

Software Aids to Calculating Port of Rotterdam Cost/Benefit Defenses

Strategies For Storms, Flooding & Sea Level Defense Investments Conference

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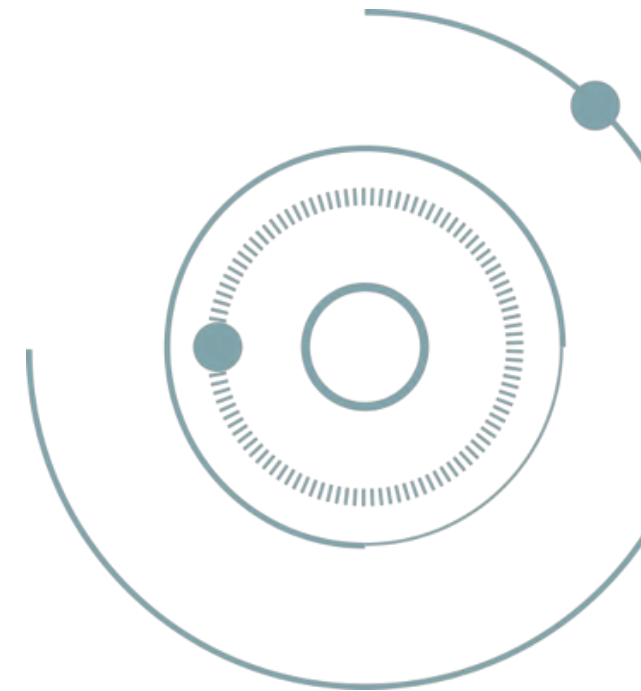
WHERE WE ARE IN THE WORLD





LEADING SERVICES

- Resilience in cities
- Smart ports, shipyards and terminals
- Airports
- Consumer goods
- Tunnels and underground structures
- Smart water in cities



OUR OPERATING INCOME & KEY FIGURES



Operating income

637 € million



- Netherlands
- Africa, Middle East and India (excl. SA)
- United Kingdom
- Asia Pacific (excl. ID)
- Americas
- Continental Europe (excl. NL)
- South Africa
- Indonesia



- Government & Society
- Industry & Business
- Infrastructure & Utilities
- Intermediates



- Industry & Buildings
- Transport & Planning
- Maritime & Aviation
- Water
- Southern Africa



