Nature-Based Solutions in Ports

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WHAT ARE NBS?

"Nature-based Solutions **address societal challenges** through actions to protect, sustainably manage, and restore natural and modified **ecosystems**, benefiting **people** and **nature** at the same time."

IUCN

NBS:

1. Address your **challenge/problem**
2. **Work / align with** natural processes, ecosystems and stakeholders.

?

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Characteristics

- Nature-based Solutions are…

- … dynamic
- … multi-functional
- … innovative
- … context-specific

- You need to **think, act** and **interact** differently!

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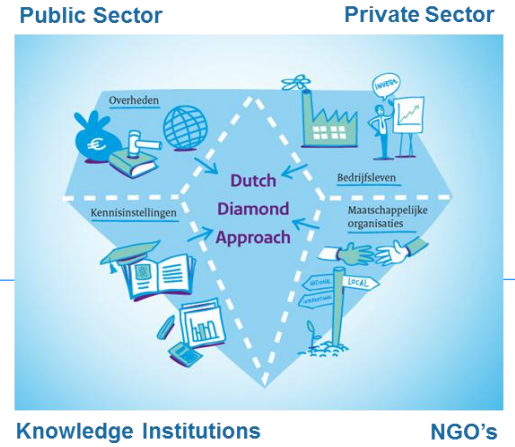
- Dutch consortium of contractors, consultants, knowledge institutes & NGO's founded in 2008
- Consortium collaboration is *pre-competitive*
- Shared ambition to:
  - Test and implement NbS concepts in practice
  - Support NbS with fundamental knowledge
  - Translate NbS to practical design guidelines
  - Upscale & mainstream NbS
- Projects are developed in a larger network of various external partners (public sector, IFI's etc)



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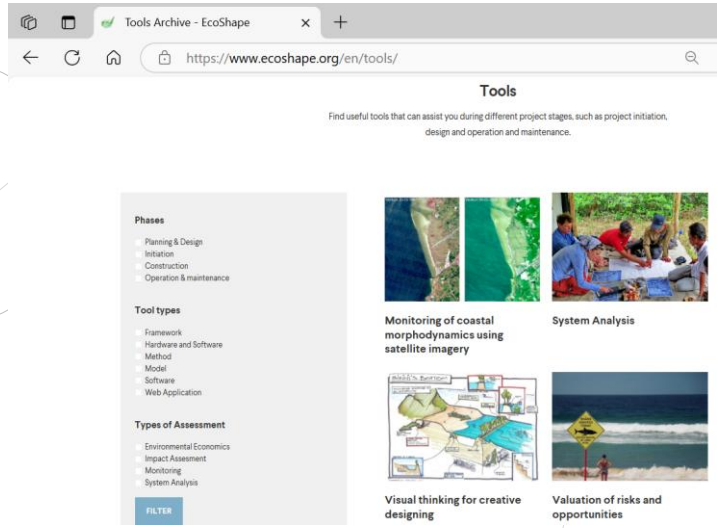
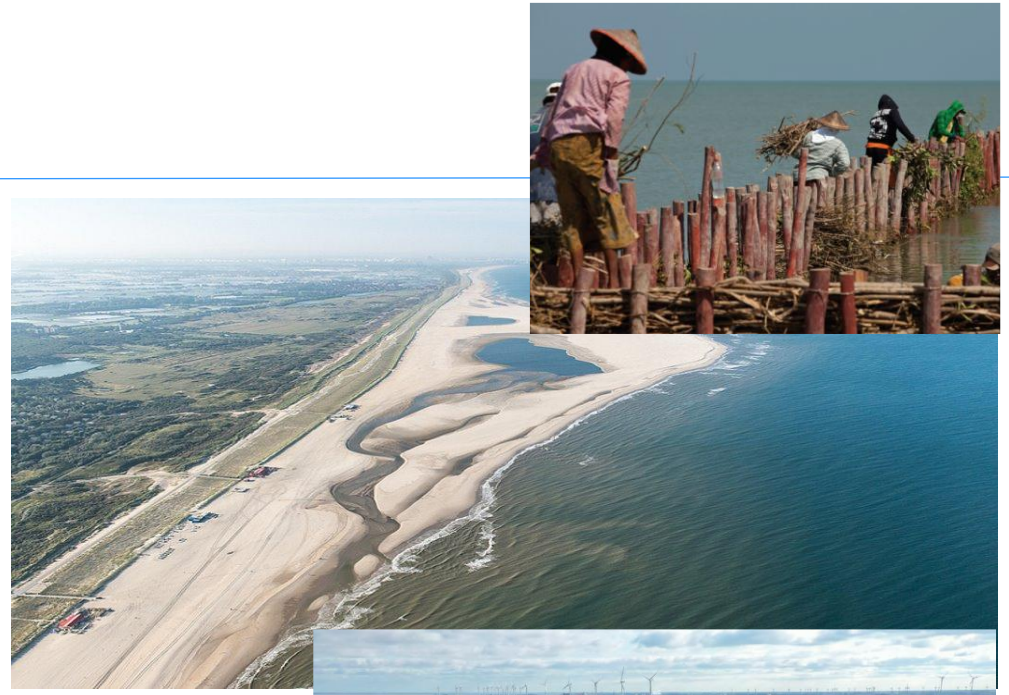
EcoShape – example of outputs

