

About the Centre for Rural Studies

The Centre for Rural Studies (CRS) is a Research Centre of Lal Bahadur Shastri National Academy of Administration, Mussoorie. It was set up in the year 1989 by the Ministry of Rural Development, Government of India, with a multifaceted agenda that included among others, the concurrent evaluation of the ever-unfolding ground realities pertaining to the implementation of the Land Reforms and Poverty Alleviation Programmes in India. Sensitizing of the officer trainees of the Indian Administrative Service in the process of evaluating of land reforms and poverty alleviation programmes by exposing them to the ground realities; setting up a forum for regular exchange of views on land reforms and poverty alleviation between academicians, administrators, activists and concerned citizens and creating awareness amongst the public about the various programmes initiated by the government of India through non-governmental organisations are also important objectives of the Centre for Rural Studies. A large number of books, reports related to land reforms, poverty alleviation programmes, rural socio-economic problems etc. published both externally and internally bear testimony to the excellent quality of the Centre.

BEST PRACTICES STUDY ON LAND RESOURCES MANAGEMENT IN INDIA

Karnataka, Maharashtra Haryana & West Bengal



CENTRE FOR RURAL STUDIES
LAL BAHADUR SHASTRI NATIONAL ACADEMY OF ADMINISTRATION
MUSSOORIE- 248 179

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KARNATAKA, MAHARASHTRA, HARYANA
AND WEST BENGAL

Edited By

**Snehasis Mishra
Akif Ahmed
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Foreword By

Dr. Prem Singh



Lal Bahadur Shastri National Academy of Administration

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- ⊕ SURVEY SETTLEMENT AND LAND RECORDS, *Government Of Karnatka, Bangalore.*
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FOREWORD

The management of land resources is one of the important functions of the government and at the district level it is primary responsibility of the District Magistrate. The multiplicity of the agencies involved in the land administration and management has led to multitude of problems ranging from poor record keeping, inaccuracies in the land records and litigations at various levels.

To streamline the management of land resources the Government of India introduced an ambitious program the National Land Records Modernization Programme (NLRMP) in 2008. This integrated program was envisaged to modernize land records, minimize scope of land disputes, bring transparency on land-related issues and facilitate moving towards guaranteed titling of land. The state governments have been implementing this scheme with varying degree of success.

This book is a compilation of five best practices on land resources management in India. These cases of best practices have been picked up from various states and are examples of how technology can be leveraged to improve service delivery.

I hope that this compilation will help us understand what the constraints in land resources management are and how some of the states have overcome them. The compilation will also help us in identifying the appropriate technological interventions and process reforms in land resources management which are critical for implementation of NLRMP.

Dr. Prem Singh, IAS
Centre Director, CRS, LBSNAA

Integration of Bhoomi and Kaveri A case study on Land Records Management System in Karnataka

Chapter I: Background Bhoomi

Computerization of Land Record (CoLR) in Karnataka

In the manual system, before computerization system of land records in Karnataka, the land records were maintained by 9,000 village Accountants, each serving a cluster of 3-4 villages. Two types of records were maintained: 1) registers, which indicated the current ownership of each parcel of land, its area and cropping pattern, and 2) village maps that reflected the boundaries of each parcel. Mutation requests to alter land records (upon sale or inheritance of a land parcel) had to be filed with the village accountant. However, the Village Accountants are not easily accessible, as their duties entail travelling. The Village Accountant was required to issue notices to the interested parties and also paste the notice at the village office. Often neither of these actions was carried out, nor any record of the notices maintained. Although theoretically, an update of land records could be carried out after a 30-day period by a revenue inspector, in practice, it could take 1–2 years for the records to be updated. There was also a problem of bribery – bribes ranging from Rs.100 to Rs. 2,000 had to be paid. If some details were to be deliberately written in an ambiguous fashion, the

bribe could go up to Rs. 10,000. Land records in the custody of village accountants were not open to public scrutiny.

Government of India (GOI) conceived the scheme of Computerisation of Land Records (CoLR) for implementation by State Government to overcome the problems inherent in the manual system of maintenance and updating of land records (1988-89). Computerization of land records in Karnataka started in 1991 when the first pilot was initiated in Gulbarga through a centrally sponsored scheme of computerization of Land records (CoLR) of Government of India. By 1996, projects for computerization of land records were sanctioned for all districts in the states of Karnataka. However, earlier efforts failed to achieve required objectives of creating a clean, up-to-date database. Later after assessing the earlier efforts, the state Government consented that all *talukas* will be computerized by March, 2002.

Then, due to massive efforts of revenue department of the state, Karnataka's 67 lakh farmers can access 20 million land records at all 177 talukas of State through Bhoomi e-governance project. This software has been designed fully in-house by NIC, Bangalore. The first Record of Rights, Tenancy and Certification (RTC) Information Kiosks centre started in Maddur talukas of Mandya district on 6th February 2001. An amendment made to the Karnataka land revenue Act 1964 by the state Government recognises only computerized land records and RTCs duly signed by the authorized signatory will be valid for all legal purposes. Manually written RTCs will have no legal

validity. The State Government has gazetted the notification in this regard and the amended Karnataka land revenue (Amendment) Rules, 2002 have come into force from June 13, 2002. Prior to this, the computer held information had been given legal sanction. For this, government issued Taluk-wise notification when the new system became fully operational in a particular taluk. The notification declared that only computer generated RTCs duly signed by the authorized would be valid for all purposes.

Emergence of BHOOMI

Bhoomi – a flagship project of Karnataka State Government is a Land Records management system. The project was inaugurated in the year 2000. Under this project, all the RTCs which prevailed at the time of data entry were digitized and made available to the citizen through Kiosk Centers. All the ownership or any other changes in the RTCs is carried out through mutation as per KLR Act using the Land Records database. Bhoomi back offices have been set up at 176 taluks, 1 additional taluk & 26 special taluks of the state. In each of these centers LR Kiosk & Application Kiosk have also been setups.

Bhoomi has reduced the discretion of public officials by introducing provisions for recording a mutation request online. Farmers can now access the data base and are empowered to follow up. A farmer can check the status of a mutation application on a touch-screen provided in computerised kiosks. If the revenue inspector does not complete the mutation within 50

days, a farmer can now approach another officer at the taluk level to authorise the mutation. The requests are to be handled strictly on a first-come-first-served basis. These measures limit opportunities for collecting bribes. After computerisation, there was a 85% jump in the number of mutation requests. This change seems to indicate a level of acceptance of the new system by the population.

The system of collecting crop data printed at the back of the RTC is also being computerised on an experimental basis. Greater accuracy in crop data would lead to a more equitable distribution of crop insurance claims. Every year nearly one million farmers (15% of the farming community) insure their crops. Earlier, farmers could obtain falsified crop records from village accountants to boost their claims. With the implementation of Bhoomi, crop data on the RTC is the only document that can be used to back a claim.

The following documents are issued to the citizen at LR Kiosk by collecting the user fees as shown below. RTCs are also being issued at 777 Nada Kacheris & various tele-centers across the state.

Table 1
Documents LR Kiosk and Respective Fees

Sl No	Name of the document	User fee
1	RTC	Rs.10/-
2	Mutation Extract	Rs.15/-
3	RR5 / RR6	Rs.15/-
4	Mutation status	Rs.15/-
5	Tippan	Rs.15/-

Application Kiosk has also been setup in the above centers to receive application for mutation from citizen. The citizen can directly walk into the Application Kiosk & apply for various mutations by submitting the required documents. Acknowledgement number is also issued to the citizen at this Kiosk. The applicant can know the status of his mutation by using this Acknowledgement number. All the mutation requests are processed at Bhoomi back offices. Biologon finger print authentication is used for all users in Bhoomi application to prevent unauthorized access to database. Amount collected in the Kiosk centers is remitted to PD Account of Deputy Commissioners. Bhoomi is a self sustained project. All the expenditures relating to purchase / maintenance of hardware, infrastructure, technical manpower, stationery, consumables etc. are met through the user charges funds collected at Kiosk centers.

Fact file of Bhoomi

- 2 crore RTCs digitized and workflow based online mutation software is only way through which RTCs can be updated.
- 203 project sites (one each in taluk/block)
- Approximately 15 crore RTCs have been picked up by farmers since inception of BHOOMI.
- Annually about 12 lakhs mutations carried out through BHOOMI.
- PKI enabled system without ink signature on documents.
- Approximately Rs. 23 crores collected as user charges per year (15 crores from taluk kiosk and 8 crores from rural tele centres).
- Total user charges collected since inception of BHOOMI amounts to Rs. 225 crores.

Table 2
Achievement statistics – J-slip Registration

Year	Total no J-slip Registration
2013	413449
2012	453941
2011	31862
2010	8544

Salient features of Bhoomi:

Bhoomi Monitoring Cell: Bhoomi Monitoring Cell has been setup under Revenue Department's Administrative control to monitor day to day functioning of Bhoomi project. Commissioner (SSLR) & Ex-Officio Director (Bhoomi & UPOR) are the head of this Cell. Bhoomi Monitoring Cell has hired technical resources to analyze & resolve technical issues that arise at the Bhoomi Centers. A help desk team is in place to monitor the daily activities at Bhoomi centers. A training center has also been setup for training the revenue staff on various changes that are brought up in the software from time to time.

State data center: A state data center has been setup at Bangalore for disaster recovery purpose. All the transactions that take place from day to day are replicated to the central database at state data center. This is to prevent the loss of data in case of any natural calamity, server crash etc. Setting up of state data center has also helped in integrating bhoomi Project with KAVERI, Banks and other Departments.

Integrated mutation: Earlier, Mutation and Podi were separate activities. In most of the cases Podi was not happening for several years even after the approval of mutation. Under Integrated mutation Podi, both these activities have been integrated to ensure that Podi is also incorporated at the time of approving the mutation itself. All transactions where partial extent is transacted or there are multiple owners existing in transacted RTC will be automatically referred to integrated

mutation podi, as a result of which, a RTC will get generated against the new owner at the end of mutation process.

Bhoomi – Kaveri Integration: Bhoomi was integrated with KAVERI (Registration Department's software) in order to get electronic copy of indexed information of J-Slip in the year 2006. Mutation was initiated using this XML file which is received from Registration Department. Further, in order to achieve online integration and cut down dual data entry time Bhoomi – Kaveri tight integration was implemented in the year 2011. The main purpose of this integration is to do away with impersonation, selling of same extent / land to multiple buyers, selling Land which belongs to Government or where Government restrictions are in place etc. Once all these conditions are satisfied, the registration of agricultural land is permitted. As of now Bhoomi has been tightly integrated with 247 Sub Registrar Offices.

Bhoomi – Bank Integration: Bhoomi – Bank Integration is intended to ease the charge creation process (Pledge & Release) on agricultural land. The request for charge creation was earlier made manually resulting in huge delay in incorporating respective details in RTC. Further, the banker was not really sure whether the loan is granted to the real owner of a particular land or not. To overcome this ambiguity Bhoomi has been integrated with Banks.

Banker is now able to access RTC information online and ensure that the beneficiary is indeed the real owner of a

particular land based against which loan is to be granted. Further, the banker can also know the beneficiary's actual share of extent on that particular land and other liabilities if any. After confirming these details, the banker initiates the charge creation process online. The request is then sent to the Bhoomi centre where the Office Revenue Inspector examines the transaction details and approves it. As soon as the transaction is approved, the charge is created against the owner and is reflected in the updated RTC. The whole process may take about 3-4 working days. The same process is also used to release the charge after repayment of loan.

Bhoomi – Land Acquisition: Land Acquisition process was carried out offline. Consequently most of the transactions were not incorporated in the RTC. As a result of which in several cases, Land Acquisition used to happen multiple times or buyers were not aware of the LAQ process at the time of buying land. Under Bhoomi - Land Acquisition integration, as soon as 4(1) notification / 6(1) notification is approved or after the final notification, the details will get incorporated in the RTC.

Strict FIFO: First In First Out strategy has been adopted in disposal of all types of mutation cases in Bhoomi. The strategy was earlier applied for hobli level & is now modified to Village circle level. This is to ensure that the Revenue staff shouldn't pick & choose the transactions. They have to dispose the earlier transactions in order to dispose the latter transactions. This is intended to achieve social equality and to not to benefit the rich & influenced people.

Land Records on Web: After computerizing the agricultural land records across the state, Government has also made the Land Records available on web. Citizens can now view RTCs over internet free of cost. The RTCs available on web are only for viewing purpose and cannot be produced as an authenticated / legal document for registration, crop loan etc.

Apart from RTC, the following facilities have also been made available on web-

- View mutation extract
- View mutation status
- View Tippan
- View mutation order
- District/ Taluk/ Hobli wise - Age wise mutation pendency reports

SMS alerts: There is an option for registering the mobile number of buyer at the Sub-Registrar Office at the time of Registration. Once registered, an automated SMS is sent to the buyer of the land about 13 various stages of mutation. This avoids buyer visiting Bhoomi centre to know the status of his / her mutation.

Office Revenue Inspector: A First Division Assistant / Revenue Inspector have been designated as Office Revenue

Inspector in each of the 203 Bhoomi Centers. Certain mutation transactions i.e. Land Acquisition, Pledge & Release, Court cases, Will etc are being referred to Office Revenue Inspector in order to speed up mutation process. This serves 2 purposes. These types of mutations will get disposed in 3-4 days since Office Revenue Inspector doesn't deal with other type of transactions. Disposal time of all other types of mutations is reduced at the regular revenue inspector's end since bulk of the transactions is already being dealt by Office Revenue Inspector. This has helped in reducing the mutation disposal time considerably.

Figure1: RoRs through Kiosk



Chapter II: Background KAVERI

Introduction

The Department of Registration & Stamps in Karnataka is one of the oldest departments dating back to the year 1856. It is the 3rd highest revenue earning department to the state exchequer. It generated Rs 5260 crores of revenue in the year 2012-13. So far, 247 Sub-registrar offices are performing registration and preservation of documents and 34 District Registrar Offices are looking after registration of firms, Societies and administration within their jurisdiction. The vision of the department is to deliver Registration Services to citizens in a timely, transparent, more accessible, reliable manner and in a comfortable environment through streamlined processes and committed, trained and motivated workforce.

The main objectives of the Department of Registration & Stamps are:

- I. Reduction of average time for registration of documents at Sub-Registrar Office
- II. Provide ease of access to the citizens by introducing electronic delivery of services through additional channels such as Web-portal, Bangalore One, Karnataka One, Nemmadi Centres , Nada Kacheri etc.
- III. Integration with other departments for seamless delivery of services

- Real time Integration with Bhoomi for curbing fraudulent registrations.
- Integration with Municipal Bodies, Treasury, Income Tax Department etc.

Table 3
Department Services, Department of Stamps and Registration

Services	Instruments	Categories
Registration Services	Documents	Documents capturing information about sale of immovable property transaction, General Power of Attorney, Mortgages, Lease Agreement, Gifts, Wills etc.
	Marriages	Hindu Marriages, Special Marriages, Parsi Marriage
	Firms	Partnership Deeds of firms
	Societies	Registration of Societies
Information Services	Certified Copies	Issuing duplicate copies of registered documents
	Encumbrance Certificate	Certificate notifying transaction and charges against properties

IV. Increased accountability of officials at various levels of the Registration processes

V. Ensure better integrity of data by enhancing security and authenticity at all levels of process and exchange of data

Table 4
Timely Delivery of Citizen Services

Service	Manual system	Computerized system
Registration of document	> 1 day	< 30 minutes
Encumbrance certificate	3 to 10 days	Same day
Certified copy of the document	3 days	Same day
Marriage registration	1 day	< 30 minutes

Table 5
Revenue Statement for last 10 Years

Sl No.	Year	No. of Docts (in lakhs)	Target (in crores)	Revenue realised (in crores)	Annual growth in percentage
1	2003-04	8.88	1354.00	1478.17	29.09
2	2004-05	11.99	1700.00	1917.26	29.70
3	2005-06	10.15	2180.00	2395.11	24.92
4	2006-07	14.13	2586.11	3436.62	43.48
5	2007-08	11.94	3812.55	3634.19	5.75
6	2008-09	10.59	3110.27	3148.29	-13.37
7	2009-10	13.18	2687.00	2817.44	-10.51
8	2010-11	12.02	3700.35	3795.26	34.71
9	2011-12	16.38	4250.00	4971.53	30.99
10	2012-13	19.13	5200.00	5265.44	5.91

Need for Computerization: Emergence of KAVERI

The Department of Registration & Stamps in Karnataka made attempts to computerize earlier with partial success and the drawbacks of earlier computerization process are: Time consuming process; Excessive dependence on manual discretion; The documents are not delivered on the same day; Multiple visits by citizens for availing services; Preservation, Security & Retrieval of records was a challenge; Prone to manipulation of records; Susceptible to Revenue leakage; integrated software was not developed; it requires huge investment from the Government; and all the 201 sub-registries cannot be computerized at a time and a reasonable estimate takes a minimum of 10 – 15 years at the present phase depending on the availability of funds. Consequent to this assessment, it was proposed to follow the Maharashtra model of e-governance with the technical help of the CDAC, Pune to automate the whole registration process on the principle of public private participation on a BOT basis wherein the registered documents will be delivered to the parties within thirty minutes. Hence KAVERI was initiated.

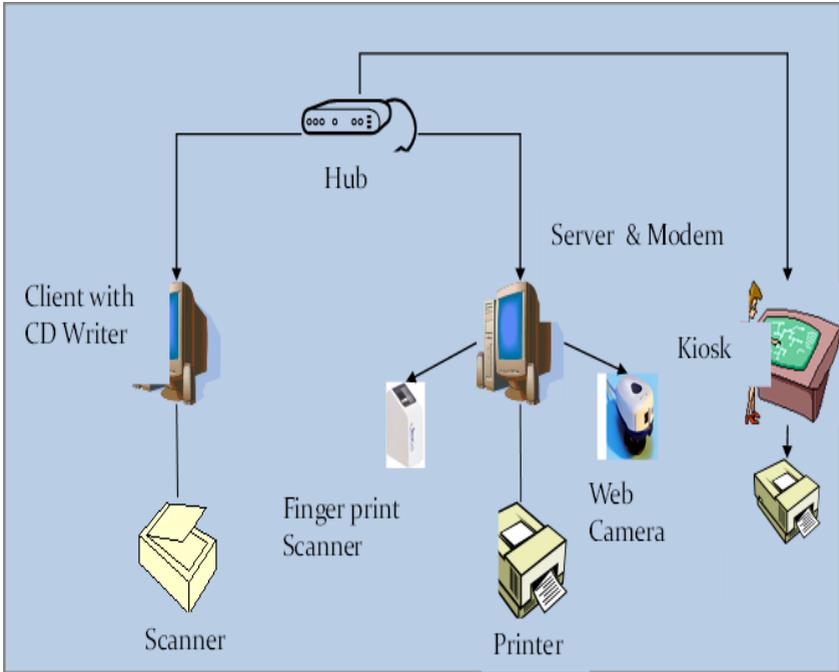
KAVERI is a model of the BPR (Business Process Reengineering) to reorient the Department of Registration & Stamps towards 100% automation in the registration process and speedy delivery of registered documents to the citizens of Karnataka. It is a client-server application designed and developed by C-DAC (Centre for Development of Advanced Computing) to cater to the needs of the Registration

Department. This software takes care of registration activity along with scanning and preserving of deeds executed during registration process. KAVERI application takes care of registration under all the articles mentioned in transfer of properties act and marriage registrations with respect to Hindu Marriage Act and Special Marriage Act.

KAVERI – Features

- Automatic calculation of Market Value/SD/RF
- Automatic Indexing of EC data
- Scanning of Registered Documents and storing in CD's
- Search and generation of Encumbrance Certificate
- Marriage registration
- Society Registration and Filing
- Automatic generation / transmission of XML J-form files to SDC
- Generation of VMS bills for scanned pages
- Capturing Photo /Thumb impressions of parties through Web Camera /Thumb Scanner
- Generation of Reports

Figure 2: KAVERI – Department Office Layout



The main features of the Department of Registration & Stamps are;

Kaveri, Bhoomi & Mojini Integration: J-slips containing information on transfer of agricultural lands is transmitted electronically from KAVERI to BHOOMI to speed up the mutation process and to eliminate the errors in manual process. Land details are captured from BHOOMI during registration process, thereby avoiding duplicate registration. KAVERI also transmits other information, using which Tahasildar generates

the mutation notice instantly, thereby avoiding delay. SMS service sends message on registration of the document and various stages of mutation to parties both in Kannada and English. Integration with Banks through Bhoomi is in the pipeline to facilitate online filing of Loan Declarations (Form – 3). 11-E sketch number fed into KAVERI, with which its genuineness can be verified from MOJANI.

Anywhere Registration & EC: The ‘Anywhere Registration & Encumbrance’ initiative aims to provide citizens with the freedom of availing department services at multiple offices by removing jurisdictional limitations. During disruptions or heavy workload in a particular SRO the citizens have the option of going to a different office to get their work done. Anywhere registration introduced in Bangalore during July, 2011 on pilot basis in Gandhinagar registration district and Service extended across all 42 SROs in Bangalore. Issue of encumbrance certificates from any of the 42 SROs in Bangalore Urban District was launched in Nov, 2011.

Data Digitization Of Legacy Records: Legacy Records before KAVERI(before 2003) are preserved in hard bound book volumes in record rooms which are susceptible to damage through human mishandling and natural calamities including fire, floods, etc. Department intends to digitize and micro film the documents to :

- a. Preservation of records
- b. Electronic Search and Issue of Certified Copies

- c. Accessibility to General public through citizen service centers and online portal

e-Stamping: e-Stamping was brought in to eliminate fake manual stamp papers through online verification. e-Stamping system was introduced on pilot basis on 14-03-2008 and extended across Karnataka from 16-12-2009 through SHCIL. Post Offices, Syndicate Bank, Corporation Bank, Indian Bank, Souharda Co-operative Bank, Apex Bank etc, are the ACC's for sale of e-Stamps. There are 1136 ACC's as on January, 2013

Chapter III: Integration of Bhoomi and Kaveri

Integration of BHOOMI and KAVERI:

Bhoomi was integrated with KAVERI in order to get electronic copy of indexed information of J-Slip in the year 2006. Mutation was initiated using this XML file received from Registration Department. Further, in order to achieve online integration and cut down dual data entry time Bhoomi – Kaveri tight integration was implemented in the year 2011. The main purpose of this integration is to do away with impersonation, selling of same extent / land to multiple buyers, selling Land which belongs to Government or where Government restrictions are in place etc. Once all these conditions are satisfied, the registration of agricultural land is permitted. There is an option for registering the mobile number of buyer at the Sub-Registrar Office at the time of Registration. An automated SMS is sent to the buyer of the land about 13 various stages of mutation. This

avoids buyer visiting Bhoomi centre to know the status of his/her mutation. Further, this has also helped in reducing the mutation disposal time.

The online integration of BHOOMI and KAVERI software now helps the farmers of the state in reducing their hardship and land related litigations. The registration of a sale deed will be strictly done by using the BHOOMI database. The sale transactions will take place only if the land is identified with specific survey number and name of the seller being available in the database and also the proposed extent of transaction available with the farmer in the database. This will ensure that there are no fraudulent transactions in future. This integration will also not allow the transactions on lands granted to Scheduled Castes and Scheduled Tribes upholding/adhering to non alienation conditions as per PTCL provisions. If there are any other Government restrictions for sale on any property such lands also will not be allowed to be sold.

Proposed System:

It is proposed to bring tight integration between BHOOMI and KAVERI by enabling KAVERI application to consume the data from BHOOMI database during registration process itself. BHOOMI will expose some web methods for the consumption of KAVERI application to extract relevant data required for registration process and also provide data to web methods to update details of transactions on BHOOMI.

Objectives:

- To bring synchronization between KAVERI and BHOOMI by reducing time lag between registration and initiation of mutation process.
- To avoid duplication of data entry work that is being done at KAVERI and BHOOMI resulting in reducing workload.
- To reduce or remove the data entry mistakes resulting in rejection of J-slips.
- To reduce rejection of mutations in BHOOMI due to wrong data entry.

Benefits:

- Facilitates in bringing synchronization between KAVERI and BHOOMI by reducing time lag between registration and initiation of mutation process.
- Facilitates to fill the vacuum of non availability of vital information during registration.
- Ensures that seller is the owner of the property.
- Facilitates transactions only on the balance extents of the owners.
- Various conditions of land grant, land reforms etc are checked before registration.
- No sale, pledge/mortgage transactions allowed on Govt. land.
- No sale transaction allowed on PTCL lands.

- Govt. restrictions like land grant conditions, LRF conditions etc. are checked before performing transactions
- Court stay and court orders existing on land parcel are also checked before allowing transactions.
- Mutation transactions initiated automatically.
- Facilitates for photo and finger print verification
- Facilitates in maintenance of electronically retrievable encumbrance certificates because identities used for a land parcel would be same in both the systems.
- Most interesting aspect of this integration is two heterogeneous systems with respect to both administrative setup and technical support provider are integrated to deliver the best to the citizen.

Controls incorporated in integration process:

Information about pyki RTC is provided at the time of registration and 11E sketch is mandatory for transactions involving pyki RTCs. All the Government restrictions to stop transaction on land parcels non-alienation condition for 15/25 years, PTCL grants, Land acquisition. Importantly, no transactions are allowed if owner belongs from Government category. Similarly, no transactions allowed on RTC which are under correction process. The joint owners are dealt as a whole and no individual joint owner can transact. Also, no transaction is allowed if owner extent is Zero.

Warnings provided in integration process:

It is interestingly designed for displaying warning message on RTC. If there are any court orders / court stay on owner or RTC warning messages are displayed.

Enhancements in KAVERI application:

KAVERI application has been modified to consume the web services publish by BHOOMI and the old way of generating XML has been disabled. The data transfer from KAVERI to BHOOMI after registration will happen either real time or using store and forward technique. The windows service in SRO server would poll the web services of SDC to transfer the index XML and Detailed XML after registration.

