

URBAN SPRAWL AND SUSTAINABLE DEVELOPMENT IN HYDERABAD: A GEOINFORMATIC APPROACH

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Abstract

With urbanization comes the need to invest in infrastructure and improve the quality of life in our cities. Rapid urbanization has not only outpaced infrastructure development, but has also brought in the downside of proliferating slums, increasing homelessness, growing urban poverty and crime, of relentless march of pollution and ecological damage. Sustainable city planning should aim at achieving social and environmental equity while improving the lives of the people. For that we need to have a sustainable city form as well as provision and proper management of the services. Thus, in order for a city or urban area to be sustainable it needs to produce and manage basic services like water, waste, energy, and transportation in a way that it conforms to the principles of sustainable development. Geographic Information System (GIS) and Remote Sensing (RS). GIS and remote sensing are land related technologies and are therefore very useful in the formulation and implementation of the land related component of the sustainable development strategy. The different stages in the formulation and implementation of a sustainable regional development strategy can be generalized as determination of objectives, resource inventory, analyses of the existing situation, development, selection, implementation, and evaluation of planning options.

Keywords: sustainable, regional, development, strategy, implementation

INTRODUCTION

Urban sprawl is the outgrowth of the urban areas 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. Towns and cities are expanding in certain pockets with a change in the land use along the highways and in the immediate vicinity of the cities due to ad hoc approaches in planning and decision-making. This dispersed development outside of compact urban and rural centers along highways and in rural countryside is also referred as sprawl. Sprawl generally infers to some type of development with impacts such as loss of agricultural land, open space, and ecologically sensitive habitats in and around the urban areas. These regions lack basic amenities due to the unplanned growth and lack of prior

information and predictions of such growth during planning, policy and decision-making. Due to lack of prior planning, coordinated decision-making and visualization of the outgrowths, these are devoid of basic amenities like water, electricity, sanitation, etc. and also results in inefficient and drastic change in land use affecting the ecosystem and thus threatening the sustainable development of the region.

Urban growth patterns resulting in sprawl are 'unsustainable', with the current consumption surging ahead of regions' carrying capacity and leading to depletion of natural resources for future generations. The need for managing urban sprawl also arises out of the global concerns of achieving sustainable urbanization. Sustainable urbanization is a dynamic, multi-dimensional process covering environmental as well as social, economic and political-institutional sustainability (UN-Habitat, 2002).

METHODOLOGY

GIS techniques was applied to show the trends in economic, spatial, land use and land cover patterns and also impact of the city of Hyderabad on agricultural patterns, diversification of economic activities, increasing demand for value for land. Remote Sensing Satellite data (IRS 1C and 1D), will be processed through Image processing techniques using ERDAS Imagine software.

STUDY AREA:

The study area covers Hyderabad City situated in the heart of the Deccan plateau at an average height of 540 mts (1760 feet) above mean sea level. The city is located at 17° N to 17.5° N and 78° E to 78.5° East Longitude, covering an area of 240 Sq.Kms. On the North it has Nagpur city, in the South it has Bangalore city, in the East it has Vishakhapatnam city, in the west Mumbai city beside many other cities around. Hyderabad is one of the fastest growing cities in the country with a potential to become the Cyber capital of India. The city is witnessing a rapid expansion, industrial boom, increased trade opportunities coupled with high population growth rate (decadal growth rate of 40 percent) accelerated due to migration from rural areas. Hyderabad is beset with increasing urban environmental problems due to the growth of unsustainable economic activities, increase in vehicular transport, and lack of public transport system and inadequate provision of basic infrastructure such as water supply, sewerage. The most important issues of concern include air and noise pollution, depleting ground water and contamination of water bodies and lakes, destruction of natural and manmade resources of cultural value and improper management of domestic and industrial effluents. This situation has lead to depletion of green cover, groundwater table and rising levels of air, water and noise pollution. To address the complex problem of remediation of urban environment of HDA area in a holistic manner covering various facets of urban pollution like air, water and noise, it is proposed to aim for sustainable improvement of the urban environment on coordinated approach.

