

CHAPTER-1

INTRODUCTION

Cities often experience growth either physically, by population or by a combination of both. Urban sprawl is much more complicated because it may or may not qualify as urban growth. How a city grows can create the appearance of sprawl. Such urban growth may appear as a low density leapfrog pattern, a linear or strip development pattern along highways, or a tightly condensed pattern of a new development around pre existing built-up landscapes without urban growth there would be no appearance of urban sprawl. Today, Urban Sprawl is one of the contemporary issues of cities all over the world. Urban Sprawl is the outgrowth of the urban area caused by the uncontrolled and uncoordinated urban growth. Sprawl is also considered to be an unplanned outgrowth of urban areas along the periphery of the cities, along highways, and along the road connecting a city. Urban sprawl has been at the centre of current debate on urban structure. In the literature of Urban planning or urban economics, there is a big debate on even the definition of urban sprawl itself.

The term "urban sprawl" was first used in an article in "The Times" in 1955 as a negative comment on the state of London's outskirts. Definitions of sprawl vary; researchers in the field acknowledge that the term lacks precision. Batty et al. defined sprawl as "uncoordinated growth: the expansion of community without concern for its consequences, in short, unplanned, incremental urban growth which is often regarded as unsustainable." Bhatta et al. wrote in 2010 that despite a dispute over the precise definition of sprawl, there is a "general consensus that urban sprawl is characterized by an unplanned and uneven pattern of growth, driven by a multitude of processes and leading to inefficient resource utilization."

Reid Ewing has shown that sprawl has typically been characterized as urban developments exhibiting at least one of the following characteristics: low-density or single-use development, strip development, scattered development, and/or leapfrog development (areas of development interspersed with vacant land). He argued that a better way to identify sprawl was to use indicators rather than characteristics because this was a more flexible and less arbitrary method. He proposed using "accessibility" and "functional open space" as indicators. Ewing's approach has been criticized for assuming that sprawl is defined by negative characteristics.

What constitutes sprawl may be considered a matter of degree and will always be somewhat subjective under many definitions of the term. Ewing has also argued that suburban development does not, per se, constitute sprawl depending on the form it takes, although Gordon & Richardson have argued that the term is sometimes used synonymously with suburbanization in a pejorative way.

Let alone its causes and impacts (Gordan and Richardson, 1997; Ewing, 1997; Fischel, 1999; Brueckner, 2001).

Sprawl is the spreading out of a city and its suburbs over more and more rural land at the periphery of an urban area. This involves the conversion of open space (rural land) into built-up, developed land over time. ‘Sprawl’ in simple terms is just spreading out of a city and its suburbs over more and more rural land at the periphery of an urban area while in reality it is a complex phenomenon that means different things in different areas and conditions. Sprawl is also considered to be an unplanned outgrowth of urban areas along the periphery of the cities, along highways, and along the road connecting the city. Urban sprawl refers to the outgrowth of urban areas caused by uncontrolled, uncoordinated and unplanned urban growth.

Travisi and Camagni (2005) defined it as ‘the uncontrolled spreading out of a given city and its suburbs over more and more semi-rural land at the periphery of an urban area’. They further state that the sprawling process of expansion is disordered, unplanned, leading often to inefficient and unsustainable urban expansion patterns.

TYPES OF SPRAWL: Urban sprawl can be categorized into three types these are as following:

Low-density Sprawl: Low-density continuous sprawl is a phenomenon caused by outward spreading of low density suburban land use as currently being experienced by many cities like America as their population becomes bigger and bigger and there is no lack of land supply. This highly consumptive use of land for urban purposes is supported by piecemeal extensions of basic urban infrastructure such as water, sewer, power and roads.

Ribbon Sprawl: Ribbon sprawl is a type of sprawl characterized by concentration of development along major transportation arteries, primarily roads. While development occurs on land adjacent to the major roads, areas without accessibility to the roads tend to remain as green areas, waiting for conversion into urban land uses when land values increase and infrastructure is extended from the major roads.

