SYNTHESIS OF CLIMATE CHANGE AND BATTICALOA LAGOON: ECOLOGICAL AND SOCIO-ECONOMIC CONSEQUENCES OF THE LAGOON ECOSYSTEM

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1. INTRODUCTION

The lagoon provides various highly valued natural services to society, including fisheries production, coastal protection, and tourism. We discuss how climate change may influence the physical structure, biological traits, and social values connected with the lagoon. This study follows comparable ecosystem-specific analyses of climate change consequences in coastal ecosystems. The study examines the social values of lagoons and proposes a vocabulary for discussing these values. Although there is substantial research on lagoons' physical and biological elements, there is far less on their economic and social values. This study analyzes how climate change is expected to affect lagoons' physical, biological, and socio-economic characteristics in the future decades.

2. Batticaloa lagoon ecosystem

The Batticaloa Lagoon is a vast estuary lagoon in Sri Lanka's Batticaloa District. The largest lagoon in Batticaloa District in Batticaloa lagoon. Batticaloa Lagoon is a long and narrow lagoon on Sri Lanka's east coast, with around 11,500 hectares of water (Partheepan et al., 2016). The lagoon in Batticaloa stretches for 56 kilometers. This lagoon stretches from Pangudaveli in the Batticaloa district to Kalmunai in the Ampara district. Two tiny waterways, one at Batticaloa and the other at Periyakallar, connect it to the sea. Sand bars impede these canals during the dry season. The lagoon is surrounded by a thickly inhabited area where rice, coconut, and other commodities are grown. Shrimp, aquaculture, and rice agriculture are practiced on the surrounding land. Mangrove swamps and seagrass beds abound throughout the lagoon. A large diversity of water birds flock to the lagoon.

2.1 Physical features of Batticaloa lagoon

The Batticaloa lagoon is defined as a "shallow coastal water feature separated from the ocean by a barrier, linked to the ocean at least intermittently by two restricted inlets" (figure 1). Sediment transport systems create and sustain Batticaloa lagoons. Sediment delivered by rivers, waves, and tides accumulates in the river and tidal deltas, marshes, and flats where submerged aquatic plants grow. The sedimentation process has the potential to fill up lagoons (Nichols and Boon, 1994). Waves and wind continuously damage lagoon barriers, necessitating regular sediment deposition to keep them in place (Bird, 1994).

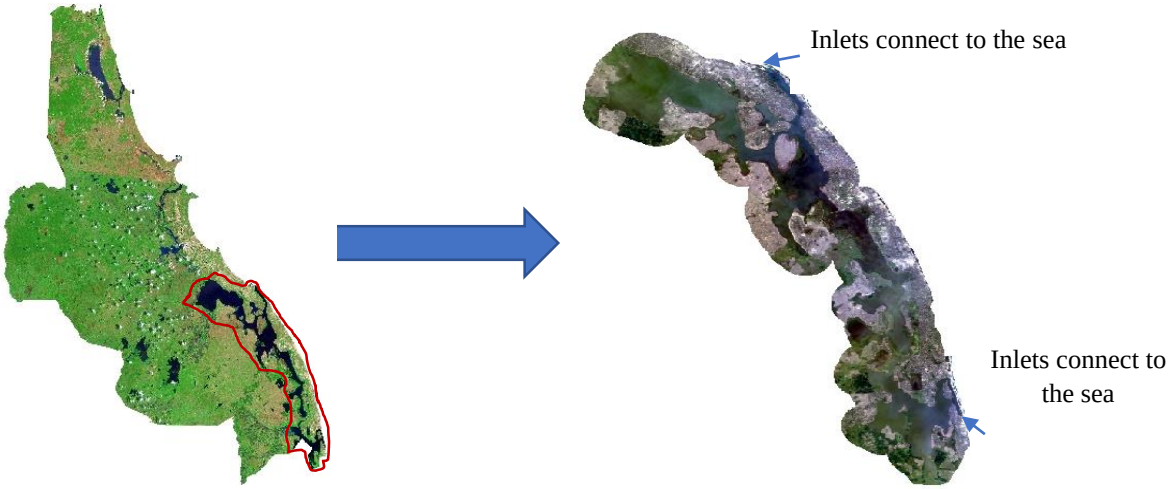

Figure 1: Batticaloa Lagoon

The rate at which a lagoon loses or gains water through evaporation, rainfall, groundwater inflow, surface runoff, and exchange with the ocean affects the lagoon's water quantity and quality. The flushing rate (The pace at which water enters, circulates through, and departs the lagoon) is a key physical parameter that governs waterborne component retention time. Lagoons have low flushing rates because of their limited interaction with the ocean, which contributes to high primary production and potentially high pollutant concentrations (Spaulding, 1994).

