



Quantifying Environmental Policy Integration: A Policy Interaction Index (PII) Analysis of Sri Lanka's Mangrove Governance Framework

P.C.P. Kumara*

The Institution of Engineers, Sri Lanka, Colombo 07, Sri Lanka.

**badchami@gmail.com*

Environmental policy outcomes depend not only on the design of individual policies but also on how conservation, development, livelihood, and market policies interact in practice. This study develops and applies a quantitative policy interaction index (PII) to evaluate the degree of environmental policy integration (EPI) in Sri Lanka's mangrove governance framework. The study asks: To what extent do environmental and non-environmental policies enable or obstruct the implementation of Sri Lanka's national policy on conservation and sustainable utilisation of mangrove ecosystems? This question is significant because mangrove management in Sri Lanka is implemented across multiple institutions responsible for the environment, forests, coastal resource management, fisheries, aquaculture, tourism, land use, and local development. Quantifying these interactions helps policymakers identify which policy links reinforce conservation and which create implementation gaps requiring coordination, incentives, or regulatory correction. The framework evaluates policies using four criteria. i.e., coverage, directness, implementation effectiveness, and outcome evidence. It assigns directional scores to identify whether policies have enabling or obstructing influences. These are converted into directional influence scores: strong enabling interactions receive +2; moderate enabling +1; moderate obstructing -1; and strong obstructing -2, with neutral or weak effects coded 0. The methodology is applied to Sri Lanka's National Policy on Conservation and Sustainable Utilization of Mangrove Ecosystems as a case study. A policy interaction matrix is constructed to assess how related environmental policies (e.g., coastal zone management, biodiversity conservation) and non-environmental policies (e.g., fisheries, land use, tourism, and economic policies) influence implementation outcomes. Applying the matrix to environmental and cross-sectoral policies shows moderately positive intra-sectoral alignment, especially with coastal zone management, wetlands, and biodiversity-related frameworks. However, cross-sectoral integration is weak and uneven. Governance and community-based initiatives provide enabling support, but coastal development, aquaculture expansion, and limited economic incentives exert obstructing effects. After normalization, the overall PII indicates partial rather than strong integration: environmental coherence exists, but is reduced by development-oriented pressures. The study demonstrates that policy integration is a measurable spectrum and that PII can function as a practical diagnostic tool for improving mangrove conservation governance and cross-sectoral policy reform.

Keywords: *Policy integration, Environmental governance, Mangrove conservation, Policy interaction Index, Environmental policy integration*