Leapfrog Development Sprawl: Leapfrog development sprawl is a scattered form of urbanization with disjointed patches of urban land uses, interspersed with green areas. Leapfrog development may be caused by obvious physical limitations such as prohibitive topography, water bodies and wetlands or by more subtle reasons such as differences in development policies between political jurisdictions. Leapfrog development Urban Sprawl: A Case Study... www.ijhssi.org 12 | Page occurs when developers build new residences some distance from an existing urban area, bypassing vacant parcels located closer to the city. Medium density areas with low connectivity indicated leapfrog patterns.

REVIEW OF LITERATURE

C. D. Deshpande (1975) has observed this process in India in the following forms, i) The rural fringe or the periphery along which the city starts sprawling, ii) The ribbon development along the main roads, railway lines and beaches, iii) The centers of the planned rail-linked suburbs and their expansion, iv) The working class migrations to industrial centers, v) The shanty towns and strip slums. A city region develops in stages 1) Rural-Urban fringe 2) Urban Sprawl 3) Suburbanization. Suburbanization is a result of over congestion in the core of city and high land values in the central localities (cf. Latkar S. R. 1993).

Sokhi & Rashid (1999) studied the landuse and landcover mapping in urban areas using aerial photographs and satellite imageries of Jaipur (1983 & 1989), Coimbatore (1984), Ujjain (1985), Delhi (1987), Dehradun (1989), Bangalore (1994) and Jammu (1995), on the basis of urban sprawl analysis of these cities they concluded that human settlements are tend to expand in all directions of favorable conditions. In another case Raju (1999) used landsat MSS, SPOT and LISS II satellite data for mapping urban land use and urban sprawl of Hyderabad and Visakhapatnam cities in Andhra Pradesh. Prasad et.al (2001) worked on urban sprawl for Hyderabad city and its environs. They applied Shannon's entropy approach to measure the degree of spatial concentration of geographical variables; they demonstrated the utility of the 18 entropy approach to identify, measure and monitor spatio-temporal patterns of urban sprawl.

Ramchandra and Jagdish (2003) studied urban sprawl pattern and modeling using GIS on Udupi and Mangalore highway according to them pattern of urban sprawl and analysis of spatial and temporal changes could be done cost effectively and efficiently using GIS and Remote Sensing data, they quantified the urban sprawl in terms of change in Built-up area.

Rosero and Bixby (2004) used traditional measurements of access based on the distance to the closest facility and proposed a more comprehensive index of accessibility that results from the aggregation of all facilities weighted by their size, proximity and characteristics of both the population and the facility.

Sulochana Shekhar 2005, studied Changing space of Pune – A GIS perspective with urban sprawl pattern and modeling using GIS on Pune city according to her pattern of urban sprawl and analysis of spatial and temporal changes could be done cost effectively and efficiently using GIS and Remote Sensing data, they quantified the urban sprawl in terms of change in Built-up area. Abundant references, research papers can be ahead on urban sprawl. In this study they tried to analyze civic amenities in the different wards of the pune city.

Saikh Moiz Ahmed (2006), Studying solid waste management planning of Aurangabad city he analyzed how to collect and manage solid waste material.

Paul Langlois (2006), A GIS approach for evaluating municipal planning capability: residential built form in Markham and Vaughan Ontario. This research describes a methodology for measuring built form patterns using spatial data and GIS that is amenable to the study of large geographical areas. This methodology was used to investigate the capability of municipal planning to influence residential development. In the early 1990s, the Town of Markham, Ontario, Canada adopted a residential development philosophy inspired by New Urbanism. An adjacent municipality, the City of Vaughan, has employed a conventional development approach. By calculating several built form measures derived from the design prescriptions associated with New Urbanism, this study seeks to discern if Markham's adoption of an unconventional development philosophy has resulted in a residential built form distinct from that in Vaughan.

Rudraiah developed (2006) 'Systematic Land Information System' (SLIM) for Kanpur town as a management tool for strategic urban planning as well as real estate management highlighting the need of physical planners for various types of topographical maps. Objectives of the SLIM as reported were to conduct the modern ground surveys using the latest tools and technology and prepare topographical maps with cadastral information on 1:1000 scales. Suman Rao (2007), emphasized the significance of remote sensing as a source of information and GPS and GIS as powerful technologies for analyzing spatial and non-spatial data in urban facility analysis. She prepared location maps for selected urban facilities and services available in DehraDun to identify service areas of different facilities. This would form inputs for preparation of a comprehensive development plan of the city. This would guide the service providers to identify areas for future expansion and location of those facilities and services. The study also included calculation of indices for ward wise levels of facilities available to the population of DehraDun city.

