EcoShape and coastal Nature-based solutions

Creating the enabling environment for NBS

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Leading professional Nature based Solutions @ Haskoning

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- Consortium collaborating *pre-competitively*
- Shared ambition to:
  - Test and implement NbS concepts in practice
  - Support NbS with fundamental knowledge
  - Translate NbS to practical design guidelines
  - Upscale & mainstream NbS => **Nature based approach**
- Sole focus on projects where partnership is needed to make the difference
- Pre-competitive advice and assistance to governments for TOR and design development (in order to achieve NbS implementation)
- Unique – only organization with ample experience (since 2007) in NbS development, design, implementation, management and monitoring

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Public Sector

Private Sector

Knowledge Institutions

NGO's

Boskalis Dredging & Marine Experts

Van Oord Marine ingenuity

Witteveen Bos

Deltares Enabling Delta Life

Wageningen University Wageningen UR

ARCADIS

Royal HaskoningDHV Enhancing Society Together

HKV Lijn in Water

Wetlands International

SWECO

Nature based Solutions and a Nature based Approach

NbS are actions to protect, conserve, restore, sustainable use and manage natural or modified ecosystems in order to tackle societal challenges such as rising temperatures, floods, water scarcity and at the same time provide benefits for human well-being and biodiversity

EcoShape: On a landscape scale NbS can be part of a Nature Based Approach. that starts with system understanding

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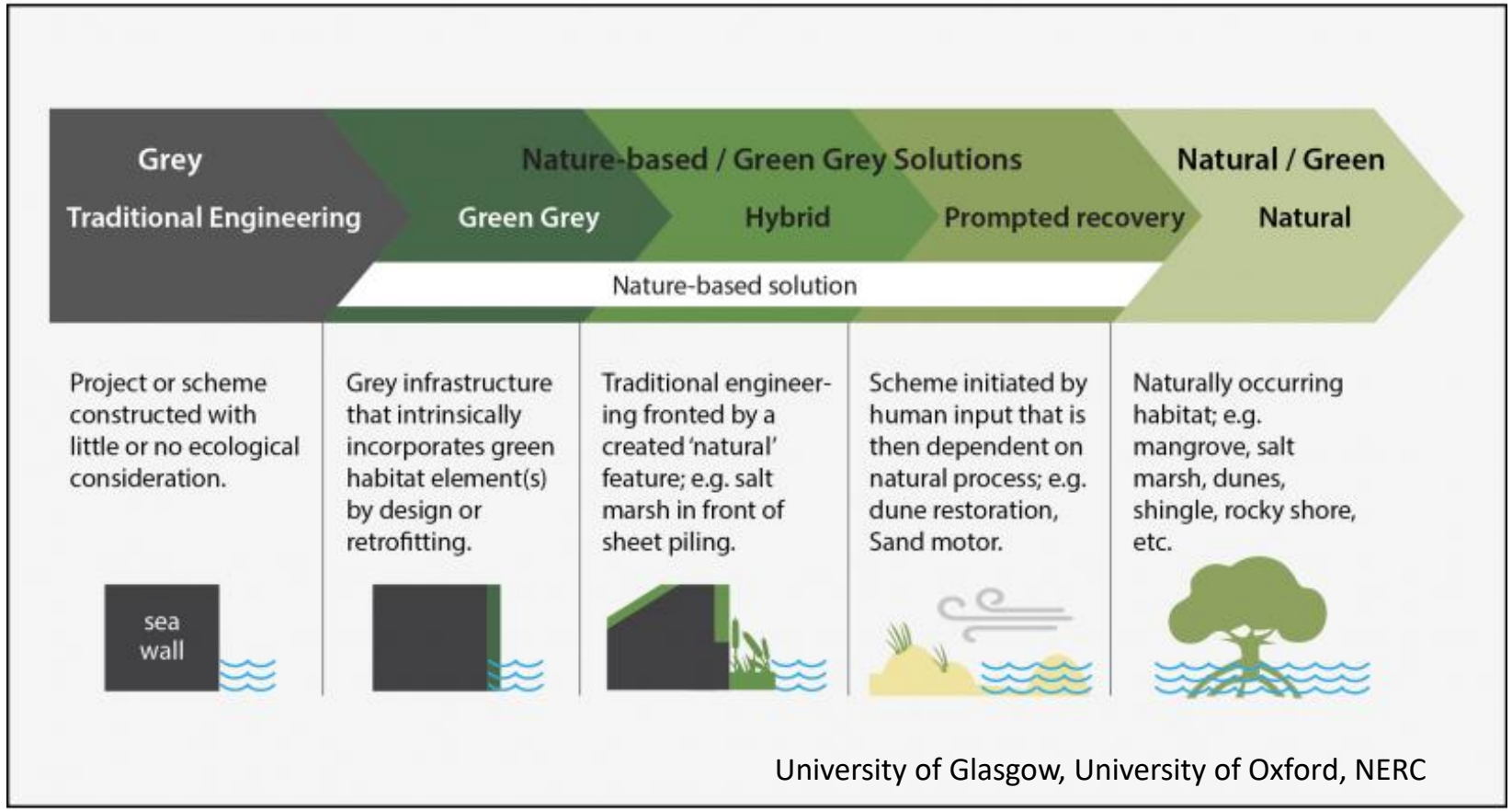
Solutions can be grey, green and hybrid



