GOVERNMENT OF KERALA
KERALA STATE PLANNING BOARD

FOURTEENTH FIVE-YEAR PLAN
(2022-2027)

WORKING GROUP ON
LAND RECORDS

REPORT

PERSPECTIVE PLANNING DIVISION
March 2022

FOREWORD

Kerala is the only State in India to formulate and implement Five-Year Plans. The Government of Kerala believes that the planning process is important for promoting economic growth and ensuring social justice in the State. A significant feature of the process of formulation of Plans in the State is its participatory and inclusive nature.

In September 2021, the State Planning Board initiated a programme of consultation and discussion for the formulation of the 14th Five-Year Plan. The State Planning Board constituted 44 Working Groups, with more than 1200 members in order to gain expert opinion on a range of socio-economic issues pertinent to this Plan. The members of the Working Groups represented a wide spectrum of society and include scholars, administrators, social and political activists and other experts. Members of the Working Groups contributed their specialised knowledge in different sectors, best practices in the field, issues of concern, and future strategies required in these sectors. The Report of each Working Group reflects the collective views of the members of the Group and the content of each Report will contribute to the formulation of the 14th Five-Year Plan. The Report has been finalised after several rounds of discussions and consultations held between September to December 2021.

This document is the Report of the Working Group on "Land Records". The Co-Chairperson of Working Group was Dr. A Jayathilak IAS. Dr. R. Ramakumar, Member of the State Planning Board co-ordinated the activities of the Working Group. Dr. V. Santhosh, Chief, Perspective Planning Division was the Convenor of the Working Group and Smt. K B Sreeletha, Joint Director, Perspective Planning Division was Co-Convenor. The terms of reference of the Working Group and its members are in Appendix 1 of the Report

Member Secretary

PREFACE

This report brought out by the Working Group on "Land Records" constituted by the State Planning Board as part of formulating the Fourteenth Five Year Plan includes a general narration of the Land Records programmes Framework in the State along with different schemes of land records now being undertaken for execution by Revenue Department.

We would like to place on record the invaluable inputs made by the Members of the Working Group in developing this report and the services rendered by the concerned Member of State Planning Board, Dr. R. Ramakumar, concerned division Chief Dr. V. Santhosh and staff of the Perspective Planning Division in compiling this report, which we are sure would serve as a blueprint for the comprehensive and effective management of Land Record Digitization programme in the State through the next five years and beyond.

Dr. A. Jayathilak IAS,
Additional Chief Secretary,
Revenue, Disaster Management and Housing
Official Co- Chairperson

CONTENTS

LIST OF TABLES

LIST OF FIGURES

SUMMARY

The 14th Five Year Plan Working Group Report on Land Records was conducted by the State Planning Board focus on to complete Survey/Resurvey of all villages during the 14th Plan period and updating of the survey & settlement records (including ground control network and ground Truthing) using modern technology options.

Land administration and governance are the responsibilities of the Government. Safeguarding the ownership of land, providing user-friendly, efficient mechanisms for citizens to buy, own, mortgage, sell and transfer the ownership of land are also functions of a modern Government. Good land governance obviously will elevate social development index, social harmony, and economic growth rate. So the generation of error free, digital land records is essential for the overall future development in all the sectors.

Kerala took a major land records modernization initiative called 'Digital resurvey of 1550 villages' in a four year timeframe to transform the existing land record practices into a comprehensive digital land management system. Through this program State planned to give highly accurate Land Records to all the landholders and move to a regime of real time updation of land records. In this direction, the Revenue department, Kerala has taken up the following three broader goals in order to channelize all the available resources towards a good land governance State.

- Land for all
- Record for all the lands
- All services to be Smart

In accordance with the second mission ie. 'Record for all the lands' is the major thrust area for the digital resurvey program undertaken by the Survey and Land Records department in which all the landholders should have a clear record of their land consisting of both textual and spatial data so as to enhance the security of the rights over the land. This program is planned to be conducted with the help of appropriate digital technologies to survey every inch of land in a four years time frame. State will also build an integrated land management system, a unified platform with all the options to manage the land transaction and to access other land related services.

Project called 'Digital resurvey of 1550 villages' has been approved by the Government with the own budgetary allocation of the State (in principle sanction of Rs.807.98 Cr). The digital survey mission has already been initiated so as to achieve the second goal of the Revenue and Survey department. Modern survey technologies like Continuously Operating Reference Station (CORS), Real Time Kinematic (RTK) rovers, Robotic ETS, Drone etc are planned to be used in this venture. A mission mode style of work is also envisaged for the timely completion of this program. In order to address the resource constraints, engagement of contract surveyors along with in-house resources are also to be adopted for the speedy completion of the mission.

A series of activities under the digital survey mission have already been started. As the aforesaid program is envisaged for the next four years, the extension of the digital survey and related activities will be the major programmes proposed for the next year as well. Stakeholder data sharing approach will improve wider spatial data (Cadastral) sharing and breaking data silos. This model will also improve interaction and relation with the Department of Survey & Land Records by strengthening the SDI platform by connecting and providing access to the seamless map and land records for better disaster preparedness and resilience mechanism.

Above all, as part of the program, institutional, technical and operational integration of the stakeholders department are also required to complete land records systematically across Kerala. In particular, the requirements for technical capacity for the modernization of land records, preparation of seamless cadastral map through re survey etc requires building the necessary capacity in all involved departments and wider Kerala's industry to perform functions effectively, efficiently and sustainably.

CHAPTER 1
INTRODUCTION

Land administration and governance are the sole responsibilities of the Government. Safeguarding the ownership of land, providing user-friendly, efficient mechanisms for citizens to buy, own, mortgage, sell and transfer the ownership of land are also functions of a modern Government. Good land governance obviously will elevate social development index, social harmony, and economic growth rate. So the generation of error free, digital land records is essential for the overall future development in all the sectors.

However, several IT initiatives have been made for transforming the existing conventional land records maintenance in the different stakeholders departments (Revenue, Survey and Registration), a substantial improvement has not yet achieved in terms of an integrated digital solution. So far resurvey of 909 villages was completed and land records were handed over for the Revenue administration. In 29 villages, the resurvey is progressing. Out of the 1,666 villages, 728 still remain to be surveyed. The resurvey of the 909 villages has been completed in almost five decades. In the light of above, Survey and Land Records has submitted a detailed project report (DPR) for the digital resurvey completion of the State in a time effective manner after feasibility study, consultation with technical experts/agencies. In accordance with that, the Government has accorded administrative sanction [G.O. (Rt) No.364/2021/P&EA dated: Thiruvananthapuram 27/08/2021] for an amount of Rs. 807.98 Cr in the RKI funding. The most modern survey instruments like Continuously Operating Reference Station (CORS), Real Time Kinematic (RTK) instruments, mobile mapping devices and drone technology etc. are planned to be used in this program for the time effective implementation. Digital survey of the entire state in a stipulated time frame with integrated land information system (ILIS), issuing of RoR and effective settlement mechanism etc. are also planned through this mission mode program. Ultimate aim of conclusive land titling is envisaged in the near future as part of this mission.

CHAPTER 2
MODERN LAND RECORDS - EXTRAORDINARY FACILITATOR FOR THE ECONOMIC GROWTH

Enhancing the land market by providing secured land tenure/ title will obviously lead land as collateral for credits and investment. The resultant outcome on the economy will become huge and that cannot be predicted at this juncture. Similarly the disaster preparedness and post disaster resilience and such economic impact also to be treated in the form of money while considering digital survey programs. Geo-coordinate supplies to different organizations/agencies/real-estate are also to be considered as another way of revenue generation. Since the cadastral data products are acting as a base planning tool, the saleability of the digital cadastral can be considered as other revenue sources.

Though the data generation of digital surveys incur cost, time and efforts etc. one of the peculiar benefits of this component is the financial self-sustainability. There are various ways in which the amount spent in this regard can be retrieved back such as demand collection from the public, sale of record of rights, sale of maps and registers etc. Similarly the digital GIS cadastral data are expected to have huge demands from multiple stakeholders (both private and govt.) for various land based developmental activities. As the map data will become a universal coordinate system, any stakeholders can check its correctness by comparing with Google, satellite, aerial photo, etc. on a real-time basis.

