VILLAGE INFORMATION SYSTEM THROUGH REMOTE SENSING AND GIS TECHNIQUES

Dr.P.Ramamohana Rao* & Prof. P.Suneetha**
*GIS and Remote Sensing Asst., Planning Dept., APCRDA, Vijayawada.
**Professor, Department of Geography, Andhra University, Visakhapatnam.

Received: July 18, 2018 Accepted: August 31, 2018

ABSTRACT *Village Information System (VIS) is a tool for legal, administrative and economic decision making as well as an aid for planning and development. Spatial Data Infrastructures have potential to assist in planning, monitoring and exchange of information between various agencies in Rural Development administration,in the absence of accurate information about all kinds of resources at village level. A suitable information system is required at village level to serve all these requirements. Such information system can provide a more effective and meaningful direction to the planning and development of rural settlements. In this study, high resolution images from Google Earth server has been used for the preparation of small scale base map of Korlakota village, Amadalavalasamandal, Srikakulam district, at scale 1:1000 in GIS environment, supported with extensive field survey. Data related to different aspects like population and household size, landuse, type of housing, sanitation facility, water facility, accessibility to water and occupation of the households is collected during field survey. This information is integrated with small scale base map and has been used to develop an information system.*

Keywords: *Micro Level Planning, VIS, Remote Sensing and GIS.*

Introduction

Village Information System(VIS) is a Geographical Information System (GIS) based application, which provides detailed information pertaining to demography, infrastructure and natural resources at village level.It is a comprehensive and detailed study of villages at the core level and provides complete information for decision – making based on their existing resources and capabilities. It comprises Spatial database mapped at cadastral level and the socio-economic information of each land parcel related to the facilities, infrastructure, population, building type, etc., the main objective of the study is to develop a village information system providing complete information for decision-making based on their existing resources and capabilities.

Spatial Database Management System of a VIS consists of three significant components (Fig- 1) viz. Mapping, Data base, Modeling. Data base collected from various sources in the form of digital satellite images, topographic maps, thematic maps, cadastral maps and aerial photographs forms the spatial data base. These maps manipulated and are stored in a common digital format and scale. The other component mapping involves georeferencing the available data base, extraction of base map and all possible spatial themes including classification of the given village under study. The base map and the thematic maps are vectorised and feature coded for ready use. The third component modeling makes use of appropriate feature coded vector layers to derive user specific composite maps and models using specific GIS techniques.

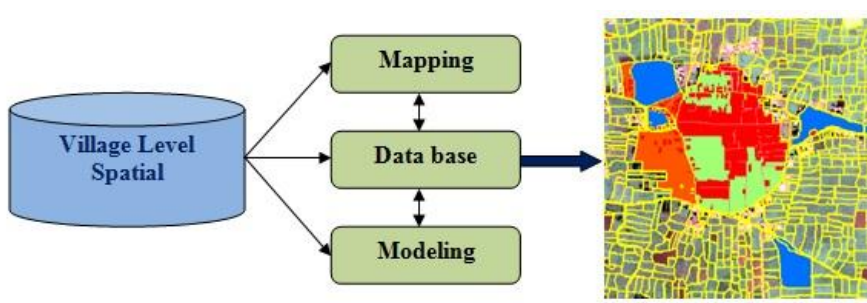

Fig- 1 Schematic Representation of Spatial DBMS

An attempt has been made to develop a Village Information system has for Korlakota village of Srikakulam District in order to provide integrated information on the existing resources and capabilities required for micro-level planning, decision – making and implementation. Korlakota is a typical village of Amadalavalasamandal situated within $18^{0}23'38''$and $18^{0}25'9''$ northern latitudes and $83^{0}51'8''$and $83^{0}52'49''$

eastern longitudes (Fig-2). It is the most populated village in the mandalwith 3,675 people according to the 2011 population census.

