Online Service Delivery in Survey Offices of Nepal

Amrit Karmacharya, Grishma Pradhan, Poshan Niraula, Prakash Ghimire, Sunil Prasad Rajbhandari, Suresh Manandhar, Subash Bhandari, Susheel Dangol
amrit.karmacharya@nepal.gov.np, mail4grishma@gmail.com , poshan.niraula@nepal.gov.np,,
mail4prakash2017@gmail.com , sunilrajbhandari9@gmail.com , suresh.manandhar@nepal.gov.np,
ersubashbhandari@gmail.com, susheel.dangol@nepal.gov.np

KEYWORDS

Online service, NeLIS, LRIMS, MeroKitta, e-land administration

ABSTRACT

The Survey Department of Nepal has started transformation of cadastral management from offline to centralized online system. This has enabled the department to provide the online services to the clients beyond the physical boundaries of Survey Offices. This paper elaborates the present status of online service delivery in different survey offices based on recent policy, institutions and their applications. Data analysis shows that Nepal Land Information System (NeLIS) supports basic norms and values of online service delivery effectively and has become a major milestone in the e-land administration. The provision of assigning different roles and sections inside a survey office has made the system more secure, reliable and responsive. Recently, directives of digital land surveying, mapping and administration for public service delivery have been formulated to address the legal aspect of service delivery. The provision of online application for map, field book and plot register print through https://www.merokitta. dos.gov.np has simplified the working procedure for general public and institutional users too. The expansion of this system in more survey offices along with additional and more advanced features are necessary. Similarly, legal provision of data sharing between Land Records Information Management System (LRIMS) and NeLIS in a meaningful way is also essential in the days to come.

1. INTRODUCTION

A Land Administration System (LAS) with its cadastral component is the infrastructure that facilitates the implementation of land policies to attain sustainable development. Therefore, the availability of a digital, up-to-date and easily accessible cadastral database has become a primary requirement for undertaking efficient land administration and/or spatial planning decisions for any country (Sengupta et. al., 2016). The Bhoomi (meaning land) project for online delivery of land records in Karnataka, shows that making government services available to citizens in a transparent and efficient manner can empower them to challenge corrupt and arbitrary bureaucratic action (Chawla & Bhatnagar, 2004). However, to achieve betterment in managing land, there is a need for accurate, reliable and up to date information about land. Such proper land management policies however remain a challenge to most governments in African nations (Kurwakumire, 2014).

In the recent development, Survey Department

of Nepal has developed client-server system architecture where application and database servers are managed in a central server hosted in Government Integrated Data Center (GIDC) and clients access these servers to provide the service (Dangol et. al., 2020). In Nepal, at present, district level survey offices have their own server within the office premises and conduct daily office activities through desktop applications run on each computer. There are 126 district survey offices, 5 special survey offices and 1 digital cadastral survey office running in Nepal. The office applications were developed as extensions of ArcMap software which is proprietary. These local servers were maintained in the office. Databases were stored in it and the individual computers accessed these servers during the transaction. Most offices did not have skilled manpower to operate these servers and required assistance from the department. Further, the applications were not updated and it would encounter problems with newer Operating Systems. The business process and the transaction tracking mechanism of the application could be bypassed from the underlying system. This was a huge security issue. Hence the necessity of a system which could address these problems was felt.

2 ONLINE STATUS ANALYSIS

2.1 Policy Status

Recently, *"Directive on digital technology-based land surveying, mapping and land administration service delivery, 2078"* has been formulated. The major provisions of current directive are as following:

1) Varieties of service delivery:

   Cadastral map print, field book print, plot register print, boundary delineation and online revenue payment services shall be available.

2) Different types of service user:

General users do not need to create user accounts. Loan Providing Institutions and local level governments need to make a user account through merokitta webapp. "Merokitta" translates to "my parcel" in english.

3) Online Service Delivery:

   Notification of process, service delivery progress and status, revenue payment, final delivery information shall all be performed using online means.

4) Data security:

   Digital data must only be stored in storage locations determined by the Nepal Government. Internal users shall get access to data according to their roles. External service users will be verified by internal users before service delivery.

2.2 Institutional status

2.2.1 Survey Department

The IT unit of the Cadastral Survey Division in the Survey Department is working as a major implementing and monitoring unit.

