Forest cover in India (1930-1975-2013)

Overview

The status of global forest cover has large uncertainty for several continents on earth owing to the paucity of comprehensive studies related to long term forest cover change. The aim of the present work is to prepare a nation-wide multi-date forest cover database which describes and quantifies historical changes in forests of India. This present analysis facilitated the determination of the status of Indian forest cover changes over last eight decades. The results indicated that forests covered an area of 869,012 km^2 in 1930 which decreased to 625,565 km^2 in 2013, a net loss of 243,447 km^2 (28%) in eight decades.

Scope of the study

The findings of the study will be useful to prioritize conservation and protection of forest cover at the regional level. It shall also provide a base for future research on the impacts of deforestation on carbon flux and biodiversity.

Methodology

This study is primarily based on classification of forest cover and spatial grid cell analysis of multi-source and multi-temporal data. To generate maps of forest cover across India, the topographical maps (1:250,000 scale) prepared by Army Map Service, U.S. Army, Washington surveyed during 1920-1940 (http://www.lib.utexas.edu/maps/ams/india) were acquired. Remote sensing data pertains to Landsat MSS (1972-1977) provided by Global Land Cover Facility Programme and was downloaded from the website (http://glcfapp.umiacs.umd.edu:8080/esdi). Resourcesat-2 AWiFS (2013) were obtained from NRSC, Hyderabad. 1930 and was considered as the base year for temporal analysis for the 1920-1940 period. 1975 was considered as the base year for the data of 1972-1977. Satellite data was acquired and preprocessed followed by image extraction, noise removal and geometric correction. Following the availability of orthorectified Landsat TM data, the common ground control points were selected on the raw satellite data with proper spatial distribution covering the entire study area. This process of geometric correction of raw satellite data was achieved using first order polynomial transformation fit. A nearest-

neighbor algorithm was used to perform the resampling procedure and the image-to-image registrations. The study area was extracted from the multiple satellite data scenes by subsetting. To reduce the error due to various atmospheric conditions at different dates of image acquisition conversion of digital number to Top-of-Atmosphere reflectance algorithm was applied. The images were georeferenced to the Albers Conformal Conic coordinate system and WGS84 datum. For interpretation of topographical maps, on-screen visual interpretation technique was used. In remote sensing data analysis, spectral and temporal characterization for land cover mapping was done by multi-season data which masked the vegetation cover for further visual interpretation. The forest cover map produced from the Resourcesat-2 AWiFS image of 2013 was used as a template for classifying the 1975 by on-screen visual interpretation for change between forest and non forest cover. Change areas were added to the spatial data of the corresponding period. The main advantage of using this technique, rather than classifying all images independently, is to minimise the changes that are associated with sensor differences as well as with phenological, atmospheric and environmental variability. The hybrid method of digital and visual interpretation of the satellite imagery for forest change supports identifying areas of deforestation and afforestation/reforestation and will reduce the inconsistencies. A grid cell of 5km x 5km was generated for time series assessment and to analyse the trends in spatial distribution of forest cover.

Publications from the study

1. Reddy, C.S., Jha, C.S., Dadhwal, V.K., Harikrishna, P., Pasha, S.V., Satish, K.V., Dutta, K., Saranya, K.R.L., Rakesh, F., Rajashekar, G. & Diwakar, P.G. 2016. Quantification and monitoring of deforestation in India over eight decades (1930-2013). *Biodiversity and Conservation* 25: 93–116; DOI: 10.1007/s10531-015-1033-2.

Contributors: C. Sudhakar Reddy, C.S. Jha, V.K. Dadhwal, P. Harikrishna, S. Vazeed Pasha, K.V. Satish, K. Dutta, K.R.L. Saranya, F. Rakesh, G. Rajashekar, R. Suraj Reddy and P.G. Diwakar.

National Remote Sensing Centre, Indian Space Research Organisation, Balanagar, Hyderabad- 500 037.

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