- Pilot portfolio – demonstrating how it works, making BwN tangible and practical
- Book and website www.ecoshape.org - providing inspiration, guidance and background info
- Guidances & white papers – providing insights, taking position and accelerating discussion





WORLD BANK GROUP

NBS IN PORTS

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Goal: Create a document which can be used to help ports make NBS and its opportunities more tangible and practical.

Link: Click here

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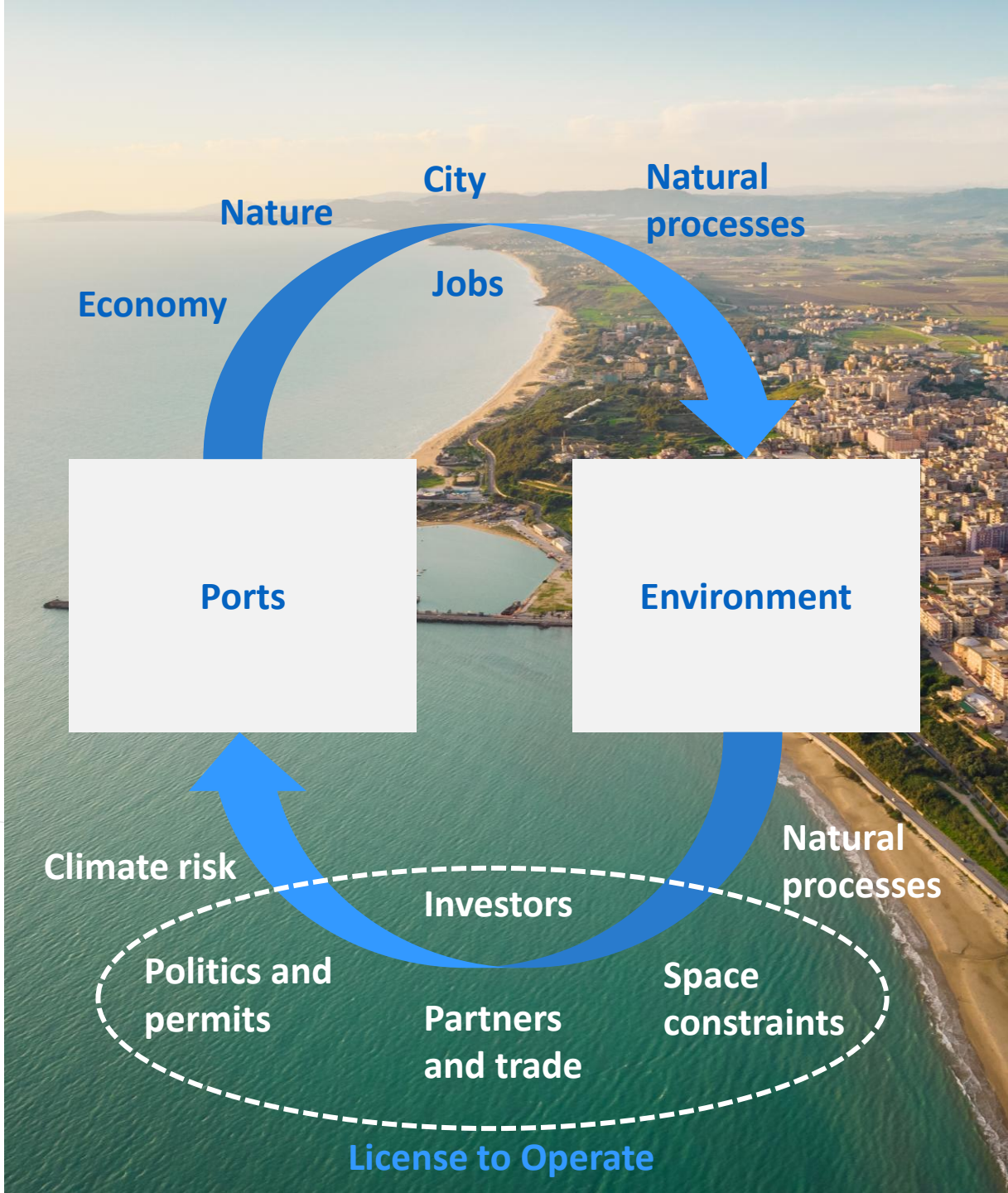
Nature Based Solutions in Ports