The zones selected correspond to different locations in the Hyderabad city dominated by Residential (Banjara Hills), Industrial (Balanagar), Commercial (Paradise, Panjagutta, Abids and Charminar) Sensitive (Zoo park)

and Mixed zone (Uppal). In the present study, we use the methodology of Yeh and Li (2001) is adopted for studying the urban sprawl characteristics through Entropy approach.

GEOINFORMATIC ANALYSIS

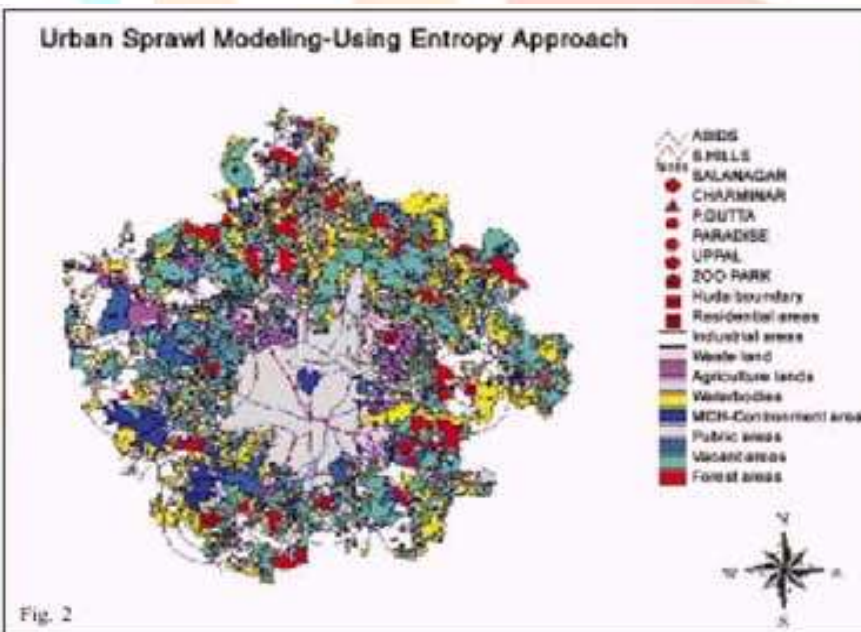
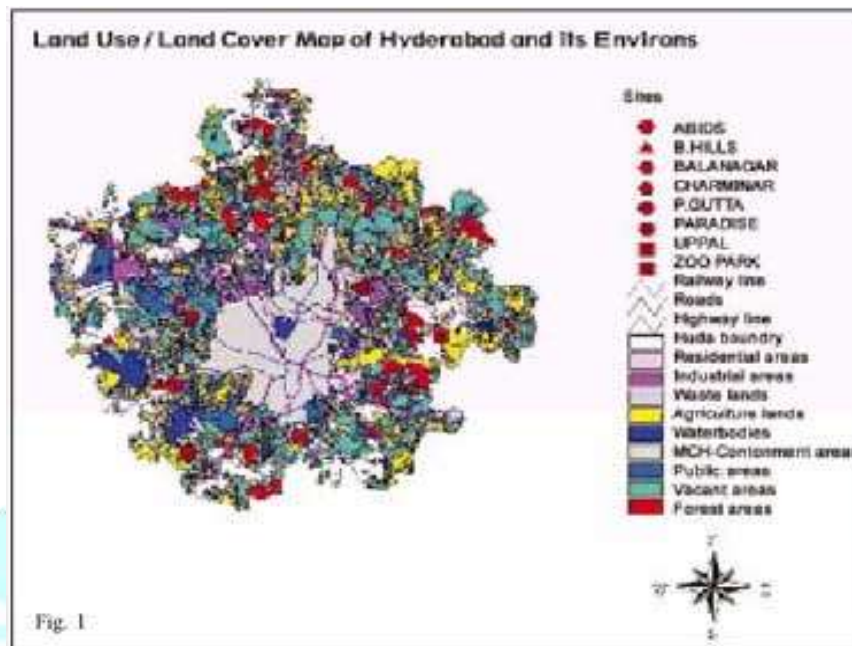
GIS and remote sensing are very useful in the formulation and implementation of the spatial and temporal changes, which are essential components of regional planning to ensure the sustainable development. The different stages in the formulation and implementation of a regional development strategy can be generalized as determination of objectives, resource inventory, analysis of the existing situation, modeling and projection, development of planning options, selection of planning options, plan implementation, and plan evaluation, monitoring and feedback (Yeh and Xia, 1996).