CHAPTER-2

OBJECTIVES

The objective of this study is to identify and analyze the rate of urban growth, with a focus to explore the morphological structure and characteristic of urban sprawl and to focus on how urban sprawl leads to land use change in Varanasi district.

The study helps him calculating the rate of expansion of the urban sprawl, which will further help in modelling of similar city and making better and sustainable decision for the setup of the new cities.



CHAPTER-3

STUDY AREA

Varanasi metropolis lies between the coordinates of latitudes 25.3176° N, longitude 82.9739°E . Varanasi is located at an elevation of 80.71 metres (264.8 ft) in the centre of the Ganges valley of North India, in the Eastern part of the state of Uttar Pradesh, along the left Crescent-shaped bank of the Ganges, averaging between 15 metres (50 ft) and 21 metres (70 ft) above the river. The city is the headquarters of Varanasi district. By road, Varanasi is located 797 kilometres (495 mi) south-east of New Delhi, 320 kilometres (200 mi) south-east of Lucknow, 121 kilometres (75 mi) east of Allahabad, and 63 kilometres (39 mi) south of Jaunpur. The "Varanasi

Urban Agglomeration" – an agglomeration of seven urban sub-units – covers an area of 112 km² (43 sq mi). Neighbourhoods of the city include Adampura, Anandbagh, Bachchhaon, Bangali Tola, Bhelupura, Bulanala, Chaitganj, Chaukaghat, Chowk, Dhupchandi, Dumraon, Gandhinagar, Gautam Nagar, Giri Nagar, Gopal Vihar, Guru Nanak Nagar, Jaitpura, Kail Garh, Khanna, Kotwali, Lanka Manduadih, Luxa, Maheshpur, Mahmoorganj, Maulvibagh, Nagwar, Naipokhari, Shivala, Siddhagiribagh, and Sigra.

Located in the Indo-Gangetic Plains of North India, the land is very fertile because low-level floods in the Ganges continually replenish the soil. Varanasi is situated between the Ganges confluences with two rivers: the Varuna and the Assi stream. The distance between the two confluences is around 2 miles (4 km), and serves as a sacred journeying route for Hindus, which culminates with a visit to a Sakshi Vinayak Temple.

It is the cultural district of the most populous state of Uttar Pradesh in India so known as **Kashi** or **Banaras**. *Banāras* , is a city on the banks of the river Ganges in Uttar Pradesh, India, 320 kilometres (200 mi) south-east of the state capital, Lucknow, and 121 kilometres (75 mi) east of Allahabad. A major religious hub in India, it is the holiest of the seven sacred cities in Hinduism and Jainism, and played an important role in the development of Buddhism and Ravidassia. Varanasi lies along National Highway 2, and is served by Varanasi Junction railway station and Lal Bahadur Shastri International Airport.

Demographic data of Varanasi District (Source: Census data, 2001, 2011 ,2021(Estimated))

Description	2001	2011	2021 (Estimated)
Population	31,38,671	36,76,841	42,59,988
Male	16,49,187 (52.54%)	19,28,641 (52.45%)	22,26,664 (52.26%)
Female	14,89,484 (47.46%)	17,53,553 (47.55%)	20,33,324 (47.74%)
Population growth	25.14%	17.32%	17.5%
Area (sq.km)	1,535	1,535	1,535
Density/km2	2,045	2,399	2,775

An official Census 2011 detail of Varanasi, a district of Uttar Pradesh has been released by Directorate of Census Operations in Uttar Pradesh. Enumeration of key persons was also done by census officials in Varanasi District of Uttar Pradesh. In 2011, Varanasi district had a population of 3,682,194 of which male and female were 1,928,641 and 1,753,553 respectively. There was a change of 17.32 percent in the population compared to population as per 2001. In the previous census of India 2001, Varanasi District recorded an increase of 25.14 percent to its population compared to 1991. The initial provisional data suggest a density of 2,399 in 2011 compared to 2,045 of 2001. Total area under Varanasi district is about 1535 sq.km. Varanasi District population constituted 1.84 percent of total Uttar Pradesh population. In the 2001 census, this figure for Varanasi District was 1.84 percent of Uttar Pradesh population. In census enumeration, data regarding children under 0-6 age were