Through natural systems and ecosystems NBS can address port challenges

Ports are major influencers, players and stakeholders in the local, regional, national and international marine environment



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Checklist for screening NBS opportunities in Ports

1. Identify NBS opportunities from the families:
   - Within the spatial scope
   - Addressing the port's challenges
   - With port environment → license to operate
2. Leverage examples and case studies
3. Conceptualise project and value proposition.
4. Explore the **six enablers** for successful implementation → increase value proposition
5. NBS full offer of benefits for port and stakeholders.
6. Evaluate financing and bankability.

Enabler 1: Technology and System Knowledge

Enabler 2: Management, monitoring and maintenance

Enabler 3: Business case

Enabler 4: Institutional embedding

Enabler 5: Multi-stakeholder approach

Enabler 6: Capacity strengthening

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Our Case

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Our Case

What we see

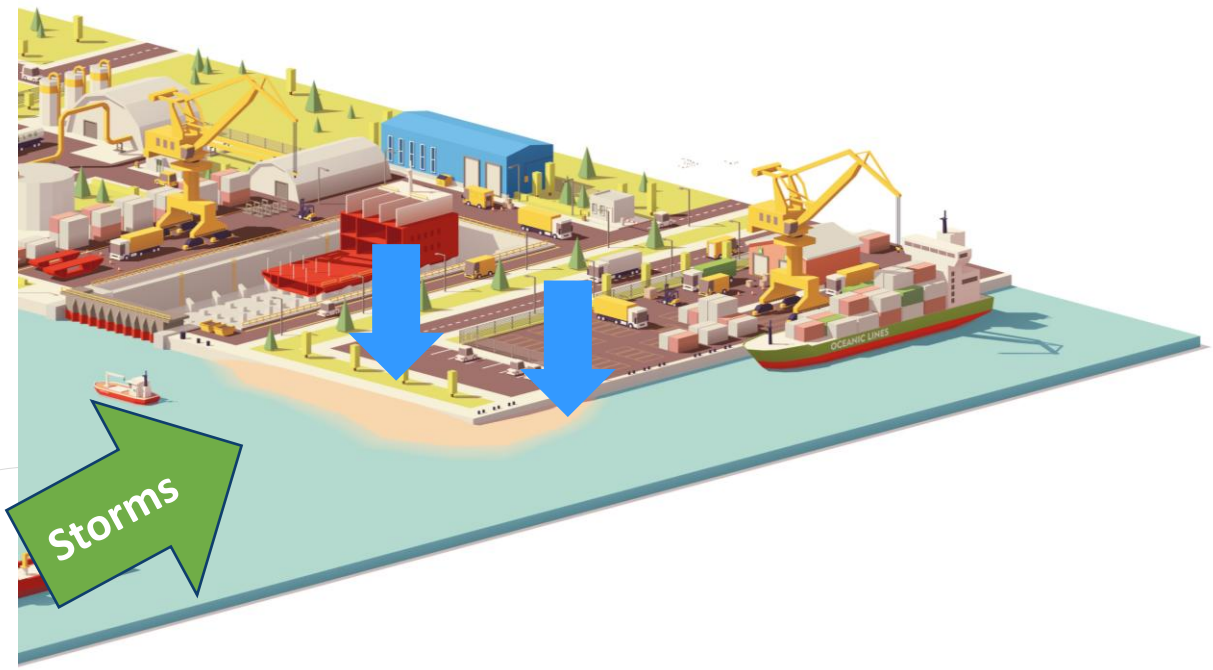
Climate change → Sea level rise

Climate change → Increased storm intensity

Risks

Wave overtopping → Downtime at terminal

Wave penetration at berth → Loss in productivity of quay operations



Considerations

- Limited budget
- Weak, muddy soil
- Recreational and fishing activities

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1. IDENTIFY NBS OPPORTUNITIES FROM THE FAMILIES:

PORT CHALLENGES

Similar to the challenges faced by society, ports encounter their own obstacles. These can be addressed by NBS.

