A GEOGRAPHICAL STUDY OF URBAN SPRAWL OF PATNA CITY USING GEOINFORMATICS

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Introduction

Urban sprawl may be defined as the scattering of new development on isolated tracts, separated from other areas by vacant land (Lata, et al. 2001). It has also been described as leapfrog development (Jothimani, 1977; Torrens and Albert, 2000). The need for monitoring urban development has become imperative to help curb the problems of this type of growth. Monitoring urban development is mainly to find the type, amount and the location of land conversion for future planning (Shekhar, 2001). Urban sprawl varies in degrees between the developed and the developing world and subsequently they have differing consequences. The objectives of this study are as follows:

- To identify the factors and problems of urban sprawl for Patna City
- To study and compare the demographic change between the sample Towns
- To study the changing pattern of landuse and map the urban development of sample towns using RS & GIS as tool.
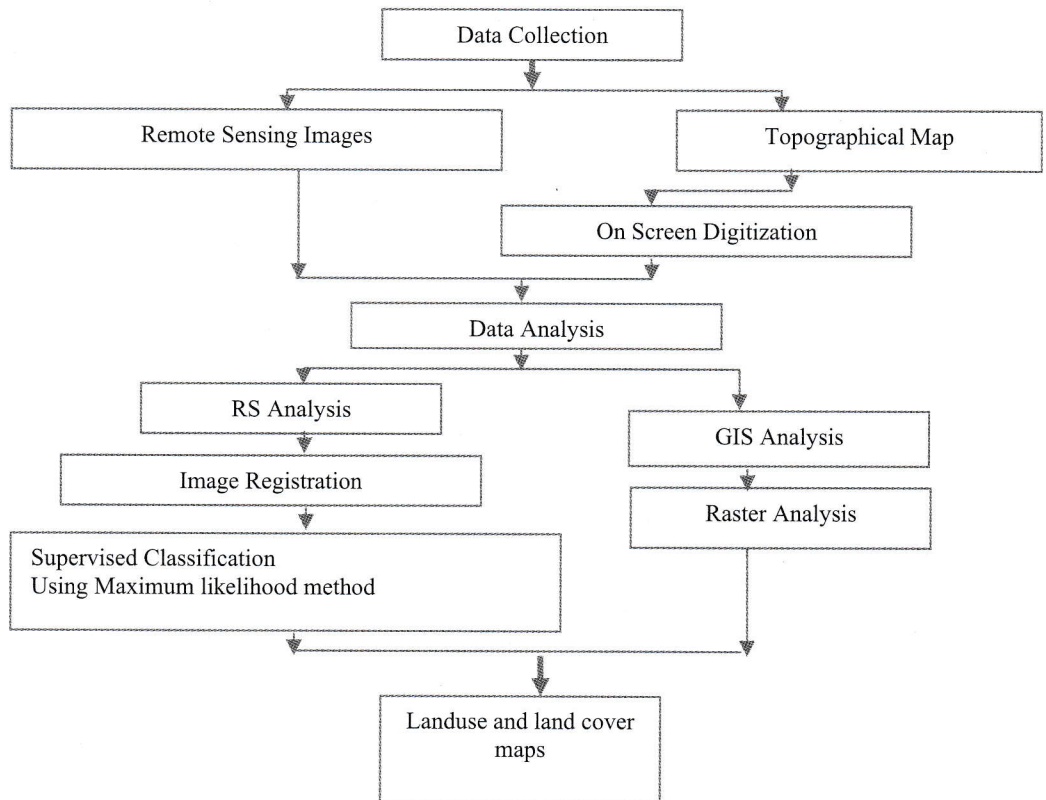
Figure 1: Study Area
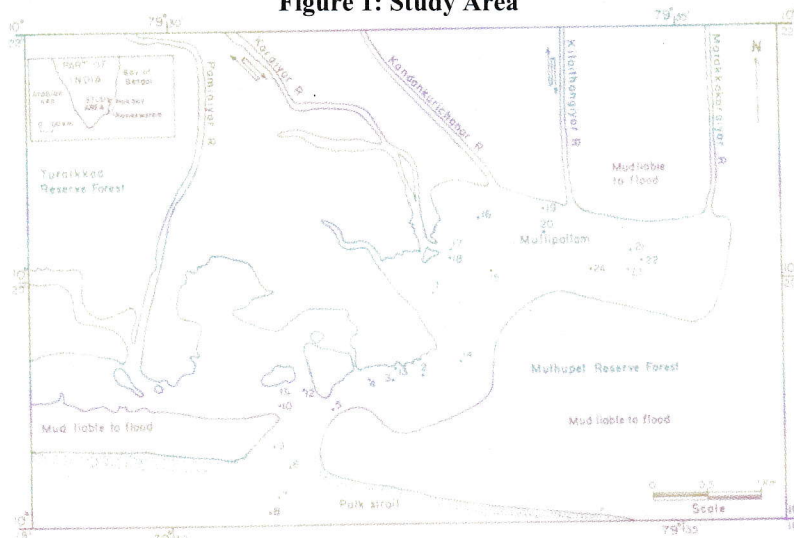
Patna, the capital of Bihar state, is a city with an ancient past. Patna is located between Latitude: 25° 30' to 25° 40'North and Longitude: 85° 0' to 85° 15'East, and lies on the south bank of the Ganga River. The two sample towns of Danapur and Phulwari which are located on the western part and southern part of Patna city. The important national highway NH30 which connects Bakhtiyanpur and Mohania passes through Danapur town and the Railway line from Patna city to Ara which passes through Phulwari Railway Station.