2.2.2 GIDC

The Government Integrated Data Center acts as a data bank of information and assists in computerization of records at governmental offices. GIDC provides physical server hosting for government institutions including the Survey Department. GIDC hosts the database server, application server, and network point for various ISPs providing intranet services.

2.2.3 Survey Offices

Survey Offices provide cadastral services through NeLIS and MeroKitta applications. MeroKitta is a public access module of NeLIS. It provides an online interface to general public and external users to get cadastral maps. It is currently a web-based application and works best on newer versions of all browsers. It can be accessed from https://merokitta.dos.gov.np.

NeLIS is a desktop application used to carry out daily activities of services like Map Print, Parcel division, Parcel Update and all other technical activities of land administration services by the survey office. It works only within the intranet network. Internal users are provided their own respective username and password. They can access the application according to their assigned roles and assigned sections which are assigned and managed by the respective office admin (Office Head).

2.2.4 Internet Service Providers

ISPs provide intranet connectivity between survey offices, GIDC and Survey Department. Dual ISPs are used to ensure network redundancy.

2.3 Application Status

2.3.1 NeLIS:

Unlike the predecessors SAEx, Parcel Editor (Dangol et. al., 2020), which were based on ArcGIS platform, NeLIS is a client-server based standalone application. It is locally developed, built using Free and Open Source Software (FOSS). Due to its custom and focused development, NeLIS follows the predefined survey office business process and it can easily and quickly implement future changes in business process.

New features of this application include the concept of sections which was not available in previous applications (SAEx, Parcel Editor). Data access is controlled by office ID , sections and roles, preventing unauthorized access and use of data. Data access and operations are tracked. Provision for adding owner/tenant information is available. Latest feature is provision for multi-parcel split i.e. applying spatial operations on two or more parcels as if they are single.

NeLIS identifies each transaction with a unique CaseId. CaseId is 15 digits long code in following format: xxxxyyyyzzzzzzz where

xxxx - 4 digit office code (2601)

yyyy - 4 digit fiscal year (7879)

zzzzzzz - auto increasing number.

This CaseId is unique over the whole system. This is used to transfer the transaction details between section, check unit, verification unit and vice versa. It is used to track work status and progress and can also be used to get an overview of whole transactions in the future. By default, the NeLIS work status window only shows cases from the last 15 days.

2.3.1.1 NeLIS Desktop Application

There are two clients in NeLIS client -server architecture. A thick client to carry out the processing of the heavier tasks of spatial management. These includes:

- Map View
- Map Print
- Georeference
- Map Update (Segments / Construction)
- Split Parcel
- Update Attribute
- Spatial Update
- Trace Map Print
- Merge Parcel
- Multi Parcel Split

NeLIS thick client works best on the Windows 10 platform. It is restricted to departmental intranet networks. To run the NeLIS client, the application has to authenticate with the server using Network code, office code and username/ password. Without these the application does not start. Furthermore, each computer which runs a NeLIS client has to be specially configured to run inside the departmental intranet. Other computers (e.g. computers of account, admin section) do not access the departmental intranet and have no access to NeLIS data. Beyond these, the NeLIS client

also includes a software auto update system. This helps to deploy new features, release bug fixes, and maintain consistency across the whole network automatically.

Besides this, NeLIS categorizes transactions in categories and progress states. Categories can have sub-categories too. Existing categories in NeLIS are as follows:

1. Parcel Unification
2. Parcel Split
3. Parcel Print (trace)
4. Land Registration
5. Map Update
6. Map Print
7. Map Amendment
8. Field Book/ Plot Register
9. Demarcation
10. *Halsabik*

The progress states are:

1. Registration Incomplete
   All the transactions that have been started to register in the survey office but were not able to complete are in this state. Registration process can be performed by any internal user.

2. Registration Complete
   The transactions that have been completely registered are in this state. It requires the date of registration, type of transaction and the task assignee name, section and parcels. After registration is completed a unique case id is generated for that transaction. Then the transaction state changes to Split/Merge/Update in Progress and only users with proper section and role can view and work on them.

