

STATUS OF URBAN SPRAWLS IN VISAKHAPATNAM CITY**GAMGAYYA MARAPATLA,**

Department of Geography, Andhra university, Visakhapatnam. Andhra pradesh, INDIA.

ABSTRACT

Visakhapatnam is a fast developing port city and recording rapid rate of urbanization. With increasing population and ever increasing demand of land the new extensions of the city have taken place. It is expanding in all possible directions resulting in large scale changes in urban land use which affects the physical and social environment of the city. The city has gained real importance from 1970 onwards due to location of many industries which had resulted in considerable spread with the establishment of new residential colonies. The spatial growth of the city has been restricted by physical barriers on the north, south and east. Visakhapatnam city is growing along the southwest, northwest and northeast directions. The rate of land development is as high as 789% during the 35 year of study period while the population growth rate is 266%. Thus the per capita land consumption has increased markedly and it is true especially in the peripheral zones a strong indicator of sprawl. The distribution of population density in various wards also justifies the above characteristic of sprawl – “dense core and dispersed suburbs”. The higher entropy values at different points during the study period indicate high rate of sprawl even in early seventies and sustained throughout. Therefore the entropy approach is proved to be efficient to identify measure and monitor the spatio-temporal patterns of urban phenomena. This paper analyzes the urban sprawl causes and consequences.

Key words: Extensions, Geospatial, Population, Zones.

I. Introduction

“Urban sprawl,” or what is characterized here as urban decentralization, is a contentious and widely debated topic among academics, policymakers, and the general public. The term urban sprawl is now a catch phrase that regular Americans use to label the underlying factor(s) they believe responsible for many of the undesirable outcomes occurring in United States’ urban areas. Negative urban occurrences as diverse as increased automobile travel and congestion, lack of functional open space, air and water pollution, loss of farmland, tax dollars spent on duplicative infrastructure, concentrated poverty, racial and economic segregation, lack of employment accessibility, and even the psychic cost of environmental deprivation have all been attributed to sprawl (see Ewing, 1994 and 1997; Sierra Club, 1998; Downs, 1999; and

Wasserman, 2000). Yet others point to the desirable urban outcomes that sprawl can also yield, including the increased satisfaction of housing preferences, the accommodation of automobile travel, the benefits of later filling in “leapfrogged” land, and the generation of an increased number of suburban local governments which are likely to have lower crime rates and better public schools.

II. Early studies

ⁱUrban sprawl dynamics using geospatial techniques. Sprawl is studied for three temporal periods of 1975, 1990 and 2009 using GIS and Remote Sensing techniques in conjunction with Shannon’s entropy. Urban sprawl characteristics, causes and effects are reviewed and analyzed with respect to Greater Visakhapatnam. Sprawl pattern is mapped and measured from various viewpoints to identify the specific local factors which control the growth pattern in the study area. Visakhapatnam is a fast developing port city and recording rapid rate of urbanization. With increasing population and ever increasing demand of land the new extensions of the city have taken place. It is expanding in all possible directions resulting in large scale changes in urban land use which affects the physical and social environment of the city. The city has gained real importance from 1970 onwards due to location of many industries which had resulted in considerable spread with the establishment of new residential colonies. The spatial growth of the city has been restricted by physical barriers on the north, south and east. Visakhapatnam city is growing along the southwest, northwest and northeast directions. The rate of land development is as high as 789% during the 35 year of study period while the population growth rate is 266%. Thus the per capita land consumption has increased markedly and it is true especially in the peripheral zones a strong indicator of sprawl. The distribution of population density in various wards also justifies the above characteristic of sprawl – “dense core and dispersed suburbs”. The higher entropy values at different points during the study period indicate high rate of sprawl even in early seventies and sustained throughout. Therefore the entropy approach is proved to be efficient to identify measure and monitor the spatio-temporal patterns of urban phenomena.

