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Contribution of Remote Sensing in Analysis of Conservation and Economic Value of Forest Stand: A Review

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ABSTRACT

India is a country where forest cover is decreasing day by day and if not looked into it, India will become totally barren land. Presently, India covers 21.5% of forest cover in the world. Stand and Forest have different meaning in forestry. Stand is defined as an aggregation of trees which have same composition, age etc. in common. Hence forest designates aggregation of different stands and conservation is the act or process of conserving. Remote sensing is the study of object without in contact with hand. In here, remote sensing is used to observe the conservation and its economic value. It stratified the stand results into three decision categories: 1) forestry opportunity for economic value, 2) conservation opportunity, 3) areas of conflict 4) forestry mapping and assessment. In all combinations except one, the large majority of stands fall in the category of conflicted values.

Key words: *Conservation, Remote Sensing, Economic value, Conflict etc.*

INTRODUCTION

India is endowed with a great variety of biological communities and is ranked sixth among twelve mega diversity countries in the world. As many as 45,000 species of wild plants, over 77,000 species of wild animals have so far been recorded, together comprising about 6.5% of the world's known wildlife[1].

But India's green mantle along with its heritage of biodiversity is in grave trouble today due to population explosion, encroachment to forest land, shifting cultivation practices and degradation caused by overgrazing, illicit felling, lopping, for fuel and folder, removal of forest floor litter, forest fire, etc. In recent times, the planners and decision makers are facing several challenges associated with resources consumption by expanding population in the face of impending global changes. Some of the challenges are (i) Maintenance of sustained utilization and prevention of ecological degradation.

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(ii) Altering landscapes to increase the production of desired or needed products. (iii) Restoring degraded landscape to enhance their ecological or economic productivity and diversity. Encroachment of human into forest areas such as forests and wetlands in recent times has resulted in the degradation or destruction of these habitats. Loss of habitat and habitat fragmentation are areas of major concern in species conservation. Road construction, deforestation, draining of swamp lands etc. resulted in large areas of habitat being broken up into a series of smaller areas or fragmented[6]. Fragmentation is mainly a part of human activities that alter size, shape, and spatial arrangement of habitat types on landscape and can result in changes to: a. Decrease in the patch means size of "natural" habitat b. Smaller patch shape c. Patch adjacency increment d. Decrease in patch interior to edge ratio. However, the recent concern is on biodiversity conservation and identification of biological rich areas.[1,2]. Forest Cover is defined as "All lands more than one hectare in area, with a tree canopy density of more than 10 % irrespective of ownership and legal status[3]. These types of land can be called as forest area. Remote sensing is a field that required many hard work and struggles. By using planes, drones, balloon, normal data extraction are done and from that data information regarding the specific area or object is evaluated whether it is good or not. In here, not any kinds of physical contact are done, only through monitoring process. In these Fig.1 (A) denotes the source of energy from the sun which is passive, (B) denotes the radiation and atmosphere, (C) denotes the forest stand, (D) denotes the recording devices like satellite and airborne i.e., aero plane or drones, (E) denotes transmission/reception/ processing of raw data, (F) denotes the interpretation and analysis of raw data by the AI (artificial intelligence), (G) denotes final products/application of data that are given by the AI for betterment of forest stand.

There is an urgent need to create reliable database in terms of qualitative and quantitative inputs for restoration, rehabilitation and conservation strategies in the Ecologically Sensitive Areas (ESA) in the country. These ESA's are those specific areas.

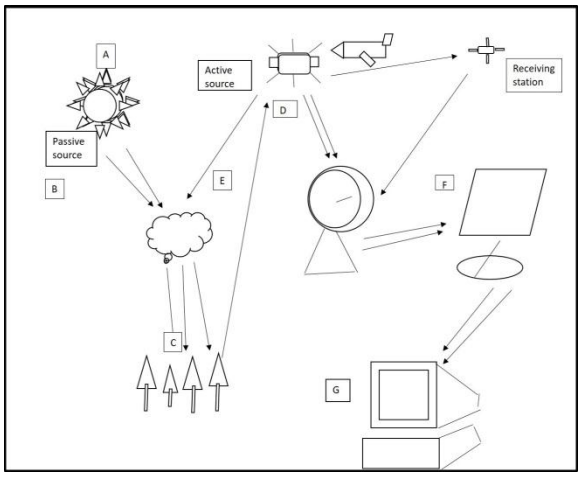

Figure1. Block Diagram of Remote Sensing in forest stand

having natural, cultural and geographical value or fragile/susceptible to factors of deterioration in the ecological balance. Most of the potential ESA's in the country are being degraded in recent times due to various impacts of developmental activities including biotic pressure. Due to its rich biological heritage, India has a special responsibility to conserve and use these resources in a sustainable manner. In the light of the above, about thirteen major parameters have been identified to recognize an area as Ecologically Sensitive Area.

The thirteen primary indicators are grouped in 3 major categories such as (i) species based indicators (endemic, rarity,

endangered, centers of evolution of domesticated species) related to the characteristics of species which are or may become threatened with extinction, (ii) Ecosystem based(wildlife corridors, specialized ecosystems, special breeding sites, areas with intrinsically low resilience, sacred groves, frontier forest) are being essential to the survival of the first category, (iii) Geomorphologic features based (uninhabited islands in the sea, steep slopes and origins of rivers) which are known to have substantial effect on ecosystems at large[4].

It is now realized that all the concerned departments are keenly interested to work towards achieving sustainability through proper scientific planning in an obvious effort to control the consumption of natural resources to protect ecologically sensitive areas from exploitation and thereby to reduce the adverse impacts of social changes to the environment.

Objectives

The environmental considerations into spatial plans in the ecologically sensitive areas are: To identified forest areas of Conservation and to prioritize economic value of forest and point out the conflict areas.

