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Land use/Land cover Mapping of IGNP Command Area in Bikaner District of Rajasthan

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Abstract

The pressures on the natural resources have tremendously increased over years by man's greed for commercialization and livelihood of local people. Devoid of regeneration, population and wide scale tree felling depleted the natural re-sources to a level, which posed a problem for the very sustenance of man. Therefore, it is imperative to understand the consequences of manmade initiatives and to devise proper strategies to counteract these detrimental effects to keep a balance of the environment, ecology, green cover, and human livelihood. Since time immemorial Environment and Development are going together as two wheels of a cart. These two aspects are the determinants of human welfare and prosperity. The present study demonstrates the scope, methodology and outcomes of land use/land cover mapping of IGNP command area in Bikaner district. IRS-IC/ID, LISS-III data was interpretated using hybrid approach for the mapping of various land use/land cover categories on1: 50,000 scale. IGNP Command area land use/land cover map will prepare. The overall land use/land cover classes in the study area are divided into six categories. The category wise wastelands in the study area are built up land (0.62322), agriculture land (19.3447), forest land (0.0650), Wasteland land (78.1550), water bodies (1.7264), and wetland (0.0857). These maps are very useful for command area planning and can be used for taking suitable rehabilitation measures like plantations, afforestation etc.

Keywords: Land use, Land cover, Satellite imagery, Remote Sensing, Geo-informatics, IRS-ID/LISS-III.

Introduction

Land cover has gone under continuous change for millennia. The change has occurred through the use of fire for game hunting and clearance of patches of land for agriculture and livestock production, since the advent of plant and animal domestication. This is because human's production demands cannot be fulfilled without modification or conversion of land covers.

In the past two centuries, the impact of human activities on land has grown enormously because of popula-tion increase, technological development and the re-quirements the125reafter, altering entire landscapes, and ultimately impacting the biodiversity, nutrient and hydrological cycles as well as climate (De Sherbinin, 2002), especially in the developing world. The land use/land cover pattern of a region is an outcome of natural and socio –Economic factors and their utiliza-tion by man in time and space. Land is becoming a scarce resource due to immense agricultural and demo-graphic pressure. Hence ,information on land use / land cover and possibilities for their optimal use is essential for the selection, planning and implementation of land use schemes to meet the increasing the dynamics of land use

resulting out of changing demands of increasing population. Land and land resources are important factors on which human existence and economic development are based. Some of the most profound changes in the landscape have arisen from direct decisions by man concerning land use from changes in cropping patterns, afforestation and deforestation to modification of water resources. These in turn have affected both the quality of environmental resources and the sustainability of a lasting diversified food chain. Land is one of the most important natural re-sources of the earth's surface like; air water and soil, rather it support to them. Proper methods of utilization and conservation of land resources are essential to keep pace with requirements of life activities in a society.

Land use: Land use is defined where the man activities are dominate and how the land is used is called as land use, such as settlements, agricultural land.

Land cover: Land cover is basically defined by that features which are permanent of earth surface and their chances of modification are less called as land cover. Land cover implies the physical or natural state of the Earth's.

Importance of GIS and Remote Sensing in Land use/ Land cover Studies

The application and integration of multi-sources of information represent a major goal to achieve more satisfactory results in the assessment of many environmental issues. The use of new technologies and science developments such as Remote Sensing, Geographic Information System, field data collection and database development have made it possible to approach the study of land use land cover and its impact from a multi-disciplinary perspective. Remote Sensing, currently offers an important tool to the synoptic and timely evaluation of natural resources over large areas. Geographic Information System (GIS) has emerged as a powerful tool for handling spatial and non-spatial geo-referenced data for preparation and visualization of input and output, and for interaction with models. Further, various information layers pertaining to the socio-economic can be analyzed and presented in the form which ultimately assists in evolving judicious management and conservation strategies