CHAPTER 3
LAND RECORDS DIGITIZATION PROGRAMME OF KERALA

Reliable, up-to-date, and digitised land records are necessary for economic development. They are necessary to ensure people's titles to land, to provide a record of ownership, and to integrate information on all kinds of land ownership and control with information on land use. Reliable, accurate, and up-to-date land records are thus necessary for land use planning. Good land records are one of the important components of a State's statistical system. In the present situation, records and up-to-date land records in which all textual and spatial data are integrated and digitised are a crucial component of ease-of-doing–business (EODB) indicators.

A fully digitised document management system allows easy storage, is accessible from anywhere, permits multiple access, is time-saving, provides better security, reduces costs associated with document search, reduces costs associated with physical storage of paper copies, improves preparedness against disaster, ensures document recovery, and permits easy movement.

The creation, maintenance and modernisation of land records is a task of State Governments. The present state of land records and modernisation varies very widely across States. The initial condition of land records in each State reflects the land records and revenue systems that prevailed in each State and sub-region of each State at the time of Independence. Thus, land records for West Bengal were as required by the zamindari system, land records in parts of Tamil Nadu were as required by the ryotwari system, and so on.

In Kerala, land records have specific features and problems. In general, we are still working with land records formats created in the pre-Independence period in the Princely States of Travancore and Cochin, and the in the British Indian Malabar district. The process of survey/resurvey and settlement that began in Kerala in 1964 is incomplete and, in many instances, is already out-dated.

The objectives of the Government of India's Digital India Land Records Modernisation Programme (DILRMP) are the following: to usher in a system of updated land records, automated and automatic mutation, integration between textual and spatial records, interconnectivity between revenue and registration, and to replace the present deeds registration and presumptive title systems with that of conclusive titling with title guarantees.

Kerala aims to go beyond the above objectives by including robust land use planning, water resources management, infrastructure planning for disaster management and related objectives in the proposed list of objectives of modernisation and digitisation of land records.

Kerala Specific Challenges

1. Unparalleled hierarchical structure: Unlike in other States in the Indian union, especially the North Indian States, the entire revenue records in Kerala are being kept and updated at the Village Office level.
2. Separate administrative mechanism for Registration and Revenue departments:

3. The non-existence of any statute to allow change in land use is another lacuna found in land administration. Government of India has laid down the 9-fold categorisation on land use. But the data maintained in the records is often out-dated and there is no provision for updating.
4. Non-existence of 'Rights' granting regulation: A land holder in the State is still at the mercy of the officials of revenue, registration and survey departments and the outside players like document writers and advocates, who can question their possession on land at any time. This warrants the establishment of a 'rights' granting authority in the State with all the powers to confirm the various 'rights' of holders on the land they 'possess'.
5. Dual tax collection on the same piece of land:
6. Non-existence of regulations to accommodate flats in the revenue records:
7. Lack of clarity in Survey Act and Rule:
8. Lack of awareness on the limitation of Survey Act and Rules
9. Confusion about the instruments and methodology of survey: Resurvey process in Kerala started in 1964.
10. The resurvey process is the joint work of the Survey and Revenue Departments. But over time, the Revenue Department has virtually abandoned its responsibility or the survey department has grabbed it.
11. There are multiple departments that procure satellite and aerial maps and have surveying equipment. There is need for sharing data with other Government departments/ agencies, when the data is procured with public funds.
12. Due to its size and density of population, the pressure on land in Kerala has always been unusually high.
13. The resurvey carried out until now is not geo-referenced.
14. It is also a fact all over the country and in Kerala that large parcels of public lands have got alienated.
15. Like Survey Department, Registration Department also has to be brought under the same umbrella as Revenue.

Digitizing the interconnectivity between departments

Under the present structure of Kerala, land records are spread across three different departments under the Revenue and Registration departments namely

(a) the Survey and Settlement Department which is in charge of preparing cadastral maps and preparing, maintaining and updating the PCs and preparing the ROR;
(b) the Revenue Department, which is in charge of maintaining and updating the RORs; and
(c) the Department of Registration and Stamps which is in charge of registration of documents pertaining to land transactions.

Benefits to citizens

- The citizen is expected to benefit from Land Record Modernization programme in the following ways;

- Real-time land ownership records will be available to the citizen
- Since the records will be placed on the websites with proper security IDs, property owners will have free access to their records without any compromise in regard to confidentiality of the information
- Free accessibility to the records will reduce interface between the citizen and the Government functionaries, thereby reducing rent seeking and harassment.
- Public-private partnership (PPP) mode of service delivery will further reduce citizen interface with Govt. machinery, while adding to the convenience
- Abolition of stamp papers and payment of stamp duty and registration fees through banks, etc. will also reduce interface with the Registration machinery
- With the use of IT inter linkages; the time for obtaining RoRs, etc. will be drastically reduced
- The single-window service or the web-enabled "anytime-anywhere" access will save the citizen time and effort in obtaining RoRs, etc.
- Automatic and automated mutations will significantly reduce the scope of fraudulent property deals
- Conclusive titling will also significantly reduce litigation
- These records will be tamper-proof
- This method will permit e-linkages to credit facilities
- Market value information will be available on the website to the citizen
- Certificates based on land data (e.g., domicile, caste, income, etc.) will be available to the citizen through computers
- Information on eligibility for Government programs will be available, based on the data
- Issuance of land passbooks with relevant information will be facilitated

CHAPTER 4
CLEAR ROAD MAP - PHYSICAL AND FINANCIAL USE OF TECHNOLOGY

Physical target

Physical targets of the program are meticulously planned for ensuring the outcome are achieved. There are different survey methods that are planned to be utilized in accordance with the terrain condition of the State. 200 Villages in a timeframe of 5.5 months are planned to be conducted at a given point of time. In this fashion 400 villages will be achieved in a 1 year timeframe. This has been designed based on the availability of the manpowers. 1700 department survey staff and 1500 contract staff are planned to be utilized for the program (total 3200) in the ground level. Detailed breakup of the resources requirements and targeted completion are given below

Table 1 Action Plan for Completing Digital Survey

Total Surveyors Required	16x200 Villages at a Time = 3200
Timeframe against manpower (Department Staffs)	1700 (1100 Surveyor + 600 Draftsman)
Timeframe against manpower (Contract Staffs)	1500 (Contract Surveyors)
Timeframe against manpower (Helpers)	4000 (20x200 Villages at a Time)
Surveyors required for the survey of one village in 5.5 months	16 (12 Teams)
Total villages to be covered	200 Villages in 5.5 months
No of villages can be covered in 11 months	400
Time duration for completing 1550 villages	3.75 years

CHAPTER 5
PHYSICAL V/S FINANCIAL TARGET

A clear-cut physical and financial plan has been laid out in the submitted DPR and comprehensive details are provided for the quick reference. Estimate breakup and the number of villages that are planned for digital survey by using the Rs.807.98 Cr is given in the below Table 2.

Table 2 Estimate breakup and the number of villages planned for digital survey

Phases	Phase 1	Phase 2	Phase 3	Phase 4
No of villages to be covered	400	400	400	350
Estimate (Rs)	3,39,43,80,000	1,56,17,31,200	1,56,18,91,472	1,56,18,61,360

Weakness of existing system

The Resurveys have always been regarded as a cumbersome activity involving multiple processes with lots of manpower involvement. In the normal course of resurvey activities, the Government land and village boundary will be re-fixed on the ground in the initial stage survey to ensure exact assessment, record preparation and protection of such valuable lands. Subsequently on verification of documents provided by the land owners, all private lands will be surveyed according to the possession which are undisputed and well defined boundaries seen on the ground. Components that are to be updated or need re-engineering are given below for the kind consideration.

IEC Activities - This awareness campaign deserves utmost importance in the entire process of resurvey. An ample publicity among all stakeholders (other Govt. departments and especially to the citizen) determines the key to the success rate of the entire process of resurvey. Most of the time, citizens may not be well aware of the actual benefit of resurvey. Hence non production of land record details, reluctance on cooperation to the resurvey party etc. from the side of citizens has been a common phenomenon and which results in large number of complaints after resurvey.

Reluctance on cooperation - Cooperation from the land owners is of utmost importance in the entire process of resurvey. Many of the time, reluctance on cooperation to the resurvey party etc. from the side of citizens has been a common phenomenon and which results in large number of litigations after resurvey.

Old record collection – In order to protect the Government land, old records like litho map, FMB, settlement/adangal registers, old measurement sketches, land acquisition sketches, details of excess land, purambok details, revenue details etc. are essential for various reference at the time of resurvey. These records are scattered in various offices: Survey office, Village office, Taluk office, District collectorates , LA offices, archives department, etc. Manual collection of these records would take a lot of time. This often takes longer than expected. The advancement in Information Communication Technology (ICT) allows scanning, geo-referencing and publishing of these documents as web map service so that the surveyor doing door to door survey with a mobile mapping application running on his Tablet will be

able to access and use the above records pertaining to his location at a given time ensuring that the surveyors have access to and has consulted the relevant documents while carrying out door to door surveying activities.

