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Land Use Land Cover of Bidar City using GIS & RS Techniques

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***Abstract*— Land use and land cover change has become a central component in current strategies for managing natural resources and monitoring environmental changes. Urban expansion has brought serious losses of agriculture land, vegetation 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. In this work we have taken bidar city as case to study the urban expansion and land cover change that took place in a span of10 years from 2002 to 2012.GIS & Remote sensing methodology is adopted to study the geographical land use changes occurred during the study period After image pre-processing, un-supervised classification has been performed to classify the images in to different land use categories. Classification accuracy is also estimated using the field knowledge obtained from field surveys. Information on urban growth, land use and land cover change study is very useful to local government and urban planners for the betterment of future plans of sustainable development of the city.**

Keywords*— Land use, Land Cover, Toposheets, GIS (geographical information system) and RS (Remote sensing)

I. INTRODUCTION

Land-use refers human activities on land for enormous uses like agriculture, forest development, settlement development, etc. Land-cover refers to natural covering of land by vegetation, water body, rocky land, etc.change detection is a method of identifying the enormous differences in LULC overtime. Land-use and land-cover are linked to climate and weather in critical ways. Key links between changes in land cover and climate include the exchange of greenhouse gases (such as the water vapor, the carbon dioxide, the methane, and the nitrous oxide) between the land surface and the atmosphere, the radiation (both solar and longwave) balance of the land surface, the exchange of heat between the land surface and the atmosphere, and the hardness of the land surface and its uptake of momentum from the atmosphere. Because of these strong links between land cover and climate,the changes in land use and land cover can be important contributors to climate change and variability. Land use/ Land-cover change information has an important role to play at local and regional as well as at macro level planning..

II Objectives

- .To generate land use land cover map of bidar city for a decade from 2002 to 2012.
- To generate Road network maps of bidar city for a decade from 2002 to 2012.
- To generate drainage map of bidar city for a decade from 2002 to 2012.
- To generate counter map of bidar city for a decade from 2002 to 2012.
- To generate& compare the satellite image of bidar city for a decade from 2002 to 2012.

III.MATERIALS AND METHODOLOGY

The materials used for this study will be GIS and RS related software models. These soft wares help us to create maps and also help in the management of data. By using these software models, editing and analyzation of the data can be done in shorter period of time.

A. Geographic Information System (GIS)

The Geographic Information System (GIS) is a computer-assisted system for acquisition, storage, analysis and display of geographic data. Geographic Information System (GIS) is an integrated set of hardware and software tools used for the manipulation and management of spatial (geographic) and related attribute data to digitally represent and analyze the geographic features present on the earth's surface and the events taking place on it.

GIS allows for creating, maintaining and querying electronic databases of information normally displayed on maps. These databases are spatially oriented, the fundamental integrating element being their position on the earth's surface. This system consists of a set of computerised tools and procedures that can be used to effectively encode, store, retrieve, overlay, correlate, manipulate, analyse, query, and display land-related information. They also facilitate the selection and transfer of data to application specific analytical models capable of assessing the impact of alternatives on the chosen environment. The underlying foundation of sound GIS is an effective digital map database, tied to an accurate horizontal control survey framework.

B Remote Sensing (RS)

Remote sensing is the science of acquiring information about earth's surface without actually being in contact with it. This is done by sensing & recording reflected or emitted energy & processing, analyzing & applying that information. A further step of image analysis and interpretation is required in order to extract useful information from the image. The human visual system is an example of a remote sensing system in this general sense. In a more restricted sense, remote sensing usually refers to the technology of acquiring information about the earth's surface (land and ocean) and atmosphere using sensors onboard airborne(aircraft, balloons) or space borne (satellites, space shuttles) platforms. In Optical Remote Sensing, optical sensors detect solar radiation reflected or scattered from the earth, forming images resembling photographs taken by a camera high up in space. The wavelength region usually extends from the Visible and Near Infrared (VNIR) to the Short-Wave Infrared (SWIR). Different materials such as water, soil, vegetation, buildings and roads reflect visible and infrared light in different ways. They have different colors and brightness when seen under the sun. The interpretations of optical images require the knowledge of the spectral reflectance signatures of the various materials (natural or man-made) covering the surface of the earth. There are also infrared sensors measuring the thermal infrared radiation emitted from the earth, from which the land or sea surface temperature can be derived as shown in figure 1. [4]

