

# **USE OF REMOTE SENSING AND GIS TOOLS FOR NBSAP**

A Review

## **Executive Summary and Recommendations**

### **I. Global Scenario**

There has been a long tradition in natural resource use- and more recently in conservation biology- to take advantage of the availability of remotely sensed data. Aerial photographs were extensively used in the past and are still being used in National programmes for conservation. This era of extensive use of analogue remote sensing data lasted for a better part of Nineteen twenties. This period was followed by a great technological advances beginning in 1970s using satellite-derived remote sensing data for a variety of uses including the conservation of biological diversity. The Convention on Biological Diversity (CBD) makes it mandatory for the contracting Parties (CP) that a National Biodiversity Strategy and Action Plan is drawn up for a National implementation of the articles of CBD. For the last three decades or so, rapid strides were made in acquiring satellite data both in spatial and spectral domain. This ability has made use of RS data almost mandatory for establishing a base line ecological characterization of ecosystems, habitats and species- an urgent task all over the globe especially in a mega diverse country such as in India. Use of remote sensing and GIS tools in biodiversity conservation is increasingly becoming a key and indispensable component all over the world. There are already spectacular examples of use of these tools in mega diverse countries such as in Brazil, Philippines, Madagascar and elsewhere. Several prominent global conservation oriented Institutions and Organizations such as the Smithsonian Institute, the Nature Conservancy, the American Museum of Natural History, Conservation International, WWF, Wetland International have at some stage or the other have depended extensively on the use of these technologies. Infact, these tools are integral part of the overall conservation efforts.

### **II. NBSAP Process vis-à-vis use of Remote Sensing and GIS**

The recommendations of the South and South East Asia workshop on NBSAP (IUCN, 2000) provide key inputs and form substantial ground for formulating a conceptual framework for this review. These recommendations form a framework for addressing issues relating to two basic questions: a) Have the RS and GIS tools in the past been used extensively in the country and if

so, what are the dominant themes relevant to NBSAP process? In order to answer this question, an extensive collection and review of published information in the National / International journals was conducted on the themes of landuse / landcover (other than forests), wetlands, wildlife, change analysis and urban applications. This analysis was conducted for each of the 27 biotic provinces of the country to gauge the national level coverage. The second question is b) How best to harness these spatial technology tools for the ongoing as well as for the next improved NBSAP process?

Such an analysis is essential to demonstrate conclusively how the technology tools in tandem with the conventional approaches could help deliver better products. In addition, it is also essential to establish how various cross cutting themes relevant to NBSAP process can be integrated in as holistic manner as possible? This will enable better insights into planning, formulating, executing and monitoring biodiversity conservation at multiple scales.

### **III. The Review Process**

The review process consisted of extensive consultations with major National and State level agencies and institutions. These institutions are National Remote Sensing Agency, Space Application Centre Ahmedabad, Indian Institute of Remote Sensing, Regional Remote Sensing Centres, Maharashtra Remote Sensing Application Centre, Andhrapradesh State Remote Sensing Centre, Bihar Remote Sensing Centre, Rajasthan Remote Sensing Application Centre, Karnataka Remote Sensing Application and Utilization Centre, National Atlas and Thematic Map Organization, Forest Survey of India. The consultation process included eliciting information from Envis Centres. ENVIS (Environmental Information System) is a network of subject specific nodes located in various institutions throughout the country. The Focal Point of the present 25 ENVIS centers in India is at the Ministry of Environment and Forests, New Delhi, which further serves as the Regional Service Centre (RCS) for INFOTERRA, the global information network of the United Nations Environment Programme (UNEP) to cater to environment information needs in the South Asian Sub-region. The primary objective of all ENVIS centers is to collect, collate, store and disseminate environmental related information to various user groups, including researchers, policy planners and decision makers. The National Institutes of relevance for biodiversity conservation such as ZSI Calcutta, BSI Calcutta, WII Deradun, IISc Bangalore, FRI Dehradun, BNHS Mumbai and various Universities. Very extensive collection of

