



MONITORING THE DEVELOPMENT PLAN OF URBAN AREA
USING GIS AND REMOTE SENSING TECHNIQUES: A CASE
STUDY OF JUNNAR CITY, PUNE (MS)

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ABSTRACT:

Now-a-days, major cities are competing with each other for attracting international capital and other investments and Junnar city is no different. It pressurises the planning authority and the administration to cope with the existing as well as future demands. A problem common to all but often relate to major cities is that many elements of their infrastructure have remained unchanged from the time when first put in place and they require enormous resources to extend them or modify them. The existing infrastructure has not been able to keep up with the expansion of many cities because of the speed of that expansion and because of cost. Using conventional planning methods will not help to resolve these problems. There is an urgent need for new, more flexible and less expensive technologies, and for a new organization of the city (S.Shekhar, 2006). To assess the implementation of development plan for a city or town, applications of information technology, particularly, Remote Sensing (RS) for capturing the spatial data, Geographic Information System (GIS) for undertaking integrated analysis presentation of spatial and associated attribute data to be of immense use in urban planning. This study reveals the advantages of high-resolution data in such planning tasks.

Overlay analysis in GIS environment helped to monitor the land use/land cover categories. Thus Geoinformatics provides for the monitoring and surveillance of compliance with planning regulations and it serves as an early warning system with regard to friction and sources of shortfalls in the process of urban planning and sustainable management. Now a day the scale of urbanisation is increasing. Most of the population of the world is living in urban area in the developed countries as well as under developed countries. The areas under urban settlements are increasing day by day, therefore the encroachment on the surrounding available land starts now. This paper focuses on the land use pattern and the change of land use pattern due to the urban settlement of the Junnar.

INTRODUCTION:

The year 2008 marks a turning point in the history of the world, more than half of its population now lives in the urban areas. Over the next fifteen years, today's developing countries are expected to become less rural and have sizeable metropolitan areas. Land is most important natural non-renewable resource and need for human settlement. Human activities mostly based on land. It fulfills the human needs by providing shelter and food. As the number of human being increases particularly in the urban life by attracting job opportunities, city spreads outward from its limit. Encroachment on the surrounding available land starts now.

A variety of factors affect the supply and demand for land and its uses in urban area. However the ever increasing population influx in the urban areas and the physical expansion of the built up area beyond city limits are envisaged as important factors for raising the demand for more land as well as land use changes. In last few decades due to increasing population and economic growth in urban landscapes, rapid urban development resulting increasing land use changes is being witnessed in India and other developing countries. The measurement and monitoring of these land use changes are crucial to understand land use cover dynamics over different spatial and temporal time scales for effective land management. Today with rapid urbanization, there is increasing pressure on the land, water and environment.

OBJECTIVES:

The main objective of the paper is to develop a plan map by the modern technology which is used in geography. The paper is based on following objectives.

1. To develop a methodology to monitor the dynamic areas, this can also be applied to other areas.
2. To detect the land use changes and land use pattern in the study area.
3. To create GIS database for the approved plan proposals of Junnar City.
4. To prepare a detailed report on the implementation of Development Plan Map.
5. To suggest better methodology to the local administration body for effective implementation of Development plan based on the results.

DATABASE:

The study is mainly based on Secondary Data sources. These are as follows;

- > DP plan of Junnar city.(2011)
- > SOI Toposheet 47/E/16 (1:50000)