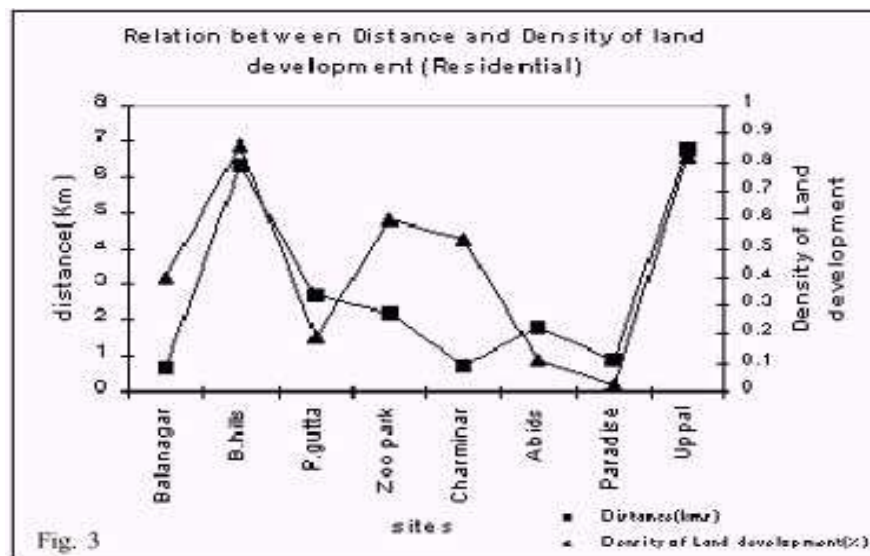
GIS and remote sensing techniques are quite developed and operational to implement such a proposed strategy. The spatial patterns of urban sprawl on temporal scale is studied and analyzed using the satellite imageries and cadastral data from Survey of India, mapped, monitored and accurately assessed from satellite data along with conventional ground data. The image processing techniques are also quite effective in identifying the urban growth pattern from the spatial and temporal data captured by the remote sensing techniques. These help in delineating the growth patterns of urban sprawl such as, the linear growth and radial growth patterns.

There are several urban applications where satellite based remotely sensed data are being applied, namely, urban sprawl / urban growth trends, mapping, change detection and updation, utility and infrastructure planning, land use zoning, urban environment and management and modeling (Raghavswamy, 1994). One of the major advantages of remote sensing systems is their capability for repetitive coverage, which is necessary for change detection studies at global and regional scales.

Entropy can be used to indicate the degree of urban sprawl by examining whether land development in a city is dispersed or compact. If it has a large value, then it indicates occurrence of urban sprawl. The buffer function of a GIS can be used to define buffers of zone from city/town centers of roads and thus the density of land development in each of these buffer zones can be used to calculate the entropy. Analysis of the results suggests a clear increase in residential, commercial, industrial and transportation in the urban area. In the non-urban area, there is a clear reduction in agriculture area and also in vacant land suggesting the increased intensity with urbanization activities. In the present study, the areal estimates of 1999 of Hyderabad and its environs have been used for studying the urban sprawl intensity at different zones, viz., Residential (Banjara Hills), Industrial (Balanagar), Commercial (Paradise, Panjagutta, Abids, Charminar) Sensitive (Zoo park) and Mixed zone (Uppal). The classified data obtained from remote sensing has been transferred to GIS domain for performing the spatial operations. Relative entropy of two types of buffer zones viz., based on the site (site buffer) and road

(road buffer) respectively, for each site has been calculated to measure the degree of urban sprawl in each of the buffer zone (Fig.2).





The present study has demonstrated the utility of entropy approach to identify measure and monitor spatio-temporal patterns of urban sprawl in Hyderabad city and its environs, by integrating with remote sensing and GIS techniques. The entropy method can be easily implemented within GIS to facilitate the measurement of urban sprawl. The study suggests that entropy is a good indicator for identifying the spatial processes in land development.