also collected for all districts including Varanasi. There were a total 478,474 children under age of 0-6 against 575,882 in the 2001 census. Of the total 478,474 male and female were 252,332 and 226,142 respectively. Child Sex Ratio as per census 2011 was 919 compared to 919 of census 2001. In 2011, Children under 0-6 formed 12.99 percent of Varanasi District compared to 18.35 percent of 2001. There was a net change of -5.36 percent in this compared to the previous census of India. Varanasi District population constituted 1.84 percent of total Uttar Pradesh population. In the 2001 census, this figure for Varanasi District was 1.84 percent of Uttar Pradesh population. Population growth rate per decade is 27.78% for 2011.(Fig. 1)

Location Of Study Area

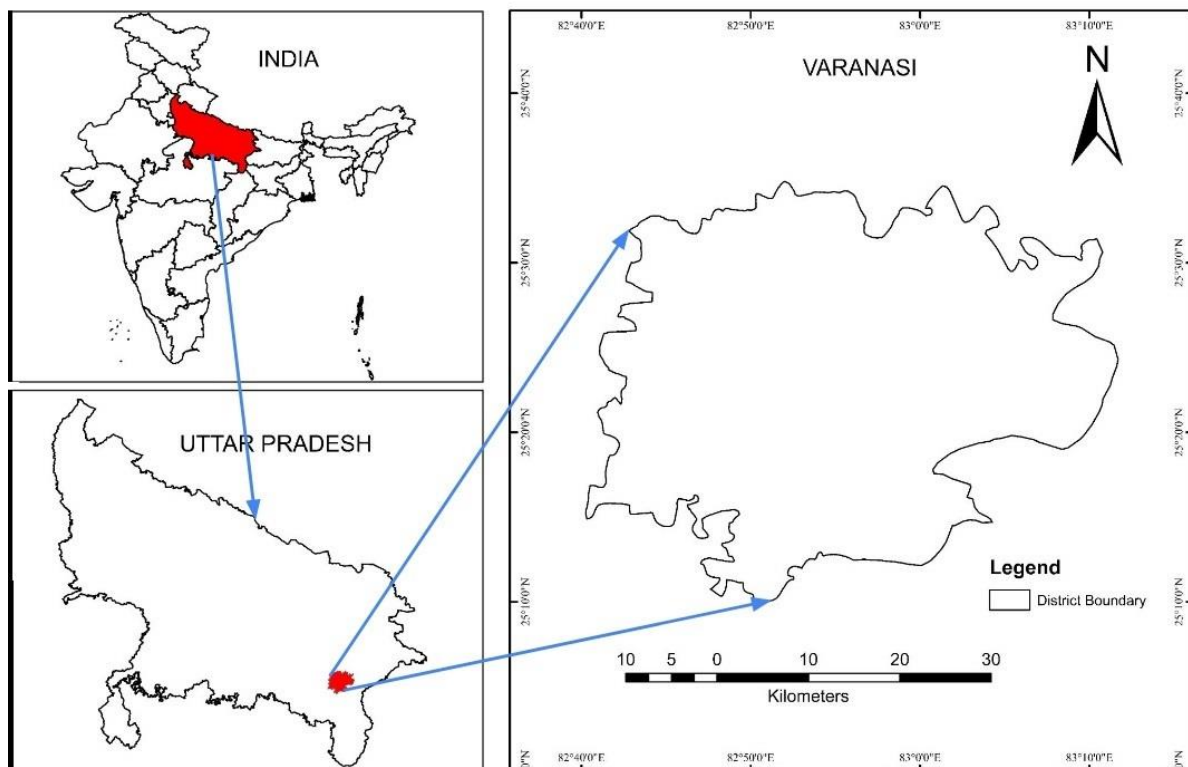