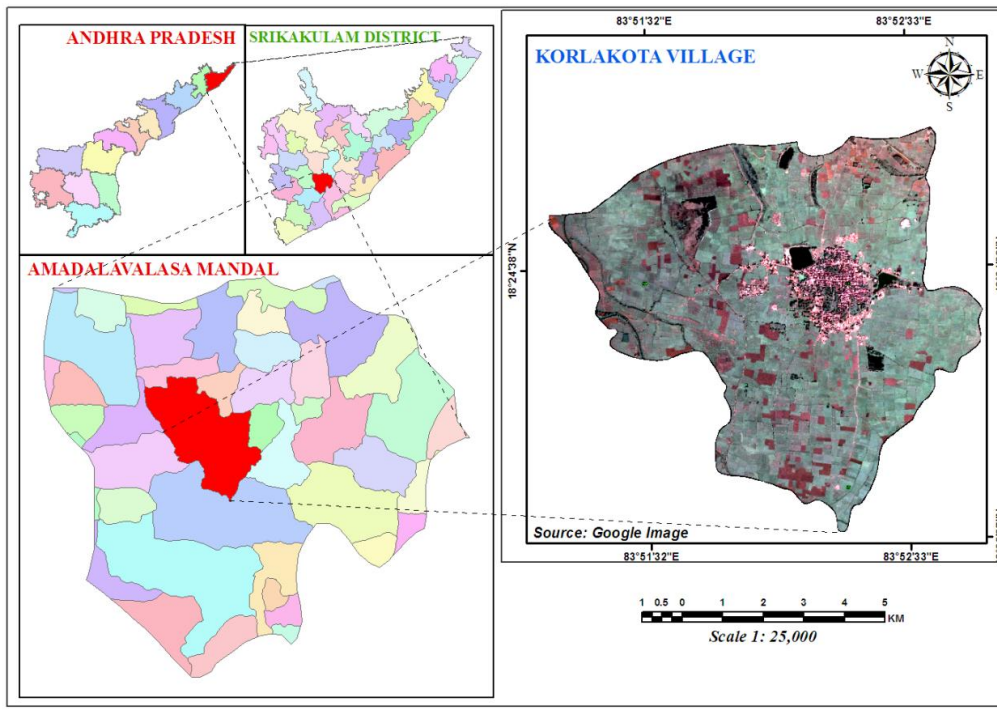

Fig- 2Korlakota village - Location Map

Database & Methodology: Survey of India Toposheet65 N/15 having 1:50,000 scale and Google Earth Image of 2010 are the input spatial data. Socio-economic survey has been conducted to collect the primary information. Remote Sensing and GIS techniques are used interactively to generate the spatial database. General methodology for developing the Village information system is described in the flow chart (Fig- 3). Village boundary of Korlakota has been digitized from the georeferenced SOI topographic map. Google image of the study area has been downloaded and the village boundary map is overlaid on the image. With appropriate magnification of the image, the base map (Fig- 4a&b), consisting road net work, built up area, tanks and water bodies has been digitized. Then the land use (Fig- 5a&b) at cadastral level is mapped using the Google image and the final map has been generated.

