TOSSOUKPE, Adjowa Yéwa PhD/SPS/FT/2021/13010

ABSTRACT

Urbanisation and population growth in West Africa have led to significant changes in land use and land cover (LULC), raising environmental concerns. In view of this, the study evaluated the impact of urban sprawl on ecosystem services in the District Autonome du Grand Lome (DAGL) and Greater Accra Metropolitan Area (GAMA) from 1986 to 2023 and from 1991 to 2023 respectively, using geospatial techniques; the Google Earth Engine platform and InVEST model. The findings indicate a decline in the verdant landscape, with forested areas in DAGL declined from 24 % in 1986 to 3 % by 2023, and from 34 % in 1991 to 2 % in 2023 in GAMA. Grasslands also saw significant reductions, while built up areas expanded dramatically rising from 18 % to 62 % in DAGL and from 10 % to 70 % in GAMA. The Urban Expansion Intensity Index (UEII) reflects rapid urban growth, with DAGL at 1.19 % and GAMA at 1.88 %. Directional analyses revealed that urban expansion predominantly occurs towards the north-west in DAGL and both north east and north-west in GAMA. In DAGL the total carbon storage significantly declined from 3,604,852 Mg of C in 1986 to 1,367,113 Mg of C by 2023. The most substantial loss in carbon storage was between 2001 and 2015. Similarly, in the GAMA, carbon storage dropped from 16,574,522 Mg of C in 1991 to 4,120,702 Mg of C by 2023, with major decrease between 2002 and 2017. More so, in DAGL, the runoff retention index has remained low, fluctuating between 2.00 % in 1986 and 2.43 % in 2001, before dropping to 2.01 % by 2023 with total runoff retention decreasing from 29,098,483 m^3 in 1986 to 17,908,270 m^3 in 2023. In contrast, in GAMA region had a higher runoff retention index of 14.75 % in 1991 and decreased to 9.66 % by 2023. Despite this initial advantage, total runoff retention also declined significantly from 85,027,128 m^3 in 1991 to 57,500,096 m^3 in 2023. The study also revealed a decrease in cooling capacity from 0.60 % in 2001 to 0.30 % in 2023 in DAGL with direct correlation with the average temperature increase from 26°C in 2001 to 29.5°C in 2023. In the same vein, cooling capacity declined from 0.65 % in 2002 to 0.25 % in 2023 in GAMA with average temperatures rising from 25.5°C in 2002 to 29.0°C in 2023. Going by all these negative impacts of urban sprawl in both cities, it is therefore recommended that vertical and mixed land use development with integrated ecological preservation approaches, should take pre-eminence over horizontal development to achieve eco-development and more resilient urban future.