



Climate Change Adaptation, Mitigation, and Ecosystem Resilience in the Pulicat Mangrove Ecosystem

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The Pulicat mangrove ecosystem, situated within India's second-largest brackish water lagoon, is a dynamic coastal habitat that supports rich biodiversity, maintains ecological balance, and provides essential ecosystem services. These mangrove forests protect shorelines from erosion, sustain fisheries, improve water quality, and enhance the adaptive capacity of coastal landscapes in the face of increasing environmental change. Despite their ecological importance, the ecosystem is increasingly affected by habitat degradation, pollution, rapid urbanization, and climate-related disturbances, threatening its long-term stability. This study evaluates the resilience of the Pulicat mangrove ecosystem through an integrated assessment of its ecological characteristics, ecosystem services, and conservation status. Field investigations assess mangrove species diversity, vegetation structure, regeneration, and habitat condition, complemented by environmental observations and secondary climate-related data. These ecological indicators are analyzed to understand the adaptive capacity of the ecosystem and its ability to maintain ecological functions under changing environmental conditions. The assessment identifies habitat degradation, pollution, sea-level rise, and climate variability as major drivers of ecosystem vulnerability. The findings indicate that structurally diverse and healthy mangrove stands exhibit greater ecological resilience by maintaining habitat connectivity, supporting biodiversity, stabilizing shorelines, and sustaining ecosystem services. Carbon sequestration is recognized as one of the important ecological functions that further strengthen climate regulation and coastal resilience. The study also highlights the role of mangrove restoration and community-based conservation in enhancing the adaptive capacity of both the ecosystem and coastal communities. This research provides baseline ecological information for the Pulicat mangroves and identifies key indicators for long-term monitoring and management. The findings contribute to a better understanding of resilient coastal ecosystems and support ecosystem-based adaptation, sustainable mangrove conservation, and informed policy development for the long-term protection and management of the Pulicat mangrove ecosystem.

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