

Analysis Of 3D Cadastre Situation In Nepal

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Abstract

The history of cadastre prevails that the records of land are kept in a text form as a basis to collect revenue and could be refer to one dimension cadastre. His Majesty's Government (HMG) of Nepal declared to launch Land Reform Program on 1964 AD. The main purpose of the program was to impose ceiling on land holding. For this purpose, it was necessary to determine the area of land hold by a land owner. In this way, the concept of two dimension cadastre was realized and the land registration was started with the help two dimension cadastral maps. As the population in urban area is ever growing and the land is fixed, the use of space under and above the surface seems to be one of the solutions to address the issue. So, there is a need of registration of vertical dimension of the legal status of real estate objects. The 3D information is becoming essential for land administration in Nepal.

HMG of Nepal has adopted a policy to build apartments and joint residential building in urban area for optimal use of available space. Although, some juridical measures exist to address registration of vertical dimension of legal status of real estate objects in the available act, a lot of institutional and technical problems are facing for registration of apartment and room in a multi storey building in Nepal. Therefore, it is necessary to make a good institutional arrangement and develop a system to visualize 3D cadastre to link with cadastral maps and related land records.

This paper first investigates the 3D cases practices in Nepal. There are more than eight such issues to be considered for the implementation of 3D cadastre. It then further elaborates about the three aspects; institutional,

technical and legal to be considered for the 3D cadastre in Nepal. A low cost solution for the 3D mapping of the apartment or multistory building has investigated. The findings of this research will help the policy makers for the effective implementation of 3D cadastre in Nepal.

Introduction

According to (Henssen, 1995) Cadastre is a methodically arranged public inventory of data concerning properties within a certain country or district, based on a survey of their boundaries. Such properties are systematically identified by means of some separate designation. The outlines of the property and the parcel identifier normally are shown on large-scale maps which, together with registers, may show for each separate property the nature, size, value and legal rights associated with the parcel. Cadastre 2014 gives reliable and complete information on the legal situation of land by taking into consideration all legal impacts on land (Kaufmann and Steudler, 1998). The traditional cadastre focused on land parcel but modern cadastre focused on land object. It gives the real situation of 3D objects in land parcels.

The history of land recording in Nepal was started from one dimension (i.e. keeping the record only) and now the registration of two dimensions (i.e. measuring the length and breadth of the parcel and calculating area) is in practice. Basically, the legal boundaries of parcels used for the registration of the legal status are fixed in 2D space. Due to the high population growth and growing interest in using space under and above the surface (Particularly in the urban areas) there is a need of registration of vertical dimension of the legal status of real estate objects. To be able to define

and manage the juridical situation satisfactory, 3D information are becoming indispensable for land administration in Nepal (Sharma and Paudyal, 2005).

In Nepal, the registration of partition of house or a building in strata basis is in practice. In field book, deed documents and land ownership certificate (Moth and Lal Purja) the legal status of partition of house or a building has mentioned. But the accurate geometric dimension and linking with cadastral map is lacking. HMG Nepal has given high priority to construct apartments and joint residential buildings in urban areas for optimal use of available space and to protect the agriculture land. Recently, the real estate business in Nepal is booming. The real estate agents and housing companies are more interested to invest money in the real estate business. They have constructed joint residential buildings and apartments and selling it. Till date not a single apartment owner has got "the ownership certificate from Land Registry Office. There is no legal security of ownerships with these apartment owners. They cannot sell it as well as use it for mortgage. There are a lot of institutional and technical problems about the registration of apartment and room in a multi storey building. These apartments and rooms are neither shown on the cadastral maps nor linked with cadastral maps. There is a challenge to Cadastral Offices (Survey Sections) to find the right geometric descriptions of these 3D real estate objects and link with cadastral maps.

3D Cases Practice in Nepal

There are more than eight real estate objects to be considered for the implementation of 3D cadastre in Nepal. They are

- Partition of a house or building in Strata basis
- Distribution of the flat in a Multi Stored Buildings
- House of higher mountains
- Underground flat (Parking area, shopping malls, godam etc.)
- Underground manmade and natural features (Drainage, tunnel, cables, caves, streams etc.)
- Sky Bridge above public and private properties
- Common passage below the private properties
- Vertical strata (May be empty 3D objects)

Partition of a house or building in strata basis

The partition of a house or buildings in strata basis is practiced in Nepal since the systematic cadastral survey began in Nepal. In the beginning, the description of partition of a house or building was recorded in the field book during

adjudication and provide land ownership certificate to the owners. There is no mechanism of recording the spatial parts of that unit. For security of ownership and to solve the boundary dispute and right and responsibilities in the common place of that building the concept of 3D cadastre is becoming the important.

Distribution of the flat in a multi stored buildings

HMG Nepal has encouraged to the housing company to invest money for residential multi storey building to protect the agricultural land and optimal use of space. There is a need of showing such building in the cadastral map. Now the concept of documentation and approval of AS_Built drawing of such residential building by cadastral office and showing the foot print of such building in cadastral map is realizing. For modeling of such 3D building in the near future, there is a need to harmonize the co-ordinate of AS-Built drawing with the co-ordinates of cadastral maps.