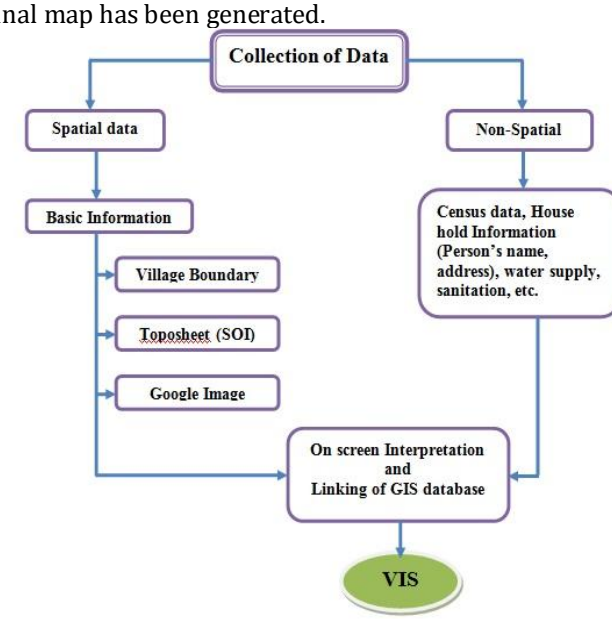

Fig- 3 General Methodology

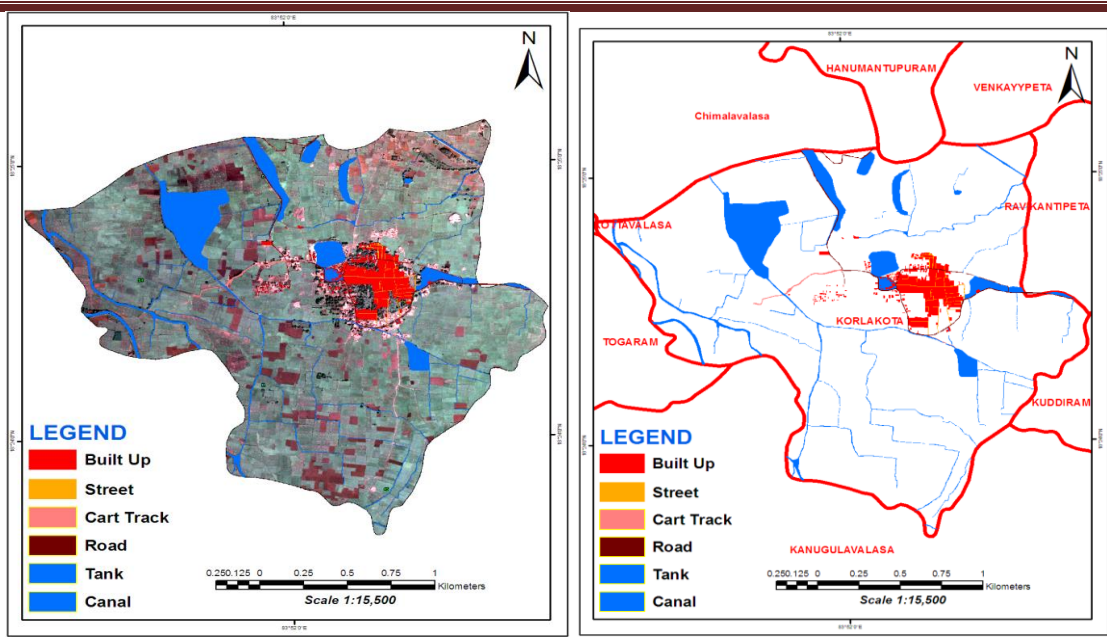

Fig- 4a&bBase map of the Korlakota village

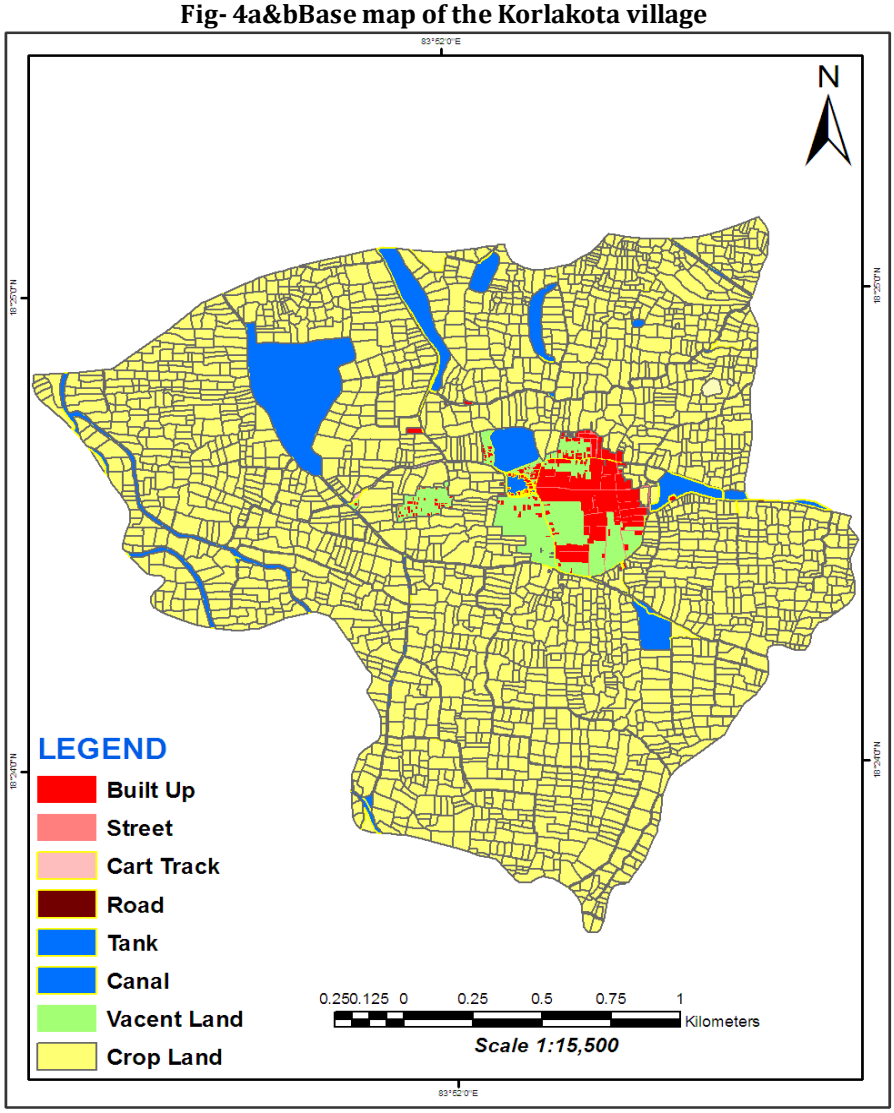

Fig- 5 (a) Korlakota Village Land use and land cover

e ISSN 2348 –1269, Print ISSN 2349-5138
Cosmos Impact Factor 4.236

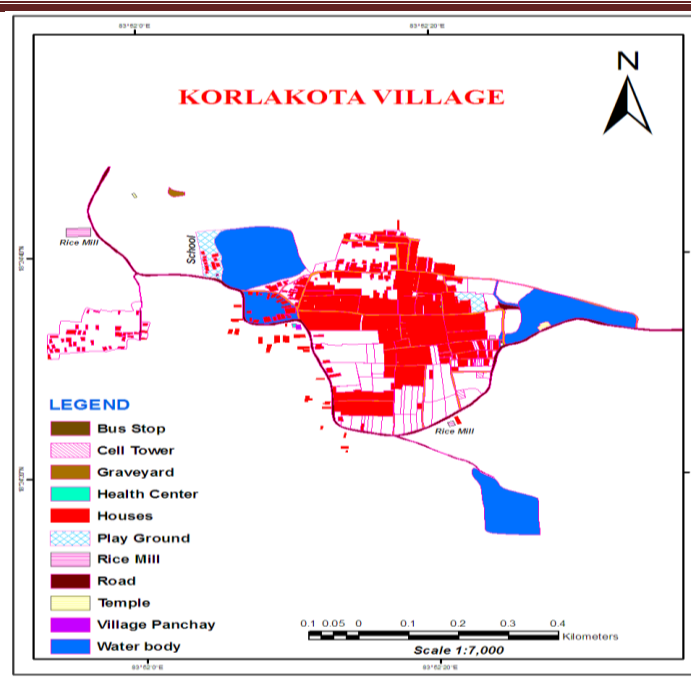

Fig- 5 (b) Korlakota Village - Cadastral map

The spatial database thus generated consists of several land parcels of the village stored as polygons in the vector format with unique identification number. Each building is identified with the cadastral map and location was confirmed with the help of GPS and surveyed with the help of a structured format (Annexure-1). The primary information regarding the socio-economic attributes viz. Name of the owner, family size, occupation, Ration card, property type, survey number of the property, toilet facility, land use type of the plot, sanitary and water facilities etc. along with the related details have been recorded. Necessary village records have also been collected and the above attribute data is integrated with the corresponding polygons with the help of unique identification number and the attribute tables edited appropriately. The secondary data available in excel formats regarding the survey number of the property are edited with the corresponding polygon ids so as to enable data transformation. Then the excel formats are converted to text format to enable to open