In our case

- Climate risk
- Downtime
- Capital expenditures / License to Operate

Challenges in port governance & development

Development and Expansion

Challenges:

- Capital expenditures
- Environmental and social licensing
- Restricted development space

Climate Risk Mitigation

Challenges:

- Storm damage
- Flooding and drainage
- Sea level rise

Performance and Efficiency

Challenges:

- Downtime
- Difficult navigability
- Limited navigational depth
- Interference on vessel loading
- IWT hinterland connections

Asset Management & Accessibility

Challenges:

- Frequent maintenance dredging
- Maintenance of aging assets

Port Environment & Stakeholders

Challenges:

- License to operate
- Workforce and safety management
- Supply chain and connectivity

PORT CHALLENGES

Based on addressing these challenges we have identified 4 NBS families that we think are relevant for ports.

Working with Coastal Systems

Wave and Coastal Dynamics Attenuation

Beneficial Reuse of Dredged Sediment

Enhanced Hard Structures

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1. Identify NBS opportunities

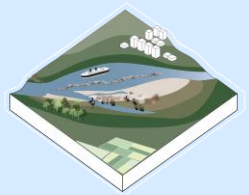
NBS Family: Working with Coastal Systems

What opportunities reside in working with natural processes?

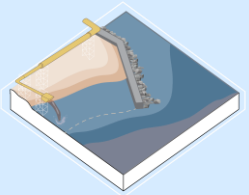
- Reduces operational downtime
- Decreases capital expenditures
- Lowers maintenance operational costs
- Minimises human interventions
- Provides ecosystem benefits

NBS:

Port siting and layout



Restoring estuarine or riverine ecosystems



Sustainable sediment management

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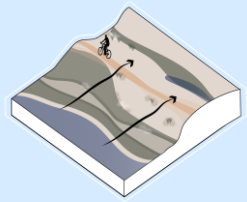
1. Identify NBS opportunities

NBS Family: Wave and Coastal Dynamics Attenuation

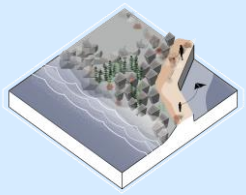
How can I minimize the impact of waves and currents on maritime activities?

- Leverages natural elements for wave attenuation
- Reduces wave energy
- Traps sediments and Minimises sedimentation in ports
- Reduces storm impact
- Promotes biodiversity and improves water quality

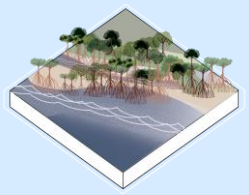
NBS:



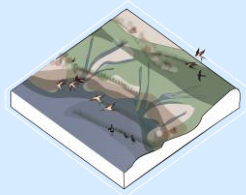
Sandy foreshores



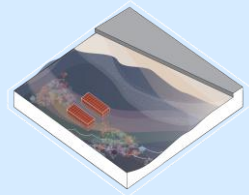
Enhanced breakwaters



Mangroves



Salt marshes



Reefs

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1. Identify NBS opportunities

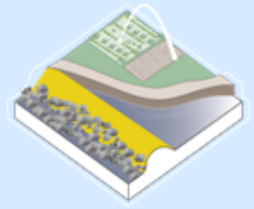
NBS Family: Beneficial Reuse of Dredged Sediments

What opportunities arise from the necessary dredging activities?

- Minimizes disposal distances
- Reduces dredging costs
- Decreases associated emissions
- Creates environmental opportunities
- Contributes positively to the port community

NBS:

Reclamation from dredged sediments



Construction material

Creation of habitats

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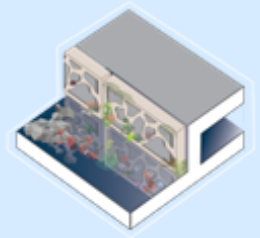
1. Identify NBS opportunities

NBS Family: Enhancing Hard Structures

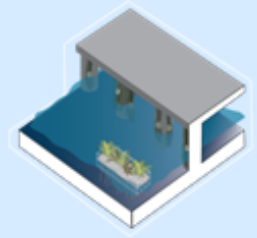
How can I make my hard structures more environmentally friendly?

- Integrated into existing infrastructures
- Helps comply with environmental regulations
- Improves water quality
- Hydrodynamic energy dissipation
- Offsets negative ecological effects

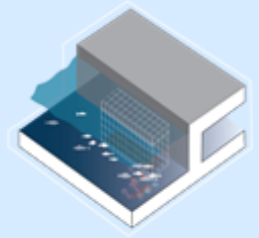
NBS:



