1.0 INTRODUCTION:

The terms land use and land cover is often used interchangeably, but each term has its own unique meaning. Land cover—refers to the characteristics and surface cover of Earth’s Surface, as represented by natural elements like vegetation, water, bare earth, impervious surface and other physical features of the land. Identification of land cover establishes the baseline information for activities like thematic mapping and change detection analysis. Land use—refers to the activity, economic purpose, intended use, and/or management strategy placed on the land cover type(s) by humans or land managers. Changes in intent or management practice likewise constitute land use change. When used together the phrase Land Use / Land Cover generally refers to the categorization or classification of human activities and natural elements on the landscape within a specific time frame based on established scientific and statistical methods of analysis of appropriate source materials. Land cover is the physical material at the surface of the earth. Land use is the description of how people utilize the land for the socio-economic activity – urban and agricultural land uses are two of the most commonly recognized high-level classes of use. At any one point or place, there may be a multiple and alternative land uses, the specification of which may have a great dimension. Hence, Land use is the activity for which land is used by the man. Remote Sensing data and techniques and Geographical Information System (GIS) provide efficient methods for analysis of land use and land cover aspects and tools for Land Use Land Cover planning and modelling. Satellite Remote Sensing data is usually the most accurate and up-to-date
map available for study the Land Use and land cover which leads to detection of change. Especially with fast growing towns and cities in India, it is best method that can follow up the urban growth/sprawl. With geographical information system flexible geographical database can be generated for the land use and land cover issues. Hence this tool is immensely helpful to bring out the results along with socio – Economic Survey (Spatial and Non Spatial data). Knowledge of both land use land cover is important, for proper planning information on both the above aspects.

According to Meyer W.B., (1995) every parcel of land on the Earth’s surface is unique in the cover it possesses. Land use and land cover are distinct yet closely linked characteristics of the Earth’s surface. The use to which we put land could be grazing, agriculture, urban development, logging, and mining among many others. While land cover categories could be cropland, forest, wetland, pasture, roads, urban areas among others.

The city is undoubtedly one of the most striking expressions of contemporary, or indeed or any civilization. It completely dominates the region in which it lies and in that sense the word may be envisaged as becoming increasingly a collection of towns and cities and the regions they serve and upon which they depend. Cities are “both places and the sum of the people living in them, therefore while their study is a very essence of human geography.

In India a settlement which is a municipality, Corporation, Cantonment or notified area is also classified as a town / city. On the bases of the
population size and other aspects the census of India (1971 & 1981) has classified the towns mainly into five classes viz: Population with more than 1,00,000 as class – I city, with 50,000 to 99,999 as class- II, with 20,000 to 49,999 as class – III city, with 10,000 to 19,999 as class-IV city, with 5,000 to 9,999 as class – V city. Except the special area notified area, any settlement of which the population is less than 5000 is considered as rural settlement. As far as the status of Belgaum city is concerned it falls in the class – I city as per the census of India with a population of 3,99,600 in 2001.

As population grows more and more, space is required to accommodate the growing population and their functions given rise to the development of different functional zones particularly in urban settlements. Thus the development of any settlement is a geographic phenomena and they are the physical and spatial expressions in geography. The land use study of urban settlement forms one of the main base for an understanding of complex functional zones. It is in this view the land use study of Belgaum city has been selected which has a strategic location. That strategic location has given scope for ill feeling between the two states of Karnataka and Maharashtra. This area has physically, economically and socially strengthened since British Period.

1.1 STATEMENT OF PROBLEM:

Spatial distribution of land use/land cover information and its changes is desirable for any planning, management and monitoring programmes at local, regional and national levels. This information not only provides a better
understanding of land utilization aspects but also provides a vital role in the formulation of policies and programs required for developmental planning. Planning means the assessment of future and making provisions for it. Most of the cities and middle order towns are changing their original landscape and filled with urban jungles in a haphazard pattern resulting of loosing urban characteristics by true sense. For ensuring sustainable development, it is necessary to monitor the on going process on land use/land cover pattern over a period of time. Urban planning and development is a continuous process and involves planners, administrators, developers, investors and of course the residents. In order to achieve sustainable urban development and to check haphazard development of towns and cities, it is necessary that authorities associated with the urban development generate such planning models so that every bit of available land is used in most rational and optimal way. This requires the present and past land use/land cover information of the area and pattern with respect to urban settlements and other local resources.