We work intensely across the world on flood risk management projects



Flood risk assessment & Strategic planning

Damage, € per m²

- 0
- 0 - 50
- 50 - 100
- 100 - 150
- 150 - 200
- 200 - 250
- > 250

Scenario: Default Scenario

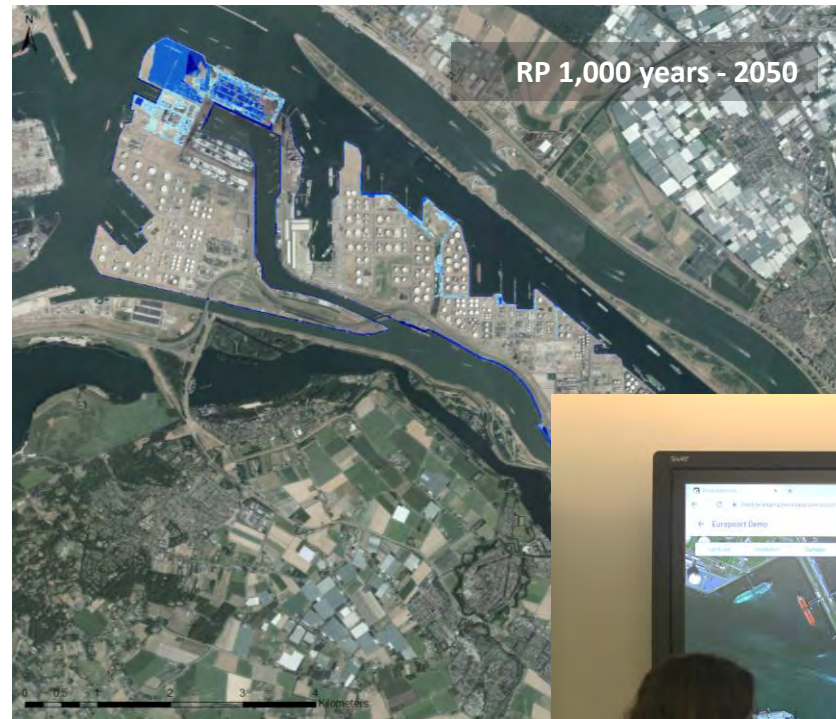
Time horizon: 2023 2050 2100

Return period: 10 100 300 1000 3000 10000

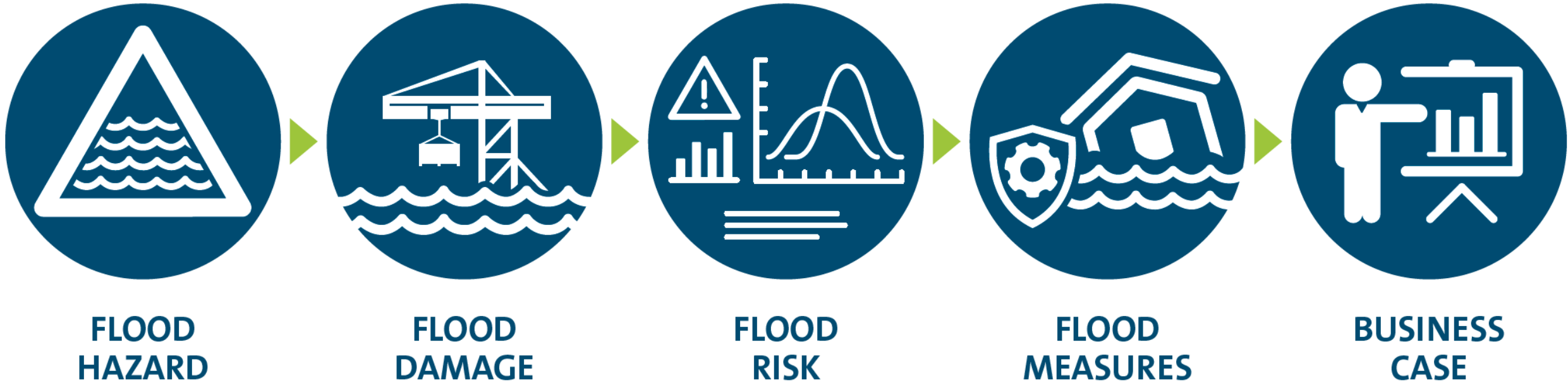


Global Flood Risk Tool – Comprehensive Risk mapping & planning tool

- **Risk mapping & Planning:** Planning tool to formulate climate resilience strategies
- **Online service:** Flood Risk calculations through cloud-based computing platform based on 5-steps approach
- **Fast calculations:** inundation and damage calculations within a minute instead of hours
- **Visually attractive:** User interface is interactive, visually attractive and understandable for non-experts to stimulate stakeholder dialogue during real-life sessions.
- **Decision-making:** GFRT to be used for scenario modelling to support and enable decision-making on business cases for different climate scenarios



