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MANAGING FLOOD RISK IN INTERNATIONAL HARBOURS



- **Origins and reasons**
- **Methodology**
- **Results**
- **Conclusions**



Why this research?

- **Increasing flood risk: CC, socio-economic development**
- **Port vulnerable to extreme flood events (KvK)**
- **Rotterdam Adaptation Strategy (2014)**
- **No legal standards: What risk is acceptable?**
- **What are other ports doing with this risk?**



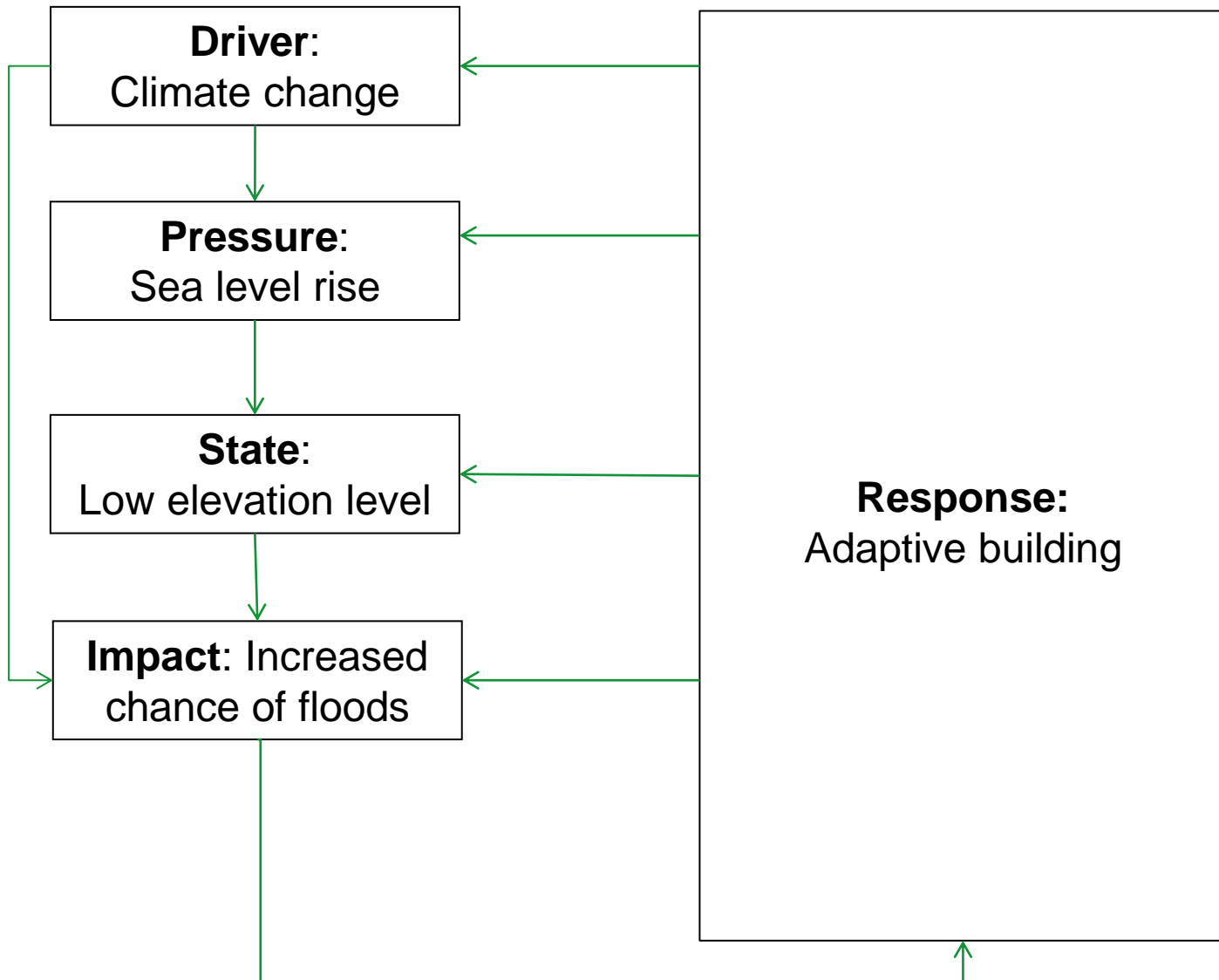
- **How do the international ports deal with flood risk now and how will they deal with it in the future?**



