Land Parcel Information System Using Free and Open Source Platform

Pawan THAPA and Narayan THAPA, Nelpal

ABSTRACT:
Paper is still in use for parcel information of a particular landowner in developing countries. This design parcel identifier prototype can support the external user to retrieve information about the landowner, land use, parcel boundaries, and land valuation in real-time. Use free and open-source software, QGIS, and leaflet for digitizing and creating web applications. This application provides the respective landowner's up to date parcel information, which reduces land issues and conflict regarding a parcel's boundaries. It will support the efficient and effective land administration and revenue collection.
Keywords: Parcel, Information, Boundaries, Web application, Cadaster

Land Parcel Information System Using Free and Open Source Platform (10910)
Narayan Thapa (Nepal)

FIG e-Working Week 2021
Smart Surveyors for Land and Water Management - Challenges in a New Reality
Virtually in the Netherlands, 21–25 June 2021

Land Parcel Information System Using Free and Open Source Platform
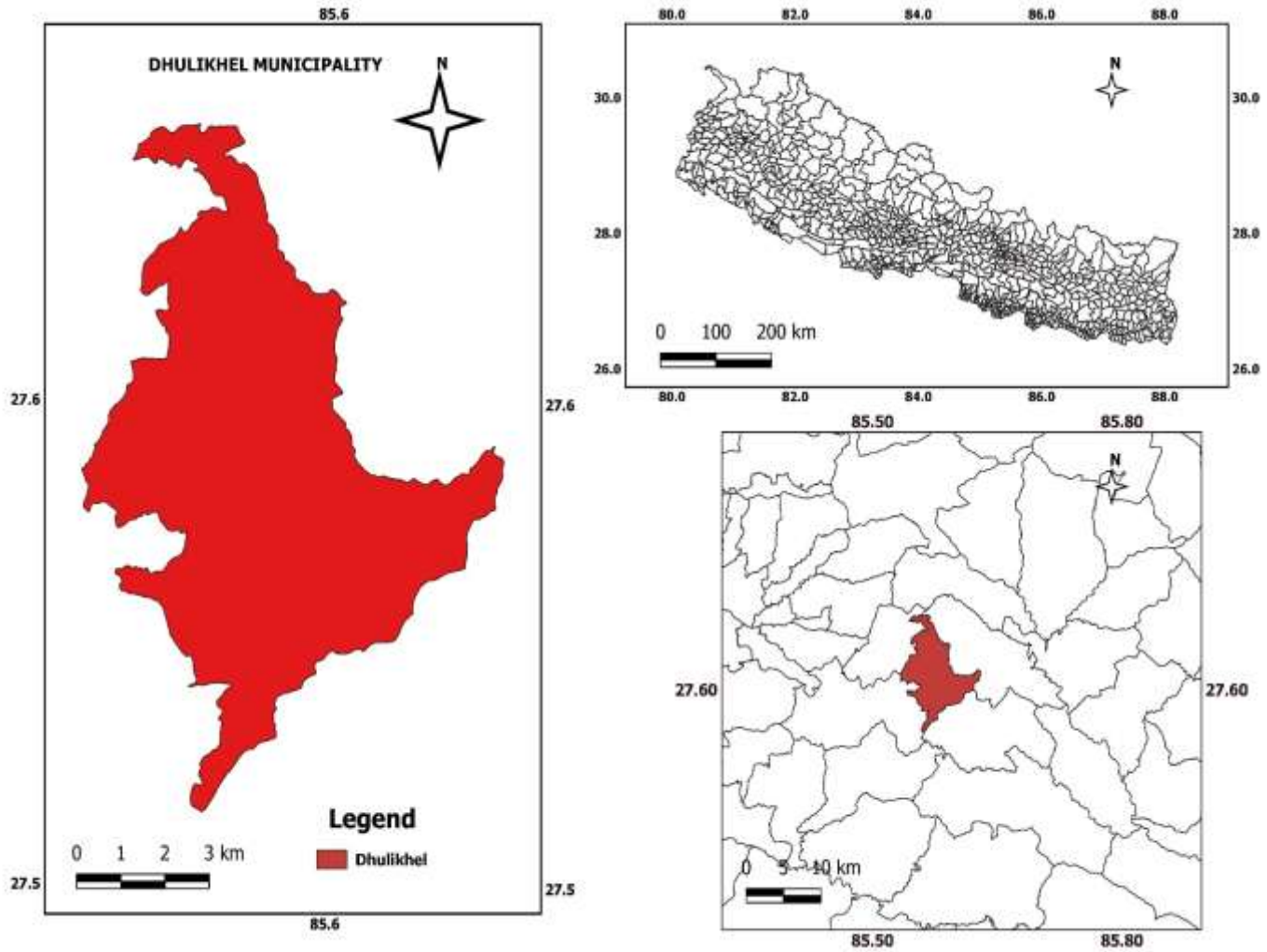
Pawan THAPA and Narayan THAPA, Nelpal

