

Abstract

Most cities in Africa's developing countries are evidently becoming more urbanized. This has led to significant modification on climate over the cities which affect human comfort, environment and socio-economic activities. Proper urban atmospheric planning and management are therefore key to making cities environmentally sustainable, economically vibrant and safe for all. To achieve all these, urban weather and climate needs continuous monitoring to offer accurate, reliable and timely update of any significant changes.

This study examined the long term modification of weather parameters: temperature, rainfall and wind by urbanization process. The study utilized decadal population data, monthly maximum and minimum temperature, daily and monthly rainfall, land surface reflectivity and wind speeds and direction for a representative stations in or in the environs of these cities for the period of forty years.

The data were subjected to homogeneity test using Short-Cut Bartlett Test method; the analyses showed that the number of rainy days was decreasing while both maximum and minimum temperature increasing though insignificant over the three cities. The urbanization is evidenced by the reducing urban land surface reflectivity and the increasing population. population growth was found to be highest over Nairobi city and lowest over the city of Kisumu. Nairobi city has equally witnessed the highest reduction in land surface reflectivity while Mombasa city has recorded the least reduction.

The spatial distribution of rainfall and temperature was performed using Surfer version 8. Wind Rose Plot View and Hybrid Single particle Lagrangian Integrated Trajectory Model used to study winds and simulate dispersion of pollutants over the city respectively. Wind direction does not show modification by urbanization, however, its magnitude has exhibited a reduction with time.

The pollutant dispersal is observed to be strongest in the dry windy seasons and least in the rainy months; March-April-May and September-October-November. The dominant winds over the cities of Nairobi and Kisumu are easterlies while in the coastal city of Mombasa are mainly south easterlies. The western environs of the cities of Kisumu and Nairobi and the northwestern parts of the city of Mombasa experience high pollution levels during the rainy calm days and residents are thus advised to minimize outdoor exposure to the pollutants during the time.

The correlation between the weather parameters and the urbanization indicators: albedo and population over the cities showed a correlation that is very low, evidenced by low coefficient of determination of the weather parameters by both population and land surface albedo of less than 20 per cent.

The study has revealed the influence of urbanization on urban climate of cities in Kenya. Although rainfall enhancement may appear positive, most of the modifications on other parameters; increase in temperatures and reduction in wind speed is harmful to human and animal comfort and the environment at large. Practical approaches such as increasing urban forest cover, proper planning of the cities and ways of energy conservation have been suggested to help prevent further modification of weather and urban climate by urbanization based on the study's findings. The findings of this work are thus important for multi-sectoral use in the urban centres in Kenya by the city planners, health practitioners, outdoor event

organizers, residents, sportsmen and women are among other people for their comfort, health and environmental conservation at large.