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DEVELOPMENT OF LAND AND WATER RESOURCE ACTION PLAN USING REMOTE SENSING & GIS - A CASE STUDY OF ZAHEERABAD, MEDAK DISTRICT, TELANGANA, INDIA

Earth Science

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ABSTRACT

The main objective of the study is to create the spatial information for natural resources in STUDY AREA and to develop methods for its efficient utilization and sustainable management utilizing Remote Sensing and GIS techniques. The thematic layers are derived from satellite imagery and Survey of India (SOI) topomaps using visual interpretation technique. These maps are converted to digital format using GIS software for the generation of final outputs.

KEYWORDS:

Natural Resources Management, Remote Sensing, Geographical Information System, and Sustainable Development.

1. INTRODUCTION:

To improve the management of natural resources with an improvement of water and land quality, greater knowledge about their quantity and quality is required. There is also a need for regular systematic geographical, hydrological, and hydro-geological data together with a system for processing the quantitative and qualitative information for the various types of water bodies. The study area is for sure helpful in micro-level natural resources management, planning, and unsustainable development for this Remote Sensing and GIS techniques.

2. DESCRIPTION OF STUDY AREA:

The Mandal is situated in the South-West part of the Medak District. The mandal lies between North Latitudes 17o 46' 22" and 17o 32' 32" and East Longitudes 77o 26' 42" and 77o 42' 36" and falls in Survey of India Toposheet Nos. 56/G/10/NW, 56/G/10/SW, 56/G/6/NE, 56/G/6/SE, 56/G/10/NE, 56/G/10/SE of scale 1:25,000 published by Survey of India in 1973. The total area of the study area is 392.15 sq. km.

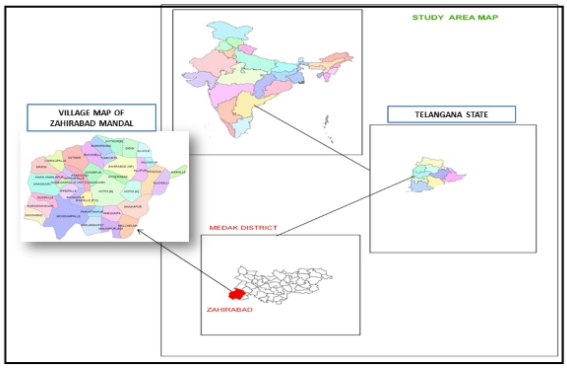


Fig: 1.1: Location Map Of Zaheerabad Mandal.

3. STUDY OBJECTIVES:

- To study the present status of water resources, land resources, ground water potential using, satellite data, collateral data, and field data.
- To prepare the digital thematic maps using satellite imageries on GIS platform. This constitutes the spatial database.
- Preparation of action plan for land resources and water resources of the study area for sustainable development.

4. METHODOLOGY

4.1. Data Collection:

The Mandal lies between North Latitudes 17o 46' 22" and 17o 32' 32" and East Longitudes 77o 26' 42" and 77o 42' 36" and falls in Survey of India Toposheet Nos. 56G/6, 56G/9 and 56G/10 of scale 1:50000 published by Survey of India in 1973. The total area of the study area is 392.15 sq. km and collateral data from related organizations, comprising of collateral data, and demography data.

4.2 Spatial Database & Attribute database::

Creating a GIS spatial database is a complex operation, which involves data capture, verification, and structuring processes. The spatial data types toposheets, aerial photographs, satellite imageries, and tables. The thematic maps are converted to digital mode using scanning and automated digitization process. It is mandatory that all spatial data in a GIS and are located with respect to a frame of reference.

5. RESULTS AND DISCUSSION:

5.1 Base Map

The area of the Mandal is 366.66 square kilometers with a population of 95,571.The density of population of the Mandal is 244 per square kilometer. There are 36,667 females and 40,108 males in this mandal i.e., the ratio is 914 females to 1000 males. The percentage of rural population is 85.55 percent while the percentage of urban population is only 14.45.

5.2 Minerals:

The mandal has large reserves of building stones in the form of different variety of Granites. The polished granites are being used in the construction and Beautification of buildings. Agate, jasper etc. found in the Deccan trap country provide large quantity of material for the Lapidary industry in making decorative articles. Minor amount of Molibdinite, an important mineral used in manufacturing special type of steel occurs in parts of Zahirabad villages.

5.3Geology:

The mandal is characterized by gently undulating topography with low hills, the highest elevation being 660m above msl at the central parts of Zahirabad and lowest 540m above msl at the southern part of this mandal. Highest elevation is extending from Gopanpalli in the central to Asadganj in the north, other one is extends from Mugdampalli in the south east to the Dhanaseri in the west in the district. Precambrian rocks, such as granite, adamellite, tonalite, amphibolite, homlende boitite schist occupy a major part of the mandal. These formations were subjected to tectonism and green schist facies metamorphism. Except for a portion in the western part of the mandal ,most of the area is occupied by granites.

5.4 Soils:

The district exhibits a variety of soils .Black cotton soil ranging in thickness from 0.3 to 0.75m occurs in Zahirabad, Tumkund, Kotur and Didgi villages. Red soil ranges in thickness from 0.75 to 2 m. It possesses high water retention capacity. Major part of the district is arable unirrigated land around Zahirabad.

