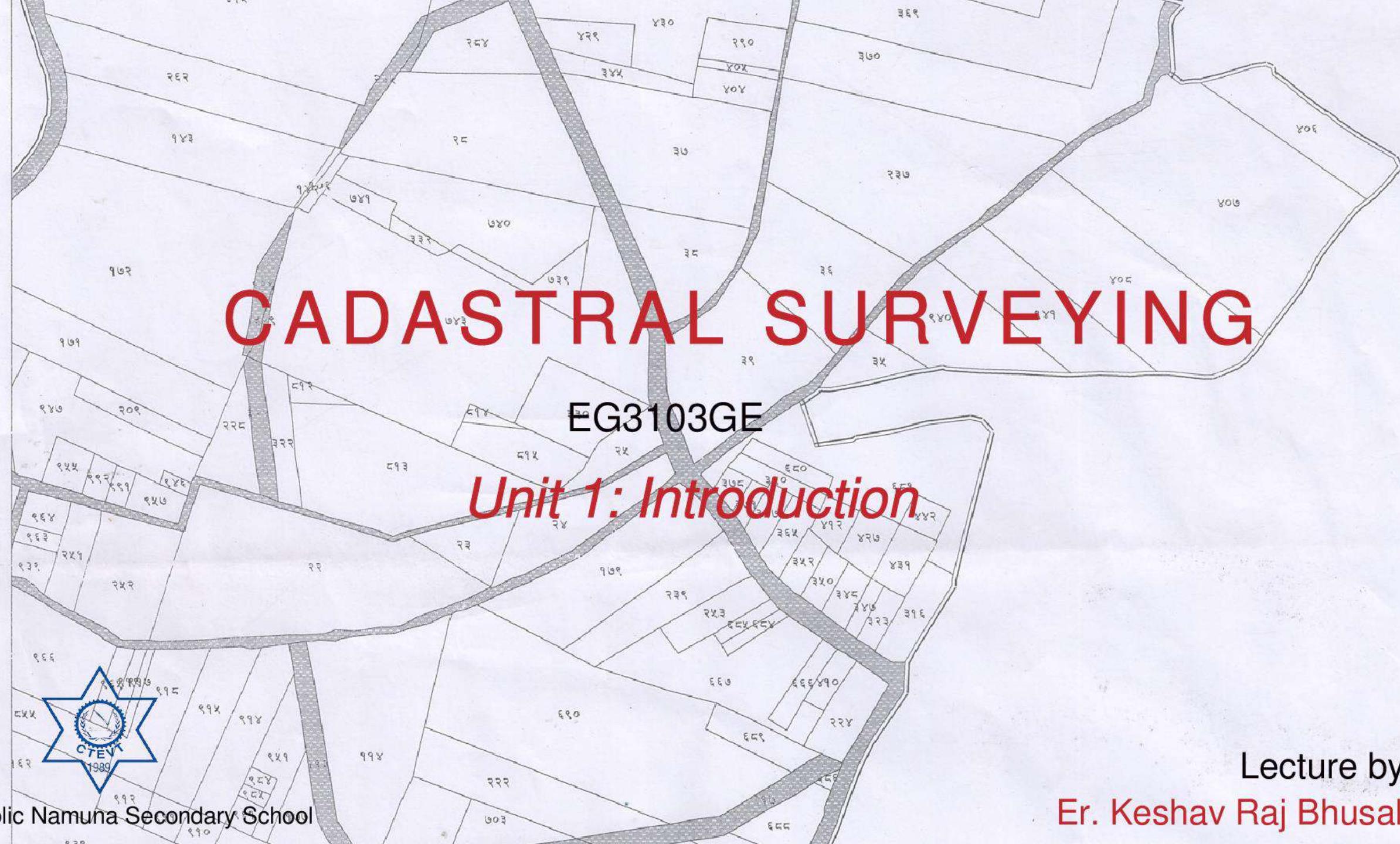


CADASTRAL SURVEYING

EG3103GE

Unit 1: Introduction



Lecture by

Er. Keshav Raj Bhusal

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Introduction



Cadastre/Cadaster

- International Federation of Surveyors (FIG) defines cadastre as
 - ✓ parcel based, and up-to-date land information system containing a record of interests in land (e.g. rights, restrictions and responsibilities).
 - ✓ includes a **geometric** description of land parcels linked to other records describing the nature of the interests, the ownership or control of those interests and often the value of the parcel and its improvements.
 - ✓ It may be established for fiscal purposes (e.g. valuation and fair taxation), legal purposes (conveyancing), to assist in the management of land and land use (e.g. for planning and other administrative purposes), and enables sustainable development and environmental protection.
- A cadastre commonly includes details of the Ownership, the tenure, the precise location, the dimensions and area, the use, and the value of individual parcels of land.
- The Cadastre is a land information system, usually managed by one or more **government** agencies.
- A Cadastre is normally a **parcel-based** system, ie. information is geographically referenced to unique, well-defined units of land.

Introduction



Cadastre

- Cadastre has mainly two parts:
 - i. Cadastral Map
 - ii. Written record (Register)

Introduction



Cadastral Surveying

- Cadastral surveying is the definition, identification, demarcation, measuring and mapping of new or changed legal **parcel boundaries**.
- It usually includes the process of re-establishing lost boundaries and sometimes resolving disputes over boundaries or other interests in real property.
- Cadastral surveys **document** the boundaries of land ownership with the help of documents, diagrams, sketches, plans, charts, and maps.
- They were originally used to ensure reliable facts for land valuation and **taxation**.
- Cadastral surveys are carried out by governmental officials and sometime by private surveyors. However, the survey done by private surveyors is not legally accepted and has to be verified by government officials.



Cadastral Surveying includes

- i. Adjudication for parcel boundary and ownership on it .
- ii. Determining the position of land parcel on the basis of parcel boundary survey.
- iii. Preparing a map showing the parcel position and other necessary supporting details.
- iv. Recording the details of the parcel regarding type and ownership in a register.
- v. Preparing the title of ownership.



Cadastral Surveying approach

There are two approaches for cadastral survey. They are:

- a. Systematic Approach
- b. Sporadic Approach

Systematic Approach

- Survey is carried out thoroughly area by area to cover whole country.
- It is used when cadastral document of whole area is required for adopting new registration system.

E.g. when Nepal undergoes in title registration system, it would required systematic cadastral survey under fixed boundary system.

- It is more expensive and time consuming method.
- More human resources are required at once.
- New organization or new structuring of an existing organization may required.
- Usually, first registration is done in such cadastral approach.



Cadastral Surveying approach

There are two approaches for cadastral survey. They are:

Sporadic Approach

- The survey is carried out for updating or gathering up to date cadastral information of a particular parcel or group of parcels when transaction is occurred or during land development activities(i.e. land Reform, land consolidation, redistribution, acquisition, plotting, etc.).
- It is only conducted at specific time(not continuous) when required in part wise survey.
- It cost effective(at low cost), timeliness(less time).
- Few human resources are required.
- First registration is not required since parcel has been already registered.

E.g. survey for parcel subdivision(by transaction, inheritance etc)

Introduction

Historical development of Cadastral Surveying in Nepal

1. The land recording system is very old in Nepal, land recording started from Lichhabi Era for the purpose of taxation only.
2. Malla Era (14th – 18th century):
 - The Malla rule introduced the system of purchase of land, land survey and land classification on the basis of productivity.
3. Ram Shah, the king of Gurkha Kingdom, started land record maintainance system by dividing the land type into various units like hale, kodale, mato muri, bijan, mana etc.
4. Rana Regime:
 - Essence of cadastral map was felt for land administration and chain survey was introduced in 1930 B.S.
 - Cadastral survey was done in some major districts only and was sporadic (occassional).
 - The map based land recording system was started after the establishment of Cadastral Survey in Bhaktapur district in 1980 B.S.