MATERIAL AND METHODS

The figure 1 shows that source of energy is received from the sun which is a passive source get pass the radiation zone and comes through the atmosphere before reaching the forest stand. Again, same source of energy is created by recording devices toward the forest stand which also comes pass through radiation and atmosphere zone.

The energy created by recording device is called as active source, this source both passive and active get reflected from the forest stand and goes directly through the device which have a sensor to collect it. Sensor is generally attached to platform which can be either manned or unmanned. From these sensor data collected is sent to transmission or reception point where the data is asses by the AI for the necessary information. Then the AI start interpreting and analyzing the information and point out certain specific distribution of forest area, presence of soil morphology, topography, ages and composition of trees presence, as well as the biodiversity status of the specific area. From this many information interprets by the AI, human know the economic and conservation value of the particular area of forest stand.

ROLE OF REMOTE SENSING

(A) FOREST TYPES MAPPING

India forest types is of 5 types, from these 5 types, it is divided into 16 groups and then again divided into many sub groups. Changing of the climate as well as human factor may result in the spatial disturbances in the forest areas that may alter species composition[7]. In the study of spatial distribution of forest types would help greatly in forest conservation for accounting the changes that have resulted in the changing quality and composition of forests. It will bring out the feasibility of satellite applications in preparation of spatial forest maps at the block level.

The changing scenario of natural forests into artificial forests could well be discerned by generation of a baseline data of forest types which are independent of each district. The availability of such maps has greater ecological significance and provide better insights to the working plan officials as to what type of species need to be introduced by replacement of natural forests or regeneration of degraded forests in the area on a more scientific and reliable distribution at the block level on 1:50,000 scale would prove an essential component in the scientific conservation of forests[7].

BIODIVERSITY STUDIES

The conservation of forest is done by knowing forest inventories and zonation of the area which is sensitive and diverse with different forest areas or adjoining area with the help of satellite data in a specific area can be resolved by using remote sensing and GIS or integration of both. The initial probabilistic diversity zones should be narrow down using satellite data and the consistency of patchiness as a function of landscape dynamics could be used as an element for bio-diversity studies. With the rapid destruction of forests and

encroachment the use of multi-temporal satellite data using digit analysis procedure provide spatial change maps by image differencing methods and logical operations. The satellite data pertaining to IRS 1A LISS II, IRS 1D LISS III and IRS 1D PAN should be used to study the forest stand[6]. The methodology recommends for detailed investigations at district level for accounting forest changes over the years within the reserved forests areas.

ECONOMIC VALUE

Economic value means in terms of money that can be found from forest, whether it may be employment generation, goods production and forest services or contributing to national income as well as trades in foreign markets. Moreover, its sustainability is measure or assess by the profit that are getting from the forest investments.

It can be done by analyzing the vegetation mapping and monitoring condition of vegetation as well as soil moisture of the areas. Different types of method can be implying in order to measure the vegetation cover and changes over periods by the usage of reflective remote sensing. Crop yield, parameter and growth model can be easily derived.

Moreover, if we know the certain specific usage of remote sensing in the particular area, crops production can also be increase considerably high as compare to past production. From the remote sensing we get to know which types of deficiency and evaluation of data into information relate out many distinct points such as identification of pest and diseases phenomenon, climatic effect on the growth of the crops.

CONFLICTS

There is a fact that conflict arises from forest stand and these types can be solved by using remote sensing and imagery data of satellite. For now, high resolution satellite imagery is used to evaluate the conflict in border areas or adjoining areas of forest stand. Conflicts are generally arising from land use planning; these are asses by the uses of GIS which resolved the territorial differences in the areas. And different types of conflicts which are complex is being resolved with the use of GIS of high resolution. GIS, geographical information system and digital tools played an important role in the major recent conflicts. Digital tools are used to clear the doubts of conflicts of territory by using of 3D visualization tool that combined satellite imagery and other imagery[8].

Images that combined satellite and other are called Powerscene, which is used to clear the matter that is confused to understand. Powerscene clear the conflict between areas and help in avoiding future trouble in the particular areas or adjoining area.

The concept is GIS is unbiased relatively in conflicts. But GIS altering make it easy in understanding reality conflict and can also make more difficult in determining exact circumstances. There are some important issues regarding conflict such as selection biased and measurement validity which give difficulties in creation of map. For these, analytical solutions are used for selection biased and dataset is required for measurement validity[8].

If biased is found, then data removal irrespective of the location is done. This is solved by raster representation, which is the collection of cells of same attribute but loses its unique identity. Major forest conflicts are solved mainly by using GIS in which data are recorded in time and analyses where data of map changes.

Territorial conflicts and mapping have a close relation between themselves before GIS come into world's scenario but by remote sensing it can be resolves with the use of digital tools.

Remote sensing acts as a digital tool and helps in providing to the conflict where human factor is not involved. By understanding the space and the GIS which give voices to different groups can resolved the territorial conflicts and tell the potentiality of solving the matter simply.

CONCLUSION

Remote sensing is the study of a particular areas, objects by getting information through a device which we get the data i.e., sensor. From the data we know the information about the object without being in physical contact. It is either unmanned or manned which is attached to a platform. Platform can be either mobile or stationary.

Remote sensing helps us to know the conflicts that were occurring in the forest and their adjoining areas by using satellite imagery. Moreover, it gives economic importance that was being neglected by people towards the forest and also conservation of the stand in more secure manner than the usual practice of forestry.

So, from the study, we get to know that forest can be conserved by using remote sensing. However, uses of tools in these fields are very costly. Using of aero plane, drone or hot balloon required more income but from these platforms we get to know very specific of a certain area where people were not possible to go and directly study.

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