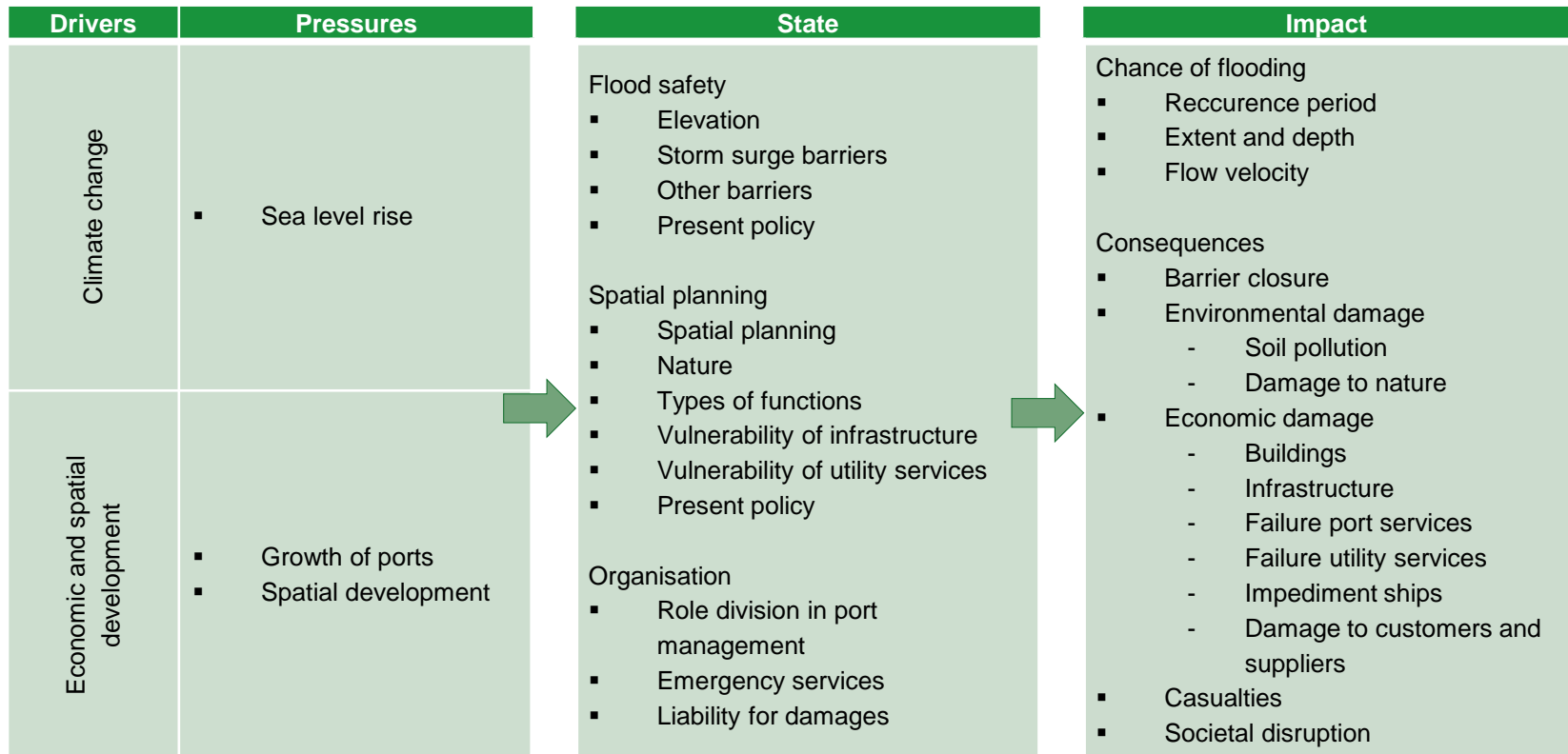
Ports



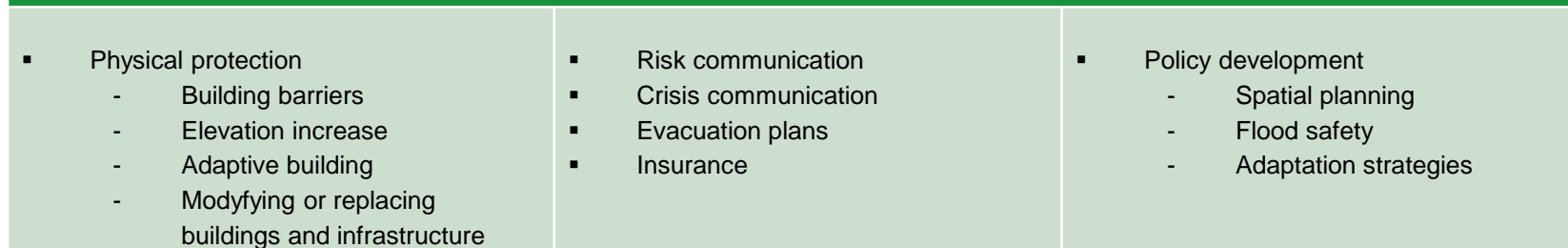
DPSIR model