Introduction

Historical development of Cadastral Surveying in Nepal

5. Major evolution in the field of cadastral surveying was establishment of **survey department** and department of land revenue in 2014 B.S and 2016 B.S respectively.
 - The district level Land Revenue Offices were established after the political division of the Kingdom into 75 districts.
6. Land measurement act was introduced in 1963 AD. With this act cadastral map were recognized for land administration, land registration, taxation and became integral part of land registration process.
7. Systematic cadastral survey was started from 1964 AD using plane table, telescopic alidade and tape for the first time in Nepal for 38 districts without **National Geodetic Control point**. Thus, obtained maps were called island map or free sheet map.
 - Later National Geodetic Control system was established under Survey Department and further cadastral survey of 37 districts was done with NGCP.
8. Complete cadastral survey of 75 districts was done till 2000.
 - Since then cadastral resurvey of 38 districts with NGCP is being carried out.
9. In 2063 B.S, digital cadastral mapping of Banepa municipality of Kavre district with Total Station was done as pilot project to create digital database and to establish parcel base land information system.

Introduction

Types of Cadastre:

- i. Fiscal
- ii. Legal
- iii. Multipurpose Cadastre



Types of Cadastre:

Fiscal cadastre

- A cadastre, which is mainly established for the purpose of revenue and tax collection.
- In such cadastre, approximate shape/size of parcels are required rather than their exact location and is primarily interested in use of land.

Legal cadastre

- A cadastre which is established to guarantee the public right and restriction over the land parcel.
- It explains the legal status of the land.
- This usually grew out of the fiscal cadastre and adds an additional dimension to the cadastre.
- Legal cadastre mainly supports the property description and identification of land registration.
- Quality of map and boundary surveys needed might be higher than fiscal cadastre and deals with the precisely located boundary.
- At present, Nepalese cadaster is a legal cadastre.



Types of Cadastre:

Multipurpose Cadastre

- A cadastre which is established not only to show fiscal and legal status of the land, but also shows other geo-data like topographic and land use data.
- It can be used for different infrastructure development, planning and construction activities, also known as Land Information System.

Introduction

Types of cadastral system:

- i. Graphical Cadastre or Analog Cadastre
- ii. Digital /Numeric/Coordinate Cadastre

Graphical Cadastre or Analog Cadastre

- Traditional method
- It includes Chain surveying/Tape surveying or Compass surveying or Plane table surveying
- Mostly human effort.
- Large scale maps are prepared and usually maps are prepared on field.
- Hard copy maps and registers separately prepared. (maps and fieldbook).
- Records analysed, stored, maintained, disseminated manually.
- Hardcopy ownership certificates, hardcopy shrestas
- .
- It Example: Current Nepalese cadastral system.

Introduction

Types of cadastral system:

- i. Graphical Cadastre or Analog Cadastre
- ii. Digital Cadastre

Digital Cadastre

- Digital cadastre is that system in which the co-ordinate of every corner of parcel is recorded and it is managed by computer.
- In this method, the cadastral survey is carried out by modern highly accurate instruments and the mapping, recording and archiving process is done in computer.
- Digital cadastre is a parcel based land information including ownership, tenure, right, restriction, land use and land valuation acquired, stored, manage, analysed and disseminate the information in digital environment.
- It includes digitizing from existing data, Field survey (Total station, GPS), Photogrammetry or Hybrid method.
- At present, Nepal is practicing digital cadastre in some districts of Nepal and is trying to practice it in all districts.

Introduction

Cadastral Components

- i. Cadastral Map
- ii. Terij
- iii. Field book
- iv. Plot register
- v. Title documents
- vi. Database

Introduction



Cadastral Components

1. Cadastral Map

- A cadastral map is a map that shows the boundaries and ownership of land parcels.
- Cadastral maps show additional details, such as surveyed areas names, unique identifying numbers for parcels, positions of existing structures, selected boundary dimensions etc.
- These maps are usually maintained by the government, and they are a matter of public record; anyone who wishes to go to the office which maintains the records can ask to see them.

Types of cadastral map:

- i. On basis of scale
- ii. On the basis of control points



Types of cadastral map

On basis of scale

1. Earlier System

- 1 inch to 400 feet
- 1 inch to 200 feet
- 1 inch to 100 feet

2. New System

- 1: 2500
- 1: 1250
- 1: 500

Introduction: Cadastral Components



Types of cadastral map

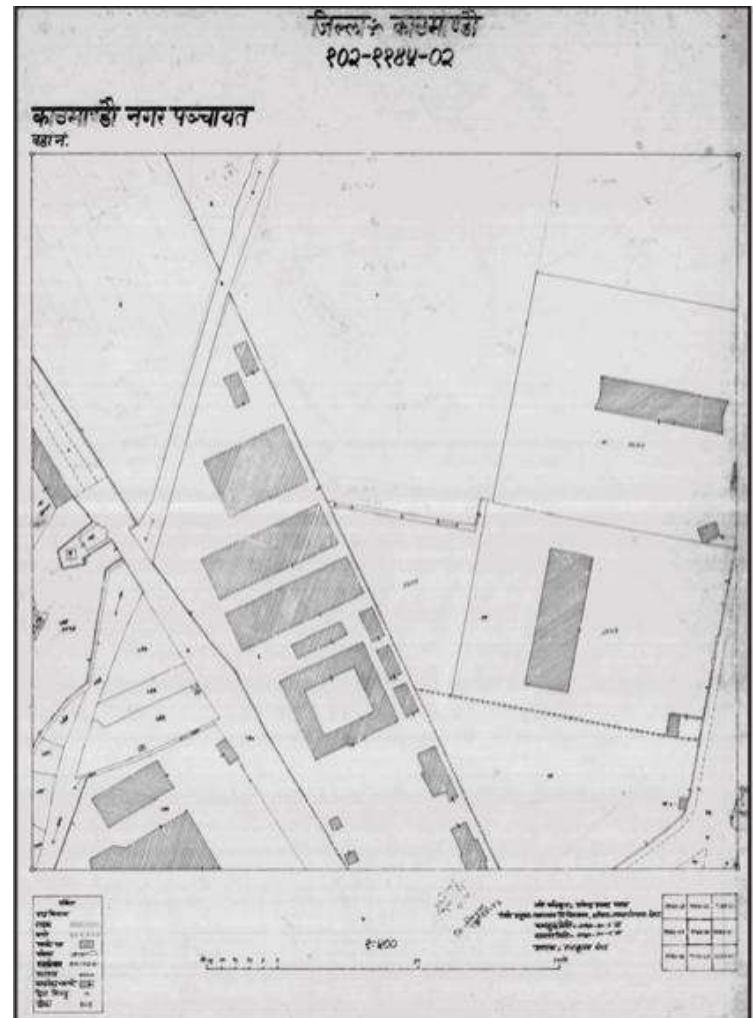
On basis of control points

1. Maps on free sheet or Island Map: It is the map prepared without national geodetic control point.
2. Maps on trig sheet: It is the map prepared with national geodetic control point.



Fig: Map in free sheet; Source: Acharya, 2011

Fig: Cadastral map in controlled sheet
Source: Department of Land Information and Archives