Enhancements in SDC setup:

Web methods have published for consumption of KAVERI using BHOOMI data to get Hobli and village; to get Surnoc and Hissa; to get owner list; to submit j-slip index data; to submit j-slip detailed data; and windows service to call web methods published in BHOOMI taluk server.

Enhancements in BHOOMI:

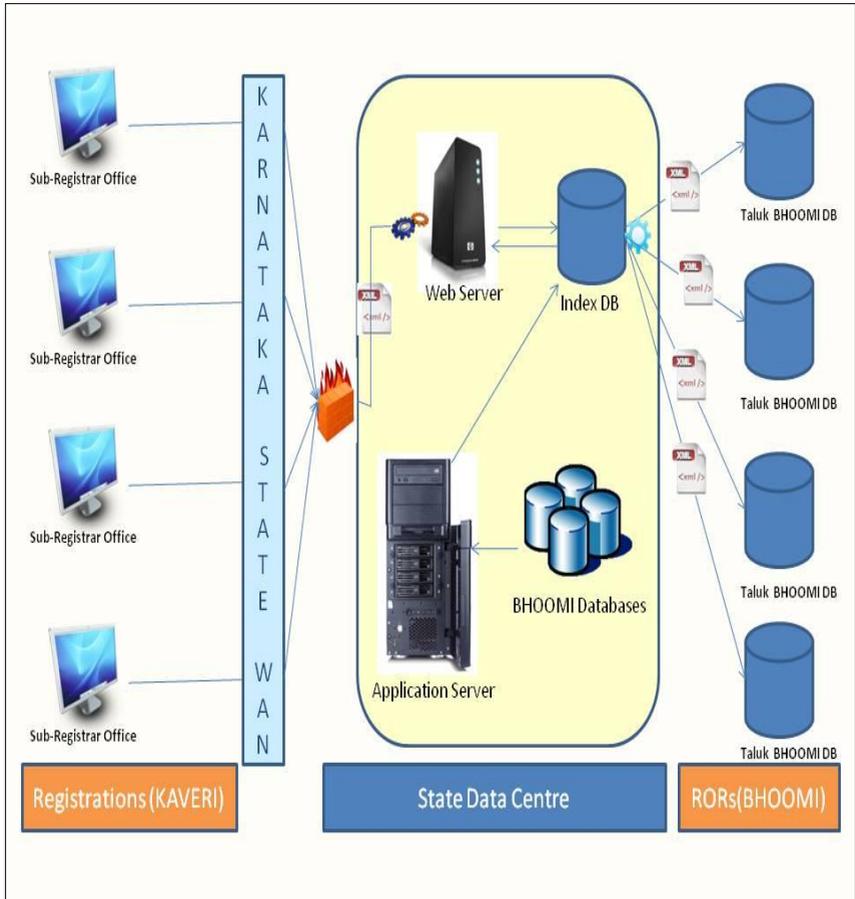
The facility to raise application based on j-slip received from SRO has been disabled in application Kiosk module and survey supervisor has been removed from the workflow of application

kiosk. Now, BHOOMI has been enhanced to automatically generate the transaction and approved notice (form-21) using detailed XML of j-slip data. The decision on Integrated Mutation Process (IMP) or simple mutation is automated in BHOOMI software. Also, handling of non agricultural properties has been simplified.

Process description – KAVERI:

On selecting taluk, hobli and village, KAVERI prompts for Survey number. Then on providing survey number, all the RTCs with given survey number and available Hissa numbers are available in drop down list. After that, on selection of hissa, list of owners with extents available for transaction and other conditions in the form of tags are provided KAVERI. Above process will be simplified after BHOOMI-MOJANI integration. On providing 11E sketch number BHOOMI-MOJANI would provide survey number and purchaser details.

Figure 3: Bhoomi- Kaveri Integration Architecture



Process description – BHOOMI:

Similarly, the facility to raise application based on j-slip received from SRO has been disabled in application Kiosk module. The survey supervisor has been removed from the workflow of application kiosk. The automatically generated transaction will be at checklist generation level and all other process will continue as it exists. The document verification with respect to j-slip, sale deed, other related documents will happen before final approval of Revenue Inspector.

Table 6
Comparative Analysis of Measures

Measure	Initial Bhoomi	Bhoomi with XML exchange with Kaveri	Bhoomi – Kaveri Online Integration
Request for Mutation	Citizen has to approach	Automatic	Automatic
Data entry of Application	Yes	Semi automatic	Fully Automated (No Data Entry)
Generation of transaction & notice	Yes	Yes	Fully Automated
FIFO	Taluk/ Hobli wise	Taluk/ Hobli wise	Hobli/ VA Circle wise
Validations	Only at Data Entry level of Mutation	Only at Data Entry level of Mutation	At the time of Registration
Disputes	Less	Lesser	Least

Table 7
Statistics on Bhoomi-Kaveri Integration

Date of Registration	Number of documents Registered	Number of Applications created	Number of transactions initiated	Pending Transactions
10/06/2013	8	8	8	0
11/06/2013	6	6	6	0
12/06/2013	11	11	11	0

Key Challenges in implementation:

Internet connectivity Issue: All the connectivity at Kaveri and Bhoomi are done by the KSWAN and no alternative connectivity network is installed. If the network is down no work can be done. There is no offline registration data entry provision.

Computer systems: Due to insufficient systems and older version of computers there is delay in the works at the SROs.

Quality of the Bhoomi data: Initial data entry didn't have much validation. For example by mistake if a private land was marked as Govt. land it is restricted for registration. The RTC has to change first through legal process for the registration.

Replication of the data: The RTC is updated at the district server and takes one day while replicating at the central server. Hence registration cannot be done on the same day.

Mapping of data: Mapping of the hobli and village master data with the Kaveri system master data. A slight error causes mis-mapping and delay in works.

Government restricted land: All the Government land allotted to a farmer to cultivate or to a tribal community for homestead are restricted for registration for a certain period of time (or year) according to the scheme. Therefore, the data entry has to be properly done to avoid additional works for corrections.

Training: There are separate training teams at Kaveri and Bhoomi. However, w.r.t. Kaveri-Bhoomi integration all the SRO, Consultants, Revenue officials and Operators are required to attend the training.

Providing Services in the Rural Areas and Enhancing Impacting on Transparency and Corruption are also two key challenges

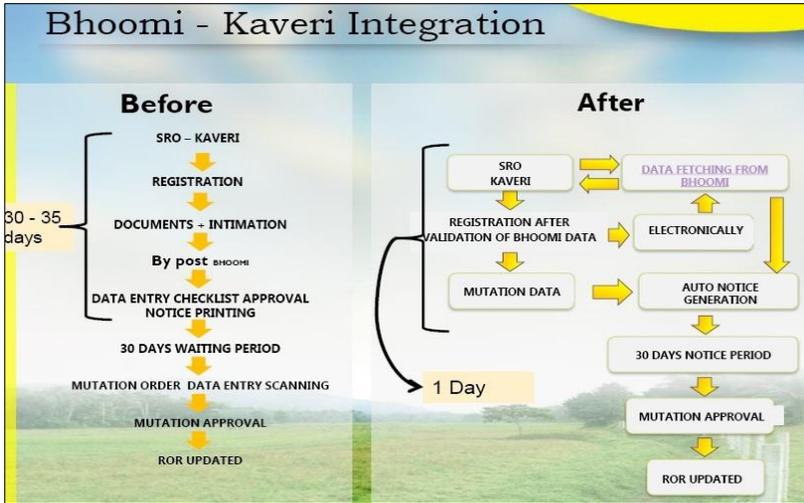
Lessons learned and Future Benefits:

Restrict encroachment of Government lands: Due to validation of the Government land at the Bhoomi system the encroachment of the lands is avoided. For example the slum areas were rejected many times for false registration on individual's name. It is hence benefiting to the Bank and Government departments as well.

Generation of the Notice of Mutation at the SRO: Presently the SRO sends the XML data to the taluk office for the notice of

the mutation initiation. It then takes 30 days for the mutation process. Now the plan is to initiate the mutation and generate the notice at the SRO itself. The buyer and the seller will sign at the SRO itself and save time to complete the mutation process.

Figure 4: Days for updating ROR



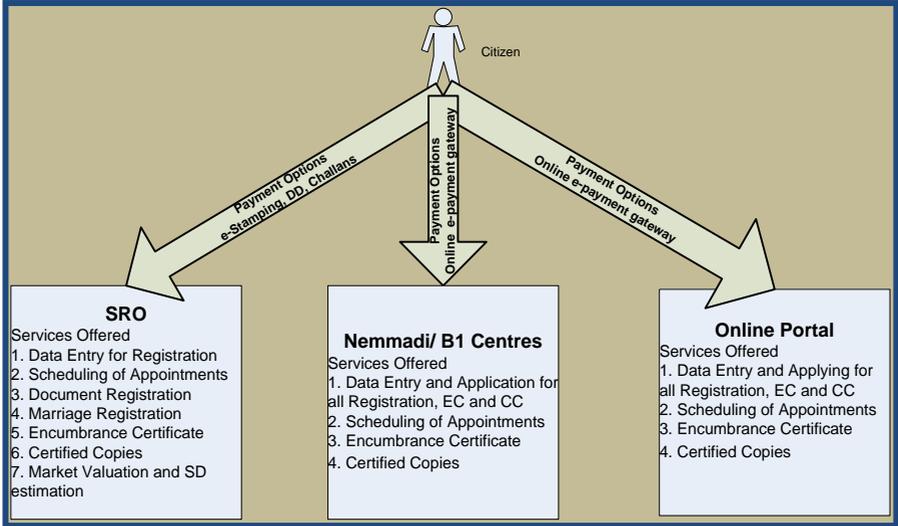
Introduction of the software – Namu Bhoomi: It is a re-engineering process with the existing software. It is an integration process of Bhoomi and Kaveri with Mojini software; where the client will not require the hard copy of the 11E sketch from the Mojini and coming to SRO anymore. S/he will just have to enter the survey number in the SRO and the pre-mutation sketch will be generated.

Introduction of Kaveri II: The hardware infrastructure procured for Kaveri which was procured in 2004 is almost decade old now. Aging hardware is hindering the effective delivery of service. Hence, replacement of old hardware infrastructure based on the latest technology for ‘KAVERI - II’ application software with the latest technology is to render the existing and additional services in a convenient and effective manner.

The main features of Kaveri II are:

- On line allotment of Appointment time slots for registration.
- Reduced average time taken for registration with capture and scrutiny of pre-registration information of documents.
- Additional channels such as Web-portal Bangalore-1, Karnataka-1, Nemmadi Centres for mediated service delivery.
- Workflow Based System with a clear definition of roles and duties for SR’s/ officials in the registration process.
- Comprehensive Accounting Module.
- New areas of integration between Municipal Bodies, Treasury, Income Tax Department etc.
- Web Based Grievance Redressal System

Figure 5: KAVERI II – SERVICE DELIVERY CHANNELS



Chapter IV: Technical note on integration of Bhoomi and Kaveri

Introduction

There exists some type of integration with the help of technology between BHOOMI and KAVERI to achieve synchronization of activities in these loosely coupled systems. Every day at the end an XML file is generated giving details of the transactions and uploaded to SDC through district register’s office. This XML file will be routed to respective taluk from SDC. Manual J-slips also follow the electronic data. Once manual records reach taluk office, electronic data is used to

initiate transaction on the FIFO basis. Data entry is done once again after analyzing electronic data and manual j-slips received.

Proposed system:

It is proposed to bring tight integration between BHOOMI and KAVERI by enabling KAVERI application to consume the data from BHOOMI database during registration process itself. BHOOMI will expose some web methods for the consumption of KAVERI application to extract relevant data required for registration process and also provide data to web methods to update details of transactions on BHOOMI.

Objectives of proposed system:

- Expected to bring synchronization between KAVERI and BHOOMI by reducing time lag between registration and initiation of mutation process.
- Will avoid duplication of data entry work that is being done at KAVERI and BHOOMI reducing workload.
- Will reduce or remove the data entry mistakes resulting in rejection of J-slips.
- Will reduce rejection of mutations in BHOOMI due to wrong data entry.

Benefits of proposed system:

- Facilitates in reflecting registration events on record of rights with minimum time lag owner wise.

- Facilitates in maintenance of electronically retrievable encumbrance certificates because identities used for a land parcel would be same in both the systems.
- Parent child relations of survey numbers can be established easily at the registration department also enabling detailed encumbrance certificates.

Assumptions:

Following assumptions are made while designing the proposed solution

- It is assumed that, broad band is available in all the sub register offices.
- In all the sale transactions, it is assumed that
 - Schedule (description of land parcel) in a transaction is always on a single survey number.
 - Sellers can be individual owner with his joint owners if any, but cannot be two or more individual owners.
 - Purchaser can be individual purchaser or joint purchasers but cannot be two or more individual purchasers.
 - Extent of the transaction is less than or equal to sellers individual extent.
- In all partition, exchange, settlement gift and donation transactions, It is assumed that
 - Transaction can be on multiple survey numbers. i.e., all the survey number pertaining to family may involve in the transaction.

- There could be individual/joint/multiple transferors and also individual/joint/multiple transferees.
- Extent of transaction is less than or equal to transferors individual extent.
- In all relinquishment transactions, it is assumed that
 - Transaction can be on multiple survey numbers.
 - Person who is executing the deed may or may not be listed as owner.
 - Beneficiary should necessarily be the owner of the land parcel.
 - One or more people can execute the deed in favor of one or more owners in the land parcel/s.
- Correction deeds will fall into any one of the above type of transactions and necessary of correction deeds will slowly be eliminated due to proposed system.

Solution Architecture:

Proposed solution involves the activities performed at three locations in the whole setup namely,

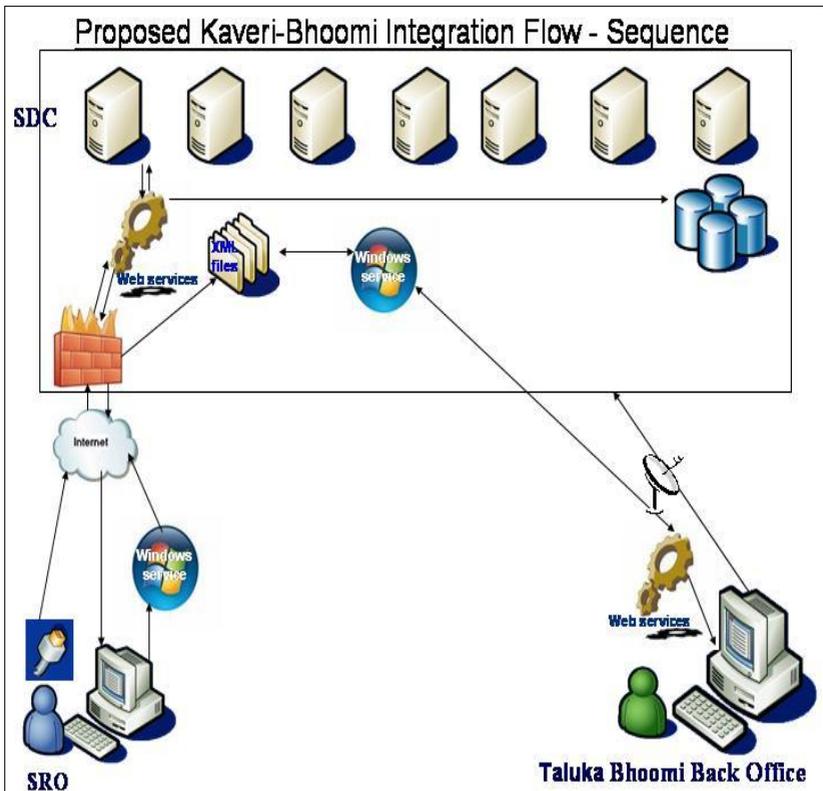
- Sub register's office
- State Data Centre and
- Taluk BHOOMI back office.

Sub-Register's office:

For every transaction that happens in sub-register office with respect to agricultural land, KAVERI application should

consume the web services published by BHOOMI in state data centre for entering the transaction details. Further, it has to submit two sets of data to web services after the transaction is complete. Details of the modifications required in KAVERI are summarized below.

Figure 6: Proposed Kaveri-Bhoomi Integration Flow Sequence



Database level changes:

New fields to stored location codes of BHOOMI should be added in master tables with respect to district, taluk, hobli and village in KAVERI database. There may be a need for new table to store the XML having details of transactions for implementing store and forward techniques while submitting data to BHOOMI after transaction. BHOOMI district codes and BHOOMI taluk code should be updated into the master tables at sub register's offices as one time activity. Mapping table giving details of which sub register office should be mapped to which taluk also needs to be updated.

State data centre:

- a. At the state data centre, one needs to create new table with fields such as district code, taluk code, hobli code, village code, land code, registration number, registration date, owner no, owner name, bincom, father's name, transacted extents, remaining extents.
- b. This table will be populated by web method called `SUBMIT_JSLIP_INDEX` and consumed by web method `GET_OWNER_LIST`.
- c. All the web services spoken in the document are hosted on the SDC.
- d. A windows service is required to call respective taluk web service to transfer detailed XML of the transaction as and when received in SDC.

Taluk BHOOMI back office:

- a. A web service to transfer xml with complete details of transaction from SDC to taluk server needs to be published here.
- b. BHOOMI application needs to be modified to take care of consuming new XML to initiate transaction/s automatically in BHOOMI.
- c. Before initiating the transaction, there may be need to initiate application automatically to get feedback of survey supervisor with respect to integration mutation process.

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Functional Requirement Specification, C-DAC

**Functional Requirement Specifications for Integration of Bhoomi
and Kaveri**

**Submitted by Centre for Development of Advanced Computing (C-
DAC), Version 1.0 (Sept. 2009)**

Objective and Definition of the Process

Need for KAVERI – BHOOMI integration

- i. Registering the transaction of an agriculture land becomes a public record. This transaction is required to be sent to Land Records department as per land revenue act 1964.
- ii. Referring BHOOMI data before registering a document will help in preventing false transactions at Sub – Registrar's office.

Enhanced Process Objectives

- This process builds a tightly coupled system between two departments.
- Importing agriculture land details, owner details from BHOOMI database is mandatory.
- Stops registration, if survey number does not exist in BHOOMI database.
- Maps KAVERI master data with BHOOMI master data

enabling seamless integration.

- The transaction is immediately updated to BHOOMI Server after the document is registered.
- Electronic data is sent in the form of XML to state data centre.
- Separate XML for each registration is generated and uploaded at the end of the day with the unique file name (Registration number).
- XML will be generated for transactions on agricultural land only.
- The process will keep log of the XML's sent to BHOOMI System
- The process will send all pending XML's to BHOOMI System at any time when it is invoked.
- The name of owners imported from BHOOMI system will be editable in the KAVERI System.
- There will be an option to add auxiliary names (sellers/buyers) in KAVERI System.
- Entering survey number directly in KAVERI System in case of agriculture lands will not be allowed.
- Data imported from BHOOMI System cannot be deleted from the document in the KAVERI System, once the document is accepted.

Actors/ Interface

i. Presenter

Role/ Responsibilities

- Does necessary checks of records and obtains RTC. The sketch to be furnished during presentation for agriculture land transaction.
- Pays mutation fees for the mutation process
- Submits the document to avail the service at the SRO.
- Presents the documents to the SR along with witnesses.
- Makes payment of applicable stamp duty and registration fees.
- Verifies and signs the summary report.
- Collects the registered document.
- Collects acknowledgement for sending J-Slip to BHOOMI System.

ii. Data entry operator

Role/ Responsibilities

- Selects nature of document, book and enters execution date of the document.
- Selects sub-registrar office and village for registration.
- Gets Survey Number details button if property is agriculture land.
- Selects appropriate Village, District and Hobli from BHOOMI System to map it to KAVERI master data if

villages are not mapped.

- Selects the Hissa number to transact.
- Enters the extent to be transacted.
- Gets Owner details for the selected survey number.
- Enter EPIC and PAN numbers of the parties.
- Edits addresses of the parties if required.
- Registers the document.

iii. System

Role/ Responsibilities

- Call web service GET_HOBLI, GET_VILLAGE to map data.
- Prompt to enter survey number.
- Call web service GET_SURNOC_HISSA to get survey number character and Hissa numbers for the entered survey number.
- Allow the user to select only one survey number at a time for transaction for a given schedule.
- Call web service GET_OWNER_LIST to get the owners of the selected Hissa number.
- Display the owners of the selected Hissa number.
- Add the selected owners as executants of the transacting document.
- Call web service SUBMIT_JSLIP_INDEX to send the index details of the transaction immediately after the transaction in the form of XML.
- Call web service SUBMIT_JSLIP_DETAILS at the end of

the day to submit the J-SLIP details of the day in the form of XML.

- Generate the XML file at the end of the day in the following format.
FINAL_REGISTRATION_NUMBER.xml
- Receive an acknowledgement from BHOOMI System after sending the XML.
- Generate the print of acknowledgement.
- Keep log of the XML files sent to BHOOMI server.

Process Flow

Document Registration – Importing data from Bhoomi

1. The data entry operator selects type of transaction, book, sub – registrar office and village.
2. The data entry operator clicks **Get Survey Number details** if the property is agriculture land.
3. The system checks for the master data mapping in KAVERI database. If the mapping does not exist, calls the web service to get the village details from the BHOOMI System.
4. The data entry operator will select the appropriate village from the villages list retrieved from the BHOOMI System.
5. The system will prompt to enter survey number.
6. The data entry operator clicks **Get SURNOC_HISSA_NUMBER** to get the survey number character and hissa numbers for the entered survey number.
7. The data entry operator selects any one of the hissa numbers to transact.

8. The data entry operator clicks **Get OWNERS_LIST** to get the list of owners from bhoomi database for the selected hissa number.
9. The system will import selected owners received from BHOOMI System to KAVERI database as executants of the document.
10. The data entry operator will complete all the necessary steps required for registration and complete the registration.
11. The system generates index details of the transaction in the form of XML and calls the web service **SUBMIT_JSLIP_INDEX** to send the XML.
12. The system receives the acknowledgement for sending the JSLIP_INDEX.

J-SLIP generation in the form of XML

- i. The system will generate the days XML for all the agriculture land transactions after the working hours of the office.
- ii. The system will check for any pending XML's for transmission and will upload the same to the BHOOMI server.

Document / Information requirements

- i. Drafted document by self or deed writer.
- ii. RTC
- iii. 11E sketch

Interfaces and Purpose

System	Information Received	Information Sent
Data import module Bhoomi database	Census codes for District, village, taluk and hobli. Survey number and hissa numbers Owners of the survey number	Census codes for District, village, taluk hobli. Survey number Survey number and hissa numbers

New Forms and Registers

- 1) Form to import data from Bhoomi server.
- 2) Form to generate XML.
- 3) Form to generate MIS reports

MIS Reports

- 1) Number of agriculture land registered day wise, month wise and year wise.
- 2) Number of jslips sent to Bhoomi server taluka wise
- 3) Number of pending jslips to be sent to bhoomi server
- 4) List of jslips sent to Bhoomi server taluka wise
- 5) List of pending jslips to be sent to bhoomi server

Appendix II

Abbreviations

Sr. No	Short form	Description
1.	C-DAC	Centre of Development of Advanced Computing
2.	IGR	Inspector General of Registration
3.	<i>KAVERI</i>	Karnataka Valuation and e-Registration Integration
4.	KB	Kaveri - Bhoomi
5.	SRO	Sub Registrar office
6.	MIS	Management Information Systems
7.	XML	Extensible Markup Language
8.	RTC	Record of right, Tenancy and Crop certificate
9.	SURNOC	Survey Number Character
10.	EPIC	Election Photo Identity Card Number
11.	PAN	Personal Account Number
12.	FIFO	First In First Out
13.	J-SLIP	Slip for Bhoomi with RTC updation
14.	11-E sketch	Temporary survey sketch
15.	MOJANI	Software at the Survey department with spatial data
16.	Pyki RTC	RTC without survey document
17.	KSWAN	Karnataka State Wide Area Network
18.	PMS	Pre Mutation Sketch
19.	EC	Encumbrance Certificate
20.	IMP	Integrated Mutation Process

Computerization of Registration and Innovative methodologies used in Payment of Registration Fees and Stamp Duty in Maharashtra

1. Introduction

1. A. Background

Land records and its administration and management play a crucial role from behind to the success of any nations. In India, Land Department has acted key role for generating revenue from British period. Maharashtra has set an example regarding land reforms starting from Computerisation of land records, computerisation of registration and several e-Governance schemes successfully implemented in the entire state for their farmers and land owners. In Maharashtra, Department of Registration and Stamps looks after mainly registration of documents, maintenance of documents, stamp duty collection and refund, valuation of property, issuance of duplicate copy etc. In Maharashtra, registration of documents is the biggest activity.

Authentic and faster process of registration of documents helps nation to grow economically and Maharashtra is moving towards that direction. Computerisation of Registration of property provides hassle free and efficient services to the citizens. The process of title changes by the SRO is to be integrated with the process of updating of RoRs (Automatic initiation of mutation notices).