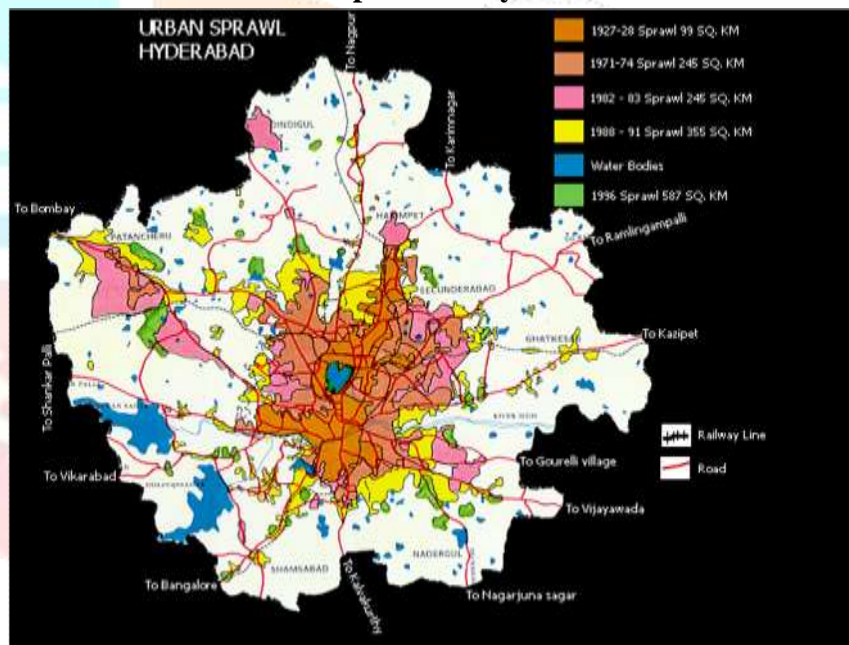
Hyderabad occupies fifth position in terms of area and population in the country. The city has been witnessing rapid growth in urban population between 1981 and 1999 (Mary and Raghavaswamy, 2000). The urban population of the city has increased by 41.57% as against 43% of the total Andhra Pradesh state and 36% of total country. In such a scenario, studies on land use cover dynamics over the Hyderabad and its environs gain importance. Land use / cover analysis from the Remote sensing data suggested different land use cover classes viz., residential, industrial, public, semi-public, water bodies and forest.

Analysis of the data suggests a clear increase in residential, commercial, industrial and transportation in the urban area. In the non-urban area, there is a clear reduction in agriculture area and also in vacant land suggesting the increased intensity with urbanization activities. In the present study, the areal estimates of 1999 of Hyderabad and its environs have been used for studying the urban sprawl intensity at different zones, viz., Residential (Banjara Hills), Industrial (Balanagar), Commercial (Paradise, Panjagutta, Abids, Charminar) Sensitive (Zoo park) and Mixed zone (Uppal). The classified data obtained from remote sensing has been transferred to GIS domain for performing the spatial operations. Relative entropy of two types of buffer zones viz., based on the site (site buffer) and road (road buffer) respectively, for each site has been calculated to measure the degree of urban sprawl in each of the buffer zone. Density of land development (%) defined as the amount of land developed divided by the land area in each of the buffer zone has been calculated following Yeh and Li approach (2001). The results suggest that there is substantial variation in the patterns of urban sprawl

among the different zones of the study area corresponding to residential, industrial, commercial, sensitive and mixed zones.

The pattern of land development away from city center is slightly different from that along the roads. The detailed analysis has been carried with respect to density of land development and the road distance for each of the sites. Analysis of the results suggest that in case of residential areas, as the road distance increased, the density of land development also increased and vice versa. This relationship has been found to be high for site of Banjara hills and lowest for Paradise. The density of land development (%) declined rapidly as the distance from road increased for Zoo Park and Charminar in residential sites. This suggests that, public amenities such as colleges, university and industrial and forest areas are not in proportion i.e., as the road distance from the city center increased, the above amenities also decreased considerably, suggesting the aggregation of the above amenities at some localities areas indicating rapid urbanization process.

