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**GIS BASED LAND SUITABILITY ASSESSMENT OF BANER AND  
BALEWADI VILLAGE**

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**ABSTRACT:**

Now-a-days, major cities are competing with each other for attracting international capital and other investments and Pune 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 and GPS for ground truth verification are found to be of immense use in urban planning. This study reveals the advantages of high-resolution data in such planning tasks. In order to illustrate the potential of these technologies, sample villages Baner and Balewadi (Unit one) out of 23 fringe villages from Pune city had been selected for monitoring the approved development Plan. The unit 1(Unit One) of the DP for Baner-Balewadi was approved in Sep 2008 with the government proposing major changes including deletion of reservation for civic amenities

and making land available for residential purposes. Overlay analysis in GIS environment helped to monitor the land use/land cover categories. Further, the proposals of approved development plan of Baner and Balewadi were checked at ground level by a detailed field survey by using GPS. Interestingly, there were less number of deviations found and it showed that these villages are having lot of potential and ample of opportunities to grow in an organised manner. 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.

## **INTRODUCTION:**

Urbanization is an index of transformation from traditional rural economies modern industrial one. It is a progressive concentration of population in urban unit. The United Nations reports that 29.1% of the world population of 2.54 billion was urban in 1950, and that 48.6% of the population of 6.51 billion lived in urban areas in 2005. In 2001, the share of metropolitan cities was 37.8 % up from 32.5% in 1991 and 26.4% in 1981.

The forces and processes of technological development, globalization and population growth accelerate the dynamics of urbanization process in the developing countries. This “accelerated” phase of urban transition from rural to urban population in developing countries, population from migration and endogenous growth of those large primate cities and industrial location on their fringes are actually expanding the urban areas.

Many terms synonymous to fringe such as urban fringe, rural urban fringe, sub-urban areas, suburbs, urban periphery and more recently extended metropolitan regions (EMRs) have been used in planning literature. Whatever may be the designations, conceptually, fringe is related to the growth of cities which lies immediately outside the designated urbanizable limits and has strong interaction with present city and bears an urban reflection on the physical, occupational and demographic characteristics. By and large, the residents of the fringe enjoy the urban services and facilities but usually do not pay for them.

**AIMS AND OBJECTIVES:**

1. To map the existing land use-land cover details of urban fringe areas.
2. To examine the temporal and spatial changes in the land use and land cover.
3. To create GIS database for the approved plan proposals of Baner and Balewadi.
4. To validate the implementation of Development Plan.
5. To map the deviations in the proposed plan and draft plan as well as the ground reality.
6. To prepare a detailed report on the implementation of DP in these two fringe villages.
7. To suggest better methodology to the local administration body for effective implementation of Development plan based on the results.

**STUDY AREA:**

The study area, Baner and Balewadi situated in the Pune city lies between latitudes  $18^{\circ}25'$  N and  $18^{\circ}37'$  N and longitudes between  $73^{\circ}44'E$  and  $73^{\circ} 57'E$  and cover an area of 450.69 Sq. kms. Pune is located at an average altitude of 560m from mean sea level. There is hilly area on western side of Pune and on south side Sinhagad- Katraj hilly area is observed. There are number of rivers flowing through it such as the Mutha River, the Mula River and the Pawna River. The climate of Pune is typical monsoon. The temperature ranges from  $15^{\circ}C$  to  $35^{\circ}C$ . The average rainfall is 70cm.