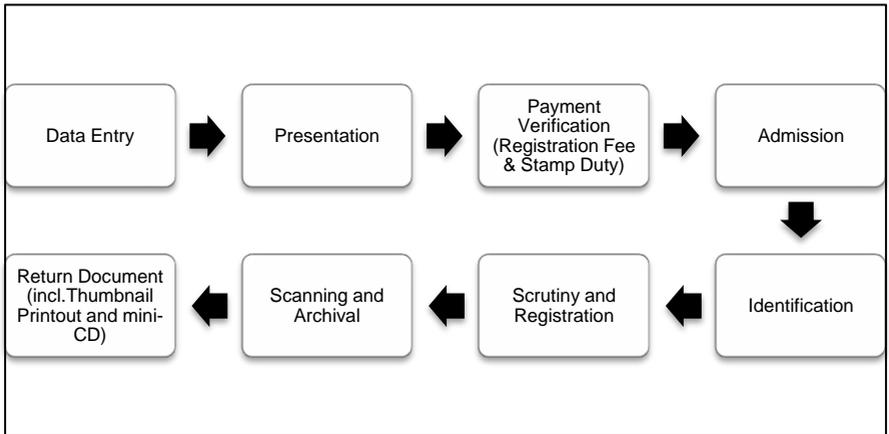
Department of Registration and Stamps, Govt. of Maharashtra took a prospective decision in the sphere of e-governance to provide transparent, authentic and faster services to its stakeholders. Despite various problems faced in the manual mode, Department started his journey with the help of modern IT solution and technology, implemented first computerized application named as SARITA (Stamp And Registration Information Technology Application) for the state of Maharashtra in 2002. To provide sufficient effectiveness, department started “Computerisation of Registration” process on Build-Operate-Transfer (BOT) basis. Apart from the list of activities by the department, they provide faster services to the citizens and established a perfect example of Public Private Partnership (PPP) model. The success of the project has been widely recognised by other states. With constant up gradation and development through modern technology department successfully implemented i-SARITA to integrate and centralize computerisation of registration process in 2012. While introducing the new system, vision of the department had remained unchanged to provide best, efficient, transparent and faster services to its stakeholders. The project utilized ICT methods to operate several functions like registration of documents, verification, retrieval, capturing and preserved copies of documents, stamp duty etc. Good understanding of technological advancement and its applicability, strong leadership and good concepts on e-governance make this project better and for that reason it has been appreciated largely and

given Gold Award under ‘e-Governance Excellence’ category at the Maharashtra State e-Governance Awards in 2013.

1. B. Computerisation of Registration: A brief Outline

Department of Registration and Stamps in Maharashtra is responsible for registration of documents, property valuation, taking care of stamp duty and so many other ancillary works for the state and this department earned 2nd highest revenue for the Government of Maharashtra. The department not only execute the registration related works but also administered The Acts like; The Registration Act, 1908, The Maharashtra Stamp Act, 1958 (earlier known as “The Bombay Stamp Act”), and The Bombay Marriage Act, 1958.

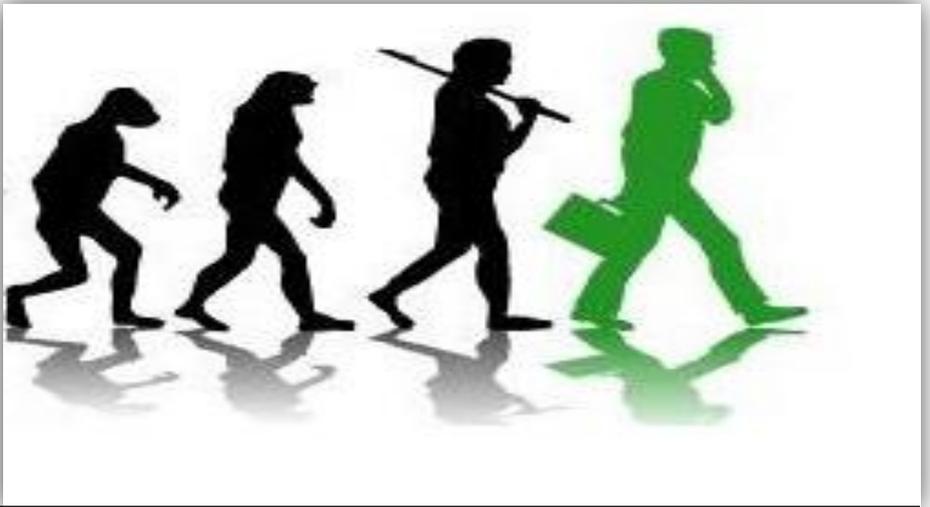
For the purpose of understanding the registration process, a workflow view is been depicted;



The department provides services through more than 500+ offices and registers more than 22 lakh documents annually. To overcome the impurities within the department regarding registration, therefore, administrative reforms through the route of computerization were initiated with local initiative and government support.

1. C. Evolution and Developmental stages of the Programme:

In the state of Maharashtra, the department was tightly engaged with lots of manual processes, but from the implementation of the first phase of computerisation of registration process in 2002, the department completely stopped the process of manual registration, which leads to a brightest future for the state.



Year: 1908 Manual registration	Year: 2002 SARITA: Decentralized CoR	Year: 2012 i-SARITA: Integrated and Centralized CoR	Year: 2013 E-Registration: Internet Based anytime anywhere Registration
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Through constant effort the department perceived the facts of increasing the awareness of the citizens and it has improved modernized user-friendly technology; the department also started the web-based integrated and centralized computerization of registration process which was launched in 2012 to serve citizen in an improved manner. The vision and mission of the programme is to give citizens anywhere, anytime registration.

1. C. 1 First Phase (1908-2001):

Manual process of registration had several issues such as erroneous documents, consumption of time consuming and inefficiency which caused difficulties to the citizens. The other major problems were as follows:

1. Sub Registrar's discretion in completing process of registration, in valuation, and in returning the document.
2. Evasion of Government dues because of geographical boundary and the discretion provided to the Sub Registrar to decide valuation and the applicable stamp duty.
3. Lack of uniform procedure, accessibility, transparency, and service norms.
4. Laborious back office work and hence pendency.
5. Document preservation problem.

1. C. 2 Second Phase (2002-2012):

Registration process was computerized in 2002 by using an application known as SARITA developed by CDAC, for the first time in the country, to overcome all the challenges mentioned above. The department decided to automate the registration process through the implementation of this application. SARITA is a G2C project with an aim to develop a computerized application for Registration of documents, received at each Sub-Registrar Office and provide data updation on timely basis to their respective Joint District Registrars and

higher offices under the jurisdiction of Department of Registration, Pune, Maharashtra State.

On the way of the development of SARITA application, department had clear ideas about the problems of the manual registration and tried to overcome those problems in computerization of registration process by following these objectives:

1. To transfer all the manual documents into the computerization process. Scanning of registered documents and develops a technique to revive these documents with backup facility.
2. Registration process should be faster, simple and uniform on the basis of the document registrations.
3. Automatic generation of property value, adjudication, generation of receipt and pending list, issuing notices to parties. Provide transparency in property valuation process.
4. Automation on Scrutiny, Valuation, and Checking for support certificates. All types of reports generation.
5. Quick services to the citizens relating to search reports, registration and certified copies of registered documents etc. Remote access to Web enabled InfoBase for citizens.
6. Set quality & time standards & to have a system of evaluation of offices / officers on the basis of these standards.

SARITA application was built to do the registration process and property valuation by using computers. After implementation of this application few drastic changes were discovered during the registration process, such as: Registration of 67 different types of documents, document is registered with all relevant parameters and delivered in less than 30 minutes assured to the public, error free registration with on-line monitoring and document encryption with photograph and thumb impression of seller, buyer, and consenter, easy replication of documents and because of the user interface in Marathi Language common user of Maharashtra used this application easily. After the essential data entry regarding registration was done, the original document was scanned after registration and the original copy was immediately returned to the registrant within prescribed time. This project helped the department in removing shortcomings in the prevailing manual registration and resulted in significant improvement in efficiency.

This application has helped in increasing document registration capacity and also in increasing revenue without any capital investment. Build - Operate - Transfer (BOT) mechanism permitted industries to participate in investing and running operations at IGR sites using their computing infrastructure on a cost-sharing basis. It drastically reduces time for registration from several days/week to an assured 30 minutes with penalties for delay and reduces subjectivity on part of Government officials and decreases hassles in a conventional registration. It means after successful implementation of the programme it has

several good effects on Government as well as Citizens and Industry sectors.

1. C. 3 Third Phase (From 2012 onwards –Today):

Steady improvement in Computerization of Registration process with a vision of overcoming problems like decentralized registration process to centralized process, Department focused on the constant development of this programme. The department kept following the objective of change strategy:

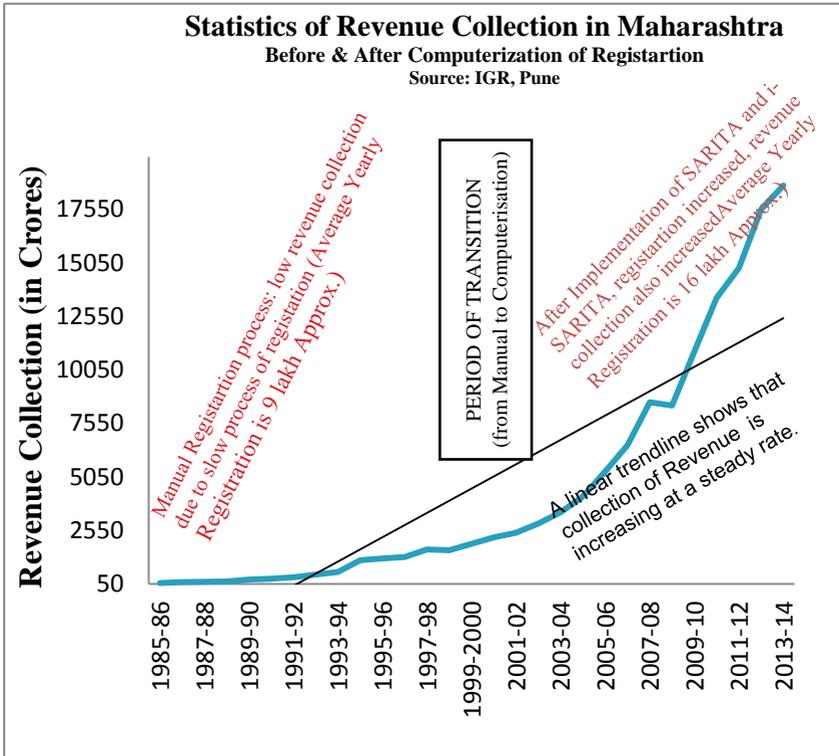
1. Enable e-Payment of Stamp Duty and Registration Fees, with facility for verification and locking.
2. An easy, reliable, secure & cost effective archival system and effective search.
3. Integration with the land records & revenue department.
4. Citizens can feed their data which will stop dependence on data entry operators.
5. Automated validation of various modes of payment of Stamp Duty like Stamp Paper, Franking, Certificate, e-Stamps, etc.
6. Administrative ease in deployment of modifications to i-SARITA software
7. Transparency increased through centralized monitoring and thumbnail printing

Following the key objectives NIC undertook the development of centralized and integrated version of web-based registration popularly known as i-SARITA (Integrated Stamp and

Registration Information Technology Application) and the application was rolled out in the year 2012. With the ultimate aim of anywhere anytime registration, the department decided to undertake final phase of computerization of registration process. The citizens can prepare their documents online, make necessary payments online, and submit the document for registration. The department shall register the document and send the registered document electronically. The minimum requirement for e-Registration is Web Camera, Fingerprint reader and Digital Signature of all parties (including witnesses and identifiers).

After the successful implementation of Computerisation of Registration process, the citizens benefited immensely as they will be spared of making trips to registration offices and their time and cost will be saved. It has been observed that after starting this new process of registration it is observed that citizens are quite happy with the new solutions and they are ready to pay higher service charges. It shows that Computerisation of Registration is a successful story of e-governance initiative in Maharashtra, due to its easy user interface and transparent and faster process. This programme not only helps the citizens of the state but also it has lots of benefits for the Department e.g. Centralized monitoring by the IGR, real-time and archive data available for managerial decision making, verification of stamp duty, registration fees collected, and documents registered, asset Management and Monitoring has become possible, 6 crore printouts could be eliminated annually. For better understanding of the benefits of the programme that

how computerization of registration changed the entire scenario of revenue collection is depicted below:



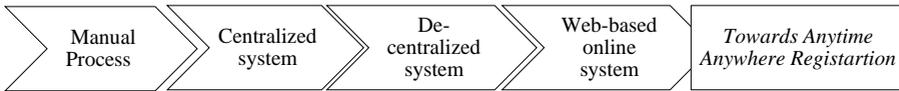
2. Project Innovation

2. A. Project Overview:

Starting from 2001-02 to till date The Department of Registration and Stamps is marking a striking development by

accepting technological advancement in the field of administration and adopting e-governance in a big way.

e- governance: To replace manual systems of verification and scrutiny of documents, valuation of properties, capturing and preserving copies of the documents, conducting, searches and maintaining back office records efficiently, registration of documents, stamp duty administration using **e-Governance services**.



2. B. i-SARITA; designed for advancement of Registration Process:

After successful implementation of SARITA for the entire state, Department has put their effort to develop new versions of these application like; SARITA 2 and 3, but they have encountered some problems and moving towards a better application for a complete solution. In this regard i-SARITA has been launched with lots of technical advancement to make this a web based application in the year 2012. The basic thought behind the up-gradation is to develop a complete solution for already stand alone applications which were set-up in most of the offices to make it a real-time web based and centralized application. Starting from 2002, Department has adopted e-governance in a smart way.

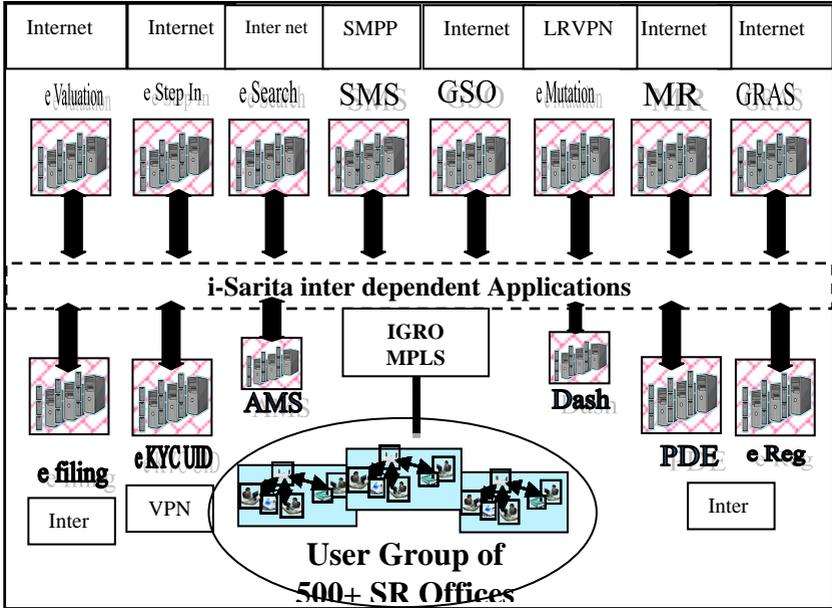
i-SARITA is an web based application for Document Registration & scanning of Registered document. It uses better technology with few e Gov reforms. It's been deployed in July 2012 and it is working at 500+ offices till date without any problems. It has provided efficient and effective services to the citizens. It has utilized ICT for storage, retrieval, transmission or receipt of digital data. With time and understanding on the project users expectations grew substantially. Now i-SARITA project has been integrated with many other applications and has now come out as one of the most successful e-Governance projects of Government of Maharashtra.

2. B. 1. Objectives:

The key objectives behind the implementation of i-SARITA are to provide faster registration, improve the error free registration, storage of all kinds of registration data centrally, photocopy of documents is not needed, identity verification by UID or Aadhaar Card, online valuation of land, time and cost saving for both citizens and for department.

Apart from all these objectives, i-SARITA application is useful for online payment, search of documents from anywhere, online data entry and time slot booking etc. these are the pillars of citizen services provided by the department.

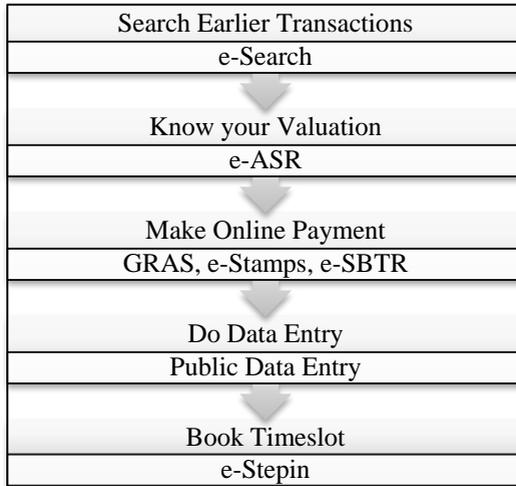
Integrated Applications Model of i-SARITA



Source: NIC Pune, Maharashtra

2. B. 2. Process flow:

As part of the core process of registration, the citizens are required to perform other activities. The department undertook initiatives to computerize these related activities as mentioned below.



a. 'eSearch' - Past registration transaction details are just a click away!!!

Whether citizen is buying a property or bank is giving a loan and taking the property on mortgage, a history of transaction search report on that property is an essential pre-requisite. Before implementation of e-Search, in manual mode, obtaining a search report was tedious, time consuming and costly. Citizen has to visit Sub- Registrar Office, make a written request and has to pay prescribed fee for such report by challan. Then, citizen has to physically search all previous registered documents related to that property. In view of the above problems faced by citizens, department launched e-Search portal for online search of property transactions. Using e-Search application, anyone can search transactions Property details, search transactions Document Number wise and Download scanned copy of documents. The citizen can now search the

property transactions (2002 onwards) from anytime anywhere. The Citizens have also been provided the facility to download a copy of registered document.

Benefits of e-Search application on registration process that are enjoyed by the citizens are;

- a. Property wise or Document wise search
- b. Search available 24 * 7 hrs.
- c. Search online from anywhere
- d. No Need to visit multiple offices etc.

People can make use of this instant real-time search facility (on e-Search) to prevent frauds of multiple transactions though they might be happening in a short period of time. It is advised that people should check e-Search at the moment in which they are executing/registering the document. e-Search has already benefited more than 6.7 lakh citizens since 1 Feb 2013. e-Search has become so popular that at any moment, around 70-100 people are online on the portal. Currently data of property transactions from 2002 are uploaded for most of the offices. Also documents previously registered are available for download for select areas like Mumbai, Thane, Pune, Nasik, etc. Department has also initiated the process of digitizing all the past documents.

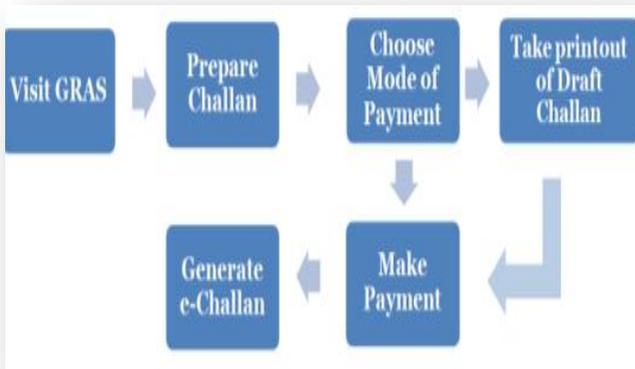
To make aware of the citizens, Department are used to print brochures and mentioned that “No need to visit Sub-Registrar Office(s). Get property transactions search, Index-II, and a copy

zones and Citizen needs to select zone to find rates. The application is developed and maintained by NIC, Pune.

c. 'ePayment' – Anywhere Anytime Payment of Stamp Duty and Registration Fees:

Citizens are followed by the process of Registration with payment of Stamp Duty and Registration Fees. They can make these payments through Government Receipt Accounting System (GRAS) using one of the two options – (i) Online Payment through Internet Banking & Debit Cards, and (ii) Across The Counter (ATC) Payment at designated Bank Branches. The citizens are required to make payment of Registration Fees, Stamp Duty, and Document Handling Charges to the department. In traditional method, the citizen is required to make payment of (i) Registration Fees in form of Bank Challan, or Demand Draft and (ii) Stamp Duty in form of Bank Challan, Franking, Demand Draft, etc. For the convenience of the citizens, the department has integrated with Government Receipt Accounting System (GRAS). To make payment of Registration Fees and Stamp Duty; citizen can visit GRAS and prepare their challan. The citizen then has option to either make payment using Internet Banking / Debit Card, or make payment at authorized bank branches. The challan so generated may be produced during registration as a proof of payment; the SRO shall verify the challan online and at the same time mark it as used to avoid re-use.

MECHANISM OF E-PAYMENT



Online payment of registration fees and stamp duty provides a lot of benefits to citizens such as;

- Facility of payment of stamp duty, registration fees and other receipts online through GRAS
- Safe, Secured, Accurate and Easy mode of payment
- No queuing or unnecessary waiting
- Payment can be made at convenience
- Possibility of making all department payment at one place relating to transaction/deeds
- Payment without any ceiling
- Increases transparency
- Counter payment with more banks

d. Public Data Entry' – Expedite registration by entering data online

Registration is web application made available to Citizens by Stamps and Registration Department of Maharashtra. The registration process may involve entry of information regarding document, party details, and property details. To reduce chances of mistakes in data entry at offices and to expedite the registration process, the department has made provision for citizens to do data entry (through Public Data Entry application) at their convenience thus ensuring complete control and accuracy of data. The citizen can, at any time, modify the information entered using the user-id and password provided while initiating data entry. At the end of data entry process, the citizen gets a unique reference number. During the registration, the data entered by citizen can be imported utilizing this number. This facility is being utilized in nearly 80% documents being registered through iSARITA. The data can be entered both in English and Marathi and it has the provision to recheck and validate the data by the owner themselves at Sub registrar' office.

It provides data entry for document to be registered with the Registration Department. With this application Citizen can;

- Enter information required for Document registration.
- Application generates (11 digit) Data Entry Number (DEN) for its usage at SR office.
Citizen should note it down.
- Citizen can modify entered details using DEN.

- Citizen can give DEN to SRO at the time of Registration to fetch information entered by Citizen. The application is developed by NIC, Pune.
- Citizen can book token for document registration using e-Stepin.

e. “e-StepIn” - Why wait in line when you can book online:

e-Stepin is web application made available to Citizen by Stamps and Registration Department of Maharashtra State. It facilitates citizen to obtain token to register document soon after citizen enters document details in PDE. e-Stepin provides following functionalities during token booking.

1. District selection.
2. Shift selection (by default General shift is selected).
3. Date of Registration.
5. SRO office of choice.
6. Verify time slot availability.

e-Stepin books slot for registration only if booking is available. Further citizen needs to enter Public Data Entry Token Number. After successful token booking, citizen should print Receipt to present to SRO. e-Stepin also allows one time rebooking. With introduction of e-StepIn, the citizens have the facility to book tokens online. This facility has been operational for 2 years now; the first 3 hours of the day are reserved for registrants utilizing this facility with first 1.5 hours reserved for registrants making e-Payment. Apart from these it has other facilities for the citizens like, Advance booking up to 30 days, document registered in a disciplined manner, document is registered on

scheduled time thereby minimizing waiting time of Registrant parties. This facility is frequently used by the citizens living in municipal corporation areas like Mumbai, Andheri, Borvali, Kurla, Thane, Kalyan, Raigarh, Pune, Satara, Sangli, Solapur, Kolhapur, Pandharpur, Nasik Lasalgaon, Malegaon, Ahmednagar, Dhule Aurangabad, Beed, Jalgaon, Jalna, Nanded etc.

f. Thumbnail Printing and mini-CD: In the manual process, the photocopy was required along with the original document and sub-registrar was required to make endorsement and signature on both copies and subsequently maintain the photocopy. In iSARITA, the citizen is required to bring only original document on which the sub-registrar is required to make endorsement and signature. The registered document is scanned and thumbnail printout (1:4) of scanned document is given to citizen for confirmation. Upon confirmation, the citizen is given a mini-CD containing scanned document. The scanned image is stored & maintained centrally, and thumbnail print signed by parties is maintained at SRO.

g. Other Modifications:

- On the basis of Land Reforms Bill i.e. integration of land records with registration of deeds.
- The pilot for e-Mutation of properties upon registration of document has been carried out.

- The citizens are enabled to search property transaction, know property valuation, make online payment, enter data of current transaction, and book time slot online.
- During registration, the property valuation is done online and captured for the purpose of calculation of Stamp Duty and Registration Fees.
- Verification of the various modes of Stamp Duty Payment (Franking, Stamps, e-Stamps, e-Payments) with locking facility to prevent reuse.

2. C. e-Registration; anywhere anytime:

e-Registration made available to Citizen by Stamps and Registration Department of Maharashtra State. Citizens can prepare their documents online using the online templates provided by department and make necessary payment of Stamp Duty & Registration Fee online and submit the document for registration. An advance version of i-SARITA has been implemented by the Department for the entire state of Maharashtra but presently it is available only for Registration of *Leave & License Agreement* and (First) and *Agreement of Sale* between Developer/Builder/Promoter and Purchaser(Second). E-Registration has been started in 9 Districts of the State, namely; Nagpur, Mumbai, Mumbai Sub-Urban, Raigad, Nashik, Nanded, Pune, Thane, Aurangabad.

2. C. 1. Benefits of e-Registration;

- No need to visit Sub Registrar offices.

- Documents may be submitted 24 × 7 as per citizen's convenience
- Efficient and transparent service
- In absence of required infrastructure, citizen can also do Registration in CSC

It provides facility of online Registration of Leave and Licenses Agreement to Citizen. With this, citizen can,

- Prepare their Agreement
- View the draft
- Modify if necessary
- Execute (sign) it
- Submit it for registration
- Get it registered.

All above activities can be performed from anywhere anytime, without going physically to Sub Registrar office. The application is developed by NIC, Pune. Registration of First agreement of Sale between Developer and Purchaser, developer can avail this facility after complying following pre-requisites:

- Project is having all the necessary approvals from various authorities.
- Project is having minimum 200 flats
- Necessary technical infrastructure mentioned below as 'Minimum Requirements' and MPLS VPN connectivity of 2 Mbps instead of internet

2. C. 2. Procedure of e-Registration: e-Registration is an advance part of online registration process. Department provides an ultimate solution to the citizens towards e-governance, through this application citizens can easily register their property document in anytime anywhere.