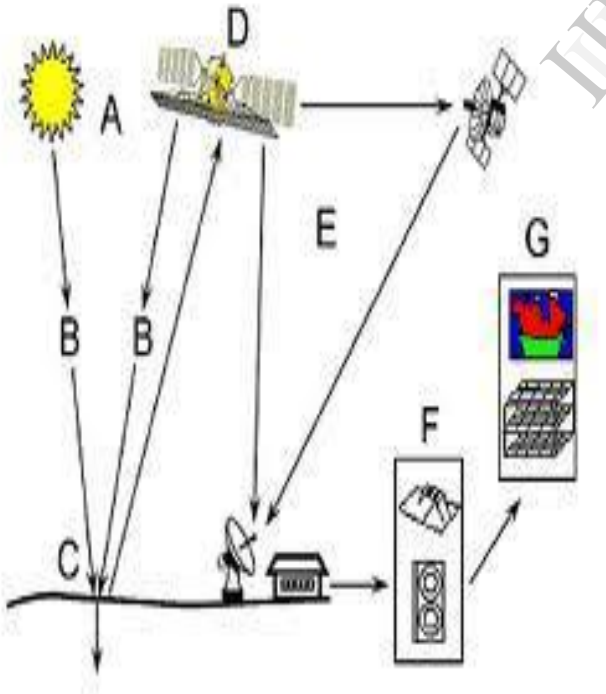


Figure.1: The principle of remote sensing.

- Energy Source or Illumination (A)
- Radiation and the Atmosphere (B)
- Interaction with the Target (C)
- Recording of Energy by the Sensor (D)
- Transmission, Reception, and Processing (E)
- Interpretation and Analysis (F)
- Application (G)

C. Software Model Used For The Study

i. ArcGIS 9.2
ii. ERDAS IMAGINE 8.7

ArcGIS 9.2 is a software model which includes a group of geographic information system (GIS). This software model is produced by ESRI.
ArcGIS is built around the geodatabase, which uses an object-relational database approach for storing spatial data. A geodatabase is a "container" for holding datasets, tying together the spatial features with attributes. The geodatabase can also contain topology information, and can model behavior of features, such as road intersections, with rules on how features relate to one another. When working with geodatabases, it is important to understand about feature classes which are a set of features, represented with points, lines, or polygons. With shape files, each file can only handle one type of feature. A geodatabase can store multiple feature classes or type of features within one file. ArcGIS for Desktop consists of several integrated applications, including Arc Map, Arc Catalog, Arc Toolbox, and Arc Globe. Arc Catalog is the data management application, used to browse datasets and files on one's computer, database, or other sources. In addition to showing what data is available, Arc Catalog also allows users to preview the data on a map. Arc Catalog also provides the ability to view and manage metadata for spatial datasets. Arc Map is the application used to view, edit and query geospatial data, and create maps. The Arc Map interface has two main sections, including a table of contents on the left and the data frame(s) which display the map. Items in the table of contents correspond with layers on the map. Arc Toolbox contains geo processing, data conversion, and analysis tools, along with much of the functionality in ArcInfo. It is also possible to use batch processing with Arc Toolbox, for frequently repeated tasks.

ERDAS IMAGINE 8.7 is primarily used for processing of geo-spatial raster data and allowing the user to display the digital images for mapping in GIS software. This software model allows the user to perform different operations on an image. ERDAS IMAGINE Suite which has grown to support most optical and radar mapping satellites, airborne mapping cameras, digital sensors used for mapping. It was released on a Sun Workstation using SunOS providing a Graphical User Interface to assist in visualizing imagery used in mapping, vector GIS data, creating maps, and so forth.

D. Generation of Thematic Maps

Process flowchart showing generation of various Thematic Maps:

IV. RESULTS AND DISCUSSIONS

The Hattikuni dam is an earthen type of dam. It is constructed for irrigation purpose. The Hattikuni River is major tributary of river Krishna. It is constructed across river Hattikuni near Hattikuni village in the Yadgir taluka of Yadgir district. It provides irrigation facilities over an area of 3100ha (7659.99 acres) of land in Yadgir district. The maximum water level in the dam is of about 415.44m.

The Generated thematic maps are as follows.

A. Location

The study area bidar city is located at latitude 17°55'00"North 77°39'00"East.

B. Transport Network Map

The transportation network mainly the distribution of metalloid and unmetalled roads have been demarcated using 1:55,000 scale SOI topo map and updated with satellite imagery in order to understand the connectivity of various habitations. The locations of villages, towns, are also mapped, incorporating the city boundaries as shown in figure 4.2. Accessibility is an indicator of the level of socio-economic development and depends on the transport network that exists.