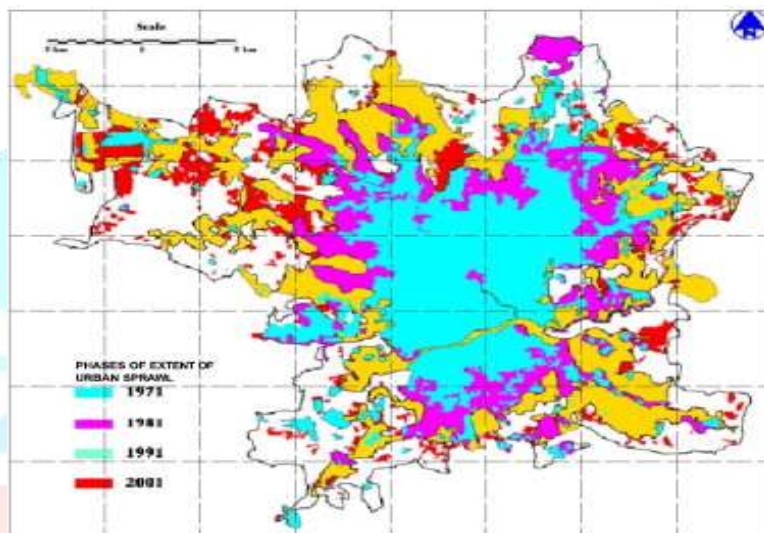
Urban Sprawl of Hyderabad



Analysis of growth in built-up area over a 30-year period indicates highest maximum increase in the 10-25 km rural belt by 428.8 %. In rural area, (25-50 km belt) area under settlement increased by 305.5 % during the corresponding period while in 5-10 km urban belt, this increase was only 37.8 % and in the city centre this growth was only 1.02 %. Overall growth in extent of built-up area in the study area was 167.89 %. An unprecedented population growth and migration, an increased urban population and urbanization are inadvertent. More and more towns and cities bloomed with a change in the land use along the myriad of landscapes and ecosystems found on earth. Today, humans can boast of living under a wide range of climatic and environmental conditions. This has further led to humans contributing the urban centres at almost every corner of the earth. These urban ecosystems are a consequence of urbanization through rapid industrial centers

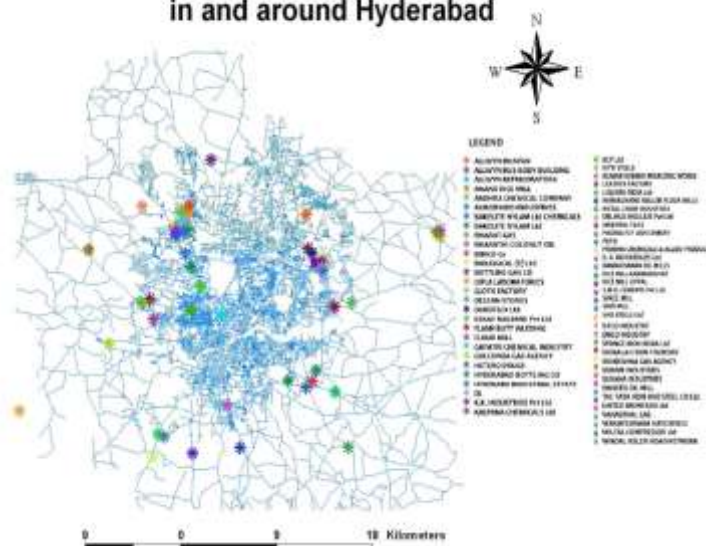
and blooming up of residential colonies, also became hub of economic, social, cultural, and political activities. In order to sustain development, the supply and quality of major consumables and inputs to our daily lives and economic production - such as air, water, energy, food, raw materials, land, and the natural environment needs to be taken care of. Land is essential because our food and raw materials originate from them and is a habitat for flora and fauna. Similar to other resources it is a scarce commodity. Any disturbance to this resource by way of change in land use e.g. conversion of forestland, agricultural land into built-up, is irreversible. The use of land unsuitable for development may be unsustainable for the natural environment as well as to the humans.

Urban Sprawl of Hyderabad Urban Agglomeration (1971–2001).



