

Geospatial Technology for Micro Level Planning of Villages: A Case Study of Hasanparthy Mandal, Warangal Urban District, Telangana, India

Renikunta Srikanth¹, Dr.K.Santosh Kumar ², Sk.Md.Imran³ and Mary Soujanya⁴

^{1,3,4} Assistant Professor, Department of Civil Engineering, Methodist College of Engineering and Technology, King Koti, Abids, Hyderabad-01

² Assistant Professor, Humanities and Sciences, Methodist College of Engineering and Technology, King Koti, Abids, Hyderabad-01

Email:santoshkoppula99@gmail.com

Abstract—Geospatial Technology has developed at a significant pace over the past two decades and will playing key role in development of nations in the 21st century. The present paper emphasizes the power of GIS, Remote sensing and GPS technology which will help the educationists, planners, researchers, decision makers, administrators, communication professionals and officials from various departments of state government to better understand and evaluate spatial data by creating graphic displays using geoinformation stored in the database on ARCGIS platform for rural development. In order to get the Environmental clearance (EC), Environmental Impact Assessment (EIA) and Environmental Management plan, which have to be submitted to the concerned authorities with the baseline data. Acquisition of this data needs too much time and is involved huge money. Therefore, it is more appropriate to have the digital database of the terrain with all the parameters at large scales. To manage, store, retrieve and disseminate such digital data products, an information system is necessary.

Index Terms— Micro Level Planning, Environmental Management & Geospatial Technology.

I. INTRODUCTION

Planners and decision-makers at micro level have to depend upon spatial and non-spatial data for optimal interpretation. Hence, the planners need to have at their disposal sophisticated data management systems to handle such spatially correlated data. Micro-Level studies are one of the most efficient ways to understand the farming systems in rural areas and also help in identifying the socio-economic and institutional constraints faced by the farming community[1].

The emergence of Remote Sensing and Geographic Information System as a powerful tool for spatial analysis and storage has in effect alleviated the problem by computerization of the spatial data. This new technology can reduce the time and cost to the planners in organizing the data in arriving at precise conclusion and decisions.

Micro-Level Information System, generated in the present project which integrates the spatial Micro-Level maps with non-spatial or tabular information, has demonstrated its potential for grass-root level development planning taking into consideration the local needs and constraints [2,3].

II. STUDY AREA

Warangal Urban district is situated to the centre of Telangana at latitude of 17.97°N and a longitude of 79.92°E. It has an average rainfall of 86mm/yr. The administrative area of Warangal Urban district Corporation is 406.87 Sq.Kms, As per 2011 census population is 820308. The Warangal Urban District Corporation has 58 election wards. Warangal is well known historical place. It is also well known for educational institutions. Total population of Hasanparthy is 14735. Males are 7463 and Females are 7,272 living in 3235 Houses, Total population of Chinthagattu is 4110 Males are 2174 and Females are 1,936 living in 938 Houses. Total area of Chinthagattu is 791 hectares.

III. OBJECTIVES

The primary objective of the study is to develop a Information System focusing on the following issues

- To develop a standardized data model for Land use on 1:400 Scale
- Development of detail Socio-economic data base of the study area
- To prepare the digital thematic map namely, land use/ land cover, using satellite imageries on ArcGIS platform and to maintain a spatial digital database.
- To develop and maintain Village Information System (VIS) and its database which can be used for micro level planning.

IV. METHODOLOGY

Raster data to vector data conversion format

- Baseline data by digitizing the maps using ARCGIS
- Identifying the baseline digital map (hard copy)
- Locations to collect the samples on the base map.
- Satellite imagery of the study area is processed and hardcopy is generated.
- Soil and water Sampling stations identification on the satellite imagery
- Thematic maps prepared by visual interpretation and digital interpretation
- Scanning and digitizing creation of digital databases
- Preparation of Water and soil Quality Maps.
- Attribute data creation, which consist of water, soil and sediment quality of sample location
- Analyzing and determine water quality index and soil quality index.
- Results and conclusions
- Suggesting various recommendations at micro level [4,5].

V. RESULTS AND DISCUSSION

The GIS database created in this project are of two types, namely, spatial and non spatial data. The spatial data is comprised of land use/land cover, drainage, base and transport maps. The non-spatial or attribute data is composed of socioeconomic details. The base maps have been prepared incorporating all the basic details existing on the topomaps to make easy for quick ground references. The base maps thus prepared are utilized in the development and derivation of thematic maps for transferring the spatial details extracted from the satellite digital data.

Thematic maps are essential inputs for any kind of area development, planning and management of resources. The requirement for thematic maps, in terms of scale, information content, classification system and legend depends on the purpose for which the maps are to be used. Both, visual interpretation and digital analysis techniques are being used for preparation of thematic maps from satellite images.

For any overall development, concentration on the basic amenities such as health, drinking water, electricity, primary education, etc., is the first priority. The village level maps showing several land form details would

help in proper scientific developmental planning of the villages. High-resolution IRS P6 LISS-III MX shows fabulous prospective to prepare the village level thematic maps.

Therefore, user-friendly Decision Support Information system is developed to help the planners to do planning at village level of Chithagattu and hasanparthy village of Hasanparthy Mandal Warangal Urban District. Socio economic data is available in detail which can be updated in future. This Information system can be used by any authenticated user without having any prior knowledge. The user can query and know the present conditions and accordingly go for further planning. It is useful to find out the drawbacks and potential of any area before going for any developmental activities. The information system can be used to evaluate the Capacity of the area for its shortcomings and therefore to improve the productivity.