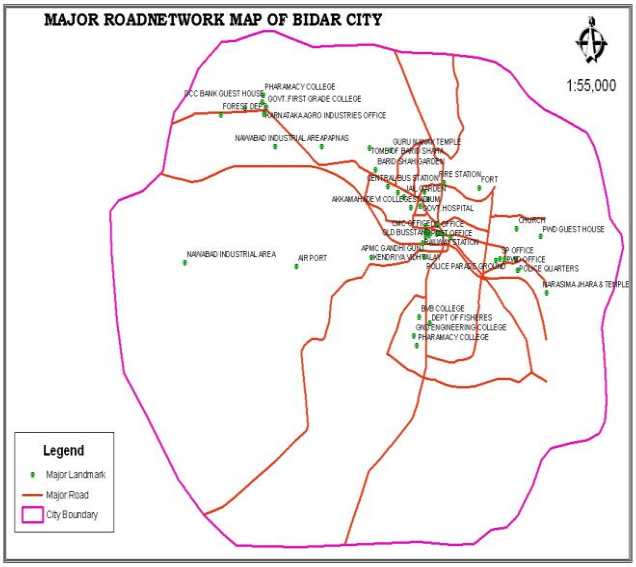
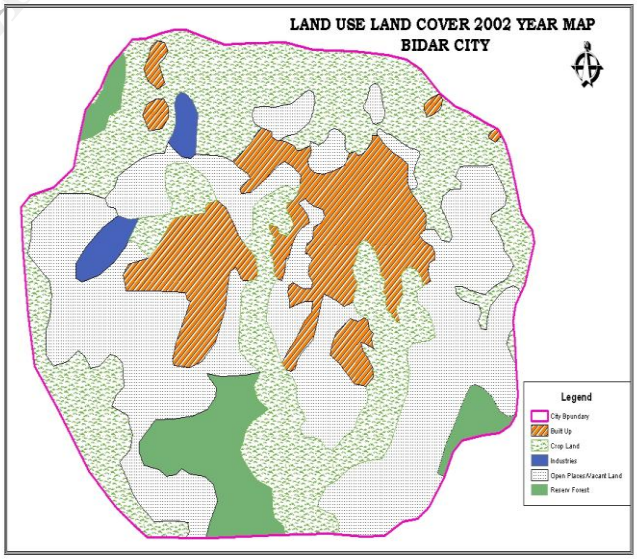


Figure 4.2: Road Network Map

C. land use land cover map

The *land use land cover map* of bidar city is digitalized to scale 1:55000 as shown in below figure 4.3.