Introduction: Cadastral Components

Types of cadastral map

On basis of control points



Fig: Map in trig sheet; Source: mapadda.com



Cadastral Components

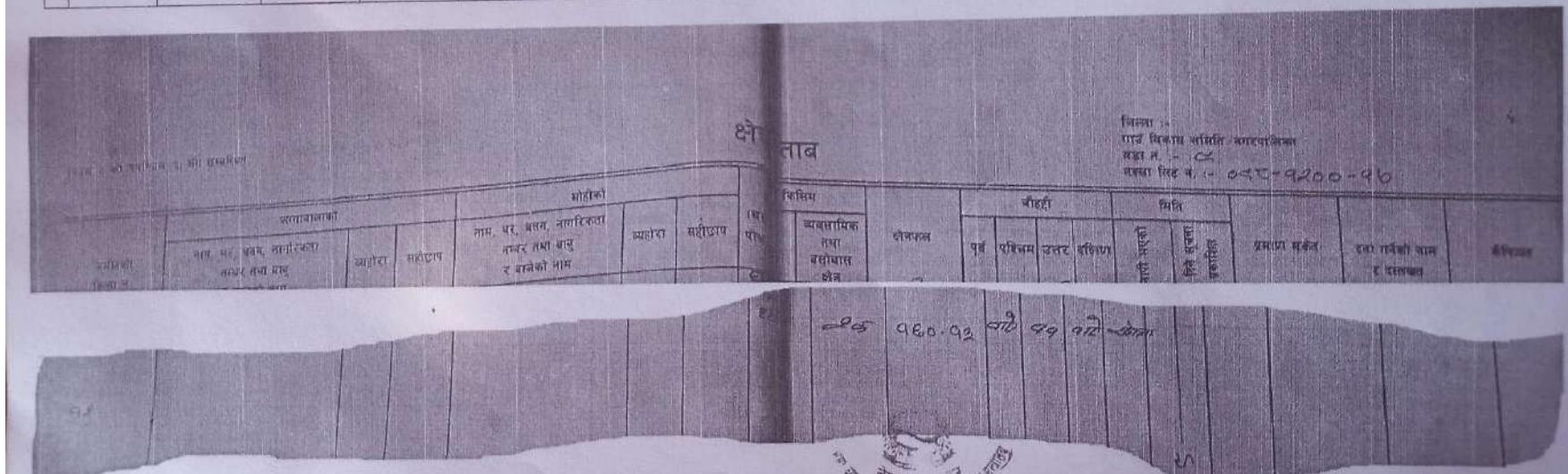
2. Field book

- The field book identify the landowners of each parcel, which is based on the evidence produced during registration of the parcel.
- It includes:
 - ✓ Description of owner and tenants (if exists).
 - ✓ Full name, address and data of birth/age.
 - ✓ Father's / or husband's name & address.
 - ✓ Description of legal document of land registration.
 - ✓ Land classification, land type, crops, irrigated or non irrigated land, area of the land parcel etc.

Introduction

Cadastral Components

2. Field book



प्रिन्ट दिने उत्सव न्यौपाने

रुजु गर्ने

लेपार्ट
विभाग विभाग विभाग
नोटी विभाग
नोटी कार्यालय
घटनाक्रम स्पष्टीकरण
२०२१

१८८२
गान्धीजी
गान्धी



Cadastral Components

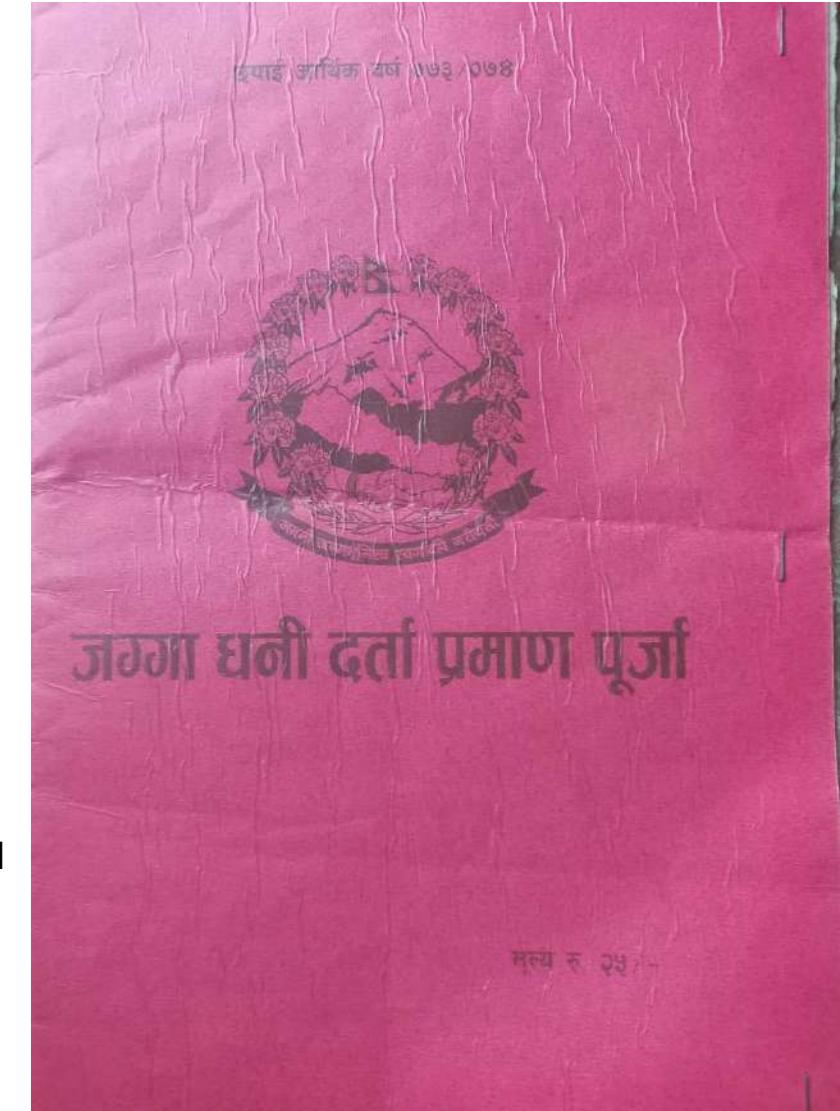
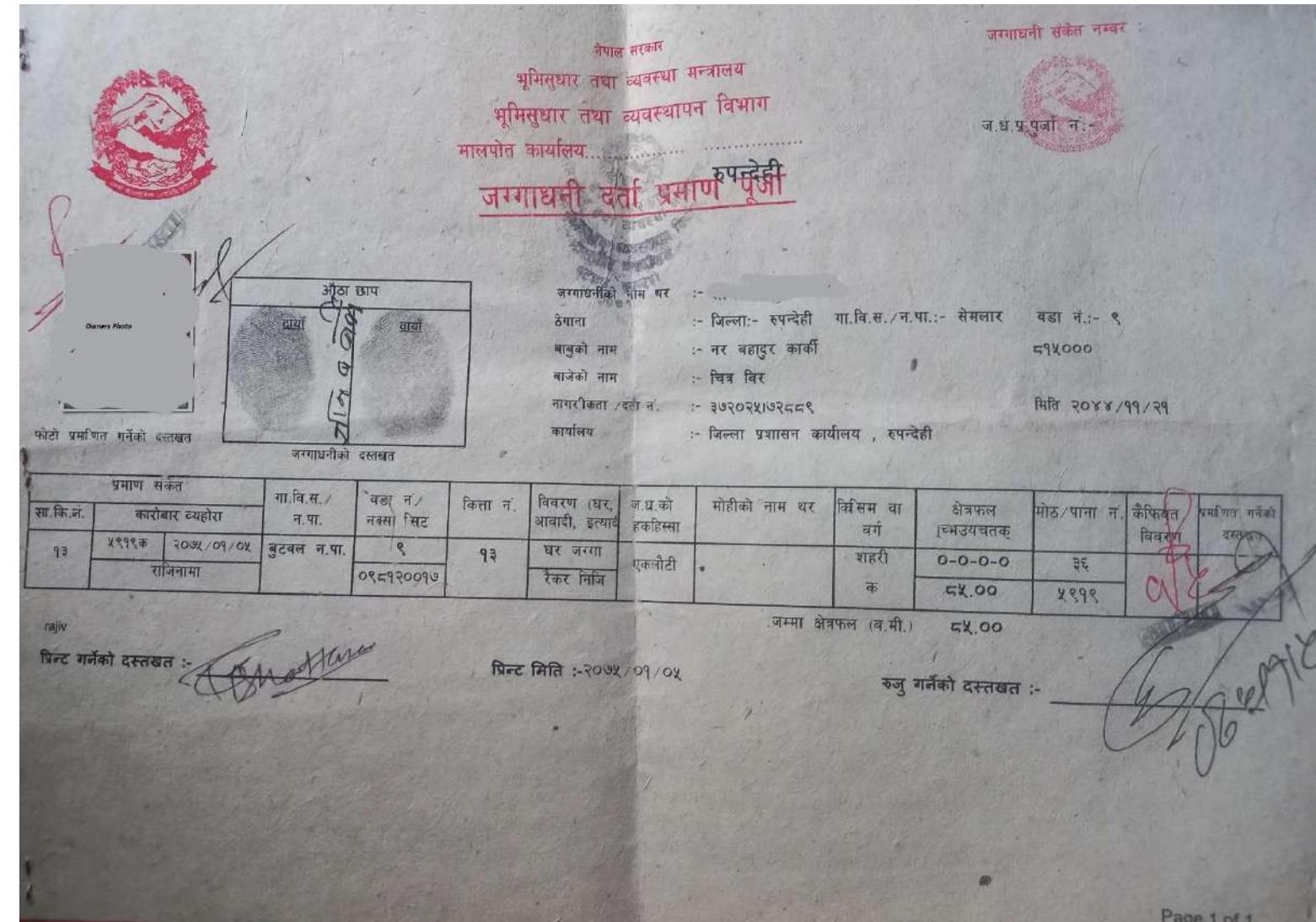
3. Land Ownership Certificate (Title document)

- Two copies of land ownership certificate are prepared, the official copy is termed as Jagga Dhani Darta Sresta, kept in office and the second copy is termed as Jagga Dhani Darta Praman Purja, distributed to the concerned owner.
- The details in these documents are copied from the field book.