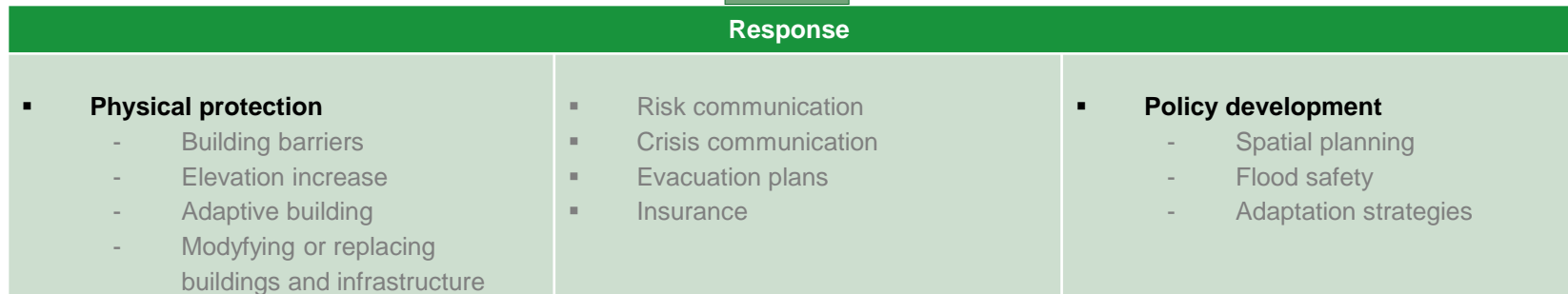
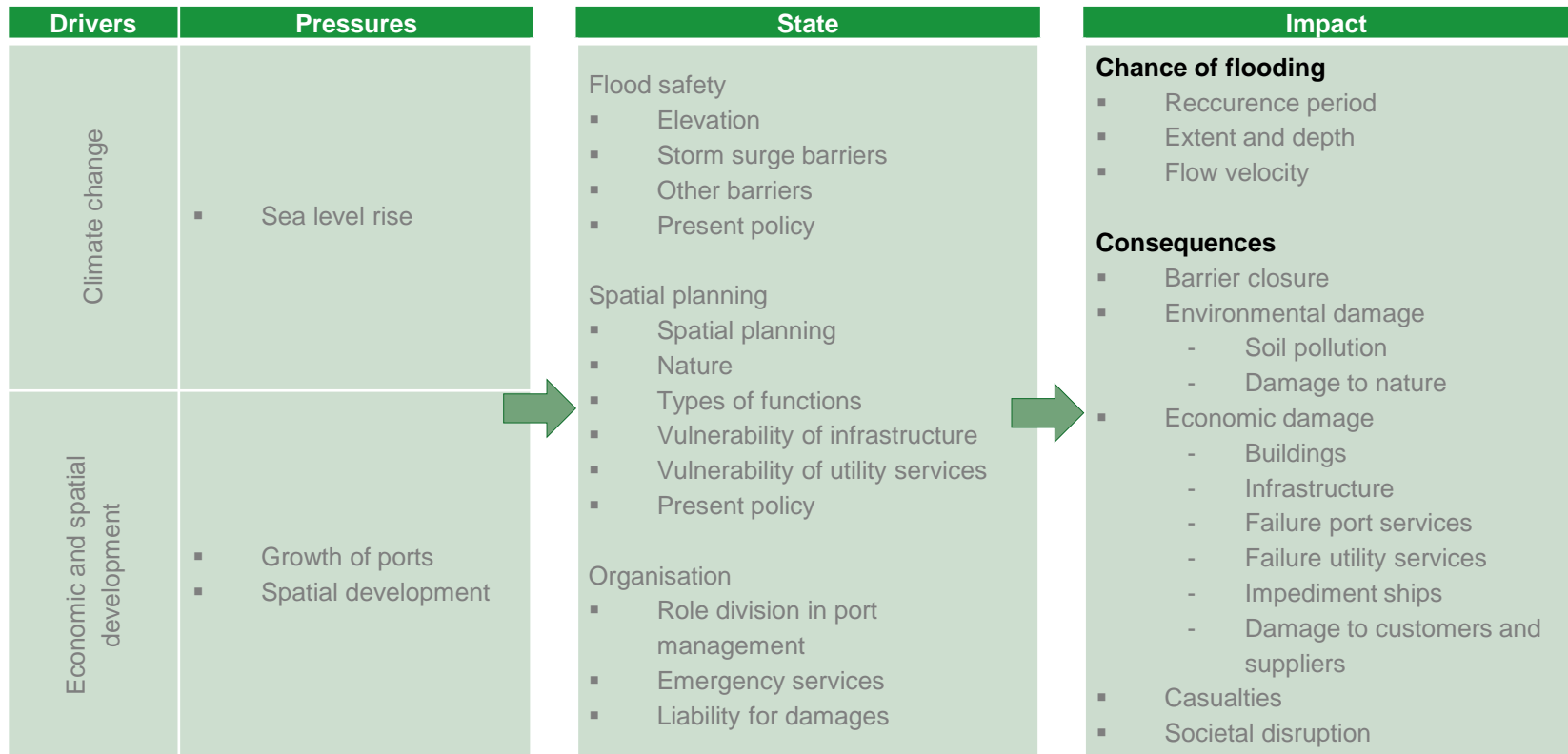
DPSIR model



