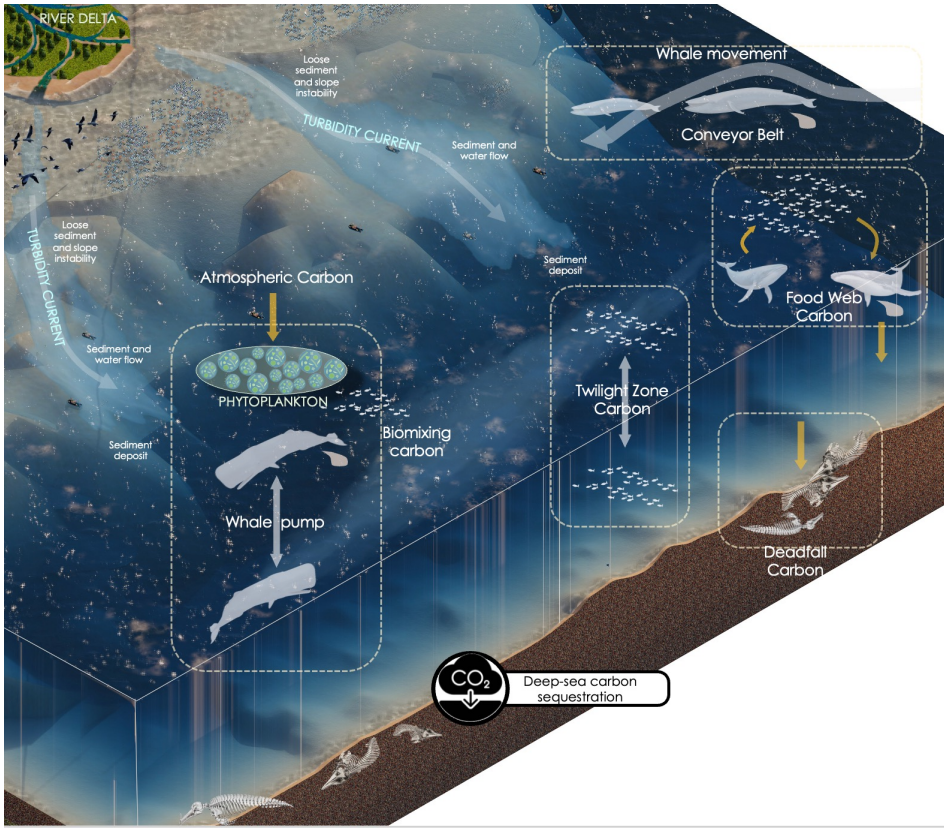
NbS-70 DEEP-SEA SEQUESTRATION OF MESOPELAGIC FAUNA



Deep-sea sequestration of mesopelagic fauna presents an emerging NbS for marine ecosystems, by leveraging natural processes to enhance carbon capture and ecosystem resilience. It involves six key actions: Enhancing the Biological Pump, which strengthens the ocean's ability to transport carbon to the deep-sea via the food web; Promoting Bioluminescent Behaviour, where mesopelagic organisms contribute to light-driven carbon cycling; Sustainable Management of Fisheries, ensuring mesopelagic species thrive without overfishing, thus maintaining their role in carbon sequestration; Artificial Upwelling Systems, which stimulate phytoplankton growth, supporting the food chain and increasing carbon storage; Marine Protected Areas (MPAs) and Conservation, creating sanctuaries to protect mesopelagic habitats and enhance biodiversity; and Monitoring and Research of Deep-sea Ecosystems, to understand carbon cycling and the ecological value of these species. In Southeast Asia, it can boost regenerative seascapes by stabilizing marine ecosystems, fostering biodiversity, and reducing sedimentation rates. It also contributes to climate change mitigation by enhancing carbon storage in deep-sea sediments. Technically, the integration of deep-sea sequestration with sustainable fisheries and MPAs will support the region's coastal economies, while research and monitoring can refine conservation practices. These approaches not only offer long-term environmental and climate benefits but also enhance the social and economic resilience of coastal communities dependent on healthy marine ecosystems.

LANDSCAPES SUPPORTED

EbA (ECOSYSTEM-BASED APPROACHES)

- ENHANCED BIOLOGICAL CARBON PUMP
- SUPPORT FOR MARINE BIODIVERSITY
- NUTRIENT RECYCLING AND UPWELLING
- CLIMATE CHANGE MITIGATION
- IMPROVED ECOSYSTEM MONITORING
- REDUCTION OF OCEAN ACIFIDIFICATION

MAIN PROBLEMS ADDRESSED

- BIODIVERSITY LOSS
- CARBON SEQUESTRATION
- DISASTER RISK REDUCTION

ECOSYSTEM SERVICES AND ACTIONS

SUPPORTING

- Enhancing Marine Biodiversity and marine life in mesopelagic zones.
- Facilitates the cycling of nutrients and organic matter in deep-sea ecosystems.

REGULATING

- Contributes to long-term carbon storage.
- Bioturbation and nutrient recycling processes help buffer the effects of ocean acidification.

PROVISIONING

- Promotes sustainable management of mesopelagic species, ensuring their role in marine food webs.
- Provides opportunities for scientific research on deep-sea ecosystems.

SOCIAL BENEFITS

- Sustainable fisheries and effective marine conservation can provide long-term benefits to coastal communities.