Belgaum city, has witnessed remarkable positive and negative imprints like expansion, growth and developmental activities such as building, road construction, deforestation and many other anthropogenic activities since its origin. This has therefore resulted in increased land consumption and a modification and alterations in the status of land use land cover over time without any detailed and comprehensive attempt (as provided by a Remote Sensing data and GIS). To evaluate this status as it changes over time with a view to detecting the land consumption rate and also make attempt to predict
same and the possible changes that may occur in this status so that planners can have a basic tool for planning. It is therefore necessary for a study such as this to be carried out if Belgaum city can avoid the associated problems of a growing and expanding city like many others in India.

1.2 AIM S AND O B JECTIVES :

1. To study the urban Sprawl and evolution of Belgaum City.

2. To study the population growth in and around the study unit.

3. To know the impact of city on its surrounding zones.

4. Identifying the Land use Land cover pattern.

5. Determining the trend, nature, rate, location and magnitude of Land use and Land cover change.

6. To identify the causes for the drastic change in land use from woodland to urban jungle.

1.3 HYPOTHESES:

1. The growth of urbanization in the city over a time has led to changes in the structure of Land use and Land cover pattern in and around Belgaum city.

2. A fertile hinterland of the city has positive impact on the growth of the city and vice-versa.

3. By identifying the pattern of Land use growth, a practical approach in planning, can be adopted which will be primarily a direct at preservation, conservation, management and exploitation of the natural resources of the city region for benefits of the people in conjunction
with the framework of physical and biological attributes, socio-economic conditions and institutional constraints.

1.4 LIMITATIONS OF THE STUDY:

There is a major limitation as a result of resolution difference. Pan+LISS III image of 2001 has a spatial resolution of 80 meters, whilst the images of 2004 and 2006 have a spatial resolution of 30 meters. Although this limitation has been corrected through image thinning of the 2001, it still prevented its use for projecting into the future so as to have a consistent result. Apart from this, it produced an arbitrary classification of water body for the 2001 classification. Since, the study unit is located in a strategic point between two states, any issue is a sensitive. This has led the researcher to restrict to use non-spatial data.

1.5 SOURCES OF DATA: DATA USED FOR ANALYSIS

The data which are analysed throughout the work of this thesis has been collected from primary as well as secondary sources. The primary data and information has been collected through personal interviews with the concerned officials and the people living in Belgaum city and also in its sphere of influence. For this purpose an extensive fieldwork had been undertaken by the researcher. The secondary data has been collected from various government and semi-government departments, such as Belgaum Development Authority, Municipal Corporation of Belgaum (Chart 1.1).

Different GIS digital data, satellite images, topographic maps and cadastral maps have also been used; Table 1.1 summarizes the data, dating from 1970
to 2008. The satellite data for the Belgaum city study area are supplied by Karnataka state remote sensing Centre, Bangalore. Toposheets are collected from survey of India and cadastral maps are collected from Belgaum Urban Development Authority Office. Remaining things are authentically compiled and computed by the researcher.

**Fig.1.1**

**Sources of Data and Research Methodology Applied**

- **Data**
  - Primary Data
    - Field Observation
    - Interviews
    - Questionnaire
  - Secondary Data
    - Cadastral Map
    - Toposheets (Pre Field LULC Map Generation, Detection, Recognition and Identification)
  - Satellite Data

- **Image Interpretation**
  - Pre Field LULC Map Generation
  - Selection of sample areas for ground
  - Detection, Recognition and Identification
  - Mapping after Recreation
  - Transfer of LULC Details on Base
  - Interpretation Accuracy
  - Map Reproduction and Finalised LULC Map
  - Report

- **Development Interpretation Keys Based on Image**
  - Spatial Arrangement of different features based on Tone, Texture, Shape, Size, Association
  - Area Estimation
Table-1.1: Spatio-Temporal Data used for Developing Land-Use and Land-Cover Data

