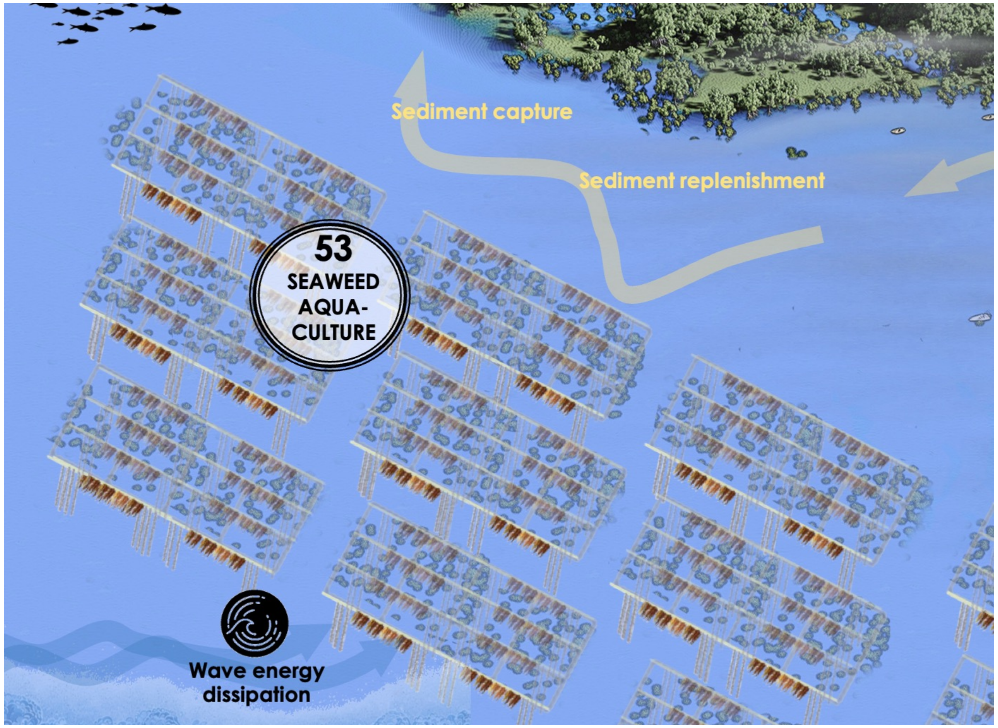
NbS-53 SEAWEED AQUACULTURE



Seaweed aquaculture can contribute significantly to carbon sequestration and marine ecosystem protection, as it naturally absorbs CO2 during photosynthesis, helping mitigate the impacts of climate change by sequestering carbon in their biomass and the surrounding waters. Additionally, seaweed cultivation promotes the remineralisation of nutrients by bacteria, enhancing nutrient cycling and water quality in coastal zones. As a biodegradable product, seaweed can be used in various industries, including food, biofuels, and pharmaceuticals, creating sustainable economic opportunities for local communities. Seaweed aquaculture also provides habitat for marine life, supporting biodiversity, while helping to protect coastal areas from erosion by stabilizing sediments.

However, the size and scale of seaweed farming are crucial to ensure it remains a beneficial NbS. If managed poorly or cultivated at too large a scale, seaweed farms could alter local ecosystems, cause shading that reduces light penetration, and potentially interfere with native species. Optimizing the density and location of seaweed cultivation is essential to avoid negative impacts on marine wildlife, including fish and coral reefs. Ideal locations are sheltered coastal zones with high nutrient availability but low risk of excess eutrophication, and farms should be carefully monitored to ensure sustainable productivity without disrupting the balance of marine ecosystems.

LANDSCAPES SUPPORTED

EbA (ECOSYSTEM-BASED APPROACHES)

- CARBON SEQUESTRATION
- WATER QUALITY IMPROVEMENT
- BIODIVERSITY ENHANCEMENT
- ECOSYSTEM RESTORATION
- NUTRIENT CYCLING

MAIN PROBLEMS ADDRESSED

- BIODIVERSITY LOSS
- FLOOD CONTROL
- SOIL EROSION
- CARBON SEQUESTRATION
- FOOD SECURITY

ECOSYSTEM SERVICES AND ACTIONS

SUPPORTING

- **Biodiversity Enhancement**: Seaweed aquaculture provides habitat and food for various marine species.

REGULATING

- **Carbon Sequestration**: Seaweed absorbs CO2 from the atmosphere, contributing to carbon storage and climate change mitigation.
- **Water Quality Improvement**: Seaweed helps improving water quality and reducing eutrophication risks.

PROVISIONING

- **Sustainable Seafood Production**: Seaweed farming provides a renewable source of food, fuel, and other products with minimal environmental impact.

SOCIAL BENEFITS

- **Livelihood Support**: Seaweed aquaculture creates jobs and income opportunities for local communities.

