Chapter 43

Monitoring Changes in Urban Cover Using Landsat Satellite Images and Demographical Information

Prashant K. Srivastava
Banaras Hindu University, India

Swati Suman
Banaras Hindu University, India

Smita Pandey
Banaras Hindu University, India

ABSTRACT

The monitoring of urban cover is very important for the planner, management, governmental and non-governmental organizations for optimizing the use of urban resources and minimizing the environmental losses. The study here aims at analyzing the changes that occurred in urban green cover over a time span of 1991-2001 using multi-date Landsat satellite images data over the Varanasi district, India and its relation to demographical changes. The Support Vector Machines (SVMs) classifier has been used for image classification. The urbanization indicators such as Land Consumption Ratio (LCR) and Land Absorption Coefficient (LAC) were also used in order to understand the changes in urban cover and population dynamics. All the analysis indicates significant changes in the urban cover values with increasing population at both spatial and temporal scale.

INTRODUCTION

Technological advancement in satellite remote sensing leads to a substantial development in the environmental and resource management policies in recent decades. Satellite earth imagery due to their global coverage and continuous temporal monitoring are proved to be significant in today's chaotic scenario of expedited population growth for limited natural resources over traditional practices (Srivastava et al.,

2010). Developmental strategies in alliance with land use land cover change monitoring have laid to a new prospect towards sustainable development especially for a mercurially evolving country like India (Singh et al., 2016).

Land cover is the state earth surface and its biophysical attributes (Lambin et al., 2001), whereas land use is the manner in which humans use natural resources for their use and convenience (Srivastava et al., 2012). Land use land cover change is significant to a range of themes to study and simulate global changes as land covers are a subject of change with pace, magnitude and spatial reach of human beings suggested by leading experts (Singh et al., 2014). Urbanization, deforestation and desertification are the consequences of uninhibited development policies due to modern territorial and socio-economic progress leading to the transformation of existing land use land cover pattern (Srivastava et al., 2013). Since deforestation and desertification needs immense amount of ecological and societal awareness and efforts to be controlled, a systematic expansion concrete sector can be our evident call for achieving sustainable development goals (Singh et al., 2015).

Urban expansion in developing countries world has been dramatic and rapid. United Nations in a report published in year 2015 quoted that the "total urban population in developing countries like India and china has increased 10 folds from 300 million to 3 billion since 1950". Coupled with the technological advancements and population explosion, Urbanization has accelerated industrial revolution leading to increased resource consumption and environment degradation rates (Banerjee & Srivastava, 2013). Rapid urbanization has been a topic of interest for researcher, planners economist, ecologist and policy makers as these developmental advances are happening in an era of shooting population, shrinking natural resource and increasing demands in need to ensure sustainable development for all (Srivastava et al., 2014b).

Digital change detection is a process of surveying temporal changes for a place outlined over ecological entities through multi temporal satellite images by detecting changes in radiance value over time (Srivastava et al., 2014a). Change detection exercises have a long range implication in

- Urban sprawl studies (Jat et al., 2008),
- Land use analysis (Martinuzzi et al., 2007),
- Monitoring shifting cultivation (Roy et al., 1985),
- Forest assessment (Wang et al., 2010),
- Deforestation mapping (Frohn et al., 1996),
- Snow melt measurement (Abdalati & Steffen, 1997),
- Disaster monitoring (Dlamini, 2009),
- Damage assessment (Rejaie and Shinozuka, 2004) and many more.

Combined assessment of satellite image classification with demographic status of the area can be used to monitor urban sprawl. Demography of an area significantly influences development and architectural pattern of an area. These studies are often supported through either an image-to-image classification or a post- classification comparison method. The post classification method compares two or more separately classified images of different dates and is considered too be most appropriate and conveniently used approach (Singh, 1989).

Related Content

Anomaly Detection in Hyperspectral Imagery: An Overview

Karim Saheb Ettabaaand Manel Ben Salem (2019). *Environmental Information Systems: Concepts, Methodologies, Tools, and Applications (pp. 1587-1606).*

www.irma-international.org/chapter/anomaly-detection-in-hyperspectral-imagery/213010

Remanufacturing, an Added Value Product Recovery Strategy

Adnan Corum (2016). *Handbook of Research on Waste Management Techniques for Sustainability (pp. 347-367).*

www.irma-international.org/chapter/remanufacturing-an-added-value-product-recovery-strategy/141904

Design and Implementation of a Fuzzy Inference Model for Mapping the Sustainability of Energy Crops

Fausto Cavallaroand Luigi Ciraolo (2015). *Soft Computing Applications for Renewable Energy and Energy Efficiency (pp. 47-68).*

www.irma-international.org/chapter/design-and-implementation-of-a-fuzzy-inference-model-for-mapping-the-sustainability-of-energy-crops/121391

Mechanisms of Electrical Conductivity in Carbon Nanotubes and Graphene

Rafael Vargas-Bernal (2019). *Advanced Methodologies and Technologies in Engineering and Environmental Science (pp. 101-115).*

www.irma-international.org/chapter/mechanisms-of-electrical-conductivity-in-carbon-nanotubes-and-graphene/211865

Heavy Metal Pollution

 (2020). *Nano-Phytoremediation Technologies for Groundwater Contaminates: Emerging Research and Opportunities (pp. 8-17).*

www.irma-international.org/chapter/heavy-metal-pollution/241165