in Arc GIS. The Tables of both spatial village map and non-spatial attribute information were opened in Arc GIS and joined together, with the help of user-defined ids, using table-join function.Thus, the Village information system (Fig-6) has been generated for the korlakota village that consists of village map with its boundaries and all essential attribute information of socio-economic dimensions. The users can generate various views by themselves depending upon their needs, using the VIS module, to make plans and take appropriate rural development decisions. VIS could be customized to make it friendlier interface using the scripts available in Arc GIS.

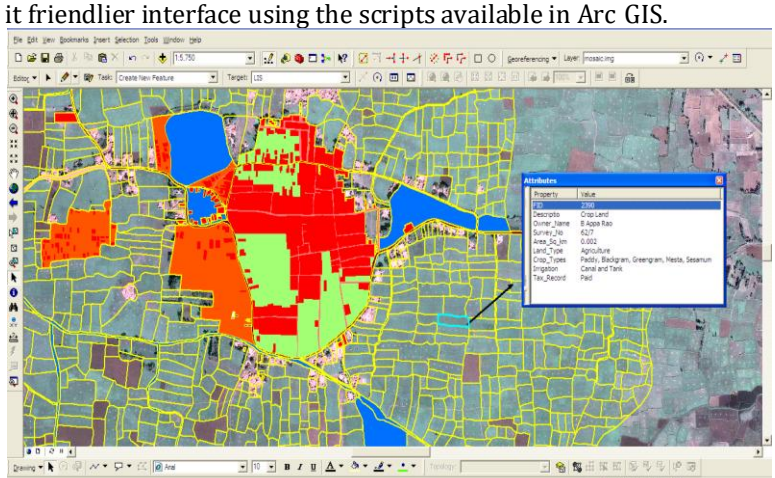

Fig- 6Korlakota Village - An overview of Land information

An overview on major spatial and socio-economic dimensions of VIS

Total geographical area of the village is 4.5 square kilometers most of which (about 4 Sq.km accounting to 88%) is crop land. Paddy is the predominant crop grown in the village. Next significant land use is under surface water bodies which include canal and tanks, occupies about 8% of the total geographical area. The built up area and vacant lands account for two and one percent respectively. Built up land includes residential and commercial buildings, temples, bus stop, health centers, rice mills, temples etc. The built up land mostly comprising houses are concentrated at the center of the village is surrounded with vacant land which in turn in