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SIMULATING DAILY RAINFALL FROM SEASONAL CLIMATE PROJECTIONS FOR CLIMATE RISK PLANNING

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ABSTRACT – This study presents a stochastic method to decompose projected seasonal rainfall into daily rainfall using a first-order Markov chain for rainfall occurrence and a Gamma distribution for rainfall intensity. The model is applied to the National Capital Region (NCR) of the Philippines using historical daily rainfall data from 1970 to 2000 and seasonal climate projections from PAGASA (2018) under RCP 4.5 and RCP 8.5 scenarios. Transition probabilities are modeled as functions of seasonal rainfall totals, allowing daily rainfall sequences to be generated based on projected seasonal values. Simulation results reveal seasonal shifts in rainfall characteristics: the dry season (Dec-Jan-Feb) and early wet season (Mar-Apr-May) show increases in both wet-day frequency and intensity, while the wet season (Jun-Jul-Aug) and post-monsoon period (Sep-Oct-Nov) show decreases in both. While a single realization is shown for illustration, Z-scores are computed from 10,000 simulated realizations to assess the model's statistical consistency. While not intended for precise daily predictions, the model offers a useful tool for exploring plausible rainfall scenarios under climate change. The approach can support applications in flood risk assessment and adaptation planning. Future improvements may include higher-order Markov chains, alternative intensity distributions, and formal validation to enhance model accuracy and applicability across regions.

Keywords: climate change, decomposed seasonal rainfall, rainfall intensity, rainfall occurrence

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