ⁱⁱThe natural history of urbanization has not yet been written, for only a small part of the preliminary work has been done. But it dates back from the ancient times of the origin of cities. In the process, people witnessed the evolution of cities from their ancestral form (the village) to small port /rail based towns and to cities of today with skyscrapers adorning landscapes. At the end of the 20th century, urban growth was rapidly pushing cities further and further out while on the 21st century the dominant form of city living became based on the automobile. This latest stretched form of the city with low density at the periphery is sometimes called sprawl. There has been no clear consensus regarding what exactly ‘urban sprawl’ is or how it is caused because sprawl is one name for many situations. Although many scholars tried to come up with explanations of the term, the central component of most definitions and most people’s

understanding of sprawl is this: 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. While many factors may have helped in explaining urban sprawl and its causes, it ultimately has always been a population and land-use issue. This paper will outline possible conditions and impacts of urban sprawl. Using a variety of discussions and arguments the founding is that sprawl is a result of inter-related social, economical, physical and political factors.

ⁱⁱⁱPresents a study that integrates Remote Sensing, GIS, and dynamic spatial modelling for predicting urban spatial growth, given the different development conditions. The prediction is based on SLEUTH, a modified Cellular Automata model consisting of an urban growth and land cover change transition sub models was chosen to calibrate urban growth in Hyderabad city. The calibrated model allows us to fill gaps in the discontinuous historical time series of urban spatial extent, since maps and images are available only for certain period between 1950 and 2004. Using the model a spatial forecast of urban growth is done till 2055. The predicted mode of growth in Hyderabad is organic or edge growth and road influenced growth due to very high coefficient of spread and road gravity. This study reveals that there will be increase in urban growth of 120% between 2005 and 2055.

^{iv}Urbanization, one of the important factors in the development of countries, creates some negative impacts on the cities. The rapid and haphazard growth of the major cities in India generates numerous problems in the country. The further growth incorporates the haphazardly developed areas into the city leading to the imbalanced land use pattern. The growth cities normally extend more to the fringe areas and it creates the unplanned development of the cities. The development of the cities in the concentric pattern or radial pattern had raised the challenges for the planning of the cities. Visakhapatnam, the cultural and education centre of Andhra Pradesh, is also facing the problems. In the same context, because of the imbalance land use pattern, Visakhapatnam city is facing problems of unequal distribution of physical and social infrastructure in the city. Urban expansion has brought serious losses of agriculture land, vacant land and water bodies. Urban sprawl is responsible for a variety of urban environmental issues like decreased air quality, increased runoff and subsequent flooding, increased local temperature, deterioration of water quality, etc. Visakhapatnam city exhibits steep decline from 78.97% decadal growth rate in 1991-2001 to 55.42% decadal growth rate in 2001-11. The average decadal growth rate from 1951 to 2011 is 63.78%. Rapid growth of the city is mainly attributed to industrialization of after 1970 and expansion of information technology (IT) sector and educational development in the last decade. Eight land use classes have been identified as Urban (Built-up), Residential, Industrial, Roads and Railways, Agricultural land, Hills & Forests, water bodies, ports and vacant land. Classification accuracy is also estimated using the field knowledge obtained from field surveys. The obtained accuracy is between 80 to 87 percent for all the classes. Change detection analysis shows that Residential area has been increased by 6.10%, agricultural area has been reduced by 5.78% and barren area reduced by 2% similarly change detection for remaining areas has been done. The increased urbanization may have several impacts on infrastructure, energy use and economy of the country.