Source: Author based on Iyer et al. (2007)

Map showing location of major industrial establishments in and around Hyderabad

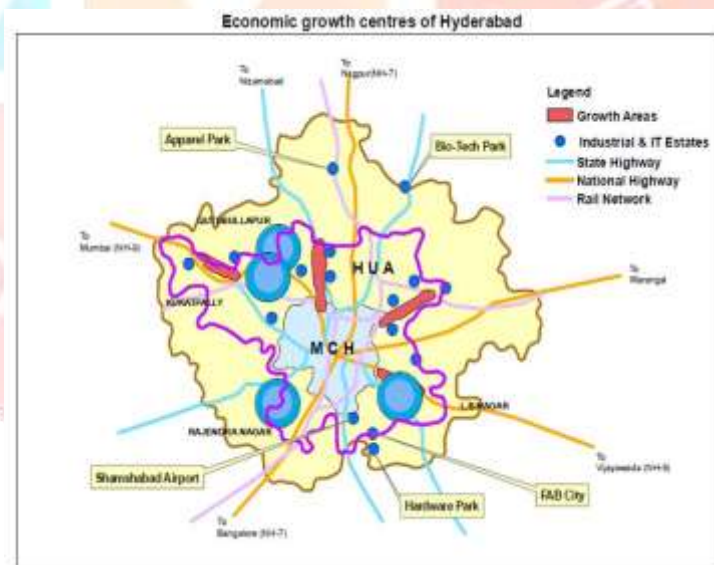


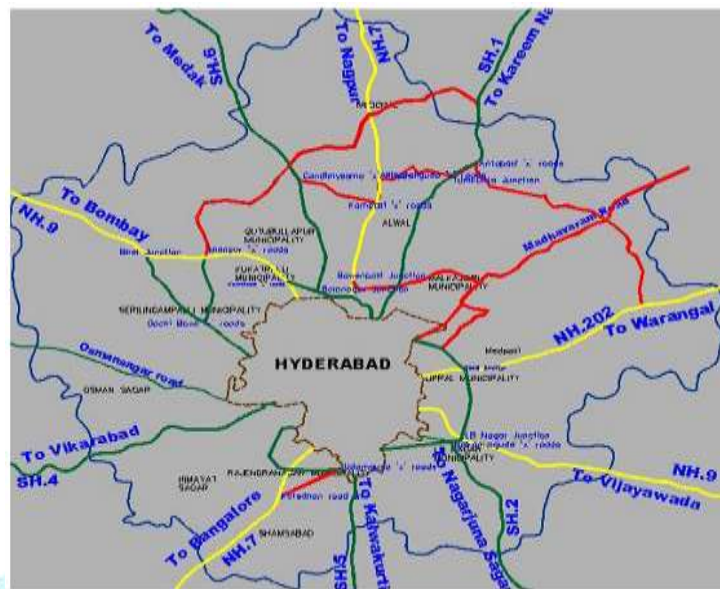
Sprawl generally infers to some type of development with impacts such as loss of agricultural land, open space, and ecologically sensitive habitats. Also, sometimes sprawl is equated with growth of town or city (radial spread). In simpler words, as population increases in an area or a city, the boundary of the city expands to

accommodate the growth; this expansion is considered as sprawl. Usually sprawls take place on the urban fringe, at the edge of an urban area or along the highways.

This trend indicates an increase in urban sprawl in rural belt and rural area at the cost of agriculture which is the main source of livelihood of rural poor. Such a trend is unsustainable as the rural population is ill-equipped to the changed circumstances. With loss of agricultural land, they are forced to migrate to urban areas to look for jobs and slums springing up in urban areas, thus degrading the environment in urban centres. Spatial analysis indicates that urban growth is eastward along the highways. Dispersed growth is observed in NW sector around Patancheru. Growth is however, constrained in SW sector owing to presence of hillocks and an undulating topography.

A major change entitling shift of agricultural land to 'other land use, category is owing to rapid urbanization in the region. Another reason which has fuelled this shift is the recurrent drought forcing farmers to opt for long fallow. This trend has affected the socio-economic condition in the region where large-scale migration of farming families to urban centers in search of livelihood, recurrent crop failure, high value of land, availability of credit facility, decreasing water resource, education, market economy, etc. have given rise to an unsustainable manner of economic development.





