“Cadastral Information System – An Integrated approach”

Mr. Ashoka Taomar
Business Head-GIS (South Asia), RAMTeCH Software Solutions Pvt. Ltd.
A-6, Sector 67, NOIDA-201309, INDIA

Abstract:
In Indian scenario, most of the states don’t have integrated land information; different methods and heterogeneous IT systems prevail in various states to store and disseminate information. This makes land information accessibility difficult and prone to manipulation. The current revenue processes are lengthy, lack transparency & standardization in maintenance & upkeeps of Records.

Digital India program aims to provide a quantum jump in all developmental projects, the Land information being the very basic aspect on which every development program is based, needs to be accurate, current and easily accessible. Digital India Land records Modernization Program (DILRMP) guidelines shall ensure Standardized land information system to provide land information for all development needs. It will also be a boon for our overstressed legal system, facing the issues of information access in resolving land related litigation.

There is an urgent need to revolutionize Indian Cadastral Information Scenario. An enterprise wide integrated cadastral Information system is the need of the hour. The solution shall provide a single window system comprehensively fulfilling the day to day working requirements of a Land Revenue department including all major workflows and processes.

A GIS based cadastre framework which supports continuous, readily available, village maps with land records information is developed using state of art GIS and database technologies, by RAMTeCH Software Solutions. The system design is scalable both horizontally as well as vertically enabling integration with other systems & users groups/stakeholder’s within & outside the revenue department.

About the Author:
Mr. Ashoka Taomar
Business Head-GIS (South Asia)
E mail ID: ataomar@ramtech-corp.com
Contact: +91 9818796924
RAMTeCH Development team has used ArcGIS Enterprise Environment to develop an integrated GIS interface using lightweight ArcGIS JavaScript API’s. This solution is integrated with enterprise Oracle 11g geodatabase to support spatial as well as textual data. The ArcGIS Server platform provides extensive data management tool sets for comprehensive management & updation of geodatabase, imagery datasets, parcel dataset & other related information. The solution provides centralized data repository for all spatial & textual information relating to land records, enabling access to unified information to all user groups and avoiding redundancy of data creation. The application implementation design includes DC / DR setup for ensuring high availability, performance and security.
Introduction

The present land records systems are originated from the reforms during Mugal period. During British period more scientific interventions were implemented. Land Revenue surveys were initiated towards the end of 18th Century primarily to collection of revenue from the estates. Survey of India as a Department of Government of India, established in 1767, was fully involved in the process of land revenue surveys till 1904. Following the recommendation of the Committee of Government of India in 1904, the cadastral surveys were delegated to the States. The Northern States of U.P., M.P., Bengal, Rajasthan, and Punjab established graphical output of surveys as the legal document whereas the Southern states recognized Field Measurement Book (FMB) as the legal document.

The land ownership has become the biggest challenge in our country due to no availability of an effective, updated land records management system. At present one is presumed to be an owner and not a conclusive owner of land unless proved otherwise. Revenue department maintains the land documents for last 150 years. Some of the documents are too old and damaged that it is very difficult to read and scan.

Generally through cadastral map and Land ownership Records the owners get legally linked to his property. The traditional system of record keeping in registers and cloth maps creates lot of scope of manipulation which is very difficult to track and results in litigations. Indian courts are choked up due to these age-old land related litigations. Also a different agencies e.g Registration and Revenue departments which has mandate of maintaining and updating the records rarely has good coordination leading to scope of manipulation.

In India most of the states don’t have integrated land information; different methods and heterogeneous IT systems prevail in various states to store and disseminate information. This makes land information accessibility difficult and prone for manipulation. The current revenue processes are lengthy and not transparent; also lack of standardization in maintaining and upkeeps of Records is a major concern.

Objective

Digital India program aims to provide a quantum jump in all developmental goals, the Land information being the very basic aspect on which every development program is based, needs to be accurate, current and easily accessible. Digital India Land records Modernization Program (DILRMP) guidelines shall ensure Standardized land information system to provide land information for all development needs. It will also be a boon for our over stress legal system, facing the issues of information access in resolving land related litigation.