1.Introduction:

Developing countries face increasing land disputes in the absence of an updated parcel information system—this system stores georeferenced parcel ownership and its value (Council, 2007; *Fit-for-Purpose Land Administration (Updated)*, n.d.; Forkuo & Asiedu, 2009) Unique parcel identifier connects cadastral records with land use, ownership, boundary, and value that facilitate data sharing among different users. Three primary forms are name-related identifiers, abstract or alphanumeric identifiers, and location identifiers that depend upon the system and the users. Land parcel information plays a significant role to store the parcel related information systematically. Department of the Land Information and Archives, Nepal, developed a District Land Information System, Spatial Application Extension, Image Reference Management System, and Plot Register Management System for handling the spatial and non-spatial data(Deininger et al., 2010; Lemmens, 2011; Sucaya & Ary, 2009; Thapa, 2020). Such a system also used unable to address land owner's conflicts. One of the potential reasons is to retrieve information about the land needs to visit the District Survey office for spatial and District land revenue office for non-spatial data. As a result, the process is time-consuming and complicated, which increases its cost and reduces access to poor people. The land parcel information system will combine this land-related information in a single digital platform to share and access information regarding land use, ownership, and value to resolve these issues.
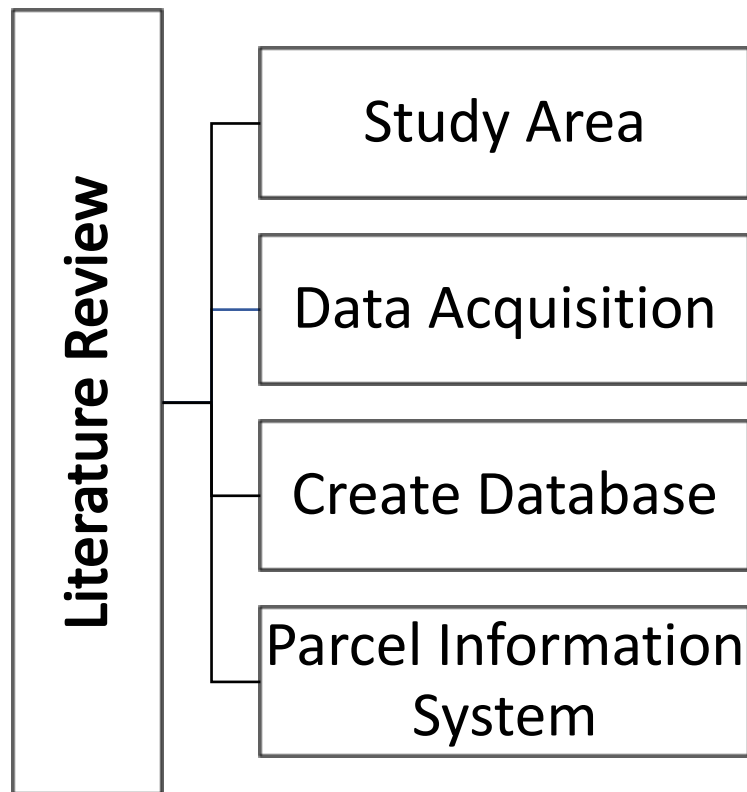
2. Study area:
Dhulikhel Municipality

