# The spatial non-stationarity of population-land use/cover relationships in Lake Naivasha basin; an application of Geographically Weighted Regression (GWR)

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## Abstract

Remotely-sensed data can be used to evaluate human impact on the biophysical environment and environmental impacts on human economic activity. Understanding human population distribution and density at different spatial levels is essential for the formulation of appropriate policies for the sustainable use of natural resources in developing countries. This study was conducted for the Lake Naivasha basin (Kenya) where population pressure, intense land utilization in the catchment and informal settlements in Naivasha town due to lucrative economic activities are the major challenges of the basin socio-ecological system. It applies a global ordinary least squares (OLS) regression model to estimate population for different land use/cover classes followed by a local geographically-weighted regression (GWR) model. This study investigates the importance of a local GWR model to estimate population in rural Africa and its potential to handle the spatial non-stationarity problems of global OLS model. The result revealed that grassland and cropland use/cover have a significant spatially varying relationship with population. Parameter estimates (coefficients) for all land use/cover classes except built-up area are also found to exhibit locally different signs, which would have gone undetected by a global model. Consequently, this study provides an improved understanding of the spatial population-land use/cover relationships and shows that effects of spatial non-stationarity need to be incorporated to have better estimates of population.

**Key words:** *land use/cover, population estimation, non-stationarity, Lake Naivasha basin, geographical weighted regression (GWR) and ordinary least squares (OLS).*

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