University of Glasgow, University of Oxford, NERC

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EcoShape Enablers for implementing NbS

"Cyclic design processes that start from ... are critical for scaling up and maintaining Nature-based Solutions"

"Dealing with natural dynamics ... understanding the system ... business case for NbS, but also makes it more complex and challenging to obtain financing"

Sandy coasts

Typical issues

Coastal erosion

Coastal squeeze

Maintenance issues

Sand by-passing

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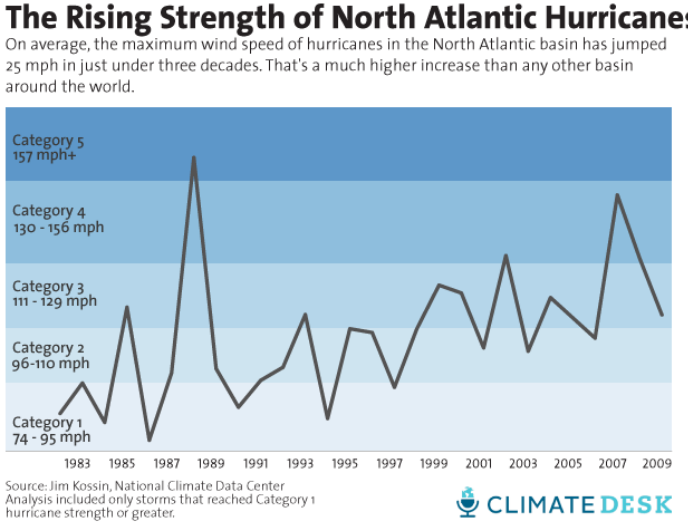
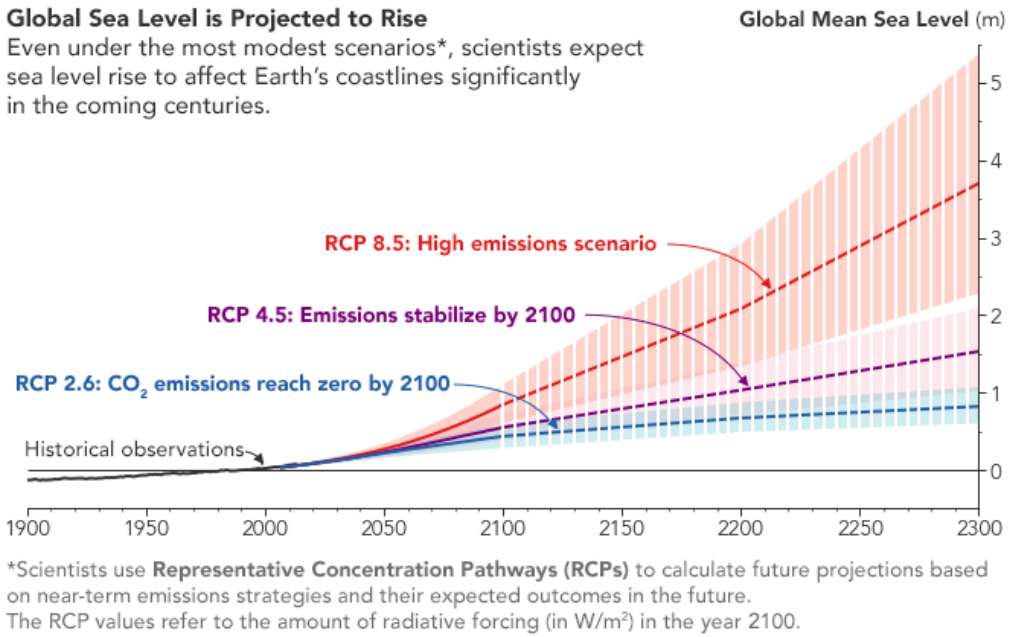
Global coastal pressures

