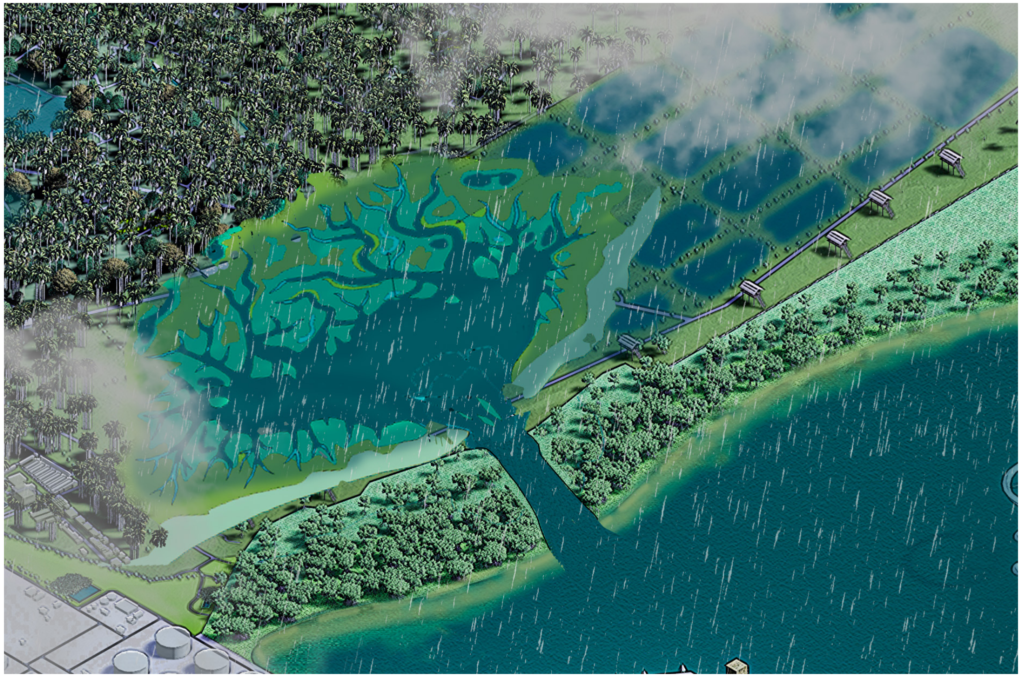
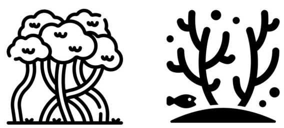
NbS-18 TIDAL FLAT NOURISHMENT



Tidal flat nourishment focuses on restoring and stabilizing soft, silty shorelines through a blend of natural and eco-engineered materials. Tidal flats are coastal areas that are exposed during low tide and submerged during high tide, often serving as critical habitats for wildlife, including migratory birds and marine organisms. This method combines traditional sand nourishment with biodegradable elements like sediment mats, coir logs, and organic substrates to reinforce unstable muddy surfaces. The added sand facilitates sediment accretion, reduces erosion, and fosters the growth of coastal vegetation such as mangroves and salt marsh grasses, which play a critical role in stabilizing sediments. By promoting biodiversity, improving water clarity, and curbing sediment runoff, tidal flat nourishment enhances the ecological balance of coastal zones.

LANDSCAPES SUPPORTED



EbA (ECOSYSTEM-BASED APPROACHES)

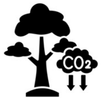
- ECOSYSTEM BASED ADAPTATION
- ECOSYSTEM-BASED DISASTER RISK REDUCTION
- ECOSYSTEM RESTORATION
- INTEGRATED COASTAL ZONE MANAGEMENT
- GREEN INFRASTRUCTURE

MAIN PROBLEMS ADDRESSED

BIODIVERSITY LOSS

FLOOD CONTROL

DISASTER RISK REDUCTION



CARBON SEQUESTRATION

ECOSYSTEM SERVICES AND ACTIONS

SUPPORTING

- Maintain biodiversity by providing habitats for diverse species, including breeding and feeding grounds.
- Enable nutrient cycling, ensuring the availability of essential nutrients for plants and animals.
- Foster soil formation and stabilization, preventing land degradation and promoting ecosystem health.

REGULATING

- Buffer against storm surges, wave energy, and erosion, reducing risks to coastal infrastructure.
- Sequester and store significant amounts of carbon.
- Filter pollutants, sediments, and excess nutrients from water, improving water quality.
- Reduce the impact of coastal and riverine flooding by absorbing and holding water.

PROVISIONING

- Provide food, including fish, shellfish, fruits, and crops essential for nutrition and livelihoods.
- Supply freshwater for drinking, agriculture, and industrial purposes.
- Deliver raw materials such as timber, fuel, and fibers for construction and energy needs.
- Offer medicinal resources, including plants and organisms used in traditional and modern medicine.

SOCIAL BENEFITS

- Provide recreational opportunities such as hiking, bird-watching, and snorkeling, promoting well-being.
- Serve as a resource for education and scientific discovery, deepening knowledge and innovation.

