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Landuse/ Land cover Analysis in Hamal Watershed of North western Himalaya's using Remote Sensing & GIS

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Abstract - *The structure, functions and dynamics of most landscapes across the world are mainly determined by their land use and land cover. Mapping land use/ land cover changes at regional scale is essential for wide range of applications, including landslides, erosion, land planning, global warming etc. Rapid and extensive modifications of land use/ land cover due to accelerated human activities have largely resulted into changes which have wider ramifications due to the sensitiveness of these fragile ecosystems of mountainous areas. The study area is environmentally fragile region facing tremendous and undue pressure on its natural resources. Watershed as a resource region clearly reveals the impact of developmental activities. The watershed is therefore an ideal spatial management unit for analyzing land dynamics as well as integrated development of natural resources potentialities of these sensitive systems. Remote Sensing satellite* IRS P6 LISS III (2012) *data have been used in this study along with information collected from the field for preparing the land use / land cover classes. Suitable ground control points were selected for ground truthing and validation of data. Varied land use/ land cover classes were identified ranging from moderate to dense forests to orchards to snow cover. An important element of this research paper has been advanced and improved data products and data collection systems. The thrust of the present research in mountainous areas revolve around better understanding of land use/land cover analysis and suitable resource management in the Hamal Watershed of Kashmir.*

Key words: **Watershed, Land Use, Land Cover, Ecosystems, Land Planning, Remote Sensing**

1. INTRODUCTION

Mountain environment forms an integral part of the earth covering about 27 percent of the world's total land area, accommodating and supporting 20 per cent of world's total population. Besides large chunk of population being alien to mountain environment derive a varied range of goods and services like wood, energy, water, environmental and biological sustainability, recreation and so on. Despite unique and similar physical environment of mountainous environment, micro variation occur mostly in climatic parameters of temperature and precipitation, the Himalayas being young folded mountains accounts for 18 percent of the total geographical area of the country, and supporting 6 percent of the country's population.

Watershed deterioration is a common phenomenon in most part of the world. Among causes for this, improper and unplanned utilization of watershed resources without any conservation work is the prime one which is more severe in developing countries [1]. The deterioration generally occurs in terms of forest loss and land degradation by soil erosion. Among several factors, the major one is deforestation followed by unsuitable agricultural practices. Therefore, it is necessary to adopt a sustainable land management and strategies which does not cause the degradation of such valuable resources. The area of watershed forms a viable unit for planning as all the settlements located in the area are interlinked and inter connected physically, socially and economically more closely than their connections with those located out of the watershed area [2].

The mountain areas are experiencing the triple revolution of industrial, transportation and tourism revolution, which results in three P's i.e., population, pollution and poverty. Successful intervention to halt the spiraling process of population growth, environmental degradation and poverty in mountain regions of the developing world requires an understanding of the reciprocal relationship between land dynamics and development in mountainous areas [3].

The study area is experiencing high growth rate of population along with introduction of scientific innovations which are adversely affecting the Landuse and Landcover of the area. Furthermore, the area is mostly inhabited by the underdeveloped community of the agriculturalists which have heavy dependence on the land resources of the area.

Land dynamics plays a vital role in regional, social and economic development. It contributes importantly to earth-atmosphere interactions and biodiversity loss is a major factor in sustainable development and human responses to global change, and is significant in integrated modeling and assessment of environmental issues in general [4]. Therefore, analysis of land dynamics becomes a fundamental tool for adaptation of conservation strategies within these hotspots. Land dynamics analysis has become a fundamental tool in assessing the environmental consequences of human activity [5], [6], [7], [8].

The land dynamics pattern of the region is an outcome of both natural and socio-economic factors and their utilization by man in the time and space. A better understanding of land dynamics change is of crucial importance to the study of global environment change [9] Land is becoming a scarce commodity due to immense agricultural and demographic pressure. Hence, information on land dynamics and possibilities for their optimal use is essential for selection, planning and implementation of land use schemes to meet the increasing demand for basic human needs and welfare. The watershed is the smallest unit where the elevation of human-induced impacts upon natural resources becomes possible.