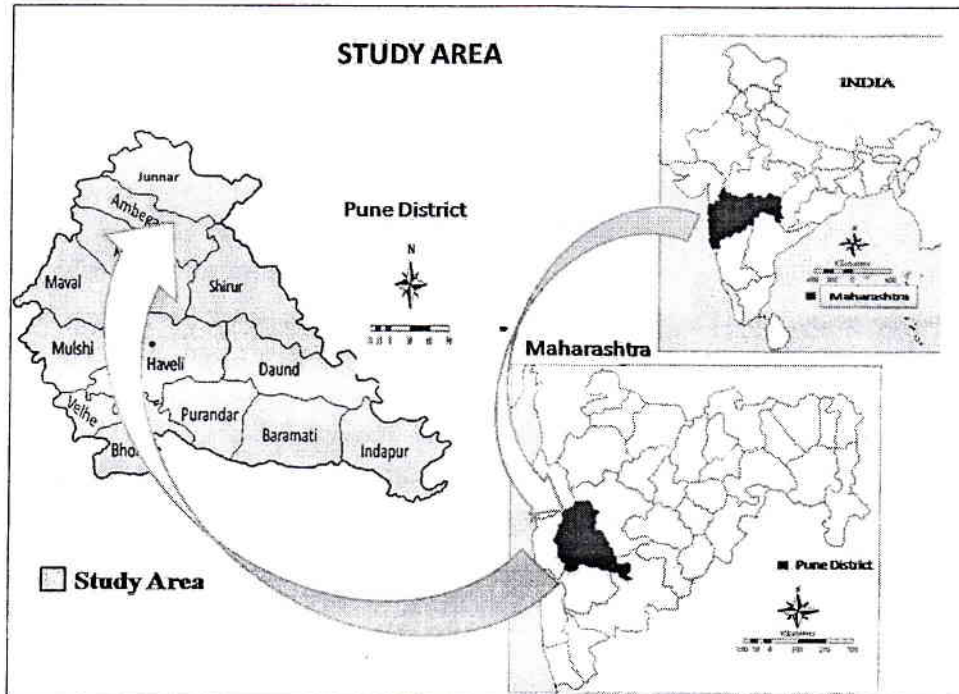
Software's used:-

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➤ Arc GIS 9.3 and Erdas 9.1

STUDY AREA:

Junnar is a city with thousands of years of history in the Pune district of the Indian state of Maharashtra. The extent of city is 19°12' N and 73°53' E. The altitude of mean sea level is 686 meters.



The total population of city according to census 2011 is 25,997. It is a Taluka headquarter. Situated at the base of the Sahyadri Mountains, it is around 95 km north of Pune and 100 km east of Mumbai. Also located near the Shivneri Fort, birthplace of Chhatrapati Shivaji, the famous Maratha king, Lenyadri (Girijatmak) and Ozar (Vighnagar) both are from Ashtavinayak. The land surrounding Junnar is very fertile and the main crops harvested are rice, wheat, and sugarcane. Junnar is also surrounded by much greenery and dams, such as Vadaj and Manikdoh, common picnicking locations. Also present are the ancient Nane ghat caves.

METHODOLOGY:

The land use maps that collected from planning department were scanned and geo-referenced with the toposheets in Erdas and brought in to Arc GIS environment for land use change analysis. After preparing various land use identify the change from one type to another type of land use. The areas under change was measured and presented in a tabular form to get the clear picture of land use and land cover change.

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Role of Geospatial Technology in the Preparation and Implementing Development Plan:

In countries undergoing rapid economic development such as India a Planning Support System is undoubtedly an important feature. Planning support system (PSS) and decision support system (DSS) are among tools for achieving planning quality in optimum information needs; institutional framework; data collection and dissemination instruments, and improving functioning capacity.

The evolution of computer and information over the last few decades provides significant impact on the planning profession. Among the technological advancements, after Geographic Information Systems (GIS) is perhaps the one that has been most attractive for spatial representation. As geospatial data and technologies apparently enable more effective and efficient operations, improved communications and ultimately, better decision-making. With its powerful capacity for spatial data management, analysis and visualization. GIS systems enable data from wide variety of sources and data formats to be integrated together in a common scheme of geographical referencing, thus providing up-to-date information (Coulson and Bromley, 1990). GIS provides planners and decision makers with new tools to implement their work more efficiently.

Maharashtra Regional and Town Planning Act 1966, the amended Act plays a major role. In the reform of the development planning system in the sense that it insists the incorporation of the GIS into the development plan preparation process at all planning hierarchy, be it the macro or micro level. The concern of adopting GIS is in the development planning process. Especially in the preparation of development plans, had encouraged many local/planning authorities to embark on small scale, multi-faceted GIS applications to suit their functions and work procedures (Yaakup et al. 2006).

Town and Country Planning Act, 1976 (Act 172) (amended in 2001) requires the formulation of plans at various spatial and administrative levels to ensure effective planning. The various plans include:

- The National Physical Plan which outlines the strategic policies for the purpose of determining the general direction and trend of the nation physical development.
- The Regional Plan, which establishes policies to guide and co-ordinate development for a region especially in the provision of infrastructure and facilities within the region.
- The State Structure Plan which sets out the policies and proposals for the development and use of the land in a state.
- The District Local Plan which translates the state policies at local level.

Land Use:

Land information is of prime importance to the researchers and planners at different levels. The land use pattern reflects the character of the interaction between people and environment, and the influence of distance and resource base upon basic economic activities. The term land use is used here to describe the function or use of an area of land is put to. Land use refers to Man's activities and the various use which are carried on land (Clawson & Steward 1965). Land cover refers to "natural vegetation, water bodies and rock/soil, artificial cover and other features resulting due to land transformation". The observed physical cover, seen on the ground or through remote sensing, includes vegetation (natural/ planted) and human constructions (buildings etc.), which cover the earth's surface. Water, bare land or similar surfaces are also included in land cover.