The Rural Development in India is one of the most important factors for growth of the Indian economy. The Ministry of Rural Development in India is an apex body to develop the rural sector implementing several developmental programmes and projects. It needs data related to rural areas at mandal / village level. The extent to be covered in Surrey of India toposheets no: 56N/8,56N12 on 1:50,000 scale and Total population of Hasanparthy is 14735 .Males are 7463 and Females are 7,272 living in 3235 Houses, Total population of Chinthagattu is 4110 .Males are 2174 and Females are 1,936 living in 938 Houses. Total area of Chinthagattu is 791 hectares.

A. Steps to convert cadastral map into Digital format and Working With RS Products:

- a) Cadastral Data:
 - Geo-referencing of Cadastral maps using GPS survey has been done.
 - Digitization of the village maps completed
 - Survey number has been attached to each village
- b) Working With RS Products:
 - For both the clusters procurement and processing of satellite data i.e, (LISS-III& PAN) is completed for one season for the year 2017.
 - Image merging has been done.
 - For both the clusters base map, drainage, road network and Land use land cover maps have been generated
 - Spatial distribution maps of water quality are generated.
- Soil infiltration tests for post monsoon is is carried out
- Soil and water data has been collected for post monsoon, analysis is be done
- Amenities and Infrastructure data collection.
- For change detection studies of land use land cover for the selected villages procurement of RS data for both the clusters for different period are done.
- Geo-tagging of public and private asserts have been taken into consideration.

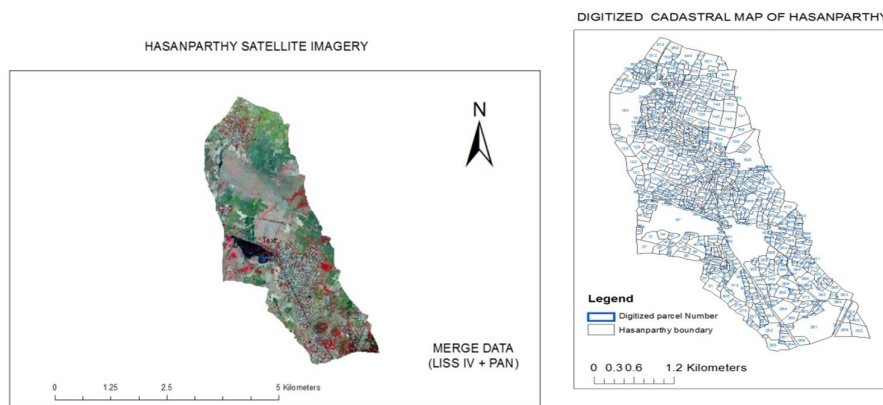


Fig.1: Hasanparthy Satellite imagery and Cadastral map

TABLE I: PHYSICO- CHEMICAL ANALYSIS OF HASANPARTHI VILLAGE

S.No	Sample Name	pH	EC (microsie meas/cm)	TDS (mg/l)	Na (mg/l)	K (mg/l)	NO ₂ ⁻ (mg/l)	NO ₃ ⁻ (mg/l)	SO ₄ ²⁻ (mg/l)	PO ₄ ³⁻ (mg/l)	DO (mg/l)	CO ₂ ³⁻ (mg/l)	HCO ₃ ⁻ (mg/l)	Total Hardne ss (mg/l)	Cl ⁻ (mg/l)	Ca ²⁺ (mg/l)	Mg ²⁺ (mg/l)	Salinit y (mg/l)
1	Hasanparthi-1	7.2	1727	1109	220.5	18.3	0.8	0.09	98	0.142	6.1	40	260	700	325	192	52.8	587
2	Hasanparthi-2	7.3	1286	826	185	15	0.6	0.05	103	0.06	5.2	40	340	460	138	124	36	249
3	Hasanparthi-3	7.3	1160	746	151.5	23.6	1.2	0.13	51.4	0.097	5.8	100	230	450	175	124	33.6	316
4	Hasanparthi-4	6.8	1087	699	155	10	1.5	0.1	50	0.08	4.9	100	330	460	95	128	33.6	172
5	Hasanparthi-5	6.8	1295	832	189	25	1	0.13	66	0.062	5.5	100	200	410	195	116	28.8	352
6	Hasanparthi-6	6.4	1510	970	165	22.1	1.2	0.13	59.5	0.15	5.8	20	290	780	280	196	69.6	506
7	Hasanparthi-7	6.4	1965	1260	295.2	12.7	1.7	0.2	75.4	0.16	6.5	20	220	750	504	204	57.6	911
8	Hasanparthi-8	7.1	1669	1072	225	27.5	1.1	0.1	61	0.093	5.7	60	140	610	365	180	38.4	659
9	Hasanparthi surface water lake	7.5	849	546	150	6.7	7.6	0.8	39	0.08	6.71	60	90	190	145	56	12	262
10	Chintagutta-1	8.2	887	575	140	32	1	0.12	32	0.125	6.08	120	160	220	120	60	16.8	217
11	Chintagutta-2	7.9	1067	686	180	35	1.4	0.15	55	0.086	6.29	60	240	310	140	80	26.4	253
12	Chintagutta-3	7.6	1443	930	176	7.8	0.8	0.09	44	0.095	5.4	80	310	680	220	188	50.4	397

VI. CONCLUSIONS

Apart from loss of human lives, natural disasters inflict severe damage to ecology and economy of a region. Micro Level Information System at village level has made significant contribution in all the three phases, i.e. preparedness, prevention and relief of disaster management. With a constellation of satellite, To develop the areas like this, ARCGIS software is been used to develop thematic map at 1:400 scale. The information can be used to assess the capability of the area for its shortcomings and hence to improve the productivity capacity. Furthermore the spatial analysis tool of the system is a handy option for the planners to correlate spatial information and hence to zero in areas of the planners interest, such site suitability assessment for and developmental activities, funds allocation etc.

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