<table>
<thead>
<tr>
<th>Year</th>
<th>Data types</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>Topographic Map 1:10,000 scale</td>
<td>Survey of India</td>
</tr>
<tr>
<td>1980</td>
<td>Cadastral Map 1:100,000 scale</td>
<td>Belgaum Urban Development Authority</td>
</tr>
<tr>
<td>2001</td>
<td>Pan+Liss III</td>
<td>Karnataka State Remote Sensing Centre.</td>
</tr>
<tr>
<td>2004</td>
<td>Pan+Liss III</td>
<td>Karnataka State remote Sensing Centre.</td>
</tr>
<tr>
<td>2008</td>
<td>Pan+Liss III</td>
<td>Karnataka state remote sensing Centre.</td>
</tr>
<tr>
<td>2010</td>
<td>8-band multispectral imagery</td>
<td>Digital Global</td>
</tr>
</tbody>
</table>

Properties of the Images

- Data type: unsigned 8-bit
- File type: binary
- Data order: BIK
- Projection: Polyconic
- Spheroid: Everest
- Datum: Bangladesh
- Pixel Size: 5.0
- Unit: Meters
1.6 LITERATURE REVIEW:

Many researchers and academicians have attempted to evaluate the future trend of Land Use and Land Cover by analysing the past and present parcel of land. Some of their works (by Indian Scholar and others) have been referred in the present study.

Harold M. Mayer and Kuhn C.F. (1965) in their study “Geography and Urbanism” outlines the major problems with which modern Geography deals. They outlined the geographer’s interest in the areas associated with activities within Urban places, the economic base of cities, the area which cities serve in one way or the other and pattern of distribution of cities.

Singh R.L. (1965) Carried out a study concerned with morphology of towns/cities. The study primarily aimed at understanding of arrangement of functional zones within the city, the importance of individual urban centres and their land use, morphology and environment; and its importance to Urban Geographers for several reasons.


Viswakarma Y. (1970) carried out a study on impact of Jamshedpur and surrounding villages. The study deals with breaking point theory, a stasitical method of delineation of Area of Interest.

Wodeyar A.K. (1980) carried out a study on impact of industries on Devangere and Harihar Region. The study deals with technical methods of delineating the study area with selected indices. Regional demarcation, Zone
of influence, Area of dominance, Area of Predominance and Area of association, morphological development, Land Use, Demographic aspects and growth of city has been explained in detail for the study unit.

Arun Sexena (1989) Explains the most important source of Urban growth - the migration of rural population to urban centres and has been an impute to rapid urbanization, it is perhaps a mechanism which has been responsible for the worlds Urbanization trend. The growth of population and industrial development in the city have kept pace with each other, this perhaps is the reason that the industrial population has a major share in the total working population of the city.

Analysis of land use and land cover changes using the combination of MSS Landsat and land use map of Indonesia (Dimyati, 1995) reveals that land use land cover change are evaluated by using remote sensing to calculate the index of changes which was done by the superimposition of land use land cover images of 1972, 1984 and land use maps of 1990. This was done to analyse the pattern of change in the area, which was rather difficult with the traditional method of surveying.

Also, Adeniyi and Omojola, (1999) in their study of land use land cover change evaluation in Sokoto – Rima Basin of North – Western Nigeria based on Archival Remote Sensing and GIS techniques, used aerial photographs, Landsat MSS, SPOT XS/Panchromatic image Transparency and Topographic map sheets to study changes in the two dams (Sokoto and Guronyo) between 1962 and 1986. The work revealed that land use land cover of both areas
were unchanged before the construction while settlement alone covered most part of the area. However, during the post-dam era, land use/land cover classes changed but with settlement still remaining the largest.

Daniel et al.,(2002) in their comparison of land use land cover change detection methods, made use of 5 methods viz; traditional post – classification cross tabulation, cross correlation analysis, neural networks, knowledge – based expert systems, and image segmentation and object – oriented classification. A combination of direct T1 and T2 change detection as well as post classification analysis was employed. Nine land use land cover classes were selected for analysis. They observed that there are merits to each of the five methods examined, and that, at the point of their research, no single approach can solve the land use change detection problem.