Enhanced quay walls and revetments



Hanging and floating structures



Creation of habitats

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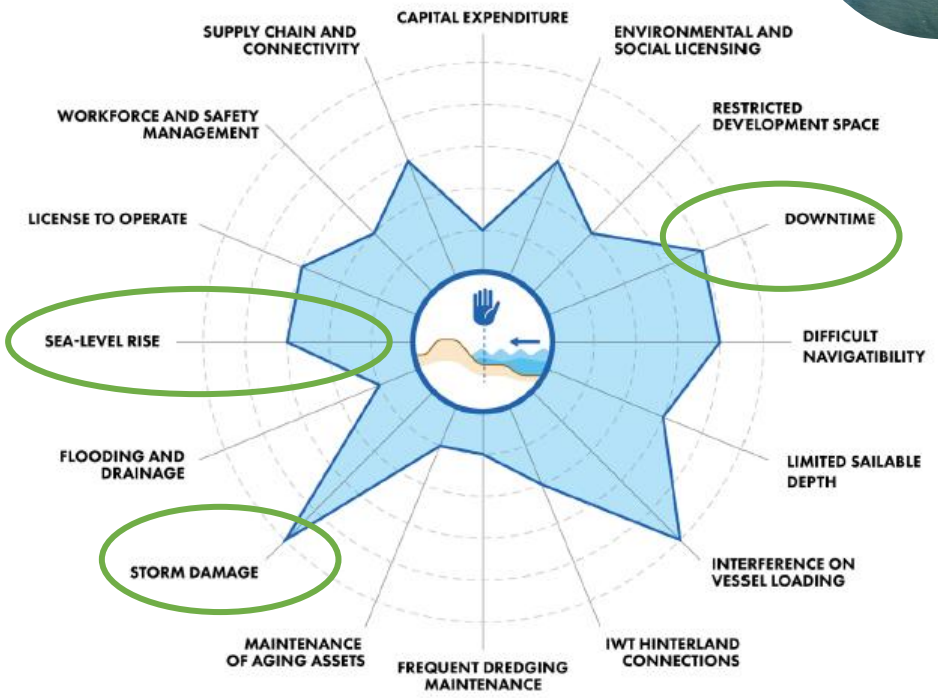
1. Identify NBS opportunities: Case



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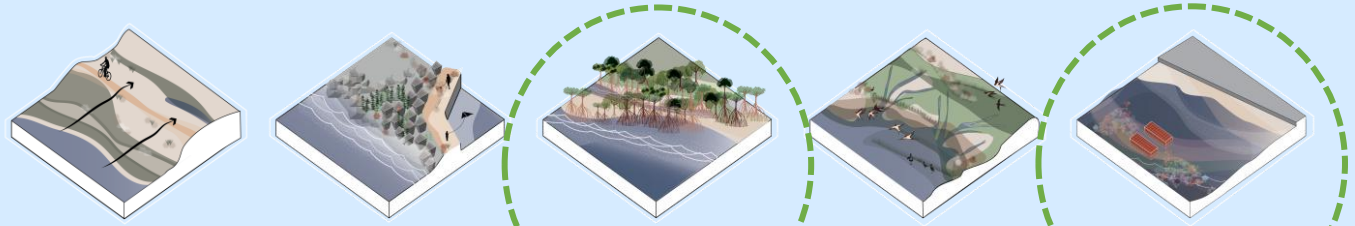

Sandy foreshores | **Enhanced breakwaters** | **Mangroves** | **Salt marshes** | **Reefs**

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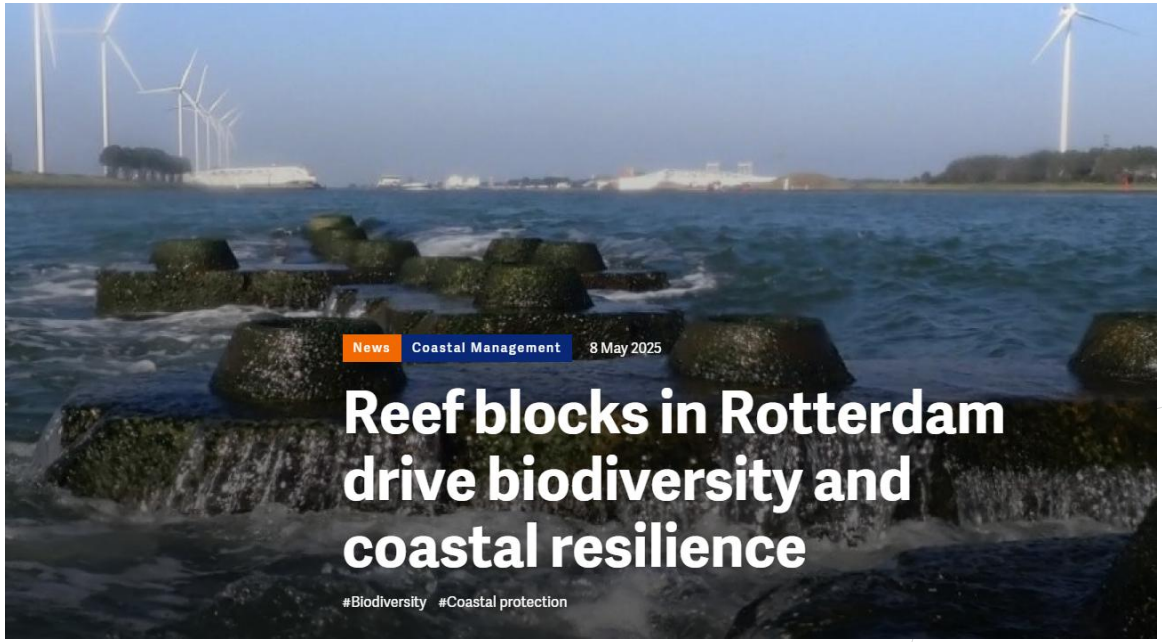
2. EXAMPLES AND CASE STUDIES IN SIMILAR SITUATIONS