2. STUDY AREA

The study was carried out in the Hamal Watershed of the Pohru Catchment of the Kashmir valley (Fig.1). The Hamal watershed lies between 34° 34' to 34° 40' N Latitude and 74° 17' to 74° 23' E Longitude. The Hamal Watershed is bounded by Kandi watershed in the east and north east, Mawar watershed in the north and Jhelum Basin in the south. Its total area is 0.13 lakh hectares. It has been divided into eleven microwatersheds by All India Soil and Landuse Survey (AIS&LUS) in accordance with the guidelines of the Watershed Atlas of India (WAI).

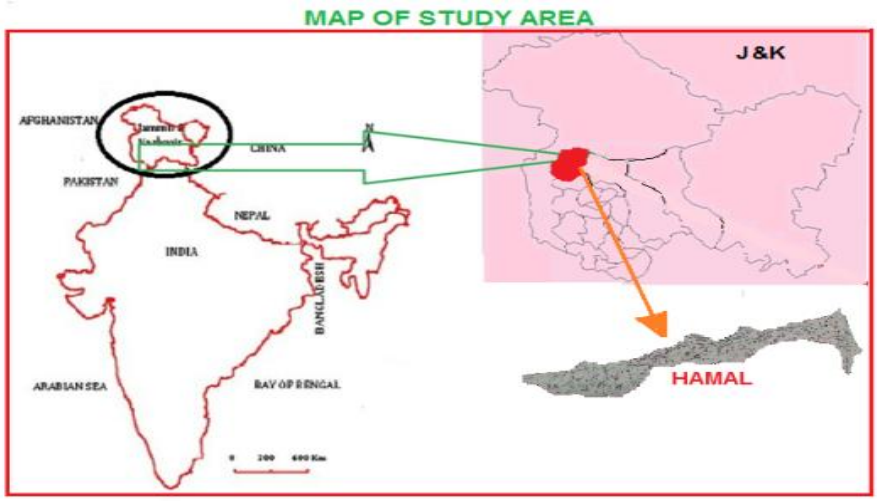

Figure 1: Location of Study area

3. DATABASE AND RESEARCH METHODS

The methodological frame work for the present study encompasses interpretation of one comprising IRS P6 LISS III (2012), followed by Ground Truthing Data and ancillary information for final analysis. The detailed breakup of the methodology is given in the flow chart.