Response



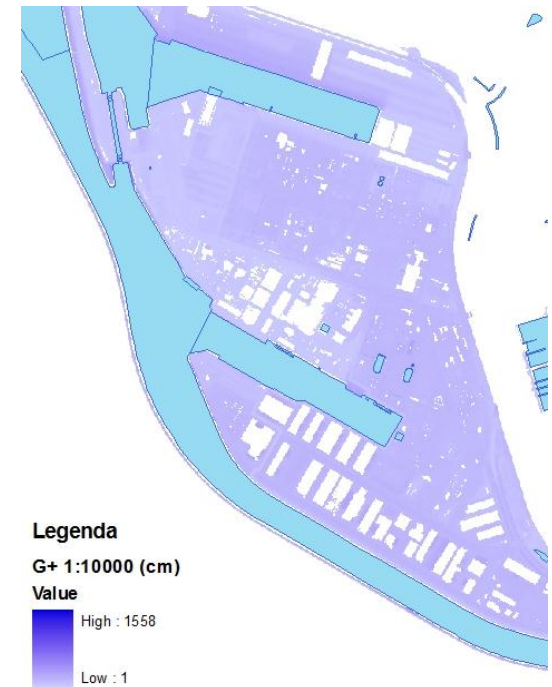
DPSIR model



Chance of flooding

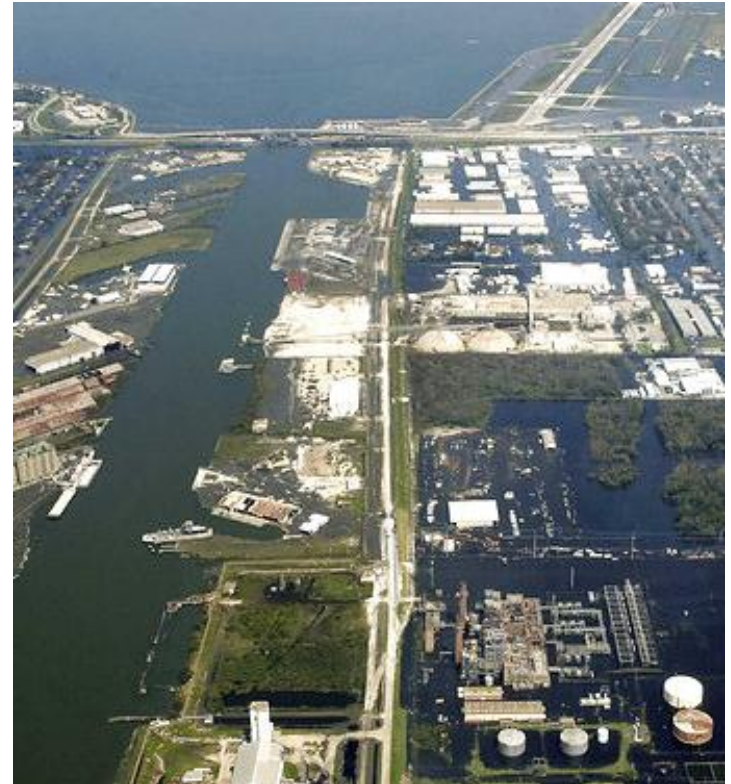
- Rotterdam 1/10.000-1/4.000
- London 1/1.000-1/100
- Hamburg 1/500