A city develops to perform a range of functions, which increase in size and complexity with urban growth. The range of functions consists of a combination of industrial, commercial, service and administration activities. The absolute and relative importance of which is associated with historical development. As the functions of the city shift from secondary industry to tertiary industry in development series, urban land use structure has undergone a profound change. The spatial pattern of the city is transforming from a uni-center to a multi nuclei one.

As the cities expand, through conurbation process, prime agricultural land, open space and forests (in and around the city) are transformed into land for housing, roads and industry. (E.Hardoy, Diana Mitlin and David Satterthwaite 1992). Urban morphology of Indian cities has mostly evolved through the process of intensification in the ancient urban core.

What is Development Plan? And Main features of Development Plan:

A Development Plan is a statutory land use plan for the city. It is created under the Maharashtra Regional and Town Planning Act (MR&TP Act). It is prepared every 20 years or so keeping in mind the expected growth of the city and the need for space for various amenities, facilities and utilities that are needed to ensure the health and well being of residents.

Contents of a city development plan have been succinctly enumerated in Section 22 of the Maharashtra Regional and Town Planning Act 1966 (and in corresponding provisions of other state acts). They broadly include:

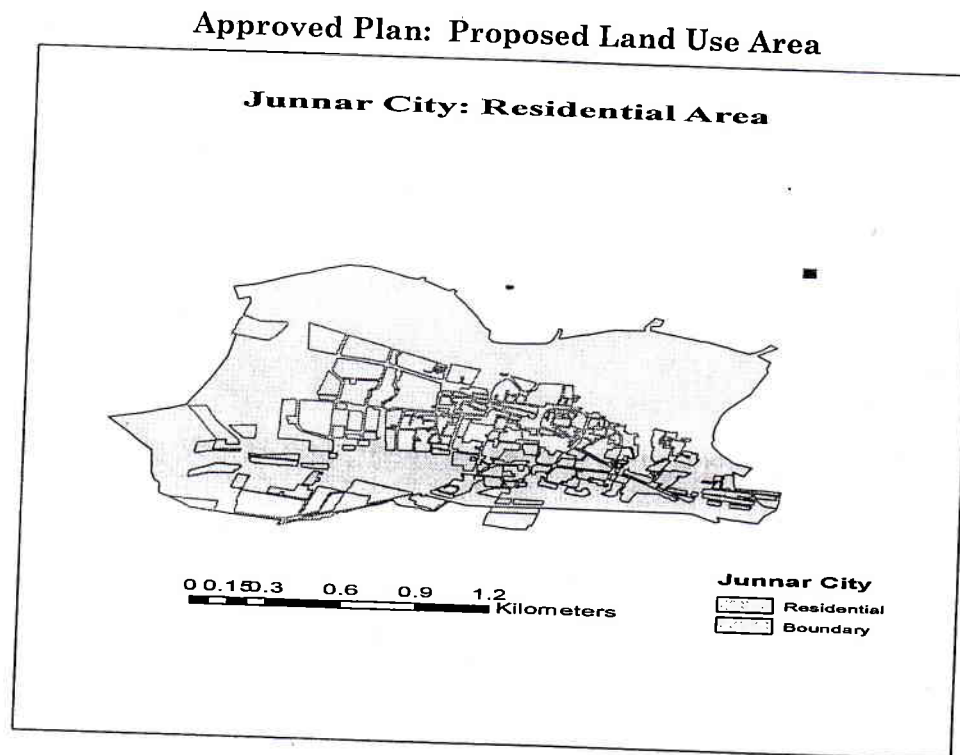
1. Land Use Zoning;
2. Proposals for infrastructure development such as new roads, road widening, junction Improvements etc., land use oriented proposals for water supply and drainage;
3. Proposals for conserving / enhancing the quality of the environment;