embedded in vast extent of crop land. The village exhibits a typical rural setting. The village has a good net work of roads. Vacant lands are mostly used for keeping hay or stacking livestock and dung etc. A play ground and a grave yard are also identified.

Total population of the village is 3,675 with a density of 816 per square kilometer. There are a total of 1453 houses in the village with an average household size 2- 3 persons. There are 334 farmers (23%) in the village who work in their own farms and 683 (47%) are farm labour. Both put together 70% of the households are engaged in agricultural activities. The remaining 30% are engaged in various service sectors. It is quite unique that as high as 7.5% of house hold heads are employed in Defense services, though most of them are in lower cadres. 8.5% are employed in private sector, 4.8% in Govt. jobs and 4.13% are teachers. About 78 % of the families have White ration card (Household Card issue by Govt.based on annual income) indicating their low income status.

Table 5.7 Occupation Structure in Korlakota Village

Occupation	No of House holds	Percentage (%)
Farmers	334	22.99
Labour	683	47.01
Drivers	20	1.38
Tailors	10	0.69
Defenses	109	7.50
Government Job	70	4.82
Teachers	60	4.13
Private Job	124	8.53
Business	15	1.03
Services	28	1.93
Total	1453	

Of the 1453 residential buildings in the village 60% (872) are concrete buildings and the rest (40%) are non-concrete and most of which are built with mud and burnt brick.