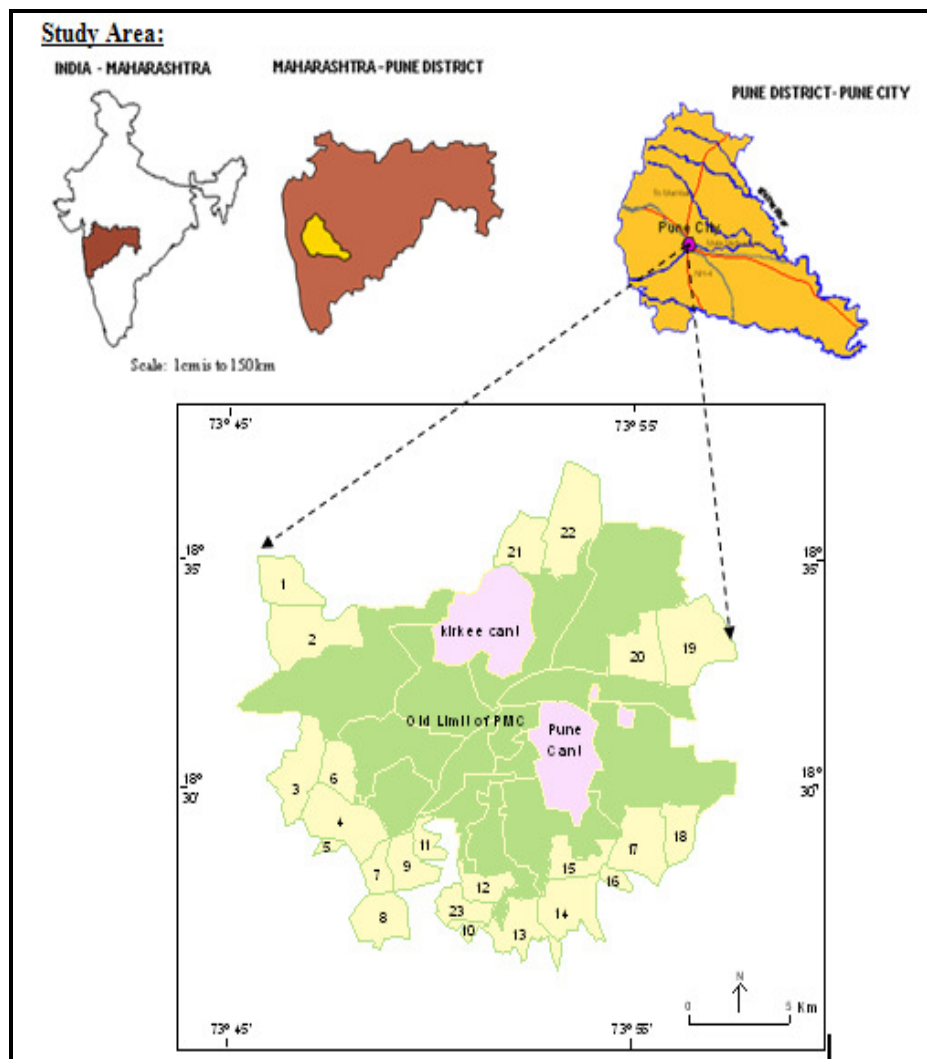
**DATA BASE: *Secondary Data***

- 1) Toposheet 47F/14 - 1:50,000
- 2) Approved Plan of Baner and Balewadi - 1: 10,000
- 3) Google Image

**METHODOLOGY:**

The Approved plan map was geo referenced in Erdas 9.1 software. Initially the toposheets were scanned and geo referenced and used as base for image registration. Land use maps of Town Planning Department were scanned and geo referenced with the base map. The image of draft plan were creating different layers(shapes files) of maps by using ArcGIS and completed land use maps The Approved plan and Google image were

studied for the overlay analysis and land cover change analysis in the ArcGIS environment, and made result.



### 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 by definition is the use of land, usually with emphasis upon its functional role with respect to economic activities. 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 included in land cover.

### **MAIN FEATURES OF DEVELOPMENT PLAN:**

While finalizing the draft DP for 23 villages, PMC's planning committee has ruled that 1600 hectares of hill land in those villages be reserved as Biodiversity parks. Simultaneously construction in the 60m distance from the riverbanks has been banned with the ultimate aim of Green Development Plan for Pune's 23 fringe villages. Achieving the aims and goals of green development plan for the fringe villages and sustainable development of Pune city now, depends on the proper implementation of these plans. It needs continuous monitoring and updating the existing plans and data. It is envisaged that high-resolution satellite images and GIS will serve various large-scale GIS operations in the areas of municipal GIS, town and country planning, facility management, disaster management and natural resources management. In this juncture, Geoinformatics play a critical role in regular monitoring and provides a complete information system to accomplish the sustainability. In order to prove the efficiency of this technology, a small case study was undertaken and the results obtained were worthy of emulation and could over the next few years change the face of Pune.