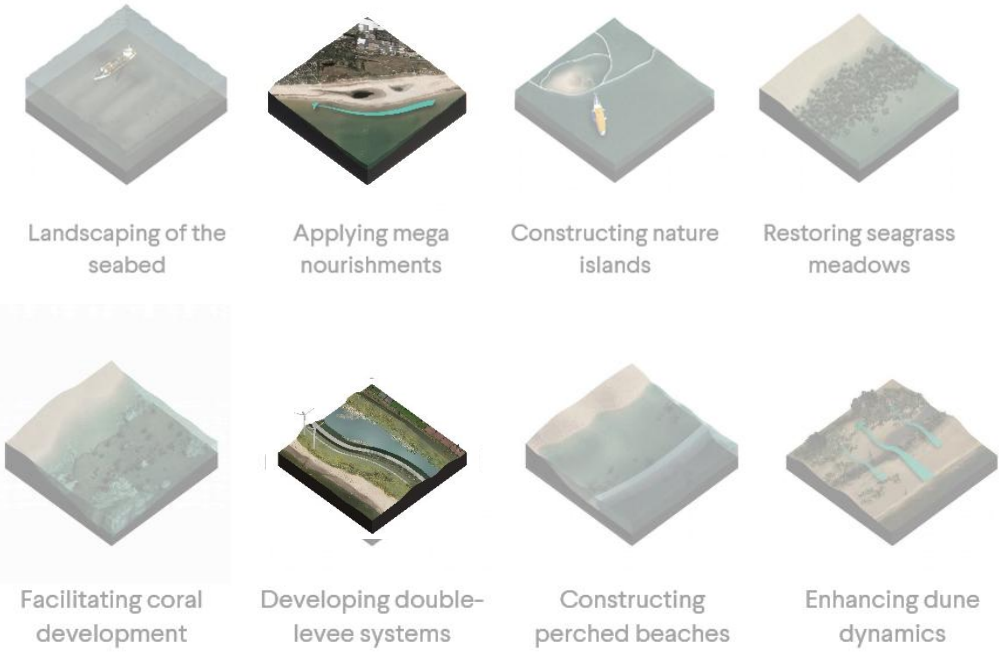


Typhoons/Cyclones/ Hurricanes



Sea level rise

Sandy Coast



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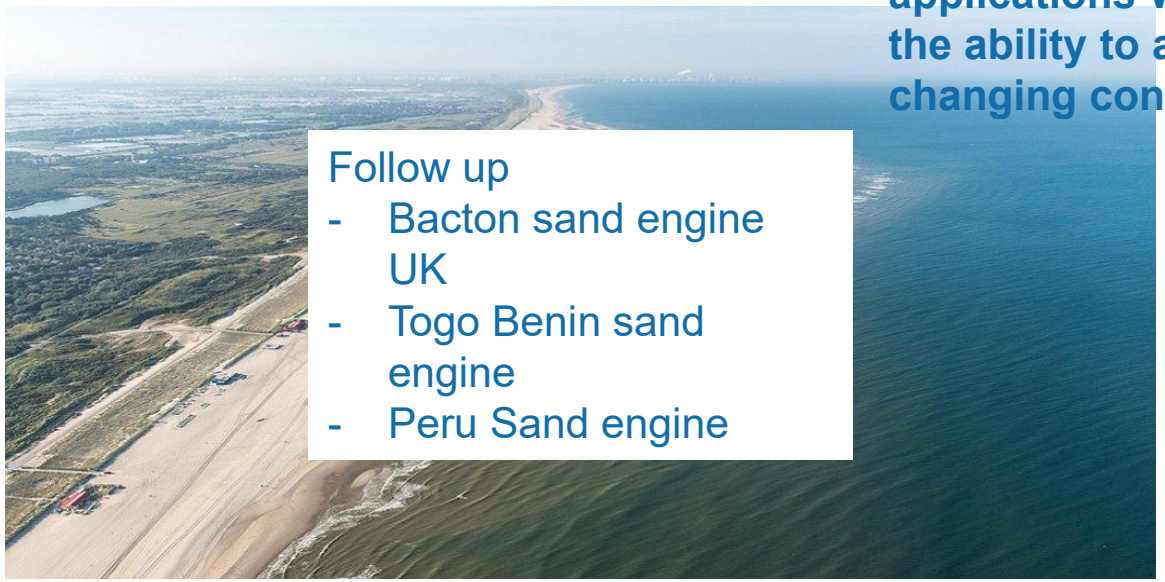
Sandy solution example: Sand engine

Concept large scale nourishment

Sandy solution should lead to a natural coastline that is **easier and more cost effective** to maintain. **No plug and play – extensive knowledge needed**

Strong stakeholder component leading to nature development, and excellent recreation opportunities

Real-time monitoring and research is applied at the sand engine that functions as a living lab for studying processes and species **Learning for new applications worldwide and the ability to adapt to changing conditions**



Follow up
- Bacton sand engine UK
- Togo Benin sand engine
- Peru Sand engine

Policy adaption - sandy solution as a starting point for a changing maintenance policy for the Dutch coast

Long term investment implications

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Sandy solution example: Hondsbossche Dunes

Dike in Dune concept

Sandy solution should lead to a natural coastline that is easier to maintain

Real-time monitoring and research is applied in the development of the Hondsbossche dunes. Focus on understanding the natural and physical development of the sandy solution and the amount of maintenance

Based on IISD's modelling, the sand dunes increase tourism revenue by almost EUR 203 million over 50 years, while the grey alternative would have increased it by only EUR 103 million

Commitment of Stakeholders realised by including multiple benefits. Flood safety, nature development, recreation and economic development