Traverse demarcation - Traverse is also a framework like GPS stations. This network will be acting as the fourth level control stations for ascertaining the accuracy of the detailed ETS survey works. Proper junctions, suitable places of traverse points etc. need to be found out on the ground by field visits. Stone plating/marking will be done on the field in this activity. This work will be done with the help of ETS survey instruments. Every traverse stations will be observed with utmost care. Traverse should be closed without any errors (either with nearby GCP or to the starting traverse station). In earlier times, theodolite instruments were used instead of ETS. Highest level of supervision/checking is needed in this task. Most of the time repeated observation is needed to be conducted to attain the desired accuracy. This can be avoided by using CORS and RTK technology. This process can be completely done away with once CORS Network is fully operational and any parcel can be randomly picked and surveyed without dilution of positional accuracy in the Surveying or Mapping and every parcel would sit at its exact geographical location, shape and orientation even though surveyed randomly.

Demarcation survey - In location survey, detailed checking of the field boundaries, bend points etc. will be assessed and a demarcation sketch will be prepared. But this is undertaken in the traditional method now. Usage of satellite imagery, vectorized old maps etc. will ease these steps and incorporation of such aspects are under consideration. This most critical stage of creating an inventory of land parcels by carrying out door to door surveys of all parcels which are already registered and recorded as well as all those parcels which are outside the system due to various reasons is one of the areas where the potential of ICT can be put to use to its fullest extent. Therefore, instead of a surveyor making a rough sketch of parcels, which is prone to much of mapping errors (in orientation, size and shape of parcels) a surveyor equipped with a mobile mapping application on his tablet can mark the location of the parcel by taking a rough coordinate of the parcel standing anywhere in inside the parcel along with biometric details of owners and other stakeholders present during survey, a few photography of the parcels, building with the owners/occupants standing in front of the buildings and store all of them in the database.

Manual preparation of land registers – As part of the preparation of land records, there are various registers needed to be prepared. As a customary practice, this has been prepared in manual method earlier (hand written). This consumes much of the time and effort in the entire process. Possibilities of errors are also there due to the unscientific practices. Nowadays, this system has been transformed to computer assisted work and web enabled interfaces are also designed as part of this.

This activity is better carried out in the field together with the Demarcation Survey described above if the databases of Revenue, Survey and Registration Offices have been cleaned, linked and published as services, as described later in this report, so as to be accessed by the surveyors from his tablet through the mobile mapping application during the demarcation

survey described above.

The Surveyor who has access to every information maintained in the Registration office, Revenue office and Survey office pertaining to the parcel on which he is standing at that point of time in the presence of the owners/occupants/representative of the parcel, can verify, compare and mark for correction in consultation with the owner, any entries maintained by any of the above offices, pertaining to the said parcels, which the owners needs correction and has documentary evidence in support of his claim.

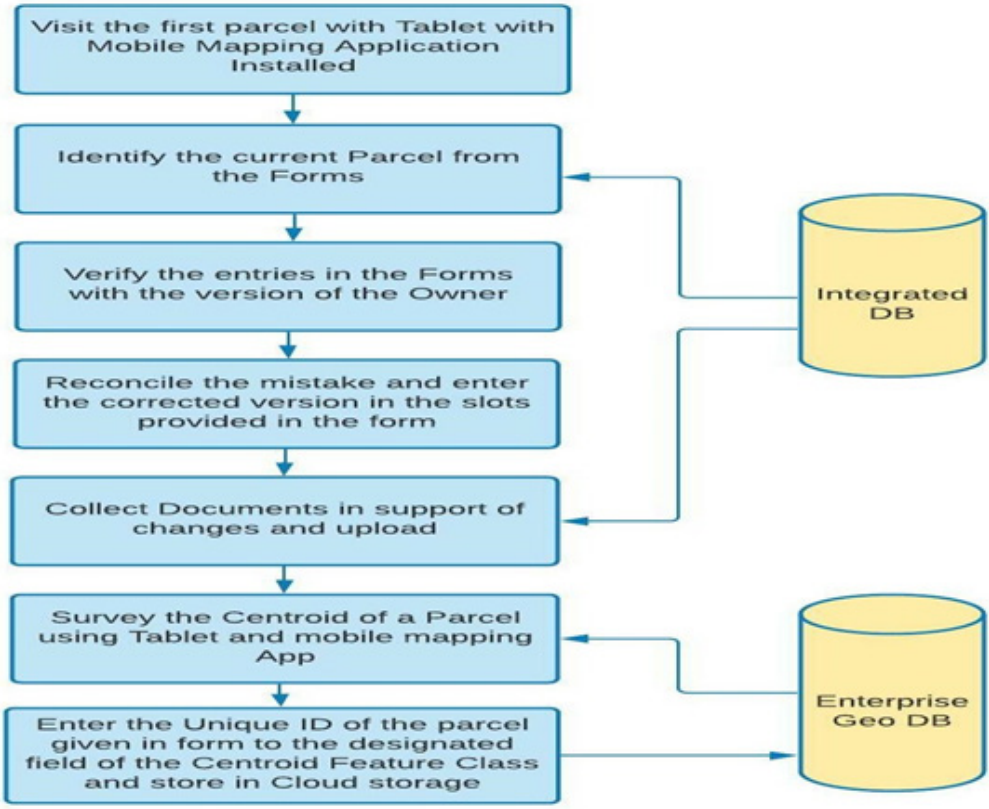
The Surveyor instead of correcting any of the entries maintained by any of the above offices, would satisfy himself with the claim of the owner and mark the corrections proposed by him in the slot provided for the same and would upload all the supporting documents then and there and would record his recommendation, in favour or against the claim made by the stakeholders, at the slot provided for the same, so that the competent authorities in the concerned offices listed above, can carry out the corrections in the database based on the documentary evidences collected during the survey and by following the due process.

The Surveyors before leaving the parcel would also enter the unique ID assigned to that parcel as available in the linked database referred above so that the concerned record get linked to the location surveyed by the surveyed surveyor as described hereinbefore.

The Surveyor would also educate the owner about the process to be followed in demarcating boundaries so that the same would get photographed if drone survey is resorted to and the ETS/Rover Survey would be able to survey those boundaries without any further consultations.

Data entry works for register preparations - After detailed ETS survey works, the textual data entry works (for the preparation of various registers like Land Register, BTR, TPR, Correlation Register etc) need to be entered with the available documents which are collected from the parties. Much of the work can be reduced by taking an online database of ReLIS and once the digital survey process starts, necessary updation can be made in the textual data. In this way substantial data entry work can be reduced. All the reports listed here can be generated from data collected (both spatial and attribute information) as described above. The workflow for the data collection is given below.

Figure 1 Workflow for the data collection of Land



Different Stakeholders - In Kerala Revenue, Survey and Registration departments are handling land related matters. Revenue and Survey Departments are under one ministry and Registration Department is under another ministry. If the three departments come under one ministry, policy decisions regarding land records integration matters may take quickly. Registration of land is happening without an approved sketch. After registration the application will be submitted to the Taluk office for Pokkuvaravu (Mutation). But many of the land holders will not show interest to apply for the pokkuvaravu (mutation) after registration. They will apply when they want to take a loan or want to sell, then only they will come for the mutation. So the land records could not be updated properly.

No maps for Register a document -While registering documents, SRO is not verifying the survey number, subdivision number and area scientifically. Registering the document with the information that is provided by the client are taken into consideration. It may sometimes lead to differences in survey number, subdivision number and area after resurvey with the document they registered. This may be attributed to the resurvey complaints many of the times. This can be solved by implementing a compulsory sketch for every subsequent

action. For this integrated land management system and updated land records are needed.

The workflow that should be part of the transaction of parcels without mutation and with mutation are furnished below along with the work flow for dissemination of various information related to parcels.