In 2005, Out of the total area as per the DP, the residential should cover 48.7% excluding the old gaathan area. As per the survey, including gaathan the total built-up (Residential, Commercial and Public & Semi public classes) area is only 11.81%. Other interesting facts in the survey are only 8.1% of the land was sold in Balewadi, for residential purpose (S.Shekhar, 2006).

The land use maps that collected from planning department were scanned and geo referenced with the Toposheet and brought in to ArcGIS 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.

### **RESULT AND DISCUSSION:**

After creating the layers from Development Plan and the Google Image, overlay analysis was carried out in ArcGIS 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-Pune Municipal Corporation(Baner and Balewadi)

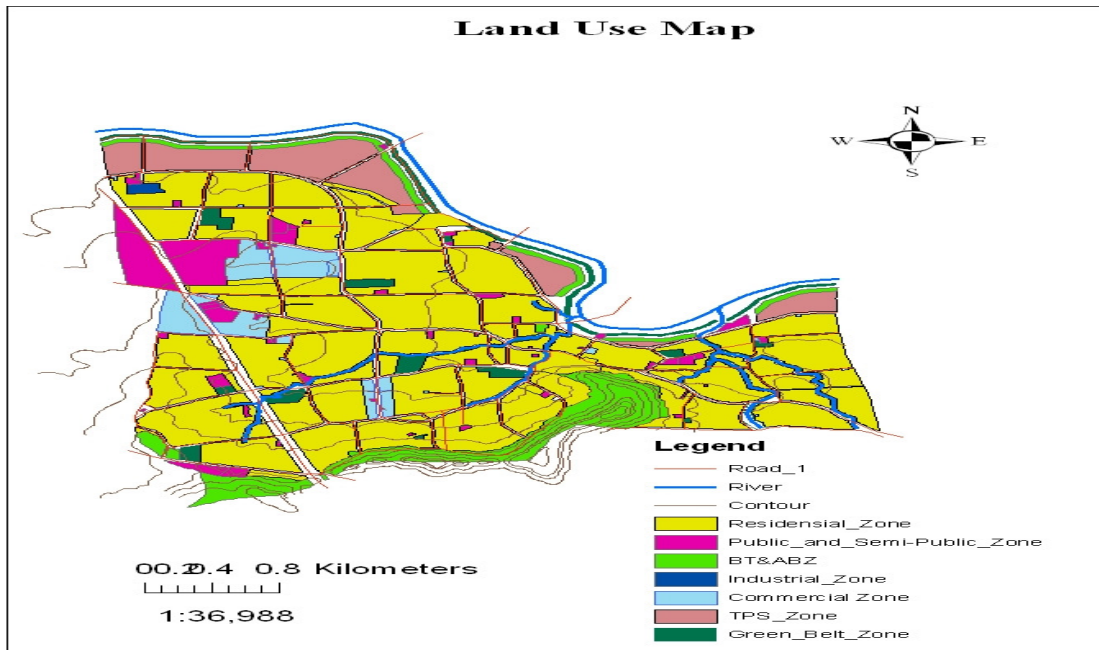
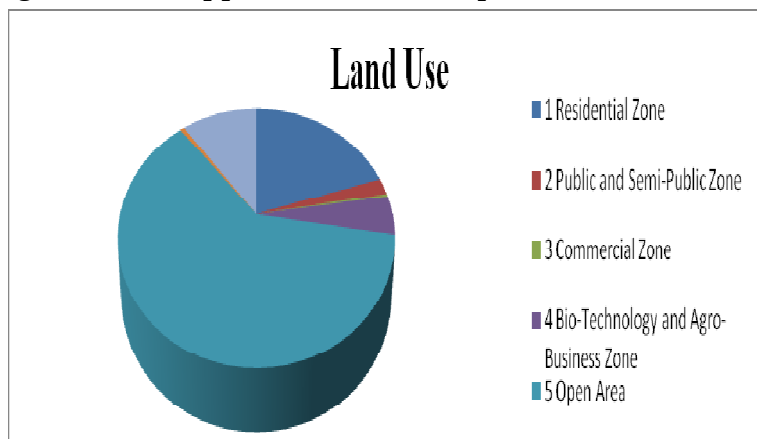