Methodology

The methodology in this study rests on the integration of GIS and Remote Sensing to identify the factors for urban growth in Patna city. In order to determine accurately the growth rates, the study depended on the various data. ARCGIS (ArcGIS 9.2) and ERDAS were the main software used in data acquisition, data storing, and data processing. Various GIS base layers were created from the toposheets, such as roads and railway network, water bodies and the administrative boundaries for the analyses. The highway passing between the two towns was digitized separately. Using remote sensing data land cover and land use analyses was done with maximum likelihood Supervised classification.

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        ┌──────────────────────────┐          ┌──────────────────────┐
        │ Remote Sensing Images    │          │  Topographical Map   │
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                    │                   │  On Screen Digitization  │
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                        │    Data Analysis     │
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           │   RS Analysis    │        │   GIS Analysis   │
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        │  Image Registration  │       │  Raster Analysis │
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   │ Supervised Classification    │
   │ Using Maximum likelihood     │
   │ method                       │
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                        │ Landuse and land cover│
                        │        maps          │
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Discussion and Conlcusion

Urban Sprawl of Patna city: The natural growth of Patna City has been towards the west till date, with the older part of Patna being in the East side of the city. This core area of Patna faces problems of overcrowding, which has led to enormous pressure on the physical infrastructure and traffic congestion. The newer development areas lying in the central and western part of Patna comprises of both plotted developments and apartment houses. In the southern part of Patna city there are low-lying areas lined along the bypass road, which again cause a constraint to the development of the area.

The linear pattern of sprawl is not only found along the river lane but also along Railway line. According to the urban expansion map prepared from satellite imagery using visual interpretation technique indicates that the total urban area of Patna District in 1991 was 196.91 Sq.kms and it expanded to 234.70 sq.km in 2008. The growth in urban area over seventeen years is 37.79 sq.km.

Demographic Characteristics of the sample towns: Danapur town is located adjacent to the city showing a notable demographic change. The total population of Danapur was 104,824 in 1991 and 159,410 in 2001 with an increase of about 20.66%, eventually its raise in households was 22.35 % which show a remarkable expansion in residential area. Similarly in Phulwari town the change in total population between 1991 and 2001 was 20.69% increase and its household was increased by 23.89% in 10 years as per Census of India report. In both the towns there was a significant increase in total main workers, total marginal workers and tremendous decrease in cultivators, agricultural workers and household workers which clearly explain the conversion of agricultural landuse to urban landuse.

Spatial comparison of urban development of the sample towns: From the comparison between landuse distribution for 1991 and 2008 of Danapur and Phulwari, it is understood that the percentage changes in land use categories of Danapur is comparatively high due to rapid urbanization than Phulwari town. The rapid urban growth is due to migration of people from rural to this town for school education, etc. Also the Railway Department has constructed the quarters for its staff and officers, they shifted from rural to the town. Due to these reasons, settlements and commercial areas were increased significantly in Danapur town.

This paper demonstrates urban expansion of Patna, and identifies the spatial development patterns by using remote sensing images and GIS tool. The present study determines tThe pattern of urban sprawl of Patna is identified as linear along Railway line, major roads and National Highways NH 30. It is found that sample towns show equal change in percentage of urban area to the total, but drastic change in percentage of cultivators and Agricultural workers. The unemployment is increased due to change in percentage of literates and non workers. The change in percentage of marginal workers is increased due to literate people not willing to work as agricultural workers or cultivators. While comparing the urban development in both the towns, development in Danapur is high due to well planned road network and residential blocks, where as in Phulwari despite the establishment of Railway station, industrial units and Administrative buildings the development is little low.

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