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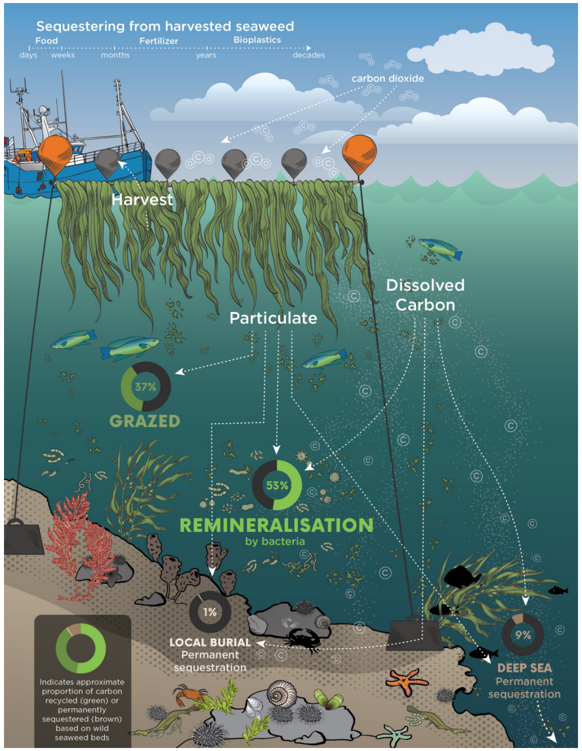
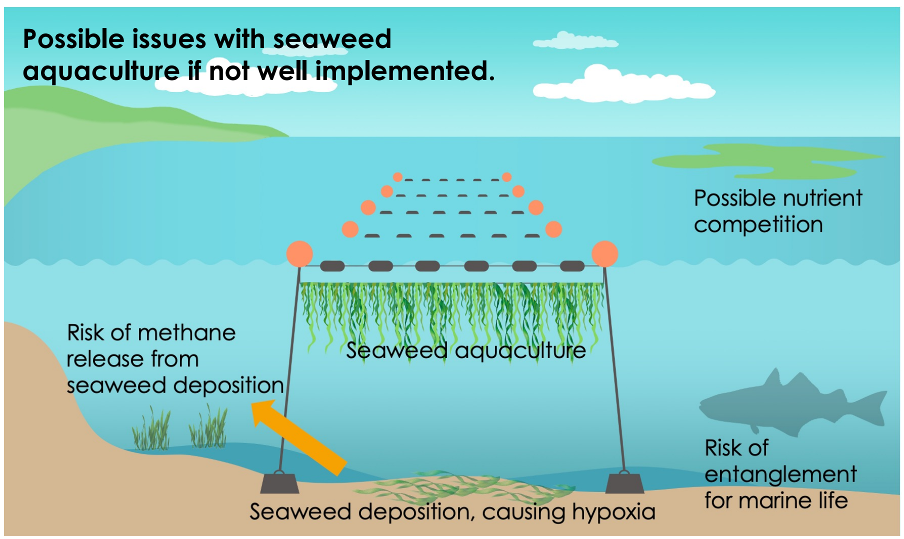


Processes of seaweed aquaculture.
Source : sustainableseachallenge.co.nz



PROJECT'S CHALLENGES & RISKS

- **Environmental Stress**: Seaweed farms can be vulnerable to environmental stressors like temperature fluctuations, ocean acidification, and pollution.
- **Coastal Habitat Degradation**: Improper placement or large-scale seaweed farming could lead to the degradation of sensitive coastal ecosystems.
- **Overexploitation and Monoculture**: Intensive seaweed farming can lead to overexploitation of coastal areas and the establishment of monocultures.
- **Market Volatility**: Seaweed aquaculture markets can be unstable, with fluctuating prices driven by global demand, impacting the economic viability of local farmers.

NbS co-BENEFITS AND THEIR INDICATORS

- **Carbon Sequestration**
  Reduced atmospheric CO2 levels due to seaweed biomass growth, measured in tons of CO2 sequestered per year.
- **Water Quality Improvement**
  Decrease in nitrogen and phosphorus concentrations in farmed areas.
- **Biodiversity Enhancement**
  Increase in species diversity around seaweed farm sites, measured by the number of species observed.
- **Coastal Erosion Prevention**
  Reduction in coastal erosion rates near seaweed farm installations.
- **Livelihood Support**
  Increase in income and employment rates in coastal communities involved in seaweed aquaculture.
- **Sustainable Food Source**
  Volume of seaweed harvested and sold as food or other products, measured in tons per year.

COST ANALYSIS

- **Direct Costs**
  Seaweed farms costs are between $2k-$5k/ha, including materials like ropes, buoys, and labor.
- **Indirect Costs**
  Capacity-building, research, and monitoring costs range from $500 to $1,500/ha/year.
- **Time Horizon**
  10–20 years, with a discount rate of 5–10% for long-term cost-benefit analysis.
- **Direct Benefits**
  Annual revenue from seaweed harvest can reach $3,000 to $10,000 per hectare.
- **Indirect Benefits**
  Benefits from ecosystem services like carbon sequestration, nutrient cycling, and coastal protection.
- **Risk Assessment**
  Risks like disease, storm damage, or market fluctuations could result in losses of $1,000 to $3,000 per hectare in affected years.

REFERENCES:

Philippines, Farmers' Development in Tawi-Tawi.
Indonesia, Seaweed Aquaculture for Blue Carbon.
Tanzania , Blue Economy and Seaweed Farming in Zanzibar.

IMPLEMENTATION OPPORTUNITIES:

Vietnam, Mekong Delta.
Thailand, Andaman Coast.
Philippines, Central Visayas.
Malaysia, Eastern Sabah.
Indonesia, Sunda Strait.