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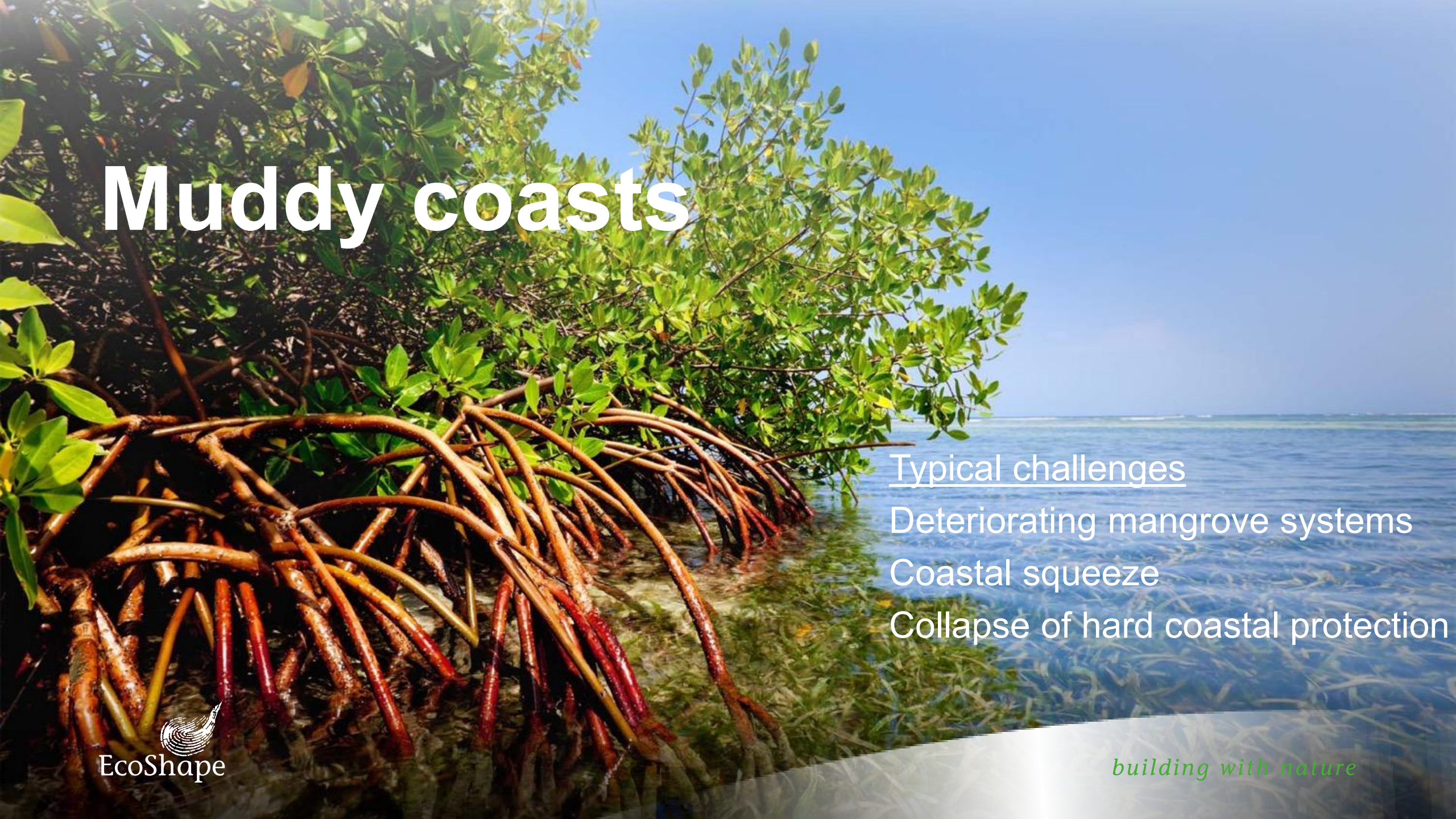
Muddy coasts