Fig. 1: location map of study area

CHAPTER-4

DATABASE AND METHODOLOGY

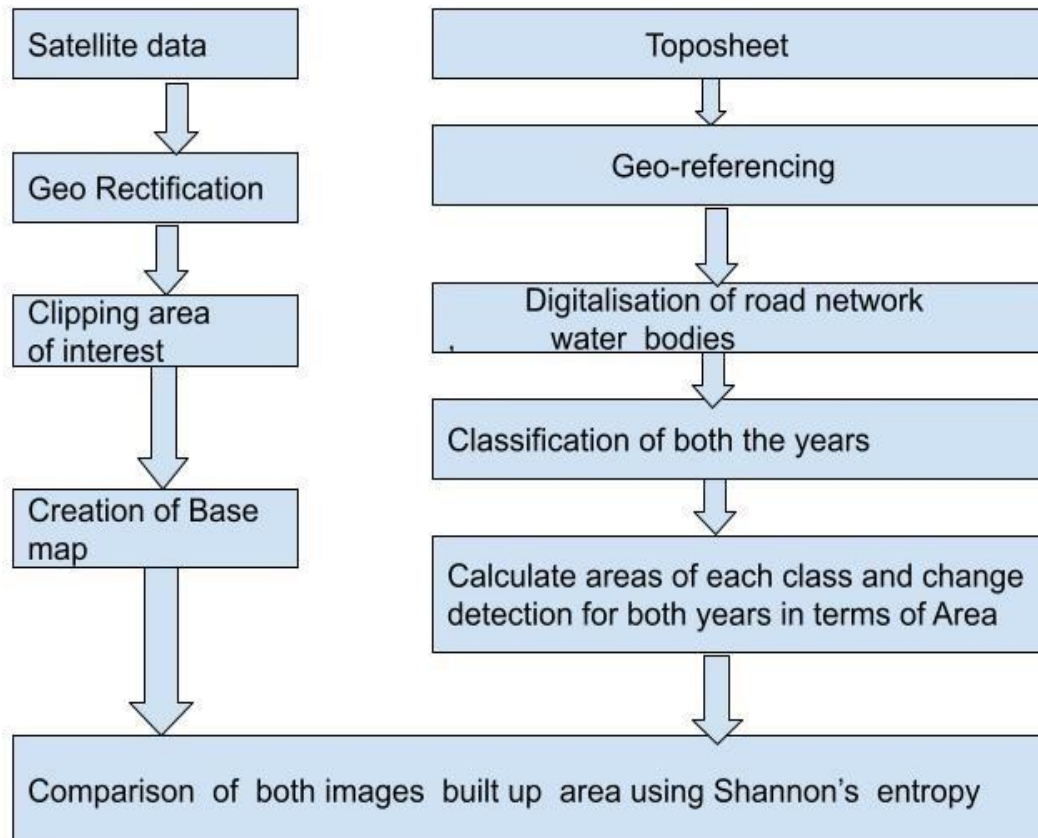
Methodology revolves around the visual interpretation and cartographic techniques, as described below:

DATA Used:

- 1) Preparation of base map from landsat 7 data image of year 2000 download from USGS ,www.earthexplorer.com Having resolution 30 m datum WGS1984 AND UTM Zone 44
- 2) Preparation of base map from landsat 8 data image of year 2021 download from USGS ,www.earthexplorer.com
Having resolution 30 m datum WGS1984 AND UTM Zone 44
- 3) . Mapping it by visual interpretation
- 4) Comparison and change detection by mapping
- 5) Comparison with predicted reports by various development authorities.
- 6) Statistical Analysis of the compared data

B) Software used:

- 1) ArcGIS 10.8
- 2)ERDAS Imagine 2015

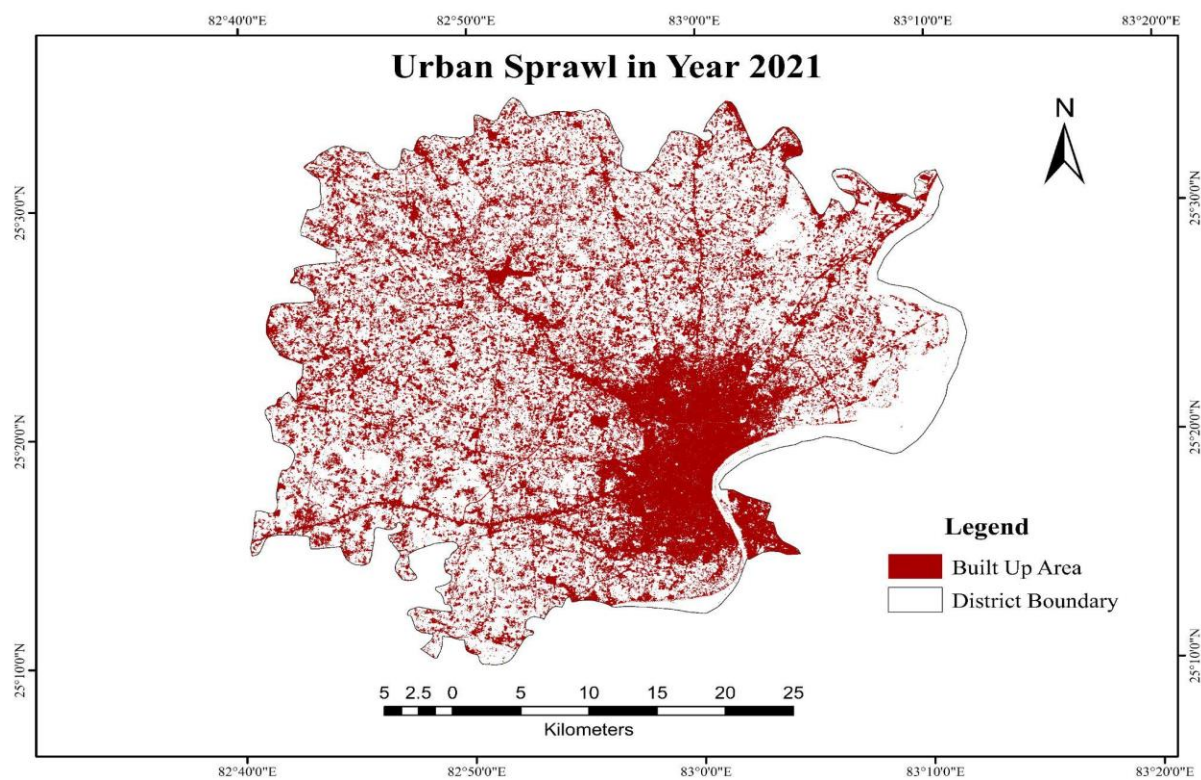
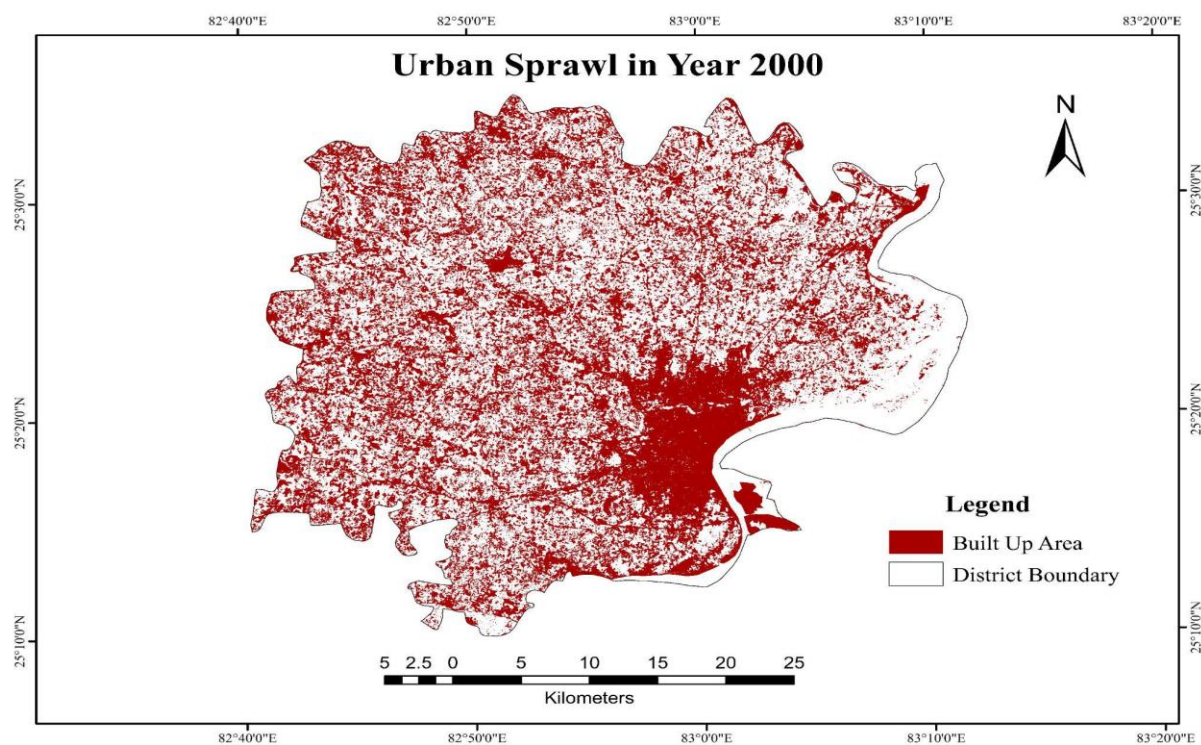