5-steps approach

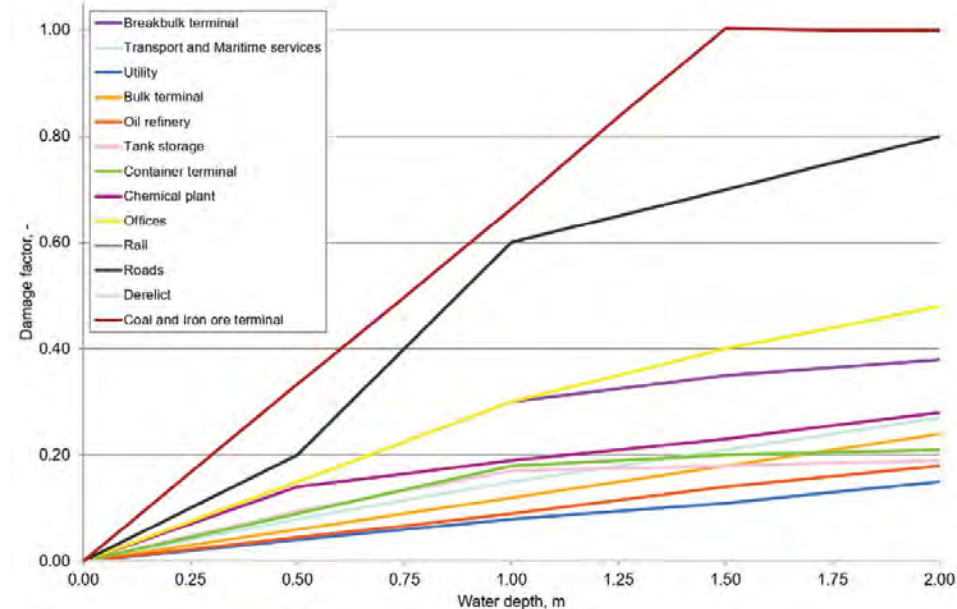


Economic input parameters

- Land use map, Land values and damage curves (obtained from literature and stakeholder consultations)



Sector	Value
Bulk terminals	€ 443
Container terminals	€ 696
Distriparks	€ 886
Public utilities	€ 1583
Goods transshipment	€ 886
Transport industry	€ 633
Other industry	€ 633



Sources:

* JCR, 2017. Global flood depth-damage functions: Methodology and the database with guidelines, Huizinga, De Moel and Wojciech:

<https://publications.jrc.ec.europa.eu/repository/handle/JRC105688>

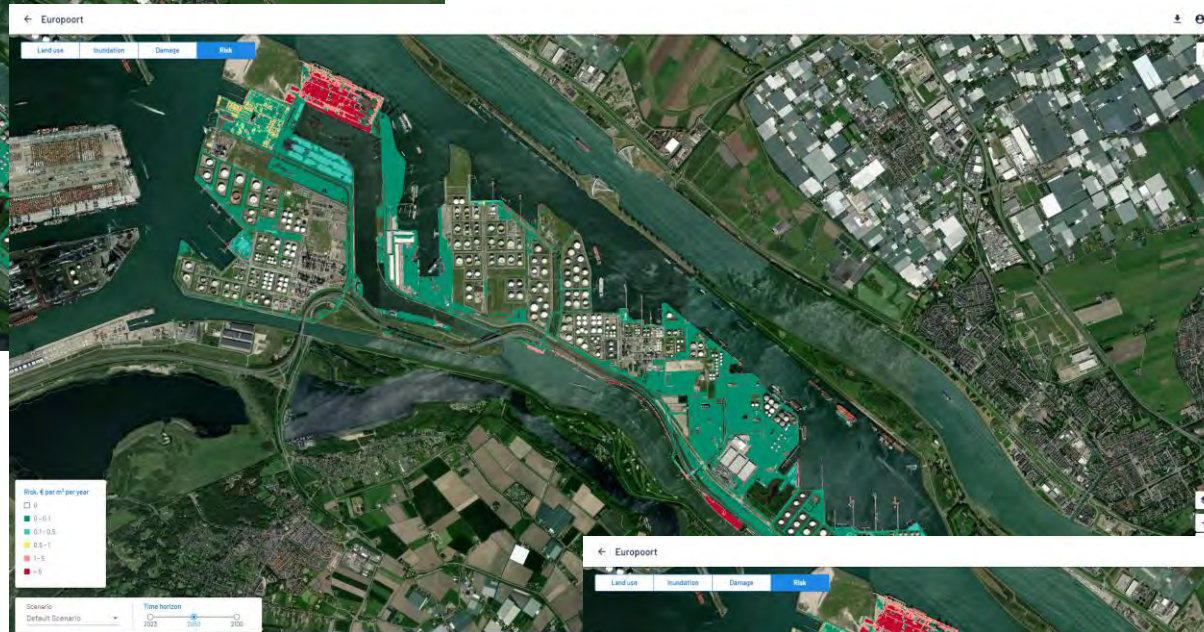
* Tebodin, 1998. Schade bij inundatie. By Rijkswaterstaat