Typical challenges

Deteriorating mangrove systems

Coastal squeeze

Collapse of hard coastal protection

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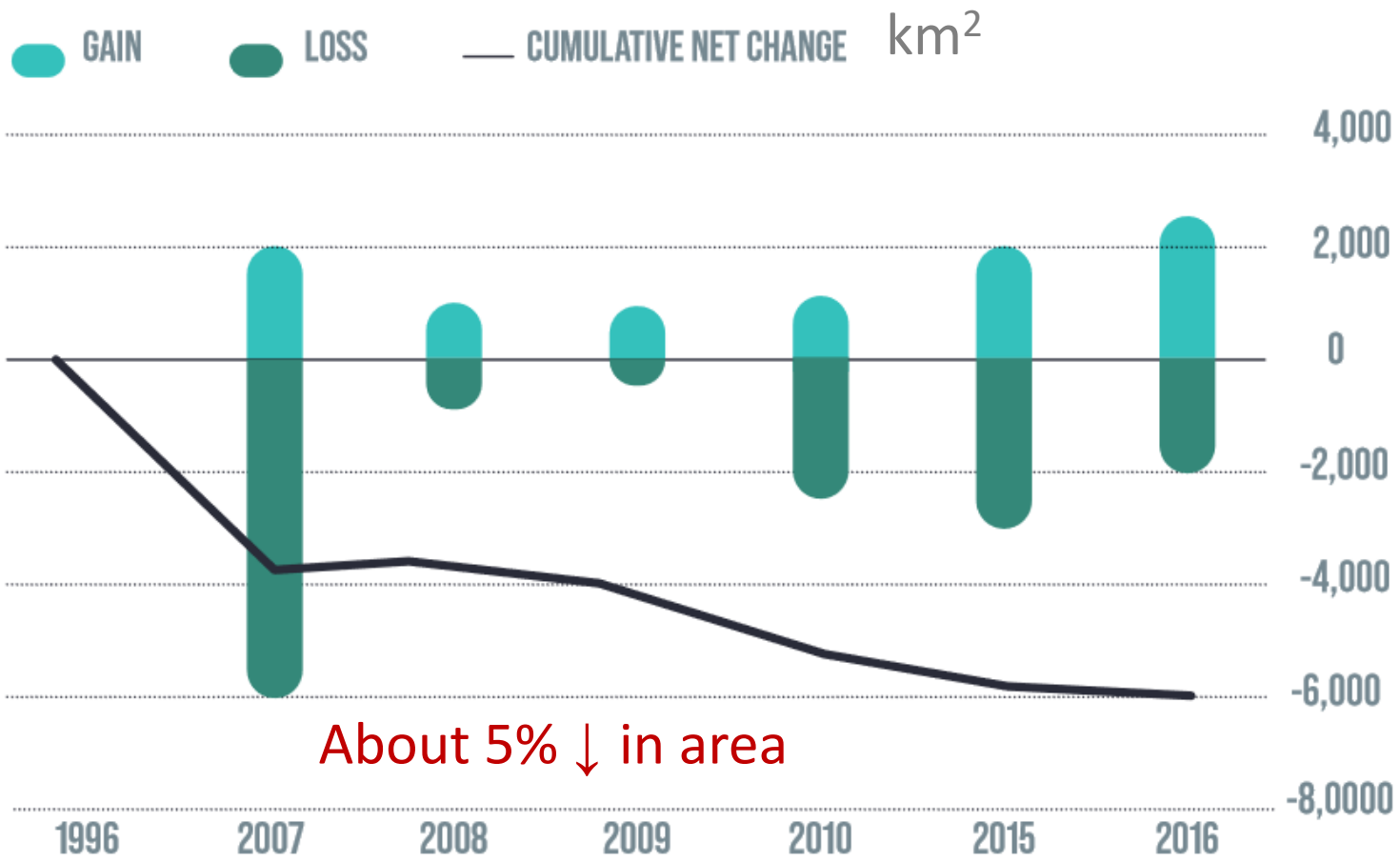
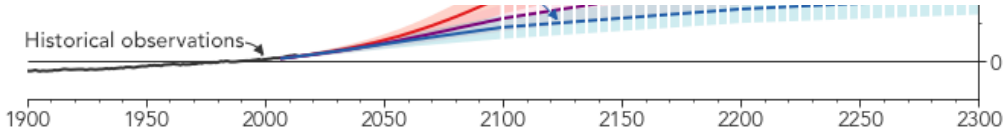
Global decline in mangrove forest



Mangrove Watch, State of the World's Mangroves



*Scientists use **Representative Concentration Pathways (RCPs)** to calculate future projections based on near-term emissions strategies and their expected outcomes in the future.
The RCP values refer to the amount of radiative forcing (in W/m²) in the year 2100.

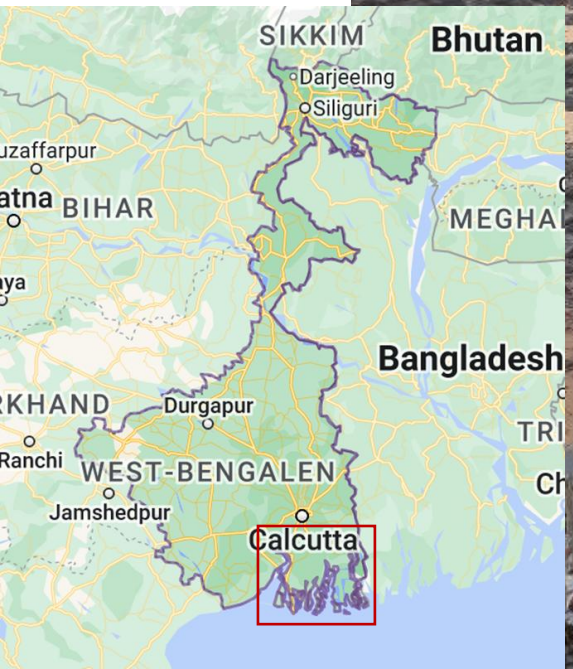
India

"Direct human impacts are responsible for over 60% of mangrove loss"