Study Area

Bikaner is a District in the northwest of the state of Rajasthan in northern India. Bikaner district is located between the 27° 11′ north to 29° 03′ north latitudes and 71° 54′ east to 74° 12′ east longitudes. The district is located in the north-western part of Rajasthan and occupies an area of 30289.62 km². The Indira Gandhi Canal completed in 1987 has allowed the farming of crops such as mustard, cotton, Groundnut, wheat and vegetables. Other industries include wool production and the mining of Gypsum, plaster of Paris and bentonite. The city of Bikaner lies within the Western Desert Region of the state of Rajasthan. The scarcity of water has affected the vegetation of the area. Similar to other desert areas, mostly cactus and thorny bushes grow in this region. The soil type of the area is basically alkaline. Saline soil with calcareous base is also seen in Bikaner. Some seasonal dwarf trees, little type of shrubs and grasses also grow here. Agriculture in this part of Rajasthan includes few Rabi and Kharif crops like wheat, mustard, Bajra and pulses. During the summer, the temperature in Bikaner rises very often above 48° Centigrade. The extreme heat becomes unbearable but humidity is not so high. Winter in Bikaner witnesses a drastic change when temperature comes down to 4° to 5° Centigrade. Any normal summer day in Bikaner is very hot but the evening is quite cold.
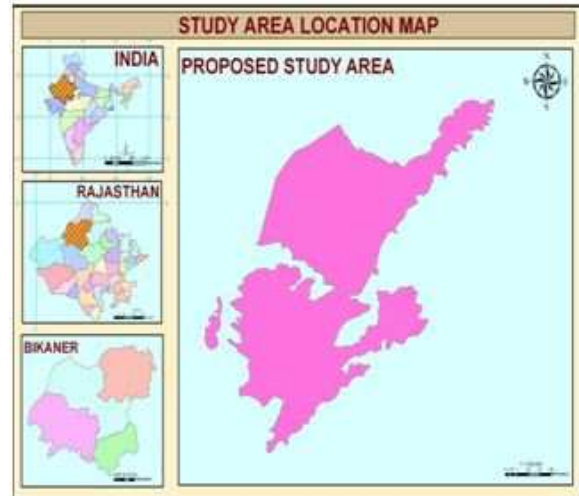

Figure.-1:- Study Area Location Map

Materials and Methods

Materials

a) Satellite Data: Indian Remote Sensing Satellite (IRS) IRS-LISS-III (Ground resolution: 23 meters) digital data used for the study. These acquired from National Remote Sensing Agency, Department of Space, and Government of India. Toposheets No TOPOSHEETS NO. 44D4 to 44D12; 44D15, 44D16, 44A1, 44A2, 44A5, 44A6,44A13, 44H2, 44H4, 44H5, 39P16 and 40M13 were also used for the study.

b) Collateral Data: Available information such as latest published reports, papers and maps used for the reference purposes. Surveys of India topographical maps also used.

c)Software Used
1. Imagine ERDAS: for data importing and geo-   referencing.
2. ARC/INFO 9.1 Version: for digitization, preparation   of land use/land covers layer and creation of database.
3. ARC/ MAP: for composition and generation of maps
4. Microsoft Access: for database preparation.

Methodology

The procedure adopted in this project work forms the basis for deriving statistics of land use/land cover dynamics and fallowing methods.
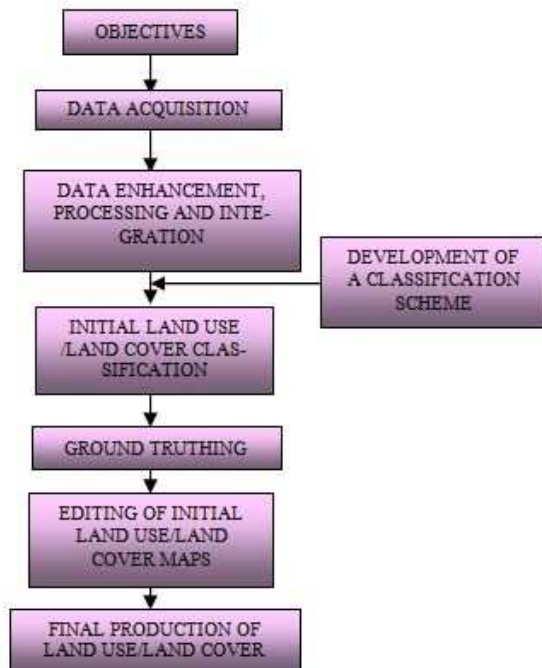
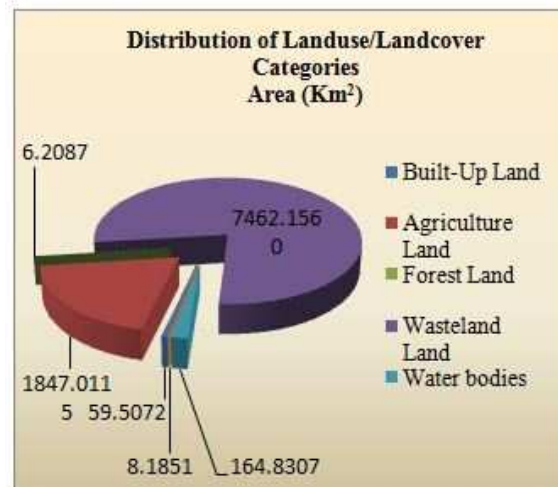59.50717 km^2**.** It is the 0.6232 percent of the whole study area.

