CLIMAR

case study “Coastal Flooding”

Evaluation of climate change impacts on flood risks in the Belgian coastal zone

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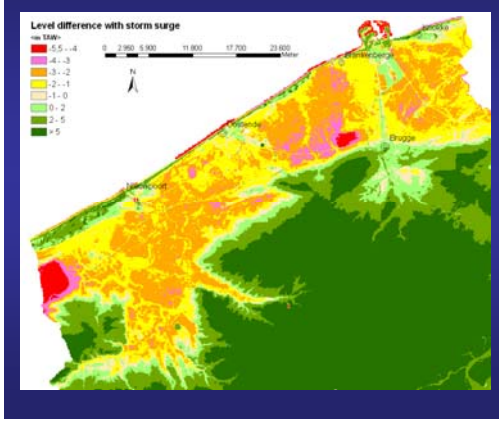
Introduction & objectives

With more then 85% of the coastal zone under a 5 elevation, Belgium is one of the most vulnerable European countries in terms of sea level rise and flooding (European Environment Agency, 2006). “Coastal flooding” is one of the case-studies considered in the project CLIMAR in order to elaborate an evaluation framework for adaptation scenarios to climate change induced impacts on ecologic, economical and social systems.

The Belgian coastal plain



- Largest part of Belgian coastal plain 2 m below level of average yearly storm (5,5 m TAW)*
- Increasing risks due to sea level rise and increased storminess

Quantification of secondary impacts

Risk calculations

- For each scenario of climate change (see poster of global CLIMAR-project) one worst credible storm
- Return period of worst credible storm = 1/17.000 years**

> Present conditions of sea level and wave climate: storm surge level 8,0 m TAW at Oostende

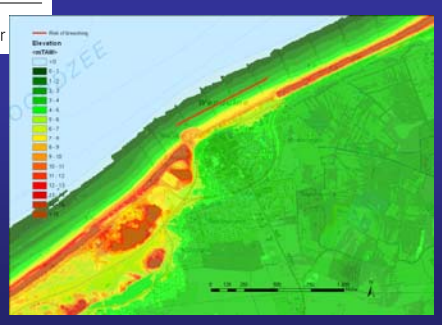
> Worst case scenario of climate change by 2100: storm surge level of 10,5 m TAW at Oostende

2. Breach formation

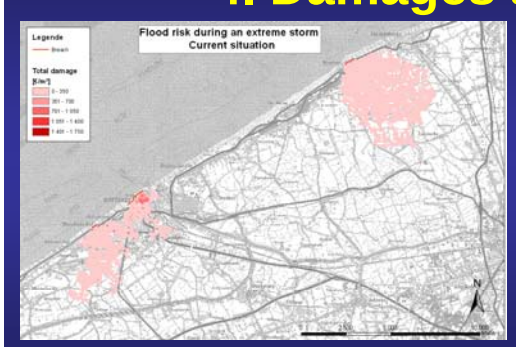
remaining volume after erosion < critical volume

➡ BREACH

Present situation
e.g.: risk of breach formation due to absence of dunes



4. Damages and casualties



Present situation:

- Highest risks near cities
- Total damage costs 500 x 10^6 €
- Number of casualties 10 – 15 (not including damages and casualties due to wave overtopping on the dike)

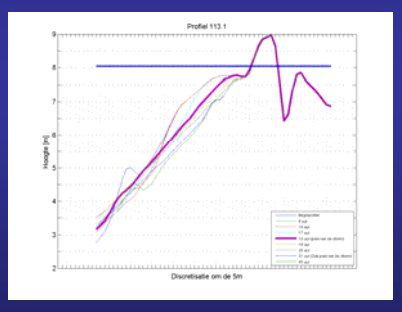
Secondary impacts

Ecologic	Social	Economical
• Habitat change • Habitat degradation • Loss of coast specific biodiversity • Ecosystem disturbance due to defence measures	• Casualties • Safety • Less attractive coast due to defence measures • Temporary unemployment in flooded areas	• Damage costs •Temporary decrease in production in flooded areas • New opportunities within alternative defence scenario’s (e.g.: broader beaches – recreation) • Economic result

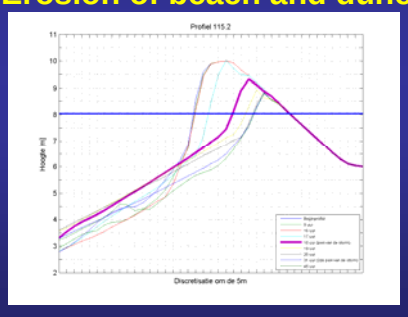
1. Erosion of beach and dune

Evaluation of 380 cross sections (foreshore-beach-dune-polder) along the Belgian coastline > identification of “weak points” in the sea defence, e.g. (present situation):

Erosion of beach



Erosion of beach and dune

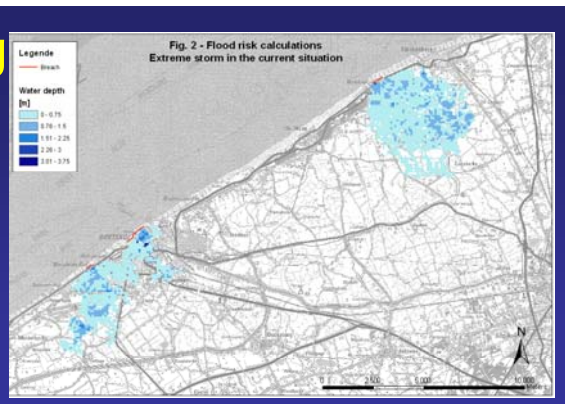


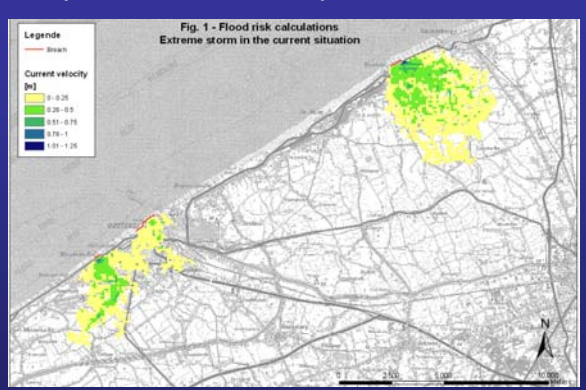
3. Hydraulic flooding

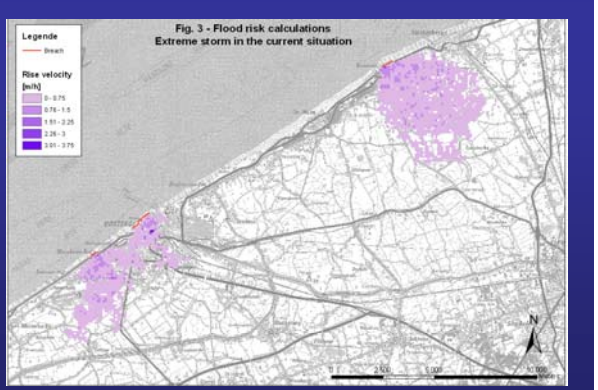
3 grids:
- Water depth [m]
- Rise velocity [m/s]
- Current velocity [m/s]

Present situation:

- Flooding of coastal plain through 13 different breaches
- Breaches only near cities (absence of dunes)







* Verwaest T., Viaene P., Verstraeten, J. & Mostaert F., 2005. De zeespiegelstijging meten, begrijpen en afblokken. De Grote Rede 15, december ‘05

** Willems P., 2007. Extreme waarden analyse hoogwaterstanden te Oostende, KUL Afdeling Hydraulica

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