REMOTE SENSING APPLICATIONS IN ENVIRONMENT MAPPING AND MANAGEMENT

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ABSTRACT:

The fast growing population, increasing urbanization and industrial activities, limited natural resources, increasing number of natural disasters and other factors have caused the degradation of the natural environment in the country. Some of the latter are encroachment of forests, deforestation and degradation of forests, harmful changes in wildlife habitats, landslides, shifting cultivation, pollution and urban sprawl, river pollution by domestic sewage and agricultural pollution etc. A large area of India is affected by various environmental problems. Haryana, one of the agriculturally dominated northern state is also suffering from a number of environment problems such as floods, desertification, erosion, land degradation, drought etc. Looking at this critical situation it is obvious that future economic development of the country will be limited if degradation of natural environment is not monitored and managed on a priority basis. During past few decades, remotely sensed data have increasingly been used as a tool for a wide variety of applications ranging from mapping and monitoring of environment management. Remote sensing technology with its capability of getting a synoptic view over a large area in a multispectral mode and revisit capability has proved to be an excellent tool in studying environmental problems. This paper highlights the applications of remote sensing technology in environment mapping and management.

I. INTRODUCTION

The environment is something we are very familiar with our day to day life. The environment is common term today. It consists everything on earth the air we breathe, the water that covers about 71 percent of the earth's surface, the planets, the animals and most important human beings. The recent researches show that human beings are affecting environment just for their greed. They are causing every type of pollutions that are dangerous for our planet and human life too. These days "The Environment" is burning issue that deals with the problems created by human beings. With the start of a new millennium, human kind faces environmental challenges greater in magnitude than ever before because the scale of the problem is shifting from local to regional and even to globally. Indeed, the footprint of human activity continues to expand to the point that it is exerting a major effect on nearly all of the Earth's systems. Global environmental problems such as global climate change, threat of biological and chemical warfare and terrorism, and unsustainable development in many parts of the world are evolving as significant issues for the future of the

planet and of mankind. At local and regional scales, acidification of surface waters, loss of biotic integrity and habitat fragmentation, eutrophication of lakes and streams, and bioaccumulation of toxic substances in the food constitute some of the many examples of how human-induced changes have impacted the Earth's systems and its environment (Tim and Mallavaram, 2003).

Remote sensing technology is the most optimal means of environmental monitoring and management because of its unique capability of providing repetitive synoptic coverage of large area across various spatial scales. Satellite remote sensing can be used for addressing a number of environmental issues at global regional and local scale. Remote sensing technology inputs provide appropriate means for tackling some of the urgent environmental problems at local regional and global scales, such as earthquake. Desertification, deforestation, flood, drought .landslide, forest fire etc. Remote sensing data is being used for addressing crucial environmental problems relevant to developing countries.

II. ADVANTAGES OF REMOTE SENSING

Remote sensing technology has a number of advantages over other mapping techniques because of its following characteristics;

- A large or wide area can be covered by a single image/photo. Different satellites with different sensor systems may cover different extent of areas.
- We can get the data of any area repeatedly at regular intervals of time, enabling monitoring of changes.
- Coverage of inaccessible or difficult terrain like mountains, thick forests etc are imaged.
- Since data is obtained in digital form & in different channels, computer processing and analysis becomes possible.
- Economic in cost and time.

II. FLOODS

Floods are the most common natural disaster. India is the worst flood-affected country in the world after Bangladesh and around one-fifth of the global death count due to floods. Approximately 40 million hectares or nearly 1/8th of India's geographical area is flood-prone. Annually estimated 8 million hectares of land are affected by flood. The cropped area affected annually ranges from 3.5 million ha during normal floods to 10 million ha during worst flood. Optical and microwave data from IRS, Landsat ERS and Radarsat series of satellites have been used to map and monitor flood events. Information about the damage caused by floods is furnished to concerned departments so that they can be able to organize necessary relief measures and to make a reliable assessment of flood damage. Owing to large swath and high repetivity, WiFS data from IRS-1C and -1D hold great promise in regional scale floods monitoring.

Fig.1 Flood in Chennai

III. URBAN ENVIRONMENT

Urbanization is a term that transforms from traditional rural economies to modern industrial one. During the last fifty years the global population is increased dramatically, as a result most urban settlements are characterized by shortfalls in stock housing and water supply, inadequate sewerage, traffic congestion, pollution, poverty and social unrest are most challenging tasks for urban governance to maintain healthy urban environment.

