RESEARCH ON SUSTAINABLE DEVELOPMENTS FOR ENVIRONMENT MANAGEMENT

Land use/land cover changes of Noyyal watershed in Coimbatore district, India, mapped using remote sensing techniques

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Abstract

The present study undertakes to produce the land use/land cover map and to explore the change detection analysis of Noyyal watershed, Coimbatore, for a time period of 18 years. Based on the remote sensing and geographical information system for monitoring the temporal variations of land use/land cover, multi-temporal Landsat satellite 30-m spatial resolution images of Landsat 4/5 MSS and TM (1999), Landsat 7 ETM + (2008), and Landsat 8 Operational Land Imager (OLI) were obtained from the USGS website. The satellite images were geocoded into the universal transverse mercator (UTM) coordinate system zone 43 N. The unsupervised classification method was done by using an iterative self-organizing data analysis algorithm to compare the images and to classify the images into various land cover categories. Kappa statistics were used to assess the validation of the present study. The analysis suggests the total forest covered in 1999 was 22.69% and that of 2008 was 24.04% and reduced to 6.09%, in 2017. The agricultural land of 17.8% is reduced to 3.11% in 2008 and 0.86% in 2017. The settlements increased from 15.59 to 24.21% in 2008 and 27.14% in 2017. Increase in deforestation leads to increase in barren land. In 1999, the percentage of barren land was 17.2%; in 2008, it was 13.19%, and 50.93% in 2017. The overall accuracy estimation of the study is 73.19% and Kappa coefficient is 0.72. This study has proven a substantial strength of agreement for the map of 2017 from the result of validation rating criteria of Kappa statistics.

Keywords LULC · Watershed · Deforestation · Coimbatore · Unsupervised classification · Kappa statistics

Introduction

Land cover studies (LULC) has been considered an important exploratory issue because it can cause environmental changes to a greater extent (Xiao et al. 2006; Fayaz Ahmad et al. 2015; Shafiq et al. 2017). LULC data can be used for better management of natural resources (Iqbal and Khan 2014; Lin et al. 2015; Kantakumar and Neelamsetti 2015): increasing population and development activities, putting pressure on the country's natural resources, and changing land use (Islam et al. 2016). LULC of rural watersheds has

a great influence on water quality and stream characteristics (Paul and Meyer 2001; Tong and Chen 2002). The effects of climate and land use changes on watershed rely upon the degree and perspective of land use (Martin Katherine et al. 2017). The LULC plays a significant role in the relationships between man and environment (Regmi et al. 2017). In LULC detection studies, land use affects the land cover; the changes in LULC do not have a potential impact on the degradation of the land cover (Rawat and Kumar 2015). Several investigations on LULC showed that metropolitan populace development rates have amplified the rates of alteration of forest and built-up land in developing nations in everywhere in the world (Klosterman 2008; Zhang et al. 2010; Barsimantov and Navia Antezana 2012; Chen et al. 2013).

The catchment processes and biochemical cycles are affected by the degradation of forest and prompt soil degradation and water scarcity both in the district areas, such as, quickly influenced, affected by deforestation, and also far-away areas. The problems and after effects caused by LULCC are many (Saadat et al. 2011). For the better understanding of relationships and interactions between human