^vUrbanization is an index of transformation from traditional rural economies to modern industrial one. It is a progressive concentration of population in an urban unit. It takes place either in radial direction around a well-established city or linearly along the highways. This dispersed development along highways or surrounding the city and in rural countryside is generally referred as sprawl. Sprawl is a term that is often used to describe perceived inefficiencies of development, including disproportionate growth of urban areas and excessive leapfrog development. Sprawl is a cumulative result of many individual decisions and it requires not only an understanding of the factors that motivate an individual landowner to convert land, but also an understanding of how these factors and individual land-use decisions aggregate over space. Some of the causes of the sprawl include - population growth, economy and proximity to resources and basic amenities. The measurement and monitoring of land-use change are crucial to government officials and planners who urgently need updated information and proper planning tools. The entropy method is most popularly used method for the measurement and monitoring of urban sprawl by the integration of remote sensing and GIS. The advantages of the entropy method are its simplicity and easy integration with GIS. GIS and remote sensing data along with collateral data help in analyzing the growth, pattern and extent of sprawl. With the spatial and temporal analyses it is possible to identify the pattern of sprawl and subsequently predict the nature of future sprawl. This project brings out the extent of sprawl taking place over a period of six years using GIS and Remote Sensing. An attempt was made to study the implications of urban sprawl on land-use & land-cover pattern of a **typical regions located in Greater Hyderabad city & its surround rural-urban fringe areas in the state of Andhra Pradesh.**

^{vi}Most significant steps needed to improve collaboration between urban ecology and urban planning? The first step is to merely acknowledge and respect the differences between the disciplines. From such a base, bridges can be constructed. For instance, planners need to identify metrics for land-use regulations and controls to implement plans. The ecosystem services concept provides a potentially useful framework for planners to assess the environmental, health, safety, and welfare consequences of city and regional plans. This suggests changes in city and regional planning theory and practice. Ecological literacy for those involved in planning processes would be a useful starting point. Planners need to know how to link ecological information to actions across scales. We have plenty of information about our environments but need to learn how to convert it to knowledge and then how to use it to take wise actions.

^{vii}Night time illumination of cities is undergoing radical change through the adoption of new street lighting technologies, but the impacts of these large-scale changes on biodiversity have not been explored. Moths are of particular concern because of their nocturnal 'flight-to-light' responses. Here we examine in situ effects of (1) street lamp replacement and (2) the spatial distribution of local street lighting on garden moth communities in Birmingham, UK, to determine whether current shifts in street lighting infrastructure are leading to an increased attraction of moths into suburban areas. Using a unique before after- control-impact survey, we show that switching from narrow (low-pressure sodium) to broad spectrum (high-pressure

sodium) lamps significantly increases the diversity of macro-moths in suburban gardens. Furthermore, we demonstrate the complex ways in which the moth community differentially responds to variation in street lighting characteristics. In particular we found that macro-moth attraction was greatest at high lamp densities, whilst micro-moth families responded more strongly to street lamp proximity and the density of UV-emitting lamps specifically. Our findings indicate that moths are attracted to suburban gardens with closer, more dense and more spectrally diverse local street lighting, and suggest that suburban areas could represent ecological traps for moth communities if they have insufficient resources to support moth survival and reproduction. Further research is now needed to determine whether street lighting is progressively damaging moth communities, and to understand whether these impacts could be mitigated through changes to street lighting regimes or through the provision of ecologically important habitats in urban landscapes.

III. Study Area

The present study is an attempt to assess the urban sprawl in Visakhapatnam city. Visakhapatnam, a port city on the east coast of India is strategically located midway between Kolkata and Chennai and situated between 17037'30" & 17045'00"N latitudes and 83007'30" & 83022'30"E longitudes. The Government of Andhra Pradesh has reconstituted the municipal corporation of Visakhapatnam in the year 2005 by extending its jurisdiction by merging the adjoining municipality and 32 villages. The reconstituted Greater Visakhapatnam Municipal Corporation has (Fig.1) an area of 540 sq.km with a population of more than 4 million. It is ranked as the second largest urban agglomeration in Andhra Pradesh.