3. Split/Merge/Update in Progress
   Only users assigned to the section can access the transaction. In this stage surveyors will apply spatial operations and update the attributes accordingly. Spatial tools are the same as in previous applications (one point and area, move line and area, join points, offset distance, general editing). An added provision is multi-parcel split, in which the parcels are temporarily merged and spatial operations are performed in the merged parcel. At the end the operation on the merged parcel is transferred to the original parcels. This window tracks and displays which and how many parcels are formed from the original parcel. This provides an additional checking mechanism than previous systems. Finally, when the surveyor completes and submits the transaction for further processing the status is changed to Split/Merge/Update Completed.

4. Split/Merge/Update Completed
   Authorized users (surveyors and officers) can view cases in this state. The users have to have the same section as the case for cases to be visible. Users will have to check and submit comments for each original parcel. They may also submit a rejection of the case with appropriate comments. Rejected cases will move to Split/Merge/Update in Progress state.

5. Checked
   The transactions that have been checked are in the checked state and are waiting for approval. After approval they will appear on the main map. Hence, approval can only be done by authorized officials. The process is the same as checking. Rejected cases will move directly to Split/Merge/ Update in Progress state.

6. Approved
   Approved state is the final state of transactions and makes the tasks permanent in the database. It is only for viewing and references.

7. Rejected
   If the transaction is rejected from checking or approval staff, then the transaction appears in the rejected state. The rejected transaction needs to be corrected and

resubmitted for check. Rejected cases will show additional options to view the rejection comments.

2.3.1.2 NeLIS Web Application

Another is a thin client to manage computationally lighter tasks. It works with any modern browser which is connected to the departmental intranet. This app facilitates following tasks:

- User / Staff Management
- Roles and section management
- Reporting
- Transaction detailing
- Public modules handling
- Field Book Image Management
- Plot Register Image Management
- User Transfer

2.3.2 MeroKitta:

MeroKitta is a system that provides online map printing and field book and plot register print services. Thus, can be obtained by providing necessary details of landowner (i.e. land ownership certificate, citizenship certificate) and detail information of parcel (survey office, vdc, ward, sheetno and parcel no.) through https://merokitta.dos.gov.np/ webpage. After submitting the application, OTP will be received via SMS to the mobile number provided by the service recipient. The application provided by the service recipient will be verified by the concerned survey office. If the application of the service recipient is official, the office will request for the payment of revenue and if it is not seen as official, the recipient will receive an SMS saying "No service flow" along with reason. The client must pay the revenue through online or by generating revenue voucher and then visiting bank, upon which the link of the document (map print) related to the service requested by the client will be made available for download through the same webpage https://merokitta. dos.gov.np/ for 15 days.

This service can be divided into two categories according to the user.

- Single Client (Landowner)
- Loan Providing Institutions and local level governments

In case of a landowner, he/she can get only his/her map print related to his/her land. The institutions and local levels of government can get the map print of bulk land parcels but must provide necessary documents of each land parcel. Also, such users need to have their own user account created for the services.

2.3.3 Network Monitoring

As discussed before, a functional intranet network is crucial for NeLIS operation. Although every office has two intranet networks for redundancy, it is important to monitor the network situation. For this, network monitoring tools have been deployed. This is a vital tool in identification, communication and coordination for resolution of network issues that arise from time to time.
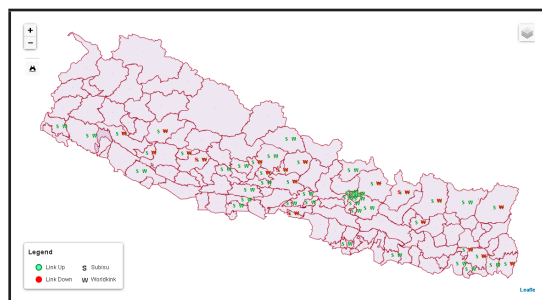
Figure 1: Network status in survey offices

3. CURRENT STATUS

Till the end of Asar 15, 2079 B.S., NeLIS and *merokitta* had been implemented in 50 survey offices. The number of transactions for each transaction type that has performed through NeLIS has been tabulated below.

