

# **Impact of population growth and land use and land cover (LULC) changes on water quality in tourism-dependent economies using a geographically weighted regression approach**

## **ABSTRACT**

This paper aims to assess the influence of land use and land cover (LULC) indicators and population density on water quality parameters during dry and rainy seasons in a tourism area in Indonesia. This study applies least squares regression (OLS) and Pearson correlation analysis to see the relationship among factors, and all LULC and population density were significantly correlated with most of water quality parameter with P values of 0.01 and 0.05. For example, DO shows high correlation with population density, farm, and built-up in dry season; however, each observation point has different percentages of LULC and population density. The concentration value should be different over space since watershed characteristics and pollutions sources are not the same in the diverse locations. The geographically weighted regression (GWR) analyze the spatially varying relationships among population density, LULC categories (i.e., built-up areas, rice fields, farms, and forests), and 11 water quality indicators across three selected rivers (Ayung, Badung, and Mati) with different levels of tourism urbanization in Bali Province, Indonesia. The results explore that compared with OLS estimates, GWR performed well in terms of their R<sup>2</sup> values and the Akaike information criterion (AIC) in all the parameters and seasons. Further, the findings exhibit population density as a critical indicator having a highly significant association with BOD and E. Coli parameters. Moreover, the built-up area has correlated positively to the water quality parameters (Ni, Pb, KMnO<sub>4</sub> and TSS). The parameter DO is associated negatively with the built-up area, which indicates increasing built-up area tends to deteriorate the water quality. Hence, our findings can be used as input to provide a reference to the local governments and stakeholders for issuing policy on water and LULC for achieving a sustainable water environment in this region.