Rotterdam, Artificial reefs



Jakarta, Mangrove breakwater

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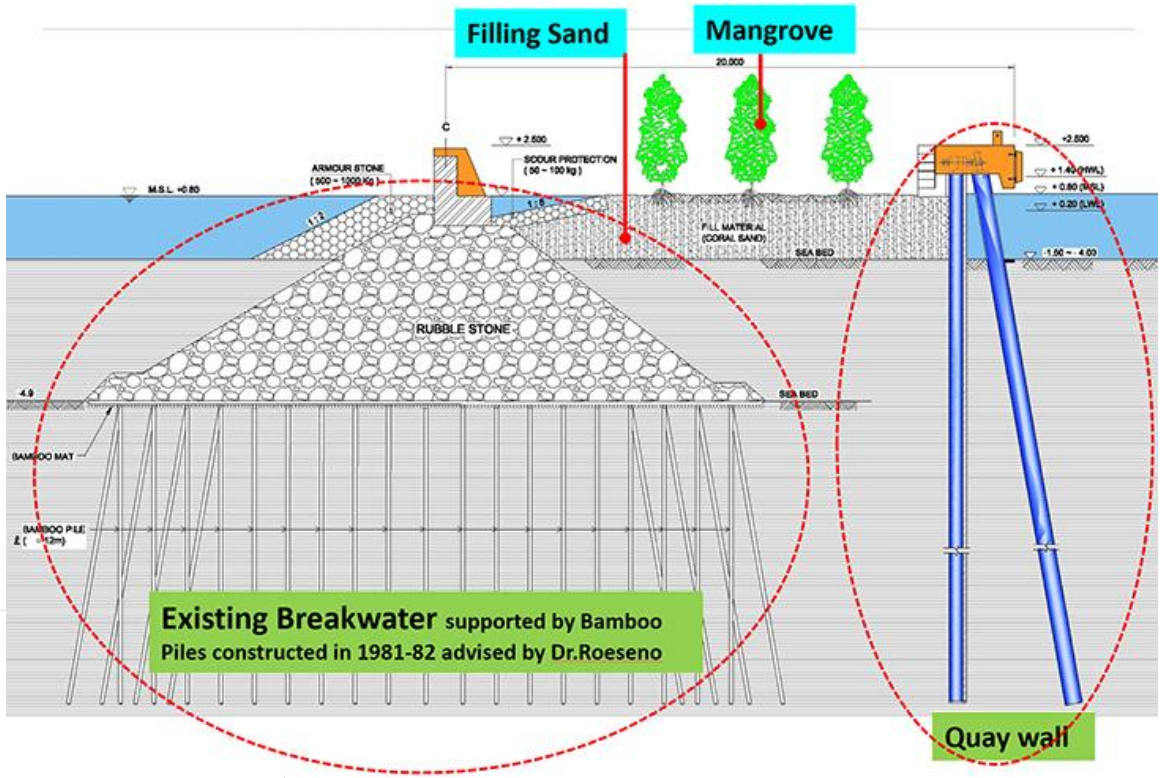
2. EXAMPLES AND CASE STUDIES IN SIMILAR SITUATIONS

Similar challenges	Their solution
Too expensive	Smaller design, supported by mangroves
Weak soil	Mangroves allow lighter design
Wave overtopping	Mangroves reduce overtopping
Sea level rise	Mangroves trap sediment and grow with SLR

