



Flood vulnerability of port infrastructure in unembanked areas

Research questions

- What is the vulnerability to flooding of port infrastructure in unembanked areas?
- How do we evaluate this vulnerability to flooding in comparison to other (flood) risks?

 The map displays a coastal area with various land uses. A large industrial port area is highlighted in orange and red, indicating high vulnerability to flooding. Surrounding areas are shown in shades of blue and green, representing lower vulnerability. The map includes roads, water bodies, and green spaces.

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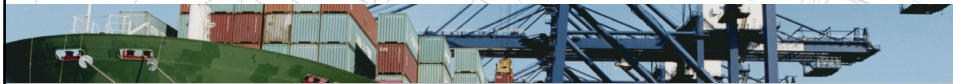


Qualitative assessment

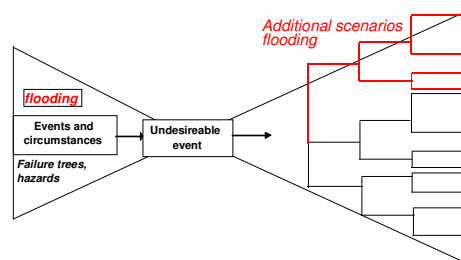
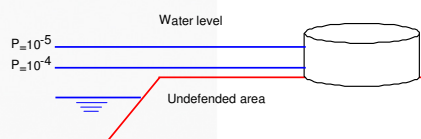
- Scoring of various port infrastructure through expert opinion
- Various aspect were taken into account:
 - Casualties
 - Societal disruption
 - Environmental risk / ecological damages
 - Economic damages

	Effect of flooding	Probability of damage given a flooding event	Casualties	Societal disruption	Environment	Economical damage
Electricity cables / transformer	Rupture by soil displacement Short cutting Chain effect of power failure: • Rail • Communication • Port safety systems • Power failure Zuid Holland => Can be partly resolved by national power network though					

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Quantitative assessment



Case study

	Worst Case Scenario No flooding	Worst case scenario Including flooding
Casualties	None / limited	None / limited
Affected persons (health effects)	1000 (~10 health effects)	1000-2000 (~100 health effects)
Economic damage	10-100 million euro (plant, down time, claims)	Idem
Environmental damage	minor	Significant
Cultural damage	None	None

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Conclusions

- Inundation probability + consequential damages small due to high elevation.
- If extreme conditions do occur, effects are to be expected mainly in terms of societal disruption and economical damage.
- Liquid bulk and public infrastructure are sensitive to flood risk

Considerations:

- Cumulative risk: multiple plants are flooded because of even terrain;
- Flood risk of chemical plants depends on weather conditions (e.g. wind).
- A case to case basis is needed: difficult to quantify without specific information