Application of GIS in Watershed Management

FSI took up a pilot project in 1991 in Almora District of Uttaranchal (then Uttar Pradesh) on behest of National Wasteland Development Board (NWDB), Ministry of Environment & Forests, Govt. of India. The main objective of the project was to demonstrate the application of GIS (Geographic Information System) technology for operational uses in integrated planning and management at micro level. The project was completed in 1993 and the project report submitted to NWDB.

Project Area

The project area, Uttari Koshi, is situated in Almora district and extends over 454.32 km^2. It has 15 micro water-sheds and forms a part of watershed of Kosi river. There are four development blocks in the project area covering 341 villages. The altitude varies between 1000 m to 2750 m above mean sea level. The area falls under temperate Himalayan Zone and has a subtropical climate. The forest types are mainly Chir, Pine and Oak. Deodar does not occur naturally but has been planted at some places. Fir forests occur at higher altitude. Soil is well drained, medium to deep and fine loamy to loamy skeletal. Slope varies from gentle to steep. Terrace cultivation constitutes 25.4% of land area and 4.1% land under cultivation in the valley. Valleys are generally irrigated whereas terrace cultivation on slopes mainly depends on rain.

Methodology

Data acquisition- The spatial data such as, topographical map, thematic map, village boundary map, geological map, ownership map, cadastral map, aerial photographs, soil maps, existing land use map, forestry map and satellite imagery of Landsat (TM) satellite, were acquired at a scale of 1:50,000. Non spatial data included demographic information, livestock population, socio-economic data, climatic data irrigation facilities, transmission line network, energy consumption etc.

Data input for creation of Data base- The spatial data were entered into the GIS system with the help of Mapper and Interpreter for data base creation. Non spatial data base with desired parameters were created through dBASE III plus for all the 341 villages of the project area and were inter-linked to GIS through export and import facility of utility modules. Digitally classified TM data was transferred from VAX computer system to GIS system through EASI/PACE Image processing software. The village boundary layer was overlaid on forest type and landuse map (digitally classified) followed by delineation of different resources within the villages. The information obtained was also entered in the village data base.

Data interpretation and analysis- Different layers of data were analyzed. The analysis included erosion intensity analysis, land suitability analysis, land capability analysis, fuelwood deficit/surplus analysis, fodder deficit/surplus analysis and waste land development analysis.

Outputs- The outputs were obtained in the form of different categories of existing landuse and proposed landuse maps for waste land management and development. These maps show areas under existing landuse including culturable wasteland namely scrub land, barren grassland, forest blanks etc., non culturable wasteland, rocky exposures that cannot be put to any use and areas under proposed landuse for fuelwood/fodder plantations, horticulture, pasture and agriculture. Some of the output maps are shown in Fig. 1 to Fig 4.

