FROM LEGAL SPACE TO HYDROLOGICAL FUNCTION:

Assessing Runoff–Vegetation Connectivity and Hydraulic Effects within Legally Designated Lakeshore Spaces: A Case Study of Laguna de Bay

Alyka M. Fangon
Thesis Adviser: Mayzonee V. Ligaray, Ph.D.
Thesis Reader: Ralph Sedricke C. Lapuz, Ph.D.

Institute of Environmental Science and Meteorology, College of Science
University of the Philippines Diliman

ABSTRACT

Lakeshore areas are increasingly affected by urbanization and land-use change, altering surface runoff pathways toward receiving lakes. Vegetation may influence runoff by increasing hydraulic resistance and modifying flow patterns. However, its presence alone does not establish that incoming runoff encounters it or that such contact produces a measurable hydraulic effect before lake entry. In Laguna de Bay, two legal regimes define lakeshore space: the public-use easement under Article 51 of Presidential Decree No. 1067 and the shoreland under the Laguna Lake Development Authority framework, including Board Resolution No. 23, series of 1996. Neither explicitly assigns vegetation a surface-runoff buffering function, but vegetation within these spaces may provide a hydrological co-benefit where it intersects active runoff pathways. This study will evaluate this potential in the Baras, Tanay, and Pililla subbasins by integrating legal-space delineation, remote sensing-based vegetation characterization, runoff-pathway analysis, and event-based HEC-RAS 2D rain-on-grid modeling. Existing lakeshore conditions (S0) will be characterized and refined through targeted field verification and historical observations. Direct Lakeshore Contributing Areas (DLCAs) will be delineated to identify areas draining toward the lake without passing through major tributary outlets. Within selected DLCAs, simulations under specified rainfall and lake-stage conditions will compare S0, a pervious, vegetation-neutralized counterfactual (S1), and vegetation-enhancement scenarios (S2) incorporating different vegetation types and buffer configurations. Runoff–vegetation contact and bypass indicators will be evaluated alongside modeled hydraulic responses, including discharge, flow depth, velocity, and timing. A weighted evaluation framework will integrate these indicators to assess relative hydrological functionality. Findings may inform targeted lakeshore management while distinguishing potential hydrological co-benefits from the designated spaces' primary legal purposes.

Keywords: Laguna de Bay; lakeshore regulation; public-use easement; shoreland; runoff–vegetation connectivity; hydraulic modeling; HEC-RAS 2D