

Evaluation and Identification of Potential Sites for Green Infrastructure using Geo Informatics -A Case Study on Coimbatore District an Emerging Smart City in Tamil Nadu

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Abstract— Global human population and urban development are increasing at unprecedented rates and creating tremendous stress on local, regional and global air and water quality. Some of the major functions of the urban green spaces include reducing air pollution, providing shade and habitat for arboreal birds, producing oxygen, providing shelter against winds, recreational and aesthetic qualities. Cities and peri - urban Settlements must be prepared to meet the challenge of unplanned settlement or slum formation. The move towards smart cities promises to bring greater automation, intelligent routing and transportation, better monitoring and better city management. The development of urban green space networks includes creation of new spatial forms, restoration and maintenance of green patches connectivity as well as protection of existing green spaces. Green space network begins to be recognized as a medium of conserving ecosystem and natural environment in urban area. In this study the land use and land cover pattern of the city is analyzed using satellite images and further identifies the suitable sites for greenspace development.

Key words: Green Infrastructure, Geo Informatics, Smart City

I. INTRODUCTION

India is considered as a developing nation where a majority of population density is in urban areas. India will have 68 cities with people migrate to cities primarily for employment. This rapid migration will push both current and future urban centers to maximize and expand the industrial, residential and infrastructures beyond their breaking points. The concept of Smart cities is those that are able to implement good infrastructure, sustainable development. Smart city is one which provides for the well being of the people through integration of urban planning systems, efficient service delivery, smart governance, energy management and conservation of resources with underlying use of technology and instrumentation leading to socio – economic and sustainable development. Smart city is a “booming” international phenomenon. There are smart cities project across the globe. The statistics shows that over 2000 smart city projects have been started or going on in Asia, Europe, America and Africa. The smart city concept is still quite new in India, although it has received a lot of attention in the last few years. This paper describes the smart city concept in Coimbatore city and explores the existing and recent landuse/landcover pattern and visualizing that the city is capable of Greenfield sites selection.

II. NEED FOR THE STUDY

The main purpose of this study is to implement the **Greenfield Development concept** and also to identify the previously vacant area (more than 250 acres) in the city using smart solutions and plan implementation tools like Remote sensing and GIS. The purpose of using Remote Sensing and GIS is that provide added dimension to data analysis which brings us one step closer to visualizing the complex patterns and relationships that characterize real world planning and problems. Visualization of spatial patterns also supports change analysis which is important in monitoring of social indicators. This in turn results in improving need.

III. AIM AND OBJECTIVES

The main aim of this study is to identify the potential areas for green infrastructure development in Coimbatore district using Remote Sensing and GIS techniques. This in turn helps us to provide the information to the citizens for sustainable housing especially for the poor and also to provide them the core infrastructure and a decent quality of life with clean and sustainable environment. The following specific objectives are pursued in order to achieve the aim.

To create the landuse / landcover map of Coimbatore, the emerging smart city in Tamil Nadu

To identify the potential vacant spaces that will be ideal to build the green infrastructure.

IV. STUDY AREA

Coimbatore District is located in Tamil Nadu (India). It has an total area of 4693.1 sq. km, the latitude and longitude extension of the study area is 10°10' to 11° 30' N and 76° 40' to 77° 44' E respectively and is altitude 43.2 meters above mean sea level. The mean maximum and minimum temperature during summer and winter varies between 35°C to 12°C respectively. The entire western and northern part of the district borders the Western Ghats with the Nilgiri biosphere as well as the Anaimalai, Valparai and Munnar ranges. Coimbatore district forms part of the upland plateau region of Tamil Nadu with many hill ranges, hillrocks and undulating topography with a gentle slope towards east except for the hilly terrain in the west. The soils present in Coimbatore district can be broadly classifies into 6 major soils types vis., Red calcareous soil, Black soil, Red non-calcareous, Alluvial and Colluvial soil, Brown soil, and Forest Soil. The district is known as the Manchester of South India and is known for its textile factories, engineering firms, automobile parts manufactures, health care facilities, educational institutions, and hospitality industries.