Considerations

Wider breakwater design



Source: JSCE: Projet 09 | Jakarta Fishing Port Project

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3. CONCEPTUALIZE PROJECT AND VALUE PROPOSITION

Wave overtopping → Downtime at terminal

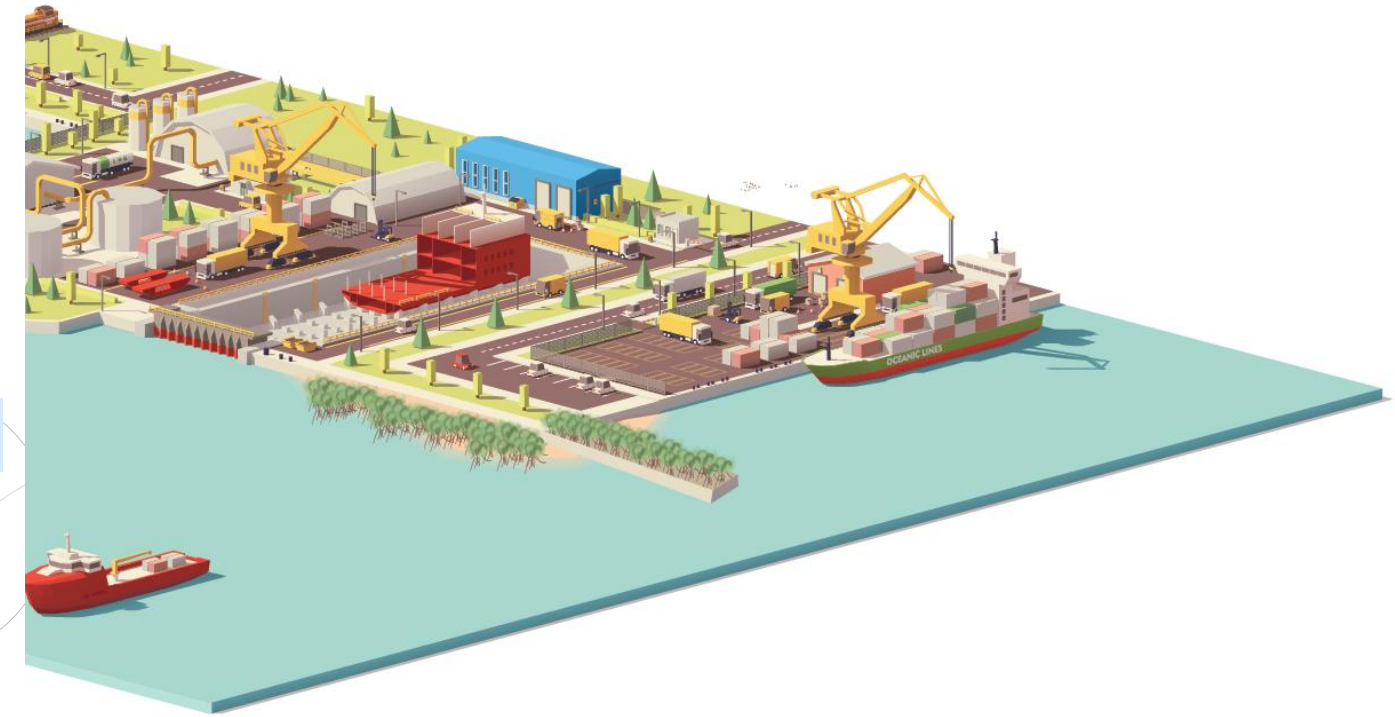
- Mangroves at beach

Wave penetration at berth → Loss in productivity of quay operations

- Mangrove breakwater

Efficient breakwater design

- Less foundations required
- Less high
- Lower CAPEX (estimated)



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4. EXPLORE THE SIX ENABLERS

Enabler 1: Technology and System Knowledge

- System knowledge
- Physical environment
- Innovative technology

What conditions are important for mangroves to thrive in?

- Consider hydro- and morphodynamic patterns.
- Map ecosystems
- Evaluate impacts from port activities

Enabler 2: Management, monitoring and maintenance

- Continuous management
- Performance
- Flexibility
- Respond to changes

Monitoring and maintenance programs for mangroves.
E.g. monitor response to sea-level rise

- Use adaptive management
- Monitoring of NBS
- Response to possible climate change effects

Enabler 3: Business case

- Business case
- Financial feasibility
- PPPs
- Project structuring
- Project feasibility

Savings achieved with mangrove breakwater design *vs. traditional methods.*

- Quantify costs, benefits and services
- Identify NBS revenues
- Tab into “labelled” financing

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4. EXPLORE THE SIX ENABLERS

Enabler 4: Institutional embedding

- Align with governance
- Design and construction
- Long-term

Are there legal /policy entry points, for support of mangrove preservation?

- Align with international plans and associated funding
- Include NBS Design in port masterplans
- Embed NBS in concession agreements

Enabler 5: Multi-stakeholder approach

- Cooperation
- Public participation
- Stakeholder engagement

Key components to consider for other stakeholders in the design.