1. Minimum requirements (PC with updated Antivirus, Internet broadband connection of minimum 2 Mbps, Web Camera, Biometric Reader, Aadhar card of all parties) for e-Registration.
2. Open e-Registration portal
3. Create user account
4. Enter data required for preparing document & verify all details
5. Validate your identity using your Aadhar number.
6. Auto calculation of Stamp Duty, Registration Fees and other charges from portal
7. Pay stamp duty and registration fees online.
8. Capture photographs & thumb impression of all the parties
9. Upload the document for Registration
10. SRO will receive document in his login.
11. SRO to verify identity of registrants with UID & payment details with GRAS
12. SRO will verify document & if found correct will register it using his Electronic Signature
13. Receive registered document in your log-in

Department had included online services ilke e-filing, PDE for filing, Adjudication, Court cases etc. to enhance the services

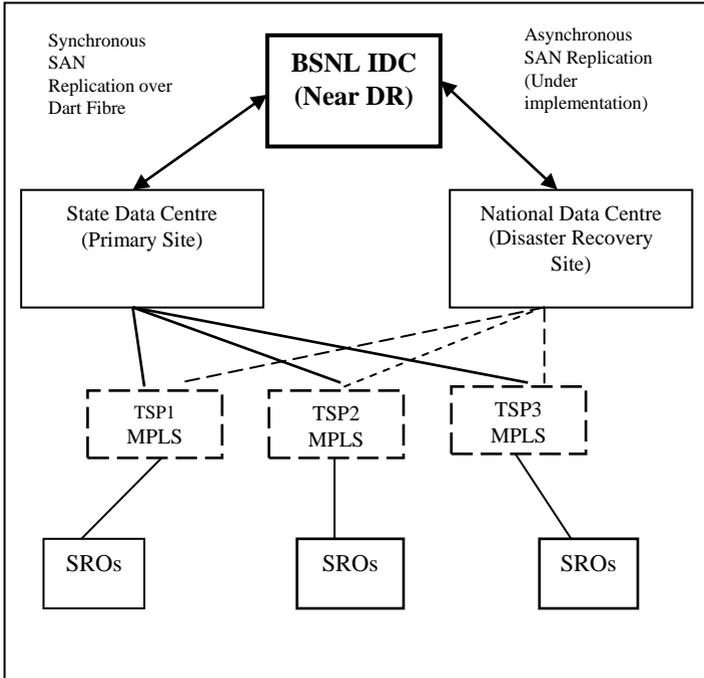
provided to the citizens and it shows the systematic effort to focus on the commitment of the Organisation towards its Citizens in respects of Standard of Services. *e-filing* is a web-service to the Mortgager to file Notice of Intimation in the Sub-Registrar's Office within 30 days of taking the loan, whether it is by way of deposit of Title deed or by agreement. Citizens can *refund stamp duty* after applying to the Joint District Registrar (JDR) if the purpose for buying stamps is cancelled or if the stamps are spoiled before use, the entire process may be done by online services. *Online Adjudication* service made available by the Department to appeal against the order of Collector of Stamps regarding determination of Market Value. In the case of Section 31 (Adjudication) or Section 32A of the Maharashtra Stamp Act, [where deficit stamp duty is not paid as per true market value] if the final order of determination of Market Value by Collector of Stamps is not accepted by the party, then he/she can file appeal against order of the Collector of Stamps under section 32B of the Maharashtra Stamp Act in the office of the concerned Deputy Inspector General of Registration and Deputy Controller of Stamps. *Issuing notices to the parties* by online application is developed by the Department. Yearly audit is carried out by Account General (AG) office to review the records in the office of Registration. If there is any discrepancy in assessment & levy of stamp duty & registration fee departmental case is filed. Party is informed by post, mail & SMS.

3. Execution & Infrastructural Outlay of the Project:

Department of Registration and Stamps execute Computerisation of Registration for the entire state of Maharashtra. To execute properly Department has been divided into five working divisions like; Mumbai, Pune, Thane, Nashik (including Aurangabad and Latur), and Nagpur (including Amravati).

PPP model has been used widely in Computerisation of Registration process, under the PPP model Department has appointed vendors for each working divisions. The department has provided the server side infrastructure (including iSARITA application) and client side hardware (including power backup for this hardware), any additional hardware required are to be purchased by the BOT vendor. The services like maintaining hardware, supply consumables (genuine toners, CDs, papers, etc.), provide manpower, maintain control centre, call centre and helpdesk. Under the control of Departments this project has been implemented very well throughout the state in time bound manner.

ICT infrastructure for Computerization of Registration Project



In view of the criticality of registration process, the overall architecture has been designed for Business Continuity Planning. The Primary Site and Near DR Site are always in same state (through real time synchronization) whereas DR site gets synchronized with Near DR site in regular intervals. In case of disaster at Primary Site, the latest data shall be available at Near DR site that shall get synchronized to DR site. Once the latest data is available at DR site, the synchronization flow shall be reversed (DR -> NDR) and all the users shall be able to access

the application from DR Site. After the Primary Site is fit to operate, the data shall be synchronized back (DR -> NDR -> DC) and synchronization flow shall be set as original (DC -> NDR -> DR).

The server side infrastructure at these sites is as follows:

Item	At Primary Site	At Near DR Site	At DR Site
Blade Servers	Commissioned	Not Applicable	Commissioned
SAN Storage	Commissioned	Commissioned	Commissioned
LAN Switches	Commissioned	Not Applicable	Commissioned
RHEL License	Commissioned	Not Applicable	Commissioned
Windows License	Commissioned	Not Applicable	Commissioned
FMS Manpower	Deployed	Not Applicable	Deployed

To enable smooth operation at field offices, the department has also provided sufficient infrastructure at all Sub-Registrar Offices (including Administrative Offices). All the hardwares provided by the department are covered under three year's warranty. The list of hardware infrastructure at Sub-Registrar Offices is as follows:

Sl. No.	Item	Qty.	S. No.	Item	Qty.
1	Desktop Computers	3	5	ADF Scanner	1
2	B&W Laser Printers	1-3*	6	Web Camera	1
3	Colour Laser Printer	1	7	Barcode Reader	1
4	Flatbed Scanner	1	8	Fingerprint Reader	1

**Provided on the basis of workload in office*

The PPP vendor is required to make necessary arrangements of additional hardware, if required, to maintain Service Levels as per the agreement. The arrangements for network connectivity for this project are as follows:

1. **At user end:** As per the security and availability considerations, the department is utilizing 2-Mbps MPLS VPN connectivity (provided by PPP vendor) through network services providers. The PPP Vendors have chosen different network service providers for providing this connectivity.
2. **For Synchronous Replication between Primary and Near DR Site:** For the purpose of synchronous replication of data between the SAN storage at Primary & Near DR sites, the department has procured the Dark Fibre. The management of SAN through Primary Site is done through an additional 100 Mbps link.

- 3. For Asynchronous Replication between Near DR Site and DR Site:** For the purpose of asynchronous replication of data between the SAN storage at Near DR and DR sites, the department has procured 100 Mbps link.

4. Training and Capacity Building & Monitoring:

Department has taken a key role to train staff to understand the advancement of technology used in registration process. Since 2002 when Computerisation of Registration started for the entire state, Department had started training and capacity building for Staff and Officers to execute the programme efficiently. In any e-governance programme training for the staff who actually operate, are inevitable, because they should have proper idea on the transition period from manual operation to technological advancement. Department had conducted so many training programmes regarding Computerisation of Registration including i-SARITA. During the training session of i-SARITA Department focused on highlighting the key aspects of iSARITA resulting in (a) reduced efforts for departmental staff, and (b) improvement in service delivery to citizens.

Departmental staff needs to understand the transition to centralized, web-enabled registration, for this purpose, the following exercises were carried out:

- Training of Master Trainers of PPP Vendors
- Workshops at Yashada, Pune for Departmental Officials

- Video Conferencing sessions for Sub-Registrars, Joint District Registrars
- Workshops at DIG offices
- Training sessions for Sub-Registrars and Joint District Registrars in IGR office

As a capacity building measure, the department has also hired consultants from leading organizations to assist in its e-Governance initiatives. The department has set up on monitoring and support purposes at various levels, the details are as follows:

Decision Making	At the decision making level, the department has set up Project Implementation Committee (PIC) having representations from DIT, NIC, Finance Department, etc.
Project Monitoring	For day-to-day issues, the department has setup the Project Monitoring Unit (PMU) at Head Quarters comprising department officials.
Operational Issues	At operational level, there are two facilities mentioned below: 1. As part of the project, the PPP vendor is required to set up the Control Centre at all districts for handling of operational issues. At the Head Quarters, the PPP vendor has set up the call centre for overall management of all Control Centres. Further, the PPP vendor is required to set up the Help Desk at the Head

	<p>Quarters to address queries of the general public.</p> <p>2. The department has recently launched the help desk for general public with special focus on electronic mode of payment.</p>
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5. Salient features of the project:

The implementation of the programme of Computerization of Registration resulted lots of benefits for the Citizens and Government. It is proved that this programme had a very good success story on the basis of citizen services, easy online mechanism, transparent and authentic process. It is also beneficial for the Government as it increases the rate of registration per day and earning of revenue, pending issues also have been resolved timely, easy to monitor etc. The salient features of the project are as follows;

1. Utilization of Biometric Authentication for Sub-Registrars at the time of login and registration.
2. UID Integration for biometric authentication of sub-registrars through CIDR has been completed while for citizens and operators it is in progress.
3. Integration with Government Receipt Accounting System (GRAS) for Stamp Duty and Registration Fee payment verification and locking.
4. In-built mechanism for valuation of property and calculation of stamp duty.

5. In-built mechanism for transliteration of data from English to Marathi and vice-versa.
6. Verification of franking for verification of stamp duty payment (under implementation).
7. The project started with usage of private cloud in a Tier-III data center for hosting the application and then shifted its own co-located hardware
8. Integration with Land Records Department for verification of title and generation of notice for mutation is in progress.
9. Online facility for citizens to enter their own data (or at MCKL outlets), nearly 80% of the registrants are using this facility and have appreciated this initiative.
10. Online facility for citizens to book the timeslot in Sub-Registrar Office of their choice.
11. Online facility to citizens to know Annual Statement of Rates for valuation.
12. Online facility to citizens for searching past 12 years registrations (through e-Search) using Document Number / Property Details, and download copy of registered documents. Till date, nearly 35 lakh citizens have made use of this facility.
13. Dashboard for centralized monitoring and informed decision making.
14. For a given division, the entire responsibility of maintenance of hardware, supply & maintenance of network, consumables (mini-CDs, Paper, Cartridges, etc.), and manpower rests with one agency i.e. PPP vendor, resulting in administrative ease for the department.
15. SLA based service delivery to citizens

16. Business Continuity Planning using a DC – NDR – DR setup
17. Real-time monitoring of vendor performance and departmental assets
18. Operating registration offices in multiple shifts (7am – 2pm, 10am to 5pm, and 2pm – 9pm) for citizens convenience
19. Enhanced data security using data encryption, application access through VPN, and hosting at multiple locations.

6. Key Success Factors of the Project:

There are lots of factors influencing the computerization of registration project and make it a success story for the state of Maharashtra. The key factors are adoption of technological advancement, steady source of financial resources and immense of dedication by the Department. Key factors of the programme are discussed here as it's a lesson for other State too.

a. Technological Advancement: Department has adopted technological advancement to make this programme fruitful for the citizens and government too and that's why with the help of National Informatics Centre (NIC) they developed the application using the worlds one of the most advanced and trusted Open Source Database (PostgreSQL) with department owning the Intellectual Property Rights (IPR) of the application. Technological progress helped citizens and as well as Department in following aspects;

- e-Payment of Stamp Duty and Registration Fees, with facility for verification and locking.

- Reduced discretion in Scrutiny, Valuation, and Checking of supporting certificates
- Automated validation of various modes of payment of Stamp Duty like Stamp Paper, Franking, Certificate, e-Stamps, etc.
- Administrative ease in deployment of modifications to iSARITA software, hassle free to maintain by field offices
- Citizen gets absolute control of their data and verification of scanned copy of registered document.
- Forward and Backward Integration with Land Records.
- Biometric authentication of SR users using UID.
- Secured centralized preservation of registered document with backup.

Apart from that Department has taken lots of other security measures to maintain privacy, restriction of accessibility of all documents to citizens, name based searches not permitted to public etc.

b. Steady Source of Financial Resources: No such financial barriers are faced by the Department ever from either government or from the bureaucracy, to develop, execution and maintenance of this programme. Another source of revenue to maintenance of this i-SARITA application has been collected from the citizens as they had to pay Rs 20 per page for document handling charges.

c. Dedication of the Department: The entire Organization has delivered their best to execute this programme successfully.

Multiple and successive trainings have been provided by the department for not only the Officers but also for the data entry operators to make them understand i-SARITA application.

7. *Reasons behind best practices:*

- Online facility to calculate and pay Stamp Duty and Registration fees by the citizens which has definitely reduced corruption, time consumption etc.
- Online verification of payment by Sub-Registrars.
- Citizens easily search previous transactions, and control their data.
- Centralized monitoring and informed decision making.
- Public awareness campaign through newspaper advertisements and brochures.
- Online filing of notice of intimation for lease or sale information.
- Provide backward & forward linkages with the land records & revenue department.

8. *Challenges and way forward:*

Computerization of Registration in Maharashtra makes registration process easier and transparent and helps to prevent frauds such as selling a property to multiple customers by using duplicate documents. In this way, State has reached to the milestone of e-Registration from manual process of registration. Department has developed stand alone computer application to

web based application to timely provide maximum services to citizen, but Department has faced several challenges like:

- Due to the delay in connectivity to the offices, this process took long time to complete. Although Department has strictly directed to the vendors for timely completion of the connectivity, the problem has not been solved. Network problem is also a big challenge for the department, as most of the working time in some taluka level offices faced “no internet access” problem almost every day by which citizen feels helpless and come back over again in the offices.
- As Department had trained their staff multiple times on handling i-SARITA but the number is not adequate. That’s why Department has faced a problem of insufficient trained manpower.
- Some taluka level offices faced problems to handle the system software; as they are very slow in operating citizen services are being hampered.
- Opposition coming from the field level officers to not implement this application. As the application will reduce the power of their chair.

“iSarita not user friendly: Lawyers” Article posted in Times of India, Pune Oct, 2012 Edition. Pune Bar Association (PBA) claimed that i-SARITA application apart from being time taking, is not user-friendly and for that purpose they had protested also. As they claimed that, in the software, citizen needs to fill all fields in English and while converting it from English to Marathi it took lots of time and erroneous output.

They also added that staff are not enough trained in this new application and had pointed out that the concession in stamp duty for registered housing societies, under section 25 (d) of the Bombay Stamp Act, has been stopped and, hence, people have to pay full five per cent stamp duty.

Apart from the challenges and obstacles faced by the Department, they have taken some remedial measures to solve like;

- Department had issued notice to the respective companies or vendors for not providing Internet connections and connectivity between offices in time-bound manner. Even Department had asked vendors to purchase quality Network Service Provider (NSP) to meet the requirements.
- Department Head meet online to SROs on almost daily basis to troubleshoot their problems and give them solutions instantly.
- Department had appointed vendors to audit software functionality of all SROs.
- For dealing with Public Data Entry as it took long time to feed data, Department had launched this section into Internet, by which applicant could feed their information by their own. This application helped citizen immensely.
- To overcome the problems of inadequate trained staff for handling this application, Department started rigorous training for staffs, vendors and Officers.
- To make citizens aware of the Computerisation of Registration and its components, Department had

published brochures or advertisement or leaflet to grow awareness of the newly developed application.

- As citizen can feed their information online they don't need to pay charges to the agency for Public Data Entry.

The success of the Computerisation of Registration from Manual process to e-Registration resulted in benefits to the citizens as well as to the department. This entire journey also helped in uplifting of Department's image in public, and State Government earned name & fame nationwide. Success of the i-SARITA project can be measured from the fact that many states have studied and are planning to adopt this project. Though there are some obstacles, but the dedication of the Department will surely overcome all those challenges. Recommendations for the Department are that they should monitor almost on regular basis to the vendors and some taluka level officers and staff to stop harassing the rural peoples. Problems regarding connectivity of offices and internet access should be fixed at the earliest possible time and provide quality training to the staff.

HRSI Survey in Haryana and its impact on the citizens

1. Background

The state of Haryana carved out of Punjab came into existence on 1st November 1966. To its north lie the states of Punjab and Himachal Pradesh and Rajasthan to the west and south. River Yamuna defines its eastern border with Uttarakhand and U.P. Haryana also surrounding Delhi on three sides, forms the northern, western and southern borders of Delhi. Consequently, a large area of south Haryana is included in N.C.R. for purpose of planning for development.

Haryana is one of the smallest states in India with 4.4 million hectares of land forming only 1.34 per cent of the total geographical area of the country. Nearly 80 per cent area of the state is under cultivation of which about 84 per cent is irrigated with cropping intensity of 184 per cent.

Known as the cradle of agriculture, Haryana is one of the most leading agrarian states in India with flat arable land irrigated by submersible pumps and extensive canal system. From being a food deficit state in 1966, at the time of its inception, Haryana has now emerged as the second largest contributor to the national pool of food grains.

The territory of present Haryana ceded to the British empire between 1803 and 1849 when after the battle of Laswari in Nov.1803, Daulat Rao Sindhia signed a treaty with East India Company according to which all his territories between the river Jamna and Ganges, including some territories in the possession of Raja of Gohad were surrendered to the East India Company and its allies, comprising the present district of Gurgaon, Faridabad, Palwal, Rohtak, Jhajjar, Sonipat, Hisar, Fatehabad, Panipat, Karnal and part of Mewat, Sirsa and Bhiwani. The territory beyond river Ghaggar which is now divided among part of Sirsa, Bhatinda and Ferozpur, was a wild desert tract in those days and known as Bhatti (Bhatinda) territory and no effective control was exercised over it till 1818.

Right from the time of Manu land revenue has been a major source of income of the sovereign. A historical analysis proves that tax on land played a pivotal role in the evolution and maintenance of the system of governance. During Mauryan and Gupta period, the revenue was collected by paid officials. Later during the sultanate period jagirdars, inamdars, subedars etc. were made the intermediaries who passed on the revenue to the kings.

Attempts to reform the system were initiated in the regime of Sher Shah Suri and Dewan Todar Mal whereby land was categorised, measured and a schedule of crop rates fixed. In the reign of the Mughal Emperor Akbar, Dewan Todar Mal was appointed as the Finance Minister and he is remembered till today for evolving a system of revenue assessment and survey

and his contribution was the overhauling of the revenue system and managing land systematically. Each tract of land was divided into revenue circles. A new system of revenue known as 'Zabt' was introduced to take care of the crop yield and their prices estimation. On the basis of this the tax was fixed on each crop in cash. He aimed at securing the peasant the power of enjoying his property and the fruit of his labour.

Under the various pre-British regimes, land revenue was collected by the state, the sole owner of the land. The administration of land was centred on collection of taxes and land revenue. When the British came into power in North-Western Province, a new province of Punjab was formed in 1849 and they decided to assess the land revenue and the land owners shall pay the sum so assessed, which in technical language was called settlement. Through summary settlement efforts were made to frame a record of rights for all right holders such as owner, tenant, lessee, mortgagee etc. The lists (Khewats/Khatauni) of each revenue estate were drawn up along with nature of rights and the amount of rate of revenue which they were liable to pay to the state. The revenue management was the worst in those days. The work in those summary settlements was done in haste by some young officers who had no past experience of settlement. In some of the early settlements neither the fields' survey maps neither were prepared nor record of rights (RoR) framed were reliable. No attempts were made to measure the fields and not even a rough sketch of Khewats was prepared.

For the first time some of the districts of present Haryana were put under summary settlement just before or after the first war of independence in 1857. The work of settlement was held in many present districts of Haryana like Hisar, Sirsa, Rohtak, Sonapat, Rewari, Nuh, Jhajjar, Gurgaon, Palwal, Panipat, Kaithal , Kurukshetra, Ambala, Yamuna Nagar and part of Fatehabad. Sirsa was district head-quarter in those days. Towards the close of this period statistics of ploughs, wells, irrigation and others which throw some light on the condition of each revenue circle was taken into consideration and elaborate tables for statistics and maps were prepared for different villages.

The second phase of settlement roughly started in 1863. During this period, settlement of many districts of present Haryana was taken in hand.

The third phase of regular settlement started around 1871 and stretched up to 1879. Sir James Lyall was settlement commissioner while Sir James Fitz and James Stephen were legal members of the council which framed the first Land Revenue Act of 1871. It was considered as the text book of Revenue Officers of the then Punjab till the passing of the second Land Revenue Act of 1887. During this period greater part of Delhi territory including Gurgaon, Rohtak and parts of present district Kaithal, Panipat and Karnal were selected for regular settlement and some steps were taken to achieve a high degree of efficiency in this period.

However, the orders issued on this subject bore little fruit. If these orders had been carried out in practice, all details would have been available for each revenue estate. The huge quantity of details was stuffed in it and these details were over-elaborated. Therefore, it has been rightly said that a perfect system failed due to the inefficiency and weaknesses of supervisory staff. Thus a more perfect system crumbled down under its own weight of defective and over-elaborated details and inefficient staff of Patwaris and the supervisory staff.

During fourth phase of settlements Major Wace was the settlement commissioner and Mr Lyall was the Financial Commissioner for the first half of the period and later on he was appointed as Lieutenant Governor. The revised settlement of Ambala and part of Karnal was undertaken during the fifth phase of settlements started in the year 1889 and continued up to 1932. During this phase, the old assessment policy and new procedure were put to test. The last revised settlement in district Hisar, Bhiwani, Fatehabad, Rohtak, Rewari, Palwal, Jhajjar, Sonipat, Karnal, Panipat, Kaithal, Kurukshetra etc. of present Haryana was held from the year 1910 to 1932. The reassessment work of district Hisar was also undertaken during this period. The re-measurement was resorted to only in those cases where it was considered indispensable. New- set of Patwari rules were framed and at the same time strength of Kanungo staff was considerably increased. A Director of Agriculture for the proper collection of agricultural statistics was appointed.

Consolidation of Holdings:

Fragmented and scattered holdings is a wasteful method of land utilization. The process of bringing together small and fragmented pieces of land into a compact block for better and intensive cultivation is known as consolidation of holdings. It saves the tiller to a great extent from wasteful supervision, irrigation of scattered holdings and enables him to avail the facility of modern agricultural techniques. The consolidation of holding was started in Punjab during British period in 1920 through Cooperative Consolidation Societies. However, the consolidation was done on voluntary basis through persuasion and propaganda. As there was no legal compulsion in the matter so the progress was slow. The Punjab govt., therefore passed the Consolidation of Holding Act 1936, which made consolidation compulsory if two-third land owners agreed to it. After the independence, the urgency of consolidation was realized and the east Punjab Holdings (consolidation and prevention of fragmentation) Act, 1948 was passed which made consolidation of holdings compulsory.

The scheme provided an opportunity for re-planning the countryside, which included planning the location of schools, hospitals and roads. Land was also reserved for community buildings such as community centres, places of worship and play grounds etc.

During the consolidation, the land is divided into uniform grids of acres. Each acre is called a killa and it has a dimension of 40

Karam x 36 Karam and length of each karam is 5.5 feet. The lowest unit of measurement is karam and killa grid of 25 acre is called a Muraba. This system of dividing the land into uniform grids helped in eliminating any major error in measurement of killas.

For administrative purposes, the state has been divided into four divisions (Ambala, Rohtak, Gurgaon and Hissar) and 21 districts. There are currently 69 Revenue Tehsils in the state.

2. *Land Records*

Modernization of land records (including digitization of Mussavi), its linkage with Record of Rights and management of old revenue documents aimed at imparting the services related to land records and monitoring revenue administration across the state in order to improve the revenue administration have also been taken up.

Under the NLRMP in Haryana, State aimed to digitizing the cadastral maps in the State and linking of the same with textual data (ROR) to extend more services to the citizens.

For every village, there are cadastral maps having parcels of land (popularly known as Khasra), which form the basic record of revenue administration. After linking of the cadastral map with textual data, citizens can be provided with the services e.g. ROR with plot map (parcel map), showing dimensions of each side, area & the adjoining plots and Textual ROR data updation in sync with spatial data updation.

The Government of Haryana has appointed HARSAC as nodal agency for the generation of Geospatial Data Base using Remote Sensing and GIS State of Art technology for the Project-Modernization of land records (which includes digitization of cadastral maps, integration with Records of Rights (ROR) and Management of Old Revenue Documents) under NLRMP in Haryana.

2.1 Summary of the exercise

Haryana Space Application Centre (HARSAC) is played a curicial role started from ideation, development, implementation and maintenance after the hand rolling of the work to the revenue department. The main beneficiaries of the exercise would be financial institutions, credit agencies, courts and land disputes would be gradually wiped out.

The work was started from Village ‘Kamal’ in the Dabwali tehsil of Sirsa District. The selection of village was based on complexity and hence Kamal village stood out. There was a strong belief that if the project succeeded, people will say Kamal ho gaya (Miracle happened).

The advantage which the Haryana had was that the land consolidation had been done and physical records were based on the 1960 survey. The next big challenge was to locate a reference point. Initially the 35 Primary control points established by the Survey of India were used to build on the reference map. Another 121 primary control points were added by HARSAC to the existing network. In the next stage, a total of 589 secondary control points were added and finally around 25000 tertiary control points were added to the network. Special Gazette notification was issued for the same.

The tendering process was highly structured, where work flows were clearly defined. The vendors were selected on Quality Control Basis and the work was rationalized among the 4 selected vendors. The outsourced work was to be carried out in house under the direct supervision of HARSAC. An NLRMP

business processing unit was established in the premise of the Patwari Training Centre where workstations were connected to main server which is manned by the HARSAC persons. On the field, every vendor was to have a district coordinator in liaison with the revenue officers.

The next big challenge was skill development as it involved tedious revenue work to be embedded with state of the art geo-spatial technologies. It was also essential for sustainability of the project as the project cannot depend on vendors. Once the deliverables were achieved, the hand rolling will shift the focus on local staff. Young and fresh technical graduates were trained and contracted for work on per hour basis. A parallel hand on training of all the Patwaris was initiated. In the database, the Patwaris were colour coded based on their performance.

The margin of acceptable error was set at $< 1\%$, though every attempt was made to make the process error free. Quality and accuracy checks were placed at every stage, and when on field a reverse checking mechanism was introduced in order of Patwari > Qanoongo > Naib Tehsildar > Tehsildar > District Revenue Officer. After the finalization of the digitized record, new RoR's are held and a Jan Sunwai is held with all revenue officers and the Collector of the district.

