Assessment of Blue Carbon Stocks in the Pulicat Mangrove Ecosystem through Integrated Sediment and Vegetation Analysis

J.Y. Jafrrin, A. Vinoth*, S. Renganathan, M. Sivanesan, S. Ramachandraprabhu, C. Chennakrishnan

Centre for Mangrove Conservation and Restoration (CMCR), Research and Education for Environmental Foundation (REEF), India.

*reefedu2024@gmail.com

Mangrove ecosystems are among the most efficient natural carbon sinks, playing a significant role in climate change mitigation through the sequestration and long-term storage of atmospheric carbon. These coastal forests store carbon in above-ground biomass, below-ground biomass, and sediments, collectively referred to as blue carbon. Quantifying blue carbon stocks is essential for understanding the ecological significance of mangroves and supporting effective conservation and climate adaptation strategies. This study aims to assess the blue carbon storage potential of the Pulicat mangrove ecosystem by integrating analyses of vegetation structure and sediment characteristics. Field investigations are conducted across selected sites representing the ecological variability of the region. Vegetation surveys document mangrove species composition, tree density, diameter at breast height (DBH), tree height, and canopy characteristics. These structural parameters estimate above-ground biomass and carbon stocks using established allometric equations. Sediment samples collected from the same sites are analyzed to determine key physicochemical properties influencing carbon accumulation and long-term storage. The study generates baseline information on the spatial distribution of blue carbon stocks within the Pulicat mangrove ecosystem while examining the relationship between vegetation structure and sediment carbon storage. Mangrove stands with higher tree density, greater biomass, and well-developed canopy structure are expected to exhibit increased carbon storage due to enhanced organic matter production and sediment deposition. Integrating vegetation and sediment assessments provides a comprehensive evaluation of carbon sequestration potential across different mangrove stands. The findings contribute to an improved understanding of the role of Pulicat mangroves in carbon cycling, coastal ecosystem functioning, and climate change mitigation. The resulting baseline data support blue carbon accounting, long-term ecological monitoring, and restoration initiatives while providing scientific evidence for sustainable mangrove management. Overall, the study highlights the importance of mangrove ecosystems as nature-based solutions for enhancing coastal resilience and mitigating the impacts of global climate change

Keywords: *Blue carbon, Mangrove ecosystem, Pulicat lagoon, Carbon sequestration, Climate change mitigation, Coastal conservation*