Figure 2 Workflow of parcels without and with mutation

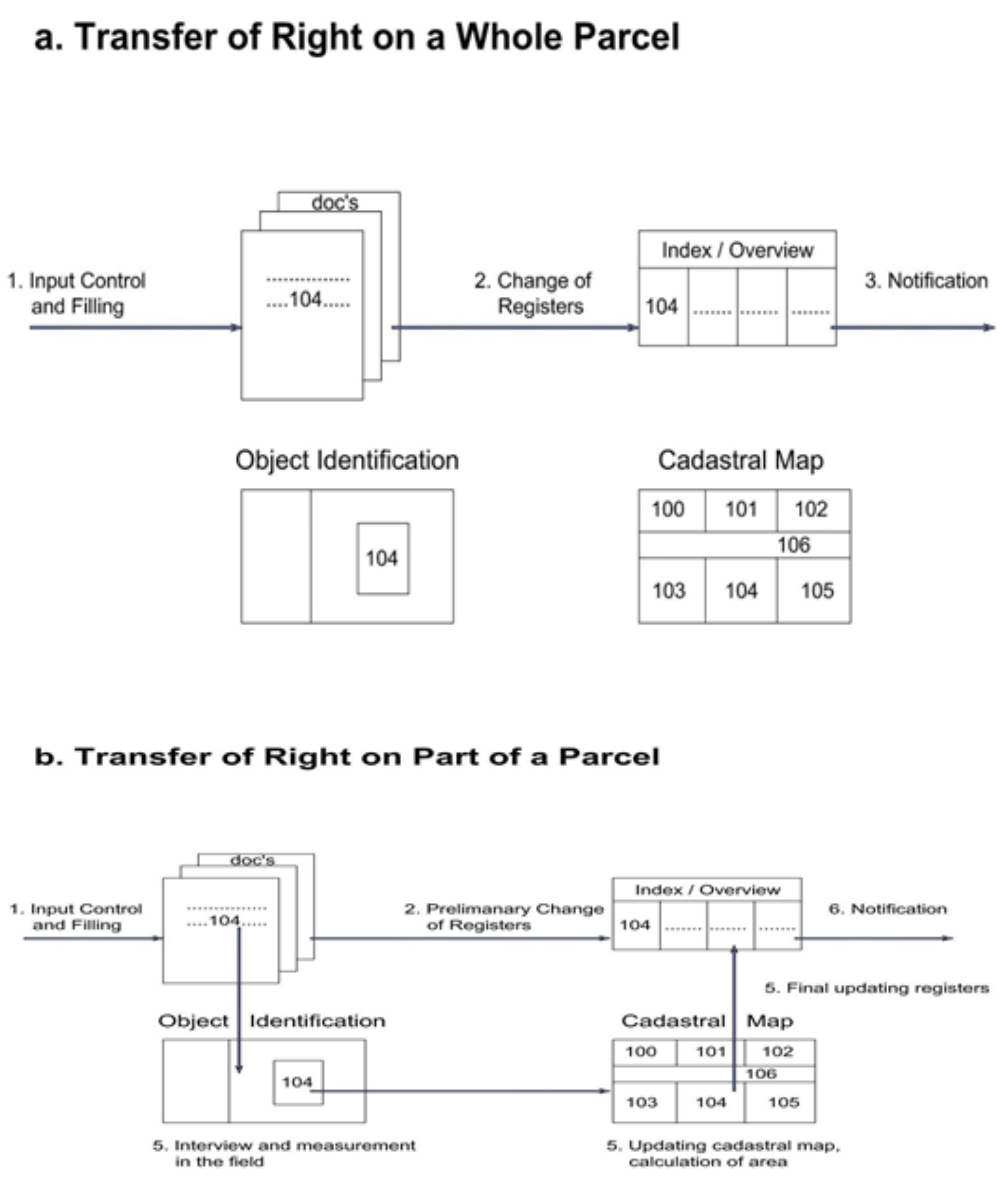
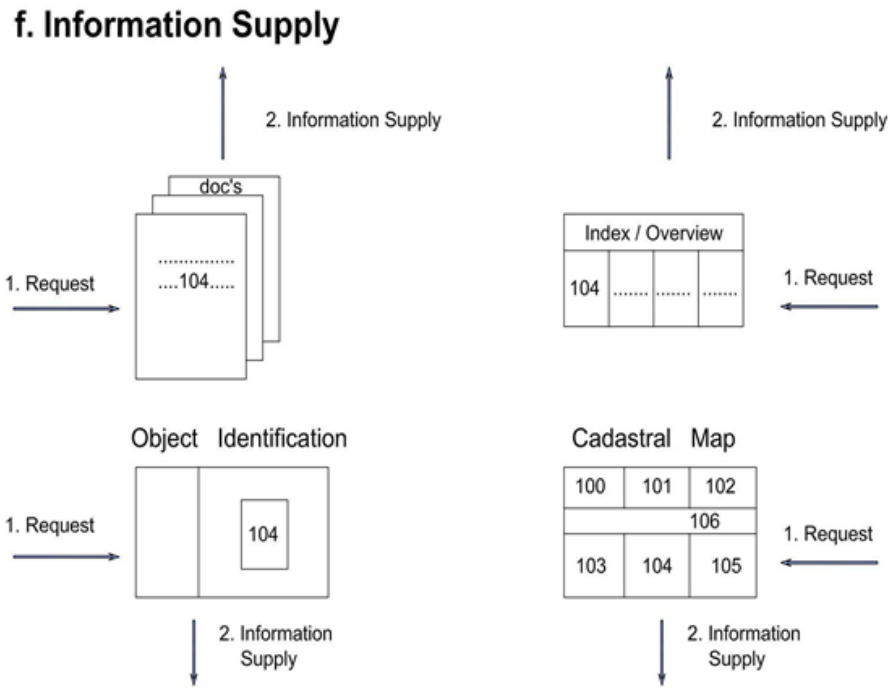


Figure 3 Workflow of Various Information related to Parcels



No unique standard -There are three different departments (Survey, Revenue, and Registration) involved in the land record management activities of the State. There is no unified/standard system or practice in place wherein single window operation of land transaction, continuous updation of cadastral data takes place. In order to effectively execute the integration of land records delivery among three stakeholder departments, a comprehensive system study needs to be conducted. There are different practices; systems exist within the departments itself. Different districts are practicing various systems. Hence unique standards and standardisation on land records practices need to be formulated.

In very simple terms the land registration system needs to maintain an accurate inventory of parcels and persons (natural or non-natural) between which there exists a relationship defining the rights, liabilities and responsibilities as described in the figure below.

