

# Land Use/Land Cover Characteristics in and Around Suryapet Town, Nalgonda District for Urban Planning

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## Abstract

The land use/land cover pattern of the region is an outcome of natural and socio-economic factors and their utilization by man in space and time; land becoming a scarce resource due to immense pressure on agriculture and demographic. Hence information on land use/land cover and possibilities for their optimal use is essential for the selection, planning and implementation of land use schema to meet the increasing demands for basic human needs and welfare. Remote sensing techniques provide valuable and up to date information on natural resources. GIS with the capability of integration multi-layer information obtained from both Satellite remote sensing and other conventional sources has proved to be effective tools in planning and detecting land use/land cover changes for Land Use development. The High Resolution Satellite Data is IRS-P6 LISS-IV is used for getting quick and useful base line information on the parameters like land use/land cover, Drainage, Roads etc. The study area is taken for 10 km buffer from Centre of Suryapet town, Nalgonda District. The main objective of the study is to produce the Land Use map, detecting various units and make it use for future planning. About 78.63% of the total area is covered by agriculture; 6.64% under waste land; 7.74% is covered under water bodies; Mining and Industries by 1.42% and Suryapet town urban agglomeration is covered by 2.22%. The city will become a trade Centre in future as it is connected well by road network. NH-65 is passing through the town. The catchment of Musi reservoir's left canal is covering on the north-western side of the town. In future the industrial activity may be proposed in waste lands on the north side of the town as the Musi reservoir source water exists nearby. The sites for Waste dumping may be selected in future by using other ancillary data like wind direction etc. Further Infrastructure development may be proposed towards eastern side of the town. As it is proposed to be the district headquarters in near future, hence a detailed planning will be possible in projecting future land use/land cover scenarios using appropriate models.

**Keywords:** Land use; Urban planning; Remote sensing; GIS; Town

## Introduction

Suryapet town has historical recognition as gateway of Telangana. Nickname is Bhanupuri. It is lies on the NH 65 and equidistant of the Hyderabad and Vijayawada. Suryapet is India's first waste-complacent city, and Best municipality award by central govt. Suryapet town area 54 sq.km, population (2011)-105250, sex ratio is 1000:932. Literacy-85% and climate is tropical climate. Avg. annual rain fall is 1821 mm and avg. Temp 32°C. Town area is mainly hard gravel soils. Natural slop of the town is from North to South. Suryapet Davison Occupation is Main Agriculture; Musi left canal passes through this buffer from West to East.

## Scope of the study

The scope of the study involves preparation of the report on land use/land cover details of the Core Zone (Suryapet town area) and the buffer zone (10 km radius from the town area boundary) using latest possible satellite imageries. The scope includes studying the topography and the drainage pattern [1].

## Location of the project

The Suryapet Town is located in Eastern part of the Nalgonda district. This Mandal covered in Kesaram, Kasarabad, Imampet, Tallakammampadu, Circlepet, Pillalamarri, Balemla, Ramannaguda, Tekumatla, Venkatrampur, Pinnaipalem, B-Dacharam villages. The location of the Suryapet Town falls under Survey of India Toposheets No 56O/12 and the geographical co-ordinates of the lease area as follows:

North-West Corner: 17°09' 31.56" (Latitude), 79°36' 37.85" (Longitude),

South-East Corner: 17°07' 57.46" (Latitude), 79°37' 55.82" (Longitude).

The 10 km buffer Zone of the Suryapet is falling in 56O/12 SOI top sheet. The buffer zone is covered in Suryapet, Chivvemla, Kethapalle, Atmakur, Penpahad and Vemulapalle mandals of Nalgonda District.

Location map shown in Figure 1.

## Tools and resources

In order to meet the project requirements, we are has acquired the following satellite data for the study area from NRSA, Hyderabad.