IV. Urbanization & Urban Sprawl

Urbanization refers to a process in which an increasing proportion of an entire population lives in cities and the suburbs of cities. It is the movement of population from rural to urban areas and the resulting increasing proportion of a population that resides in urban rather than rural places. Urbanization is a form of metropolitan growth that is a response to often bewildering sets of economic, social, and political forces and to the physical geography of an area. Population increase as well as immigration from rural area towards larger cities, particularly in developing countries results in considerable increase in urban areas. Sprawl is a pattern and pace of land development in which the rate of land consumed for urban purposes exceeds the rate of population growth which results in an inefficient and consumptive use of land and its associated resources.

V. Characteristics of Sprawl

Urban Sprawl is widely spread-out development outside city centers, usually on previously undeveloped land. Urban Sprawl which is characterized by haphazard patchwork of development leads to an improper development in any city usually happens due to land use/land cover conversion in which the growth rates of urbanized land significantly exceeds the rate of population growth over a specified time period, with a dominance of low density impervious surfaces (Barnes et al, 2001). According to Gillham (2002) there are four main characteristics of sprawl, which mirror the earlier definition given by Nelson et al. (1995). These characteristics are leapfrog or scattered development, commercial strip development, low density and large expanses of single-use development. Low population density, homes that are separate from commercial and industrial areas and branching street patterns, developments such as shopping malls, fast food chains, strip malls, and housing subdivisions are especially typical of Urban Sprawl. Another key characteristic its is low efficient use of space i.e. low-density land use, where the amount of land consumed per capita is much higher than in more densely populated city areas. Buildings in sprawl developments are generally single-story and widely spaced. The final aspect of Urban Sprawl, the proliferation of single-use development and an almost exclusive reliance on automobiles for transportation is just as important as density in the identification of Urban Sprawl. Single use zoning, is also a common part of modern city planning approach which separates residential, commercial and industrial areas from one another.

VI. Causes and Effects of Urban Sprawl

Some of the causes of the sprawl include population growth, both natural and migration, economy, infrastructure initiatives like the construction of roads and service facilities (such as hotels, etc.). The relation between population growth and Urban Sprawl is that the population growth is a key driver of Urban Sprawl. As Gillham (2002) elaborates “we owe our contemporary version of suburbs and sprawl to the Industrial Revolution of the nineteenth century. Burchell and Mukherji (2003) explained that Urban Sprawl has allowed people to gain access to less expensive, single family homes on large lots situated away from urban centers. The lifestyle choices of the general public, especially those who can afford to live in the attractive urban fringe, have proven to be very enduring (Carruthers and Ulfarsson, 2002). Suburban Sprawl is the direct result of a number of policies that encouraged urban dispersal and most significant of them is loan programs, road improvement and neglect of mass transit and the concept of planned development.

Generally, population growth, rise in household income, subsidization of infrastructure investments like roads, ineffective land-use, excessive growth, social problems in central cities and poor land policies are taken to be the main causes of sprawl. One of the main

factors that help in explaining the increasing sub-urbanization of population in rich countries is the demand for larger suburban lots. With rise in household incomes, people who move into the suburbs are motivated to a significant degree by the desire for more living space. Between 1950 and 1980, one-half of the increased sub-urbanization in America can be explained by people getting richer (Glaeser and Kahn, 2003). Compared to people who live in cities, suburbanites live in larger houses, on larger lots and use automobiles more often. Developed countries like USA also invest a lot of money on road and transport infrastructures encouraging the use of private cars. The high correlation between using automobiles and living in low-density edge cities may not prove that cars caused sprawl but is an indication that the two strongly complement each other. Both rising incomes and automobile ownership were therefore necessary conditions. Most people do not want to live in the cities - they choose to move out. Thus, sprawl in developed countries is usually a matter of preference. In the developed world, the movement of people from rural area of the country to more heavily populated cities and towns has been reversed. In contrast, for developing countries sprawl is largely a result of necessity - people move to the city in search of better employment and opportunities (Menon, 2001). They could be driven out of their farmlands for different reasons such as bad weather conditions, poor harvest or simply because they do not have means of income. Increased urban population leads to an increase in size well beyond the limits of the city. When the cities are not expanding, the people are forced to live in informal settlements with increased congestion and density (higher number of people per household and no basic services).