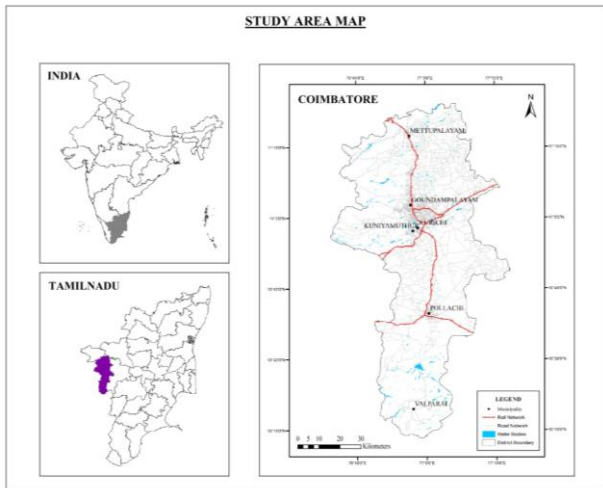


Fig. 1: (Study area map)

V. METHODOLOGY

The data has been extracted from the satellite image (LANDSAT-2015). Remote sensing software: Erdas Imagine version 10 and Arc GIS version 10.1 were used for the processing of the image. The raw satellite image were converted from Tag image file format (Tiff) to img format using Erdas in order to be compatible with other Erdas imagine files.

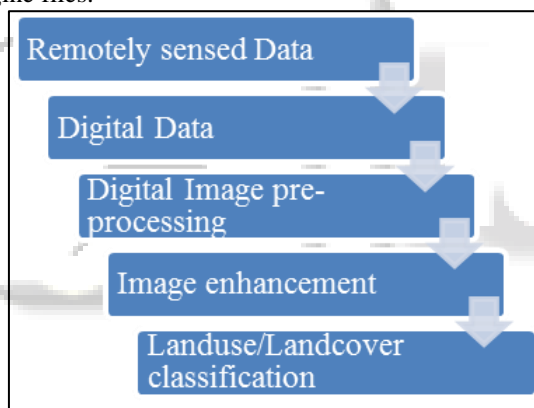


Fig. 2: (Overview of Remote sensing process for Landuse and Landcover)

The supervised classification method used to classify the images into various land cover categories. The maximum likelihood supervised classification method is applied for grouping the pixel. Level-1 classification were been carried out.

VI. RESULT AND DISCUSSION

A smart building is designed to optimize usage of energy, water and to minimize environment impact. Some of the building blocks of smart building and urban planning solutions include real estate management, capital projects management, space management, facility maintenance and energy management. However, the complexity and the pace of smart city, combined with the need for integrated and systemic solutions, are presenting a major challenge to local authorities who traditionally have developed responses and requires organizational change as well as deploying innovative technology and such one technology is Smart city has sought to provide support to cities, developing more

integrated approaches, by providing a platform for the cities which were been growing faster.

There are significant barriers to adoption/uptake the new concept of green building development. But it would be a mistake to think that Green building development is purely a developing phenomenon. The process highlighted the difficulties which many Urban Local Body (ULB) authorities are facing. Considering those open spaces, developing upon their function can be within the city and/or on its outskirts. They should include, apart from organized open spaces for green building development purposes. Depending upon the requirement of the city, these open spaces should be adequately provided and should be well defined in area and landuse.

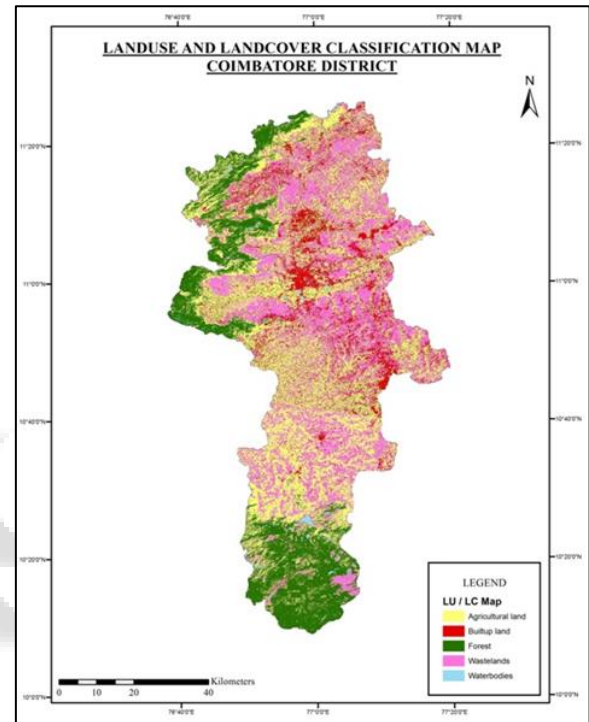


Fig. 3: Landuse / Landcover map of Coimbatore District

The image represents the Landuse and Landcover classification for the Coimbatore district. Level I classification were been carried out for the process.

