

Resilience of harbour companies at Eemshaven to flood risk

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Outline

- Delta program: goals and strategy
- Vulnerability and adaptive capacity
- Harbours in Wadden area
- The case of Eemshaven
- Conclusions



Wadden Sea: World heritage site

Dutch Wadden Sea



- Birds, fish, shellfish
- Erosion of sediments and loss of habitats
- Decreasing inhabitants
- Increasing tourism
- Tidal flats, salt marshes





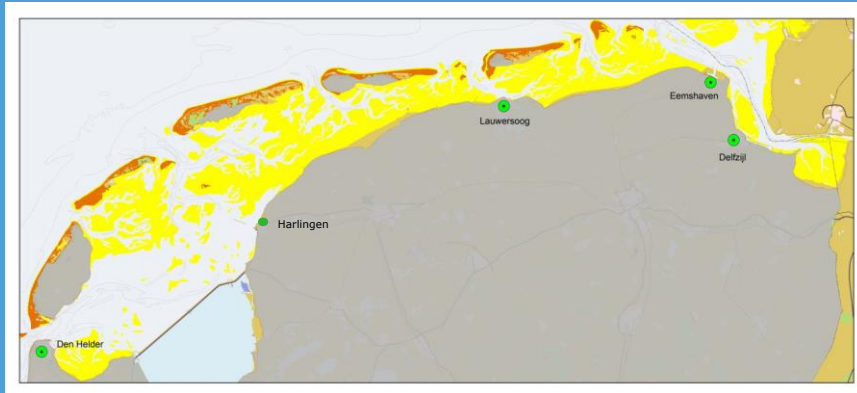


Impacts of climate change on Wadden

- Sea level rise:
 - human safety
 - salinization of arable land
 - drowning of ecosystems
- Water temperature:
 - changes in food web
 - exotic species



Harbours in the Wadden Sea

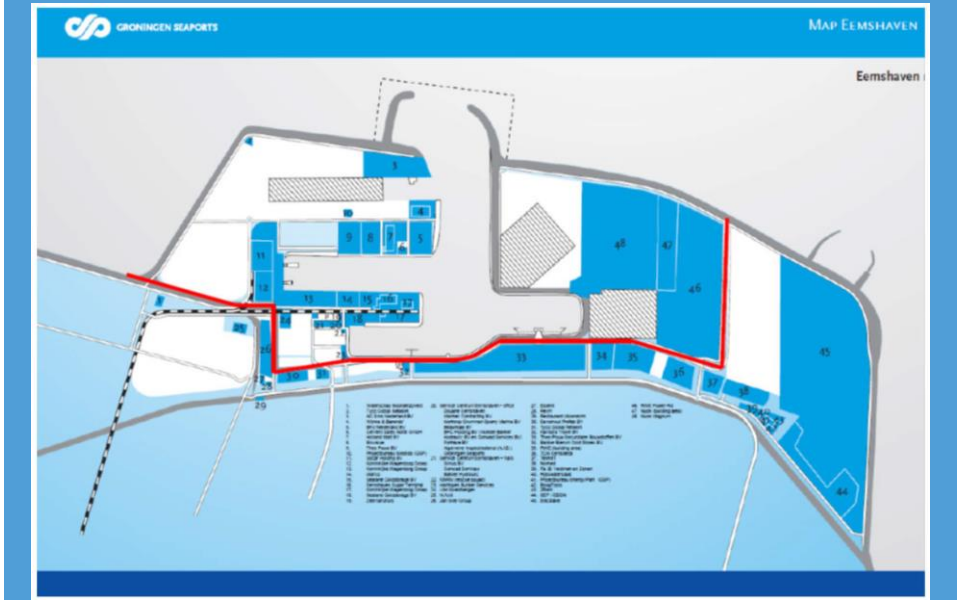


The case of Eemshaven



- Large seaport in the North of the Netherlands, 26,000 ha.
- Companies outside of dykes
- Are companies in Eemshaven aware of their sensitivity and exposure to flooding?
- Are companies anticipating on climate change?