Figure 4 Land Registration Systems - Basic Data Model of Rights

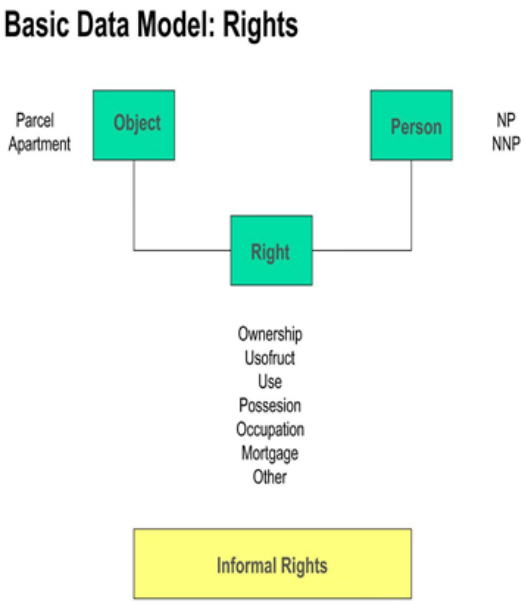
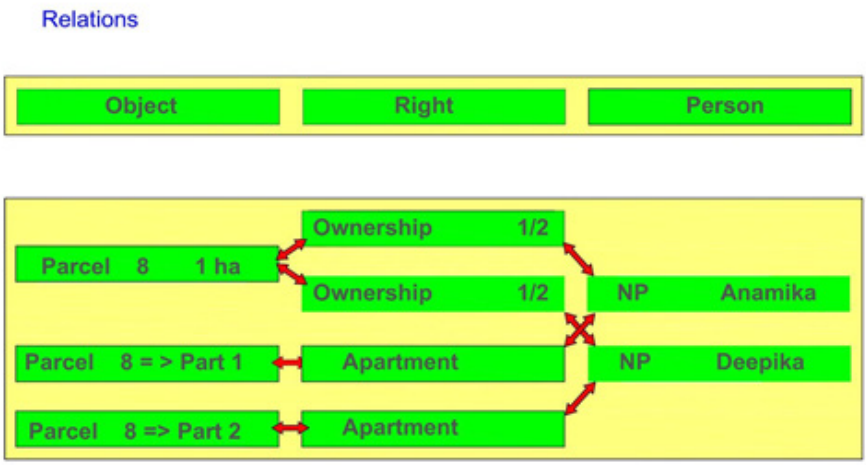
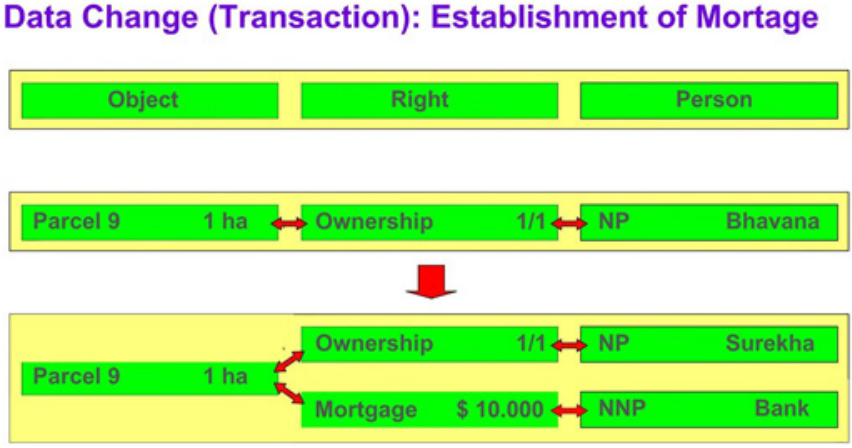
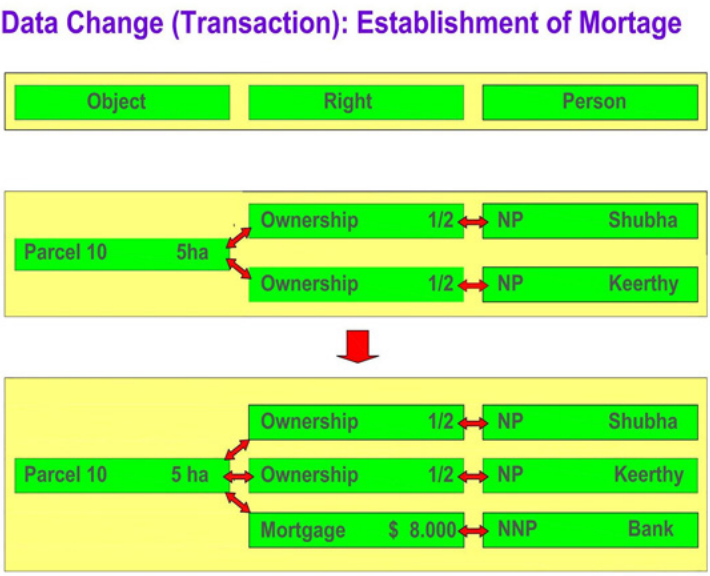


Figure adapted from the lecture notes of ITC, the Netherlands
And the database should get populated as and when such transactions get registered and recorded as a result of the transactions below illustrated.

Figure 5 Land Registered and Recorded in a Data Base



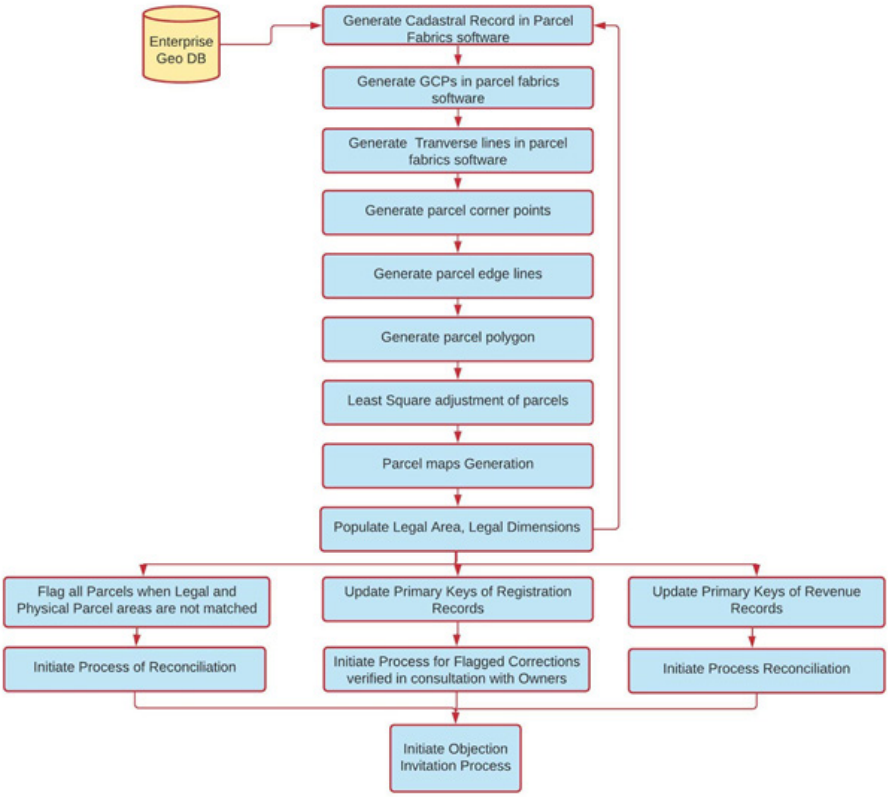




Figures adapted from the lecture notes of ITC, the Netherlands

Inadequate Software and workflow - Currently the online Pokkuvaravu (mutation) of land records are done through 'RELIS' software of the Revenue department. Land records updation (textural data only) is also entering in the said software. As the map data of the Survey department are not fully digitized and geo referenced, the integration of map data into the RELIS is not possible as of now. Similarly the 'OPENPEARL' software of the Registration department is also not linked with Survey data. The major hurdles faced in the integration process are the non-availability of digitized map data from the Survey department. Full-fledged IT infrastructure capable of implementing the process and workflow described below along with the workflows described later in this report should be established.

Figure 6 Proposed Work flow



Paper records - Almost 95% of the resurveyed villages are completed by using conventional methods (chain, crosstaff, and theodolite) and the resulting paper maps are in local coordinate systems. These records also have defects and inherent errors. As compared with the latest technology like ETS and DGPS, digital surveys will give mm level accurate data. Moreover, the survey was conducted long back in these villages and not updated so far. Since the records are in hardcopy nature and not having a universal coordinate system, digitization and bringing that into WGS-84 geo-coordinate standards are found to be an impossible task. In order to address the issue, the only way forward is the fresh digital survey of the entire State. Both un-resurveyed villages and conventionally surveyed villages are also to be considered for the digital survey to generate the land records into the same standard.

Shortage of Instruments - The Electronic Total Stations (ETS) are very limited in the department and the manpower is engaged into Land records maintenance wing, and other infrastructure development survey works like Pattaya survey, Purambook survey, Refixing survey, Forest survey etc. So the number of villages that can be undertaken at a time is very limited. Since the manpower and resources are insufficient to complete the survey of the entire state in a short period of time.

No updation in Maps -Proper updation is not happening in the master data. All the changes are reflected in the individual maps. In many of the times, map updation is not at all happening. All the changes cannot be updated in the master map due to the incorporation difficulties as paper records. Timely mother sketch updation only possible if it is in digital GIS seamless data with web editing facilities.

Geographical conditions - Crowded buildings and tall vegetations limiting to apply modern survey technologies like Photogrammetry, Ariel survey etc. in the state. As far as the Kerala terrain conditions are concerned, only field survey work is mostly possible. But it will consume more time and manpower compared to Photogrammetry, Ariel survey etc. Having said that, the possibilities can be explored with the latest technologies like drone survey, LIDAR sensors etc. Open areas like paddy fields, vacant lands, water bodies etc. are also other possible areas for drone techniques to cover.

Drone based survey, which is the cheapest mode of Survey among the three technologies such as ETS, RTK Rovers and Drone Photogrammetry, has many allied advantages such as dimensionally corrected photograph of the parcels showing all the manmade and natural features contained within and the neighbourhood of the parcels relative to which the lines and points representing the parcel sides and corners are overlaid, allowing all the stakeholders to correctly visualize the boundaries (being recorded and registered) with its relative position on the ground and satisfy themselves about the correctness of the boundaries being recorded and registered which would considerably reduce the anxiety of all stakeholders, reduce the possibilities of a litigation as mistakes get highlighted and get corrected as and when survey is carried out using ETS/RTK Rovers. This also has the potential to reduce the scope for any manipulation of boundaries, if any,. Further, having a dimensionally correct drone image in the background would help the surveyors to identify the errors in the survey while surveying itself in the form of misalignment between the survey boundaries being surveyed and the boundary features such as compound wall, fences which physically demarcate those boundaries on the ground.