Introduction

Cadastral Components

3. Land Ownership Certificate (Title document)



Source
:mapad
da.com



Cadastral Components

4. Plot Register

- Plot register is an information of each parcel which has been fragmented.
- The main information in the plot register are the newly established parcel numbers along with the mother parcel number, the area of each fragmented parcels and how the parcels has been fragmented.

Introduction

Cadastral Components

4. Plot Register

क्रमांक	परा	परा का विवर					
१	१						
२	२						
३	३						
४	४						
५	५						
६	६						
७	७						
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९	९						
१०	१०						
११	११						
१२	१२						
१३	१३						
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१५	१५						
१६	१६						
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१००	१००						

Introduction



Cadastral Components

5. File Map

- A large scale map which is prepared in a separate sheet while the process of land transaction if the parcel is too small and if it is not possible to plot in the map after fragmentation of the parcel.

Introduction



Cadastral Components

6. Database

- The organised collection of logically related data in a systematic manner, that is stored to meet the requirement of different users of an organisation, institution, government bodies, that can be easily accessed, managed and updated.
- It also means the digital geodatabase of parcels that is used further in GIS.
- The digital database includes spatial as well as attribute information. Such a database is called as spatial database.
- The Digital database of Survey Department includes different layers of point line and polygons .

7. Terij

- Terij is the preliminary form containing the information about the parcel containing the information especially about total mapped parcels and total remaining parcels to be mapped.
- It is prepared with the help of preliminary sketches (map).

Introduction

Cadastral Components

7. Terij

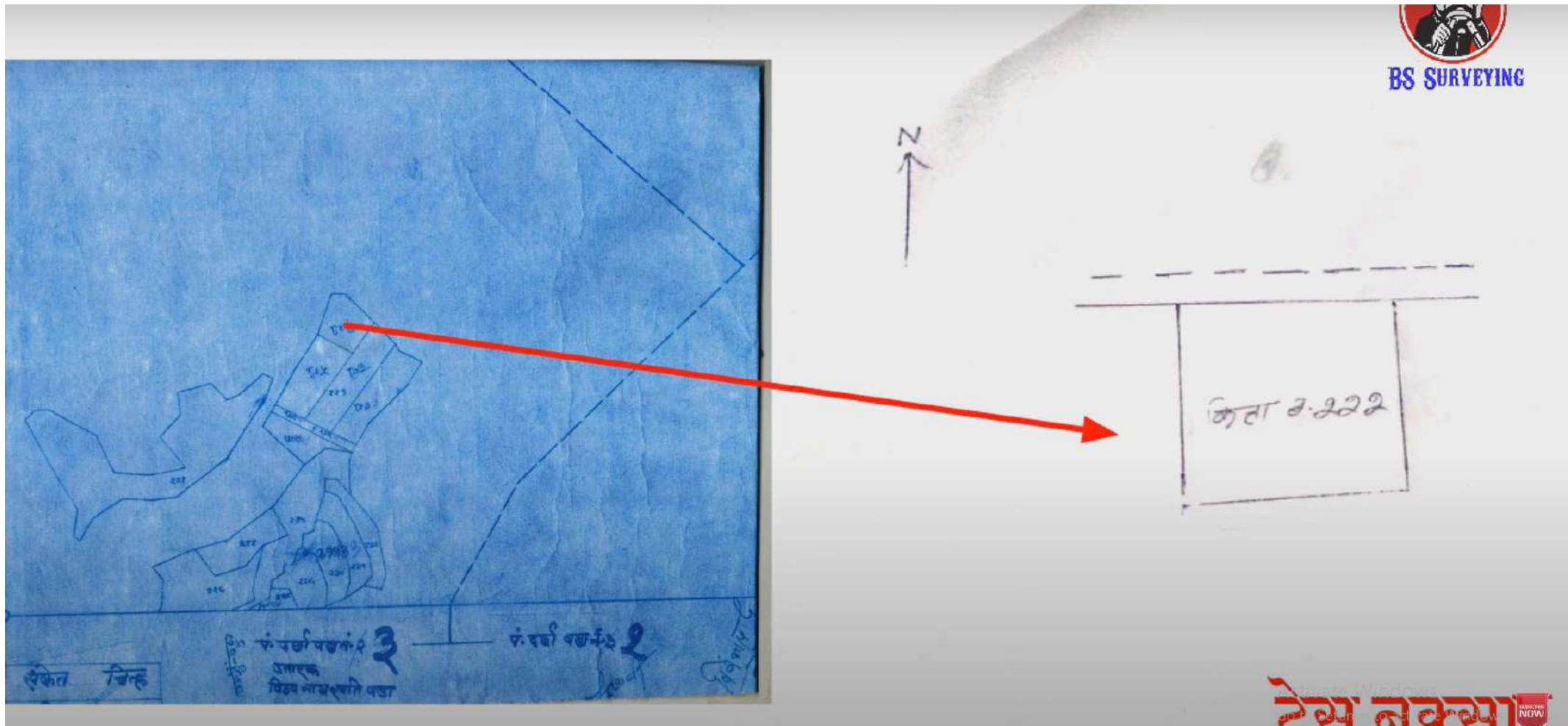
तेरीज			
१) जम्मा किता			
२) जम्मा हेक्टर			
३) जम्मा सोही संख्या			
४) जम्मा जग्गाधी संख्या			
५) सरकारी कार्यालयले दर्चको जम्मा किता	हेक्टर		
६) गैवर (सावंजनिक) किता	हेक्टर		
७) मिनाहामा रहने अरु जग्गा जस्तै बदी, सडक, भीर, पहिलो, कलो आदि किता	हेक्टर		
८) जड्डल किता	हेक्टर		
९) ऐतानी जम्मा किता	हेक्टर		
१०) गुठी जग्गा :- (क) दर्ता भएको किता	हेक्टर		
(ख) दर्ता नभएको किता	हेक्टर		
११) किसिम			
धनहर वा खेत		भीट वा पाखो	
किता	हेक्टर	किता	हेक्टर
अबल			
दोयम			
सिम			
चाहार			
पाखा पाँचौ तह			
१२) जग्गा पर्नीको नाउँमा दर्ता भएको किता		जग्गाधीनीको संख्या	
हेक्टर			
१३) दर्ता बाँकी			
किता	हेक्टर		

Introduction

Cadastral Components

Trace map

- It is the map which is prepared by tracing the original cadastral map.



Introduction



Cadastral Components

Parcel map

Government of Nepal
Ministry of Land Reform and Management
Survey Department
Cadastral Survey Branch

PARCEL PLAN

District :- Bhaktapur
Municipality:- Madhyapur Thimi
Ward No. 12

Scale 1: 250

Sheet No: 102-1190-18
Parcel No: 302



Introduction



Importance of cadastre

- i. Cadastre guarantee people about the ownership over the land and secures land transaction.
- ii. It helps to settle land conflict.
- iii. It protects the government and public land.
- iv. It provides the basis of getting loans to the people.
- v. It aids in land market regularization.
- vi. It ensures reliable facts for land valuation and taxation.
- vii. It also aids in land use planning and land administration.
- viii. It supports environmental monitoring, improve urban planning and other development activities.