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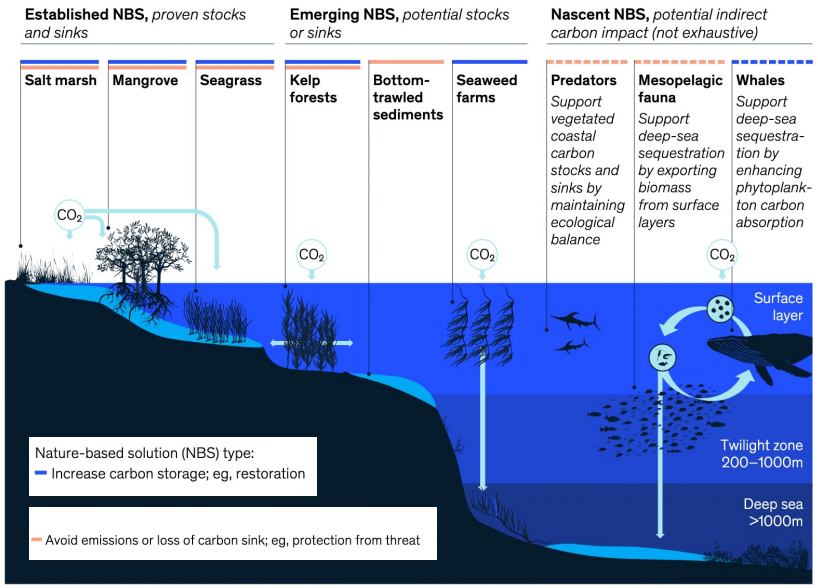
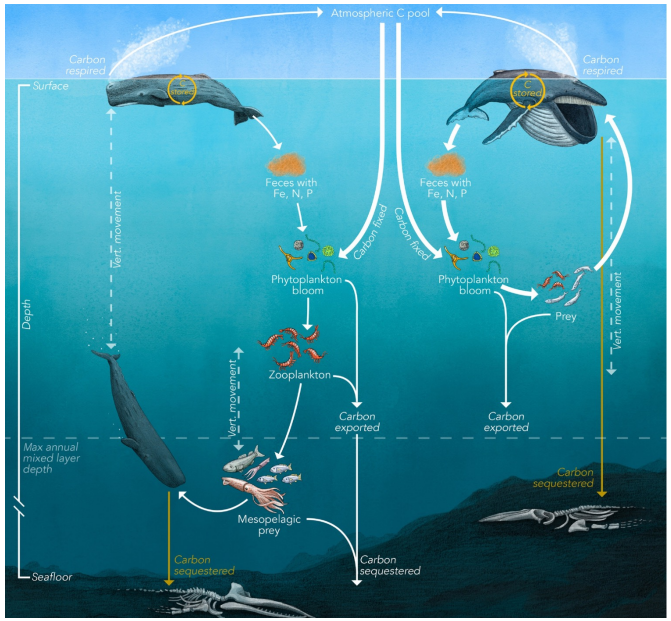


Blue Carbon : The potential of coastal and oceanic climate action
Source : McKinsey



Great whales direct and indirect nutrient and carbon cycling pathways
Source : University of Hawai News, Photo credit : Pearson, et al.2022)

PROJECT'S CHALLENGES & RISKS

- **Uncertainty in Ecosystem Dynamics**: Poor understanding of the complex interactions in deep sea ecosystems. The biological pump makes it challenging to predict the effectiveness of deep-sea sequestration efforts.
- **Overfishing and Unsustainable Practices**: Unsustainable fishing practices undermine conservation efforts, disrupting the mesopelagic food web.
- **Technological and Monitoring Gaps**: The lack of advanced monitoring to assess deep-sea ecosystems hinders the ability to track artificial upwelling or bioluminescent behaviour promotion.
- **Limited Funding and Policy Support**: Insufficient financial resources and lack of clear policies for marine conservation and sustainable fisheries.

NbS co-BENEFITS AND THEIR INDICATORS

- **Enhancement of Carbon Sequestration**
  Increased rate of carbon storage in deep-sea sediments.
- **Improved Biodiversity Conservation**
  Increased species diversity and abundance in Marine Protected Areas (MPAs).
- **Resilience of Marine Ecosystems**
  Reduced vulnerability of marine ecosystems to climate change impacts, as evidenced by the stabilization of deep-sea habitats and food webs.
- **Promotion of Ocean Health and Water Quality**
  Enhanced water quality and reduced ocean acidification due to balanced nutrient cycling and sedimentation processes.
- **Sustainable Fisheries Management**
  Recovery of mesopelagic fish populations and improved fisheries yield through reduced overfishing.
- **Advancement in Scientific Knowledge &Research**
  Increased number of research publications, data collection, and policy recommendations for deep-sea ecosystems and their conservation.

COST ANALYSIS

- **Direct Costs**
  USD 5-10M per year for establishing and maintaining research, marine protected areas, artificial upwelling systems, and fisheries management programs.
- **Indirect Costs**
  USD 2-4 million per year for policy development, community engagement, and monitoring of impacts on marine ecosystems.
- **Time Horizon**
  Typically 10-30 years for this kind of project.
- **Direct Benefits**
  Carbon sequestration, biodiversity enhancement, and increased fisheries productivity.
- **Indirect Benefits**
  Enhanced climate resilience and improved coastal protection.
- **Risk Assessment**
  Potential failure of artificial upwelling systems or lack of enforcement in MPAs.

REFERENCES:

The **Southern Ocean Carbon and Climate Observations and Modeling** (SOCCOM) Project explores the impact of mesopelagic fauna and the biological pump on carbon sequestration.
Sulu-Celebes Sea Marine Ecosystem-Based Management (MEbM) Program includes strategies for creating marine protected areas (MPAs) to enhance nutrient cycling and biodiversity.

IMPLEMENTATION OPPORTUNITIES:

Philippines, Sulu Sea could benefit from MPAs and biological pump research.
Indonesia, Bali Strait, is an ideal location for artificial upwelling systems.
Gulf of Thailand (Cambodia, Vietnam, Thailand) could implement research on mesopelagic fauna.