

Predictive Analysis of Climate, Water, Health and the Environment Nexus

*Abhishek ⁻¹, Deepika ⁻²

1. Technical University Dresden, GERMANY, 2. BPS Government Medical College for Women, Sonapat, INDIA

Amid the major demographic transition of developing world from a rural, agrarian society to an urban, industrial one, there is a need for predictive analytics of impact of the major biotic and abiotic stressors on the environmental constituents. The current study emphasizes the connections between climate, water, environment, and health and their interdependency followed by an impact assessment focusing on an urban environment. A data-driven hybrid framework for water resources assessment and management based on machine learning techniques was developed, calibrated and validated with the ground data for the sub-region scale of North-East Indian regime (mean spatial coordinates: 28° 38' 41.2800" N and 77° 13' 0.1956" E). The remote sensing data for land cover and land change were coupled with the climate model simulations to formulate the health risk assessment framework. The large ensemble of downscaled scenario based outputs including the effects of anthropogenic factors was used to drive the hybrid model framework.

Multi-dimensional Random Walk Metropolis (RWM) algorithms used to optimize the sample observations converged with an RMSE error of 0.18 with a range of 0.006. Pearson Product Moment Correlation coefficient range of all the ensemble members was 0.886-0.904. The prediction accuracy construed from 95 % model uncertainty bounds was 89-91 % for the constituent parameters. The sensitivity analysis revealed that the climate is the key parameter and is the most sensitive for all other linkage units followed by water availability and health factors. Comparative analysis of the simulated- and experimental results enforced comprehensive clarification of the assumptions made therein. By real-time monitoring and forecasting the vital impacts, this research will serve and benefit local policymakers and in the decision-making process, particularly regarding water resources vulnerability and future availability with significant economic consequences. The upscaling of the model form sub-regional to regional scale is well underway.

Keywords: Climate Change, Urbanization, RWM algorithm, Ensemble model