For 10 km Buffer Zone and Core Town Area:

## Data

Satellite: IRS Resourcesat2,

Sensor: L4 FX,

Path: 101,

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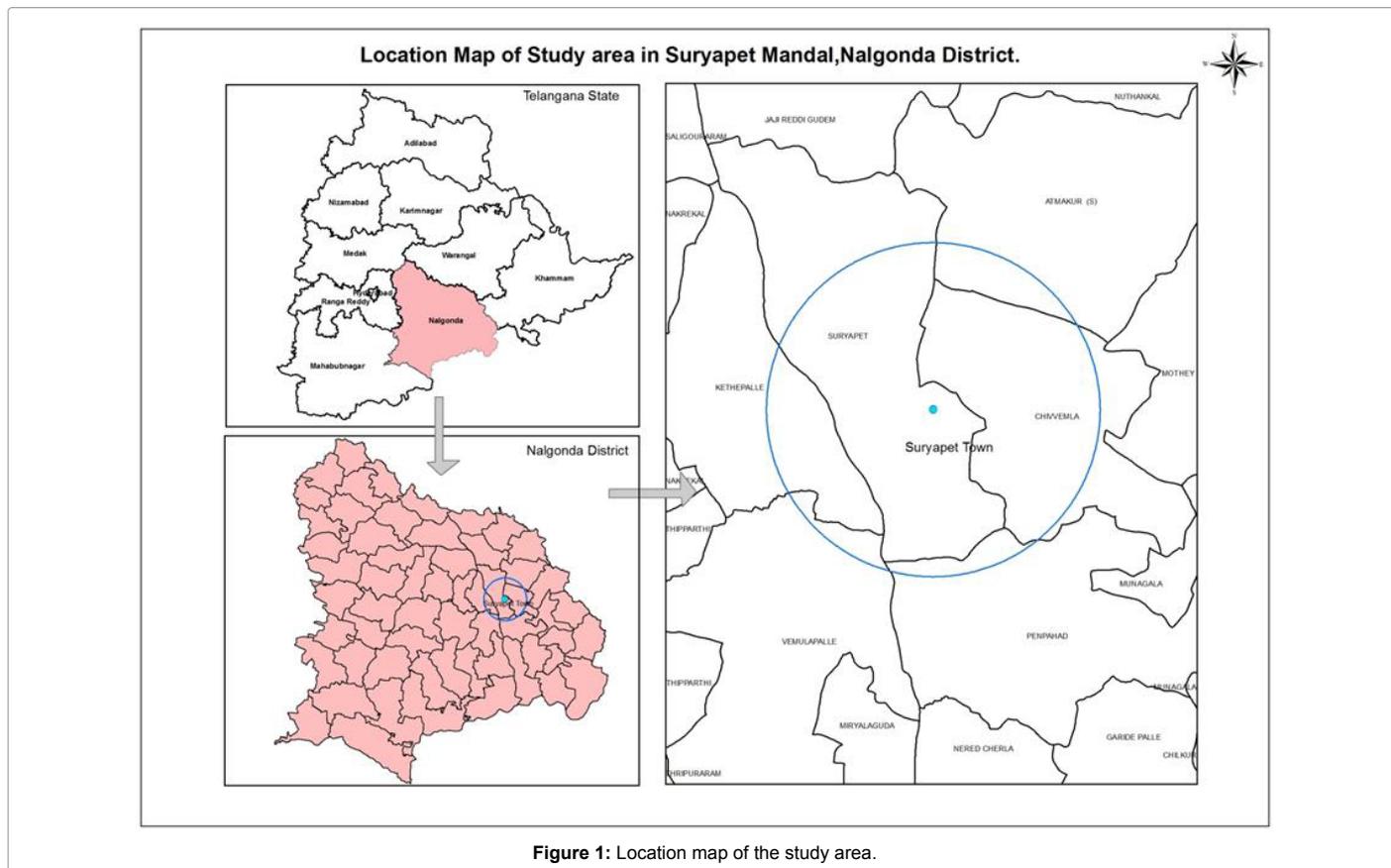


Figure 1: Location map of the study area.

Row: 061a,

Spatial Resolution: 5.8 m,

Date of pass: Dec-2012.

The merged data of IRS R2 Liss-IV and IRS PV Cartosat Pan A data is shown in Figure 2.

### Limitations

The limitations of remote sensing, image processing, geographical information systems, cartography and GPS are applicable in this study.

### Methodology

The Digital Image Processing has been performed using ERDAS Imagine software tools and Garmin 12 GPS has been used for Ground truthing.

The IRS Resourcesat2 Liss IV Multidated (Kharif and Rabi) satellite data has been geometrically corrected with respect to the Survey of India Toposheets. To carry out the geo-referencing, ground control points (GCPs) were identified on the maps and raw satellite data [2]. The coefficients for two co-ordinate transformation equations were computed based on polynomial regression between GCPs on map and satellite data. Alternate GCPs were generated till the Root Mean Square (RMS) error was less than 0.5 pixels and then both the images were co-registered.