Table 1: Status of transactions in NeLIS

Transaction types	Count
Copy of Field Book and Plot Register	15
Field Visit	26
Hal Sabik	7660
Map Amendment	830

Map Update		44435
Merge		23093
Parcel Split		142998
Print Map		400283
Print Parcel		88
Grand Total		619441

The pie chart in Figure 2 shows the percent of transactions for each survey office that has been performed through NeLIS. It shows that survey office Kalanki has the highest (25.11%) and survey office Lalitpur has second highest (16.36%) transactions performed through NeLIS.
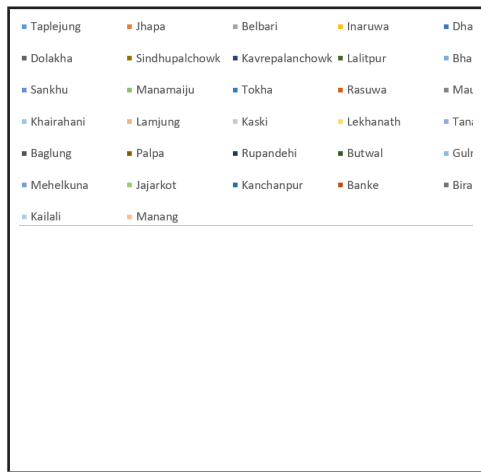
Figure 2: Pie chart showing transactions in 50 survey offices
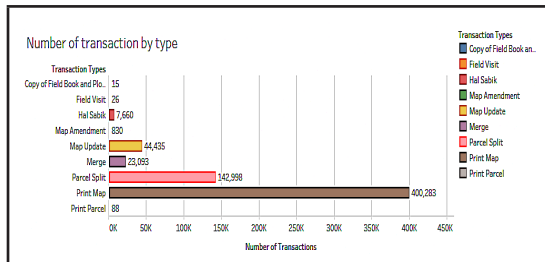
Figure 3: Number of transactions by type

Map Print, Parcel Split and Map update are the transactions with highest frequency. Further investigation of the transaction by month and by the survey office is done. Figure 4 shows the number of transactions have increased after July 2021. Survey Office Kalanki, being the first office to implement NeLIS, is leading in number of transactions. SO Lalitpur is in

runner up position, while SO Bhaktapur and SO Chitwan are competing closely.

Figure 4: Number of Transaction by Transaction Type and Quarter

Figure 5: Average Time Taken to complete transaction by type

Figure 5 shows that *Halsabik* is the most time-consuming process. Map print is also a fast process but some transactions include parcels

which are not updated or run into other errors. These issues take longer times to resolve hence these transactions skew the average to higher value. With more time and bug fixes, it is expected to have less of these and the statistics should reflect the real situation. Figure 6 shows the comparative extent of time taken by *Halsabik* to other transactions. *Halsabik* takes more time than all others combined.

Figure 6: Tree map of Average Time Taken to complete transaction by type

(A)

(B)

Figure 7: TimeLine of Data Migration (A) Fiscal Year 77-78, (B) Fiscal Year 78-79.

Kalanki, being the pilot implementation
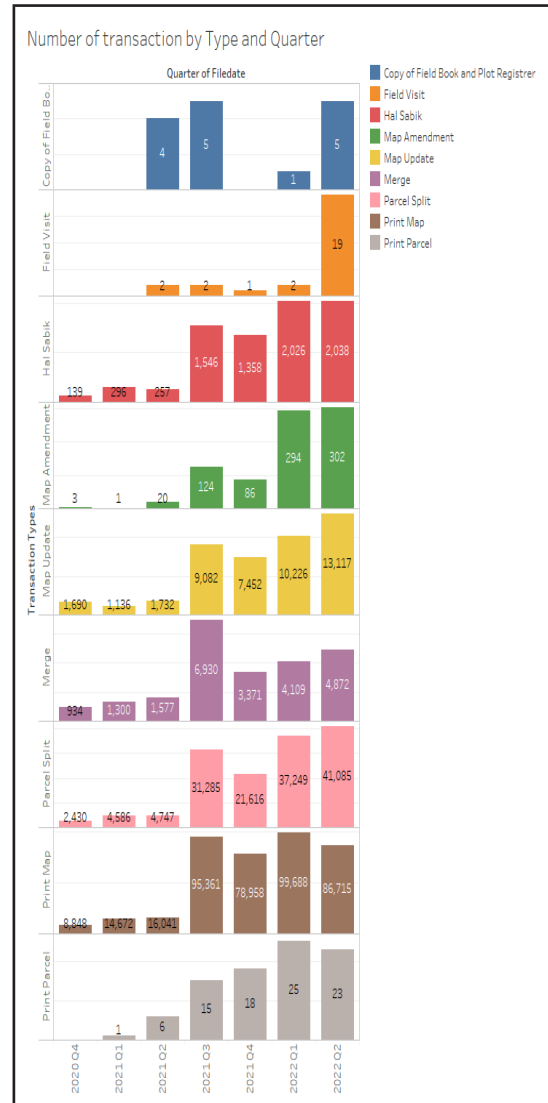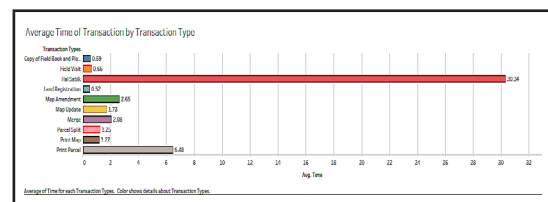
office, started migration in October 2020. It went through lots of testing and iterations of migrations and software. After 3 months, it was successful. The results, improvements and learning from Kalanki were then carried over to Dillibazar and tested in March and then to Bhaktapur and Chabahil in April. Then in geometric progression Chitwan, Lalitpur, Manamaiju and sankhu followed next. Some data are updated and migrated in later time in Lalitpur and Kalanki.