For pursuing work of such magnitude, channelization of energy in right direction is required, where capacity building will be an ongoing process. Work assistance has to be provided at every level and special attention should be paid initially to smoothen the bottle necks.

There is a 100% success rate in respect to land titles till date in all public meetings.

2.2. The objectives of the exercise

- 2.2.1. To preserve the data available in the documents.
- 2.2.2. Electronic storage and facilitate its easy access to the users.
- 2.2.3. Easy retrieval to the public and user Department by obtaining the drawing of land along with dimensions, area (as on ground and also as per (ROR), other attributes and Neighbourhood details.
- 2.2.4. Facilitate in prompt updating of digital land record so that modern land record system will add value to a common man. Whenever there is a future updation /mutation the survey can promptly upload the data from the field mobile device to enter the field data in to a computer in office to update the land parcel simply.
- 2.2.5. Better resource planning and better monitoring of Govt. lands such as hamlet lands and easy identification of encroachments on public/private properties using Geospatial data base and Geo referenced satellite Image.
- 2.2.6. Easy Disaster Management - Identification of properties for crop compensation, crop insurance, encumbrances etc. as relief measure after natural calamities

2.3. Basic Principles:

This comprehensive and transparent land records management system aims to implement the conclusive land-titling system with title guarantee and will be based on four basic principles, i.e.,

- 2.3.1. A single window to handle land records (including the maintenance and updating of textual records, maps, survey and settlement operations and registration of immovable property)
- 2.3.2. The “mirror” principle, which refers to the fact that cadastral records mirror the ground Reality
- 2.3.3. The “curtain” principle which indicates that the record of title is a true depiction of the ownership status, mutation is automated following registration and the reference to past records is not necessary, and
- 2.3.4. Title insurance, which guarantees the title for its correctness and indemnifies the title holder against loss arising on account of any defect therein.

2.4. Components:

Components in the development of Digital Cadastral Reference Database using village cadastral maps.

- Computerization of cadastral maps and generation of GIS products.
- Geo-referencing of cadastral maps
- Value addition

2.4.1. Computerization of cadastral maps and generation of GIS products.

The first component is the computerization of cadastral maps and generating GIS compatible softcopy products. This involves identifying the procedures for generating the softcopy products and standardization of each product for unique identification of each cadastral map in the entire country and content (legend) codification so that each feature in the map is uniquely defined.

- I. Making available the village maps
- II. Indexing, Coding & Scanning
- III. Tiling map using GRID
- IV. Digitization of village maps
- V. Attribute Data attachment
- VI. Hard copy output generation
- VII. Hard copy evaluation by LRD
- VIII. Database Generation in GIS environment
- IX. Softcopy validation by DLR in GIS environment
- X. Final hard copy generation
- XI. Final Hard copy validation
- XII. Satisfactory training to the departmental officials,
- XIII. Security & Authentication Policies
- XIV. Requirements if any at the Government level
- XV. Providing deliverables as per technical specifications.

2.4.2. Geo-referencing of cadastral maps

The second component is geo-referencing of cadastral maps. The digital cadastral maps are carried forward for deriving geodetic coordinates for each parcel and in turn for each vertex of the cadastral map. This is achieved through geo-referencing the maps using real world coordinates of the ground control points (GCP's). The GCP's are derived from high resolution satellite data. The accuracy of geo-referencing of the cadastral maps using ground coordinates from satellite data is analyzed.

- i) Scanning, digitizing and linking with RoR data.
- ii) Satellite data preparation
 - a) Acquisition of satellite data
 - b) GRIDBASE generation
 - c) MAPGRID generation
 - d) Geo-referencing of LISS Images
 - e) Registration of PAN /QB/WV data/ HRSI
 - f) Merged product generation
- iii) Geo-Referencing of village maps
 - a) Acquisition of Ground Control Point (GCP)
 - b) Geo-referencing of Village map
 - c) Validation of geo-referenced output
 - d) Edge-Matching of neighbouring village maps
 - e) Mosaic generation at RI, Taluk & District Level
 - f) Get the design document approved from the Director Land Records, Haryana.

2.4.3 VALUE ADDITION

The third component is value addition to the geo-referenced cadastral maps. The spatial information generated using remote sensing & GIS techniques, and development of socio-economic data will be integrated with geo-referenced cadastral maps. Village level planning will be attempted using spatial/non-spatial information. This will enrich the utility of cadastral maps in the present day context. The scope of applications of geo-referenced cadastral maps will be attempted with relevant examples.

3. *Computerization of cadastral maps and generation of GIS products*

3.1. Scope of Work:

- a) Cataloguing, indexing and scanning of old land records (Mussavies, Field book, Misal Haqiyat, Registered deed etc.).
- b) Digitization of the Mussavies.
- c) Updation of digitized Mussavies by incorporating all changes till date. Generation of missing remaining Mussavies and updation during AMC.
- d) Monumentation of the control points.
- e) Integration of spatial data base with RoR data available in HARLIS using Bhu-Naksha s/w.
- f) DGPS survey for establishment of Primary, Secondary and Tertiary control points.

- g) Ortho-rectification of high resolution satellite images of World View-1 / World View-2.
- h) Generation of missing data either by interpreting it from field book or any other revenue records.
- i) Survey/Resurvey through ETS for the unconsolidated areas, areas where data is missing and areas where area discrepancy is observed and for areas defined by District Administration.
- j) Validation of interpreted data through field survey.
- k) Development of Document Management System.
- l) The generation of seamless digital vector data & production of hard copy of village/tehsil /District also.
- m) Capacity building by imparting training for digital (spatial and non-spatial) data updation during annual maintenance period (2 years).
- n) Geo-referencing and mosaicking of village Musavies.
- o) Develop seamless geo-database for state.

3.2. Digitization

1. Revenue Department will provide the existing musavis and agency will scan the musavis and give the hard copy to the Revenue Department for updating. Revenue department will return the updated copy of the Musavi to the vendor agency for digitization (in defined time frame strictly). Digitized musavis will be geo-referenced with the help of High-Resolution Satellite Imagery (HRSI).

2. If Musavies (hard copy) is not available with DLR/DRO or not readable, the creation and digitization of the New Musavies will be done from field book.
3. Digitized cadastral maps/musavis, integration with Records of Rights (RoR) in GIS layers depicting Geographic information (the property co-ordinates, the actual measurements as per ground reality and musavi), attributes information (based on RoR) Survey on), it's interlinking with optimum precision.
4. To generate integrated, Geo-referenced village/tehsil/District mosaic of cadastral maps.
5. To develop retrieval system to obtain the drawing of the land along with dimensions, area (as on ground and also as per RoR), attributes and neighborhood details.
6. The property maps should be able to integrate with the Record of Rights and future web application/publishing.
7. For updation of Revenue records / Musavis the following survey methods can be adopted as per the ground situation /reality using any / both of the following method
 - a) Pure ground method using Electronic Total Station (ETS) and Differential Global Positioning System (DGPS)
 - b) High Resolution Satellite Imagery (HRSI) and ground truth by ETS and DGPS.

The Purpose of ETS and DGPS survey is as follows:

- I. Updation of Maps / Parcel which could not be updated by the department due to the unavailability /clarity of record.

- II. Ground truthing of the features captured from satellite image
- III. Fixing of Sehada stone
- IV. Georeferencing / Ortho rectification of the satellite image

Digitization and Management of Old Revenue Documents

- I. Scanning of Misal Hakiyat copy of Jamabandi
- II. Scanning of all the deeds registered during last 12 years
- III. Cataloguing and indexing of all the scanned documents
- IV. Storage of scanned documents in soft format
- V. Security of scanned documents
- VI. Software for indexing and retrieval of scanned documents
- VII. Scanning & preservation of old documents
- VIII. Geo-link with RoR Geo-link with Document management
- IX. Modern record rooms/land records management centers at tehsil/taluk/circle/block level. It should be developed as a virtual record room, not to be set up physically.

Process methodology:

The activity involved for Geo-spatial database generation involves the following process.

- I. Tehsil wise, collection of Mussavies& old revenue document by deputing specialized revenue officer at each tehsil level.

The Activity involved is as follows:

- A. Authorized representative of vendor will collect tehsil wise maps.
- B. Submission of the list of the authorized representative of vendor to DLR / HARSAC.
- C. Authorization of the vendor representative by DLR/HARSAC.
- D. Issuing of identity cards to the authorized representatives of vendors.
- E. Finalization of the list of the authorized representative by DLR/HARSAC at district level, tehsil wise with contact details.
- F. Scheduling of the maps collection activity from each district & tehsil wise.
 - a) The Mussavies of tehsil shall be provided in a single lot (should be organized village wise).
 - b) The date of the collection of Mussavies tehsil wise shall be intimated to the concerned officers (as the contact details provided in Annexure-4&5) one week prior to the date of collection.
 - c) Any change in the above schedule shall be intimated to the concern stake holders two days in advance.
 - d) Maps collection activity shall be completed in the first months from the date of the finalization of SDD.
- G. Process for maps collection: The collection of the Mussavies from each district.

Tehsil wise (to be organized village-wise) Mussavies collection shall be done by the authorized representative of the vendors and shall be tabulated in the format.

- (a) List of Mussavies in triplet will be prepared village-wise comprising the details / conditions of the collected map.
- (b) Each village list shall be countersigned by the representative of vendor and DRO in original. One copy each shall be retained by DRO, Vendor and HARSAC.

- II. Indexing and cataloguing of documents/maps followed by its safe storage and damp free environment.
- III. Identification of missing Mussavies followed by generation of missing Mussavies using Field book, Jamabandi , Misal Haqiyat, and Sajra map etc.
- IV. Survey/Resurvey through ETS for the unconsolidated areas/areas where data is missing and areas where area discrepancy is observed and for areas defined by District Administration.
- V. Scanning of the Mussavies & one print on 75 micron polyester matt film which will be submitted to DLR as final delivery.

The scanning of the Mussavies has to be done considering the following parameters:

1. Maps should be scanned at 200 dpi color mode. If Mussavies are damaged/destroyed or boundaries are not clear then scanning should be done at 400 dpi on 24 bit color.
2. Images should be stored in tiff /geo-tiff and pdf format.
3. The image orientation should be upright.
4. Registration / Rectification of the Mussavies with the grid.
5. The image should be cleaned and de-speckled to remove noise.
6. Legibility of features should be good.
7. Measured length and width within the bounding box of map should be +/- 0.1% of the original maps.
8. The image should not be skewed or wrapped.
9. Scanned image will be approved by officer/ official designated.

- VI. Village wise numbering of the Mussavies.
- VII. Grid generation (Murabba, Killa, and Mussavies and its attribution (Numbers)).
- VIII. Mussavies registration on planimetric murrba grid.
- IX. Digitization dimension based as per data modal.
- X. Processing of scanned & digitized Mussavies followed by printing on 100 gsm paper for updation.

Steps.

1. Original scanned Mussavies prints on 75 micron polyester matt film delivered to DLR as final delivery (Annexure-7).
2. Original digitized Mussavies prints in color on 100 gsm paper for updation.
3. Sajra map prints on 100 gsm paper for final acceptance by DRO.
4. Final digitized Mussavies prints on 75 micron polyester matt film (3 copies) as final delivery.

- XI. Updation from respective Patwari/Kanungo.
- XII. Updated Mussavies incorporated by vendor for final updation.

Updation of the Musavi

The digitized Mussavies will be printed on the 100 gsm paper on 1:1 plot scale for updation. The printed digitized Mussavies will be delivered to the DLR-H authorized representative. The digitized musavi will be updated as per the record and latest status of mutation by the DLR-H and handed over to vendor for final updation.

- i) The quality assurance of the data will be carried out by HARSAC
- ii) This will include checks for topological correctness, unique feature coding, and completeness of data, naming conventions, and accuracy and RMS errors.

- iii) The quality assurance form duly filled in as per the specified format has to be submitted along with the soft copy data.
- iv) Data not complying with the standards and accuracy specifications will be sent to vendor for correction and will have to be re-submitted after necessary corrections.
- v) If the data complies with the quality assurance standards and error limits are in the prescribed range the data will be accepted.
- vi) The quality assurance should comply with the following aspects
 - (1) Positional accuracy
 - (2) Attribute accuracy (attribute updated by DLR shall be considered as final)
 - (3) Logical consistency
 - (4) Completeness
 - (5) Mosaicing fit of the data.
- vii) Quality assurance of database will be done within a specified time set by HARSAC. On sample basis, the geo-referenced files of individual villages and the mosaic will be digitally quality checked by HARSAC

XIII. In house quality assessment and layout generation for digital data validation from client.

After necessary correction like image orientation and skewing, cropping, cleaning etc., vendor will generate check plots for each Mussavies in monochrome/color as per original map on 75 micron transparency and get this checked / verified from the authorized official deputed by the HARSAC.

The print should be on 1:1 plot scale. Checking process will include the following steps:

- I. Visual inspection of scanned maps for:
 - i. Validation of errors during the scanning process.
 - ii. Ensuring correct nomenclature and file format.
- II. Ensure that each raster image should open in computer environment.
- III. Rescan of the original hardcopy mussavi in case of any failure in quality check.
- IV. Issuing an acceptance certificate to vendor to proceed with digitization work.

XIV. Detailed study of the RoR data structure for integration, unique code incorporation in spatial data base.

XV. Integration of spatial data base with RoR, by converting spatial data files into *.shp/*.gdb file format as per define requirements of Bhu-Naksha software.

XVI. Listing of the parcel numbers without RoR data and listing of the RoR data not attached with any parcel will be identified along with its reason and resolution analysis under intimation to the HARSAC.

XVII. Seamless data generation tehsil / district wise.

XVIII. Final quality assessment in house of seamless data.

The criteria and acceptance levels for various parameters are given below:

- a) File naming 100%
- b) Directory structure 100%
- c) Data readability 100%
- d) Data structure 100%
- e) Data format 100%
- f) Topology 100%
- g) Attribute correctness 99-100%
- h) Attribute completeness 100%
- i) Data mosaicing 98-100%

3.3. Geo-referencing (Setting up Ground Control Network)

Geo-referenced Administrative Boundaries of Revenue Village with Name of Village/Tehsil/District (UTM Projection). By using the Revenue maps / ETS Survey each Mussavies of all villages will be mosaicked / merged to create cadastral map of entire village.

This Cadastral map of village will be Spatially Adjusted over the Rectified (Geo-referenced using ortho-rectification technique) High Resolution Satellite image (Section 2.2) the spatially adjusted vector thus derived should attain the accuracy of 98% - 100% in length and area parameters subject to the same as per ROR Data. The village map thus created can be

used to create a village boundary. The above mentioned process will be repeated for all villages of Subject Tehsil / District.

These Village – Cadastral maps will finally be merged to build entire Tehsil and then District.

Edge matching of individual villages must further attain accuracy of 98% – 100%, measured on length / area variations on plots / killa boundaries located at the boundary of individual village.

Control Points.

- Grid / Primary Control Points
- Secondary Grid / Secondary Control Points
- Tertiary Grid / Tertiary Control Points
- Auxiliary Grid/ Auxiliary Control Points.

3.3.1. Grid / Primary Control Points:

Primary control points located in each 20 Km (16 to 22 km)/Tehsil Headquarter. Space must be located in a secured Campus, a Government Office preferably a Tehsil Office or Block Development office or any other government building in Tehsil Head quarter and Panchayat Bhawan Government School or any other government property in a selected village for fulfilment of 20 Km criteria.

Criteria of Monumentation of Primary Control points are as follows:

- i) Rock-stone or Sand-stone 24*24*100cm or RCC.
- ii) The control point should be 15 cm above the ground and 85 cm inside the Ground.
- iii) The control points should be fixed to the ground using at least 15 cm of cement block.
- iv) Monuments shall bear a triangle on top with a plummet hole in the middle and a 15 cm steel rod inserted (flush with concrete surface).
- v) The control point number should be inscribed on the monument

3.3.2. Secondary Grid / Secondary Control Points:

Secondary control points situated in each 10 Km (8-12 km) spacing again in a secured campus as for primary grid.

- i) Best places for affixation: In protected areas like premises of government buildings including school buildings, veterinary hospitals, etc. and other protected structures, etc. The selected site should be open and clear to sky with a cut off angle of 15°. High-tension power lines, transformers, electric sub-stations, microwave towers, high-frequency dish antennas, radars, jammers, etc., which interfere with GPS signals, should be strictly avoided.
- ii) Densification: 10 km average
- iii) Instrument to be used: Dual-frequency DGPS receivers

- iv) Accuracy levels required: 1 cm as determined by the residuals of the network adjustment with 95% confidence interval. (Annexure-20)
- iv) GPS network design: Secondary control points should be observed with a geometrically sound network plan, connected to primary control points in triangle.
- v) Schedule of observations: Observations should be scheduled with proper mission planning, considering the optimum availability and geometric dilution of precision (GDoP) of satellites less than 3 (i.e., geometric strength of satellite configuration on GPS accuracy). Minimum observation time should be 4 hours.

All the secondary control points should be connected by spirit-levelled heights. The levelling lines for such connections should terminate at precision control points and all errors adjusted within them. Permissible error for levelling line: $0.025 \sqrt{k}$ (in meters), where k is the length of levelling line in km.

Criteria for Monumentation of Secondary Control Points are as follows:

- a) It should be light in weight.
- b) It should be easy to install.
- c) Material used should be fire resistant.
- d) It should stand for at least 50 years, if metal is proposed, it should be rust proof as well as difficult to uproot.
- e) Should have provision of engraving/punching the name of organization.
- f) Pillars/markers for sandy/swampy soil.

- g) Sleeve length for Secondary Control point survey marker would be 1 meter (100 Cm) in case of rocky/hard grounds where 1 meter hammering is not feasible 60 cm shaft may be used.

3.3.3. Tertiary Grid / Tertiary Control Points

Each at 5 km spacing and / or sehedra stone in of a village boundary is placed one tertiary control points.

- i) **Distribution:** The distribution and location of horizontal, vertical and full control points should be decided after preparing with the help of input images (i.e. as per the requirement of stereophotogrammetric).
- ii) **GCP selection criteria:** The selection of location for a control point will depend on the identification of the image point and the measurement characteristics of the image point. But, at the same time, they should also meet the horizon parameters (15° cut-off angle). Thus, the criteria for selection of such points should be:
 - a) GCP should be precisely identifiable on imagery as well as on the ground.
 - b) GCP should be a sharp point on image and ground.
 - c) The selected GCP shall be open and clear to the sky, without any obstruction to the sky.
- iii) **Post-pointing:** All tertiary control points should be post-pointed on imagery (i.e., the points should be identified on the image), preferably in softcopy. If post pointing on hardcopy is to be done, the control point should be post-

pointed at full resolution. In addition, a sketch magnifying the vicinity of control points and their detailed description should be prepared on the ground, to aid the photogrammetric operator.

- iv) Additional points: In addition, tertiary control points may be provided on structures like village boundary tri-junction or bi-junction, existing govt./non govt. buildings like gram Panchayat offices, school buildings, veterinary hospitals, etc., as per the field survey requirements.
- vi) Instrument: Single/Double-frequency GPS, Total Station
- vii) Accuracy levels required: 5 cm
- viii) GPS network design: Tertiary controls should be observed as triangular offsets. Single offset will not be allowed.
- ix) Schedule of observations: Observations should be carried out with proper mission planning. Minimum observation time should be 45 min to 1 hour.

3.3.4. Auxiliary Grid/ Auxiliary Control Points.

The Tertiary and Auxiliary Control Points (applicable to those villages for which ETS survey will be done) should be established on each and every scheda stone and one or two locations within village/ Mussavies boundary so that satellite image can be geo-referenced within required accuracy.

4. *Tendering Process.*

5.1. Eligibility of bidders.

- (A) **Technical Capacity:** The Bidder should have at least 5 (five) years of experience preceding the PDD, of undertaken assignments as specified.
Relevant documents are to be submitted as per TOR.
- (B) **Financial Capacity:** The Bidder shall have a minimum turnover of Rs.2.0 (two) crores from geo-spatial activity during the last 3 (three) financial years preceding the Proposal Due Date. For the purpose of evaluation, Bidders having comparatively larger revenues from geo-spatial works shall be given added weightage.
- (C) **Availability of Key Personnel:** The Bidder shall offer and make available all Key Personnel as mentioned.

The Evaluation Committee will open the Techno commercial Offers of qualified Vendors i.e. who will obtain minimum 60 marks in the technical evaluation, in the presence of the representatives of the Vendors who choose to attend, at the time, date and place, as decided by the HARSAC, Haryana . The Bidder will have to provide the mentioned details in provided format.

Technical proposal:

Technical Proposal will be evaluated on the basis of Bidder's experience, its understanding of TOR, proposed methodology

and Work Plan, and experience of Key Personnel. Only those Bidders whose Technical Proposals score 60 marks or more out of 100 shall qualify for further consideration, and shall be ranked from highest to the lowest on the basis of their technical score (TS).

The scoring criteria based upon the concept of Quality-cum-Cost Based Selection (QCBS) will be followed for evaluation. For this weightage as provided below shall be given:

Item Code	Parameter	Evaluation Criteria	Maximum marks
1	Relevant Experience of the Bidder	a) Implemented at least one project related to cadastral map digitization. (5) b) At least Three GIS Project related to digitization using scanned maps and High resolution satellite Image(HRSI) and implementation of project value not less than 50 lakhs (6) c) At least one project of spatial data integration (5) d) Overall experience and Credential of the firm: (10) i. Financial strength,	32

		<p>capacity of firm: (5) <2 crore=0, 1 marks for each 2 crore, maximum marks 5.</p> <p>ii. Turnover from Software Development Services, (3). 1 mark for each 1 crore with a maximum marks of 3.</p> <p>iii. Year of Experience in MIS/GIS: (2) 1 marks for each 2 years, with maximum marks of 2.</p> <p>e) Cadastral experience of Haryana/ Punjab/ Delhi/ Western U.P. (un-divided) : (6)</p>	
2	Approach & Methodology:	<p>a) Clear understanding of scope of services (15), including their interpretation.</p> <p>b) Team organization and scheduling : Team and its Optimization work plan to meet an efficient activity scheduling (10)</p>	25
3	Key Personnel	a) Experience and	10

	(minimum 50 GIS and CAD personal are required)	<p>competence of the Key staff for the assignment</p> <p>b) Experience, competence and hands-on experience of the Team Leader in execution and co-ordination of such projects.</p> <p>c) Profile and Experience of Key Staff in man years on similar MIS/GIS projects</p> <p>d) Extent of on-site commitment/ engagement of the key staff for the project</p> <p>Senior Cadastral Scientist/Engineer -cum-Team leader(4), Software Engineer(4) Revenue officer, Surveyor, Documentation officer(2)</p>	
4	Evaluation Committee observation	<p>a) Demonstration / presentation of the pilot village related to desired accuracy as per the scope of this project (20)</p> <p>[Fathehabad district is selected as pilot district for</p>	33

		trial basis] b) Presentation of capabilities of the organization and implementation plan for this project(5) c) Corporate Social Responsibility(CSR) performances	
		G total	100

For financial evaluation, the total cost indicated in the Financial Proposal will be considered. The Authority will determine whether the Financial Proposals are complete, unqualified and unconditional. The cost indicated in the Financial Proposal shall be deemed as final and reflecting the total cost of services. Omissions, if any, in costing any item shall not entitle the firm to be compensated and the liability to fulfil its obligations as per the ToR within the total quoted price shall be that of the Consultant.

The lowest Financial Proposal (FM) will be given a financial score (SF) of 100 points. The financial scores of other proposals will be computed as follows:

$$SF = 100 \times FM/F \text{ (F = amount of Financial Proposal)}$$

Combined and final evaluation:

Proposals will finally be ranked according to their combined technical (ST) and financial (SF) scores as follows:

$$S = ST \times Tw + SF \times Fw$$

Where S is the combined score, and Tw and Fw are weights assigned to Technical Proposal and Financial Proposal that shall be 0.70 and 0.30, respectively.

Award of Contract:

The contract will be awarded to the Vendor whose Techno-Commercial offer will be the lowest and will be ranked as R1. The award of contract would be decided on the basis of Weighted Score (70%) for the normalized score as per the marks awarded by Evaluation Committee for the Technical Offer and Weighted Score (30%) for the normalized score as per the financial bids. After evaluation of all accepted proposals by the evaluation committee, the contract may be awarded to the four top ranked bidders in order of merit.

Keeping in view the time limitation of NLRMP, four vendors will be selected for award of work. The vendors will be ranked R1, R2, R3 and R4 etc. based upon the combined score of technical and financial weightage described above. The work will be allotted to four vendors in order of merit of the combined score.

However, all the selected vendors will be bound to work at the lowest rates quoted by any one of the four selected vendors (R1, R2, R3 and R4) in its financial bid. All the four vendors (R1,

R2, R3 and R4) have to submit their written acceptance for the above to qualify for award of the work in a distributed manner as indicated in the example.

For example, if the work is allotted to four vendors R1, R2, R3 and R4, and the rates of R3 are the lowest in its financial bid, the rest of three R1, R2 and R4 will be bound to work at the rates quoted by R3. The work among four vendors will be divided by the Evaluation Committee based upon geographical location, topographical conditions and volume of work.

4.2 Financial:

S. No. K- Key Events	Event	Completion Date	Payment % of total contract value
K 1	System study and design(SDD)(Including Hardware requirement, System software requirement, Design of security ,Architecture, Data Migration Strategy and Data backup strategy	T+4 WEEKS	NIL

K2	<p>1. Digitization of Cadastral maps and integration of textual and Spatial data</p> <p>2. Survey/resurvey and updation of the survey & settlement records (including ground control network and ground truthing) using the modern Technology.</p> <p>3. Document Management(Virtual Modern record room/ land record management center at Tehsil/taluk/circle/block)</p> <p>4. Training of Technical Field Staff at each Tehsil and AMC</p>	T+28 weeks	20% (As per the break up mentioned in the event)
K3	Verification & Final User Acceptance Test of Project	T + 32 Weeks	15 %
K4	Handholding/ Customization (Comprehensive training of employees on packages development)	T+ 36 WEEKS	20%

K5	Handling over of all the documents and manuals for packages development	T+ 36 WEEKS	
K6	Commissioning of Project (including mosaicing)	T + 38 weeks	25 %
K7	Annual Maintenance of project and operational support for two years AMC	K6 + 3 years	20% against Performance Bank Guarantee (PBG) of 20% of total contract value for a period of 2 years

*T = Date of signing SLA with vendors

*K- = Key EVENTS

4.3. Penalty Clause:

Vendors are supposed to achieve the milestones in the specified time frame. Nonadherence to the specified time frame will attract penalty @1% of Gross Bid value per week maximum to 15% of the contract value of the work in the form of forfeiture

of the amount of Bank Guarantee or Demand Draft duly deposited.