In the middle of 2010, the cadastral resurvey using total station named digital cadastral system was started in Dhulikhel municipalities (SD, 2011); however, this is not fully digital as output printed paper map verification of survey officer provided to the landowner. It's semi-digital and still ongoing in this municipality. Lack of continuous update of the digital database during a transaction has made the database out of date. This developed system will use integrated images from satellite and drone to update the parcel information with a participatory approach for attribute filling and adjudication.

Land Parcel Information System Using Free and Open Source Platform (10910)
Narayan Thapa (Nepal)

FIG e-Working Week 2021
Smart Surveyors for Land and Water Management - Challenges in a New Reality
Virtually in the Netherlands, 21–25 June 2021

Figure 2.1: A Study Area Dhulikhel Municipality for this research work

Land Parcel Information System Using Free and Open Source Platform (10910)
Narayan Thapa (Nepal)

FIG e-Working Week 2021
Smart Surveyors for Land and Water Management - Challenges in a New Reality
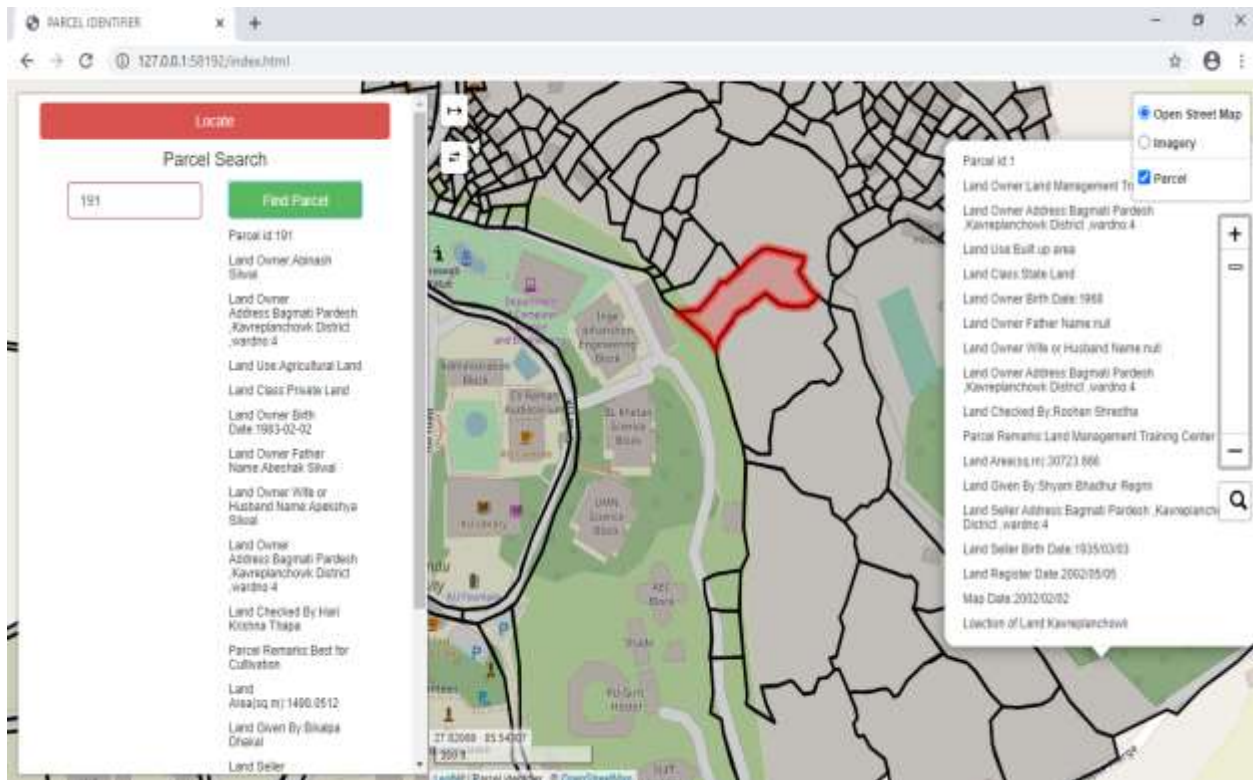Virtually in the Netherlands, 21–25 June 2021