CHAPTER -5

RESULT

The total area of Varanasi district is 1535 sq. km. The built up area is 661.120 sq.km and other area is 873.88 sq.km as per data of Landsat 7, year 2000. The built up area is 709.567sq.km and the other area 825.433 sq.km as per data of Landsat 8, year 2021.

It is clear from the above data that the built up area has increased to 48.447sq. km(7.32%) from 2000 to 2021. This increase in the built up area can be justified by the increasing population and thus increasing infrastructural need for residence, education, health care facilities, transport, cultural and religious activities, etc. And also because of smart city missions, pilgrimages sites, tourist sites and becoming the constituency of the PM has increased the attraction of people towards Varanasi.



CHAPTER-6

RECOMMENDATIONS

The people can be a solution to urban sprawl through participation and action. The people can challenge local bodies to vote for more sustainable development methods. People can also challenge local governments to partner with organizations that promote smart growth and new urbanism. Investors can buy land that is spreading, while the government can draw attention to the disadvantages and effects of urban sprawl and solve them. Also smart growth is required by the planners, by combining residential areas with work and commercial areas instead of isolating individual areas, allowing more pedestrians and transit as opposed to traffic and pollution.

CHAPTER-7

CONCLUSION

This paper studied the phenomenon of urban sprawl in Varanasi district, which now is experiencing a high rate of urbanization. The study shown that unlike the western countries, where urban sprawl is the consequence of suburbanization, and it is a spontaneous phenomenon that city dwellers look forward to high quality of living environment and escape from problems in inner cities, the nature of urban sprawl in varanasi district is a phenomenon of low-density urbanization. The study shows that from 2001 to 2021, the built-up area of Varanasi district increased rapidly, and the low density, excessive urban expansion is most due to the rapid growth of industrial land and residential land, especially the industrial land. In order to find the causes of urban sprawl, the monocentric urban model is shown in this paper. Taking account of the nature of urban sprawl in varanasi district, factors like gross output value of industry, population, institutional and policy factors, incomes growth, GDP, investment in real estate development, density of main road are included to establish the empirical model. However, urban sprawl is so complicated that it is difficult to include all measures factors which may affect urban expansion. Although it doesn't account institutional and policy factors (mainly due to the difficulty in measuring), the multivariate analysis suggests that population and gross output value of industry play the most important roles in urban sprawl of Varanasi district. The result shows that the hypothesis that urban sprawl in India is a phenomenon of low density of urbanization and mainly caused by industrialization and population growth is correct. Moreover, this paper suggests that the tendency of urban expansion could not easily be restrained in cities of India, which is experiencing a high rate of urbanization. Maybe the policy measures of zoning control and the compact city which are useful tools to encourage sustainable development should be adopted.

Short Biography SATISH KUMAR TRIPATHI has a B.A. in geography and economics, and a Master of geography, both from siddharth University kapilvastu in india. She is presently doing PG Diploma in Remote sensing And GIS at the BANARAS HINDU UNIVERSITY Institute OF SCIENCE DEPARTMENT OF GEOGRAPHY on questions related to urban sprawl, especially in its comparative dimensions across cities, countries, and cultures. While touching upon institutions, individuals, environments, and transportation, her work is as focused upon the spatial variations of peripheral urban spaces as it is upon the underlying social, political, and economic issues.

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- 10) file:///C:/Users/Tiwz/Downloads/urban%20sprawl.pdf P. 17-19