

THE INFLUENCE OF LAGUNA LAKE ON TEMPERATURE AND RAINFALL IN METRO MANILA

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ABSTRACT

Metro Manila is highly vulnerable to climate-related hazards, including extreme rainfall and temperature events. One geographical feature that may influence these local climate patterns is Laguna Lake; a large and shallow inland water body located southeast of the region. Shallow lakes such as Laguna Lake are highly responsive to atmospheric conditions. Its influence can further extend to meteorological variables, like humidity and water vapor. Due to the thermal difference between the lake and the surrounding land, lakes can influence local weather and climate. Hence, studying the role of Laguna Lake in the local climate is increasingly important. This study aims to evaluate the influence of Laguna Lake on temperature and precipitation. Specifically, it will characterize the lake effect on daytime and nighttime temperatures. The study will also analyze the intensity and distribution of convective rainfall in connection with the lake's presence during easterlies.

The study used the Weather Research and Forecasting (WRF) model to quantify Laguna Lake's influence on the local climate. Two experiments were conducted for this study. A control experiment was conducted to establish a baseline for the study region. Afterwards, an experiment where the Laguna Lake was replaced with natural vegetation was conducted to simulate the absence of the lake.

WRF simulations show that Laguna Lake reduces daytime 2-m air temperature and increases nighttime temperature by up to $\sim 2.5^{\circ}\text{C}$, acting as a daytime heatsink, and nighttime heat source. Moreover, rainfall simulations showed that the lake influences rainfall by suppressing rainfall over the lake while enhancing rainfall inland in its surrounding areas.

The results of this study can provide a deeper understanding of how lakes influence local climate, especially the temperature and precipitation. The findings can also serve as a basis for government agencies in developing preparedness plans to address the lake's climate-related effects.

Keywords: lakes, heatsink, temperature, rainfall, WRF