Even if all the sides of a parcel is not visible due to tree coverage on the drone image, a part of the boundary visible on the image would be sufficient for the stakeholders to check and satisfy the accuracy of survey as long as the ETS/RTK Rover output are matching with the alignment shown in the Drone output relative to the natural and manmade features locations visible in the drone image.

Though the drone based photography would add a nominal percentage of cost to the project, the drone based survey has the potential to reduce the overall cost of the project manyfold and hence should be the integral part of the Digital Resurvey.

The Surveying workflow which would minimize the overall cost of Survey would be the one which would deploy the cheapest mode of survey (in this case the drone based survey) for covering maximum extent of the project area possible, then taking up balance survey with the next costlier mode of survey (RTR Rover in this case) and cover as much as possible from the balance area before deploying the costliest and most versatile of all the mode (the ETS) for surveying of those parts which could not be surveyed with any of the earlier

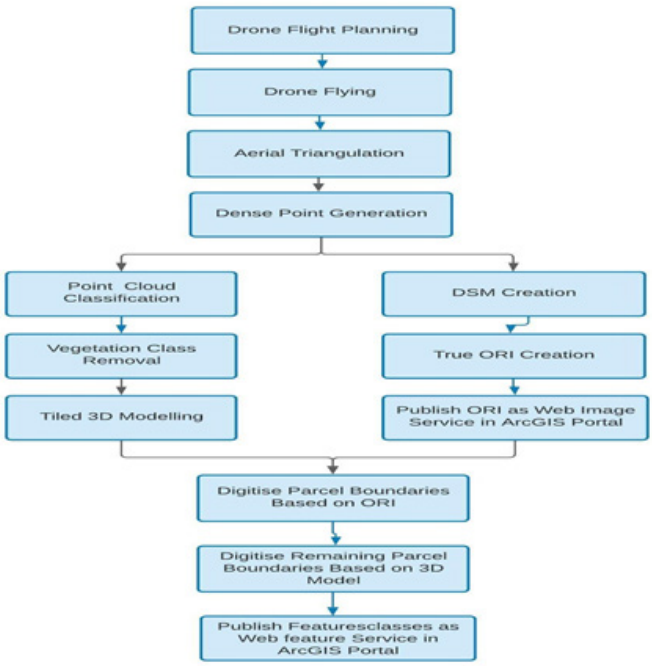
modes. Ascertaining and fixing the exact percentage of the total project area for each of the modes would not be possible at the beginning, but deploying the technology following the principles described above would ensure that the project is completed at the least cost.

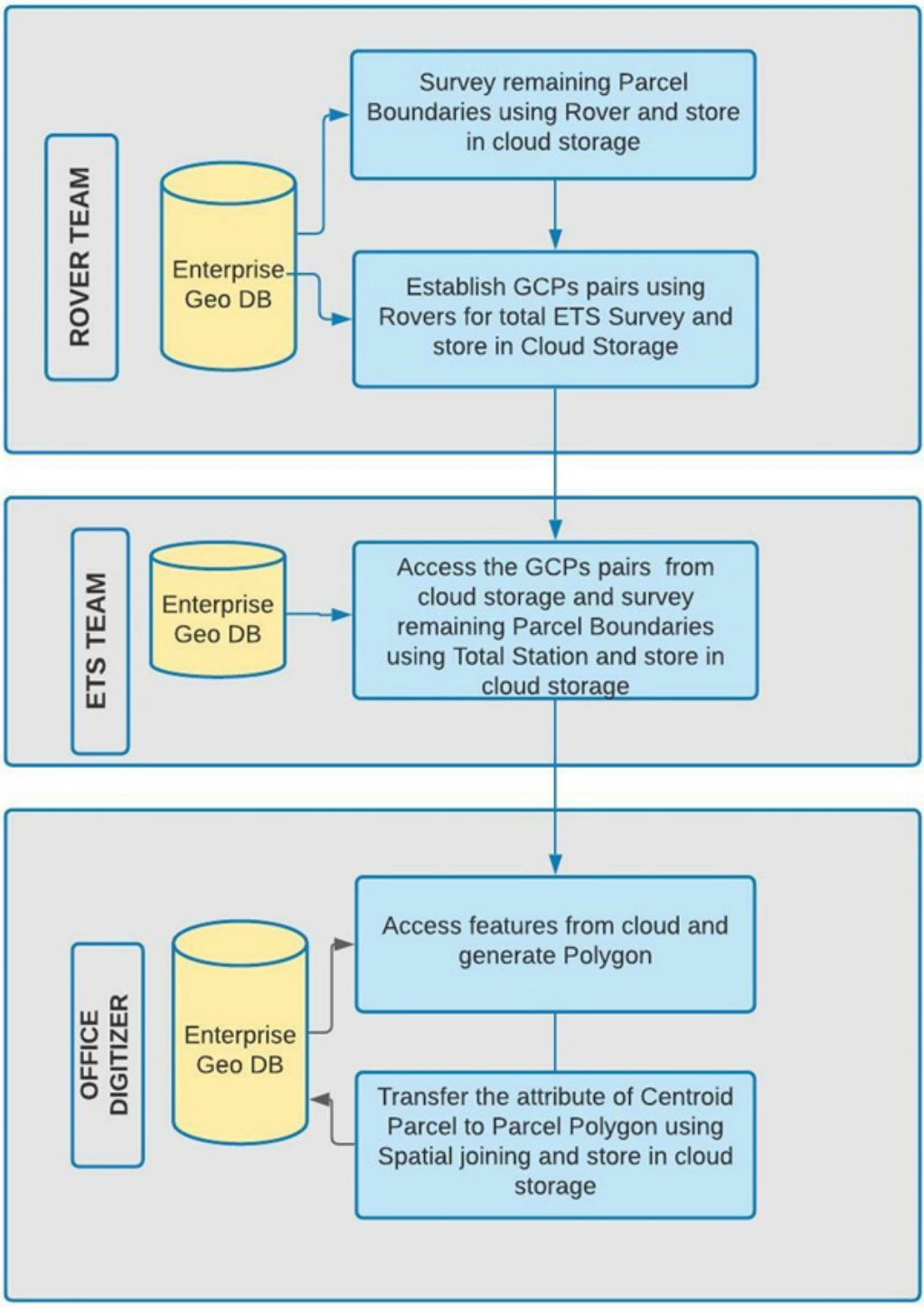
This would mean that one segment of the parcel boundary would get captured based on drone output sitting in the office by a digitizer, while the second and third boundary of the parcel may be surveyed by a surveyor with RTK Rover while the remaining boundaries by a second surveyor using ETS and the attributes information by a fourth surveyor as part of the demarcation survey.

For such an integrated survey operation to be successful, one of the essential requirements would be that the input and output of all the above operations performed by different personnel should be all stored accessed and updated from an enterprise database stored in a cloud storage.

This would also ensure that all the instruments (ETS, RTK Rovers, Tablets, Drones and Personal Computers in the Office) all are part of the single domain controller and are configured and access controlled centrally in client-server architecture. This would ensure that all field equipment are configured centrally, all accuracy parameters and tolerances are adhered to uniformly, all equipment are tracked, and managed centrally and utilized optimally and all the feature collection both in the field and office are collected following a predefined workflow and remain consistent throughout even though 3200 surveyors, as proposed, are deployed simultaneously all over Kerala.

Figure 7 Drone Survey




ROVER TEAM
Enterprise Geo DB
Survey remaining Parcel Boundaries using Rover and store in cloud storage
Establish GCPs pairs using Rovers for total ETS Survey and store in Cloud Storage
ETS TEAM
Enterprise Geo DB
Access the GCPs pairs from cloud storage and survey remaining Parcel Boundaries using Total Station and store in cloud storage
OFFICE DIGITIZER
Enterprise Geo DB
Access features from cloud and generate Polygon
Transfer the attribute of Centroid Parcel to Parcel Polygon using Spatial joining and store in cloud storage

Variation in Survey Number - The survey number recorded in the documents / title / revenue documents etc. often do not match the survey number of the actual land holdings. Although land tax is levied on such lands at the Village Offices without knowing the difference, this discrepancy is detected accurately at the time of resurvey and such landlords are unable to pay the land tax after the re survey.