Hazard & Damage maps: in 2050 +35cm SLR

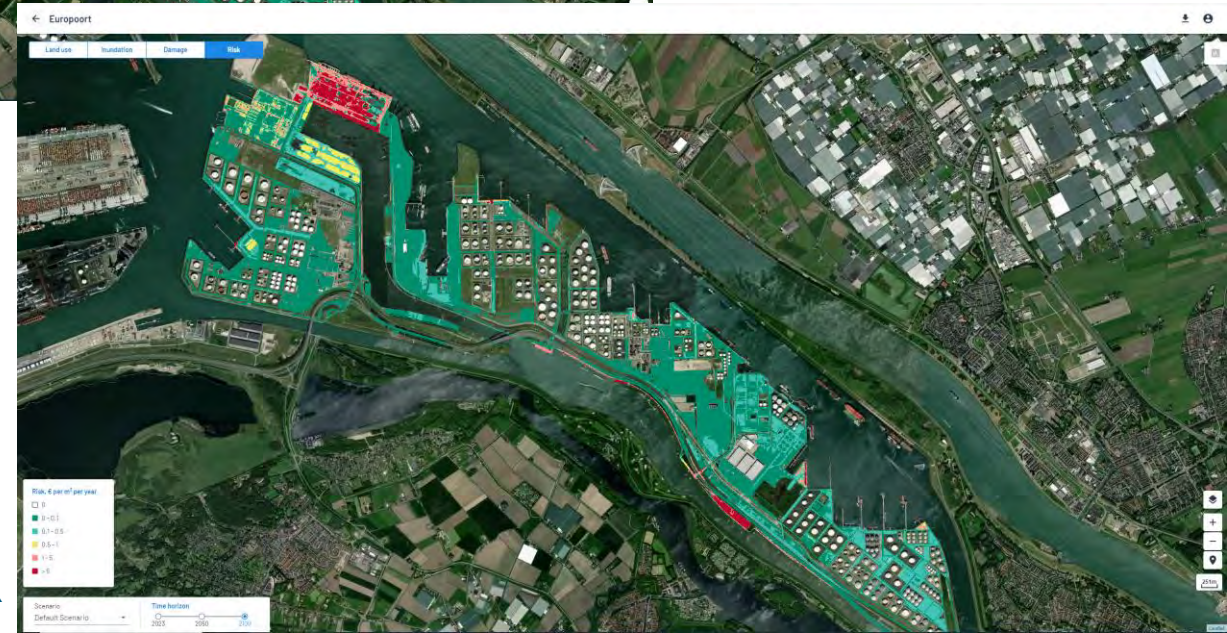




2023

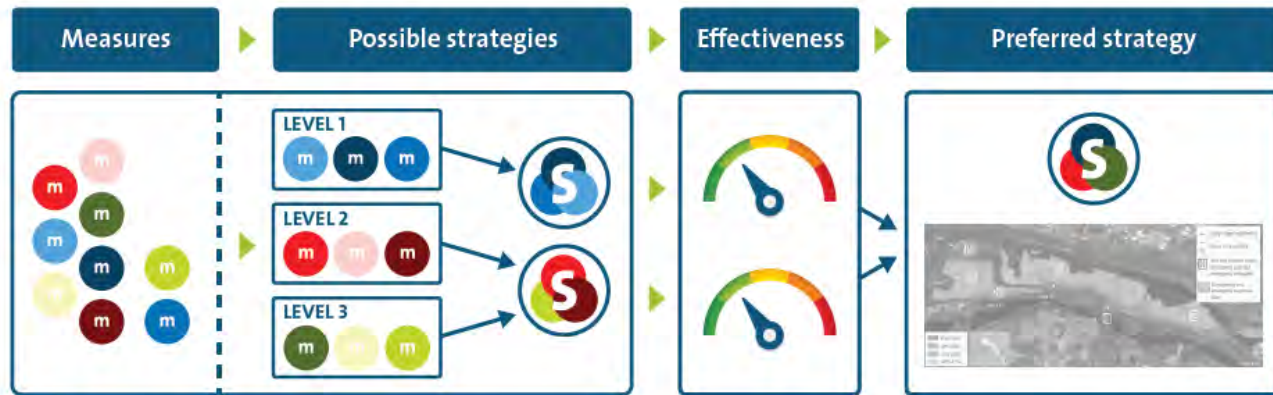


2050 +35cm SLR



2100 +85cm SLR

Strategic measures

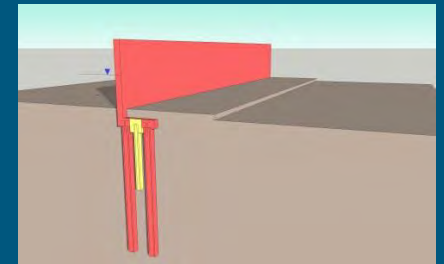


m Measure
S Strategy

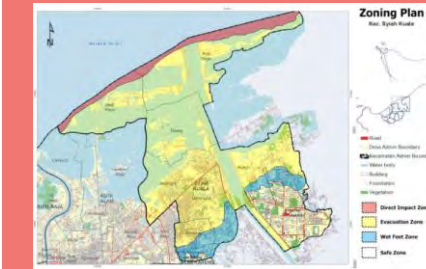
Based on the hazard, damage and risk & vulnerability assessment we will provide you with appropriate measures based on the multi-level safety approach to reduce the impact of hazards and to reduce the risks.

- **Level 1:** preventive structural measures dikes, spillways, culvert, sluices (grey) mangroves, wetlands, foreshores, nourishments, increasing conveyance by dredging and river widening (green) and storage areas, side channels and dike in dune system (hybrid).
- **Level 2:** adaptive and non-structural measures raising terrains or floors, dry/wet proofing (adaptive), land use planning, relocation/ managed retreat, operation and maintenance protocols, monitoring, building codes and laws and regulations (non-structural).
- **Level 3:** emergency response measures early warning response systems, emergency response and crisis management plans (controlled shutdown, stock removal), evacuation routes and storm shelters and temporary dikes.