Subsequent changes recommended by Government of Haryana during implementation and maintenance phase and after development phase AMC will attract penalty @0.5% per week. Penalty shall also imposed as follows for inaccuracy/ errors detected during checking of work:

S. No	Numbers of errors (in each Map/Record)	Penalty (in % of the built amount of that map data)
1	Less than 15	No Penalty
2	15 – 25	5 %
3	25 -35	8 %
4	35 – 50	10 %
5	>50	15 %

5. *Impact on Citizens:*

Land is a recognition and identity for a person in rural social set-ups. The relationship between human being and land is time immemorial. Land is one’s real identity on societal as well as economic level. Land is also authenticated and recognized as a big asset. Ownership of land even raises the social status. Sometimes it is also helpful in establishing the social relation such as marriages in rural India. But this traditional relationship

has not got transparency on the verge of legal authority though it is inevitable and cannot be undermined.

HARSAC has pioneered an innovative strategy viz. 'Land Record Modernization Project' in Haryana since 2009. With the collaboration of ISRO, India HARSAC is doing digitization of maps, integration of textual and spatial data collection of lands using satellite based technology. Through this, exact boundaries of lands can be defined which was earlier not very clear. In earlier times lots of discrepancies and overlapping of lands in terms of demarking the exact land boundaries were seen.

Moreover, the exact demarcation of the boundaries of land is being helpful in building trust amongst the people. They are more sanguine and confident about the ownership of their defined land. Undoubtedly, this effort will come up with boasting and encouraging results which has started giving its initial signs. Some of the likely socioeconomic impact of the land record modernization project is being discussed underneath though re-surveying of land will have manifold tangible impacts in the long run.

1. Land dispute settlement:

As of now, Indian courts have mostly witnessed the cases of land dispute. Some of them remained pending and unsolved for so long a time that chasing it even pushes the owner into debt. At the meantime, it also puts a lot of untoward pressure on government's revenue including spoilage of long

working hours of judiciary. Some of the results of re-surveying have been proven mile stone in dispute settlement amongst rural people in general and farmers in particular. For instance- the identification of scattered land and its real owner have cleared doubts and misunderstanding of co-villagers. Only after that, consolidation of scattered land through mutual swapping has been possible, followed by updating of settlement data after re-surveys and new data has been digitized for future records and avoiding any dispute later. The extensive ongoing spatial survey is expected to come out with more such results at other places as well.

2. Promoting transparency mechanism:

Jalsa e Aam (open village meeting) is commonly called for the announcement of results of special surveys openly in the presence of all villagers. This village's meetings are uniquely designed with the display of machines which have been used for the re-surveying. This transparent forum inculcates trust and shed away doubts from the people's mind regarding their true possession.

3. Agricultural loans and associated benefits:

Once the legal entitlement of land is defined, banks perceive farmers as more trustworthy customers. On the other hand, with the consolidated and extended lands, farmers will be in better position to repay the loans assuring land as collateral.

Additionally, the consolidation will directly promote agriculture as a livelihood on extended land of a single owner. The farmers will have better earnings that in turn raise his/her social status as well. Not only that, the better economic position also raises the social indicators such as education and health in one's family.

4. Compensation:

Demarcation of land is also remarkable in getting compensation out of it. When, the land is acquired by the government for the purposes e.g. roads, bridges, highways, buildings, factories etc. it is easier to pay compensation on the basis of entitlements. Besides, it also eases the process of buying and selling even when it comes to dealing with private parties for their business work.

Last but not the least, the demarcation of exact boundaries of land ownership is essentially required. It is not only for business purposes but also to upgrade socio economic status in rural set-ups. In India, land has been considered as integral assets for a family. It's legal entitlements give strength and confidence to the poor masses. They have been marginalized and excluded even from cultivating their own lands sometimes in the feudal structure of the society. The efforts of HARSAC in the form of 'Land Record Modernization Project' in Haryana will be envisaged as a boom in land mapping. It is assumed that the model will be replicated and scaled up in other parts of the country as well.

6. Appendix 1 – Work Responsibilities

Work	Responsibility
Signing of Service Level Agreement (SLA)	HARSAC/DLR /All Vendors
Preparation of System Design Document (SDD)- First meeting	HARSAC/DLR /All Vendors
Preparation of SDD-Second meeting	HARSAC/DLR /All Vendors
Preparation of Common SDD including Document Management System (DMS) specifications: 3rd meeting	HARSAC/DLR /All Vendors
Formal approval of SDD from concerned Authorities	HARSAC/DLR
Request for supply of information on no. of mussavies/parcels/ shehda stones/ number of documents/areas for survey/resurvey etc	HARSAC
End to End POC on one village each	All vendors
Supply of information from respective DC/DROs	DLR/DC/DO
Establishment of Project office at Patwari Training Centre (PTC) Hisar by each Vendor	DLR/DC/DO
Deployment of Operational Resources by each vendor as per project requirement at PTC	Vendor
Deployment of Operational Resources as per requirement at District level (DC will provide appropriate working space)	Vendor/DC
Installation of security system	HARSAC/VE NDOR
Issuing of Identity Cards to vendors	HARSAC

Mussavic Collection, Indexing and Updation	
Collection of Mussavies	DRO/Vendor
Indexing and codification of Mussavies, including listing of missing/ damaged mussavies	Vendor
Scanning of mussavies	Vendor
Creation and digitization of the missing/ damaged musavies from field book/ revenue record	Vendor/dro
Digitization of mussavies	Vendor
Printing of original musavi sheets on 75 micron polyseter matt film on 1:1 scale and submission to DRO for verification	Vendor/dro
Colour printing and submission of original Digitized Mussavies to DRO and updation by respective Patwaries	Vendor
Survey/ Resurvey by ETS	
Request for supply of areas for survey/Resurvey	HARSAC
Supply of information for survey/ resurvey Areas	Dc
Survey and Resurvey of required areas	Vendor
Quality Assurance/ Quality Checking (QA/QC)-1 for above activities	HARSAC
Updation in digital data as per updation done by DRO	Vendor
Updation in digital mussavies as per updation by Patwaries/DRO	Vendor
Random quality checking of updated mussavies by HARSAC	HARSAC
Incorporation of recommendations of HARSAC in digital mussavies by vendor till final acceptance by HARSAC	Vendor/HARSAC
Generation of table of parcels (in excel sheet) for	Vendor

each village from the updated digitized musavies	
Comparison of the total area of the village by aggregating the parcels etc. vis-à-vis the area available with the DLR in the RoRs	Vendor/HARSAC
DGPS survey	
Procurement of SOI- GCPs by HARSAC	HARSAC
Primary monumentation	Ramtech
Primary and secondary control Survey & marker installation for secondary points	Ramtech
Tertiary control survey & marker Installation	Vendor
Auxiliary control survey by DGPS for use in ETS survey	Vendor
Satellite data preparation/processing	
Acquisition and Procurement of Satellite data (World View 0.5 mtr resolution)	Nrsc/HARSAC
Collection of Satellite Data from HARSAC	Vendor
· Satellite Triangulation	Vendor
· Digital Elevation Model generation	Vendor
Orthorectification	Vendor
QA-QC 2 - OrthoRectified Image	
Validation of ortho rectified image by HARSAC	HARSAC
Geo referencing of cadastral map using Satellite image	Vendor
Collection of GCPs and Transformation	Vendor
Ground truthing of the encroachments, as depicted/ interpreted from satellite image	Vendor
QA/QC-3 for above activities	HARSAC
Mosaic generation of digitized	Vendor

cadastral data	
Edge matching of all features, parcels and admn boundaries upto district level	Vendor
Edge matching of all the districts	All vendor
Evaluation of digital cadastral data after edge matching	Vendor/dlr/HA RSAC
Resolution of boundary mismatches during mosaicing at village/ tehsil/ district level	Dlr
QA/QC-4 for above activities	
Integration of Spatial data with RoR	
Supply of two set of database (georeferenced and Cartesian database) to HARSAC in soft copy	Vendor
Training to vendors on BhuNaksha operation and Geo Linking of BhuNaksh with HALRIS by NIC at Ambala	Dlr/nic
Geo-Linking of Spatial data with ROR data through Bhunaksha Software and generate a gap analysis report with reference to ROR.	Vendor
Hard Copy Print of the updated Sajara (prepared from digitized muusavies) for verification and acceptance	Vendor/dc
Final field verification by various officers as per guidelines and acceptance of data	Patwari/ Kanunga/ Tehsi ldar/ RO/SDM/ DC
Printing of Mosaiced tehsil and district maps on A0 size paper	Vendor
Printing of each final mussavi sheet on 75 micron polyester matt film (3 copies) on 1:1 scale	Vendor
Operationalization of integrated RoR services on	Dlr/vendor

geo-linked completed village by revenue officials (DRO/Tehsildar)	
DMS Related Activities	
Finalization of coding scheme, meta data and format of DMS	Ramtech
Inventory and scanning of Existing Records (DMS) by respective vendor	Vendor
Development and Supply of DMS s/w by Ramtech to HARSAC	Ramtech
Testing of DMS Application by Core Technical Team (CTT)	Vendor/HARSAC
Printing of Scanned DMS Records as final Deliverables	Vendor
Validation of scanned and printed Records by HARSAC	HARSAC
Trainer's training on DMS application by Ramtech to other vendors	Ramtech
Installation of DMS application at Tehsil Level	Ramtech
Entering of Metadata of Scanned Documents into DMS and Porting / uploading of scanned documents on DMS application by all vendors	All vendors
Training of trainers and operational staff of revenue department on usage, operations and maintenance of digital data, including documents and user manuals.	Vendor
Final all database integration, including Spatial, RoR and DMS	Vendor
Annual Maintenance Contract (AMC)	Vendor
Final District capacity building schedule	vendor

Digitization of Cadastral Maps and its Integration with textural data in West Bengal

A. History of Computerization of Land Records in West Bengal

Land Records system was started more than a century ago in our country with the aim for a better land management and prosperity. Computerization of land records in West Bengal was conceived in 1986 as a State Government Project. The computer technology facility was inaugurated on 18 August 1951 at the Indian Institute of Technology, Kharagpur in West Bengal and in 1955 computerization started in Indian Statistical Institute, in Kolkata West Bengal. After the successful implementation of Computerization, Govt. of West Bengal decided to go for Computerization of land records in all the districts.

In 1990-91, a pilot project on Computerization of Land Records (CLR) was approved by the Ministry of Rural Development, Government of India in Burdwan district which was successfully completed. Later in 1993-94 the scheme was extended to the districts of Hugli, Nadia and Jalpaiguri. In 1995-96 it was extended for eight more districts of Darjeeling, Malda, Birbhum, Bankura, Mednipur, Tamaluk, South 24 Parganas and North 24 Parganas and further in 1996-97 the scheme of computerization of land records was started in all the remaining districts.

West Bengal has a good record in preventing tenant farmers and their cadastral records which are updated regularly through frequent surveys. The programs such as the Computerization of Land Records and Strengthening Revenue Administration and Updating of Land Records (SRA & ULR) are merged to pave way for the National Land Record Modernization Program (NLRMP). In addition, the NLRMP focuses on the computerization of registration process. The departments of Revenue and the Registration are now interconnected with the launch of NLRMP. The state has rejuvenated its work i.e. updating of land database; the best example for their work is creation of Bhumi software, now known as Bhuchitra. As the name implies this software accumulates both Spatial (Mouza maps/plot maps) and non-spatial data (RoRs database). The extended work has been accumulating in the entire state and the work is still to be completed. Seeing the quantity of data, modern techniques of updating cadastral system need to be adopted.

Initially Database used MS-DOS as the Operating System. The main problem faced at that time was in keeping the data in Bengali script. A third party hardware called GIST CARD (developed by CDAC, Pune) was therefore used. The computerization of land records was done to provide safe storage and generation of reports; accordingly data entry of 3.92 crore (approx.) number of records had been completed by 1998. In the year 2000 operations were shifted to WINDOWS platform with Visual Basic 6.0 as frontend tool and SQL Server as RDBMS. GIST SDK has been used for regional language

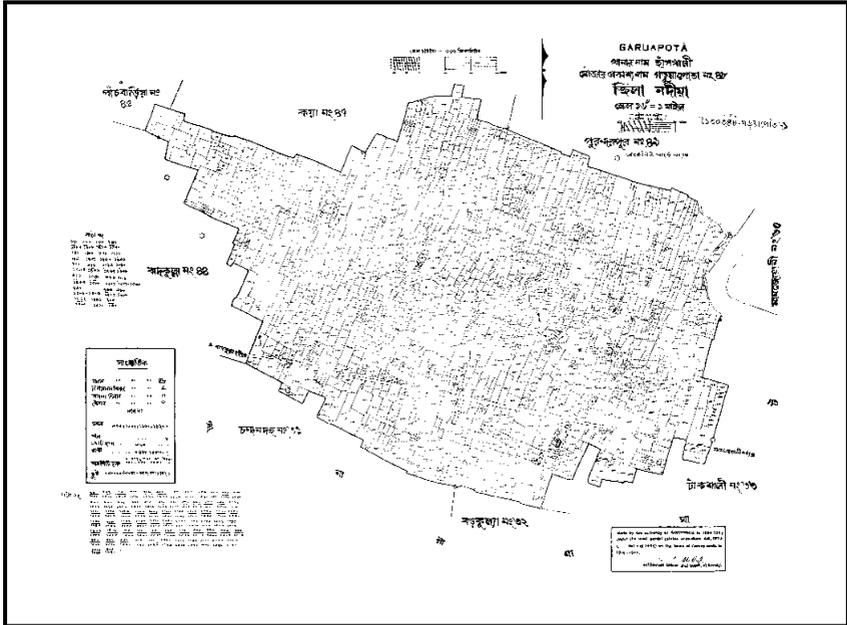
support and interactive reports had been developed with CRYSTAL REPORT. Robust software was developed keeping in mind all functions performed in the Block Land & Land Reforms Offices (BL & LRO) so that all the activities can be done through computer eliminating any manual handling of paper records.

Operationalization of this scheme had been done in all the 341 blocks, 65 sub-divisions and 18 districts with 5 service locations in the State. Intensive training of officers and staff are being regularly conducted at Analysis, Research & Training Institute located at Salboni of Paschim Medinipur district and Land Management Training Institute located at Berhampore of Murshidabad district. Manual issuance of certified copy of khatians has been discontinued by issuance of a Gazette notification and computerized land records have been accorded legal sanctity as per sec. 50(2) of the WBLR (Amendment) Act, 2000.

B. Digitization of cadastral maps in West Bengal

A cadastral map in West Bengal reflects the boundaries of land parcels. Cadastral maps also feature additional details, like district, P.S. & mouza names with J.L.(Jurisdiction List) numbers, unique identifying number for each parcels, certificate of authority, legends, positions of existing structures (in-situ & alamaths), adjacent mouza names, selected boundary dimensions and references to prior maps. Directorate of land Records and surveys, Govt. of West Bengal is responsible for

cadastral mapping in the state showing land parcels boundary on large scale maps. All surveys regarding cadastral have been conducted by the Directorate.



Cadastral Surveys have been conducted by conventional methods but the Directorate didn't lag behind to adopt the latest state of art technologies in surveying like Electronic Total Stations, Global Positioning System, Aerial Photography, Remote Sensing etc. Due to the advancement of survey technologies, digitization of cadastral maps gained momentum from 2007 onward where work was outsourced and required technical support was provided by NIC, West Bengal. Alamaths,

line and polygon features have been checked properly in manual mode as well as digitized map through Map Management System Software. The database was then incorporated to the SQL Server. Scheme of digitization of maps was initially approved and funded by the State Govt. in 2007-08 and later on by the Govt. of India. Out of total 68328 map sheets in West Bengal covering 42042 mouzas, 60665 map sheets have been digitized.

In West Bengal digitization cost incurred for each map sheet is



Fig-2. Conditions of Block Map in Birbhum

lowest in the country (only Rs. 750/- per sheet). Mouza (Revenue village) map sheets containing 1000/1200 plots are on 120 GSM paper (paper dimensions are A0 size = 84 cm X 119 cm / A1

size = 84 cm X 59 cm). 68,328 map sheets are mostly in the scale of 1:3960 and the rest are in bigger scale of either 1:1980 or 1:990. A few maps are also in 1:600 (Howrah Town Survey) & 1:495 (in Asansole) scale. The hard copy of Cadastral maps is in very poor condition, hence the Directorate and the initiative taken by NIC, West Bengal to digitize all the old maps and preserve it for betterment of land administration.

Maps should be scanned in true scale of the map, vectorized and converted into shape file format (.shp, .shx, .dbf) [item 2 & 3 above], .gif formats [item 1, 4, 5 & 6] along with the data in .dbf format [item 5] as detailed in the scope and methodology of the work.

B.1. Methodology follows for preparing Maps

West Bengal is pioneer in creation of web based application for land database management. Digitization of Cadastral maps is done by the use of AutoCAD software by the competitive vendors under the direct supervisions of technical persons from NIC and Directorate. Methodology is as follows;

1. Establishment of ground control points with the help of theodolite to prepare a skeleton plan of each village with reference to primary control points (GTS).
2. Detailed survey with the help of Gunter's chain (66 ft long) and optical square maintaining the fundamental principle of survey, i.e., surveying from whole to the part and with an accuracy of 1:200.
3. In course of detailed survey barring chain survey sometimes plane table survey was conducted in case of obstacles.
4. Plot boundaries owned by individual tenants of various classification of land of the revenue village are plotted on the basis of measurement with the help of chain survey & plane table survey where required.

5. Distance and planimetric area of land are extracted from the map itself, as no dimensions of the plots are mentioned on the cadastral maps. Each map has a definite scale on which map was prepared.
6. Quality of every map so prepared by the surveyors is checked by the departmental supervising officers.
7. The maps so prepared reflect the true features of the field.
8. The unit of survey for cadastral mapping and preparation of land records in W.B. is a mouza (a revenue village).

B.2. Cadastral Maps Digitization Process

Directorate of Land Records and Surveys, West Bengal described the process flow used for Cadastral Maps Digitization by scanning from the source maps;

1. Vectorization of scanned map with AutoCAD Map 2000i
2. Using of the glass table method digitization works (digitized maps) have been checked with the hard copy.
3. garbage cleaning in the raster data
4. topology building
5. Softcopy checking with the help of Map management System software made by the NIC
6. Composition of checked map
7. Integration on regional Script as level.
8. Final printout of Composed Maps
9. Updating of the digitized map
10. Then the entire database is ported into a secured database, MS-SQL Server.

The raster data may be converted to vector data using a raster to vector converting software. This

Software works in three distinct methods as mentioned below: -

1. Full Automatic Method
2. Semi Automatic Method
3. Completely Manual Method

Digitized map in West Bengal is kept in the following three layers;

Point layer – Alamaths to be represented by a point (like tri-junction pillars etc.), plot centroid, text & .gif files [like name.gif (mouza name), sign.gif (signature of the Settlement Officer), lege.gif (map legend) etc.]

Line layer – Alamaths to be represented by a line (like forest boundary etc.)

Area layer - Plot boundary & Mouza boundary

The land parcels are not usually isolated, hence knowledge of the adjacent boundary is mandatory and this is why topology building is necessary. This is done by treating each intersecting point as a node. Overshoot, undershoot, and duplicate lines are the major problems and which are to be eliminated during the process of Topology building. The overshooting dangling lines are deleted and the undershooting dangling lines are extended to their nearest node. While digitizing the scale factors are to be maintained accurately, so that output should be in ground scale (1:1).

Details of File generated after Digitization:

<i>File Name</i>	<i>Contents</i>
Centroid.shp	Co-ordinate of plot nos., rendered plot nos.
Almp.shp	Code of the <i>alamat</i> on point layer
Alml.shp	Code of the <i>alamat</i> on line layer
Scale.shp	Map Scale
Bnd.shp	Sheet boundary
Mbnd.shp	Mouza boundary
Img.shp	Co-ordinates of mouza name, <i>bata</i> plot list, legend, signature of the Settlement Officer
Text.shp	Co-ordinates & Text of surrounding mouza names etc.
Jl.shp	Area of the plots etc.
Alm_bata.dbf	Database of Mouza code, Sheet No., Map Type (RS / LR), reference plot no. against which there is <i>bata</i> plot, <i>alamat</i> code
First_last.dbf	Database of first and last plot no. of the map sheet
Missp.dbf	Database of missing plots in the map sheet
Name.gif	Mouza details
Lege.gif	Details of map legend
Bata.gif	List of the <i>bata</i> plots
Sign.gif	Signature of the Settlement Officer

All the Maps related information is stored in different file format, which are useful in future also. The digitized maps is being checked by the officials manually or by light-table

method, for the betterment of the digitized maps checking process before final print, NIC developed one online solution Map Management System Software which can easily detect the flaws of the digitized maps.

B.3. Scanning and Dimensional Accuracy Followed during Digitization

For cadastral maps, the scanning has been done at 400 dpi. For maps which have some dimensional deformation, special methodology is adopted before scanning. Before the digitization process starts some sort of raster editing is done for unwanted patches in the scanned maps, so that the digitization will happen smoothly. Dimensional accuracy of the raster data means the one to one relationship between the raster file and the original data. The following procedures are used to achieve dimensional accuracy.

1. Checking for expansion.
2. Checking for contraction.
3. Checking for translation.
4. Checking for rotation.

Digitized Raster data may appear to be expanded or skewed as compared to the original map, which may affect the vector data and the digitization process. The checking for expansion and contraction is based on the property that 'area is invariant'. After the digitization process ends, the area is rectified by using the

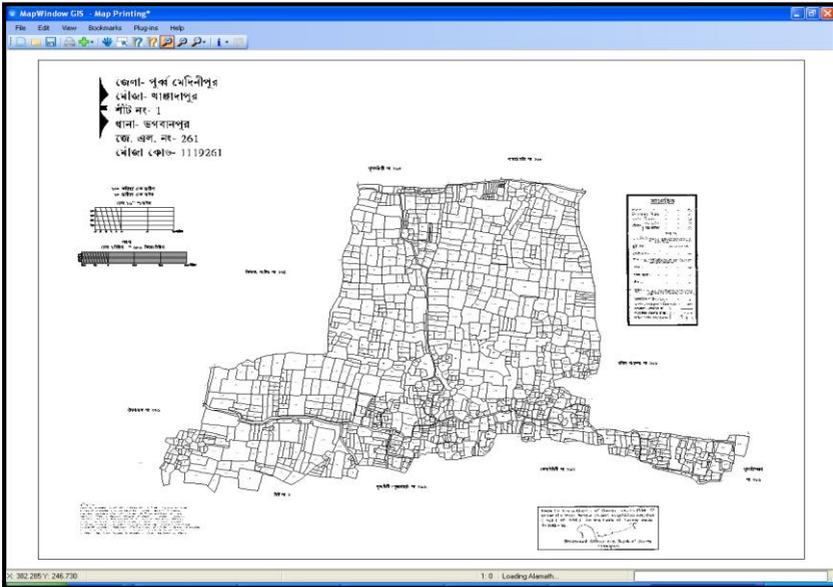
Jurisdiction List (JL) in which the total mouza area is defined and actual area of owners is also being defined. These two are compared with the digitized maps to check for the expansion or contraction of the map. Translation and rotational error may occur during the scanning process. A calibrated plotter HP 1050C or higher is used to plot a map from the vector data. This map is then compared with the original map to find a one to one correspondence between the lines of the two maps. Any mismatch between the two reveals the existence of the above mentioned errors. Flat-bed scanner/roller type scanner as per requirement should be used as per the condition of the original map. For maps that are skewed or squeezed flat bed scanner shall be most suitable.

Report of Digitization of LR Maps District wise

<i>Sl. No.</i>	<i>District</i>	<i>Total Mouza</i>	<i>Total Sheet</i>	<i>Sheet Digitized As of 25-02-2013</i>	<i>Sheet digitized As on 25-02-13 (in percent)</i>
1	Bankura	3847	5776	5462	94.56
2	Bardhaman	2826	5754	5199	90.35
3	Birbhum	2493	3809	3733	98.00
4	Darjeeling	615	1504	132	8.78
5	Howrah	836	1552	1045	67.33
6	Hooghly	1999	3241	2436	75.16
7	Jalpaiguri	743	2649	2276	85.92
8	Kochbihar	1170	2423	2360	97.40
9	Malda	1814	3133	NA	NA
10	Paschim Medinipur	8820	10242	9166	89.49
11	Purba Medinipur	3199	3960	3810	96.21
12	Murshidabad	2290	4298	4037	93.93
13	Nadia	1406	2899	2687	92.69
14	Purulia	2700	4078	2905	71.24
15	North 24 Parganas	1829	3824	2850	74.53
16	South 24 Parganas	2293	4793	3854	80.41
17	Dakshin Dinajpur	1646	1986	1982	99.80
18	Uttar Dinajpur	1516	2407	2295	95.35
	Total	42042	68328	59416	86.96

Table-1. Directorate of Land Records and Surveys, West

Fig-3. Digitized Mouza Maps on the System



In this figure, this Mouza map contains a large number of plot, boundary of parcels, text, alamaths and so many other information. This digitized map enables editing in future whenever up-dation is needed.

C. Integration with Textural Data or Non-Spatial Data

The state of West Bengal integrates all the non spatial information or textural data with the digitized cadastral maps. After the completion of digitization process the integration of textural data and cadastral maps takes place. W.B is the first state to start the process of integration of spatial and text data. This spatial data is then integrated with the text data based on primary key-foreign key relationship. Based on a 7-digit mouza

Identification number consisting of district, block & mouza code both spatial data & text data are related.