3.1 Gap Analysis

As this system is currently in the development phase there are many needed improvements. Some of the gaps on this system are:

- **Infrastructure**: This system is dependent on the intranet service, needing to create a new network on every survey office and replacing the old network.

- **Data**: With passing time and different situational complexity in survey offices, survey offices have amended the data structure to address the office's requirements. Due to this, database in survey offices may be inconsistent than the original structure (like having ward number: numeric and textual like 1,1ka, parcel numbering done based on sheet in some place and ward on some places)

- **Interoperability**: NeLIS is based on the open source and these are best on the windows 10 as the library used are the latest packages. But this system can also be operated on other versions of windows like windows 7 or 8, even on ubuntu but there needs to be some updates or additional software needed to operate smoothly.

- **Integration of NeLIS and LRIMS:** Both LRIMS and NeLIS are the land administration-based applications, the major differences between these applications being the mode of the operation. For a single service, customers

need to visit two different offices operating two different systems. In order to provide the efficient land administration services, these systems need to be integrated so that customers do not need to carry the paper documents from one office to another.

4. CONCLUSION

NeLIS is the web-based application developed by the Survey Department for the management of the cadastral data. This application replaces the existing system and performs all the cadastral data related operations from a single application. This makes current cadastral data seamless with a centralized database system. It also provides better security of cadastral data along with fast, reliable and effective service delivery. The provision of recording of all user activities through the system enhances transparency, responsibility and accountability.

5. RECOMMENDATION

Expansion of the system all over the country is recommended in coming years. The improvement of the network is essential for stable, reliable connection with the central server. The establishment of a backup server and disaster recovery server in each province will help in case of system failure. As both NeLIS and LRIMS use parcel as the base entity, integration of their system is convenient in near future. Integration with the spatial data of other public institutions like

department of road, forest, Nepal electricity authority, national planning commission is also recommended. NeLIS can also be the backbone of NSDI.

REFERENCE

Sengupta, A., Lemmen, C., Devos, W., Bandyopadhyay, D., & Veen A. (2016). *Constructing a seamless digital cadastral database using colonial cadastral maps and VHR imagery – an Indian perspective,* Survey Review, United Kingdom 48(349), 258-268

Chawla, R., & Bhatnagar, S. (2004). *Online Delivery of Land Titles to Rural Farmers in Karnataka, India,* Scaling Up Poverty Reduction: A Global Learning Process and Conference Shanghai.

Kurwakumire, E. (2014). *Digital Cadastres Facilitating Land Information Management.* South African Journal of Geomatics, 3(1), 64-77.

Dangol, S., Joshi, P., & Dahal, T. P. (2020). *Online Service Delivery in Survey Offices: Step towards e-Land Administration.* Journal on Geoinformatics, Nepal, 20(1), 67–74.

Author's Information

Name	:	Amrit Karmacharya
Academic Qualification	:	Qualification: Master of Science in GeoSpatial Technologies (UJI, WWU, UNL)
Organization	:	Survey Department
Current Designation	:	Survey Officer
Work Experience	:	8 years
Published paper/article	:	2
E-mail	:	akarmacharya8@