Transport network of Hyderabad

In peri-urban area or rural belt, a number of fruit orchards and tree plantations have been established by large business houses that have brought land from small farmers and consolidated them into large holdings. These plantations and orchards account for the increase in vegetative cover in rural belt. Area under water body has decreased as tank bottom and riverbeds are encroached for cultivation using conserved moisture. A few tank beds have been encroached upon to set up residential colonies – a most undesirable trend, compounding the problem of water shortage in the study area. In view of these changes, the Government of Andhra Pradesh has promulgated the Andhra Pradesh Water, Land, Tree Act (2002) in order to safeguard all water body from encroachment by declaring a buffer zone of 5 km mandatory.

The concept of Public-Private Participation (PPP) in any development plan would lead to sustainable growth and development of the city. Encourage social forestry, gardens, greenery in and around the Hyderabad. Encourage private investment for urban infrastructure / amenities and facilities and collect user charges whenever necessary.

Hyderabad Metropolitan Area (HMA) can be broadly defined as the jurisdiction covered presently under Hyderabad Urban Development Authority (HUDA) and three Special Area Development Authorities (SADAs) namely Cyberabad Development Authority (CDA), Hyderabad Airport Development Authority (HADA) and the Buddha Purnima Project Authority (BPPA).

It depicts the continues growth of Hyderabad since its inception. Despite changes in administrative extent of Hyderabad urban area, the trends in growth of constituents of HUA and HUDA regions have been gradual

CONCLUSION

Relocation of certain amenities and facilities to relieve traffic and maintain balanced location and distribution. Expand arterial roads along with the main roads, plan for MMTS along with roads wherever possible and

provide multilevel parking using open spaces to free congestion on roads. Flyovers / Foot over bridge up to a certain limit can reduce congestion which in return can reduce pollution. Smooth flow of traffic without abstracters could reduce air pollution. Encroachments on either side of the roads in the city should be removed immediately. The concept of Public-Private Participation (PPP) in any development plan would lead to sustainable growth and development of the city. Encourage social forestry, gardens, greenery in and around the Hyderabad. Encourage private investment for urban infrastructure / amenities and facilities and collect user charges whenever necessary.

References

- Alam S.M. 1965, "Hyderabad-Secunderabad: A study in Urban Geography", Allied Publishers Pvt., Ltd. Bombay
- Anonymous 2004, A plan for sustainable development (Hyderabad 2020) *Draft Master Plan for Hyderabad Metropolitan Area*, HUDA
- A Plan for Sustainable development (Hyderabad 2020) "*Draft Master Plan for Hyderabad Metropolitan Area*", HUDA.
- Development Plan for Hyderabad City, 1962, Proposal, *Directorate of Town Planning*, Andhra Pradesh, Hyderabad, Vol. II.
- Eastes J.E, 1992, *Remote Sensing and GIS Integration: Research Needs ; Status and Trends*, ITC journal 1.
- *Industrial Profile of Hyderabad District*, 2006, General Manager, District Industries Centre, Hyderabad.
- *Industrial Profile of Rangareddy District*, 2006, General Manager, District Industries Centre, Rangareddy District.
- Kamalakar Reddy, A. & Vijaya Bhole, 2001, *Studies in Land use Planning and Environmental Management*, Dept., of Geography, O.U, Hyderabad.
- Markandey, Kalpana, 2005, *Urban Squalor as a Facet of Urban Landscape: Environmental Issues from Hyderabad*, ISRO RESPOND Project Report
- Mujtaba, S.M., 1994, *Land use and Environmental Change due to Urban Sprawl: A Remote Sensing Approach*, Daya Publishers, Delhi, 1994.
- Sudhira, H.S. & Ramachandra T.V., 2003, *Urban Sprawl Pattern Recognition and Modeling using GIS*, Venus Publication, Mumbai.
- Venkatesh K, *Urbanization in Hyderabad*, PhD Thesis.
- Yeh, A.G.O. & X. Li, 2001, *Measurement and monitoring of Urban sprawl in a rapidly growing region using entropy*, *Photogrammetric Engineering & Remote Sensing*, 67(1): 8.