The integration of Spatial and non spatial data benefits the entire state land administration. Like,

1. Providing certified copy to the public in A-4 size paper instead of the whole mouza map.
2. To study various aspects of R-O-R and map data like extraction of plot area, area under barga cultivation, govt. lands, agricultural land, water bodies, etc.
3. Useful in rectifying the discrepancy that may exist for a particular plot area between the RoR and map by ground truthing.

Fig-4. MODEL of Integration of Spatial with textural database

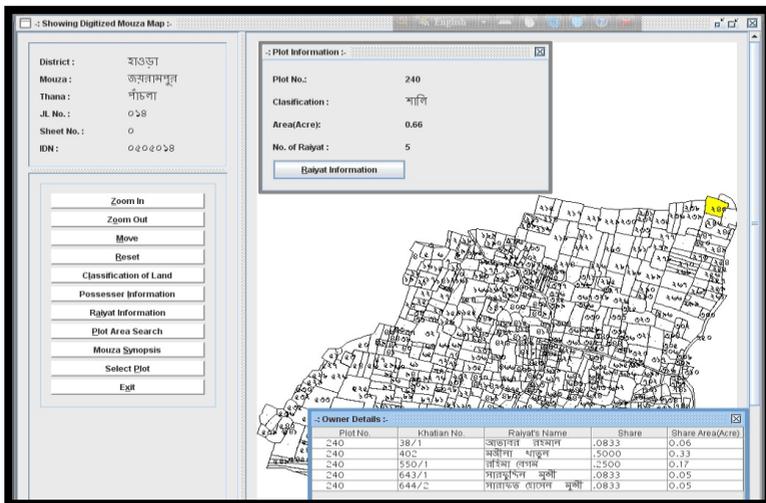
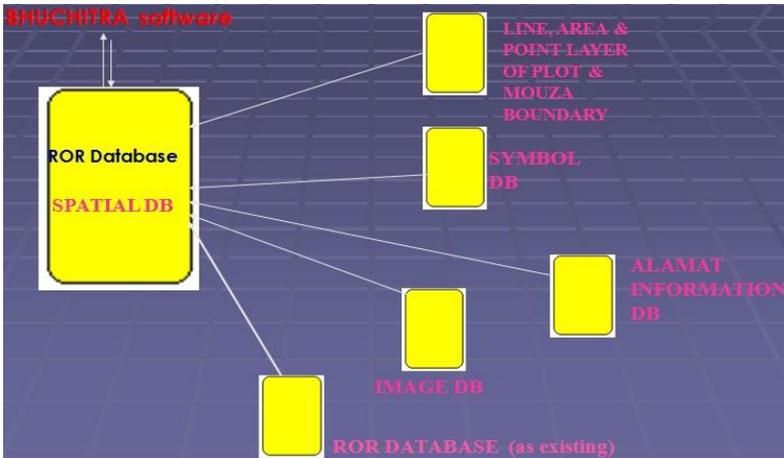


Fig-5. Integration of Maps with textural database on system



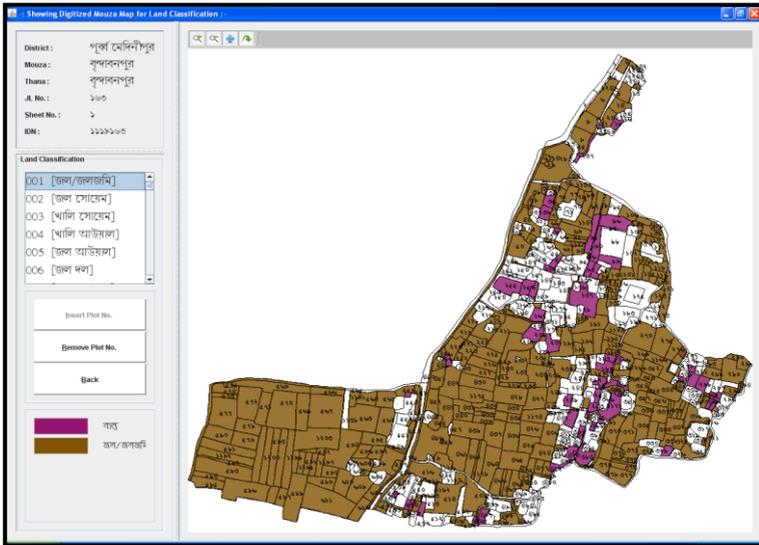
In this respective figure, Integration of Spatial data (digitized plot maps) with textural data, like plot information, land classification, khatiyani number, land owner and all other information have been attached. Attachment is shown on window after clicking any plot the information may also open in the same window which proves the authenticity of integration.

Plots are digitized as a closed polygon in the Digital maps. Every polygon is defined by a unique 5 digits, which depicts the plot number. This unique plot numbers are used for integration of digitized maps and RoR databases. RoR database consists of several tables which stored the information like ownership, land classification etc. Database are connected with two common fields, those are IDN: a seven digit code to identify a Mouza (2 digit for District, 2 digit from

Block & 3 digits for the Mouza) Plot no: a five digit Plot number. RoR database is added with the tables which contains map information to create an extended RoR database. Integration of Spatial and textural data integrates very easily by the means of “BHUCHITRA”, by which it provides the flexibility to manipulate text and map data without any constrains and provides various improved citizen services and generate MIS report. Some of them are given as follows.

- 1) Providing Plot map (parcel map), showing dimensions of each side & area with the ROR.
- 2) Generating various derivative maps based on possessions, classifications, legal sections applicable, Size of the plot etc.
- 3) Analytical reports on area in the ROR with respect to the digital map to help in data correction, both texts as well as map.
- 4) ROR updation is integrated with its map updation.

Fig-6. Digitized map showing land parcels having specific classification



Map Management System

Map Management System Software has been developed by NIC, West Bengal and it has immense utility for checking and rectifying all the digitized maps before up loading into the server. This software is mainly for keeping track of 67,436 Mouza map sheets being vectorized by engaging vendors and viewing and composing the digitized maps easily as per requirement. This software will ensure data Integrity, accuracy and timeliness in Land Records Information Processing. It will also reduce anomalies within data. Possibility of queries on any range date is possible and it can generate report whenever required.

Map Handover to Vendor : Directorate of Land Records & Surveys

Map Handover to Vendor

Vendor Name :

Date of Handing Over : [dd/mm/yyyy] Estimated Date of Return of Map : [dd/mm/yyyy]

Map Information

Mouza Code.: <input type="text" value="1002025"/>	District : বেদীপুর
Sheet No.: <input type="text"/>	Block : গোপীকলাতপুর-১
Scale of the Map : <input type="text" value="16"/>	Mouza Name : চুমাগেডা
Type of Map : <input checked="" type="radio"/> LR <input type="radio"/> RS	Police Station : গোপীকলাতপুর
Gate pass No.: <input type="text" value="072"/>	J.L.No. : ০২৫
Total No. of Maps Given :	

Fig-7. Vendor name, date of handover ,estimated date of delivering softcopy and hardcopy of maps, mouza code, sheet number will be recorded here

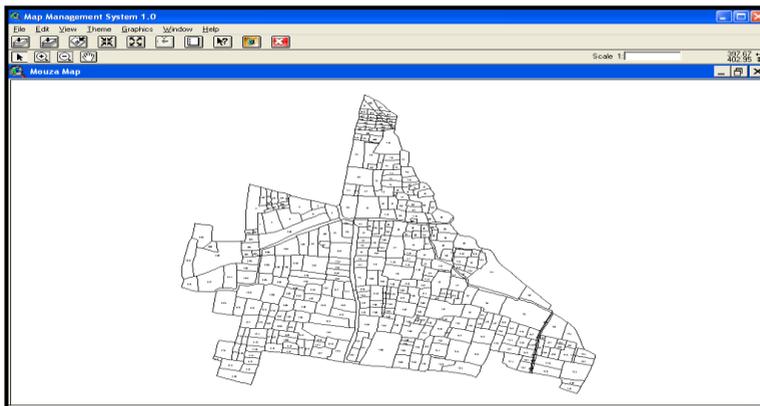


Fig-8. Area checking will start after clicking on the Check button on the toolbar.

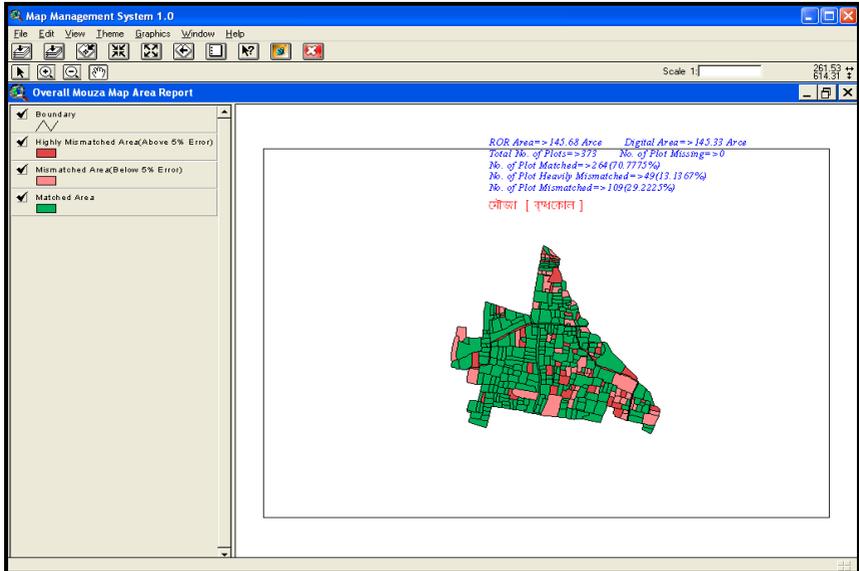


Fig-9. It will verify the digital area (automatically calculated from the digital maps) with the ROR data stored in database.

Map Management System workflow:

1. The mother copies of which maps are returned by the vendors will be recorded by the Map Management System software.
2. Digitized maps received from the vendors will be recorded by the Map Management System software. Maps are not yet received are also being shown.
3. Checking of the softcopy & hardcopy receiving details.
4. The digitization done by the vendors newly digitized or previously also ensured by the system software.

5. Contents of the CD given by the vendors will be checked.
6. The selected shape files will be transferred to database.
7. Digitized map areas can be checked.
8. Select Mouza maps for composing the digital maps.
9. After composing the final Layout will open which will provide you 100% accuracy compared to the original map.
10. One can create the PDF copy of the composed digitized map after composing it and save it in the database.

D. “BHUCHITRA” - The Land Information System in West Bengal

Land Information System started in West Bengal from 1990 with active involvement of NIC, West Bengal. NIC developed the software, named BHUMI in 1989 and after integration of map data BHUCHITRA succeeds BHUMI. All the 36.70 million RORs are digitally available thereby creating a data base of 37 GB. Digital ROR maintained at 341 Blocks. Now they are migrating from Client Server to web application. There are four interfaces that comprise BHUCHITRA. Those are:

- A. Administrative Interface; This interface deals with creation of users with different functional responsibilities, maintenance of various code database like District, Block, Mouza (Revenue village), Classification of Land, Tenant Types and Possessor Details.
- B. Data Preparation Interface; All RoR entries with the corresponding plots along with possessor details (if any), checklist generation and subsequent task of correcting the data to make it 100% correct.

- C. Citizen Service; Certified Copy, Plot Information, (RS - LR) plot information and copy of digitized map are provided to the citizen on demand.
- D. Updation / Maintenance of data through case records; Citizen centric services like Mutation, Conversion, Barga Enrollment, Vesting, Di-vesting, Pattadar & Homestead Beneficiary enrollment and Legal Heir enrollment are managed from this interface. Standard useful reports are also generated here.
- E. Map Information

D.1. Highlights of BHUCHITRA:

- Application will be log-in based
- Record correction based on request received: Manually in BLLRO Office, from registration office. From Web site (<http://banglarbhumi.gov.in/>) / CSC.
- Role Based access control
- Continuous Map correction on Record correction / Conversion
- Area of Plot to be measured in different units (e.g., Sq. Ft in addition to Acre/Dec.)
- Delivery of Mouza Map on payment
- Delivery of Record (ROR) on payment
- Plot map delivery
- Plot map for Registration office
- Search facility for citizen
- Extensive audit trail facility for record corrections

- Dynamics of changes of record should be viewable (history of changes)
- Land Bank with query facility
- Status of Case application/petition
- Comprehensive Management Dashboard
- Reports: Mouza based, Block based, District based, State based
- Integration of ADHAR No.
- It provides user interface in Bengali scripts and accepts data in Bengali.
- No need to remember codes. With domain knowledge system can be used with few hours of training.
- Bulk Data preparation work has been well taken care of.
- Live ROR data can be kept in full security.
- On line mutation keeps data being up-to-date with no extra effort
- Comprehensive users' request for services incorporated
- Fingerprint authentication introduced
- Generation of standard analytical reports
- Touch Screen based reporting incorporated

The environment is used for- WINDOWS 2000/2003 Server, MS SQL Server 2000/2005m, WINDOWS XP Client.

Fig-8. System Outline of BHUCHITRA

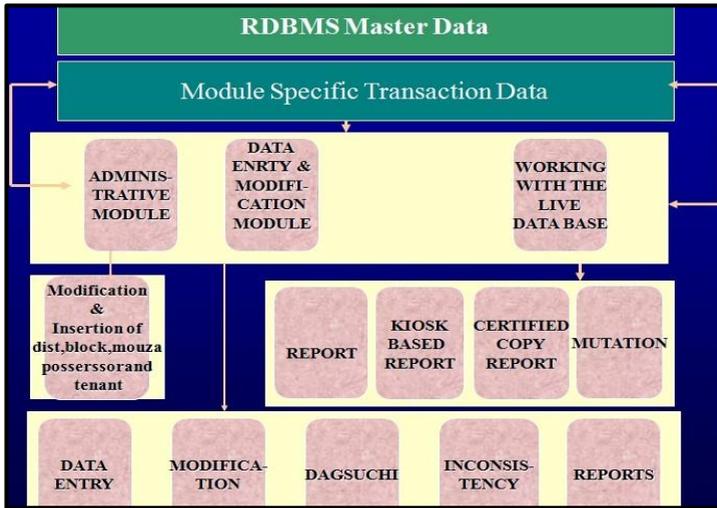


Fig-9. Main Interface of BHUCHITRA

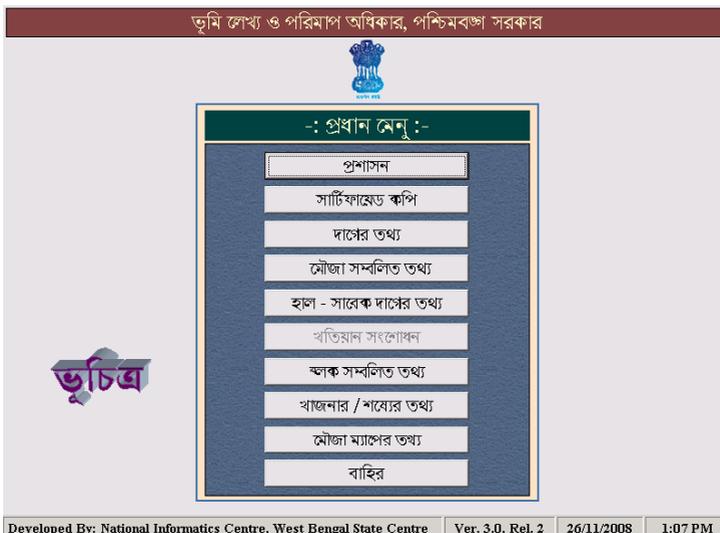
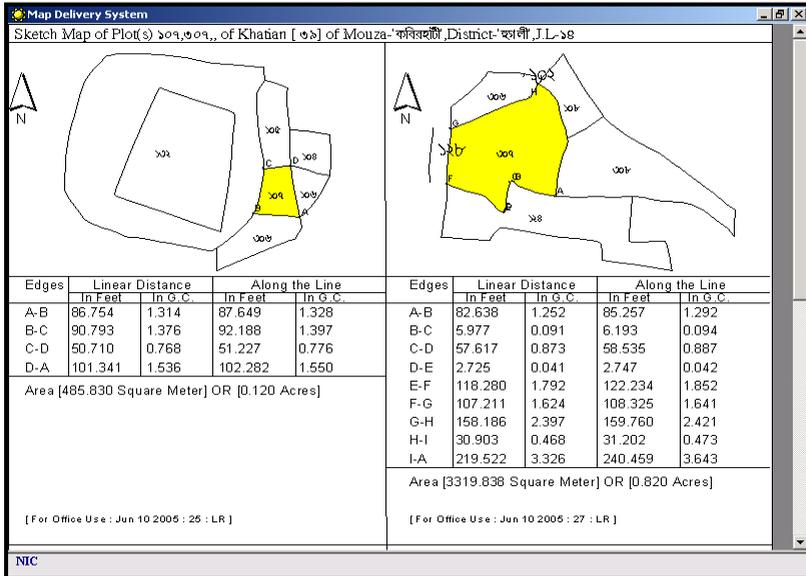


Fig-10. BHUCHITRA-Map Service to Citizen



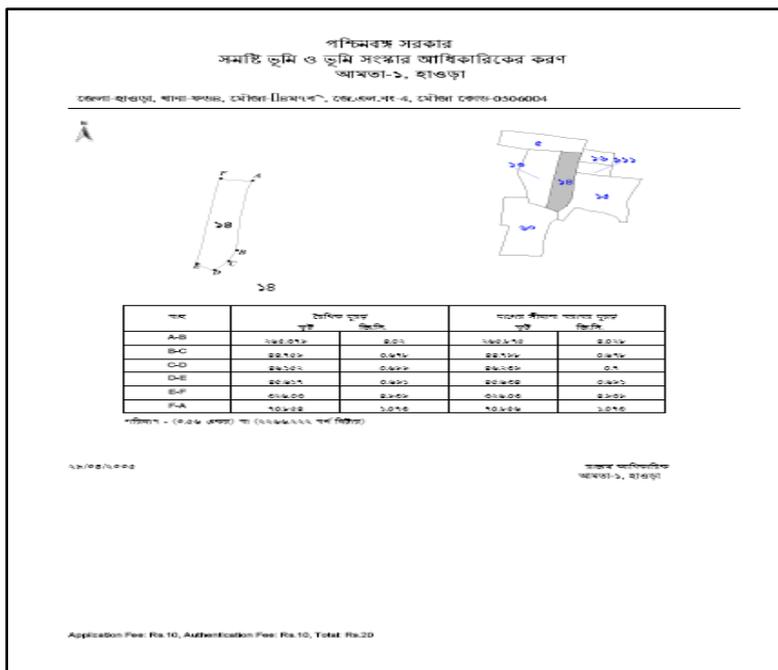
D.2. Modules of BHUCHITRA

- **Administration:** This menu consists of mainly two parts- User Management and Maintenance of Various Codes. User Management module is used for creation or deletion of user information, passwords etc. Second module is used to facilitate the administrator to add or modify the master tables containing records related to Districts, Blocks, Mouza, Land Classifications etc., which are used as the source files in the user interfaces. DISTRICT Codes, BLOCK Codes, MOUZA Codes, CLASSIFICATION OF LAND CLASS Codes, POSSESSOR Codes TENANT Codes, R.I. Codes.

- Certified copy: This module is for Certified Copy Service for Khatian. The sub menu of this module are- **Input request, Viewing request, Report and Delete Request.**
- Plot Information: This menu interface for Plot Information Report for Entry.
- Mouza Based Activity: This module contains Mutation, Conversion, Bargadar Enrollment, Homestead Benefits, and Legal Heirs (warish) Enrollment. Various Mouza based report are generated from this module like, Khatian Report (Copy Of Right's Report), Plot Information report, Barga Possessor Report, Plot Index Report, Plot Information Report With Mentioned Class, Land Report Within a Specified Range of Area, Possessor Report, Tenant Report, Khatian Owner's report, Plot Information Report For a Mentioned Legal Code.
- Block Based Activity: Vesting, Divesting, Pattadar Enrollment, Error Correction and Report. This module almost same from Mouza based activity, it shows the information is block based.
- Khatian Data Maintenance: In this interface all khatian entries are made with necessary details and there is also provision for checking validation for all inputs.
- Exit

BHUCHITRA i.e. certified copy of plot maps supplied to the citizen on demand in A4 size paper along with adjacent plots & dimensions of the concerned plot.

Fig- 11-Report Generation of plot and adjacent plot information with maps from BHUCHITRA



E. Road Ahead and Future Initiatives Taken:

A joint initiative is being taken by the L&LR Department and Finance Department for automatic processing of mutation after property registration. With this application, mutation will automatically be transmitted to the BL&LRO office without the physical presence of the applicant and processing of mutation will start instantaneously.

Presently Sankrail & Panchla BL&LRO offices have been inter-connected with Ranihati ADSR (Additional District Sub Registrar) office in Howrah district by MPLS-VPN connectivity. Other than these two blocks, data of another 10 blocks of Paschim Medinipur, Nadia, North 24 Parganas and South 24 Parganas district have also been collocated in the 6th January, 2014 central database server located at the State Data Centre. It will target to connect all BL&LRO offices through MPLS-VPN connectivity by March, 2014. Computerized R-O-R data along with map data has been uploaded on the Departmental Website for public view, which was inaugurated by the Hon'ble Chief Minister of West Bengal on 19.05.2012. The job of re-writing the entire BHUCHITRA software in open source technologies to minimize recurring costs on proprietary software is under progress. In fact the first version of the web-based BHUCHITRA is under audit process with STQC (Standardization Testing and Quality Certification) Directorate, Salt Lake, Kolkata. The present modules have been up-graded and some modules are proposed like; Khatian Entry & Modification Module / Misc. Correction, Plot Information Module, Certified Copy Module, Hal Sabek Module, Mutation Module, Bargadar Enrolment, Homestead Beneficiary enrolment, Land Conversion Module, Warish Selection Module, Lease Khatian Detail Module, Vesting Module, Di-vesting Module, Patta Enrolment Module, Master Control Data Management Module, User Management, Mouza Map Information, Reports etc. and will include very soon. Software development on progress for the following modules: Mutation, Conversion, User Management, Reports.

Documentation of the Urban Property Ownership Record (UPOR) Karnataka.

1. *CONCEPT OF PROPERTY RIGHT AND RECORDS*

The Indian law requires compulsory registration of land transactions. These transactions are governed by the Registration Act of 1908 which is only mandated to register document of the agreement between the two parties and ensure that the prescribed revenue has been paid to the state. The registrar has no authority to question the ownership of the land from the seller.

The prevalent system in India is referred as presumptive nature of land titles. With the changing times, it calls for a more definite system of land titles, where individuals have guarantee and assurance from the state with respect to the land they own. The system which has such guarantees is referred as conclusive land titling system.

The National Land Record Modernization Program and the Jawaharlal Nehru National Urban Renewal Mission, both call for strong reforms in the aspect of land administration where the States have a play a major role to play as Land being a state subject as per schedule VII of the constitution.

There are very conflicting and ambiguous conventions regarding the proof of ownership, referred as Record of Rights (RoR). The Concept of RoR varies from state to state. The product of such confusion can be seen in the form of conflicts, crimes and pending court cases.

With regard to land, there are three major components which cover all forms of the land record and are the bases for establishing the land title. The crux of the problem lies in non synchronization of these three components, namely-

1. Survey
2. Registration
3. Updation

With such a situation at the ground, the Government of Karnataka decided to work upon the most ambitious and magnanimous task of giving identification to and linking of properties with their owners in Urban areas.

Accurate and well maintained land records are of great importance to a smoothly functioning economic system as it establishes faith in the transaction and a larger number of people can participate in land related transactions. A McKinsey report indicated that distortions in India's land markets are a major barrier to economic expansion ('India: The Growth Imperative – Understanding the Barriers to Rapid Growth and Employment Creation, McKinsey Global Institute, 2001).

2. UPOR – AN INTRODUCTION:

Karnataka is the first state to have taken up the project of creating Urban Property Ownership Records in a fully digital environment. With an existing system put in place in the British era, it was worthy to go for modernization and to provide legal ownership document with spatial components.

Having a strong legacy of Bhoomi and Kaveri in the state, there was a growing demand from various quarters for a comprehensive record system for the urban properties. The Karnataka Land Revenue Act 1964 and Rules 1966, mandates the Survey Settlement and Land Records (SSLR) department to create and maintain ownership documents for all urban areas. The specific sections of the KLR Act 1964 are:

- Chapter 1 – Article 1(2) and Article 2(2, 6, 38),
- Chapter XIII – All Articles (148 to 156) which is popularly known as “City Survey”.

Bhoomi (meaning land) is the project of on-line delivery and management of land records in Karnataka. It provides transparency in land records management with better citizen services and takes discretion away from civil servants at operating levels.

Kaveri (a river flowing in Karnataka) is a model of the BPR (Business Process Reengineering) to reorient the Department of Registration & Stamps towards 100% automation in the registration process and speedy delivery of registered documents

to the citizens of Karnataka. The KAVERI application takes care of registration under all the articles mentioned in transfer of properties act and marriage registrations with respect to Hindu Marriage Act and Special Marriage Act.

The state had already in place an existing system of Property Records on the basis of which the department decided to built upon a computerized database which reflects the realities of the ground. The major reasons for the department not expanding city survey all across the state although there was a mandate to carry out city survey was due to:

- Lack of funds
- Lack of huge manpower required to create initial data.
- Not having sufficient modern survey instruments and expertise to create data in the digital form.

The Land Revenue Act sets down that for every urban area with a population of more than 5,000, city survey maps may be prepared. There are two distinct responsibilities of SSLR department in case of urban properties:

- Measurement and Mapping of all non agricultural lands
- Creating and maintaining Record of Rights for all non agricultural lands.

2.1. OBJECTIVES:

The Objectives of the program were defined as-

- A robust system of Urban Property Ownership Records is to be created for every property which accurately records both

the spatial details of the property as well as non-spatial record of rights data for the following.