Introduction



Land

- Depending upon Interests of different peoples land can be defined as
 - ✓ Economist- resource to achieve economic production and Development.
 - ✓ Lawyer - volume of space from center of earth to the infinity of sky with variety of rights for determining many objects
 - ✓ Geographer- land scape, the product of geographical and geomorphologic process
 - ✓ Other – simply the space for human activity as reflected in the many forms of land use.
- According to land survey act 2019 BS "land" means all categories of land, including those with buildings, gardens, trees, factories, lakes, ponds etc.;

Introduction



Parcel

“जग्गा (नाप जाँच) ऐन, २०१९

- “जग्गा” भन्नाले घर, वाग, वगैचा, रुख, कारखाना, ताल, पोखरी, इत्यादि भएको समेत सबै किसिमको जग्गा सम्झनु पर्छ ।
- “कित्ता” भन्नाले चारैतिर साँधले घेरिएको र प्रत्येक स्थानमा हक, भोग र किसिममा समानता भएको जमिनको टुक्रा सम्झनु पर्छ ।

Introduction



Parcel

- Parcel is the smallest unit of land unit of land within which rights and interests are legally recognized.
- It is the basic building block for maintaining land information.
- For identifying different parcels , unique ID has been provided to the each parcel called parcel number.
- Using parcel number , we can identify each parcels attribute information.
- Public lands, railway, highway, and utility corridors etc also partitioned as cadastral parcel.

Parcel Number

- The parcel number is a particular number allotted to a unit area to guarantee the **particularity** of the land and is a number given to each parcel as a **registration** unit.
- Every trade of the land is guaranteed only after the allowance of the parcel number.
- The most reason to grant the parcel number is to **distinguish** the land and to guess the **location**.

Introduction



Parcel Numbering System

- It is the system for giving numbers to the parcels.
- The parcel numbering system of parcel during cadastral survey starts from north-west corner and ends to South east corner.
- First numbers are provided to government land and public land and then for the private land.

Generally parcel numbering system is divided in the following three categories:

- i. Filiation System
- ii. Fractional System
- iii. Free Numbering System /Independent Numbering System

Introduction



Parcel Numbering System

Filiation System

- In this system of parcel numbering, parcel is sub-divided into two parcels using sub-script.
- For example, consider a parcel 14 then after division, it is numbered as 14a and 14b respectively.

Fractional System

- In this system of parcel numbering, parcel number is sub-divided into two parcels as 14/1 and 14/2 for a parcel with parcel number 14.

Free Numbering System

- In free parcel numbering system, when parcel is sub-divided into two parcels and suppose the greatest parcel number in that map sheet is 350 then new number is given as suppose 351 and 352 for a parcel 15. and parcel no 15 is removed.
- It is also called random numbering system and Nepal follows this system of parcel numbering.

Introduction



Boundary

- A boundary is an imaginary line that divides two adjoining estate.

“साँध” भन्नाले दुई भिन्न टुका जग्गाको बीचको सीमाना निर्धारण गर्ने सीमा रेखा सम्भनु पर्छ ।

- It is a surface which defines where one landowner's property ends and the next begins.
- A monument is any tangible landmark indicating a boundary.

Types of parcel boundary

- i. General boundary
- ii. Fixed boundary

1. Introduction: Types of Boundary



General boundary

- It refers to that boundary where the precise line on the ground has not been determined although usually it is represented by a physical feature and shown graphically on a map.
- In this boundary, there is some degree of uncertainty or ambiguity in its location or description.
- General boundaries are less precise boundaries usually defined by features such as rivers, streams, trees, rocks, hedge, fence, ridges, etc.
- The boundary system adopted by Nepal is general boundary.
- Features
 - ✓ Physical object
 - ✓ Not accurate
 - ✓ Can not be relocated accurately

1. Introduction: Types of Boundary



Fixed boundary

- It refers to that boundary where the precise line of the boundary is determined.
- Features
 - ✓ Mathematical position
 - ✓ Coordinates of corner values
 - ✓ Very accurate
 - ✓ Can be relocated exactly

1. Introduction



Basic principle of cadastral surveying

A basic cadastral surveying follows the following principle:

1. Adjudication :

- Adjudication is the process of legally **recognizing** the ownership over a particular unit of land.
- It includes signing and agreement by all the adjacent parcel holder with the adjudication form in the presence of ward/municipal representative.
- It is done before land demarcation and survey.

2. Boundary demarcation, monumentation, and Surveying

- After adjudication the corners of parcel boundary are identified and those corners are monumented using wooden peg, iron pipe etc. which is then surveyed using Plane Table /Total Station or any such instrument.

1. Introduction



Basic principle of cadastral surveying

A basic cadastral surveying follows the following principle:

3. Deed or title registration:

- It includes the type of land registration during cadastral surveying depending upon the registration used in the country.
- The registration can be through title or through deeds.
- In title registration the state compensation is done for the fault in the measurement whereas no state guarantee in case of the deed registration.

4. Preparation of cadastral records:

- It includes the preparation of documents that legally identifies the land ownership.
- In case of Nepal such cadastral records are: Jagga Dhani Darti Purja, Jagga Dhani Darti Shrestha, Cadastral map, Field book etc.

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References:

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CADASTRAL SURVEYING

EG3103GE

Unit 2: Cadastral Surveying Techniques



Public Secondary School

Lecture by
Er. Keshav Raj Bhusal

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- 2.2 Cadastral surveying by using chain/tape, Cadastral surveying by using compass,
- 2.3 Cadastral surveying by using Plane table alidade,
- 2.4 Cadastral surveying by using Total station,
- 2.5 Cadastral surveying by using Aerial photograph/ Orthophoto/Satellite imagery/UAV,
- 2.6 Cadastral surveying by using GPS
- 2.7 Hybrid method,
- 2.8 Comparison of different methods

2. Cadastral Surveying Techniques



Cadastral surveying by using chain/tape

- It is the process of carrying out surveying with the help of chain/ tape.
- Cadastral surveying using chain or tape started in 1952 B.S from Sindhupalanchok and Kavre.
- It is less accurate method of cadastral surveying.
- This is the simplest and oldest form of land surveying of an area using linear measurements only.
- It can be defined as the process of taking direct measurement, although not necessarily with a chain. Equipments used for this surveying can be divided into three, namely
 - i. Those used for linear measurement. (Chain, steel tape, linear tape).
 - ii. Those used for slope angle measurement and for measuring right angle (Eg. clinometers, abney level cross staff, optical squares).
 - iii. Other items (Ranging rods or poles, arrows, pegs etc).

2. Cadastral Surveying Techniques



Cadastral surveying by using chain/tape

General procedure for chain surveying are:

1. Reconnaissance:

- Walk over the area to be surveyed and note the general layout, the position of features and the shape of the area.

2. Choice of Stations:

- Decide upon the framework to be used and drive in the station pegs to mark the stations selected.

3. Station Marking:

- Station marks, where possible should be tied into a permanent objects so that they may be easily replaced if moved or easily found during the survey.
- In soft ground wooden pegs may be used.