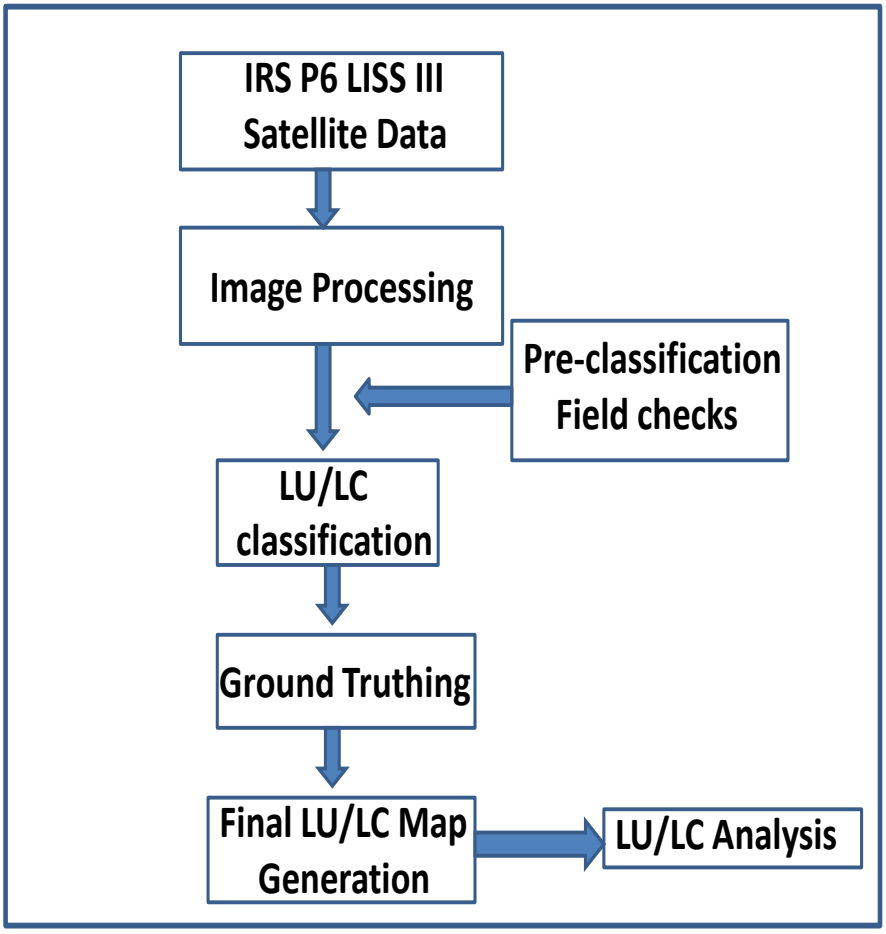

Figure 2: Methodology Flow chart

4. RESULTS AND DISCUSSIONS

4.1. Land Dynamics Classification

There are several methods to classify the satellite imageries; however supervised classification algorithm has been used to classify the IRS P6 LISS III (2012) to achieve better, precise and desired results.