Table No.1: Approved Plan: Proposed Land Use Area

Sr. No.	Land Use	Area Proposed	Area in(%)
1	Residential Zone	7.9 Km <sup>2</sup>	54.40
2	Public and Semi-Public Zone	0.8 Km <sup>2</sup>	5.5
3	Commercial Zone	0.6 Km <sup>2</sup>	4.13
4	Bio-Technology and Agro-Business Zone	1.1 Km <sup>2</sup>	7.57
5	Town Planning Scheme	0.9 Km <sup>2</sup>	6.19
6	Industrial Zone	0.02 Km <sup>2</sup>	0.13
7	Green Belt Zone	0.6 Km <sup>2</sup>	4.13

Figure No.1: Approved Plan: Proposed Land Use Area



Map No.2

Google Image Digitize Map of Baner and Balewadi

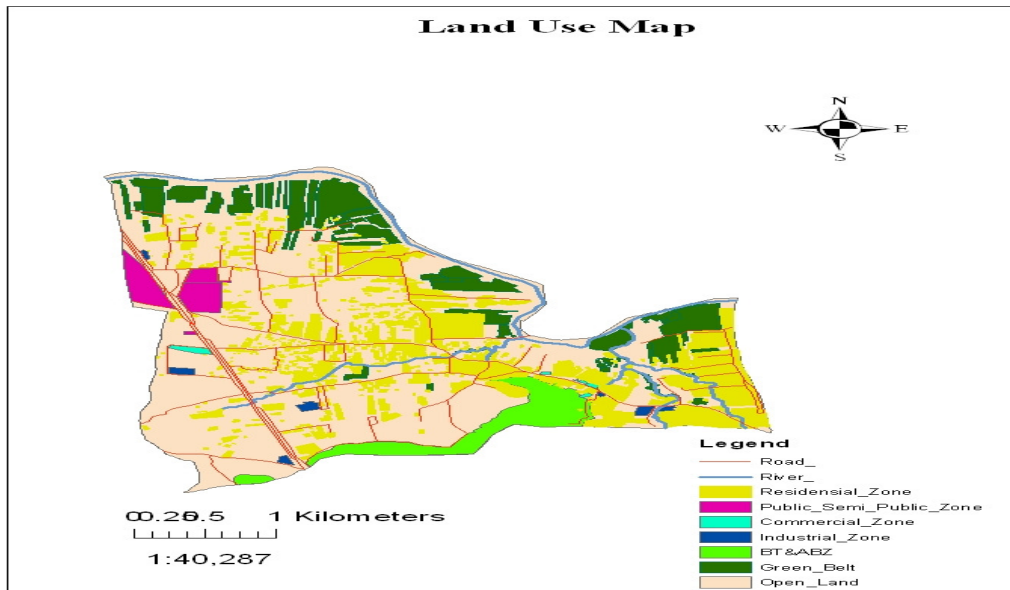
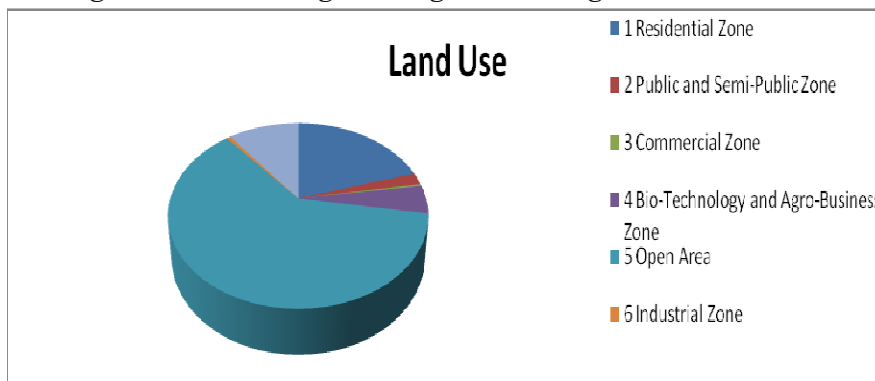


