Popular Summary

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Trends of Greenness in Addis Ababa and its Surrounding (2000-2016)

Monitoring of resources with repeated observations of remotely sensed data help to understand the status of a resource and develop accurate and timely information. NDVI (Normalized Difference Vegetation Index) has been under use since the early 1970s for monitoring of the physical and/or anthropogenic environments: vegetation, crop productivity, drought/famine and built-up areas. However; there has been an academic debate whether variability (decrease or increase) in NDVI is caused by natural factors or anthropogenic ones, particularly LULC (land use/land cover) change induced by rapid urbanization.

The current study attempts to examine the link between MODIS based trends of NDVI with LANDSAT based LULC change and field based rainfall data.

Supervised classification of LANDSAT data is employed to identify four thematic classes. LULC change is detected using post classification comparison method. Yearly aggregates of mean, standard deviations (SD), minimum and maximum values of NDVI were generated from MODIS time-series images (n= 387) using zonal statistics algorithm and spatially mapped. The aggregated yearly NDVI and rainfall values were standardized to *z-scores* and statistically correlated.

The result revealed an overwhelming increase in built-up area (183%) at the expense of agriculture and vegetation which were reduced by 34% and 29% respectively. A general decline in NDVI and rainfall implying net-loss in greenness was revealed in the study area. Considerable spatio-temporal variation was observed in the onset (start), green up (peak), senescence (decline) and end (dormancy) dates of NDVI. Spatially, three classes of NDVI were identified: low NDVI zone (the center with homogeneous built-up area); medium NDVI zone (the transitional zone with mixed LULC) and high NDVI zone (the periphery with a relatively higher vegetation cover). Bi-modal rainfall seasons were identified by MODIS based NDVI and field based rainfall data. NDVI was found to be positively correlated with rainfall data (R^2=0.25, Addis Ababa station) and (R^2=0.2, Bole station). The correlation (R^2 values) between NDVI and rainfall revealed a declining trend.

The study concludes that decline in NDVI between 2000 and 2016 in the study area is more explained by net-loss in vegetation and agricultural land than decline in rainfall.

Therefore; caution has to be made while using satellite based NDVI to monitor the physical and/or anthropogenic landscape.

Key Words: Physical Geography and Ecosystem Science, NDVI, Addis Ababa, MODIS, Time-series, Greenness, LULC.

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Monitoring trends of greenness and LULC (land use/land cover) change in Addis Ababa and its surrounding using MODIS Time-series and LANDSAT Data