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Impact of Population Growth on the Water Quality of Natural Water Bodies

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Abstract

Human activities pose a significant threat to the water quality of rivers when pollution exceeds the threshold limit. Urban activities in particular are highlighted as one of the major causes of contamination in surface water bodies in Asian countries. Evaluation of sustainable human population capacities in river watersheds is necessary to maintain better freshwater ecosystems in a country while achieving its development goals as a nation. We evaluated the correlation between the growth rate of the population in a watershed area and water quality parameters of a river ecosystem. The Kelani River in Sri Lanka was selected for the study. The highest correlation coefficients of 0.7, 0.69, 0.69 ($p < 0.01$) corresponding to biochemical oxygen demand (BOD), dissolved oxygen (DO) and total coliform (TC) were obtained with the population in watersheds of the Kelani river in Sri Lanka. Thus, we propose a quantitative approach to estimating the population capacity of watersheds based on water quality classification standards (WQCS), employing the Bayesian network (BN) classification model. The optimum population ranges were obtained from the probability distribution table of the population node in the BN. The results showed that the population density should be approximately less than 2375 to keep the water quality in the watershed for bathing and drinking purposes and approximately less than 2672 for fish and other aquatic organisms. This research will offer a means that can used to understand the impact of population on water quality in river basins and confer direct influence on natural water bodies.

Keywords: population growth, water quality, river pollution, urbanization, Kelani River, biochemical oxygen de

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