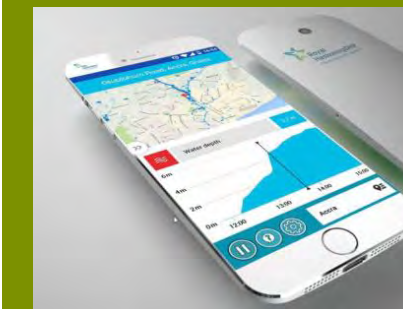
Level 1



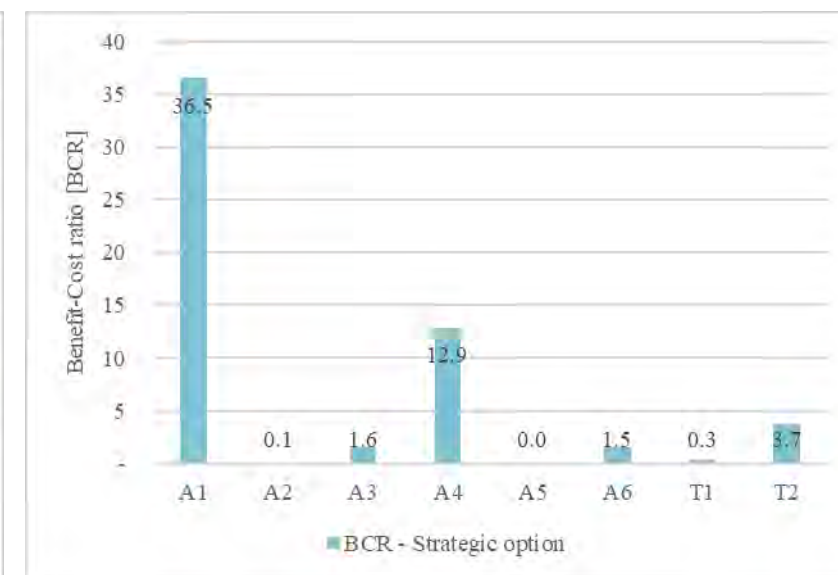
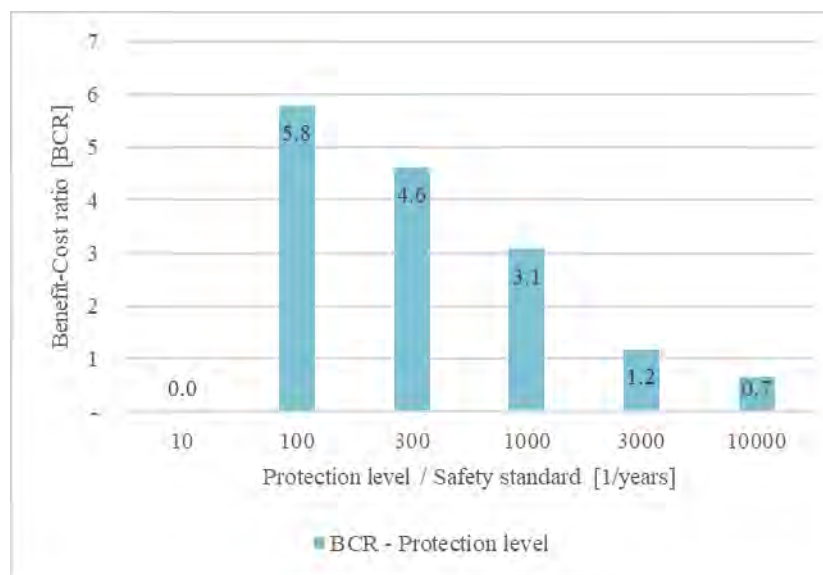