Open ocean
Incoming cyclones

Big tidal flat, **used to be mangrove forest,** now eroding

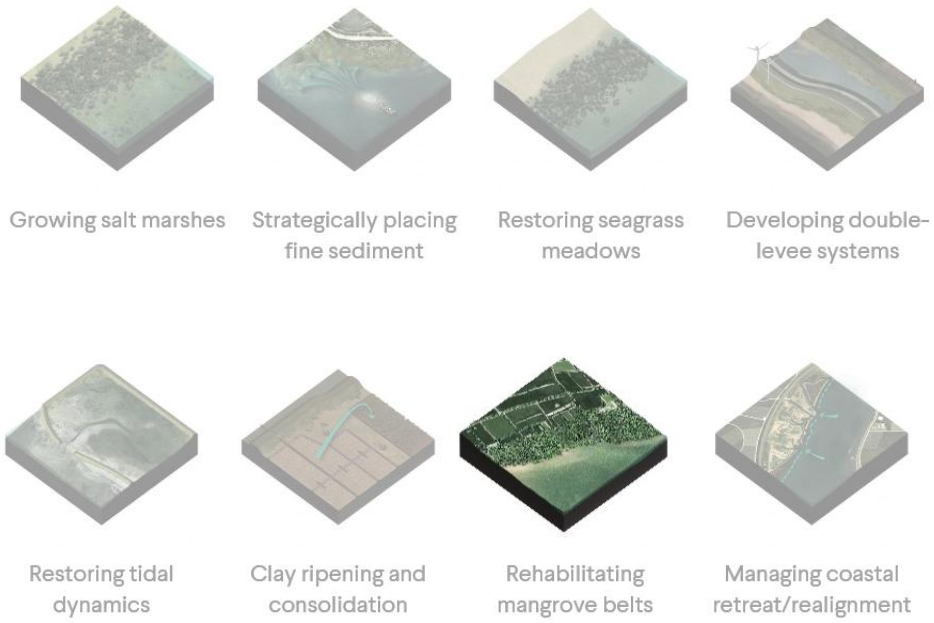
Former toe of the dyke

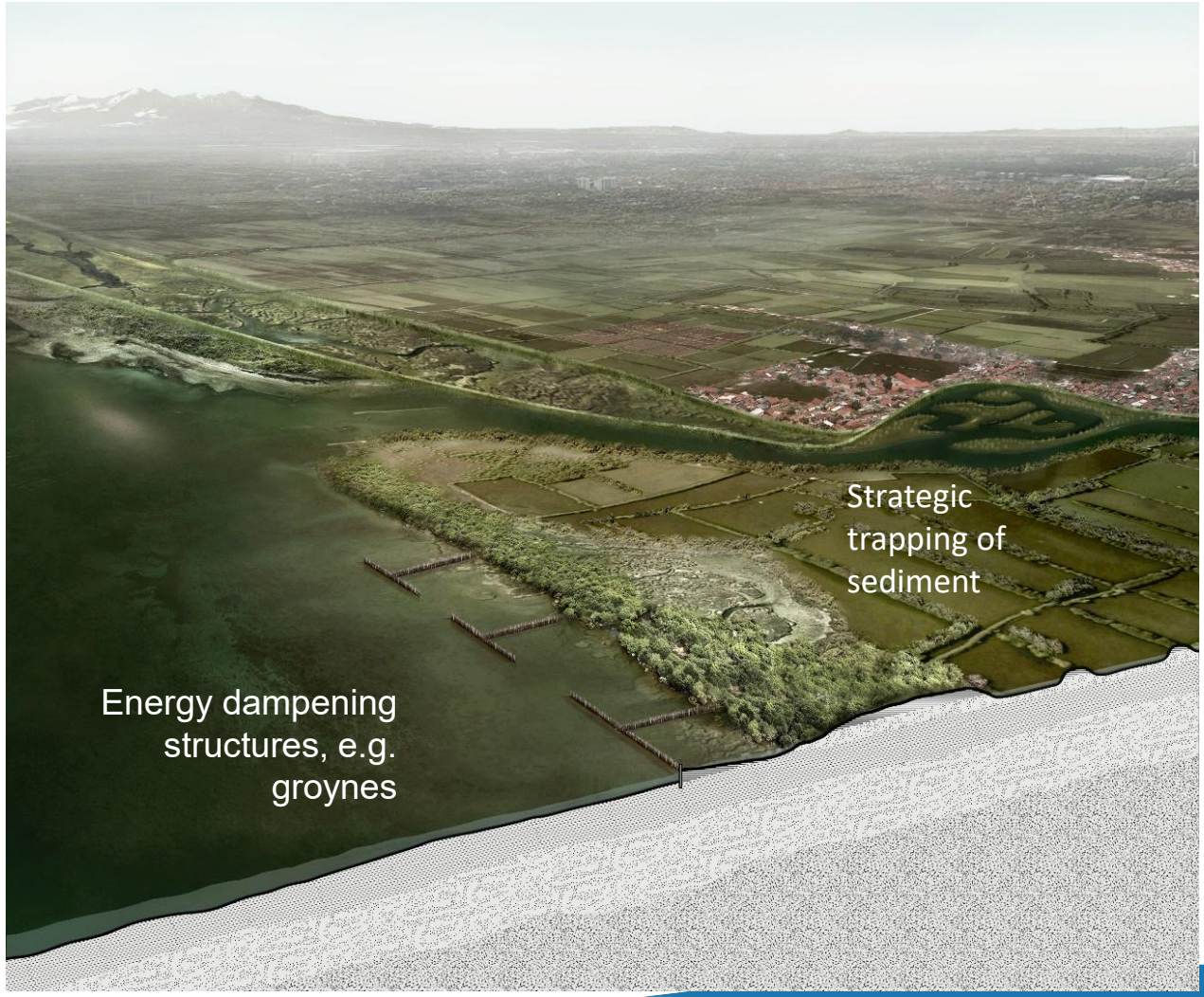


- Once protective natural systems are lost it is difficult to get them back
- Relying on technical solutions creates lock in situation the long run