Variation in Area – Without any scientific survey, registrations of lands are happening in the state. Therefore, the area noted in the document and the area of holdings which are scientifically surveyed and prepared on the basis of current holdings, are often inconsistent. Since the land tax is levied on the basis of the area of the resurvey when the resurvey records come into force in the revenue administration, this often leads to resurvey complaints.

Changes in the type of land –Wet land to dry land conversion has been a controversial issue for several years. In resurvey the reference record verified by the resurvey party is the back record (settlement registers or adangal register etc.). Agriculture land has been used as a house and ancillary activities for many years even if it is wet land in the previous registers. At the time of resurvey, there is no provision for changing the original tenure of land and hence it has been marked as "Nilam" in resurvey records and such marking by blindly adopting the year old reference records often leads to many resurvey complaints. In such cases, an effective land settlement mechanism is the ideal option to suggest.

Ongoing maintenance of records once the re survey is completed

Land Records Maintenance (LRM) in the digital environment is planned in the envisaged program. Digital subdivision survey by using RTK rover devices in the CORS infrastructure will reduce the effort and time of data updation in future. Pre-registration sketch in every land transaction will be ensured for timely updation of the map records. In this way, a real time updation of spatial records are envisaged.

Amendment in the existing act and rules

At present all the survey works are undertaken based on the Survey and Boundaries Act 1961. Since modern technology and standards are to be used, the existing Survey and Boundaries act has to be updated to meet the newer technology standards. Inclusion of new methods in the data capturing, legal validity of settlement, RoR etc. are also needed to be included in the new Act and Rules. Different set of Standard Operating Procedure for digital survey, settlement etc. are also to be prepared. Integrated Land Information System (ILIS) for the use of three departments are also to be taken care of by the legal framework.

Land use related issues

Un scientific land use planning is a clear-cut example for the frequent flooding and related issues in the State. Encroachment towards water bodies and other government land are also common in the floodplain regions and catchment areas. In order to conduct a systematic spatial planning, a seamless Cadastral map platform is highly essential. In this connection the digital survey program and ILIS and data sharing deserve the highest importance. The coordinate-based maps which are created post digital survey forms the base map for use of various departments for various purposes, like disaster management, hazard prone area mapping and above all this can be used for land use planning, town planning etc.

Refixation of existing fair value
With the changing time and land value, this is a high time to redefine the fair value. Along with the digital survey program, a settlement authority is also proposed with the authority of the Revenue department. By analysing the spatial data with proximity to amenities, land use classes etc, a retained fair value may be fixed by the Revenue department which ultimately increases the revenue to the Govt.

Intelligent parcel numbering system and smart card system
Instead of a traditional survey numbering system, a unique survey numbering system is proposed in the digital survey program and the technicalities are under discussion only at present. In this connection an SoP amendment team has already formed under the survey department with the chairmanship of Joint Director. After their study result, the same may be discussed in detail.

Customized system of land survey to all the stakeholders
During the digital survey operations, a village as whole will be taken into consideration and hence, a customized survey (for a particular geographic area other than village unit) is not a feasible solution. That will totally deviate the very purpose of the digital survey. In short, a demand based survey or customized survey is not a practical solution.

Capacity building of 3 institutions
In the changed environment, a comprehensive capacity building and training program to be developed early in the program. Funding to support the implementation of this plan has been included in the program budget. This will cater to the needs of three departments. Initial management training has been started for the Survey department higher officials at the Survey institute in ILDM campus.

Proper audit trail and responsibility on every edits
ILIS will implement a seamless workflow of completing different land transactions, guaranteeing full transparency of the process, record completeness, integrity, security and authenticity. This development will also include implementation of a web-portal, providing various e-services, interactive maps and useful statistics and Block chain assisted workflow. Development of a mobile application to implement similar features of the web-portal is considered under this Sub-Component as well.

Customized software and purchase of industry standard software
This aspect is in the discussion stage at present with NIC, survey instrument vendors etc. Once confirmed the solution will be intimated to the SPB committee.

Unique linkage (ID) between cadastral and legal document
A refined land record will be generated after the digital survey process and such 'single truth' of record has to be used by various authorities which includes the registration department. Linking of spatial records with the textual database is the key element which ultimately gives the facility to operate in the ILIS environment. Necessary policy decisions, institutional arrangement etc. are needed for such kinds of services.

The importance of a map which acts as an index as shown in the diagram below and the

importance of a unique ID which anchors all the information pertaining to a transaction on a parcel cannot be over emphasized. And any land registration systems which neglect these two components cannot succeed in ensuring a secured deed/title in a large system such as ours. Therefore maps and the unique IDs should be an integral part of the digital resurvey.

Figure 8 Cadastral basic Structure

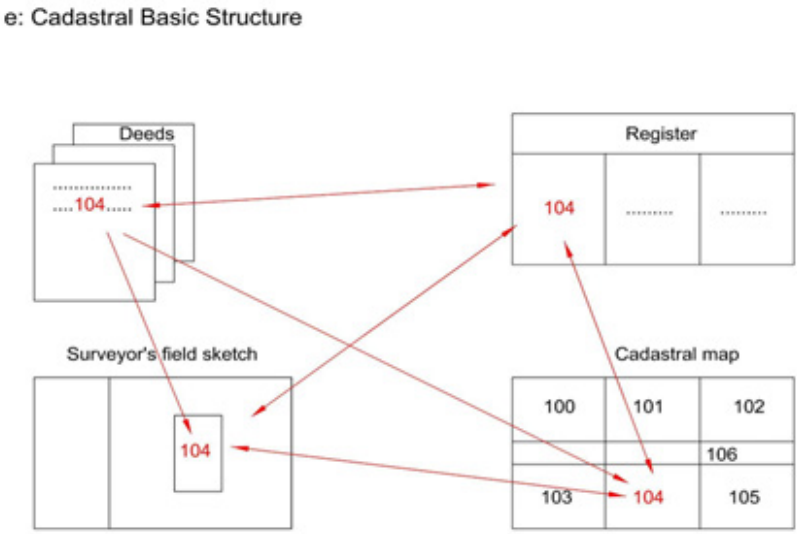
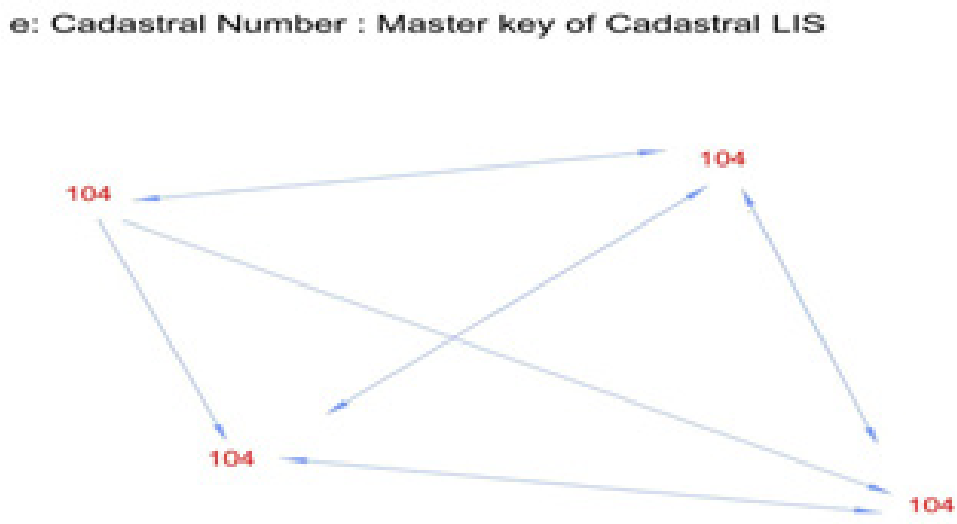