This problem is very serious in India because urbanization in India began to accelerate after independence due to countries adoption of mix economy. Which gave rise to the development of the private sector? Population residing in urban areas in India according to 1901 Census was 11.4 % this count increased to 28.53 according to 2001 census and crossing 30% as per 2011 census, standing at 31.16 %. According to a survey by UN State of the World population report in 2007 by 2030, 40.76 % of countries population is expected to reside in urban area. So its very important tool for India to manage their urbanization by remote sensing technique. The remote sensing inputs on urban land use, urban sprawl and urban land use zoning maps shows areas of less productive agricultural lands, areas available for conservation of green-belts, for building activities, etc are used routinely for urban management purposes. Satellite remote sensing in conjuction with GIS is proving to be a valuable tool as has been demonstrated in India.

VI. PRESERVING BIODIVERSITY & FORESTS

Remote sensing aids in the (i) periodical determination of the extent and distribution and forestation; (ii) assessment of timber volume and growth (iii) regular monitoring of forest stresses due to disease insect infestation, forest fires; and (iv) regular monitoring of habitats to identify conservation need, etc, thus forming an essential component in management planning and conservation of rich heritage of biodiversity.

In India the results of forest mapping using IRS and Landsat imageries showed 2% annual deforestation during 1972-1982. Regular monitoring of the forest cover once in town years and the subsequent afforestation measures have brought down this deforestation rate to 0.08% a year. In addition remote sensing has also been used for wildlife habitat management in India.

VI. Tsunami

Tsunamis are water waves caused by large-scale sudden movement of the sea floor due to earthquakes; landslides; volcanic eruptions or man-made explosions. With increasing population and development along most coastlines, there is a continuous increase in tsunami disaster. Satellite remote sensing can help us study tsunami damage in many ways.

In the first stage general damage information about tsunami can be obtained promptly using an analysis combined with ground truth information in GIS. The tsunami area is one of the most important types of information just after a tsunami. travel to a tsunami affected area for field surveys takes a lot of time to study and damaged roads and bridges become big obstacles.

In the second stage detailed damage interpretation can be analyzed; i.e classification of then building damage level. Recently the quality of commercial satellite images has improved. These help us clarify i.e whether a house was washed away or survived they can even classify more damage levels.

In the third stage we collect the damage and hazard information obtained from a numerical simulation. The damage data are compiled with the tsunami hazard data through GIS.

The highest spatial resolution of optical imageries form commercial satellites is up to 60-70 centimeters or 1 meter. After the Sumatra-Andaman earthquake tsunami in 2004, these satellites have captured images of tsunami-affected areas and the images have been used for disaster management activities including emergency response and recovery.

V. Desertification land degradation

Land is the most valuable resource for production of food, fiber, fuel and many other essential goods required to meet human and animal needs. About 50.8 mha land area (15.8% of the country's geographical area) is arid, 123.4 mha (37.6) is semi-arid and 54.1 mha (16.5%) area falls in the dry subhumid region. All put together about 228 mha area i.e 69% of the geographic area of the country is dry land (arid, semi-arid and dry subhumid). Degradation status mapping carried out for the entire country on 1: 500,000 scale using multi-temporal Resourcesat AWiFS data. The dominant problems of land degradation, viz. water erosion, vegetal degradation, wind erosion, water logging, salinization /alkalization, frost heaving, mass movement,

etc. have been mapped using satellite data. The study proves that 105.48 mha area of our country is undergoing processes of land degradation (32.07% of the total geographic area of the country). 81-1 mha area is undergoing desertification.

A study carried by (Ajay, et al, 2009) using multi-temporal RESOURCE SAT AWIFS data reveals that in India area under desertification is 81.4 m ha.

VI. CONCLUSION

The implications of consumption patterns, unsustainable lifestyles and economic development in developed countries and population-poverty and poorly planned developmental efforts in developing countries are leading to massive environmental breakdown all around the world. The consequences far outweigh the gains of development and further worsen the standard of living of poor who are totally dependent on natural environment. Damage to land, water and biological diversity as well as potential alterations in temperature, precipitation, sea level, etc threaten the very ecological foundation which is essential for sustainable social and economic development. The ultimate remedy for such ecological maladies lies in sustainable development of both land and water resources. Research has proved that remote sensing is the most appropriate technology for assessment of the resource base of the region at micro level and monitor factors contributing to environmental degradation and global environmental change. Remote Sensing, GIS and GPS has proved a powerful tool for the disaster monitoring in many cases

VII. References

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