

Impacts of urbanization on the ecosystem services of the Muthurajawela Marsh and Negombo Lagoon, Sri Lanka

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This study examines the impacts of urbanization on the ecosystem services of the Muthurajawela Marsh and Negombo Lagoon (MMNL), a critical urban wetland ecosystem (UWE) in Sri Lanka. We developed a framework to estimate the changes in the ecosystem service value (ESV) of the MMNL based on land use/cover (LUC) changes in the area from 1997 to 2017. This framework encompasses various sub-disciplines, including environmental history, urban ecology, wetland science, GIScience, and remote sensing. Considering a business as usual scenario (BAU) and an ecological protection scenario (EPS) and using a set of spatial variables (driving factors of LUC changes), we simulated the future LUC changes (2017-2030) in the MMNL and examined the consequent projected future changes in its ESV. The results showed that the total ESV of the MMNL has decreased by LKR 7,005.85 million, or about 66%, from 1997 to 2017, in which about 98% was due to the loss of marshlands and mangroves. The scenario analysis revealed that if the current LUC change pattern continued, marshlands would continue to decrease by 2030 under the BAU scenario. However, under the EPS scenario, the marshland would increase. The scenario analysis also revealed that the total ESV of the MMNL would also continue to decrease by LKR 3570 million under the BAU scenario. However, under the EPS scenario, there would only be about a decrease of LKR 2120 million. In this study, LUC management strategies and environmental engineering measures are discussed to provide scientific guidance for improving the ecosystem services of MMNL and other UWEs in the country.

Keywords: Wetland ecosystem service, Muthurajawela Marsh, Negombo Lagoon, Socio-ecological scenarios, Land Change Modeler, Urban ecology