Extreme length of dykes to maintain, challenges with construction and maintenance

Muddy Coasts





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Mangrove example: Indonesia

Brushwood groyn concept

Creating the right physical conditions (sedimentation) for mangrove to recover

Extensive knowledge needed

1) Involve stakeholders in design, building **Monitoring & maintenance**
2) Use economic incentives (bio-rights) to restructure longer term public involvement

Capacity building at many levels:

1. local via Coastal Field Schools
2. Regional via inclusion in the curriculae of various eductional facilities
3. International via an online MOOC

All focus on upscaling in implementation

Policy adoption and incorporation in many Indonesian governmental layers (National and regional) **including monitoring and maintenance**

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NATURE-BASED INVESTMENT OPPORTUNITIES

Tam Giang Đông

1b Long-term planning
Reserve inland areas for future succession

1d Pollution reduction
Organize collaborative wastewater & solid waste management

3b Payments for ecosystem services
Monetize mangrove benefits to compensate relocations from the coastal zone

3a Institutional framework
Update the land use guidelines for the Ca Mau coastal zones

1c Mangrove regeneration
Silt fences to reduce wave energy and facilitate sediment capture

high dikes

Longshore sediment transport

2a Economic opportunity: efficiency
Employ aquaculture diversification models and innovations for increased productivity

2c Economic opportunity: diversification
Provide trainings & capacity building for seasonal eco-tourism

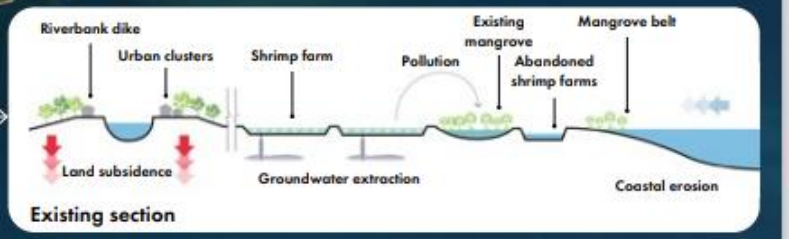
2b Economic opportunity: increased product value
Create a certification of integrated mangrove aquaculture

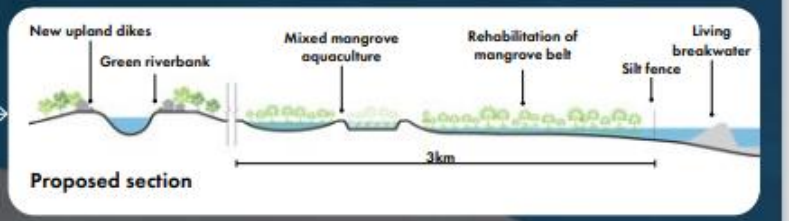
natural breakwaters / reefs

1b Coastal zone management
Establish framework for mangrove protection, coverage, and continuity

1c Mangrove regeneration
Create the abiotic circumstances to support a sustainable mangrove belt

1a Nature-based systems analysis
Analyze sediment availability and composition to refine restoration approach and objectives





Concepts

Rivers, Inland, Cities, Ports, Estuaries

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Philippines: shift in river basin management

Without Room for the River

With Room for the River

+ Lower water levels + flow velocities
  + Lower embankments
  + No sheet-pile needed
  = More sustainable solution

RESTORATION, REHABILITATION, AND CREATION OF HABITATS

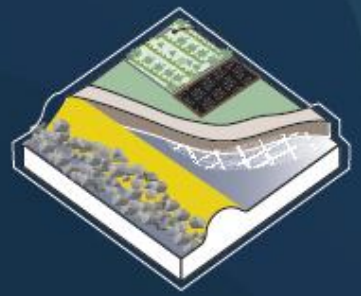
Dredged material can be beneficially used in various ways for restoration, rehabilitation, and ecosystem creation. It can be utilized to create new wetlands, enhance existing habitats, rebuild eroded coastlines, and even serve as a source of nutrients for soil in agricultural areas. By repurposing dredged material in such ways, it contributes to sustainable ecosystem management and helps mitigate environmental impacts of dredging activities.

LAND AND FORESHORE RECLAMATION

Land reclamation is the process of creating new land from sediment from oceans, riverbeds, or lakes. This is typically done by infilling of the area with soil or other materials to expand usable space for different purposes, such as development, agriculture or coastal protection. Dredged material from maintenance and capital dredging operations can be repurposed for both land and foreshore reclamation projects, promoting the sustainable and efficient use of resources

