ABSTRACT

In India, the planning process is a multi level one with national level planning at the apex of the hierarchy followed by state level and district level planning. At district and sub-district level a three tier decentralized planning approach is followed namely District level, Block level and Gram Panchayat level. At Block level it is generally known as Micro-level planning. It is worthwhile here to mention that in India the village is the lowest administrative unit. A group of villages form the next higher order unit named as Gram-panchayat. A group of Gram Panchayats together form a Block. Next in order is the District which is formed by aggregation of a number of Blocks. A number of Districts form a state and the states together form the country. Block as the unit for planning is well accepted for socio-economic sector. In planning of natural resources, a plan at Block level aims at optimum utilization of land, water and other resources. The state of the art areal unit in planning of the natural resources is the watershed. The Block is divided into a number of watersheds of workable dimensions specified by Government of India. The village wise socio-economic aspects of the Block are integrated with the natural resources base of smaller micro-watersheds to provide a comprehensive plan of the Block. Therefore, a vast amount of information on Natural Resources, Physio-graphical conditions, Demographic as well as Socio-Economic aspects are considered essential before the actual planning process starts. A fairly acceptable database on demographic and socio-economic aspects is available to the planners in the country. But handling such vast amount of data without computer assisted techniques poses a serious management problem. Further, database on physiographical conditions and natural resources are available in the country through a number of maps namely the topographic maps and thematic maps. These maps have a number of limitations such as inadequacy of scale, outdatedness etc. The recent advances in satellite remote sensing by way of acquiring images of the surface of the earth with finer spatial resolution has opened a new era in map making on a real time basis. Also the advent of computer based Geographic Information System (GIS) has made it possible to handle the large amount of spatial information on natural resources available either through satellite images or from existing maps. This system can also handle non-spatial data such as the socio-economic aspects and integrate it with the spatial data in the form of thematic maps in order to assist in decision making in a planning exercise. Under this background, the present research has evaluated the capability of satellite remote sensing images particularly IRS-1C, as a source of mapping the physical environment. Also the utility of GIS technique in analysis of socio- economic data has been examined in the context of micro-level planning.

The Nilgiri Block of Balasore district (Orissa) with a total area of 311 sq.km has been selected for this research work. The methodology includes development of digital topographic database, restoration of geometric fidelity of SPOT and IRS-1C images, mapping from IRS-1C images, digital analysis and mapping of socio-economic data. Finally watershed development program specifically planning of the surface water harvesting structures for a selected watershed has been carried out.

Initially four topographic maps on 1:50,000 scale covering the study area are digitally mosaiced to form a continuous digital topographic database with high order of accuracy.

The SPOT and IRS-1C images are geometrically registered over this topographic data base providing planimetric accuracy of the order of 15 and 26 m respectively. This level of accuracy fits to the requirement of 1:50,000 scale.

The IRS-1C fused image has been utilized to extract planimetric topographic information. It is observed that the roads and railways, water bodies and drainage can be well extracted from the image. However, limitations exist for first/minor order drainage. Small tanks and ponds are well recognisable. This information is adequate even for 1:12,500 scale mapping. But information like built-up areas cannot be extracted from this data. Only settlement spread can be extracted. Minor order roads/footpaths cannot be easily extracted.

In thematic mapping front, it is observed that IRS-1C image data can be effectively used for generation of landuse/landcover maps through digital classification techniques compatible to 1:50,000 scale landuse mapping. But for landuse information, usable in micro level planning, neither the information content nor the digital classification technique has a satisfactory answer. For mapping of soil resources, the image data can be well interpreted to find different soil classes having valuable contribution at micro level. The geomorphology map with lineaments generated from this data is also highly reliable and has substantial use in micro level planning.

The study has clearly demonstrated the use of computer based GIS techniques in the analysis of demographic and socio-economic information. The villages with large concentration of scheduled population have been successfully demarcated through GIS techniques. A composite backwardness index map for villages was developed for use in the planning process after integrating a number of socio-economic parameters namely the concentration of scheduled population, occupational pattern etc. This could be utilised to delineate the villages needing prioritisation.

Finally, one watershed in the Block namely Kamala, has been considered for in-depth analysis as a demonstrative study. This watershed has been subdivided into eleven micro-watersheds each covering an area between 500 - 1000 hectare. Morphometric analysis for each watershed has been carried out. Surface run-off of the micro-watersheds has been computed. Water resources development planning of the watershed particularly design of surface water harvesting structures has been carried out. It is observed that the use of maps generated from satellite images has certain limitations but is the best alternative technique available at present for the micro-level planning. The improvements in the forthcoming satellites are likely to overcome most of the limitations. Therefore, this is perhaps going to be the technology for planners of twenty first century.

From the experience gained in this study, some suggestions are made for improvement in the imaging technology so that the requirements of the micro-level planning are met to a larger extent. These suggestions include improvement in spatial resolution, need of rectangular array of detectors in the focal plane of the sensor, fore and aft stereo viewing system etc.