe: The RISC-KIT Approach



1. Coastal Risk Assessment Framework (CRAF) to identify hot spot areas of coastal risk

2. Evaluation tool to analyze effects of DRR measures on hot spots

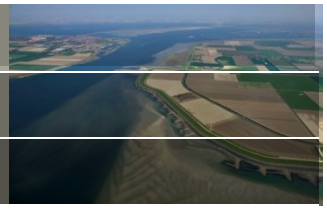
3. Web-based management guide of innovative, cost-effective, ecosystem-based DRR measures;

4. Coastal Risk Database of present and historic socio-economic and physical data.

Image source: RISCKIT.eu

1630hr: Session 4.1: Auditorium 11

A converging story



- U.S. and The Netherlands faced with **similar threats** of increased coastal risk

- Suggests **coastal risk framework** based on a benefit-cost analysis constrained by
  - acceptable individual fatality risk and
  - social and environmental aspects
  - group risk of mass casualties

- Use the full array of preventive, mitigation and preparedness measures

- Differences are in the alignment of **risks, rewards, resources and responsibility**
  - Do not underestimate differences in governance, historical and cultural experiences and outlook

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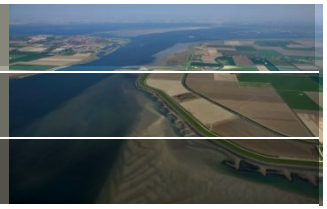
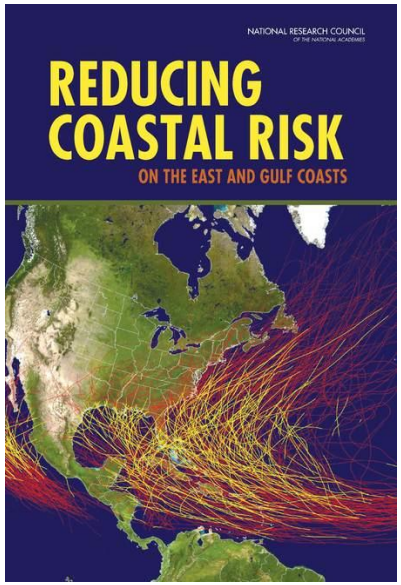
More resources:



- NAS report at www.nap.edu
- Webinar and slides on dels.nas.edu
- www.rebuildbydesign.org/
- www.risckit.eu
- http://www.deltacommissaris.nl/english/delta-programme/



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