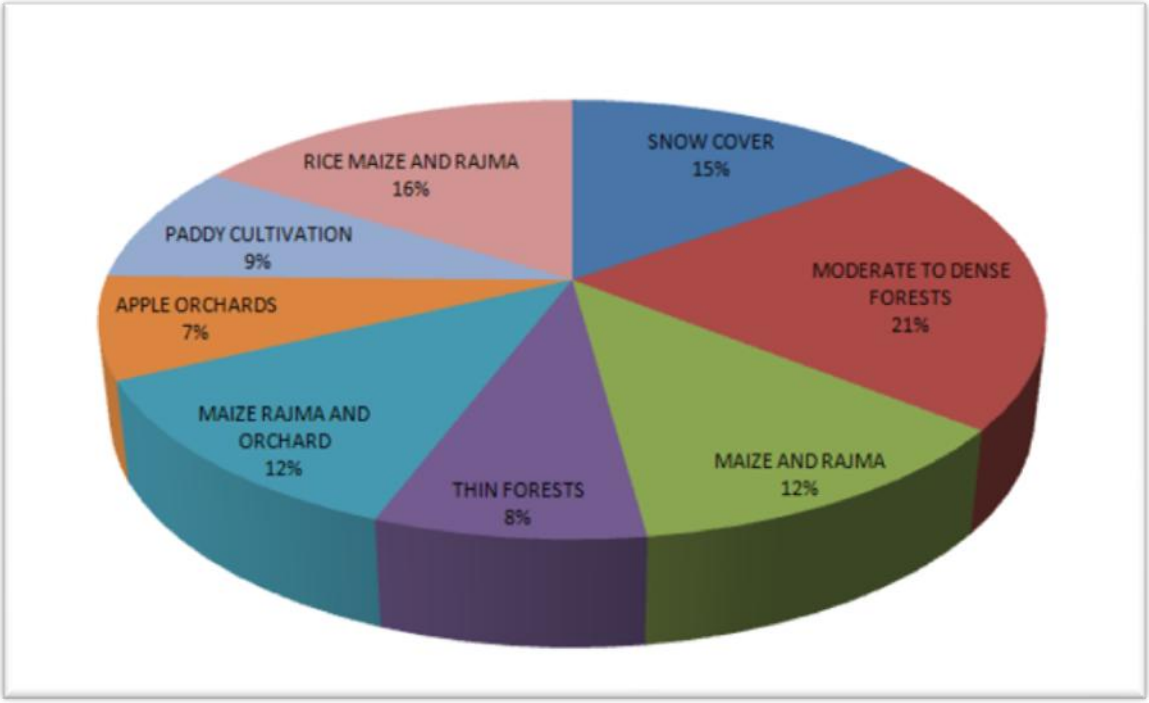

Figure 3: Percentage areas under different Land Classes

4.2. Land Dynamics Map

Himalayan mountain system, a fragile ecosystem, is full of natural wealth and resources. However these resources are under huge and tremendous anthropogenic stress. Inventorization, evaluation and sustainable conservation of these resources assume much importance in the present scenario.

The study of the land dynamics of the area revealed eight land cover classes that range from dense forests to snow covered areas. Forests are the most important Landuse of the Hamal watershed. Forests both dense and thin forests cover 21 per cent and 8 per cent area respectively and came up as the dominant class covering about 29 per cent of the total area. These forests mostly occupy mountains and Karewas. These forests are poorly managed in Karewas and moderately managed in mountains. These percentages of forest cover are not upto the mark and present a grim situation. As per national forests policy the mountainous area

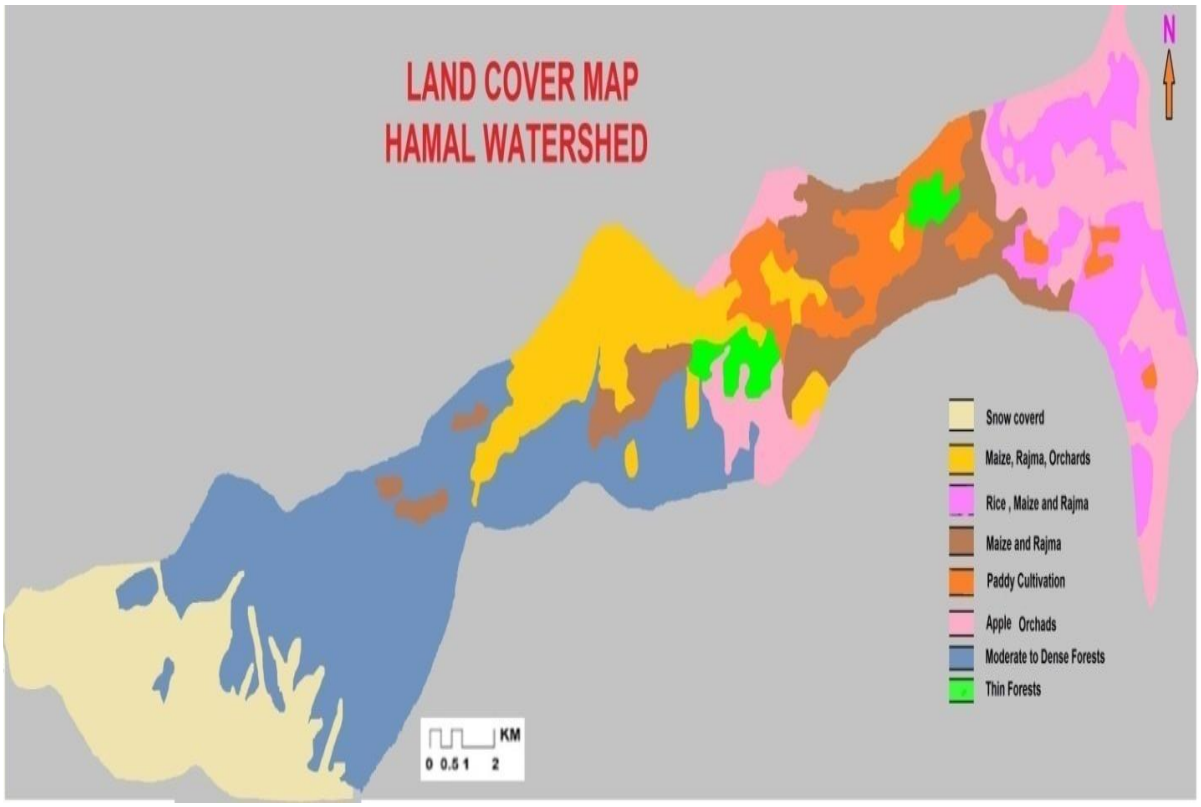

Figure 4: Land cover Status of Hamal Watershed (Kashmir)