Only thirty percent of houses have their own sources of drinking water of which bore wells constitute twenty percent and open well for ten percent. Seventy percent of the houses do not have their own sources but depend on the community bore/openwells. With respect to the sanitation facility, 38 % houses have toilets and the rest 62% do not have the provision.

Village Information System (VIS) generated in the present study integrating the spatial village maps with non-spatialhas demonstrated its potential for grass-root level development planning taking into consideration the local needs and constraints. It has also established its usefulness to the decision-makers in the district to generate views/scenarios for decision-making at local-level. This prototype Community GIS tool will serve as a first step towards the development of Decision Support System for decentralized planning at Micro- level.

Conclusion

Village information system is the study of village at micro level and technique of remote sensing and GIS make this work easier. The forming and sustaining of the information systems in an effective manner depends on construction of up-to-date and accurate base map in digital environment. High spatial resolution satellite data from Google Earth shows the potential in the development of parcel level base map, which is a common data source for information systems.An attempt is also made to develop a village information

system consists socio economic data at cadastral level. All of these can be effectively used for micro-level planning aimed at sustainable rural development. Remote Sensing techniques in conjunction with Geographical Information Systems are quiet effective in developing and integrating the spatial data base.

The Village Information System (VIS) generated as a part of micro level planning integrated the spatial data and non-spatial data has demonstrated its potential to identify the potential of local resources, needs and constraints. Further it is capable of generating various view/scenarios for decision-making at local-level. This model GIS tool will serve as a decision support system for planning and implementation at micro-level. As all the above models are capable of incorporating data successively, development can be monitored by change analysis. Making this information available in rural areas and increasing the people's participation in formulation and implementation of developmental plans and imparting fundamental training to the farmers will empower them to improve their economic wellbeing so that sustainable rural development can be achieved.

References

1. AdinarayanaJ., Raj F.J and Sharma V., (2004) "Village Level Information System – A Tool for Decentralized Planning at District Level in India". Journal of Environmental Informatics. Vol.4 (2), pp56-64.
2. Brian E. Mennecke (1999). "Understanding the Role of Geographic Information Technologies in Business: Applications and Research Directions." Journal ofGeographic Information and Decision Analysis, Vol.1, No.1, pp.44-68.
3. Dutta U. & Singh Y. (2007). "Micro-level Planning Using Spatial Database". Current Science, Vol.93. No.7, pp.921-926.
4. Ghosh A., Ghosh PK. &Datta D (2011). "Development of Spatial Database for Sustainable Micro-Level Planning of ChandanpurMouza, Purulia, West Bengal" e Traverse –The Indian Journal of Spatial Science. Vol.II,No.2. pp1-8.
5. Mohan C.& Sharma P. (2012). "Micro LevelPlanning for Rural Development "A Case Study of Bhiwani District Haryana". Int. J. Shodh, SamikshaAurMulyankan. vol.IV. issue 47. pp.25-27.
6. Nagarajan, M., and Gupta, C.A., (2013). "A GPS and GIS based Model for an Emperical Study of Village Information System". Int. J. of Scientific Engineering and Technology. Vol.2, No.6. pp496-501.
7. Prthiban M, Selvavinayagam K, Madhu N.S and Suresh Babu S., (2011) "Village Information System for Koratti Village Using GIS Techniques". International Journal of Earth Sciences and Engineering, Vol. 04, No 01-Spl issue, pp.36-40.
8. Sitender, Satish Kumar and Reena., (2012) "Village Information System-A Case study of Muklan Village, Hisar, Haryna (India)". International Journal of Research in Social Sciences, Vol.2, Iss.2, pp.184-193.
9. Zahir Ali and Muhammad Shakir., (2012) "Implementing GIS-Based Cadastral and Land Information System in Pakistan". Journal of Settlements and Spatial Planning, Vol.3, No.1, pp. 43-49.