2.2 Ecological features of Batticaloa lagoon

The Batticaloa lagoon is a productive environment. It adds to the overall productivity of lagoon waterways by supporting a diverse array of species, including marshlands, seagrass beds, and mangroves. Additionally, they provide vital habitats for a diverse array of fish and shellfish species. Mangroves may enhance a lagoon's biodiversity by providing a physical haven from predators and serving as nursery and feeding habitats for various species. Batticaloa lagoon is ideal for primary producers because of its low flushing rates (phytoplankton and aquatic plants). Surface water and groundwater fluxes, as well as exchange with the ocean, carry nutrients to lagoons. Because primary production is typically constrained by nutrient availability, the Batticaloa lagoon can maintain higher secondary production rates than other aquatic ecosystems.

2.3 Social value features of Batticaloa lagoon

The public highly values the Batticaloa Lagoon and its ecosystems. However, value has different meanings in different contexts. Philosophers have a dispute over whether natural systems have an intrinsic worth independent of human determination (Williams, 1994). These are difficult philosophical concerns that cannot be answered here; hence, we limit ourselves to expressions of lagoon social values.

Because social value expressions vary considerably, we classify them into four broad categories: pragmatic, academic, inspiring, and tacit. In this study, the phrase "social values"

refers to a synthesis of these categories. The fact that a value manifestation is contained inside one category does not exclude it from influencing or migrating into another. For example, while tourism's economic engine may be a pragmatic manifestation of social value, a tourist destination's appeal is contingent on its capacity to attract individuals, contingent on inspirational and tacit representations of social worth. Pragmatic values are the most concrete expressions of value, and in policy, management, and economic literature, they are also referred to as "usage" values. Academic values are expressed in activities that further our understanding of lagoon ecosystems, including scientific investigation and historical research. Academic manifestations frequently contribute to the advancement of pragmatic values. A greater understanding of the Batticaloa lagoon, for example, might enhance management, positively affecting commercial fishing interventions and ecotourism incomes (Hume, 1999). Knowledge is also valued in society for its own sake. Creatively producing activities such as photography and landscape painting and locations for films, books, music, and other artistic expressions are attributed to inspiring values. Tacit values include the appreciation of landscapes, the sounds of the waves (singing fish specifically a unique feature for Batticaloa lagoon) and waterbirds, and other sensory landscape elements. Considering this diversity of methodologies, the primary challenge for lagoon management stakeholders is including a wide variety of values, which are difficult to define.

3. RESULTS AND DISCUSSION

3.1 Impacts of Climate Change on Ecosystem of Batticaloa Lagoon

Climate change is projected to drastically alter sea level, temperature, rainfall, rainfall pattern, and cyclones, all of which will affect the Batticaloa lagoon. While indirect effects such as soil salinization are significant, there is much ambiguity regarding possible effects on lagoon ecosystems; hence, the paper focuses on direct consequences. Although both floods and cyclones may be severe during some weather events, researchers approach them as distinct components of climate because they have varying effects on lagoons. We outline the present knowledge about these climate change factors and discuss how they will almost certainly influence the lagoon's physical structure, biological features, and social values.

3.2 Impacts of Climate Change on Socio-Economic Values of Batticaloa Lagoon

The combined effects of rising temperatures, sea-level rise, and weather pattern variability would very probably affect societal systems that rely on the presence of certain lagoons. Batticaloa Lagoon is valued for a range of factors, including their pragmatic value as ecosystems that sustain a diversity of species necessary for livelihoods, their academic value as sites of historical tradition, their inspirational value as a catalyst for creative endeavors, and their value as a source of a sense of place. Historically, coastal erosion has been handled by the construction of retaining walls. While hardened shorelines may provide short-term protection for lagoon features, they may accelerate erosion downstream by diminishing sand supply.

4. CONCLUSIONS

Batticaloa lagoon will have to adapt to Climate change-induced physical and ecological changes. Societies may become more vulnerable to eutrophication and disease, and native

species may be lost as a result. Anthropogenic activities will affect natural groups' ability to adapt. However, ongoing coastline development limits salt marsh movement. Contrast this with the latter, which exposes society to the loss of lagoon ecological values.

In the present, even ecosystem-based management does not measure all social values Management choices primarily weigh pragmatic criteria since they are easier to measure and look absolute and compelling. As a result, tacit values are often disregarded in coastal management. Contrary to common opinion, tacit values sway stakeholders. Moreover, they are supposed to shape human conduct as well as all societal ideals. Due to their universality, implicit values match everyone's interests and needs, regardless of social, political, or economic power. The lagoon stakeholders need tools that articulate and quantify tacit values. A multidisciplinary approach is required to develop such tools. As the most immediate victims of climate change, Batticaloa lagoon and its residents face unique problems. Stakeholders can better engage society by appealing to tacit values.

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