Title: Mapping Mangrove Extent, Landscape Configuration, and Structural Connectivity in Infanta and Real, Quezon (2000-2025): Implications for Land Use Planning

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Abstract

Mangrove conservation and coastal planning require information on both changes in forest extent and the spatial arrangement of the remaining stands. Area estimates alone can obscure localized losses, gains, and changes in structural connectivity, and relating these changes to land-use and zoning decisions requires spatially explicit assessment. In Infanta and Real, Quezon, existing studies provide ecological and management information, but no integrated historical assessment has yet linked mangrove extent and landscape structure with the municipalities' land-use and zoning designations.

This study will assess mangrove extent, landscape configuration, structural connectivity, and their alignment with land-use and zoning designations in Infanta and Real for 2000, 2010, 2020, and 2025. Mangrove extent will be mapped from annual Landsat surface-reflectance composites using the Mangrove Vegetation Index and Otsu thresholding. Reference data from high-resolution imagery and field validation points will support accuracy assessment and area estimation, and the classified maps will be compared with existing NAMRIA and Global Mangrove Watch products for matching years. Post-classification comparison will quantify persistence, loss, gain, gross change, and net change. Five landscape metrics will characterize mangrove amount, aggregation, patch size, isolation, and shape. Morphological Spatial Pattern Analysis (MSPA) will identify seven structural classes and their transitions over time. Reference-adjusted area and net-change estimates will be reported with confidence intervals where the reference sample is sufficient.

The resulting maps will be overlaid with land-use and zoning designations to identify where mangroves and plans align and where designations may warrant review. Outputs will include historical mangrove maps, area and change estimates, landscape metric summaries, MSPA maps, and planning overlays, providing updated spatial information to support mangrove monitoring, conservation and restoration assessment, and land-use plan review.

Keywords: mangroves; Landsat; Mangrove Vegetation Index; change detection; landscape configuration; morphological spatial pattern analysis; structural connectivity; land-use planning; Infanta; Real; Quezon