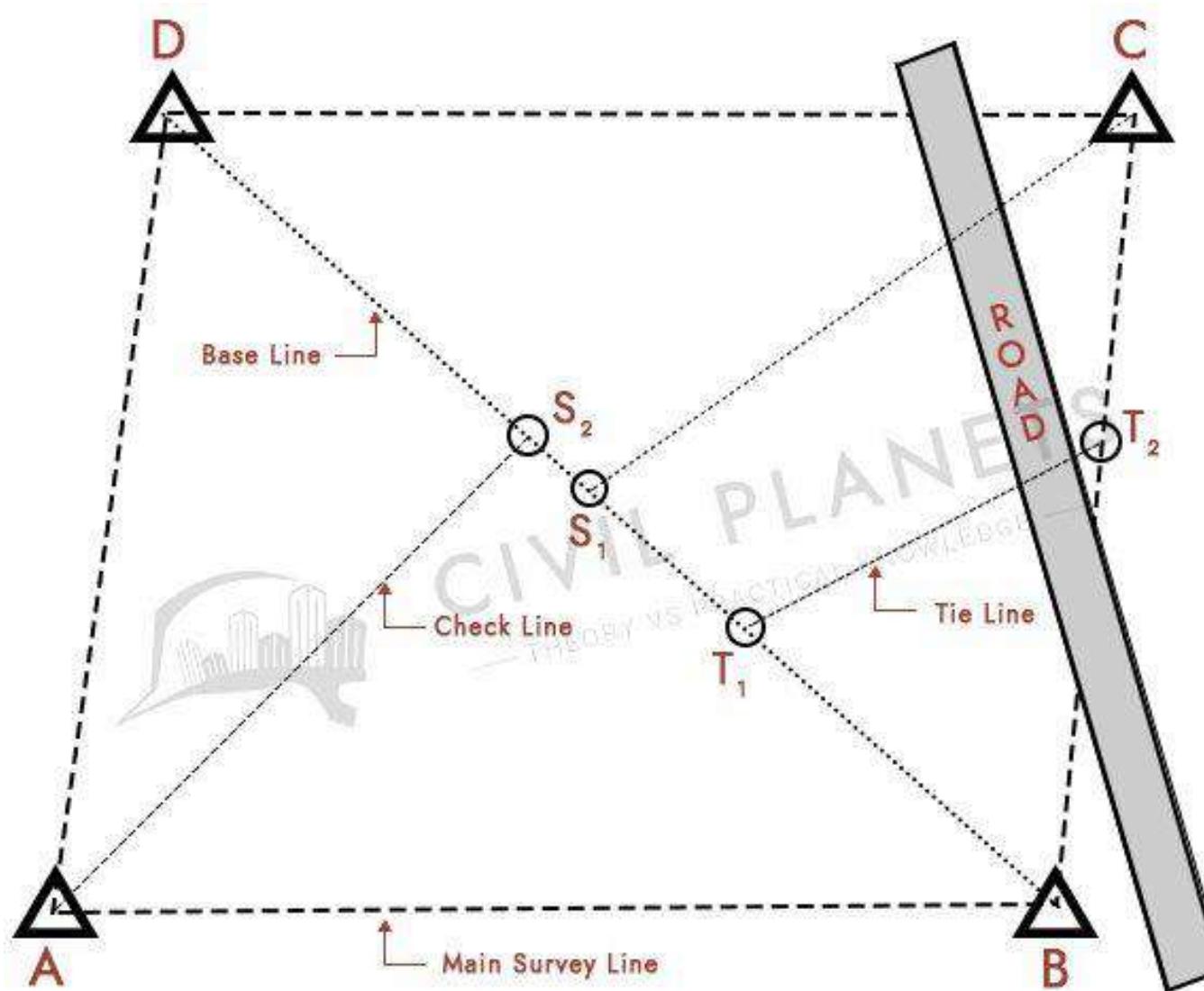
4. Witnessing:

- This consists of making a sketch of the immediate area around the station showing existing permanent features, the position of the stations and its description and designation. Measurements are then made from at least three surrounding features to the station point and recorded on the sketch.
- The aim of witnessing is to re-locate a station again at much later date even by others after a long interval.

2. Cadastral Surveying Techniques

Cadastral surveying by using chain/tape

General procedure for chain surveying are:



2. Cadastral Surveying Techniques



Cadastral surveying by using chain/tape

General procedure for chain surveying are:

5. Offsetting:-

- Offsets are usually taken perpendicular to chain lines.
- The offset distance are measured with the help of chain or tape from the chain lines. The offsets can be both perpendicular and oblique but mostly perpendicular offsets are taken. The readings are recorded systematically on the field book.

6. Sketching

- Sketching the layout on the last page of the chain book, together with the date and the name of the surveyor, the longest line of the survey is usually taken as the base line and is measured first.

2. Cadastral Surveying Techniques



Annotation on existing map/image

- It refers to the marking or annotating in photographs.
- It is a **participatory** approach.
- Example printed google earth images or aerial photographs or high resolution satellite images are taken to the field and demarcation of the cadastral boundary can be made in the field with close consultation with the local people.
- This approach is more people centered than technological as it focuses on incorporating community views.
- Since local people are directly involved in cadastral demarcation, cases of land dispute also decrease.
- The technology may not be suitable for cadastral survey of the urban area but could be very efficient where quick rehabilitation or re-establishment of land records are required like that of destroyed area.

2. Cadastral Surveying Techniques



Cadastral surveying by using Total station

- A total station instrument is a high precision theodolite equipped with EDM (Electronic Distance Measurement) and data logger (external data recorder for the temporary storage) is used to capture the coordinate of each boundary monuments exactly in digital form.
- It is very accurate method as compared to plane table and traditional methods.
- This is highly efficient and effective method of the cadastral surveying and has been in practice in Nepal at the present.
- Economic method for surveying. The cost of operation of this method and traditional plane table remains almost the same if we do not consider the cost of instrument.
- It can be used for multi-purpose cadastre.
- Since it gives the digital data, we don't further need to worry about the digitization of the acquired data.

2. Cadastral Surveying Techniques

Cadastral surveying by using Total station



Fig: showing cadastral survey using total station.

Source: mapadda.com

2. Cadastral Surveying Techniques



Cadastral surveying by using Total station

General procedure of Total Station survey:

1. Traversing

- It is the method of transferring horizontal control point throughout the survey area.
- It includes traverse angle measurement (clockwise horizontal angle from preceding traverse leg to the succeeding leg) and traverse leg measurement (line joining any two traverse stations).
- Angle and distance obtained are computed and adjusted with the help of bearing to find the independent coordinate of each traverse station.

2. Detailing

- It refers to getting details of features or parcel dimension of the survey area.
- For this prism is placed to the corners of the parcel and successive measurements are taken.
- The data is recorded in the form of x, y and z coordinates in the digital format.

2. Cadastral Surveying Techniques



Cadastral surveying by using Total station

General procedure of Total Station survey:

3. Data download, processing and map making:

- The data is then downloaded. The download of data from total station can be done with the help of software.
- The downloaded data is in the excel format.
- Thus downloaded data is loaded into GIS for making parcel features and making cadastral maps.

2. Cadastral Surveying Techniques



Cadastral surveying by using UAV

- UAV is used to capture aerial data with downward-facing sensors, such as RGB or multispectral cameras. During a drone survey with an RGB camera, the ground is photographed several times from different angles, and each image is tagged with coordinates.
- It is very fast and cost effective but is less accurate than ground survey.
- Provides a historical record of landscape that can be revisited in the future to see what changes have taken place and even to re-measure conditions in the past.

2. Cadastral Surveying Techniques



Cadastral surveying by using UAV

General procedure of drone survey:

1. Project Planning and Recce
2. Ground control points establishment through control survey.
3. Flight planning and image acquisition
4. Image processing
5. Production of Photogrammetric products
6. Digitizing and database creation

2. Cadastral Surveying Techniques



Cadastral surveying by using UAV

General procedure of drone survey:

1. Project Planning and Recce

- This is the first stage where all the necessary decisions are taken and relevant documents are collected.
- Necessary decisions include the **methodology**, instruments, human resources, budget, mapping areas, product accuracy etc. Relevant **documents** include existing maps, mapping specification (Scale of map, Contour Interval, etc), flight permission etc.
- The **visit** of study area is also done for further planning.

2. GCP establishment

- Ground control points(GCP) increases the accuracy of photogrammetric products. At present GCPs are establish using DGPS, RTK and other survey grade receivers.
- It depends on client accuracy and budget.
- Cost of establishing ground control ranges between 20 to 50 % of total mapping cost.
- In GCPs position, generally some large flags and **symbols** are kept in grounds so that they can be recognized clearly in aerial photographs and georeferencing can be done easily.

2. Cadastral Surveying Techniques



Cadastral surveying by using UAV

General procedure of drone survey:

3. Flight planning and image acquisition

- In this stage, flight path for aircraft is planned and images along that respective path is taken .
- These days, flight planning is done using **mobiles apps** like Pix4d capture, DroneDeploy etc. We can adjust the settings like required overlap, speed of UAV, flying height and other various settings.
- Flight planning has become very easy with the technological development.

4. Image processing

- Once the image is captured they are to be processed. In modern photogrammetry, processing of such digital aerial images is done using softwares like **Pix4d Mapper**, Webodm etc.
- It involves orientation (interior and exterior orientation) and aerial triangulation (when orientation process is done in blocks). Aerial triangulation also enables densification of control points required to make mosaics.
- It also includes image matching(the determination of conjugate points in a stereo image pair), feature matching processes.
- At this stage, images are georeferenced with the help of GCPs.

2. Cadastral Surveying Techniques



Cadastral surveying by using UAV

General procedure of drone survey:

5. Production of Photogrammetric products

- Image processing results generation of point cloud. After point cloud **densification** DSM, Orthophoto, DTM and contour are generated.

6. Digitizing and database creation

- Thus obtained orthomosaic is then digitalized in GIS software to obtain parcels which are then provide with attribute information.
- The non-spatial characteristics associated with a feature are collected on the field to insert with features.