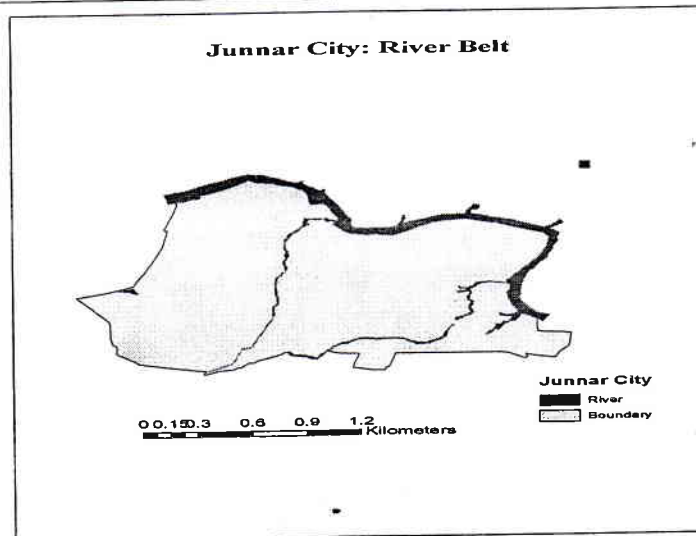
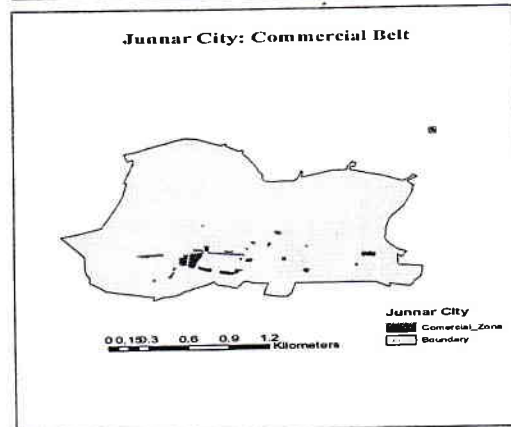
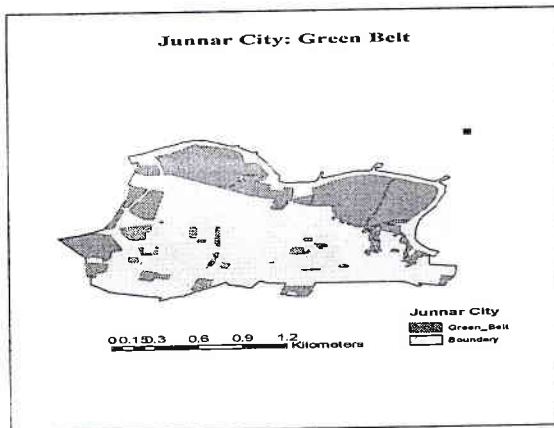
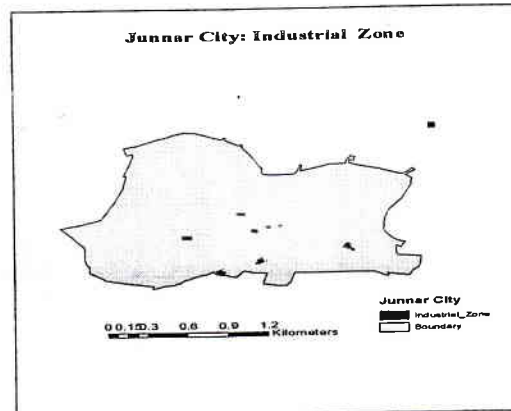
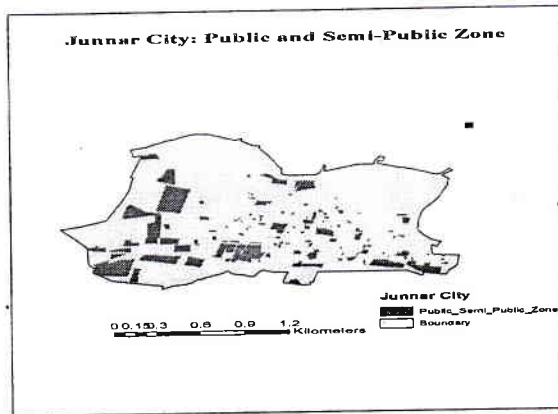
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4. Reservation of lands for various public purposes to make good current deficiencies and meet needs which may arise in the future, such as schools, hospitals, gardens, playgrounds etc.; including lands which may be required by government or semi government agencies; and
5. Provisions for development control to ensure that all future development is orderly and healthy.

RESULT AND DISCUSSION:

After creating the layers from Development Plan, overlay analysis was carried out in Arc GIS environment in order to monitor the growth and development of various land use categories. The results are tabulated for better understanding.