VII. Conclusions

Urban Sprawl in Greater Visakhapatnam did not follow a regular radial pattern like many other Indian cities owing to its peculiar topographic and morphologic conditions. Ribbon pattern of sprawl is observed along the Highway and Leapfrog type towards northern and southern ends of the city. Built up in urban areas reflect all its functions in total and the measurement of this parameter is essential for monitoring the urban dynamics. The rate of land development is as high as 789% during the 35 year of study period while the population growth rate is 266%. Thus the per capita land consumption has increased markedly and it is true especially in the peripheral zones a strong indicator of sprawl. The distribution of population density in various wards also justifies the above characteristic of sprawl – “dense core and dispersed suburbs”. The higher entropy values at different points during the study period indicate high rate of sprawl even in early seventies and sustained throughout. Therefore the entropy approach is proved to be efficient to identify measure and monitor the spatio-temporal patterns of urban phenomena (Built up land). The impact of distance on land development is evident through the distance decay analysis. The growth rate of built up is high away from the city centre (CBD) and the NH-5, but the built up density (%) is low indicating possible growth in the future. The impact of primary developmental factors such as population growth, industrial growth, and infrastructural development combined with the regulatory and cultural aspects is clearly evident

from the above study. Greater Visakhapatnam like many other cities in the developing countries is in the middle of the transition process with very high growth rate. To ensure adequate housing, sanitation, health and transportation services to this sprawling city with exceptionally high growth rate is a big challenge to the administrators and planners. A proper understanding of the sprawl pattern, direction, and level of dispersion is required for planning the future developmental projects and as well as residential & facilities development and management. Thus the present study would provide this basic information and efficiently support the planners in decision making.

REFERENCES

-
- ⁱ . **GOVINDU VANUM and KIROS MELES HADGU, sep-2012.** GIS and Remote Sensing Based Urban Sprawl Detection and its Implications on Sustainable Development, **IJMIE Volume 2, Issue 9 ISSN: 2249-055.**
 - ⁱⁱ . Haregewoin Bekele, Stockholm 2005, **Urbanization and Urban Sprawl**, ,Master of Science Thesis No. 294, Department of Infrastructure, Section of Building and Real Estate Economics Kungliga Tekniska Högskolan.
 - ⁱⁱⁱ . **S. Indhira Gandhi and Dr. S. Madha Suresh, july 2012, Prediction of Urban Sprawl in Hyderabad City using Spatial Model, Remote Sensing and GIS Techniques, IJSR - INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH vol;1 issues.2.**
 - ^{iv} . Ganapati Naidu. P 1, Dr. K. Durga Rani, Sustainable Urban Transport Planning Strategies for Land Use Pattern in Visakhapatnam City, International Journal of Engineering Development and Research, Volume 4, Issue 2 | ISSN: 2321-9939.
 - ^v . T. Phanindra Kumar Dr. P. Kesav rao Dr. V Madhava Rao, and Yuva Kishore, (**January 2014**) Spatio-Temporal Analysis of Urban Sprawl in Greater Hyderabad Region and Its Impacts on Rural Urban Fringe Areas Using Geoinformatics Technology, **International Journal of Recent Development in Engineering and Technology Website: www.ijrdet.com (ISSN 2347 - 6435 (Online) Volume 2, Issue 1, January 2014).**
 - ^{vi} . Frederick Steiner, (2016), Opportunities for urban ecology in community and regional planning, Journal of Urban Ecology, 2016, Vo.2, No.1.
 - ^{vii} . Kate E. Plummer, James D. Hale, Matthew J. O'Callaghan, Jon P. Sadler and Gavin and M. Siriwardena, (2016), Investigating the impact of street lighting changes on garden moth communities, Journal of Urban Ecology, 2016, 1-10 , Vol.2, No.1.