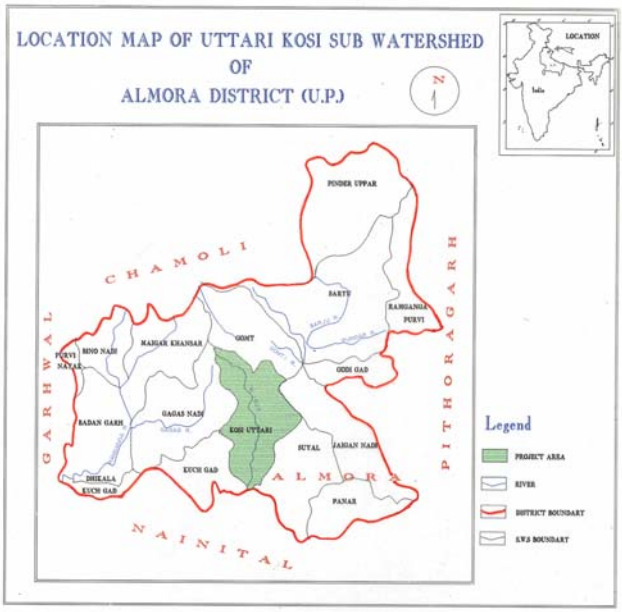
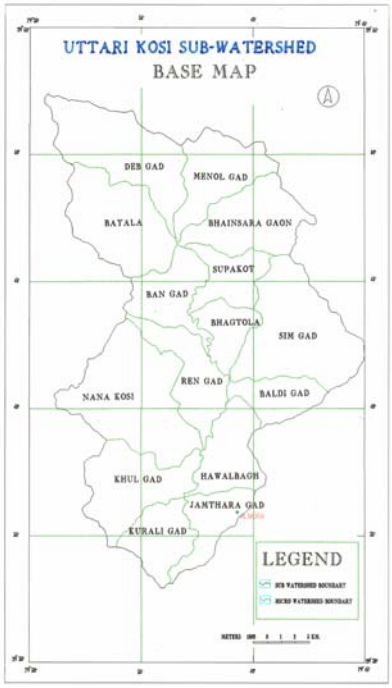
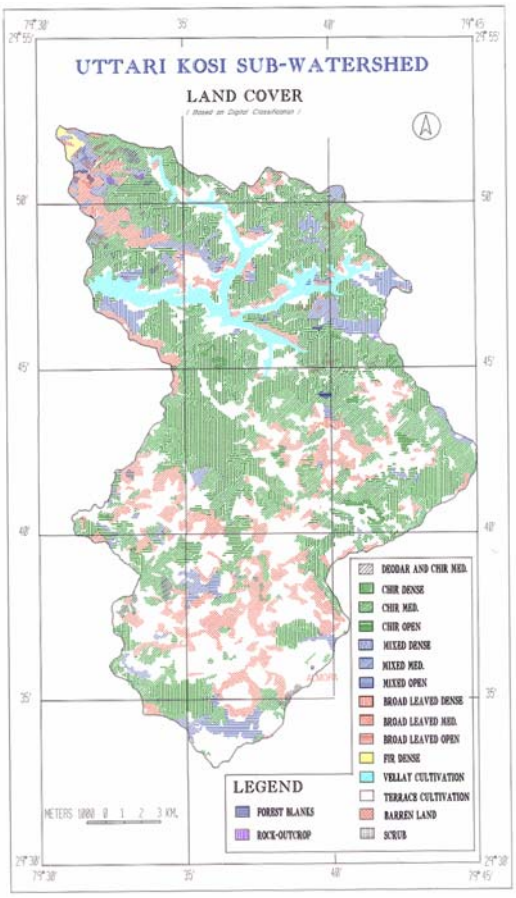


Fig.1: Location Map of Uttari Kosi Sub Watershed



Error! Fig.2: Base Map of Sub Watershed


UTTARI KOSI SUB-WATERSHED
LAND COVER
(Based on Digital Classification)
A
74°38'
35'
40'
74°45'
29°55'
58'
45'
40'
35'
29°38'
DEODAR AND CHIR MED.
CHIR DENSE
CHIR MED.
CHIR OPEN
MIXED DENSE
MIXED MED.
MIXED OPEN
BROAD LEAVED DENSE
BROAD LEAVED MED.
BROAD LEAVED OPEN
FIR DENSE
VELLAY CULTIVATION
TERRACE CULTIVATION
BARREN LAND
SCRUB
LEGEND
FOREST BLANKS
ROCK-OUTCROP
METERS 1000 0 1 2 3 KM.

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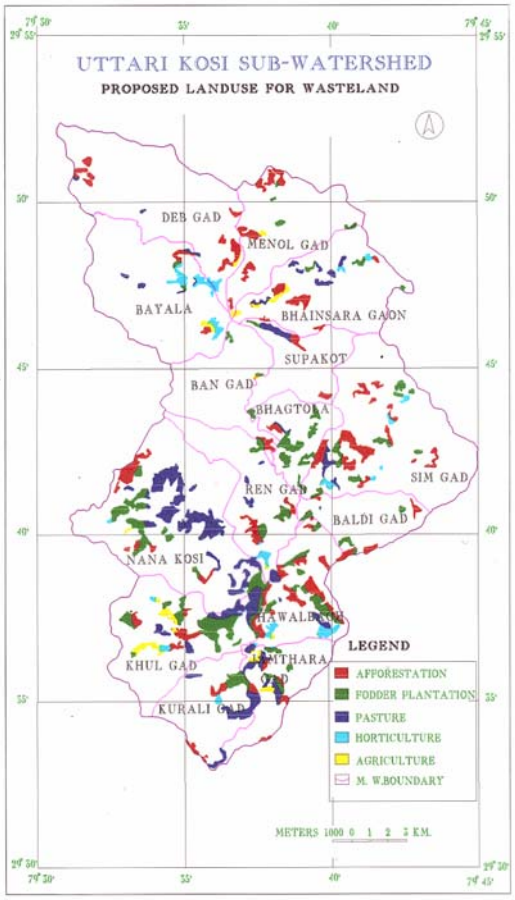

Fig.3: Land Cover Map of Watershed

Fig.4: Proposed Landuse for Wasteland