CONSTRUCTION MATERIAL

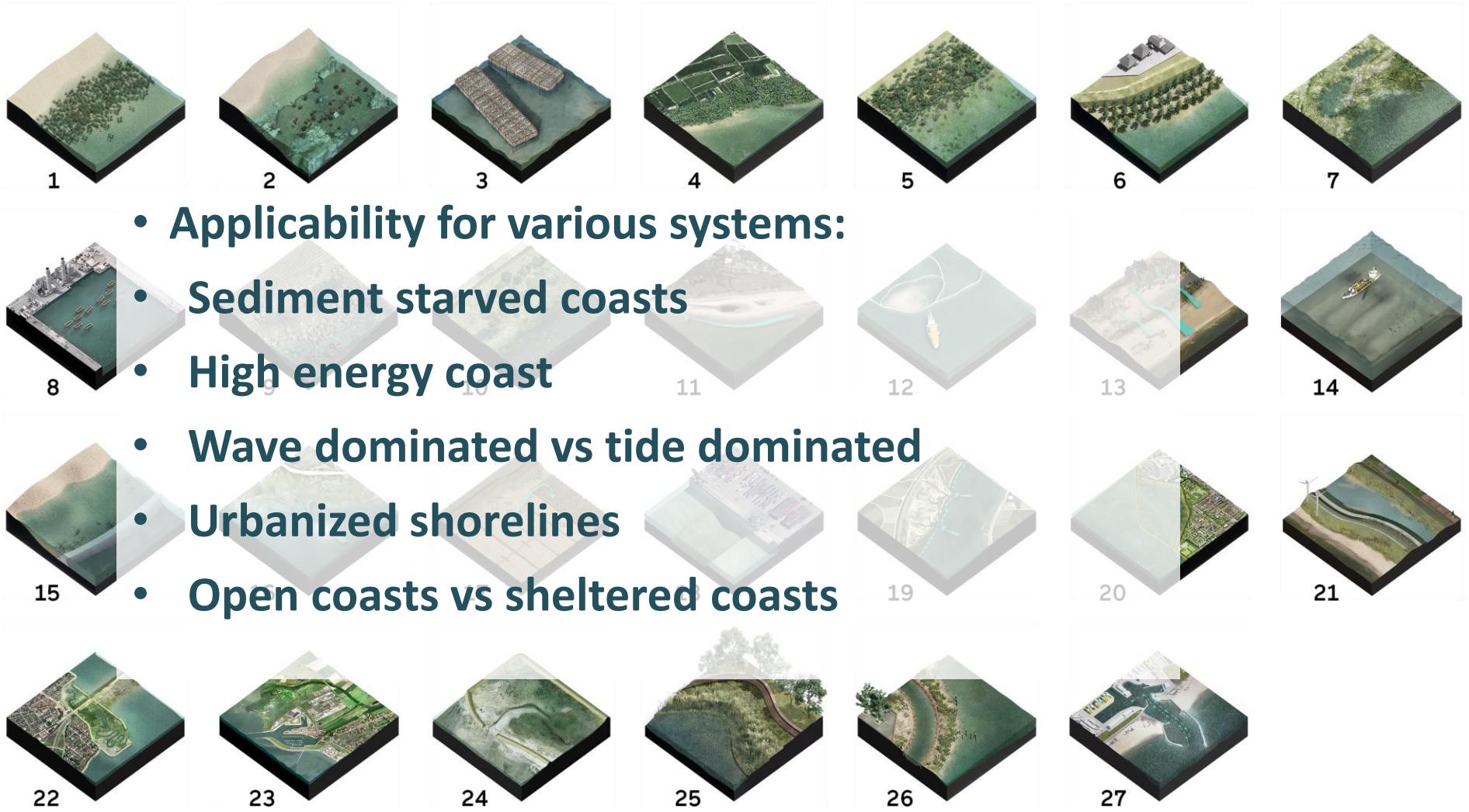
From waste (dredged sediment I) to source (dredged sediment) to product (dike reinforcements, construction blocks, coral reef foundations, etc.). The change in perception from trash to the multitude of possible functions for dredged material



NbS in ports guideline

Building with Nature concepts

1 Restoring seagrass meadows
2 Facilitating coral development
3 Building shellfish reefs
4 Rehabilitating mangrove belts
5 Growing salt marshes
6 Establishing wetland forests
7 Developing wetland areas
8 Creating hanging and floating structures
9 Creating rich revetments
10 Integrating vegetated foreshores
11 Applying mega-nourishments
12 Constructing nature islands
13 Enhancing dune dynamics
14 Landscaping the seabed
15 Constructing perched beaches
16 Strategically placing fine sediment
17 Clay ripening and consolidation
18 Creating sedimentation basins
19 Managing coastal retreat/realignment
20 Developing inland buffer zones
21 Developing double dike systems
22 Restoring connections
23 Restoring salinity gradients
24 Restoring tidal dynamics
25 Creating tidal parks
26 Constructing secondary channels
27 Optimizing flow patterns



- **Applicability for various systems:**
  - **Sediment starved coasts**
  - **High energy coast**
  - **Wave dominated vs tide dominated**
  - **Urbanized shorelines**
  - **Open coasts vs sheltered coasts**

Concluding remarks

- Nature-based solutions – not only a buzz word but real solutions with added benefits for society
- EcoShape design philosophy – use a Nature based Approach and work on the Enablers
- Often leading to hybrid solutions – combining the best of both worlds
- It always starts with thorough understanding of the natural and societal system, appreciate that each project, case and location is different
- Appreciate that during the design and implementation trajectory innovation and knowledge are key assets
- Acknowledge the importance of monitoring and maintenance
- Ample examples available – project development, design, implementation, monitoring and maintenance on **Ecoshape.org**

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