This IRS Resourcesat2 Liss IV (Kharif and Rabi) satellite data has been used for the Land Use Land Cover Analysis of Buffer Zone. The satellite image is analyzed digitally by the method of supervised classification with necessary Ground truthing using the reference map

as well as GPS instrument. The hybrid method of Digital Interpretation and visual interpretation has been used to classify the Core Zone to achieve accuracy levels.

The topography of the buffer zone has been studied using the Survey of India Top sheets considering the elevations and the drainage pattern including drainage orders.

### Study Area

#### Topography

The 10 km buffer zone from the core zone boundary i.e. Suryapet area is mostly undulated with different slopes, the elevation values ranges between 150 m-320 m from amsl. Almost half of the buffer zone has gently slope. The Suryapet town has the elevation contour values within the range of 165 m-175 m from amsl. About south east part of the buffer zone covered with Hills and pediment with scrub, and also southern part of the buffer zone is dykes and pediments. Musi River is passing through the Western part of the buffer zone. The buffer zone is covered with streams, which are up to 5th order. Drainage network is passing through North to south. Musi left bank canal and right bank canals passing this buffer zone [3].

**Land use/Land cover classification for buffer zone:** Digital image processing was carried out to delineate various land use/land cover categories in 10 km buffer Zone viz. built up area, crop areas, scrub, land with or without scrub, water bodies by assigning necessary training sets, which were identified based on tone, texture, size, shape pattern and location information. Necessary care has been taken to identify proper Land use class, where there is conflict between signatures of various classes. The interpreted map was verified on ground at limited

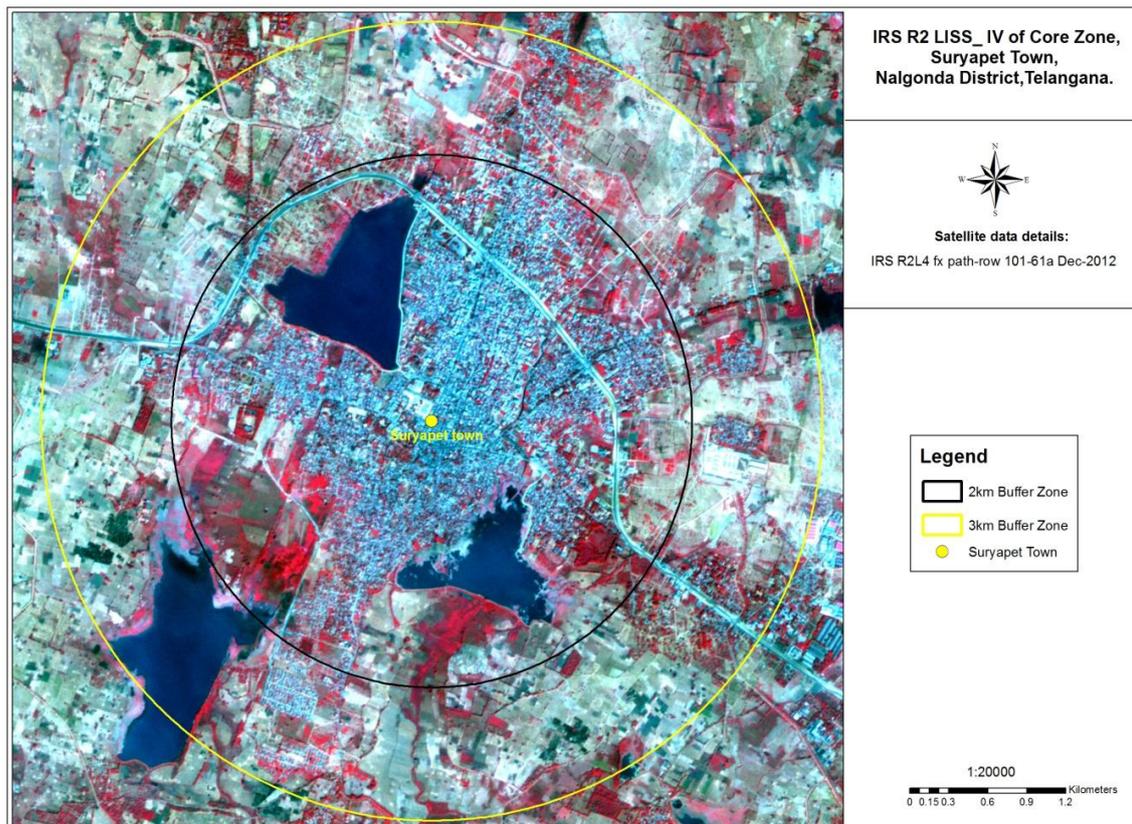


Figure 2: IRS resourcesat2 Liss-IV data of study area (3 km buffer).