- Land Parcels
- Structures / Buildings
- Roads etc
- Property records will serve as trusted records for all transactions.
- This property record created through this project will evidence property ownership for all regulatory and legal purposes.
- The property record will continue to remain current and accurate forever through the process of mutation. In other words, Records will not become obsolete or inconsistent.

All property record related transactions and services will be handled through this project.

2.2. PRINCIPLES:

The idea was conceived by the department if Survey Settlements and Land Records are based on the following principles-

- Reduce conflicts between land rights
- Accelerate land transactions
- Enable local governments to provide better services to the citizens
- Improve land management
- Provides easier access to credit
- Facilitate recovery reconstruction after a natural disaster

2.3. SALIENT FEATURES OF THE PROJECT:

- The property details will contain both the building and land on which the building stands.
- The Property details captured will include :-
 - Spatial Details - Coordinates of the boundary points of land plot ,
 - Area of the land, Building details - built up area, number of floors
 - Rights on the property-Ownership, Mortgage, Lease , Easement ,
 - History of Transactions on the property.
- The Department has ensured that property ownership will remain confidential and shall be shared to only those parties that have an interest in the property.
- All mutations and changes to the property records will be certified through a PKI mechanism and biometrics by the authorized government officials.
- Different types of existing urban properties related data available with various government agencies such as urban local bodies and urban development authorities will be used as reference data in the project.
- The Project will be implemented through PPP Model where the Private Partners will be responsible for first time spatial data creation, creation of IT infrastructure and delivery of services. The Department will continue to discharge its core responsibility including title enquiry of

the properties and approve any change to the property Record (Mutation).

- Use of Modern spatial Technology- Global Positioning System (GPS), Total Station (TS), for ground based Survey and use of ICT (Information and Communication Technology) for data management, MIS Reports, and GIS tools for Mapping of data

3. *MANAGEMENT:*

The Project management Committee regarding the project are to be comprised of the following features-

- DS & Ex-officio Director (Bhoomi and UPOR)
- Head of the UPOR Project
- Project heads of the UPOR project in four cities (Deputy Director of Land Records)
- Representative of e-Governance Department
- Representative of NIC
- Technical Expert from IISc.
- Project Manager of SP
- Project Manager of TSP.
- The Project Monitoring Committee may draw assistance from additional technical experts who may be co-opted to the Project Monitoring committee

The department wisely went for a pilot exercise. The pilot project involved consultations with all possible stakeholders. As a pilot project, Khasbagh area of Belgaum city has been taken

up. The reason behind selection of area was the availability of terrain, as the region provided all types of terrain. The project covered all the four major types of terrain and used all the existing survey methodologies, as in

- a. Ariel photography
- b. Satellite imagery
- c. Ground methods

It was this pilot exercise, during which the department learnt that the complete exercise cannot be completed by the department itself and external agencies need to be involved.

Finally after the pilot exercise, it was decided that ground methods will be used and two external service providers will be brought in at two places for specific functions.

1. Service provider (Control points monumentation and field data collection)
2. Technical Service Provider. (CMM Level 5 Company)

Separate units and sectors were defined by the department for uniformity as wards and zones defined by the municipal or other civic organizations were not standard.

Working Model:

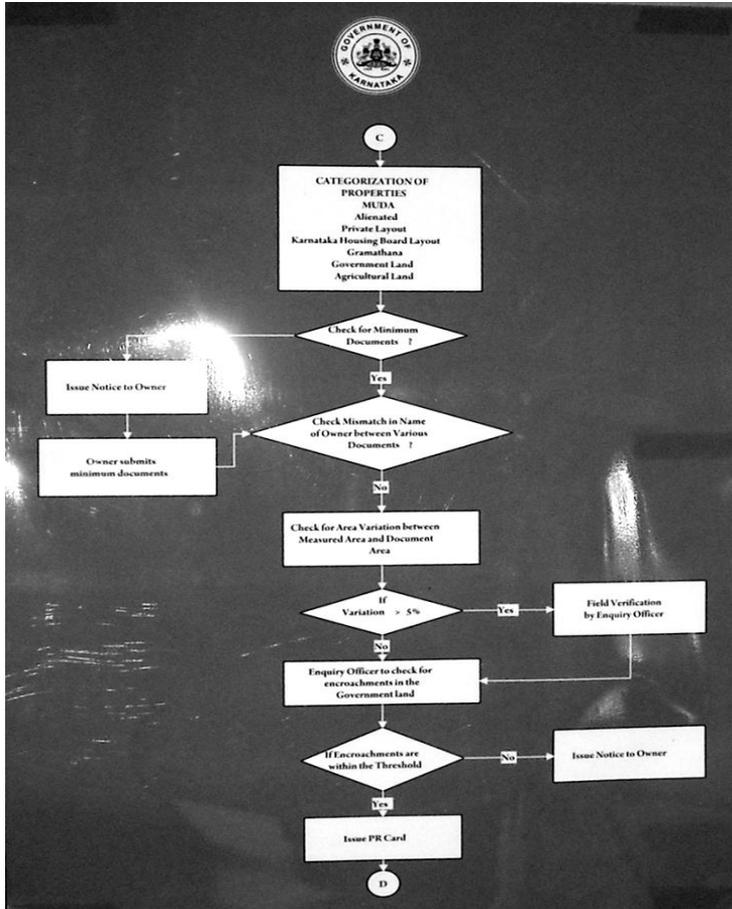
The Project was implemented through a PPP Model where the Private Partners were responsible for first time spatial data creation, creation of IT infrastructure and delivery of services. The Department will continue to discharge its core responsibility including jointly create spatial records along with Vendor, conduct title enquiry, approve any change to the property Record.

- Government is funding a part of the project cost,
- Vendor (s) will need to fund a large proportion of the cost of the project.
- Vendor (s) would recover this cost only through delivery of services to citizens

An Image of the Traditional PR Card in use.

ಮೈಸೂರು ಸರ್ಕಾರ GOVT. OF MYSORE		ಭೂಮಾಪನ ಇಲಾಖೆ DEPT. OF SURVEY SETTLEMENT AND LAND RECORDS				
AB No. 8478		PROPERTY CARD ಆಸ್ತಿ ಪ್ರಕಟನ ಪತ್ರ				
Division No. ವಿಭಾಗ ಸಂಖ್ಯೆ	Name of the area ಕ್ಷೇತ್ರದ ಹೆಸರು	P. T. Sheet No. ಸಮೀಪದ ನಕಾಶೆಯ ಸಂಖ್ಯೆ	City Survey No. ನಗರ ಸರ್ವೆ ನಂಬರು	Area in Sq. Mts. ಮೀಟರ್ ಚದರ ಮೀಟರುಗಳಲ್ಲಿ	Tenure ಹಿಡುವಳಿ ಹಕ್ಕು	Assessment ಕಂದಾಯ
Easements ಅನುಭೋಗದ ಹಕ್ಕುಗಳು						
Name of the Holder ಆಸ್ತಿಧಾರಕನ ಹೆಸರು						
Lessee ಗುತ್ತಿಗೆದಾರ						
Other encumbrances ಇತರ ಭಾರಗಳು						
Other Remarks ಇತರ ಪರಾ						
Date ದಿನಾಂಕ	Transaction ಹಕ್ಕಿನ ವ್ಯವಹಾರ	Vol. No. ಸಂಪುಟ ಸಂಖ್ಯೆ	New Holder (H) Lessee (L) or Encumbrances (E) ಹೊಸ ಆಸ್ತಿಧಾರ (ಧಾ) ಗುತ್ತಿಗೆದಾರ (ಗು) ಇತರ ಭಾರಗಳು (ಭಾ)		Attestation ಸಾಕ್ಷಿ ರುಜು	

Process flow Diagram (display at the UPOR office, Mysore)



4. UPOR: PROCESS BREAKUP

4.1 The Framework:

The process has four major components which are listed and explained below.

- I. Establishing the control network,
- II. Geo-referencing of village maps
- III. Data entry of the bulk secondary source data
- IV. Generation of Index Map:

4.1.1 ESTABLISHING THE CONTROL NETWORK

Ground Survey Control Network is the first activity in any modern day cadastral survey. Survey cannot be precisely carried out without a good Control Network as the proper Control Network ensures that the area of survey is well within the jurisdiction. It ensures that the accuracy required in survey is maintained and it helps in re-fixation of the property boundaries with less time, efforts and with same accuracy. There are three levels of control points:

- Primary Control Point
- Secondary Control Point
- Tertiary Control Point

The details of each are explained below:

- **Establishment of Primary Control Point (PCP) network:**

- a) Generally one PCP is established in 4 sq. kmts. The minimum distance between two PCPs is one kilometer. One PCP out of five should have a pair within range of 100 m and there should be inter-visibility between the pairs. The first task by the vendor is to locate the PCPs established by Department of Town Planning, co-ordinates and location description given by Survey of India. In case some of these are damaged or missing, then they have to be repaired or re-established. In case there are insufficient PCPs within the Area of Interest then fresh PCPs have to be established by the vendor.
- b) Out of the selected 5 towns only in Shimoga town the Department of Town Planning has not established any PCPs. So the vendor has to set up the required PCPs in Shimoga keeping in mind the parameters mentioned in (a) above and the specifications given by the department.
- c) The measurement of PCPs should be done only by using DGPS.
- d) The vendor should validate all the PCPs to ensure that there are no errors or that they have not been shifted.

The department should also carry out 100% validation as accurate control network is required for creating accurate property maps with co-ordinates.

- **Establishment of Secondary Control Point (SCP) network:**

- a) The SCPs should be established one in one sq. km and the minimum distance between two SCPs should be 0.5 kilo meter. One out of five SCP should have a pair point within range of 100 m and the pairs should have intervisibility
- b) The vendor should calculate the required number of SCPs that would be required within the area of interest
- c) They should identify the location of SCPs – with SSLR – so that they are evenly spread out as per requirement of RFP and are established preferably in government properties so that they are safe and not disturbed.
- d) The SCPs should be monumented as per the specifications laid out in the RFP
- e) Only DGPS should be used for measurement of SCPs and arriving at the co-ordinates
- f) The department should do 100% validation to check whether the required accuracy has been achieved.

- **Establishment of Tertiary Control Point (TCP) network:**

- a) The TCPs should be established in each and every street corner. Inter visibility between TCP / SCP for any point is a must

- b) TCPs will have semi permanent monumentation – washer and a bolt with a circular paint
- c) The TCPs should be established in such a way that DGPS or Total Station Instrument can be used for taking the readings of the co-ordinates.
- d) The vendor should calculate the required number of TCPs within the area of interest
- e) The vendor should identify the location of TCPs and the traverse route with the assistance of the department.
- f) Validation by the department to check whether the required accuracy has been achieved.

Details of Control Points	Mysore	Shimoga	Hubli-Dharwar	Mangalore
Total No. of PCPs measured and validated	70	20	36	14
Total No. of SCPs measured, monumented and validated	166	75	200	160
Total No. of TCPs measured and validated	14,000	6,210	10,559	8,323

4.1.2 Geo-Referencing of the Village Map:

All the old village maps which fall within the Area of Interest have been digitized by the department and the vendor has

updated these maps with the hissas (sub-divisions) and geo-referenced the same with the assistance of the department surveyors. This is required because in the title enquiry process it should be confirmed whether the properties lie on a private revenue survey number or government survey number. This is done by super-imposing the UPOR detailed map on the geo-referenced village map.

4.1.3 Data Entry of the Bulk Secondary source Data:

Collection of property data from other related agencies/departments – in order to have a comprehensive database, it was felt necessary to get the secondary source of data from the Municipality, UDA, taluk office, KHB, KIADB etc.

4.1.4 Generation of the Index Map:

Preparation of Index Map using the UPOR software – after creating the control network a map with road blocks would be generated. The vendor should take these maps and walk across the streets and count the number of properties in each road block and mark it approximately in the block map. The properties so marked would be given Chalta Numbers – tentative numbers till the final cadastral number and UPOR number are given. This map is the Index Map. The vendor should also get whatever information is possible from the field such as house number, Municipal ID, PAN / UID, number of floors, whether residential or commercial, and so on.

Through the pre-survey publicity campaign, information on the above listed project activities were communicated along with appeal to citizens to cooperate with the project team during execution of the project.

4.2 Detail Survey of Each Property:

The vendor should form teams for the different dedicated works such as serving of notice; demarcating the property corners as pointed out by the government surveyor, document collection; field survey by ETS; carrying out data entry; CADD operators to generate maps on daily basis after downloading the data from the ETS; QC team for validation and so on.

Activities involved in this second stage are as follows:

4.2.1 Serving of Notice:

- a. Pre-printed Notices are personally served by SP to property owners / occupants before detailed measurements begin.
- b. It informs owners to be present at the time of measurement & to submit the relevant documents
- c. List of required documents are pre-printed on notice so that owners can get them ready
- d. Data such as door no., khatha no., address, property type & usage, number of floors, etc are also collected from during the time of detailed survey.
- e. Office copy of notices are maintained in the department

4.2.2 Marking of Property Corners:

- a. Property boundary Corners are Identified by department surveyors & marked by SP in presence of the government surveyor
- b. Marking is done by paint / wooden pegs for vacant sites
- c. Marking is done in presence of owners/occupants to avoid any future disputes
- d. In case of disputes by neighbours on marking of boundary -
 - It is resolved by Enquiry Officers at the time of title enquiry
 - Unresolved cases are mapped as single property and enquiry would be finalized after the dispute is resolved
- e. Guidelines and circulars for marking of properties have been issued by the department.

4.2.3 Measurement of Properties using ets:

- a. Each and every Property is measured by Service Provider
- b. No measurement is done without marking of corners
- c. ETS is used for precise measurement
- d. Both plot and building corner points are measured
- e. Day to day survey data is downloaded in site office and map is generated on the same day

- f. Photographs of all properties are also captured by SP operators

4.2.4 Collection of Property Documents:

- a. Photocopies are collected on-site from property owners/occupants by SP Operators
- b. Documents are also collected at citizen service centres
- c. Mobile units are deployed for copying of documents onsite as & when required
- d. Documents are maintained in separate Self Indexing files created for every property
- e. Files are kept block wise in record rooms in UPOR office

4.2.5 Verification of Spatial Data:

- a. Validation of measurements is done by Government Surveyors
 - Concurrent validation on site
 - Sector-wise (Post-facto)
- b. Validation is done using ETS/Tape
- c. In case error cases exceed 20% of total properties measured, SP is asked to re-measure the entire sector
- d. Second level of validation is done through system during title enquiry process
 - More than 5% variation cases are logged for re-verification in the field by the department

- Variation is seen between measured area and area indicated in document
-

4.2.6 Generation of Detailed Maps:

- a. Sector-wise detailed maps are generated after verification is successful
- b. Maps have co-ordinates & dimensions for all properties and the road names are also indicated.
- c. Verification of spatial data is done by SP using UPOR tool developed by TSP
- d. Block area is compared with sum of plot areas. Other checks done through system are as follows:

- Duplicate polygon, vertex, label, number
- Boundary not closing (Undershoot and Overshoot)
- Boundary overlapping, Self-intersecting
- No Label, number, or label, number is repeated

Validated maps qualify for further title enquiry process by government

4.2.7 Non-Spatial Data Digitization:

- a. Bulk data collected from govt. departments/agencies like Taluka office (Alienation, Govt. Land data), Municipality, Land Acquisition office, Sub-Registrar Office (for Encumbrance Certificate), Urban Development Authority, Karnataka Industrial Area

Development Board, Karnataka Housing Board are digitized by operators using UPOR software

- b. Documents collected from citizens are scanned and digitized using UPOR software
- c. After digitization the documents are uploaded and linked to respective properties by SP operators
- d. Index data of digitized documents are maintained in the system

4.2.8 Quality Check for Non-Spatial Data:

- a. QC of digitized data done by both SP and Department
- b. Data entry is verified with documents collected from department and citizens
- c. 20% Sample data are subjected to department verification
- d. If errors exceed 20% of the total data entry done same is rejected for re-work by SP
- e. Only cases passing the QC checks are ported to database for title enquiry process

4.3 Title Enquiry Process:

- a. Title enquiry is conducted by department officials
- b. Three User-levels are designed in work-flow
 - Govt. Surveyor
 - Survey Supervisor
 - Enquiry Officers

- c. Legal documents submitted by citizens and UPOR maps are checked during title enquiry. Following important checks are done during title enquiry:
 - Area entitlement
 - Owner decision
 - Check for government land
 - Hatching of encroachments
 - Resolving disputes by conducting hearings.
 - d. UPOR software is used for title enquiry and generation of PR Card
 - e. PR Card contains following information
 - Ownership Details-name, identity, source of ownership, lease details
 - Property Details – type, usage, dimension, area, shared plot details
 - Encumbrances – Mortgage with banks/financial institutions
 - Easementary Rights – public/private easements, court orders, government restrictions
 - Cadastral Data – Parcel map, overview map, schedule, dimensions and area
1. The Unit of property will comprise of both the
 - Building, and
 - Land on which the building stands
 2. The Property details captured will include the following:
 - **Spatial Details**

- Map with Co-ordinates of the boundary points of land plot, dimensions , Area of the land, Building details - built up area, number of floors
- **Rights on the property**
 - Ownership details, property details, Mortgage, Lease , Easement , History of Transactions on the property

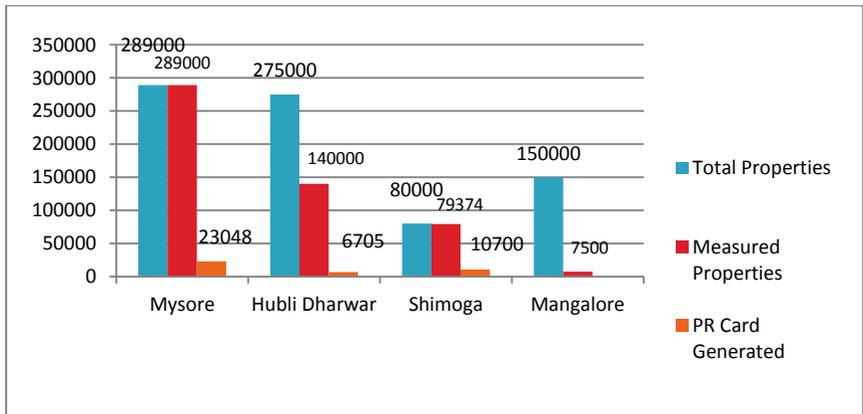
Process Flow:

Entry of the information received from the owner and other governmental agencies. Scanning of the documents.	Survey by the authorized agencies. 2 stages 1. GCP and preparation of Index point. 2. Detail survey.	[QC – 1]
When information which in synch with all the three elements it comes to the department for final verification		
[QC-2]	Verification of the record generated with the textual record	In case of discrepancy, such as name or area mismatch or in-sufficient documents etc, it goes for recheck and other defined processes.
When information is found correct, a draft UPOR card is issued and the order is advertised		
Notice served to all the stakeholders	At the department website	Local Newspaper
After 30 days from the advertisement, in case of no objections, the Final UPOR card is issued. In case of objections legal process of hearing are followed.		
After the passing of the 30 day notice period, the draft card can be collected from CSC after the payment of appropriated fee.		

5. DATA FACTS

<i>Responsibilities to Stakeholder</i>	<i>Key Function</i>
Revenue Dept.	Creation and Maintenance of UPOR Database; Title Enquiry.
Citizens	Avail Services – Ownership enquiry, Encumbrance Search, Due diligence on property, Mutation etc.
Registration Department	Due diligence for Registration; Stamp Duty Estimation
Banks	Create and Release Charges; Due diligence for loan processing
Courts	Due diligence for judgments; Enforcing court order on property;
Local Bodies	Property Tax Collection

Present Status



Finance

Initial estimation of (Departmental Contribution)	8.15 Crores
Total cost estimates as of now- (Amount Spent by the Department)	12.07 Crores

Geographical Coverage

<i>Details of the towns</i>	<i>Mysore</i>	<i>Shimoga</i>	<i>Hubli-Dharwar</i>	<i>Bellary</i>
Area covered	190 sq. km	52.5 sq. km	230 sq. km	81 sq. km
Total No. of wards	65	35	63	35
Total No. of villages	42	25	53	11
Total No. of Zones	9	3	6	3
Total No. of Sectors	49	14	22	12
Total Estimated Properties	2,92,401	79,893	2,25,876	1,00,000

UPOR Information

UPOR Work started	Purchase Order to Service Providers Mysore and Shimoga -on 2-12-2009 and MSA signing on -11-01-2010
First PR card issued	In Mysore- On 17-12-2011 In Shimoga- On 27-11-2012

Ground Impact

No of Districts (Towns)covered	Started in 5 Towns-but under implementation in 4 Towns: (Mysore, Shimoga, Mangalore and Hubli-Dharwar)			
No of Districts planned to be covered in next phase	Selected 50 wards of Bangalore City (out of 198 wards)-I st Phase, remaining 148 wards of Bangalore city in II nd Phase.			
No of Draft PR cards Generated/issued and Final PR cards sold in each town	As on 05-05-2014			
		DPR Generated	DPR Issued	Final PR cards sold
	Mysore	100506	26756	10112
	Shimoga	31350	27994	10121
	Mangalore	4871	2575	-
No of Average transaction per day (Final PR cards issuing)	Mysore- Per day average transactions-16 Shimoga- Per day average transactions-26			

Teams involved

Service Provider side

Mysore	Activity	No of persons deployed	
	Document collection	11	
	Survey activity	36	
	Office work & data processing team	18	
Shimoga	Activity	No of persons deployed	
	Document collection	8	
	Survey activity	24	
	Office work & data processing team	14	

Government side

Mysore		Shimoga	
Project officer	1	Project officer	1
Enquiry officer	6	Enquiry officer	2
Survey Supervisors	3	Survey Supervisors	1
Surveyors	31	Surveyors	12

6. Findings from Mysore

Initially it was estimated that there will be around one lakh of properties, but as of now the number is touching and more applications are pouring in. The list of mandatory documents had to be altered as per the needs and lesser documents required now.

Interviews with the beneficiaries:

M. Puttaswamy , a retired bank official and presently VP of a cooperative bank. He came to know about the program through advertisements and within a week, he came to the UPOR office to enquire about it. He followed it up and submitted the required documents. After submitting the documents he didn't turn up and it was after about 6-7 months he had come to collect the draft PR card.

Mr. Manu, he is a superintendent at the City Central Library. The Library had been allotted a land of 340 X 400 Ft by the Mysore City Council in 1984 for building of a public library. They are now planning to build the library, and came to know about UPOR through the municipal corporation when they went to it for necessary paper work. The work is to being taken up by KRIDL.

Mr. V Nagasundara, is a school teacher and resident of Parasayunahundi village in Mysore. He came to know about the UPOR project when the survey was being conducted in his area. He was of the opinion that people from older generation need time to absorb a new idea. The process is although simple, but

people often find it difficult to get the right documents in support of their ownership. He also feels that there is the concept of getting records straight when there is question of property alienation.

Mr. Arun Pandit, who is the resident of Vijay Nagar (Ist stage) expressed hope that through such comprehensive Land records programs would clear a lot of cases on its own. He claimed that he is also stuck in a dispute over ownership of land and hopes that UPOR will definitely makes thing easier in times to come.

Mr. Subhash Chandra Jain, a businessman from Rajasthan, who is settled in Mysore for the last four decades, was at the UPOR office to collect his final PR card. He had collected the PR cards for two of his properties after a payment of Rs 225 and 438 respectively. He was of the opinion that there should be provisions to make such schemes compulsory as it does create an environment of free and fair land deals.

The overriding feature in all the interactions was that the staff at the centre was cooperative, all the required information was readily available and there was not a single case where a penny of bribe was solicited or paid.

7. CHALLENGES AND WAY AHEAD

The major change was in the operation model.

Previous Model	Proposed Model
<ul style="list-style-type: none"> • PPP Model (Transaction Based) • Partial one time support by government against creation of Property Cards (Rs.118.50 per property) • Balance to be recovered through share in user charges (discovered through lowest bid) • Uncertainty over transaction volumes • May result in greater risk and higher bid 	<ul style="list-style-type: none"> • PPP model but full funding by government – Annuity based payment model • Payment for successful creation of Property card • Cost recovery through tender • 70% payment upon PR card creation and remaining 30% distributed over the project period of three years • 10% of cost of creation to be paid in each of the 3 years along with operation and maintenance charges • SLA penalties for deficiencies • Less uncertainty for the vendor and reduced project risk • Bid prices likely to be more realistic

Shortcomings:

From the vendors:

- Not many survey companies are there which have expertise in survey of urban properties
- Getting skilled ETS operators is a challenge. Out of the 5 towns in 3 towns this problem was there
- As they have multiple projects on hand their managerial level staff keep moving between the projects thereby effecting the project

From the department:

- Due to the shortage of officers project cannot be completed within the timeline
- Delays in taking crucial decisions at government level
- Lack of manpower with the required knowledge of modern technology
- Lack of incentives for project work resulting in unwilling staff doing the job
- The government officials do not maintain the timings as done by the vendors. To meet the timelines and due to climatic conditions it is sometimes required that the work be commenced early. The government officials oppose this. If incentives are given then they would be motivated to work better

Challenges:

- Willingness of Public to go for the UPOR card instead of traditional RoR's which has its limitations.
- People, who claim ownership of land, do not have sufficient documents to prove it, hence making the task of the department tough.
- The department has estimated that they can access the property record at Sub-Registrars office Municipal office and banks and can build upon their database upon it, but it turned out that only a fraction of such documents constitute the claim of ownership.
- Working in the capital city of Bangalore, which the department is planning to start upon very soon, it estimates that since the value of land is much more and it will be cumbersome task in dealing with properties which have no clear titles.
- Issues with agencies, shortage of manpower (the case of Mangalore where labour was not available), terrain and climate.
- The timings for surveyors is a major issue when urban population is concerned. No member of household is present in day time when the surveyors visit.
- Absentee landlords: Those who had settled somewhere else, how to acquire information.
- Security issues: Persons not ready to share property information.

- With the UPOR being made mandatory for any land transaction, there is expected to be a sharp increase for the UPOR card.
- It has to be completed in a timeframe, and if it implemented like a scheme, it will deviate from its purpose.