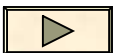


# LIS and GIS – An Electronic Infrastructure For The Nation For Effective Governance

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This paper attempts to present the various issues defining need for Land Information Systems as a fundamental infrastructure element and need for GIS-based e-Governance.

## **1.0 LIS - INFRASTRUCTURE FOR THE NATION**

### **1.1 Background**

#### **1.1.1 Project in computerization of Land Records.**

Ministry of Rural Development, Government of India, has funded numerous projects in computerization of land Records across the country. These projects were of two types - those dealing with computerization of survey/cadastral records. Of these, the projects in computerization of Survey records are indisputably creating digital infrastructure for all government departments to do micro and macro level planning.

#### **1.1.2 GIS based e-Governance**

The Government of India is placing a major importance on e-Governance and use of IT interfaces for public services. For most Govt. Departments, e-Governance without GIS is meaningless. A traditional MIS only serves to improve peripheral functions of Govt. departments. Only a GIS based system can address the core functions of most Govt. Departments, the examples of which are endless.

#### **1.1.3 A few examples where GIS based solutions are the most natural ones**

1. Issue of certified copies of land plans to land owners / prospective buyers / land developers.
2. Registration of transactions of land.



3. Rural roads maintenance, development of link roads.
4. Watershed management.
5. Soil/Crop mapping for improvement of agricultural potential.
6. Rural infrastructure development - like public water sources, irrigation canals, drainage, rural electrification, rural Communication.
7. Disaster management - floods, drought.

An accurate base map of rural areas is the pre-requisite for the above and many other such management functions of the Government.

### **Why are we calling maps infrastructure ?**

An infrastructure element.

- Serves a large community or audience
- Provides basic services
- Cannot be funded locally due to large revenues involved
- Is an essential building block for improving the quality of life in the area under consideration.

When roads, water, drainage, transportation, health care etc. can be treated as an infrastructure element, maps are an obviously more basic infrastructure element on which the other infrastructure planning and development can be built. The concept of digital mapping and GIS at micro levels is an inescapable future part of the country's growth. With the advent of the 21st Century, the concept of hi-tech for high-end users is dead. Today's need is to apply technology effectively to help the common man.

## **1.2 Spatial Analysis Applications**

Maps are a powerful medium for planning, analysis and monitoring for a large number of applications. Satellite images, Cadastral Maps, Political Boundaries, Contours, Networks and Location Analysis are handled on a day-to-day basis by decision-makers in numerous organizations.

The data of cadastral Survey forms the basis for generation of any accurate higher-level map. Spatial analysis applications are of two types:

### ➤ Micro level planning and development

Micro level planning generally involves ground study and evaluation of data of a specific area of interest. For e.g., rural Development Schemes, Irrigation, Ground Water Development, Town Planning, Mining etc., require a study of maps and data pertaining to small zones.

### ➤ Macro level planning and development

Macro level planning generally involves study and evaluation of data of a large geographic zone. For e.g., Statewide policies, Excise, Fiscal Analysis etc., are macro level applications.

Spatial Analysis Applications, especially in micro level, are a natural progression from Land Management applications, as the maps are directly used or derived from cadastral survey data and the land profile and usage information is available in land registers.

## **2.0 VISION LIS 2000 - An indigenous solution**

### **2.1 Background**

VISIONLABS, a pioneer in indigenous software development in Scientific and Engineering applications, has developed a GIS/LIS software solution VISION LIS 2000, to meet every requirement of Land Management and also spatially distributed data management. The development is a product of 5 years of

meticulous research, which involved interactions with many senior experienced officers involved in land management portfolios, Central Survey office, numerous State Land Records Departments, and analysis and testing by various surveyors and field executives. VISION LIS 2000 is the product of over 200 man-years of coordinated effort put in by Software Engineers, Surveyors and User Departments.

## **2.2 Components of VISION LIS 2000**

VISION LIS 2000 is a software suite comprising of

- **VISION Surveyor** - Survey Records computerization software following the traditional survey methods used in the country for the last 150 years.
- **VISION Map Maker** - Digital Mapping software for computerization of field sketches or village maps where field survey data is not available.
- **VISION Cartographer** - A comprehensive GIS for integration of Record of Rights data and any other user specific data based to the village spatial records. Also suitable for building any higher level spatial analysis application.
- **VISION Office** - Multilingual support using common Windows protocols suitable for data interchange/storage using any general Windows based application. BIS ISCII Compliant interface.