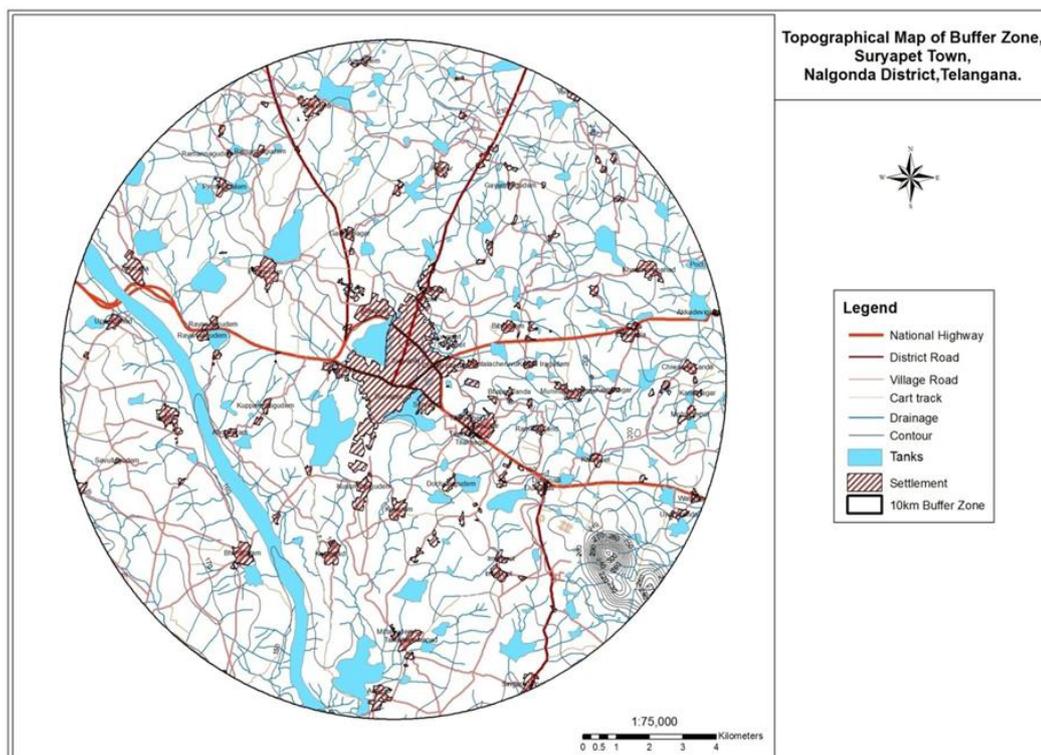


Figure 3: Topographical map of buffer zone.