Figure.-3:- Distribution of Land use/Land cover Categories

Agriculture land: The agriculture lands are primarily used for farming and production of food, fiber, and other commercial and horticultural crops. The total area of agriculture land in the study area is 1847.011495 km^2. It is the 19.3443 per cent of the whole study area.

Forest land: These are the areas bearing an association predominantly of trees and other vegetation types (within the notified forest boundaries) capable of producing timber and forest produce. The total area of forest land in the study area is 6.208717 km^2. It is the 0.0650 per cent of the whole study area.

Waste land: Land, which in its present state does not or only processes limited ability to support vegetation, is called waste land. Eroded soil, ravine, rock, sand, scrub land, undulated land etc. and active depositional features are included in this category. The total area of waste land in the study area is 7462.156 km^2. It is the 64.2519 per cent of the whole study area.

Water bodies: Both man-made and natural water features covered with water are included in this categories i.e. rivers/streams, lakes, tanks and reservoirs. The total area of water bodies land in the study area is 164.830739 km^2. It is the 1.72625 per cent of the whole study area.

Wet Land: The total area of wetland is 8.18506 km^2. It is the 0.0857 per cent of the whole study area.

Figure.-2:- Methodology Flow Chart

Result and Discussion

The study area covers the IGNP command area in Bikaner district of Rajasthan state. The total geographical area of IGNP command in Bikaner district is 9547.89 km2. Total six categories of land use/land cover were identified in the study area. Which are Builtup land, Agriculture Land, Forest Land, Wasteland and Wetlands. The wasteland category acquired major area. The description of the land use/land cover categories and their areal extent is given below:

CATEGRIES	AREA (km sq)	AREA (%)
Built-Up Land	59.50	0.62
Agriculture Land	1847.01	19.34
Forest Land	6.20	0.06
Wasteland	7462.15	78.15
Water bodies	164.83	1.72
Wetland	8.18	0.08
Total	9547.89	100.00

Table- 2: Area under different Landuse/Land cover categories

Built-up land: The built-up lands are areas of human habitation developed due to non-agricultural uses like building, transport, communication, and utilities in the association with water, vegetation and vacant lands. The total built-up land of the study area is
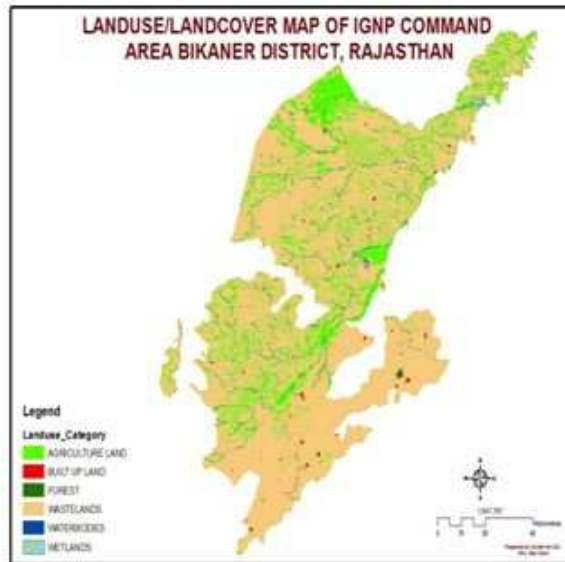
Figure.-4:- Land use/Land Cover Map

Conclusion

The study demonstrates the potentiality of satellite remote sensing technique for preparation of more consistent and accurate baseline information on land use/land cover. Interpretation of IRS 1C/1D, LISS-III data supported by ground truth information revealed that there are six types of categories of land use/land cover in the study area. These are built up land, Agriculture Land, Forest Land, Wasteland and Wetlands. Based on the work carried out during this study, following conclusions have been derived:

- The wasteland is (64.25%) lying unused and require to develop for agriculture use and check the extent of sandy area (64.193%) otherwise they will develop further.
- The dried up Lakes/Ponds (0.00245%) of the total area require immediate attention for taking up suitable measure for deepening to increase the storage capacity.
- The canal contains (1.68%) of total area in Bikaner district, so there is need to planning for canal extension in the district.

The spatial information generated on land use/land cover on 1:50,000 scale can be utilized for various reclamation measures and other uses for the district level planning.

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