House of Higher Mountains

In Nepal, the houses of higher mountains are constructed in the slopes. To protect the house from cold, some rooms of the house are constructed inside the grounds. The part of roof of lower house is made base to construct upper house. There is overlapping rights above and below the house. So there is a need of concept of 3D cadastre in the rural area of Nepal too.

Underground Flat (Parking area, shopping malls, godam etc.)

In the urban areas, the parking place, shopping malls and godams are constructed undergrounds. The ownership of underground construction is different with the ownership of buildings. So there is also a need of concept of 3D cadastre.

Underground manmade and natural features (drainage, tunnel, cables, caves, streams etc.)

In Nepal, the underground natural features like streams, caves etc are the properties of Government. The ownership of drainage, tunnels, cables (pipelines, telephone lines, electricity lines, internet lines) are the properties of related public organizations. These underground features are situated below the private or public properties. So the case of 3D cadastre is very important in this case too.

Sky Bridge above public and private properties

The sky bridges are constructed above the public, private or government properties. The ownership of Sky Bridge is different from the ownership of properties below it. Hence there is a need of 3D cadastre in this case.

Common passage below the private properties

In the dense populated urban area of Nepal, a very narrow passage has left below the private houses. The passages are just like the tunnel and it is for the common use. Now, only as a description the use right of common passage is mentioned in the ownership certificate. The passages are very important access for the settlements. For reconstruction of building the spatial measurement of such passage are very important. Hence, it is also a typical 3D cadastre cases practice in Nepal.

Vertical strata (May be the empty objects)

The transaction of vertical empty strata is not practice in Nepal. But due to the shortage of available residential land in urban area of Nepal there is a growing demand of transaction of empty space above the roof. For the transaction of such empty space there is a need of concept of 3D cadastre.

Institutional, Technical and Legal Aspect for 3D Cadastre

For the effective implementation of 3D cadastre; all three aspects institutional, technical and legal are important. A brief description has given in the following section.

Institutional Framework:

According to (North 1990) institutional are defined as ‘the humanly devised constraints that shape human interactions’; the rule of the games and organizations are the players of the games. Later (Feder and Feeney 1991) distinguished three basic categories of institutions, namely the constitutional order, institutional arrangements, and normative behavioral codes.

Ministry of Land Reform and Management (MoLRM), Ministry of Local Development (MoLD) and Ministry of Housing and Physical Planning (MoHPP) are the main three Ministries responsible for implementation of 3D cadastre in Nepal. These Ministries are mandated to formulate and implement the policies and programme for implementing 3D cadastre. The Department of Land Reform and Management (DoLRM), Survey Department (SD) under

MoLRM are responsible for registration and maintenance of 3D cadastre. The Department of Urban Development & Building Construction (DUDBC) under MoHPP is responsible for regulating and monitoring of 3D real estates like buildings and other overhead/underneath structure of public utilities. Likewise, the Local Authorities (Municipalities and Village Development Committees (VDC’s)) are responsible for the valuation, taxation, permitting, as well as right, restriction and appeal about 3D real estate objects. The details of 3D cadastre related organizations in Nepal have given in the section below.

Organizations involving for 3D cadastre in Nepal

There are basically five organizations involving for implementing 3D cadastre in Nepal. A brief description has given below.

- Survey Department (SD)
- Department of Land Reform and Management (DoLRM)
- Department of Urban Development & Building Construction (DUDBC)
- Housing Company/ Real Estates Agents
- Local Authority (Municipality/VDC)

It was realized from the workshop held on may 3, 2005 at Kathmandu, that there should be the following three different roles of organizations for the implementation of 3D cadastre in Nepal (CSB, 2005).

- **Regulating:** Ministries, Departments such as a DUBC, SD, DoLRM, Municipality/VDC etc.
- **Development:** Departments such as, DUDBC, Housing Companies/ Real Estate Agents, Municipality/VDC, Utilities services related organization etc.
- **Consumer:** Housing Companies/ Real Estate Agents, Individual Owner, Developer, Line Ministries, DoLIA, Financial Institutions, Insurance Companies, Lekhapadhi Professional (Notary), Lawyers, Academia, Consultancies etc.