Also due for release by April 2002 are the following modules which integrate seamlessly with other modules:

- **VISION Landscape** - A Complete Remote Sensing Application.
- **VISION Map Net** - Internet and Intranet support for hosting/ transferring map data.
- **VISION Map Secure** - Encryption and biometric access control devices interface for secure spatial

data management.

This power suite of applications caters to every possible GIS application and is a product without any parallel in terms of functionality and utility.

### **2.3 National Perspective - VISION LIS across the country**

- VISION LIS 2000 can be used for computerization of land records of any state of the country.
- It is a 100% indigenous product with source level support
- It supports computerization of data obtained from any traditional and modern survey methods.
- It has been successfully used for numerous pilot works. Computerization of Land Records for 16 States is being done using VISION LIS 2000.
- It has been successfully proven both for Bombay Survey System (Maharashtra, Gujarat, Parts of Andhra Pradesh etc.,) and for Madras Survey System (Tamil Nadu, Pondicherry etc.,)
- It has been successfully utilized to computerized village maps in Northern and North Eastern states where consolidation was done or original tippans are not available.
- The product is field tested with successful application to Survey and Land Records departments of 16 states across the country.

### **2.4 Meeting the future needs**

- VISION LIS 2000 integrates with modern survey equipment like EDM, Total Stations, GPS etc.,.
- VISION LIS 2000 embeds data security requirements to enable safe access on LAN/WAN/Internet

- VISION LIS 2000 is capable of converting fields/maps generated using any survey method to any other standard form, meeting possible future requirements of standardization in Survey and land management System across the country.
- VISION LIS 2000 follows the concept of Open Architecture - it can import and export data across various CAD/GIS software and supports full Open DataBase Connectivity.
- VISION LIS 2000 includes a full GIS and Remote Sensing Application.

### **3.0 APPLICATIONS OF LIS IN GOVERNMENT - CASE STUDIES**

#### **3.1 Survey and Land Records Departments.**

Ministry of Rural Development, Government of India has initiated a number of modernization measures in the last decade with respect to Land Reforms and Land Records Management. Some of the major steps taken in this respect are:

##### **3.1.1 Computerization of textual data, i.e., Records of Rights.**

In a number of states across the country, pilot works were undertaken to computerize the RoR information. Where successful pilot works were completed, a full - scale implementation programmed was initiated. The RoR computerization pertains to computerization of information of land titles, registration detail, land classification and revenue dues/collections. This information is a critical component of Districts Revenue Department activity.

##### **3.1.2 Computerization of Survey Record.**

Pilot works were also initiated to computerize the graphical land parcel record, i.e. the survey detail of individual land holdings and village maps. The original authenticated records are very old and in a dilapidated condition in most states. A computerization is inevitable as these records form the basis for redressal of any land title dispute. These records clearly demarcate the field boundaries, its extent/area, its subsequent sub-divisions and change of ownership.

### **3.1.3 Application/Utility**

- In computer form, these records can be maintained without damage for a long period of time.
- These computerized records can be used in future, after due authentication, as a base for future land surveys, dispute redressal, land sub-divisioning and for revenue collection.
- These computerized records form the core information system, which other Government departments can utilize to do their activity, for e.g., Irrigation ayacut analysis, Water Supply / Drainage network planning, municipal / property taxation analysis etc.,.

### **3.2 Roads Network Planning**

R&D Departments of various states (also called Public Works Departments \_ PWD - in some states) can utilize this information for Road Network Planning. Normally, the R&D Department handles National and State Highways. The district and Rural Roads fall under Zilla Parishads or Panchayat Raj Engineering Departments. In some cases, road planning is done by other agency which take up large scale road development works. Two applications of LIS outputs used for Road Network Planning are listed below:

#### **3.2.1 Mumbai-Pune Express Highway - Maharashtra State Road Development Corporation**

Mumbai - Pune Expressway is presently a stretch of 73 km length with a road corridor width of 90 metres. Since this corridor is meant for high-speed Traffic, the alignment of the corridor was made to have minimum bends. This work involved making civil survey of the stretch, preparation of the road alignment, identifying curves and their details, preparation of longitudinal section, preparation of cross-section details, taking up mandatory details along with the road length on either side of the proposed corridor trial pits etc., and bundling of information in the form of a Land Information system. Base cadastral map of the area was used to identify land acquisition requirements.