Arvind C. Pandy and M. S. Nathawat (2006) carried out a study on land use land cover mapping of Panchkula, Ambala and Yamunanger districts, Harayana State in India. They observed that the heterogeneous climate and physiographic conditions in these districts have resulted in the development of different land use, land cover in these districts. An evaluation by digital analysis of satellite data indicates that majority of areas in these districts are used for agricultural purpose. The hilly regions exhibit fair development of reserved forests. It is inferred that land use land cover pattern in the area are generally controlled by agro – climatic conditions, ground water potential and a host of other factors.
Fenglei Fan, Qihao Weng and Yunpeng Wang (2007) did a research work on Land Use and Land Cover Change in Guangzhou, China, from 1998 to 2003. The study throughs light on how, Economic development, population growth, and urbanization, has led a major metropolitan in South China, to experience a dramatic land use and land cover (LULC) change over the past 30 years. Fast LULC change have resulted in degradation of its ecosystems and affected adversely the environment. It is urgently needed to monitor its LULC changes and to analyses the consequences of these changes in order to provide information for policymakers to support sustainable development. This study employed two Landsat TM/ETM+ images in the dry season to detect LULC patterns in 1998 and 2003, and to examine LULC changes during the period from 1998 to 2003. The type, rate, and pattern of the changes were analyzed in details by post classification method. LULC conversion matrix was produced in order to explore and explain the urban expansion and LULC change.

Ohio Phosphorus (2008) carried out a work on Evaluation of Land Use/Land Cover Characteristics in Ohio Drainages to Lake Erie. It deals with Spatio–Temporal analysis with the help of Satellite image. The study shows the negative as well as positive growth that has taken place during seven decades in the study unit.

Wodeyar A.K. (2009) carried out a work on land use and land cover of Dheradun. The study deals with spatio-temporal change analysis of Dehradun between 1998 and 2004. The study is done using remote sensing and GIS techniques.
1.7 ORGANIZATION OF THE STUDY:

To study the meaningful and multifaceted spatial development, it is proposed to derive the research design based on sound philosophy and scientific methodology (chart 1.2). It is truesome that results are any better than methods by which they are obtained.

The present research work has been divided into six chapters and presented by assigning each chapter to a specific problem. The plan of the whole research work is as follows:

**The First Chapter** gives the introduction of the study, which includes introduction, statement of problem, significance of study, aims and objectives, hypotheses, limitation of the study, data used for analysis, organisation of the study which provides the necessary perspective of the study and literature review.

**The Second Chapter** provides a brief introduction regarding environmental setting of the study area and scientific method of delineating area of interest, which includes Delimitation of the study area, Regional Demarcation, zone of Influence (a) Area of Dominance (b) Area of Pre-Dominance (c) Area of Association. Geographic personality like Topography, geology, drainage, soil characteristics, vegetation and Climatic characteristics has been discussed too.

**The Third Chapter** gives information related to the evolution and growth of Belgaum city. It provides detail information about the history and growth of the city. It shows the phase wise growth of the city and its administrative units both, Municipal Corporation (MC) as well as Belgaum Cantonment (CB). It gives a picture of land values of the study unit and describes the villages within the study unit.
**The Fourth Chapter** is concerned with the study of Demographic dimensions and occupational pattern of the city. It highlights growth of population, spatial distribution of population, land and population ratio, literacy ratio, sex composition, Age sex composition, occupational structure of the city and dependency ratio.

**The Fifth Chapter** deals with the detailed information of land use and land cover of the study area. This includes introduction, methodology, Importance of Remote Sensing and GIS in Land Use and Land cover analysis, land use and land cover distribution, land use and land cover change: 1970, 2000, 2004 and 2008, three levels of classification for the year 2010 is done. It also includes the changes in two phases, the first from 1970 to 2004 and second from 2004 to 2010. A detailed study of Land use and Land cover for the central Business district has been done.

**The Sixth Chapter** summarizes the whole work and concludes with suggestions. The work cited and the reference has been given to the end of each chapter.
CHAPTER-I: REFERENCES


Idrisi 32 guide to GIS and Image processing, volume 1, Release 2. P. 17.


Weblography :

www.en.wikipedia.org/wiki/Urban_geography
www.library.csun.edu/dhelfer/Urbanweb
www.books.google.co.in/books?isbn=0415462029...
www.planning.org
www.geog.ubc.ca/research/urban_geography.html
www.books.google.com›Science›Earth Sciences›Geography
www.wileygeohottopics.com/tag/urban-geography