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RESEARCH ARTICLE

A LITERATURE REVIEW ON LAND USE LAND COVER CHANGES.

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Abstract

The present paper discusses the phenomena of land use and land cover (LULC) which has undergone constant changes over the past few decades due to major variations in the environment caused by anthropogenic and natural factors. A comprehensive review of the studies has done so far in which a decreasing pattern in land use land coverage has been identified. It has also been observed that land use affects land cover and vice versa.

Introduction:-

Land Use/Land Cover:-

Land is defined as a place on which all human activity is being conducted. Use of land resources by the people gives rise to "land use" which varies with the purposes it serves, whether they be food production, provision of shelter, recreation, extraction and processing of materials, and the bio-physical characteristics of land itself. Hence, land use is being shaped under the influence of two broad sets of forces – human needs and environmental features and processes. The terms land use and land cover are not synonymous and the literature draws attention to their use and land cover change. Land cover is the biophysical state of the earth's surface differences so that they are used properly in studies of land and immediate subsurface **(Turner et al. 1995**). It describes the physical state of the land surface; e.g., cropland, mountains or forests (**Meyer, 1995 in Moser, 1996).** Land cover deals with the quantity and type of surface vegetation, water, and earth materials **(Meyer and Turner, 1994).** i.e man-made constructions (buildings etc), the type of material used in housing structure **(Parveen, 2017).** The term land cover originally referred to the type of vegetation that covered the land surface, but has broadened subsequently to include other aspects of the physical environment also, such as soils, biodiversity and surfaces and groundwater **(Moser, 1996**). In the disaster prone areas of landslides, the destruction of forests and the vegetative cover that binds the top soil at an increasing pace and the conversion of forest land into agricultural and horticultural holdings **(Khan et al., 2017)** brings changes in land use and land cover.

Review of Literature:-

The understanding of land-use/land cover change has moved from simplicity to realism and complexity over the last decades. In the beginning, the studies were concerned mostly with the physical aspect of the change, but later, in the research agenda on global environmental change. Scientists realized that land surface processes influence climate because of the land use/cover change. In mid1970s, it was recognized that land cover change modifies surface albedo and thus surface atmosphere energy exchanges, which have an impact on regional climate **(Otterman, 1974; Charney and Stone, 1975; Sagan et al. 1979).** Much broader range of impacts of land-use/cover change on ecosystem, goods and services were further identified. Of primary concern are impacts on biotic diversity worldwide **(Sala et al. 2000**), soil degradation **(Trimble and Crosson, 2000),** and the ability of biological systems to support human needs **(Vitousek, 1997;Praveen, B. 2017).**

Historically, humans have been modifying land to obtain the essentials for their survival, but the rate of exploitation was not the same as it is today. Recent rapid rate of exploitation has brought unprecedented changes in ecosystems and environmental processes at local, regional and global scales. Presently, land use/land cover changes encompass the environmental concerns of human population including climate change, biodiversity depletion and pollution of water, soil and air. Today, the monitoring and mediating the adverse consequences of land use/land cover change while sustaining the production of essential resources has become a major priority of researchers and policy makers around the world **(Erle and Pontius, 2007).** Unsustainable human activities are becoming key environmental concern as they deteriorate the quality of water in the. The relationship between landuse and water quality helps in identifying threats to water quality rivers **(Ding et al., 2015)** and builts an understanding of about 'access' to sanitation is crucial for human survival **(Parveen et al., 2015). (Praveen et al., 2017).**

Existing Literature on Land Use/Land Cover Change Studies:-

Human populations and their use of land have transformed most of the terrestrial biosphere into anthropogenic biomes. Such transformation has caused a variety of new ecological patterns and processes to emerge and has been significant for more than 8000 years **(Ellis, 2011).** Recently, issues related to LULC change have gained interest among a wide variety of researchers, ranging from those who favor modeling spatio-temporal patterns of land conversion to those who try to understand the causes, impacts and consequences **(Verburg et al. 1999; Brown et al. 2000; Theobald, 2001).** Land use affects land cover and changes in land cover affect land use. A change in either however is not necessarily the result of the other. Changes in land cover by land use do not necessarily imply degradation of the land. However, many shifting land use patterns driven by a variety of social causes, result in land cover changes. These changes affects biodiversity, water and radiation budgets and other processes that come together to affect climate and biosphere **(Riebsame et al. 1994).**