3.Methodology:

Figure 3.1: A methodology for this Land Parcel Information System

At first, the study area is chosen Dhulikhel started a new digital system in 2010, focusing on field survey. However, they disregard office work entirely, i.e., how this information will share and store with landowners. The prototype design will address keeping and sharing land parcel information through integrated web and map applications using free and open source. Firstly, they acquire aerial photos of the selected site, scanned with a high-resolution scanner, and are then georeferenced using the control points. Then Orthophotos and mosaics images produced using the QGIS. Then parcel boundary information is extracted, displayed on the application. For the successful implementation of the cadastral system, field verification processes are essential, carried out through a participatory approach. The digital cadastral database, along with the attribute data, is prepared- office and fieldwork through digital will keep up to date per land parcel information changes. This information will fulfill the public's demand for a modern system that supports transparent and proper land administration.

Land Parcel Information System Using Free and Open Source Platform (10910)
Narayan Thapa (Nepal)

FIG e-Working Week 2021
Smart Surveyors for Land and Water Management - Challenges in a New Reality
Virtually in the Netherlands, 21–25 June 2021

4.Results:

Figure 4.1: Land Parcel Information System

According to the cadastral vision 2014, "The separation between maps and registers will abolish." In Nepal, these two separated into Survey Department for mapping and surveying, and the Department of Land Reform and Management was responsible for the land registration and revenue collection. This developed prototype consists of an integrated system for land parcel information, which provides the landowner certificate that contains information about the landowner and parcel number, an area covered by the parcel. This information available in the land revenue and survey office database will be access to the users, as there will be three levels of user, admin, and super admin. The general user can do a query using the parcel number, and they can measure the parcel after selecting it. The chosen parcel highlight with a popup facility that helps the user to know about the adjoining property. They can select the base map as per their needs. They can also locate themselves on the ground and map. And admin can edit, update information, which is later verified by super admin. Also, resolve issues of mismatch of land parcel information caused due to separate offices for handling data. This platform merges the cadastral map and attribute, supporting reliable and quick communication of their owned parcel that reduces cost and time.

Land Parcel Information System Using Free and Open Source Platform (10910)
Narayan Thapa (Nepal)

FIG e-Working Week 2021
Smart Surveyors for Land and Water Management - Challenges in a New Reality
Virtually in the Netherlands, 21–25 June 2021

5. Discussion:

Resurvey speed is relatively slow, which raises dissatisfaction with people; they are demanding an updated and reliable digital information system that supports proper land administration. A resurvey had worked for field data collection; however, storing and sharing through a survey and land revenue offices are still unknown. A landowner wants a transparency, efficient, and effective digital platform; this can be this design prototype (Thapa, 2020). It supports a reliable platform for sharing land parcel information such as ownership, value, use. A digital photogrammetric method with participatory field verification is an alternative for a quick and reliable update of the cadastral system. Many countries have adopted this technology for cadastral mapping (e.g., Turkey, Bhutan, India, Zimbabwe, Cyprus and Bulgaria) (Basiouka & Potsiou, 2012; Gkeli et al., 2019; Potsiou et al., 2020; Tamrakar, 2012). This surveying method may be cheaper and provide better land parcel boundaries that minimize land disputes and information mismatch. It will guarantee land ownership and security of tenure.