7. Verification/Adjudication in the Field

- Field verification is done to identify the actual location of legal boundaries that may not be visible on the photography or may have been wrongly identified.
- For this survey team with GPS and related orthophotos should go to the field to check the parcel boundaries.

2. Cadastral Surveying Techniques



Cadastral surveying by using Satellite imagery/ Remote Sensing

- The use of remote sensing gives relatively rapid, cost effective and mass production in comparison to field survey techniques and further advantages are provision of historical records.
- Extraction of the parcels cadastral can be done more easily in multi spectral bands and the spatial objects such as building, roads, rivers and other physical objects are easily extracted from both multispectral and panchromatic bands.
- It can be used mostly for rural area where land value is low and small scale cadastral map is sufficient.

2. Cadastral Surveying Techniques

Cadastral surveying by using Satellite imagery/ Remote Sensing



Fig: showing
digitalized
parcels along
with control
points.

Source:
https://fig.net/resources/proceedings/2015/2015_11_nepal/T.S.6.6.pdf

2. Cadastral Surveying Techniques



Cadastral surveying by using Satellite imagery/ Remote Sensing

General procedure:

1. Project planning and preparation:

- It includes determine the extent of the area to be surveyed, specific goals of the cadastral survey and other relevant remote sensing datasets for the survey area.

2. Data Acquisition:

- Acquire remote sensing data: Obtain the required satellite imagery or aerial photographs covering the survey area ensuring sufficient resolution and coverage for the intended analysis.
- Consider ancillary data: It includes additional data sources that may aid in the interpretation and analysis of the remote sensing imagery, such as existing cadastral maps, ground control points, or ground truth data.

3. Image Pre-processing:

- Georeferencing: It refers to aligning remote sensing data with ground control points.
- Radiometric calibration: Adjusting the imagery to remove sensor-specific biases and variations.
- Atmospheric correction: Removing atmospheric effects such as haze or scattering to improve image quality.

2. Cadastral Surveying Techniques



Cadastral surveying by using Satellite imagery/ Remote Sensing

General procedure:

4. Feature Extraction and Digitization:

- It includes identifying relevant cadastral features, such as property boundaries, buildings, roads, and vegetation.
- It also involves digitizing parcels and related features using different bands.

5. Field verification:

- It comprise of visiting selected locations on the ground to validate the accuracy of the extracted cadastral features and identify potential errors or discrepancies.

Limitations

- As it relies on visual interpretation. In case of highly dense settlement area, shadow region, high canopy cover, unclear boundaries due to similar spectral reflectance, small parcel etc. similar accuracy cannot be achieved.
- It is less accurate than ground survey.

2. Cadastral Surveying Techniques



Cadastral surveying by using GPS

- It is the technique of carrying out survey by GPS, with the help of signals from satellite.
- Cadastral survey can be done quickly without an additional control point surveying and works out an accurate result of centimeter level.
- It is very accurate and very fast.

Limitations:

- The technology is best preferred in open terrain. In cases where sky obstructions were high, GPS can have some problems with receiving the signals.

2. Cadastral Surveying Techniques



Cadastral surveying by using GPS



Fig: showing
DGPS setup for
cadastral survey.

Source: mapadda.com

2. Cadastral Surveying Techniques



Cadastral surveying by using GPS

General procedure:

1. Project planning:

- The surveyor plans the cadastral survey, considering factors such as the purpose of the survey, survey accuracy requirements, project timeline, and any legal or regulatory considerations.
- This includes identifying the boundaries to be surveyed and determining the required control point network.

2. Control Point Establishment:

- This includes establishing control points using GPS and selecting points that will serve as reference points for the survey.
- Typically, these points are permanent, stable, and easily identifiable.

3. Field Data Collection:

- With the control points established, the surveyor proceeds to collect field data using GPS receivers.
- The surveyor moves along the boundary of the parcel, collecting coordinates of key points such as boundary corners, monuments, and other relevant features.

2. Cadastral Surveying Techniques



Cadastral surveying by using GPS

General procedure:

4. Data Processing:

- The collected GPS data is processed using specialized software. The software combines the GPS data with the control point coordinates to calculate accurate positions for the surveyed points.
- This process involves adjusting the GPS data to account for factors such as satellite signals, atmospheric conditions, and other sources of error.

5. Mapping and Documentation:

- Once the survey data is finalized and verified, the surveyor prepares cadastral maps and related documentation.
- The maps depict the surveyed boundaries, relevant features, and any legal or regulatory information.
- The documentation may include a survey report, property descriptions, and any other required information for legal purposes.

2. Cadastral Surveying Techniques



Cadastral surveying by using GPS

Major advantage of GPS survey are as follows:

- Traverse stages in the field for providing control points as required in total station surveys (including reconnaissance, demarcation, establishment, observations and adjustment) are not needed.
- Not requiring inter-visibility between observing stations.
- It is more accurate and simpler for establishing control points for cadastral surveys.
- The destruction of control point problems can be solved readily as the coordinates of the control points can be restored digitally.
- GPS observations are not hampered by day/night or weather.
- Simple field operation and appropriate.
- Being fast it is time saving.

2. Cadastral Surveying Techniques



Cadastral surveying by using hybrid method

- It refers to the combination of two or more methods of surveying.
- It combines traditional surveying techniques with modern technologies such as Global Navigation Satellite Systems (GNSS), Geographic Information Systems (GIS) etc. and get advantage of both methods.
- It includes using Total Station field survey method in urban and dense area and using GPS method in relatively open area where there is no obstruction to GPS satellites or use of high resolution satellite images in rural area.
- Photogrammetry techniques can be integrated with the ground survey techniques. As explained earlier ground survey techniques like DGPS and total stations are used for the establishment of control points and the control points are used for georeferencing of these photographs.

2. Cadastral Surveying Techniques



Comparison of different methods

Analog system (Plane Table, Tape)

- It is time consuming.
- It required more human resource.
- It is costly.
- Less effective and efficient for the data handling.
- Customer dissatisfaction.
- Less secure physically and technically.
- Weather dependent.

2. Cadastral Surveying Techniques



Comparison of different methods

Digital system (Total Station, UAV, Remote sensing, GPS)

- Portability
- Efficient Storage
- Fast retrieving
- Data Analysis
- Fast
- Durable
- Maintenance and updating efficiently.
- Multipurpose

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References:

- <https://www.fig.net/resources/publications/figpub/pub11/FIG%20Statement%20on%20the%20Cadastre.pdf>
- <https://people.utm.my/tlchoon/files/2015/09/1-Introduction-SV.pdf>

CADASTRAL SURVEYING

EG3103GE

Unit 3. Cadastral maps

Lecture by
Er. Keshav Raj Bhusal



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Unit 3. Cadastral maps

- 3.1 Map Projection and sheet numbering for cadastral maps,
- 3.2 Geodetic control points for cadastral surveying and mapping,
- 3.3 Different types and scale of cadastral maps (index map, file map, parcel map),
- 3.4 Plotting Error,
- 3.5 Various kinds of Parcel numbering system,
- 3.6 Specifications and Standards of cadastral maps

3. Cadastral Maps



Map Projection for cadastral maps

- The systematic representation of the parallels of latitude and the meridians of longitude of the spherical surface of the earth into plane surface of paper is called projection.
- In Nepal Modified Universal Transverse Mercator (MUTM) projection is adopted.
- It has following parameters:
 - Central Meridian – 81, 84, 87
 - Projection: Transverse Mercator
 - Latitude of Origin: 0
 - False Easting – 500000
 - False Northing – 0
 - Scale factor- 0.9999
 - Units: Meters
 - 120 zones each of 3° longitude.