There is an urgent need to revolutionize Indian Cadastral Information Scenario. An enterprise wide integrated cadastral Information system is the need of the hour. The solution developed by RAMTeCH shall provide a single window system comprehensively fulfilling the day to day working requirements of a Land Revenue department including all major workflows and processes.

A GIS based cadastre framework which supports continuous, readily available, village maps with land records information is designed. The system design has been kept scalable both horizontally as well as vertically enabling integration with other systems & users groups/stakeholder’s within & outside the revenue department.
Challenges

To develop an integrated Cadastral information system (CIS) many operational and technological challenges are faced:

- The preservation of older records creates huge data to handle with.
- Due to non-standardization of revenue processes creation of standardized interlinked datasets is a very complex task.
- Due to Computerization & implementation of Revenue processes there is some need to Incorporation of changes in States Survey & Settlement acts.
- The present revenue department is involved in multitasking and has limited resources for their revenue related work. In order to implement the CIS revenue department need to be strengthened.
- Provision of online updating the records requires multi stage data verifications and revenue department need sufficient technical resources which are in general not available.

Design and Implementation

The DILRMP program has given an opportunity to streamline the current revenue processes and automate them by implementing state of the art technology platforms like implementation of enterprise GIS systems and enterprise RDBMS. Moving from manual process to integrated approach the CIS is designed and developed using ArcGIS Server with JavaScript API & .net C# for overall better performance including advance GIS functionality. The CIS application has been designed in such a manner that from a single user interface an authorized user can traverse among different modules. The enterprise RDBMS is designed to ensure provision of interlinking between different form of revenue records from present to older versions.

RAMTeCH has used ArcGIS Enterprise Environment to develop an integrated GIS interface. This solution is integrated with enterprise Oracle 11g geodatabase to support spatial as well as textual data. The ArcGIS Server platform provides extensive data management tool sets for comprehensive management & updating of geodatabase, imagery datasets, parcel dataset & other related information. The solution provides centralized data repository for all spatial & textual information relating to land records, enabling access to unified information to all user groups and avoiding redundancy of data creation. The application implementation design includes DC / DR setup for ensuring high availability, performance and security.
The CIS application module provides solutions for managing, querying and printing of land records information. Functionalities includes workflow based online spatial and attribute editing, maintaining parcel edit history (versions.), data quality validations, parcel report with surround parcel information, role based map view, parcel measurement in customized land measurement unit e.g. Kanal & Marla, linking of parcel with other modules i.e. “Document Management System”, “Record of Rights (RoR)”, “Mutation”, “Girdawari” etc.

RoR Data & Spatial data is organized in Oracle Database created on SAN in different tables, all revenue processes related to data collection and data updation are handled through application are stored in Oracle database configured in fail over mode to ensure high availability.

GIS interface of CIS Application in basically on top of ArcGIS Server is to handle spatial data (Map) requests and suffice the requirement of online editing of Parcels due to ownership transfer with extensive support of geoprocessing and data analysis options, ArcGIS server components are installed on separate server to optimize overall performance of the application.

**Few highlights of CIS application modules:**

- Integrated navigation between different modules e.g. DMS to Map to ROR and vice versa
- To ensure security and authorized user access, biometric systems are integrated and users with defined admin units can only access information for editing.
- Online topological editing alerts are given to ensure all validations.
- The parcel edit history is maintained with all required information.

**Conclusion**

RAMTeCH’s CIS solution manages land records effectively, property rights of people would be secured, provides ease of access to the Land Owners, create real time land maps and boundary fixations and land database management with up-to-date information on a regular basis. In built security features of software platforms and further customization through programming make system more robust and reliable with data security point of view. Further the transaction can be made only by authorized user and second level authentication with Bio-metric is required to proceed.

The CIS application has very effective reporting system to identify and checks and balances required in processes as well as application, the integration of email/SMS alerts makes system more reliable and secure to keep track of day to day transaction done by Revenue officials.
References

1. Prof P Misra, Consultant, Land Information Technologies, New Delhi, India
   http://mycoordinates.org/cadastral-surveys-in-india/
3. DILRMP guidelines https://data.gov.in/catalog/status-computerization-land-records