5.5 Geomorphology and Geohydrology:

The mandal is covered under Godavari basin. Karanja Vagu, is a major small river which flows NW – NE direction in this mandal. The drainage pattern is dendritic in granite terrain and parallel in Deccan Traps. The hard rocks viz., Archeans and Deccan Traps occupy 79.35%, soft rocks viz., laterites20.63% and alluvium 0.2%. The depth to water table in granite varies from 4.5 to 199mm, in laterites from 5 to 30m and in alluvium from 0.5 to 7.5m.In Deccan Traps, Water occurs in fractures, crevices and joints

5.6 Agriculture:

The people of the mandal overwhelmingly depend on agriculture for their sustenance. About 78.11% of the total population dependent on Agriculture and allied activities. The principle crops in the district are Paddy, Jowar, Cotton, Turmeric, Maize, Arhar, Chillies, Sugarcane and Sesame.

5.7 Natural Vegetation:

The District does not contain large or important forests. The district has the smallest proportion of forests to the geographical area. The percentage of area under forests to the geographical area being as low as 5.8. The forest vegetation of the district belongs to the dry, deciduous, tropical forest type of the Krishna basin. The wood from the forests of this region is useful only for fuel and for agricultural implements like ploughs.

5.8 Water Resource:

The mandal is drained and watered by the small river Karanja vagu. The river Karanja vagu flows towards NW part to the NE. Other notable streams are found in the eastern parts of the mandal. In addition there are a good number of tanks of varying sizes caters the needs of drinking and minor irrigation. Garukhan Cheruvu and Yelamma Cheruvu are the important tanks which drains the southeastern parts of the mandal. There are some other notable tanks which helps for the agriculture in southern parts.

5.9 Land Use/Land Cover:

Land Use/land cover map is prepared adopting the classification system of the land use categories from (i) Manual of Land use/Land Cover Mapping using Satellite Imagery, Part-I and II (NRSC, 1999) and (II) Manual of Procedures for Wasteland Mapping (NRSC, 1996). The forest boundaries are taken from SOI topomaps of the same scale and incorporated in the base maps.

6. ACTION PLANS

6.1 Action Plan for Land Resources

In view of this semi-arid climatic conditions of the study area the following measures are recommended for general soil conservation.

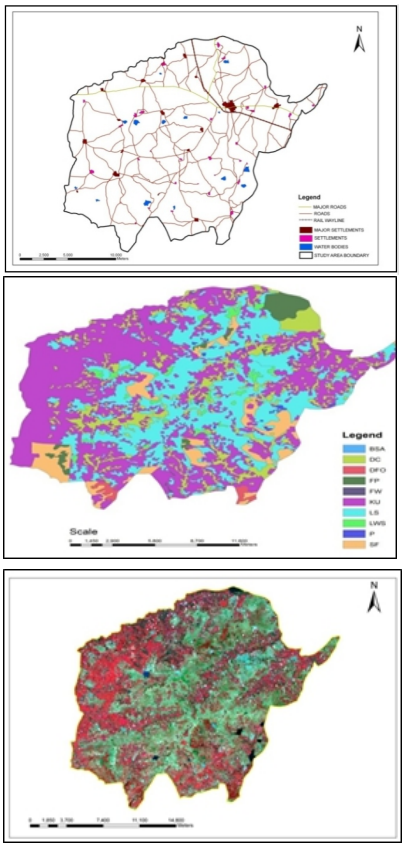
- Crops like Paddy, red gram, Bengal gram, chilles, Fruits and vegetables are recommended. Individual bunds of land parcels may be planted with acacia-nelotika (nalla tumma), acacia-senegal, neem, papaya, wild drumstick, and tamarinds are suggested.
- Individual bunds of land parcels may be planted with acacia-nelotika (nalla tumma), acacia- senegal, neem, papaya, wild drumstick, and tamarinds are suggested.
- Commons in each village may grow fodder species like stylo santhes hamata, stylo santhes scabra, dalichas lab-lab, vigna, unguiculata, and sorghum sudanense.

6.2 Action Plan for Water Resources

1. Water allocation for agriculture in the study area can be made keeping in mind the irritability of land, food requirement and equity issues in sharing the water and related infrastructure.
2. Mechanisms must be evolved and developed in sharing the reservoir and tank waters during deficit rainfall years, normal rainfall years and above normal rainfall years.
3. New technological options in recycling of water, water harvesting, soil and water conservation and multiple use of water are to be adapted on a big scale. The technologies include micro filtration at household level to desalination of water for drinking water supplies.
4. Rainwater harvesting and storage for further economic use of the study area must be made mandatory of all the households, public and private institutions both in the rural and urban dwellings.
5. Restoration of age-old tanks and lakes are highly essential by removing silt and maintaining it with fresh water to ensure proper groundwater recharge and ecological development.
6. Conjunctive use of different water sources to be made mandatory for all areas for efficient use of water.

7. CONCLUSION:

It is established that remote sensing technology and GIS to are of critical nature and Generation of resource information system like, land and water resources which will become handy for the planners for their effective monitoring and management. This study recommends effective soil and water conservation measures to increase the subsurface aquifer capacity and identifies suitable cropping patterns, which help in reduced soil erosion, increased moisture conservation and improved productivity of the soil. The physical characterization of an area is also useful to plan the basic minimum needs of farmers, thereby improving their socio-economic conditions and helps in evolving a broad national policy which can be applied by decision makers for sustainable development of any given study area.



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