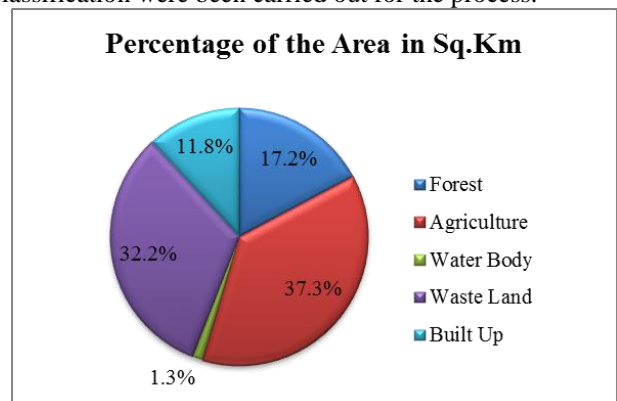


Fig. 4: Percentage of the area in sq.kms

The above mentioned pie-chart represents the percentage of area in Sq.km in Coimbatore district.

Level I Classification	Area in sq.km	% of the Area
Forest	826.26	17.2
Agriculture	1749.07	37.3

Water Body	61.27	1.3
Waste Land	1504.70	32.2
Built Up	551.85	11.8
Total	4693.15	100%

Source: Result of Calculation

Table 1: Landuse / Landcover classifications of Coimbatore District

This project reveals the final result by achieving the below mentioned three criteria's:

- The selected site should to make the best connectivity by the means of road network so that a person can move or about to start moving.
- Understanding the surroundings and considering that within 500 meters of distance any water logging surface should not be found (i.e. lake, pond, etc).
- The site which is been selected for the green building development should be considered that land should be already an existing waste land or fallow land is mostly preferable.

By achieving the above mentioned criteria's final result could be made easily using proper GIS tool. The final result shows that there are four sites were been identified in Coimbatore district.

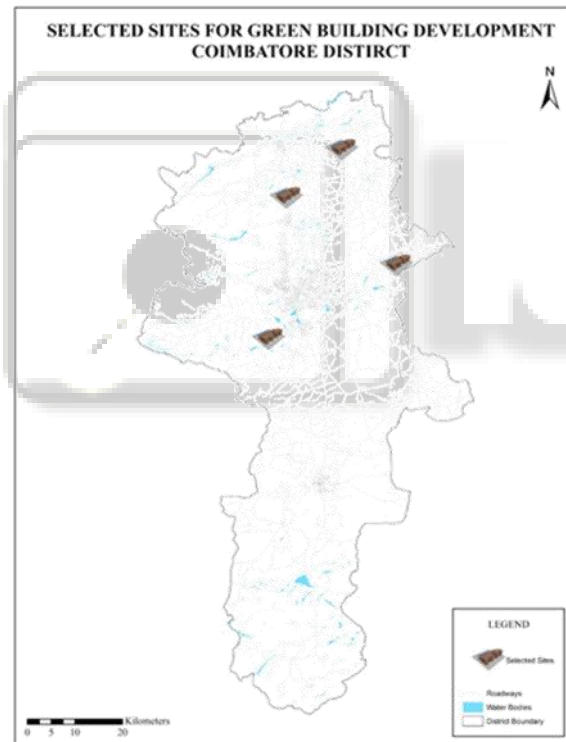


Fig. 5: Selected Sites for Green Building Development, Coimbatore District

VII. CONCLUSION

The current study presents the one of the Smart city concept – Green Building development and selecting the suitable sites to implement that concept for the development of the Coimbatore city. Identifying potential areas of more than 250 acres were been highlighted along with criteria's which is mentioned already. Along with it, several GIS tools were been implemented in promoting mixed land use in area based developments-planning for unplanned areas containing a range of compatible activities and land uses

were been made in order to identify the suitable area to implement the plan and also consideration of different characteristics, factors, parameters and criteria's in a non-weighted way expresses From the present study 4 places where been identified and demarked within the Urban Local Body territory limits of Coimbatore district which facilitating the parameters that suits for Green Building development.

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