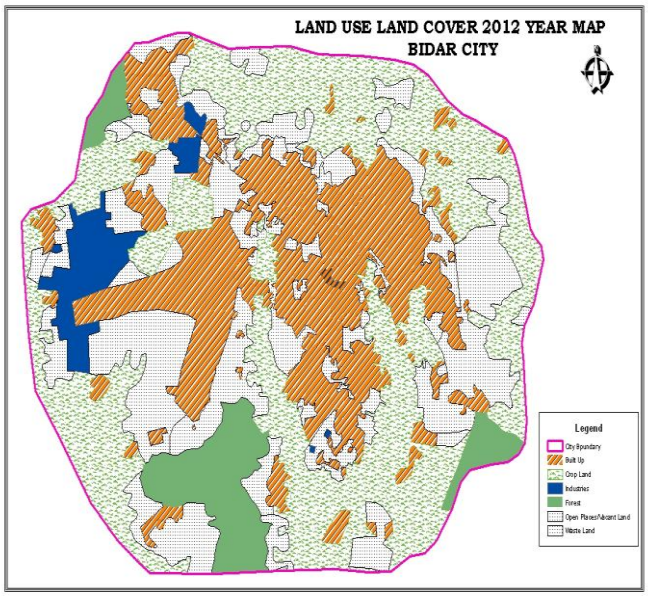


Figure4.3: land use land cover map of bidar city in 2002& 2012

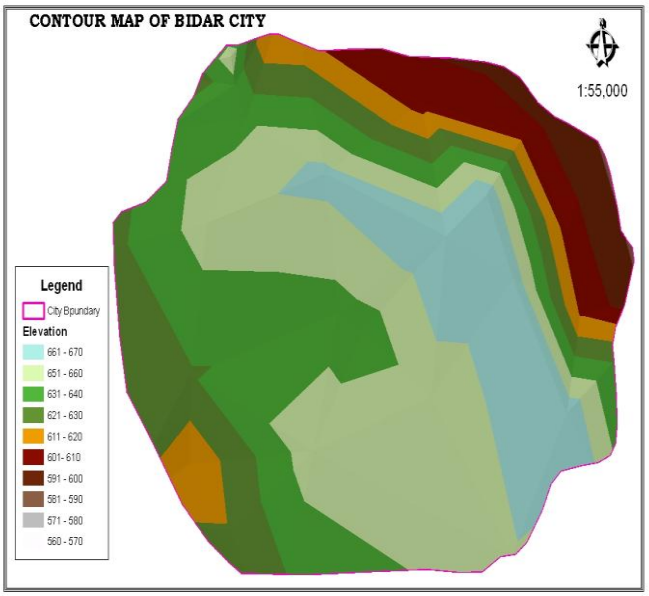


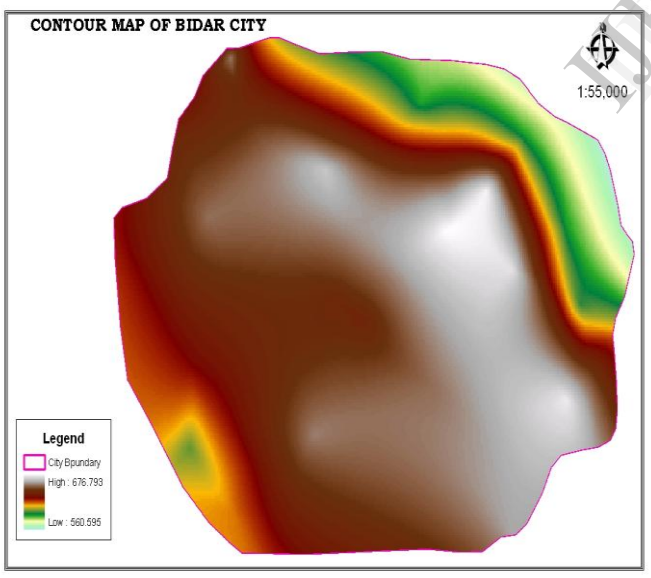
Figure 4.4.The contour map of bidar city in 2002& 2012

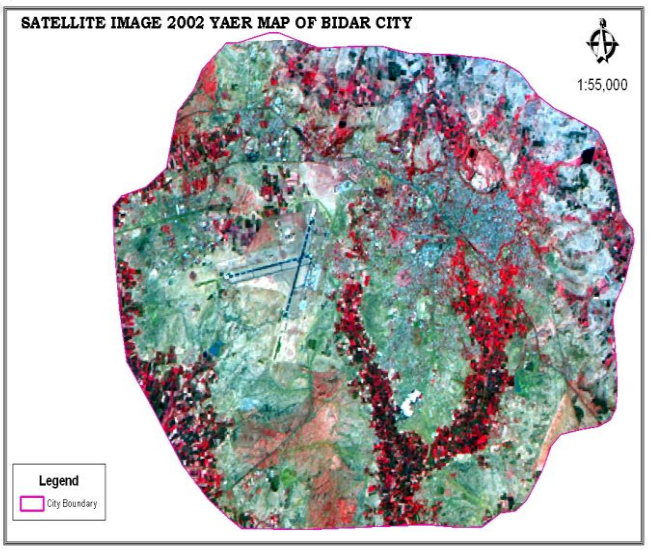
D. Contour Map

The contour map of bidar city is digitalized to scale 1:55000 as shown in below figure 4.4.

E. satellite image map

The *land use land cover map* of bidar city is digitalized to scale 1:55000 as shown in below figure 4.3.