should at least have 66.6 per cent of their total area under forest cover, in the study area the figure is below not only the recommended average but below the Himalayan average where it is about 40 percent. The area under this class need to be increased for environmental conservation. Agriculture is the main source of livelihood for the population and large chunk of working population is engaged with this primary activity. Land is mainly used for growing rice, maize and rajma. Paddy cultivation occupied about 9 per cent of the area. Flood plains are ideal for rice cultivation with good irrigation facilities with high productivity. The depth of the soil is very deep & properly managed. However in Kandi belt, because of various geographical problems like terrain and inadequate irrigation the cultivation of paddy gets restricted and the crop land is used for dry land agriculture like maize and rajma. This Landuse covers more than 30 per cent of the total area. The depth of the soil varies deep to moderately deep and soil is poorly managed. The agriculture in the region is still traditional and subsistence, the people have not been benefited from the government schemes to increase their yield per hectare. The growing population has forced the population to encroach in to the forest land to feed their rapidly growing population, which is clear from the croplands being found deep into the forest land. 7 per cent area has been classified as Apple Orchards; this class has developed recently, as paddy land has been converted into horticulture mainly with the notion of more economic benefits.

5. CONCLUSIONS

The National Research Council recently identified land cover dynamics as one of the grand challenges for environmental research .The present study is an attempt to elevate and analyze land dynamics to provide data, information and decision making for sustainable resource development and environmental conservation strategy. The recent improved data sets like satellite images and archived data sets has made possible to carryout research studies on land dynamics at various spatial scales and various management and conservation strategies has been recommended and implemented. Still progressive and grand research work is required on the part of research community to bring accuracy and further improvement in the mapping of landscape for sustainable resource management. Hence an effort has been made through this research work to depict the prevailing deplorable and unsustainable condition of the resources in this part of Himalayas that needs to be conserved and managed on sustainable basis for the better and prosperous future.

6. REFERENCES

[1]. Food and Agriculture Organisation.1985.Tropical Forestry Action Plan, committee on forest development in the tropics. F.A.O., Rome.

[2]. Marh, B.S. 1998. Sustainable Mountain Development, Watershed Management and lessons to be learnt from a recent catastrophe in the Himachal Himalayas. In: Singh, R. B.(ed). *Sustainable Development of Mountain Environment in India and Canada*. Oxford and IBH Publishing Co.Pvt.Ltd.New Delhi, Calcutta, 197-207

[3]. Karan.P.P.1989. Environment and Development in Sikkim Himalayas: A Review. *Human Ecology,17*,2: 257-271.

[4]. Chen, S., Zeng, S. and Xie, C. (2000). Remote sensing and GIS for urban growth analysis in China. Photogrammetric Engineering and Remote Sensing 66, 593–598.

[5]. Hunt A, Ditzer T (2001) Long-term impacts of logging in a tropical rain forest - a simulation study. For Ecol Manage 142:33–51

[6]. Veldkamp A, Lambin EF (2001) Predicting land-use change. Agric Ecosyst Environ 85(1–3):1–6

[7]. Brown DG (2003) Land use and forest cover on private parcels in the Upper Midwest USA, 1970 to 1990. Landsc Ecol 18:777–790

[8]. Dunn RR (2004) Recovery of faunal communities during tropical forest regeneration. Conserv Biol 18(2):302–309

[9]. Turner-II, B.L., Kates, R.W. and Meyer, W.B. 1994. The earth as transformed by human action in retrospect. *Annals of the Association of American Geographers*, 84, 4: 711-715

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