- Engage with experts
- Engage with local communities
- Establish monitoring committee

Enabler 6: Capacity strengthening

- Awareness of NBS
- Training and educational programs
- Creating NBS communities

Can local communities aid in monitoring?

- Provide technical training for development teams
- Conduct outreach events
- Empower local communities

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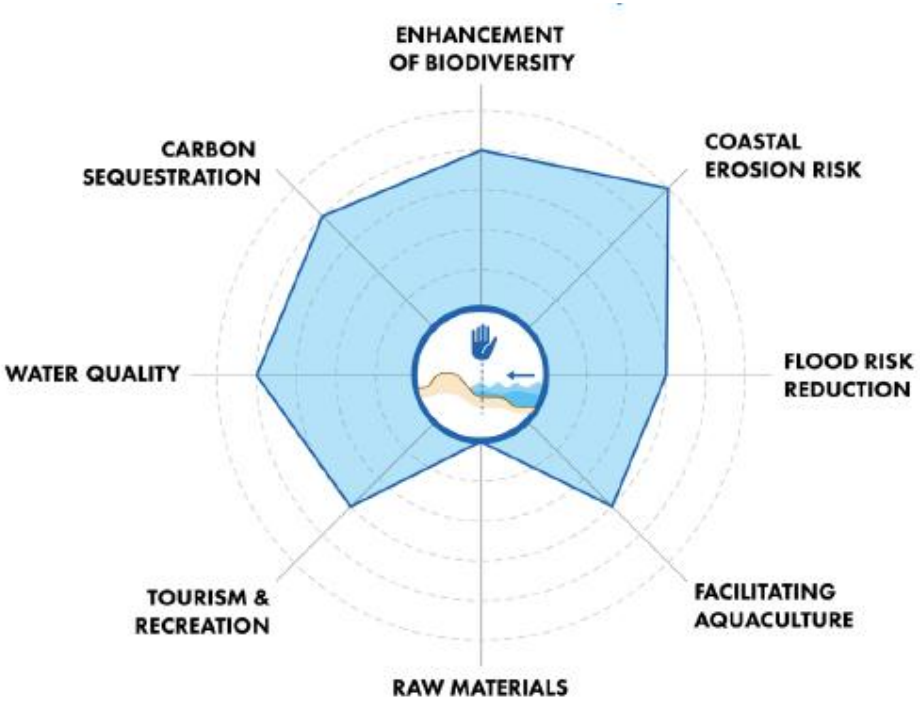
5. EVALUATE NBS FULL OFFER OF BENEFITS FOR PORT AND STAKEHOLDERS



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6. EVALUATE FINANCING AND BANKABILITY

Tools for generating project revenues:

- **Tax-based instruments:**
  - *Reductions and/or exemptions*
  - *Transport tax*
- **User Fees:**
  - *Port dues*
  - *Lease tariffs*
  - *Service tariffs*
- **Cost Reduction and Value Capturing:**
  - *OPEX or CAPEX reductions*
  - *Carbon markets*
  - *Compensatory habitat banking*
  - *Third party benefits*

6. EVALUATE FINANCING AND BANKABILITY

A wide variety of enablers exists on how to support and enable the bankability of NBS:

Financing enablers:

System level	Market level	Project level
• Capacity building • Enabling policies • Performance standards • Reporting methods and certification • Awareness and visibility	• Supply *(track record and pipeline)* • Scalability *(aggregating or pooling)* • Data availability • Insurance	• Risk-return understanding • Joint screening *(between developers and financial institutions)* • Adaptive, long-term management

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CASE: HABITAT BANKING SEATTLE

- In 1999, the Port of Seattle acquired Terminal 117 to create a **new maritime cargo area**, but the project was halted due to **heavily polluted soil** from prior ownership.
- In 2007, the **Duwamish Valley community** pushed the port for improved cleanup standards.
- The Port completed the cleanup of the shoreline and sediment by 2015, while the City addressed toxic contamination in the neighborhood in 2016.
- In 2020, the Port initiated construction of **Duwamish River People's Park**, providing 14 acres of vital fish and wildlife habitat and public access to the shoreline.
- This project introduces the Port's first **"habitat credit bank"**, allowing **third parties to invest** in habitat initiatives as mitigation credits under the Clean Water Act and Endangered Species Act, with generated revenue supporting further restoration efforts in the Green-Duwamish Watershed and Elliott Bay.

Key Points:

- As a large landowner the Port of Seattle is dedicated to be a responsible steward of the Lower Duwamish River area.
- A **multi-site wetland mitigation and habitat conservation bank** has been created to restore vital habitats, improve ecological functions, and promote sustainable development.
- Additional projects are planned, covering a total of 53 acres, including the Terminal 25 South project.

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