Human activities which are mainly driven by socio-economic factors bring out changes in non-built-up and built-up land despite restrictions by physical conditions **(Long et al. 2007).** Land use change, including land transformation from one type to another and land cover modification through land use management, has altered a large proportion of the earth's land surface. The aim is to satisfy mankind's immediate demands from natural resources **(Meyer and Turner, 1992; Vitousek et al. 1997).** The worldwide changes to forests, farmlands, waterways and air are being driven by the need to provide food, fiber, water, and shelter to more than six billion people. Global croplands, pastures, plantations and urban areas have expanded in recent decades. This expansion is accompanied by large increases in energy, water, and fertilizer consumption, along with considerable losses of biodiversity (**Foley et al. 2005).**

Land cover can be altered by forces other than anthropogenic. For instance, Natural events such as weather, flooding, fire, climate fluctuations and ecosystem changes may also initiate modifications upon land cover. There are also incidental impacts on land cover from other human activities such as forest and lakes damaged by acid rain from fossil fuel combustion and crops near cities damaged by tropospheric ozone resulting from automobile exhaust **(Meyer, 1995).**

Kuemmerle (2009) observed the conversion of cropland to grassland in Arges¸ County in Romania which he related to the rapid changes in socio-economic, demographic and institutional conditions after 1989. Similarly, **Brown (1995)** states that more recent changes in land use have been dominated by losses of agricultural land. In particular, in eastern China there has been an unprecedented conversion of arable land into built-up uses following rapid industrialization. While **Kebrom Tekle and Hedlund (2000)** reported increases in the size of open areas and settlements at the expense of shrub lands and forests in twenty eight years (between 1958 and 1986) in Kalu District,

Southern Wello, Ethiopia. Similarly**, Woien (1995)** reported increase of homestead in studies made in the central highlands, during 1957 and1986 attributing it to increase in population density.

Mark and Kudakwashe (2010) in a study in Shurugwi district in Midlands Province of Zimbabwe observed the increase in cropland. He attributed this increase to the Land Reform and Resettlement Program. Large areas of forests were cleared for different farm related activities like opening new farming plots, wood for fuel, poles for building both homes and cattle pens, among other activities. The built-up area around the water bodies in Davangere city, Karnataka, India has almost doubled between 1970 and 2005, at the cost of the agriculture land and scrub land **(Begum et al. 2010).**

Prakasam (2010) studied land use/land cover change over a period of 40 years in Kodaikanal taluk, Tamil Nadu. In this study major changes has been observed like area under built-up land and harvested land has increased whereas the area under forest and water body has decreased. **Javed and Khan (2012)** studied land use land cover change during due to mining activities from 2001 to 2010. The study revealed that significant decrease has been observed in dense forest area, cultivated land and water body, however settlement, wasteland land and uncultivated land has increased mainly due to anthropogenic activities.

Bisht and Kothyari (2001) have carried out land cover change analysis of Gurur Ganga watershed in Uttaranchal. The study from 1963 to 1996 and 1986 to 1996 revealed that the area under agriculture and settlement has increased whereas the forest and barren land show decline in area**. Dhinwa et al. (1992)** studied land use change of Bharatpur district, the analysis in the study reveal that forest cover has been depleted whereas wasteland undulating terrain with or without scrub and rock out crops has been increased during 1986 to 1989.