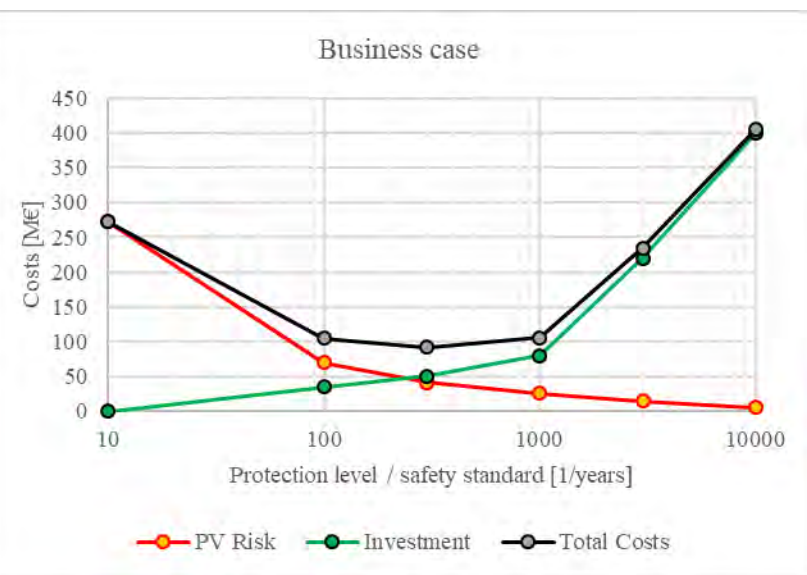
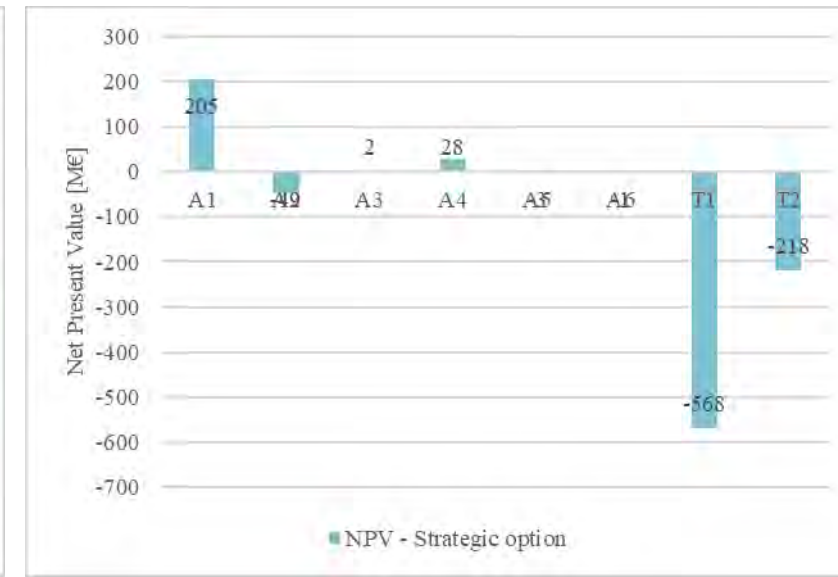
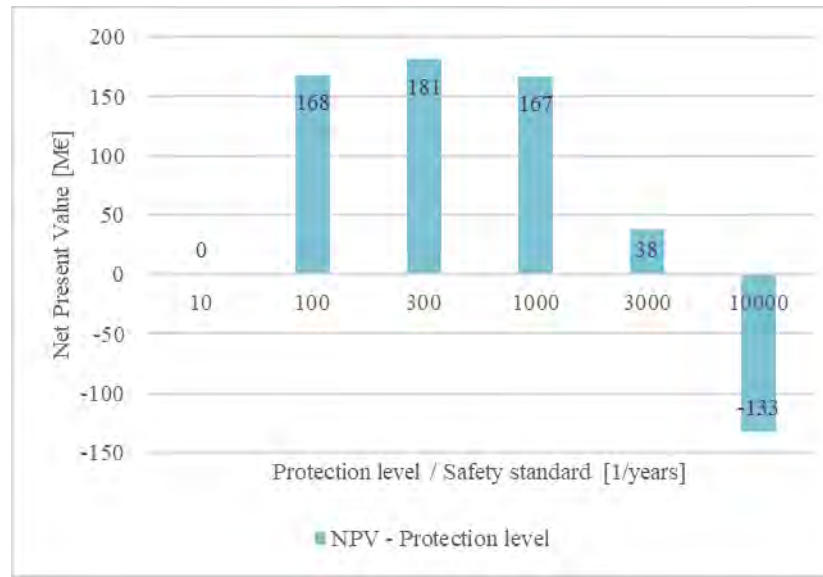
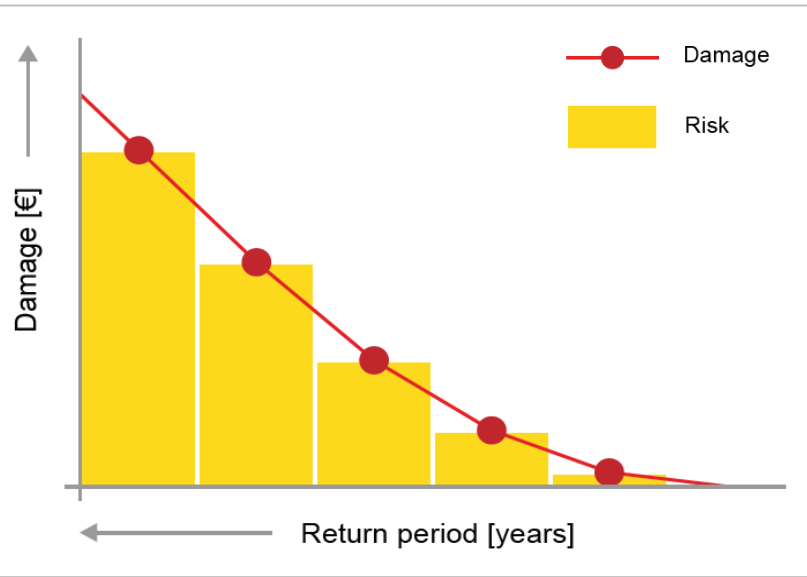
Level 2