Figure adapted from the lecture notes of ITC, the Netherlands

Figure 9 Cadastral Number

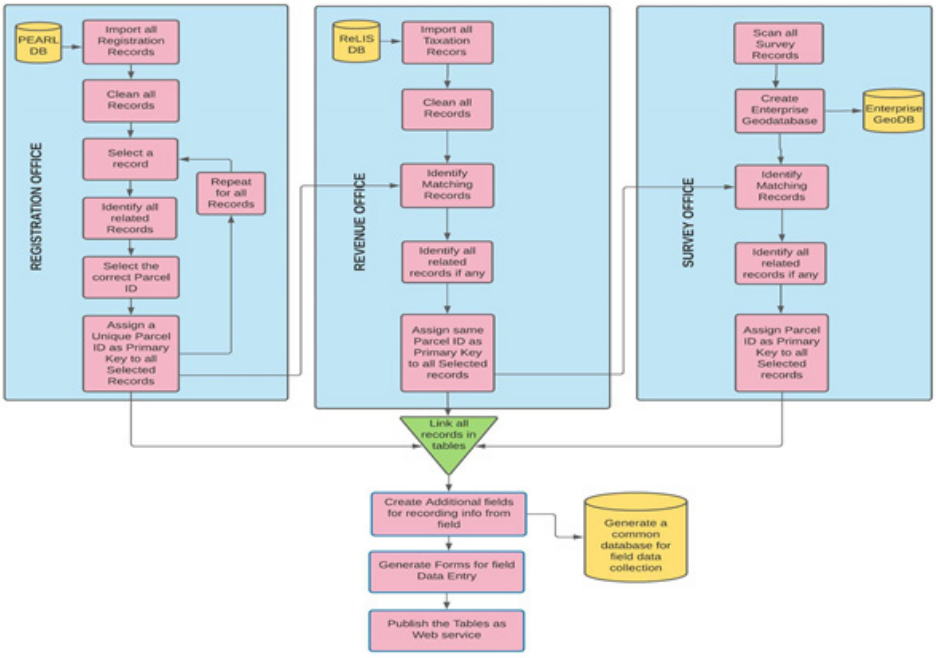


CHAPTER 6
MIGRATION OF THREE DATABASE TO A COMMON CLOUD ENABLED DATABASE FOR USE OF THREE DEPARTMENT

Today there are at least three different systems involved in managing land records – ReLIS, PEARL and e-maps. These three systems split land records into three pieces – registration, survey and revenue, where the taxation database is the source of ownership information. Although data exchange is implemented between these systems, it does not guarantee full synchronization between respective databases and data discrepancies can be found and produced. Moreover, conducting data analysis, completing land-related transactions or providing centralized e-services makes it much more complicated than having one integrated land information system, where complete land records are maintained. Once the digital survey is conducted, the different databases to be merged or refined as single truth and provide access to the respective departments with user access in the ILIS.

A workflow describing the cleaning and linking operation to be carried out for bringing all the records maintained by these offices into one term and linked each other in order to ensure that as and when each parcel get surveyed in the ground as part of digital resurvey fits well with all the databases and merges seamlessly into all the databases is given below. Once this linkage is established, the databases can be published as a service and the surveyors doing parcel to parcel surveys can access this information from their tablets and act upon as required during the survey.

Figure 10 Workflow of Cleaning and Linking Operations



Use of KSREC data for the digital survey program

It is really important to have a base satellite imagery of a high resolution nature for the preparatory activities of the digital survey. This will ease the survey operation in many ways. Identification of site situation before going to the field is important in the planning phase. In this connection, the high resolution imagery, vectorized cadastral map etc. will be very much helpful for the department. An official letter in this connection has already been submitted to the Govt. for sharing of such data to the department.

Prefer LiDAR platform for data collection

This technology needs to be experimented in the drone survey program. As part of this, a sample survey has already been conducted at Varkala village earlier and the result is awaiting from the Survey of India end. Once the result is acceptable in terms of its accuracy, the use of LiDAR and its scale up may be decided.

Use of mobile app for data collection

As part of resurvey process, the land register (details of land owners) is prepared manually. Only after the land register is prepared manually, other records which are essential for revenue administration are prepared using data entry applications (Resurvey Management System developed by NIC). This consumes so much time during the resurvey process. In order to avoid manual preparation of land registers and to do the live entry at the field, a dedicated mobile application can be customised such a way that it would handshake with ReLIS or other textual software. Pre-populated data from ReLIS and PEARL should be there in the data entry application. On the field this should be synchronized with the data captured by the mapping devices (RTK rover). Once the resurvey is over and published, the data should automatically be a part of the workflow to the ReLIS platform for the Revenue administration. In this way a lot of post processing operations can be eliminated.

Outsourcing/hiring for the resurvey program

Instead of outsourcing the survey work to an external agency, the manpower shortage is addressed through hiring of contract surveyors and helpers in the digital survey program. In this way the survey work can be effectively undertaken in the stipulated time frame.

Post Resurvey Mutation

In order to get a near real time updation of the survey plot mutation, it may be made mandatory that the registration of the plot can only be made with the submission of boundary Geo-coordinates and the georeferenced polygon of the plot, with the area reconciled. The same can be done smoothly once there is empanelled agencies across the state with strict standards and rates fixed by Survey and Land Records Department. The agencies can be ranked/ black listed based on the data quality and performance efficiency by Survey department. This will reduce the workload of the Survey Department and also reduce delay in the update of the survey bifurcations. The Survey Department will intervene in places where there is dispute.

APPENDIX-I

PROCEEDINGS OF THE MEMBER SECRETARY
STATE PLANNING BOARD
(Present: Sri. Teeka Ram Meena IAS)

Sub: - Formulation of Fourteenth Five Year Plan (2022-27) – Constitution of Working Group on **Land Records** – reg.

Read: 1. Note No. 297/2021/PCD/SPB dated: 27/08/2021
2. Guidelines on Working Groups

ORDER No.SPB/437/2021/PPD/W(3) Dated: 7/9/2021

As part of the formulation of Fourteenth Five Year Plan, it has been decided to constitute various Working Group under the priority sectors. Accordingly, the Working Group on **Land Records** is here by constituted with the following members. The Working Group shall also take into consideration the guidelines read 2nd above in fulfilling the tasks outlined in the ToR for the Group.

Co-Chair Person

Dr. A. Jayathilak IAS, Additional Chief Secretary, Revenue and Disaster Management, Housing, Room No. 201- A, 1st Floor Annex I, Secretariat, Thiruvananthapuram, Phone: 0471- 2333028, 2517214, E-mail: prl.secy.revenue@gmail.com

Members

1. Sri. Biju K. IAS, Commissioner, Land Revenue, Revenue Department, E-mail-lrcommissioner@gmail.com Mob: 854610000
2. Sri. Inbasekhar IAS, Inspector General of Registration, Registration Department, E-mail-igregn@kerala.nic.in, 9188959001
3. Sri. Seeram Sambasiva Rao IAS, Director of Survey and Land Records Survey and Land Records Department E-mail dslrkerala@gmail.com
4. Dr. P. V Rajasekhar, Director, Kerala and Lakshadweep Geo-Spatial Data Centre, Survey of India, Department of Science and Technology.E- mailpvr.soi@gmail.com, Mob:9483957957
5. Sri. Jayamohan V, Assistant Commissioner and Nodal Officer, IT Cell Revenue Department
6. Sri. Satheeshkumar P S, Deputy Director , Survey and Land Records Department, E-mail-satheeshsarangiad@gmail.com,
7. Dr. Suresh Francis, Scientist, KSREC, Trivandrum, sureshfrancis @yahoo.com, 9847467469.
8. Sri. Salim S, Assistant Director, Resurvey, Neyyattinkara, salimsmaths@gmail.com, 9446180002
9. Sri. Bineesh Antony, Project Manager Kerala Land Records Modernization Mission, E-mailbineeshantony84@gmail.com

10. Sri. Riza M M, Sub Registrar and Nodal Officer IT Registration Department, e-mail-regadmn@kerala.nic.in

Convener

Dr V. Santhosh, Chief, Perspective Planning Division, State Planning Board, drsanspb@gmail.com ,Chiefppdspb@gmail.com Mob: 8547434266

Co-Convener

Smt. K.B. Sreelatha, Joint Director, Perspective Planning Division, State Planning Board, 9645390896

Terms of Reference

1. Prepare a roadmap for the State in the sphere of modernisation of land records. This includes issues of survey, settlement and registration.
2. The roadmap mentioned in (1) should include financial estimates.

Terms of Reference (General)

1. The non-official members (and invitees) of the Working Group will be entitled to travelling allowances as per existing government norms. The Class I Officers of GoI will be entitled to travelling allowances as per rules if reimbursement is not allowed from Departments.
2. The expenditure towards TA, DA and Honorarium will be met from the following Head of Account of the State Planning Board "3451-00-101-93"- Preparation of Plans and Conduct of Surveys and Studies.

Sd/-
Member Secretary

To

The Members concerned

Copy to

PS to VC
PA to MS
CA to Member (Dr. R. Ramakumar)
Sr. A.O, SPB
The Accountant General, Kerala
Finance Officer, SPB
Publication Officer, SPB
Sub Treasury, Vellayambalam
Accounts Section
File/Stock File

Forwarded/By order
Sd/-
Chief, PPD, State Planning Board