Table No. 2: Existing Landuse Area of Baner and Balewadi

Sr. No.	Land Use	Existing Area	Area in(%)
1	Residential Zone	2.9 Km <sup>2</sup>	19.97
2	Public and Semi-Public Zone	0.3 Km <sup>2</sup>	2.06
3	Commercial Zone	0.05 Km <sup>2</sup>	0.34
4	Bio-Technology and Agro-Business Zone	0.7 Km <sup>2</sup>	4.82
5	Open Area	8.8 Km <sup>2</sup>	60.60
6	Industrial Zone	0.08 Km <sup>2</sup>	0.55
7	Green Belt Zone	1.5 Km <sup>2</sup>	10.33

Figure No. 2: Google Image: Existing Land Use Area



**Table: 3 :Farther Growth Development**

Sr. No.	Land Use	Farther Growth Development
1	Residential Zone	5.0 Km <sup>2</sup>
2	Public and Semi-Public Zone	0.5 Km <sup>2</sup>
3	Commercial Zone	0.5 Km <sup>2</sup>
4	Bio-Technology and Agro-Business Zone	0.4 Km <sup>2</sup>
5	Open Area	8.8 Km <sup>2</sup>
6	Industrial Zone	-0.6 Km <sup>2</sup>
7	Green Belt Zone	-0.9 Km <sup>2</sup>

The **Table No. 1** showing Proposed Land Use Area in that providing by PMC. Showing plan residential area is more it is 7.9 Km<sup>2</sup> and also in plan think about facilities for people and included Public Zone, Commercial Zone, Green Zone For that given, and there are lot of scope for farther development because of Town Planning Scheme it is 0.9 Km<sup>2</sup>.

The **Table No.2** showed existing land use of Baner and Balewadi. In that residential area is developed only 2.9 Km<sup>2</sup>. There are open area is 8.8 Km<sup>2</sup>. and also green belt is more because existing area agriculture area is more.

The **Table No. 3** shows the farther development of future in that residential area remaining is 5.0 Km<sup>2</sup>. And also public zones, commercial zone, not much developed also open land is much more so lot of scope to farther development and modification. There are also show the deviation industrial area and green belt is less because of lot of agriculture land existing in google image.

## CONCLUSION:

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 and GPS for ground truth verification are found to be of immense use in urban planning. This study reveals the advantages of high-resolution data in such planning tasks.

In the present study Google Image was used to keep an eye on the land use/land cover of Baner and Balewadi villages and verified with land use/land cover categories approved in the Development plan of Unit-1(Baner & Balewadi Villages). The findings are as follows:

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1. As per the Development plan (DP), 7.9 km<sup>2</sup> area is approved (2008) for residential development. But as on 2008 (Google Image) the actual development under this land use is only 2.9 km<sup>2</sup>. The main observation is land under Town Planning Scheme (TPS) as per DP is at present under agricultural use. Therefore 8.9 km<sup>2</sup> area under TPS is untouched and available for future growth.
2. Area under Public and Semi public (approx 51%) of approved use is still not utilized. Similarly very less commercial use is identified (Out of 0.6 km<sup>2</sup> area, commercial land use is 0.05 km<sup>2</sup> area only).
3. The bothered observation during the field survey was the deviation from residential use to industrial (Software/IT & ITES companies) use. These are observed during the GPS field survey.
4. The land devoted for BT and ABZ, Green belt is indeed occupied by green cover. But continuous monitoring is necessary to keep the reserved land under green cover due to increasing urbanization.

With only few deviations observed in the field checking, it gives the satisfaction that these villages are having lot of potential and ample of opportunities to grow in an organised manner. Thus Geoinformatics (High resolution data, GPS and GIS) 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.

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