Level 3



Benefits, measures & business case modelling



Preferred strategy through MCA and CBA approach

■ Multi-Criteria Analysis (qualitative) :

- technical (e.g. adaptive to climate change, effectiveness, does it require relocation, does it have stakeholder support, replicable and scalable);
- economic/planning aspects (e.g. urgency, consistent with policy and plans, does it stimulate the economy);
- socio-economic (e.g. protect people affected, reduce risk on losing lives, benefiting women or minority or vulnerable groups);
- environmental impacts (e.g. disturbance or destroys habitats).

■ Cost-Benefit Analysis (quantitative)

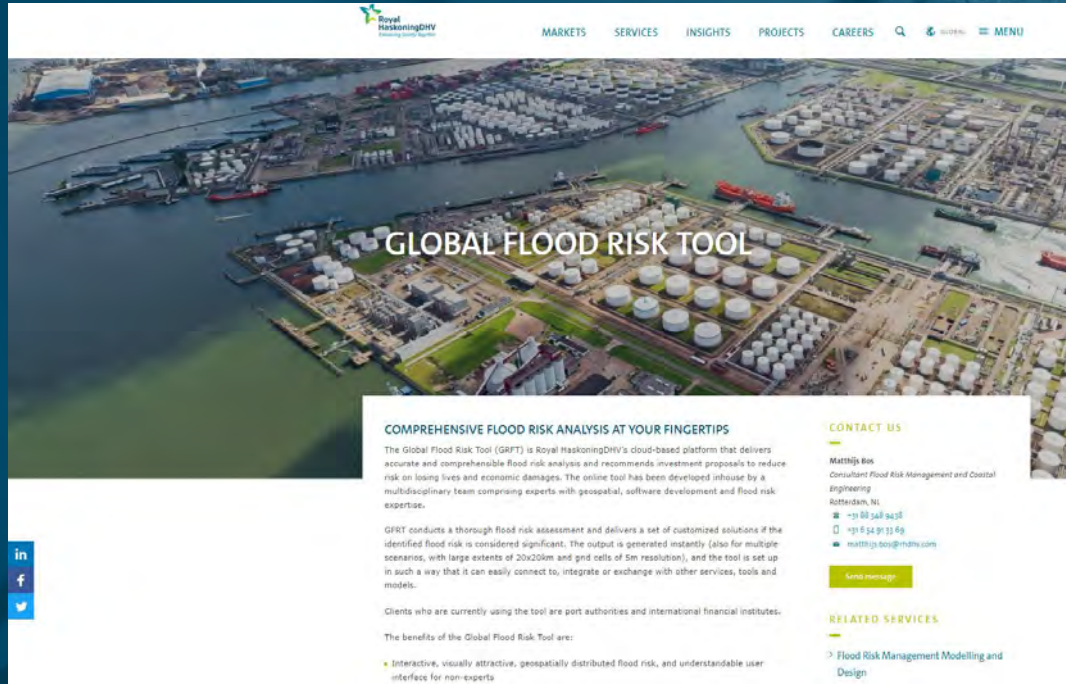
- Optimum Protection level (% Average risk reduction);
- Net present value (NPV) and Benefit-cost ratio (BCR) on strategic options.



Thank you!

More information online: [LINK](#)

Blog: [Providing protection and security through our Global Flood Risk Tool](#)



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