Conclusions:

Existing cadastral maps are now outdated and do not fulfill the needs of the general public. Land parcel information obsolete paper format provides parcel information in a digital platform. It incorporates the central database to promptly meet the growing public demands on reliable land information systems—using satellite and drone images with a participatory approach for adjudication to prepare an Integrated system with an up-to-date database. This digital platform uses free and open-source software to store and share parcel information, significantly reducing its operating cost and developing an accurate and reliable land information system.

Land Parcel Information System Using Free and Open Source Platform (10910)
Narayan Thapa (Nepal)

FIG e-Working Week 2021
Smart Surveyors for Land and Water Management - Challenges in a New Reality
Virtually in the Netherlands, 21–25 June 2021

References:

Basiouka, S., & Potsiou, C. (2012). VGI in Cadastre: A Greek experiment to investigate the potential of crowd sourcing techniques in Cadastral Mapping. *Survey Review*, *44*(325), 153–161.

Council, N. R. (2007). *National Land Parcel Data: A Vision for the Future*. https://doi.org/10.17226/11978

Deininger, K., Augustinus, C., Enemark, S., & Munro-Faure, P. (2010). *Innovations in land rights recognition, administration, and governance*. The World Bank.

Fit-for-Purpose Land Administration (updated). (n.d.). Issuu. Retrieved December 27, 2020, from https://issuu.com/landgltn/docs/160621_ffp_web_as_of_29_june_2016

Forkuo, E. K., & Asiedu, S. (2009). Developing A One Stop Shop Model For Integrated Land Information Management. *Journal of Science and Technology*, *29*, 114–125. https://doi.org/10.4314/just.v29i3.50061

Gkeli, M., Potsiou, C., & Ioannidis, C. (2019). Crowdsourced 3D cadastral surveys: Looking towards the next 10 years. *Journal of Geographical Systems*, *21*(1), 61–87.

Lemmens, M. (2011). *Geo-information: Technologies, applications and the environment* (Vol. 5). Springer Science & Business Media.

Potsiou, C., Paunescu, C., Ioannidis, C., Apostolopoulos, K., & Nache, F. (2020). Reliable 2D Crowdsourced Cadastral Surveys: Case Studies from Greece and Romania. *ISPRS International Journal of Geo-Information*, *9*(2), 89.

Sucaya, I. A., & Ary, K. G. (2009). *Application and validation the land administration domain model in real life situation: A case study in Indonesia*.

SD, 2011. Annual Report of 2067-68 Programme of Cadastral Survey Branch, Survey Department (SD), Government of Nepal, Unpublished.

Tamrakar, R. M. (2012). A Prospect of Digital Airborne Photogrammetry Approach for Cadastral Mapping in Nepal. *Nepalese Journal of Geoinformatics*, *11*, 1–6.

Thapa, P. (2020). A Prototype for Interactive Web Map. *Geospace*, *6*, 16–18.

Land Parcel Information System Using Free and Open Source Platform (10910)
Narayan Thapa (Nepal)

FIG e-Working Week 2021
Smart Surveyors for Land and Water Management - Challenges in a New Reality
Virtually in the Netherlands, 21–25 June 2021

BIOGRAPHICAL NOTES

CONTACTS

Title: Pawan Thapa
Organization: Kathmandu University
Address: Dhulikhel
City: Dhulikhel
COUNTRY: Nepal
Tel.: +9779840530216
Email: pawan.thapa@ku.edu.np
Web site: https://ku.edu.np/contact-detail/212

Title: Narayan Thapa
Organization: Kathmandu University
Address: Trehathum
City: Trehathum
COUNTRY: Nepal
Email: nt02249417@student.ku.edu.np

Land Parcel Information System Using Free and Open Source Platform (10910)
Narayan Thapa (Nepal)

FIG e-Working Week 2021
Smart Surveyors for Land and Water Management - Challenges in a New Reality
Virtually in the Netherlands, 21–25 June 2021