Different land use changes may affect one another. Most of the ecological consequences of land use change reflect interactive effects under different land use changes. For example, deforestation has led to the degradation of freshwater habitat through due to the siltation of rivers. Similarly, the role of the Asian forest as a carbon sink and source varies from year to year or from place to place as a result of interactive effects between deforestation, afforestation and reforestation. Therefore, the interactions of different land uses along their change trajectories represent a 53 challenge for a better understanding of the land use change issue. Changes in land and ecosystems and their implications for global environmental change and sustainability are a research challenge for the human environmental sciences **(Omenn, 2006; Turner et al. 2007).**

Land Use/Land Cover Studies Using Remote Sensing and GIS Techniques:-

In order to use land optimally, it is necessary to have the information on existing land use land cover. It is also important to have capability of monitoring the dynamics of land use resulting out of both changing demands of increasing population and forces of nature acting to shape the landscape. Land is in a continuous state of transformation as a result of various natural and man-made processes. The study of spatio-temporal patterns of intra and inter urban form and understanding of the evolution of urban systems are still primary objectives in urban research.

Therefore, the information about change is necessary for updating land cover maps and the management of natural resources **(Xiaomei and Rong Qing, 1999).**

Land use/land cover change detection process of identifies the differences in the state of an object or phenomenon by observing it at different times **(Singh, 1989).** Change detection is an important process in monitoring and managing natural resources and urban development because it provides quantitative analysis of the spatial distribution of the population of interest. **Macleod and Congation (1998)** list four aspects of change detection which are important when monitoring natural resources. They include; firstly, detecting the changes that have occurred; secondly, identifying the nature of the change; thirdly, measuring the area extent of the change and lastly, assessing the spatial pattern of the change. The basis of using remote sensing data for change detection is that changes in land cover result in changes in radiance values which can be remotely sensed. Techniques to perform change detection with satellite imagery have become numerous as a result of increasing versatility in manipulating digital data and increasing computer power.

Conventional ground methods of land use mapping are labor intensive, time consuming and are done infrequently. These maps soon become outdated with the passage of time in a rapid changing environment. In recent years, satellite remote sensing techniques have been developed, which have proved to be of immense value 54 for preparing accurate land use/land cover maps and monitoring changes at regular intervals of time. Despite spatial and spectral heterogeneity challenges of urban environments, remote sensing seems to be a suitable source of reliable information about the multiple facets of urban environment (Jensen and Cowen, 1999; Herlod et al. 2003). So, the analysis of dramatic changes of land use/land cover at global, continental and local levels and further to explore the extent of future changes, the current geospatial information on patterns and trends in land use/land cover are playing an important role.

Remotely sensed imageries provide an efficient means of obtaining information on temporal trends and spatial distribution of urban areas needed for understanding, modeling and projecting land changes **(Elvidge et al. 2004).** In case of inaccessible regions, this technique is perhaps the only method of obtaining the required data on a cost and time effective basis (**Olorunfemi, 1983).** Satellite imagery is able to provide more frequent data collection on a regular basis unlike aerial photographs. Although aerial photographs may provide more geometrically accurate maps but is limited in respect to its extent of coverage and expenses. The importance of remote sensing technique was realized by **Olorunfemi in 1983** while using traditional method of surveying i.e., aerial photographic approach to monitor urban land use in developing countries with Ilorin in Nigeria as the case study.

A remote sensing device records response which is based on many characteristics of the land surface, including natural and artificial cover. An interpreter uses the element of tone, texture, pattern, shape, size, shadow, site and association to derive information about land cover. The generation of remotely sensed data/images by various types of sensor flown aboard different platforms at varying heights above the terrain and at different times of the day and the year does not lead to a simple classification system. It is often believed that no single classification could be used with all types of imagery and all scales. The successful attempt in developing a general purpose classification scheme compatible with remote sensing data has been carried out by Anderson in 1976, which is also referred to as United States Geological Survey (USGS) classification scheme.