Map No.1 (DP Plan- Digitize Map)

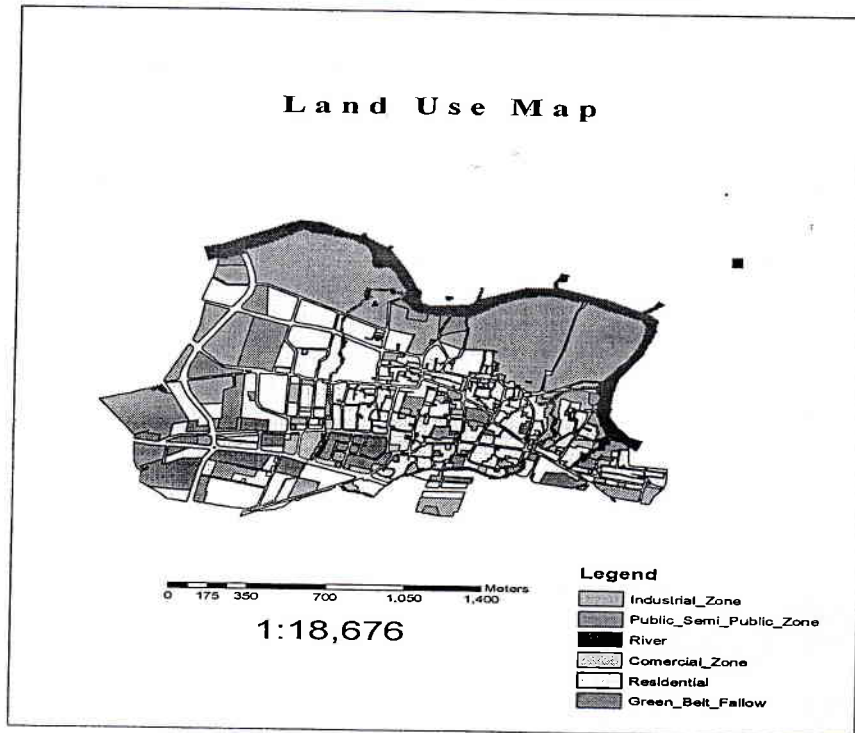
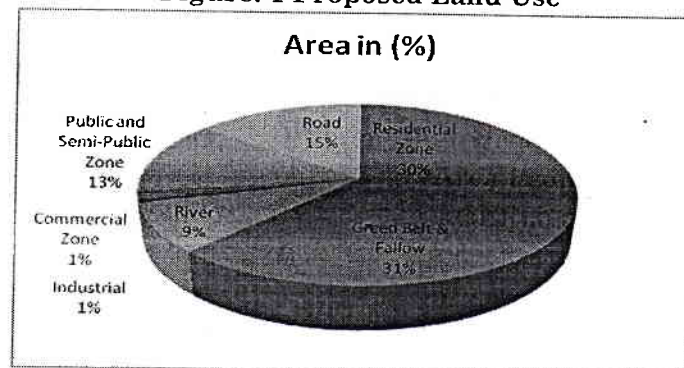


Table: 1 : DP Plan- Digitize Map

Sr. No.	Land Use	Area Proposed	Area in (%)
1	Residential Zone	1.00 Km ²	30.49
2	Green Belt & Fallow Zone	1.02 Km ²	31.10
3	River Zone	0.28 Km ²	8.54
4	Industrial Zone	0.02 Km ²	0.61
5	Commercial Zone	0.05 Km ²	1.52
6	Public and Semi-Public Zone	0.43 Km ²	13.11
7	Road	0.48 Km ²	14.63
Total		3.28	100

Figure: 1 Proposed Land Use



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The table no. 1 shows proposed land use area providing by Junnar Nagarparishad. The total area of city is 3.28 Km². out of total area of the city the residential area is 1.00 Km² and green belt-fallow land is 1.02 Km². The plan also shows the facilities for people, included Public Zone, Commercial Zone.

SIGNIFICANCE OF THE STUDY:

- It is very much essential to monitor the planning process and maintain of development plan for sustainable development.
- Urbanization is a dynamic process both in space as well as in time.

CONCLUSIONS:

For the assessment of the implementation of development plan for a city or town, applications of information technology, particularly, Remote Sensing (RS) for capturing the spatial data, Geographic Information System (GIS) has been used. For undertaking integrated analysis, the presentation of spatial and associated attribute data use in urban planning. This study reveals the advantages of high-resolution data in such planning tasks.

Land use/land cover categories approved in the Development plan of Junnar City. The findings are as follows:

- As per the Development plan (DP), 1.00 km² area is approved for residential development.
- Area under Public and Semi public (approx 13.11%) of approved use is still not utilized. Similarly very less commercial use is identified, that is 0.05 km² area only.
- The land devoted for Agricultural area and Play grounds, is indeed occupied by green cover. But continuous monitoring is necessary to keep the reserved land under green cover due to increasing urbanisation.

With only few deviations observed in the field checking, it gives the satisfaction that, the city is having lot of potential and ample of opportunities to grow in an organised manner. Thus Geoinformatics provides for the monitoring of compliance with planning regulations and it serves as an early warning system with regard to friction and sources of shortfalls in the process of urban planning and sustainable management.

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