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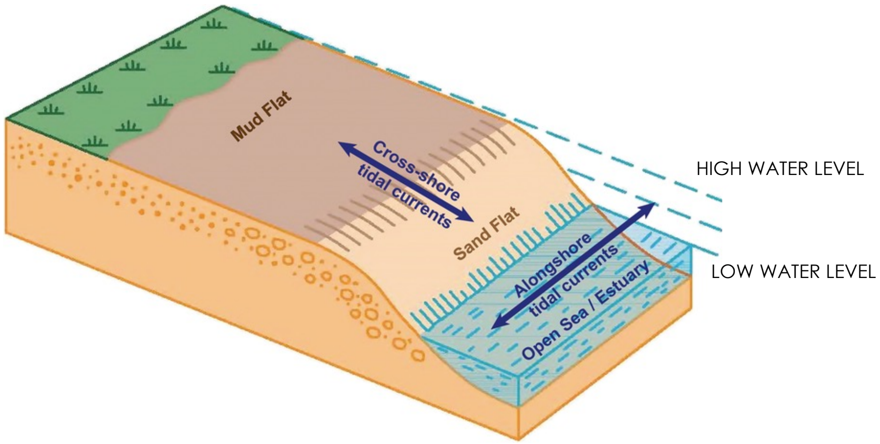
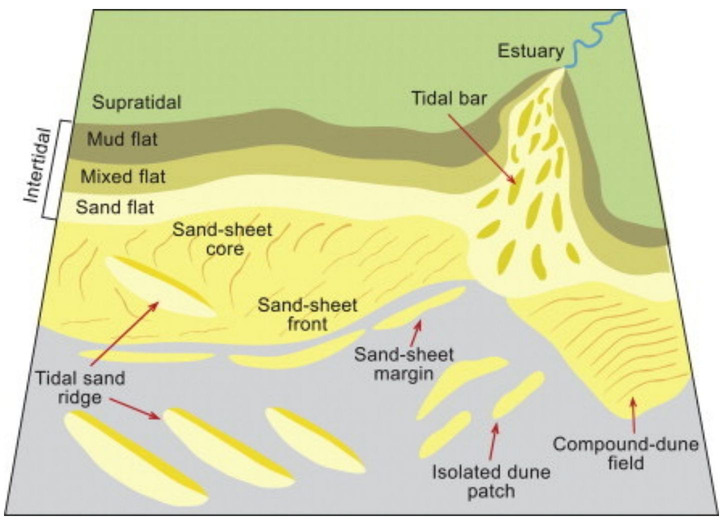


Profile sand-mud tidal flat influenced by cross-shore and alongshore tidal currents
Source : Journal of Geophysical Research, Oceans



Environments of deposition within a tidal flat system, including the subtidal, intertidal, and supratidal zones.
Source : Desjardins et al., 2012

PROJECT'S CHALLENGES & RISKS

- **Sediment Quality and Contamination:** The sediment used for nourishment must closely match the natural sediment in the tidal flat to ensure compatibility and protect the ecosystem.
- **Erosion and Redistribution :** High-energy environments can erode or redistribute the nourished sediment, making the effort less effective.
- **Ecological Disruption:** The nourishment process can disturb existing habitats, smother benthic organisms, and temporarily disrupt the ecological balance.
- **Economic and Logistical Constraints :** Tidal flat nourishment projects can be expensive and logistically complex.

NbS co-BENEFITS AND THEIR INDICATORS

Biodiversity Enhancement
Increased abundance and diversity of bird, fish, and invertebrate, species using the restored area as breeding or feeding grounds.

Coastal Protection
Reduction in wave height and energy, rate of shoreline erosion (before and after nourishment).

Flood Mitigation
Reduction in floodwater levels during storm events, area of land protected from flooding.

Water quality improvement
Levels of nitrogen, phosphorus, and pollutants in water, turbidity reduction (water clarity).

Fishery Productivity
Increase in fish and shellfish populations. Catch per unit effort (CPUE) for fisheries.

Community resilience
Number of households benefiting from reduced flood risks, community engagement in restoration.

COST ANALYSIS

Direct Costs
Materials, transport, labor, equipment :$350,000 - $1,200,000/ha.

Indirect Costs
Assessments, community engagement, opportunity costs : $30,000 - $80,000/ha.

Time Horizon
Short-term (1-5 years): project setup, material placement, and initial monitoring.
Long-term (15+ years): full restoration benefits.

Direct Benefits
Flood mitigation, erosion control, biodiversity boost.

Indirect Benefits
Carbon sequestration, water quality, community resilience.

Risk Assessment
Overnourishment may smother existing ecosystems or alter water flow, poor sediment placement or inadequate materials could lead to project failure.

REFERENCES:

Netherlands, Oosterschelde (Eastern Scheldt), Galgeplaat.
New Zealand, Stewart island, natural tidal flats.
Ireland, North Slob, Wexford, natural tidal flats.

IMPLEMENTATION OPPORTUNITIES:

Indonesia, Demak Regency, Central Java (conditions favourable for tidal flat recovery and mangrove regrowth).
Vietnam, Ca Mau Peninsula, Mekong delta (severe erosion and land loss and degraded tidal flats).