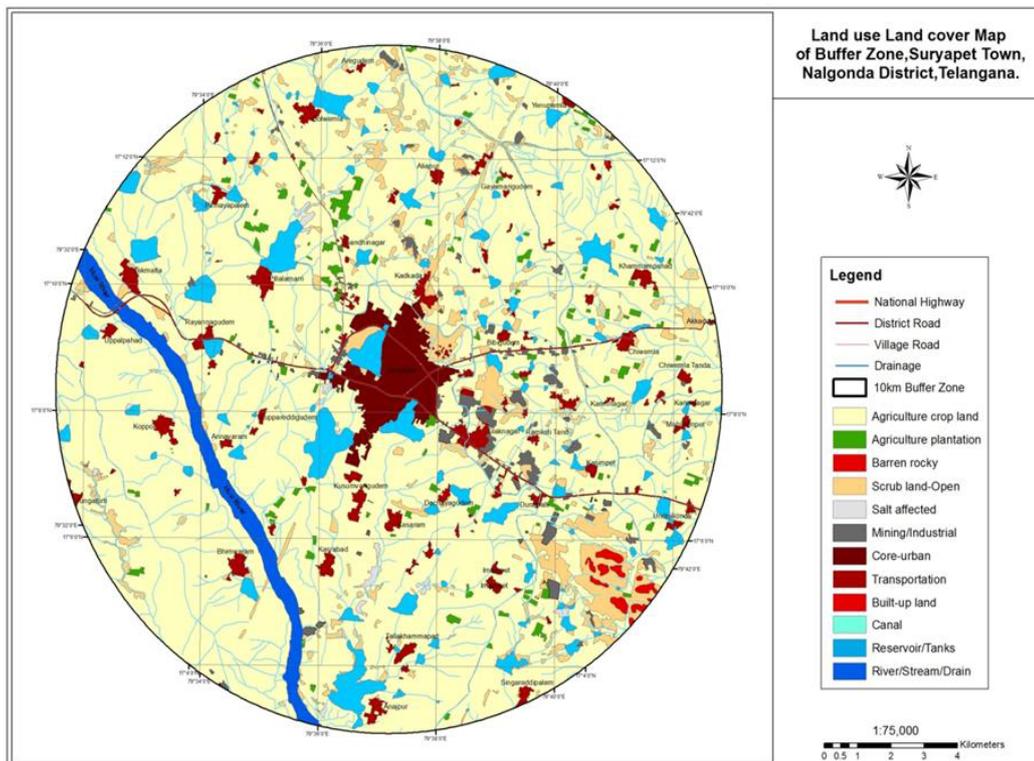


Figure 4: Land use land cover details of 10 km buffer zone.

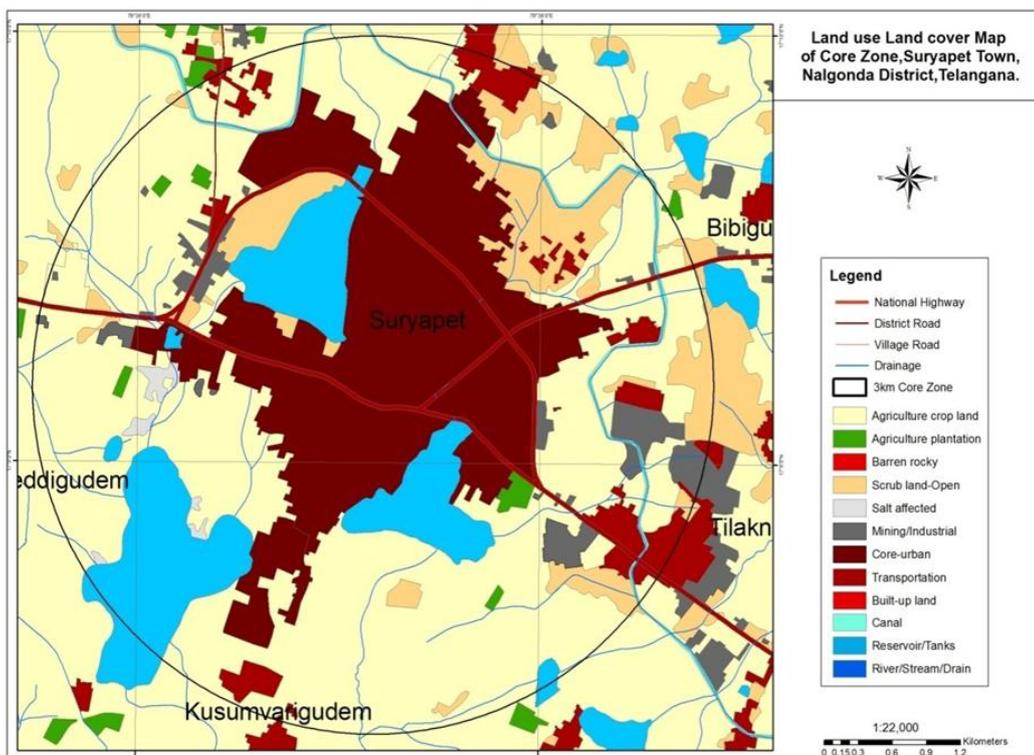


Figure 5: Land use land cover details of core zone.

points and final land use/land cover map was prepared [4].

**Various land use classes identified:** The buffer zone can be broadly identified into built-up areas, agriculture areas and other land with or without Scrub. The definitions of various land use classes are given below.

**Agriculture area**

*Single crop land:* The areas where farmers practice cultivation for single season (Kharif) in a year.

*Double crop land:* The areas where farmers practice cultivation for two seasons (Kharif and Rabi) in a year.

*Fallow:* The areas not cultivated in current year/years.

Plantations: The private areas with horticulture/other plantations.

**Waste lands**

*Areas with/without scrub:* Generally waste lands, non-agriculture, non-forest areas covered with or without scrubs.