Existing role of different 3D cadastre related organizations

Role of DUDBC

- Permit issue for land development and construction
- Monitoring/regulating of land development and construction
- Overhead/underneath structures of public utilities
 - Planning

- Development
- Management

Role of Local Authority (Municipality/VDC)

- To provide construction permit for apartment housing
- Monitoring and regulating of apartment housing
- Taxation
- Right, restriction and appeal overhead and underneath structures of public utilities

Role of SD

- Show foot print of 3D real estates objects on cadastral maps
- Prepare 3D cadastre specification
- Approve and authenticate AS_ Built drawing and link with cadastral maps
- Provide 3D real estate objects information

Role of DOLRM

- Improve the existing registration system to incorporate the registration and updating of 3D real estate objects
- Improve the land ownership certificate and deed document format to incorporate rights/interest, restriction and responsibilities for 3D registration
- Improve the legislation for 3D real estate registration
- Improve service delivery for 3D real estate objects registration

Role of Real Estate companies; an example of housing development

- Get planning and construction approval from DUDBC
- Construct the buildings as per approved plan
- Fulfill the terms and conditions as per agreement with apartment owners
- Execute AS_Built survey as per the specification of SD
- Promote real estate market

Legislative Framework:

According to Molen (2003) the role of institutions and appropriate legal frameworks and transparent public administrative structures are very important for the implementation of 3D cadastre. The following laws related to land administration and real estate ownership currently govern the 3D real estates registration in Nepal.

- Muluki Ain (Common Law Codes)
- Land (Survey and Measurement) Act, 1962
- Land Administration Act, 1967

- Land Revenue (Administration and Revenue) Act, 1977
- Joint Residence Ownership Act, 1997
- Local Independent Administration Act, 1998
- Housing Act, 2000
- Town Development Act, 1989

Muluki Ain is equivalent to a common law and this law prevails where there is no any specific law in any specific subject. Before enactment of subject specific acts, land administration was used to be governed by chapters of this law. After enactment of Land Revenue Act, 1977 and Land Act, 1962 many of the provisions made in this law have been ineffective. For the implementation of 3D cadastre still some section of this law can be useful.

In Land (Survey and Measurement) Act, 1962 (8th amendment) there is the provision of measurement and registration of separate ownership for a floor or room in a building. The attribute information of ownership about the part of a building can be recorded in the field book and land ownership certificate. But still there is not clear description about the ownership (right, restriction and responsibility) of common place such as ladder, roof, passage etc.

In land Administration Act, 1967 and Land Revenue Act 1977, there is a lack of description about the 3D registration of real estate objects.

In Joint Residence Ownership Act, 1997, there is a provision of registration of flat/apartment in a multi storey building. Still there is need of linking of this Act with other land registration Act and clear description about the right, restriction and responsibilities about joint residential area. The role and responsibility of local authority for land management is mentioned in the Local Independent Administration Act, 1998. Likewise, Housing Act, 2000 and Town Development Act, 1989 describes about the housing development and urban development.

Technical Framework

The technical framework consists of 3D cadastral mapping, 3D real estate objects registration, creation of 3D cadastral database and visualization of 3D real estate objects.

3D Cadastral Mapping: In Nepal, only the 2D parcels are surveyed in the field so there is a lack of 3D cadastral mapping. At the time of adjudication and boundary survey

the description of 3D real estate objects had recorded on the field book. The ownership certificates are prepared based on these field books. The system of 3D cadastral mapping is not yet developed. Only the x and y co-ordinates of the parcels are recorded on the cadastral maps. Now due to the high land value and growing demand for transaction of house above and below the surface there is a need of numerical cadastral mapping and 3D cadastral mapping in the urban area. The corner points of each of the real estate objects are to be shown with x,y,z co-ordinates.

3D real estates objects registration: In Nepal, the 3D real estate objects like the room in a building can be registered at the land registry office. Still the identification of real estate objects and their spatial parts recording system is not sufficient. The existing registration system could not fully incorporate the security of ownership for 3D registration. Now it has been realized that the land registration system should incorporate the 3D real estate objects registration. The AS_Built drawing of each of the real estate objects will be documented with deed documents with its description and kept at the cadastral office linking with cadastral map.

Creation of 3D cadastral database: The cadastre of Nepal is parcel-based land information system. The existing cadastral databases are based on 2D information of land parcel. Now the concept of 3D land object is emerging. For low cost approach for 3D cadastral database, the foot print of real estate objects are shown on the cadastral map and the AS_Built drawing of 3D real estate objects are kept separately as a file map. The 3D real estate objects has unique ID derived from the parcel ID. Survey Department Keep the documents at AS_Built drawing of each of the real estate objects. The AS_Built drawing is also geo-referenced with national geodetic system. A separate AS_Built layer has made for each of the real estate objects in GIS system and hyperlinked with cadastral maps to incorporate the 3D information.

Visualization of 3D real estate objects: According to the cadastre 2014 document, the cadastral mapping will be changed to cadastral modeling. The 3D real estate objects will be visualized in term of 3D model. With the help of new ICT and GIS/CAD tools the 3D real estate objects will be visualized.

Conclusions

This paper investigate that there are more than eight real estate objects to be considered for the effective implementation of 3D cadastre in Nepal. Different Departments under different Ministries are involving for the 3D real estate objects registration in Nepal. There is a need of effective institutional arrangement for the registration of 3D real estates and improvement of the legal security of spatially complex rights. The AS_Built drawing georeferenced to the national geodetic coordinate system are the base for the technical solution of 3D cadastre. For the time being a hybrid solution for data modeling of 3D cadastre is useful for Nepal.

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