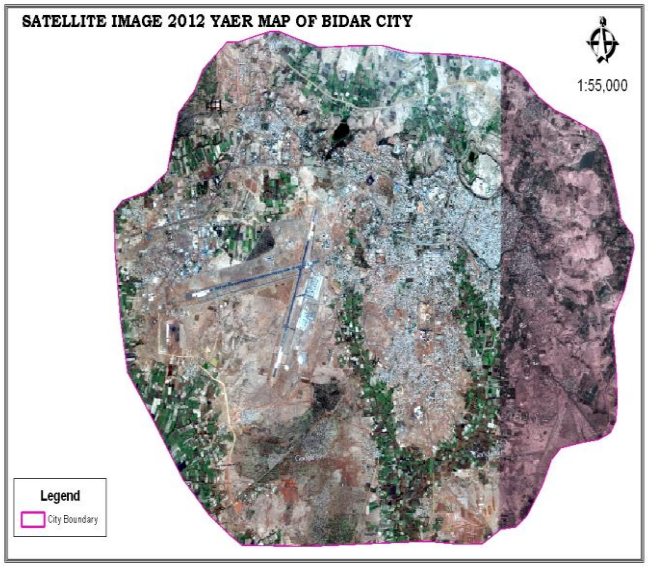


Figure4.5: satellite image map of bidar city in 2002& 2012

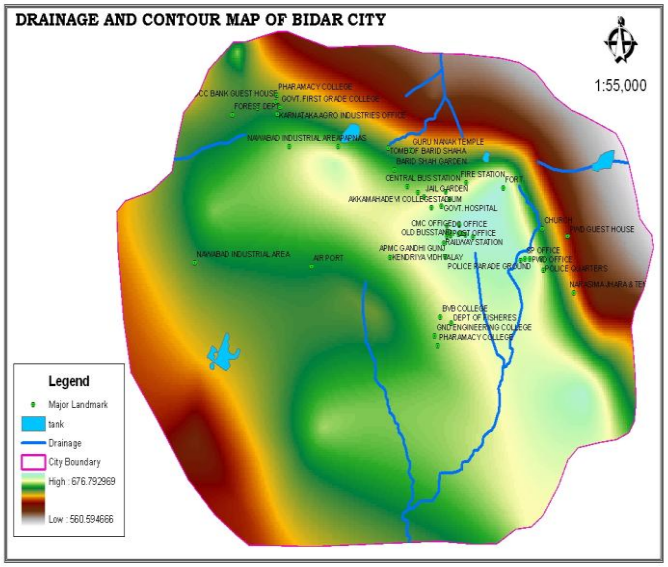


Figure 4.7.The drainage map of bidar city.

F. Toposheet Map

The topoosheet map of bidar city is digitalized to scale 1:55000 as shown in below figure 4.6.

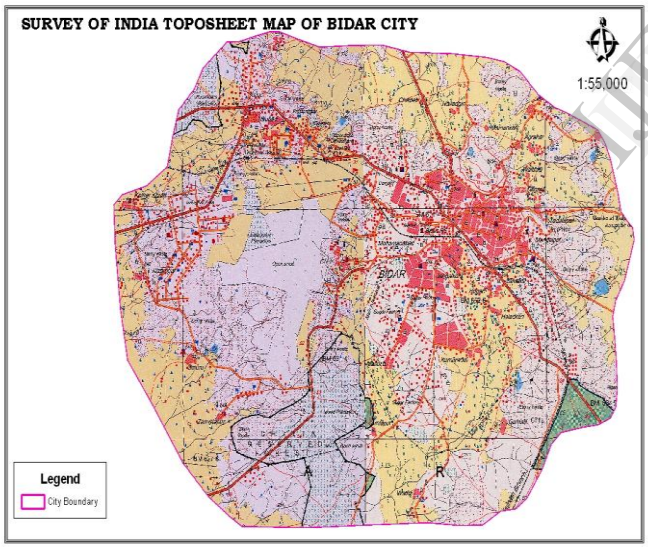


Figure 4.7.The Toposheet map of bidar city .

V. CONCLUSION

Average urban development and increasing land use changes due to changing population and economic growth in bidar city's landscape is being witnessed of late. Rural agricultural land is being converted into urban purposes in all around the city. Since bidar has shown a typical urbanization, industrialization and improvement in information technology sector there is an increasing pressure on land, water and environment.

Further, in the present study, entropy method was applied to monitor and measure the sprawl. Due to increase in built-up area from nearby villages into the City, the built-up area of the City in 2002 was 1584.65ha and it was 2714.05ha in 2012, an increase in built-up area by 1129.4ha. This growth is within 10 years and this rate of growth is very rapid when compared to all other previous years. One of the important Human Development Indices were considered to understand the quality of the society in bidar City in particular and bidar Division in general. It is found that the bidar region is very backward in terms of literacy, education, infrastructure facilities, health and other aspects.

The results of the present project work as discussed in the earlier chapters, clearly demonstrate the potential of Remote sensing and GIS for monitoring urban growth and land use changes which are critical for evolving and updating development plans. The outcome of entropy analysis have enabled in identifying the area undergoing rapid development, and areas suitable for further development, knowledge of which would be very critical for the planning authorities.. This knowledge coupled with an understanding of the current status of the City will ensure that the concerned authorities will incorporate appropriate measures for proper monitoring and management of the urban environment.

VI. ACKNOWLEDGEMENT

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