scientific papers (250 scientific papers, 50 reports and few unpublished Ph. D. thesis), articles published in various scientific journals was done to review countrywide experience on views of Remote Sensing and GIS for biodiversity conservation, themes of landuse/landcover, wildlife, wetlands, ecosystem processes, GIS application, change analysis and urban application. We expect vast amount of unpublished reports, maps dispersed through out the country which were not consulted due to lack of resources and time for the present review. We choose to represent this information according to the most recent biogeographic classification consisting of 27 biotic provinces. Obviously, the chief merit of such linking lies in the ready accessibility of information pertaining to the use of Remote Sensing and GIS to a wide range of user groups. The NBSAP process by itself can benefit by accessing this information in the unfolding era of digital domain and knowledge enterprises. Among the variety of datasets that would be involved, spatial (or map) information system will be a major “content”. These spatial information sets are vital to make sound decisions at the local, regional, state and central level planning, implementation of action plans, infrastructure development, and disaster management support and business development vis-à-vis biodiversity conservation and management.

A new wave of technological innovation is allowing us to capture, store, process and display an unprecedented amount of map information about our country (and the earth) and the wide variety of environmental and cultural phenomena. Much of this information will be “spatially referenced” – that is, it will have an explicit geographic identity or have 2/3- dimension coordinates to depict its location. With the availability of satellite based remote sensing data and the organization of spatial databases around a Geographic Information System (GIS), combined with the Global Positioning System (GPS), the process of semantic spatial information system has now become a reality. The advent of GIS technology has transformed spatial data handling capabilities and made it necessary for re-examining the roles of government with respect to the supply and availability of geographic information. Using GIS technology, users are now able to process maps – both individually and along with tabular data and “crunch” them together to provide a new perception for a better understanding and management of complex biodiversity issues.

In the above context, particularly, for biodiversity issues, the planned National Spatial Data Infrastructure (NSDI) initiative should be modified to form a Biodiversity Spatial Data

Infrastructure (BSDI) either as a separate or part of the larger NSDI initiative. The BSDI should aim to provide and establish an infrastructure, at the National, Regional, State and local levels to make available organized spatial and non-spatial data at multiple hierarchical levels. The BSDI in addition, should contribute to local, National and Global information needs for sustainable economic growth, environmental quality and stability and social progress to ensure overall priority for biodiversity conservation. The proximate goal for such a system is to create databases covering physical, geographical, biological and socioeconomic attributes for storage, retrieval and analysis.

#### **IV. Recommendations**

We recommend following actions:

1. Establishment of Biodiversity Spatial Data Infrastructure (BSDI).
2. The Proposed National Data Infrastructure should be modified to incorporate the action points for current NBSAP and improved NBSAP processes. We suggest a modified NSDI action plan to work in Collaboration with ENVIS centers. The proposed BSDI frame work is given.
3. Proposed BSDI should make use of current and historical, spatial and non-spatial data.

#### **Use of Historical Data**

- a). Aerial Imagery
  - Establish a task force to prepare a catalogue of aerial photographs (Scale, vintage, stereo capability, nodal agency to work stream procedures to obtain the imagery). This includes data from declassified CIA, Russian source. The Task force will be multidisplinary in nature. This will be the main umbrella under which small groups could wor
- b) Past series (editions) of SOI maps at 1: 50,000 and 1:250,000 scale should be acquired, digitized- themes related to forests, water body and road, railways and irrigation canal networks.

c). Thematic maps based on aerial photographs, FSI maps ( Total Number 2200) on 1:50,000.

d). **Thematic satellite derived maps**

- Vegetation maps (NRSA, Hyderabad; FSI, Dehradun)
- Wastelands (NRSA, Hyderabad)
- Wetlands (SAC, Ahmedabad)
- Grasslands (SAC, Ahmedabad)
- Integrated Mission for sustainable development (NRSA, Hyderabad)
- Rajiv Gandhi Drinking Water Mission.

e). **Data Standards/ Methodology/ Procedures/Monitoring Protocols/NSDI/ NRIS**

4. **Establishment of Web Based Biodiversity Information System at Hierarchical Level.**

This web based information system should include National, State and sub state level hierarchical system. This Web Based Biodiversity Information system should also include Watershed as well as Administrative boundaries

5. **A reporting and monitoring system.** This may be instituted under the proposed National Biodiversity Authority (NBA) consisting of various ministries, Institutes under well Constituted thematic groups and.

6. **A proposal for identifying hotspots of diversity in the Western Ghats and North East India.**