Eemshaven



Vulnerability and adaptive capacity

- **Vulnerability:** The propensity of a system to suffer significant transformations as a consequence of perturbations.
- **Sensitivity:** the amount of change a perturbation can cause in a system.
- **Exposure:** Degree, duration and/or extension in which the system is in contact with, or subject to, the perturbation
- **Adaptive Capacity:** Ability of the system to adjust to or resist the perturbation, moderate potential damage, take advantage of opportunities and cope with the consequences of the transformations that do occur

(Gallopín, 2006)



Methodology: interviews Eemshaven



- Semi-structured interviews
- 9 interviews with 11 organisations
 - 2 (semi) governments
 - 8 companies
 - Eemshaven association
- Recorded and transcribed interviews, coding in Atlas-ti to prepare for analysis
- Workshop for validation of results



Analysis 1: Company activities and employees

Activities
Storage of fuel and chemicals
Energy production, offshore windmill transport
Malting of barley
Stevedoring (cars, bulk goods)
Business services (catering, technical services, crane rental)
Ferry to German Wadden island

Companies	Employees
3	Less than 10
5	10-100
3 (during construction phase)	More than 100

Companies	Land size
1	Less than 1ha
3	1-10 ha
4	10-100 ha



Analysis 2: Important installations

Paved / developed areas	Quays, storage areas, parking lots, offices
Electricity	Cables, electric appliances, static inverter station of NorNed, control panels, equipment in factory
Storage / use of fuels	Pipelines for gasoline and diesel, Gas-fired plants, Emergency diesel
Loading and unloading installations	Scaffolds, Transport systems, Roll on-roll off bridges
Transportation equipment	Lift trucks, Loaders, Trucks, Cars, Ships, Cranes
Water installations	Demi water treatment plants, cooling systems, water treatment facilities
Stored (raw) materials	Barley, Windmill components

Analysis 3: Outside of dike?

- 6 companies aware of being located outside of the dyke
- 3 of these confirmed by administrative procedures (tax water board etc.)
- 2 assume they are inside the primary flood defence system
- Reasons for confusion:
 - Changes of dyke location
 - Not informed by government
 - Visual: dykes everywhere

Examples of dykes in Eemshaven



Analysis 4: Experience with flooding

Category	Example	Response
Yes, experienced flooding (2)	Once: November 2007	Waited until water level dropped Removed cars, but left big machines, like cranes
Nearly experienced (2)		
Never experienced (4)		

Possible consequences of flooding:

- Water damage immovable installations
- Shut down activities at the quays
- Explosions (short circuit)
- Revenue losses (not being able to run)
- Produced products unusable
- Most people can leave on time

Analysis 5: strategies/prevention

- 3 companies have flood strategies:
 - Elevation of installations (3)
 - Elevation of terrains
 - Checking weather forecasts
 - Protocol for high water calamity
- The other companies act when it happens
- None of the companies is insured against floods

Why no prevention measures:

- Consideration costs vs. benefits
- "We cannot do anything, as we are situated outside the dyke, the water will come when it comes"
- Is responsibility of water board



Analysis 6: responsibilities companies / government

What companies say	What governments say:
Responsibilities of companies: <ul style="list-style-type: none"> • Outside the dyke is our own risk • Prevent damage to dyke / quay • We pay for dyke maintenance • Calamity protocol: collaboration companies with government 	Responsibilities of companies: <ul style="list-style-type: none"> • Outside the dyke is the risk (of damage) of companies (they should be informed)
Responsibilities of government: <ul style="list-style-type: none"> • Disaster plans • To warn us for approaching high water (GSP/ Municipality) • GSP will brief us when problems are expected • All dykes (not just primary flood defense systems) • Inside or outside the dyke: both government 	Responsibilities of government: <ul style="list-style-type: none"> • Disaster plans • Storm warning protocol • Maintenance of primary flood defense • Maintain safety level by land elevation • Evacuation

Conclusions Eemshaven 1

- 2 categories of companies:
 - Aware and concerned
 - Uninformed and underestimating
- Most preventive measures implemented during construction phase (either harbour or the company)
- Concerned companies act on their own
- None of the companies is insured against flooding
- Inadequate communication by governments about responsibilities and risks
- What is the role of the government outside the dyke, as they also have interest in business development in certain areas?

Conclusions Eemshaven 2

		Motivation
Sensitivity	low	few human lives, robust equipment (except electric appliances)
Exposure	low	elevated land (except for extreme events)
Adaptive capacity	high /low	one group high, other group low

- Vulnerability: low; however
- If no one takes responsibility, a gap about risks arises: no knowledge, no awareness: a vicious circle
- Easy to improve with a communication effort

Recommendations Eemshaven

- A discussion based on results of this research between the companies
- Similar discussion among governments, including GSP
- Develop guidelines for the construction phase
- Check disaster plan
- Communication plan to inform companies



Questions?