### **3.2.2 Hyderabad Bypass Expressway - Hyderabad Urban Development Authority**

A computer mapping of the road alignment for the proposed Hyderabad Bypass Expressway was done for the purpose of land acquisition. This work involved preparation of base map of the area with the greatest accuracy, overlaying the topographic sheet with the proposed alignment and optimizing the road alignment for minimum revenue losses and vexatious litigation during land acquisition. Field survey for correctness was also undertaken to compare the accuracy of the work done. Based on the overlay of proposed road over the cadastral maps of the various villages through which the road was passing, the exact computation of survey numbers affected and the area of land to be acquired were determined.

### **3.3. Irrigation**

Irrigation departments across the country are involved in water management programmes like construction of canals, rural water distribution, minor and major irrigation schemes etc.,. Two applications of cadastral data overlaid with Engineering/MIS data are listed below:

#### **3.3.1 Preparation of a Land Information System for the ayacut under DBM 22 of SRSP**

Sri Ram Sagar Project is an irrigation project in the State of Andhra Pradesh. A Pilot project for mapping the entire canal network including details of land ownership, mapping pattern, irrigation structures, etc., was done for the ayacut under distributory DBM 22 and integrated on to the map of that area using LIS software. An analysis was done on the effectiveness of the irrigation system, which revealed some major drawbacks that required to be rectified. This was the first pilot done by the Irrigation and CAD department of Government of Andhra Pradesh for studying Irrigation management through an LIS/GIS.

#### **3.3.2 Lift Irrigation Scheme - Minor irrigation Department, A.P.**

A pilot work using a cadastral area map was done for identifying the Engineering requirements for a Lift Irrigation Scheme. A computerized base map including contours for a village was prepared and the information on land holders and cropping pattern was overlaid. Now an analysis was done as to the optimal

design of a Lift Irrigation System layout such that all the beneficiaries (i.e., land holders under the scheme) were covered and lifting of water from reservoir and then pipeline flow through gravity was as per required Engineering constraints.

### **3.2 Municipal Taxes**

A pilot work was done in West Maredpally area of Secunderabad city to demonstrate the use of revenue maps for diverse purposes. The detailed ward/block maps were computerized and for each land parcel, an identification of constructions, number of floors, land classification etc., was done. Such a basic LIS coupled with external data can act as an excellent tool for municipal/property collection agencies and can also be useful for private agencies which want to do marketing planning - for e.g., locating of retail outlets, potential market segments etc.

### **3.4 Railways**

The Railway Management Board has placed a major emphasis in the last few years on use of computerized land management tools. Railways own vast tracts of lands around thousands of Kilometres of railway track in the country. The land plans of these areas are very old and in many cases, are outdated and do not reflect changes that revenue departments have made over the years. Compounding the problem is the phenomena of land grabbing and encroachment of land adjacent to rail tracks. Due to the large quantum and also the commercial value of land, a number of Railway Zones have initiated works to computerize their land plans, match them with Revenue/Land Records departments and update with latest authentic information. In this context, Central Railway have initiated a work in high land cost zone of Mumbai and South Central Railways have also done a pilot work.

The above are excellent examples of how a land planning application of two different organizations can be inter-linked and help each other. A similar scenario exists for land management applications of Defence owned land and township land owned by Government / Public Sector organizations.

#### **4.0 Advantages of GIS**

Fast and effective data management

Graphic Visualization

Geographic Link to information

Excellent tool for management of spatially distributed data

Advantages of computer environment

Speed Precision, Consistency, Absence of Computational errors.

Reproducibility of maps to any scale

Easy editing and updation of information

Complex maps can be easily understood

Fast and selective retrieval of information and its representation on maps

Interactive analysis

Cost-effective

#### **5.0 SUMMARY**

GIS can be used for various Government departments like Irrigation, Forestry, R&D, Rural Development, Urban Development, Police, Municipal Corporations, Town Planning, Mines & Geology, Water Supply, Telecommunications, Railways etc.,. Virtually most Govt. departments work on a spatially distributed information and can utilize the effective visualization and analysis techniques provided by GIS software.