*Barren lands:* Land without any usage and without scrubs and sometimes they are rocky exposed areas.

**Built-up area:** The villages/colonies/urban area will be shown in this class.

**Mining areas:** The areas, where the mining activity is being carried out/has been done are shown in this class.

**Industrial area:** The industrial Establishments will be shown in this class.

**Water bodies:** The oceans, rivers, streams, lakes, tanks, reservoirs, canals etc. will be identified in this class.

**Land use land cover details of buffer zone:** The image of the study area around 10 km. from Town site (Core zone boundary) as captured by satellite is presented in Figures 3 and 4. The Land use land cover in this study area is depicted in Figure 5. Total 78.63% of the buffer zone is covered in Agriculture area under various crop categories and 6.64% of the area is under waste land. And 7.74% of the area is under Surface water bodies. Mainly this area fully irrigated under Musi reservoir command area [5]. 1.42% of area under mining and industries. Suryapet surroundings plastic, Iron, poultry and chemical factories in established, so this area is good source for industrial establishment. Suryapet Urban area is (691 hectares) 2.22% of the total buffer area. National Highway and State highways are passing through this buffer. This NH connecting Vijayawada-Hyderabad-Mumbai. The various classes and their respective areas with percentage of coverage are given below in Table 1 and Figure 6.

**Recommendations**

The main objective of the study is to produce the Land Use map, detecting various units and make it use for future planning. About 78.63% of the total area is covered by agriculture; 6.64% under waste land; 7.74% is covered under water bodies; Mining and Industries by 1.42% and Suryapet town urban agglomeration is covered by 2.22%. The city will become a trade Centre in future as it is connected well by road network. NH-65 is passing through the town. The catchment of Musi reservoir’s left canal is covering on the north-western side of the town. In future the industrial activity may be proposed in waste lands on the north side of the town as the Musi reservoir source water exists nearby. The sites for Waste dumping may be selected in future by using other ancillary data like wind direction etc. Further Infrastructure

| Land Use Land Cover Class | Area of Sub Class        |            |       |
|---------------------------|--------------------------|------------|-------|
|                           | Area in Ha               | % of Usage |       |
| Agriculture               | Crop Land                | 24277      | 77.28 |
|                           | Plantations              | 424        | 1.35  |
|                           |                          |            | 78.63 |
| Waste Land                | Barren Rocky             | 100        | 0.32  |
|                           | Land with/ without scrub | 1889       | 6.01  |
|                           | Salt Affected Land       | 99         | 0.31  |
|                           |                          |            | 6.64  |
| Surface Water             | Canals                   | 167        | 0.53  |
|                           | Reservoir/ Tanks         | 1604       | 5.11  |
|                           | River/ Stream/ Drain     | 661        | 2.1   |
|                           |                          |            | 7.74  |
| Others                    | Built Up Land            | 902        | 2.87  |
|                           | Mining/ Industrial       | 441        | 1.4   |
|                           | Urban Land               | 691        | 2.2   |
|                           | Transportation           | 161        | 0.51  |
|                           |                          |            | 6.98  |
| Total Area                |                          | 31416      | 100   |

Table 1: LU/LC details of 10 km Buffer zone.

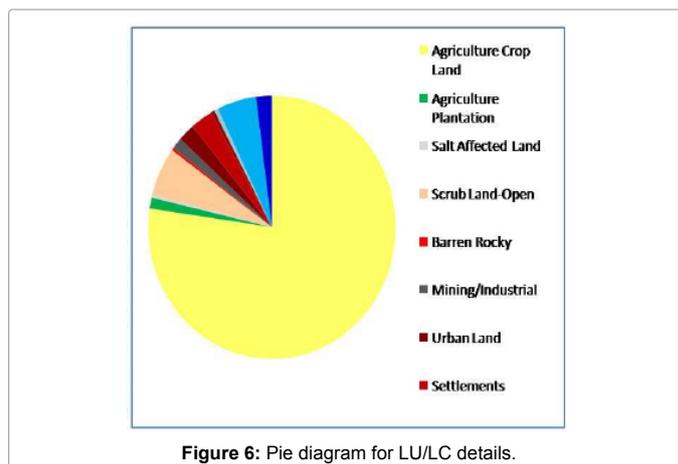


Figure 6: Pie diagram for LU/LC details.

development may be proposed towards eastern side of the town. As it is proposed to be the district headquarters in near future, hence a detailed planning will be possible in projecting future land use/land cover scenarios using appropriate models.

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