Ever since the launch of the first remote sensing satellite (Landsat-1) in 1972, land use/land cover studies were carried out on different scales for different users. For instance, waste land mapping of India was carried out on 1:1 million 55 scales by NRSA using 1980-82 Landsat multi spectral scanner data. About 16.2% of waste lands were estimated based on the study. It has been noted over time through series of studies that Landsat Thematic Mapper is adequate for general extensive synoptic coverage of large areas. As a result, this reduces the need for expensive and time consuming ground surveys conducted for validation of data.

The State of Maryland Health Resources Planning Commission used Landsat TM data to create a land cover data set for inclusion in their Maryland Geographic Information (MAGI) database. In 1985, the U.S Geological Survey also carried out a research program to produce 1:250,000 scale land cover maps for Alaska using Landsat MSS data (Fitzpatrick et al. 1987). All seven TM bands were used to produce a 21-class land cover map (EOSAT, 1992). Georgia Department of Natural Resources in 1992 used Landsat Thematic Mapper data completed mapping the entire State of Georgia to identify and quantify wetlands and other land cover types (ERDAS, 1992). Similarly, The State of southern Carolina Lands Resources Conservation Commission carried out a detailed land cover map composed of 19 classes from TM multi-temporal and multi-spectral data (EOSAT, 1994).

In Indonesia combination of MSS Landsat and land use map was carried out for land use/land cover pattern analysis (Dimyati, 1995) using remote sensing techniques to calculate the index of changes. This was done by the superimposition of land use/land cover images of 1972, 1984 and land use maps of 1990. **Adeniyi and Omojola (1999)** in their land use land cover change evaluation in Sokoto –Rima Basin of North–Western Nigeria used remote sensing and GIS techniques to study changes in the two dams (Sokoto and Guronyo) between 1962 and 1986. The work revealed that land use/land cover classes changed but with settlement still remaining the largest.

In India, National Remote Sensing Agency (NRSA) of Department of Space under National Urban Information System (NUIS) scheme used Cartosat-1, Resourcesat-1 and LISS-VI+PAN merged satellite data to carry out national level urban land use thematic mapping at 1:10,000 scale of 564 cities/towns including State capitals and Union Territories; 23 cities with Million plus population; NCR towns; and one town from each class (from Class I to Class VI) from each State and Union Territories (NRSA, 2008). 56 For this urban land use mapping a classification

standard was designed with classes hierarchically arranged with increasing information content as the levels increases from Level I to Level V. The classification also consists of certain land cover classes up to Level II designed to accommodate the rural classes noticed within the urban administrative limits.

At Level-I land use includes Built-up, Agriculture, Forest, Grazing land/Wastelands, Wetlands, Water bodies, Others. At Level-II Built-up has been classified into Built-up Urban and Rural and at the same level Agriculture, Forest, Grazing land/Wastelands, Wetlands, Water bodies and Others have been classified into 3, 4, 5, 3, 7, 3 sub classes respectively. At Level-III Built-up has been classified in to Residential, Industrial, Mixed Built-up area, Recreational, Public and Semipublic area, Communications, Public Utilities & Facilities, Commercial, Transportation, Reclaimed/vacant land, Vegetated Area/Trees. Similarly, at LevelIV Residential class of Built-up (urban) has been classified in to High, Medium and Low density residential and at the same level Industrial, Recreational and Public and Semipublic, Communications, Public Utilities & Facilities, Commercial, Transportation, Reclaimed land/Vacant land classes have been classified into 6, 10, 15, 4, 6, 8, 9, 1 classes respectively.

In the present study land use/land cover mapping of Srinagar city, India, has carried out applying the above land use classification standards designed by NRSA.

Conclusion:-

It's very important to study land use land cover which changes and degraded day by day due to natural causes like climate variability or climate change resulting floods drought, or anthropogenic causes due to industrialization and urbanization many more reasons also there explained in literature review and tells clearly how land use land are affecting, literature review are important for policy making and taking decisions to save environment degradation. There are many techniques which are used in monitoring and assessment of land use land cover like remote sensing and GIS and GPS.

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