

Impact of Economic Land Use Land Cover (LULC) on ecosystem capital: An assessment of urban dynamics of Chennai City

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Abstract

Promoting sustainable urbanization and limiting land consumption are a local and regional priority policy target in most of the developed and developing nations. Monitoring and quantifying urban growth, support decision-making processes for the prevention of ecological and socio-economic consequences. In this context, this study examined the LULC dynamics along with spatio-temporal Ecosystem Services Valuation (ESV) to decipher the factors of growth in Chennai Metropolitan Area (CMA). The combination of GIS (Geographic Information System) and RS (Remote Sensing) was used to extract the data on LULC change over the period from 1978 to 2017. The study demonstrates the use of value coefficient of the ecosystem service for various land types and LULC helps in characterizing the patterns of development that shows outward growth of the city boundaries which in turn leads to decline in ESV. The agricultural farmland ecosystem marked the maximum loss of services during the study period followed by shrubs and water bodies respectively. During the interval of 2006-2011, the water body across the CMA was affected severely due to exponential urbanization. Mostly the changes were observed on the land used for water storage, that got correlated with the economic value of ecosystem service also to decline from 15337.15 US\$/km² to 11641.20 US\$/km². Since, LULC is the main cause of flooding that alters the hydrological processes, the direct and indirect impacts of ecosystem loss were clearly indicative from the recent frequent urban flooding faced by the CMA. Water storage areas such as lakes, detention and retention ponds, have effectively reduced the general flood load as well as peak discharge on the downstream side of the river resulting in a reduction in the flood inundation area. Due to economic progression along with socio-economic improvement, the overall LULC change has led to 24.42% decline in the regional CMA ESV. The inference from the present work would help the flood preparedness and mitigation/management strategy as well as to take precautionary measures for avoiding flooding risk in the identified flood-prone areas. This study also highlights the need for sustainable development policies that will curb the fast conversion of land from green to gray.

Keywords: Chennai, Ecosystem valuation, Land use land cover, Spatiotemporal changes, Urbanization

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