- New York 1/100
- Melbourne 1/100
- Ho Chi Minh 1/30



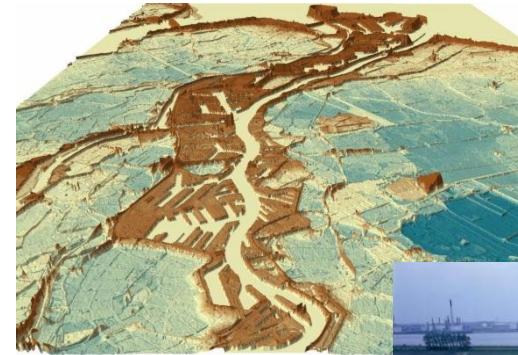
Impacts of flooding

- **Economic damage**
 - Damage to facilities
 - Failure of port services
- **Environmental damage**
- **Casualties**
- **Societal disruption**
 - Failure of utility services
 - Failure of services to hinterland

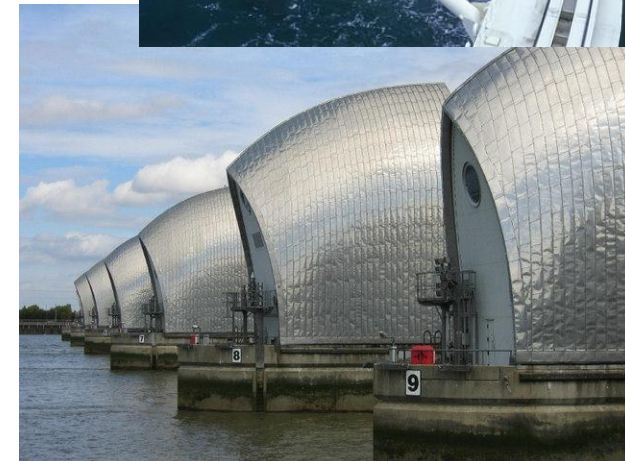
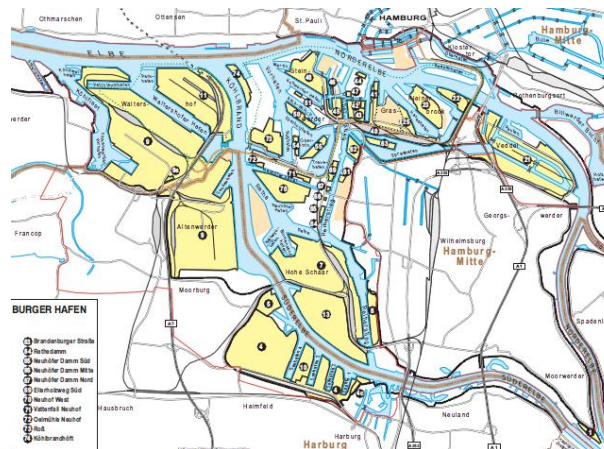


Response – physical protection

- **High elevation levels**
 - Rotterdam, Melbourne
- **Storm surge barriers**
 - Rotterdam, London
- **Other physical protection**
 - Hamburg (74 polders)



Bron: Bobbink TU Delft
i.o.v. gemeente Rotterdam



Response – Climate adaptation in policy

▪ Rotterdam – on all levels

- Municipality: Minimal elevation levels, Rotterdam Adaptation Strategy
- Province: Casualty methodology
- National: Delta program Rijnmond-Drechtsteden

▪ Other cities – not on all levels

▪ Attention for the port is still lacking everywhere



Conclusions (1)

- **No quantitative study on port vulnerability yet conducted**
- **There is a general lack of attention for ports in adaptation strategies**
- **Ports take flood risk into account differently**
- **Adaptation gets more attention, different priorities, no implementation yet**
- **Companies are liable for flood damage, sometimes insurance is available**
- **Indirectly ports benefit from other measures**



Conclusions (2)

- **No large-scale adaptation plans on short term, there is no urgency to reduce flood risk.**
- **On long term the ports will consider large scale adaptation options.**



▪ More information: www.rotterdamclimateinitiative.nl

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