3. Cadastral Maps

Map Projection for cadastral maps

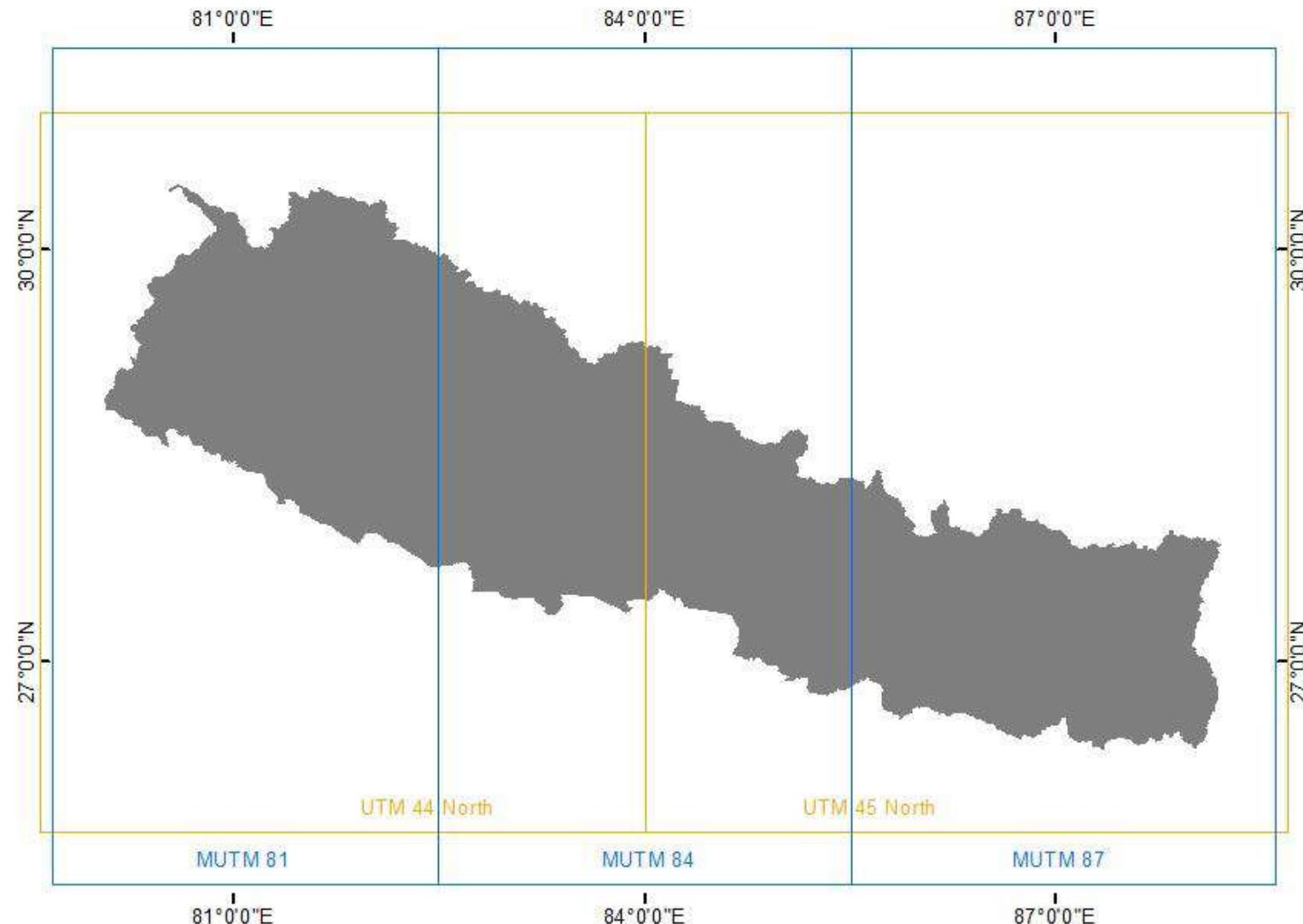


Fig: showing MUTM zones along with 44N zone

Source:
<https://spaceappnet.wordpress.com/2020/06/24/coordinate-systems-used-in-nepal/>

3. Cadastral Maps



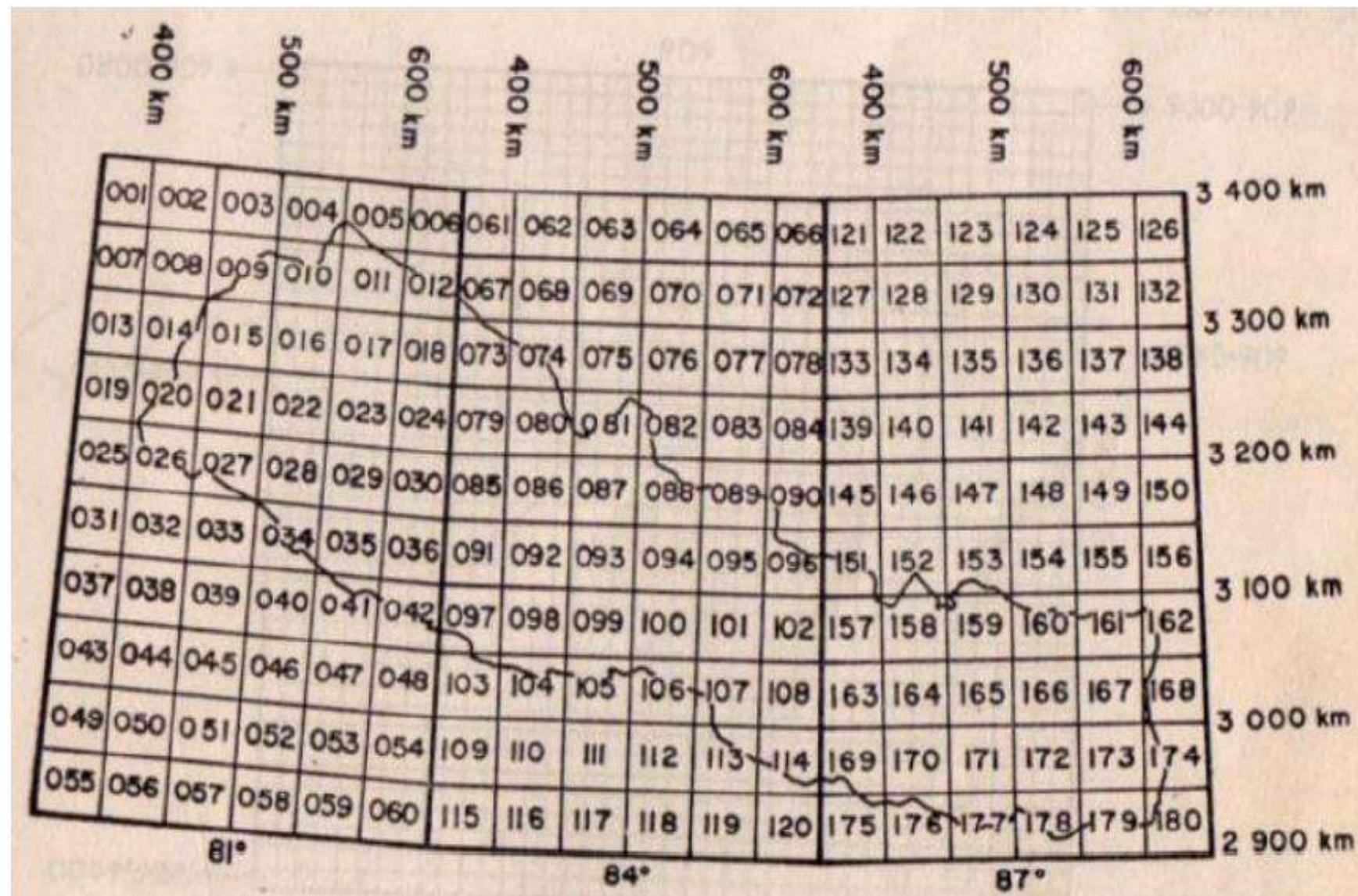
Map Sheet Numbering System

- The area of 3° longitudes ($1^{\circ} 30'$ east and $1^{\circ} 30'$ west of central meridian) and 5° latitudes (26° to 31°) is taken as 1 Zone. By this way, Nepal is divided into three zones.
- Area of each zone is $300 \text{ Km} * 500 \text{ Km}$.
- Each three zones is divided into grid square $50 \text{ Km} * 50 \text{ Km}$ (10 rows*6 columns) called grid sheet.
- Numbering of this grid sheet starts from the North-west corner to the South-east corner.
- 60 Grid sheets are in each Zone and total 180 number of grid Sheet (Numbering 001 to 180).

3. Cadastral Maps



Map Sheet Numbering System



Source:
<https://dipeshsuwal.files.wordpress.com/2013/04/sheet-numbering-system-in-nepal.pdf>

3. Cadastral Maps



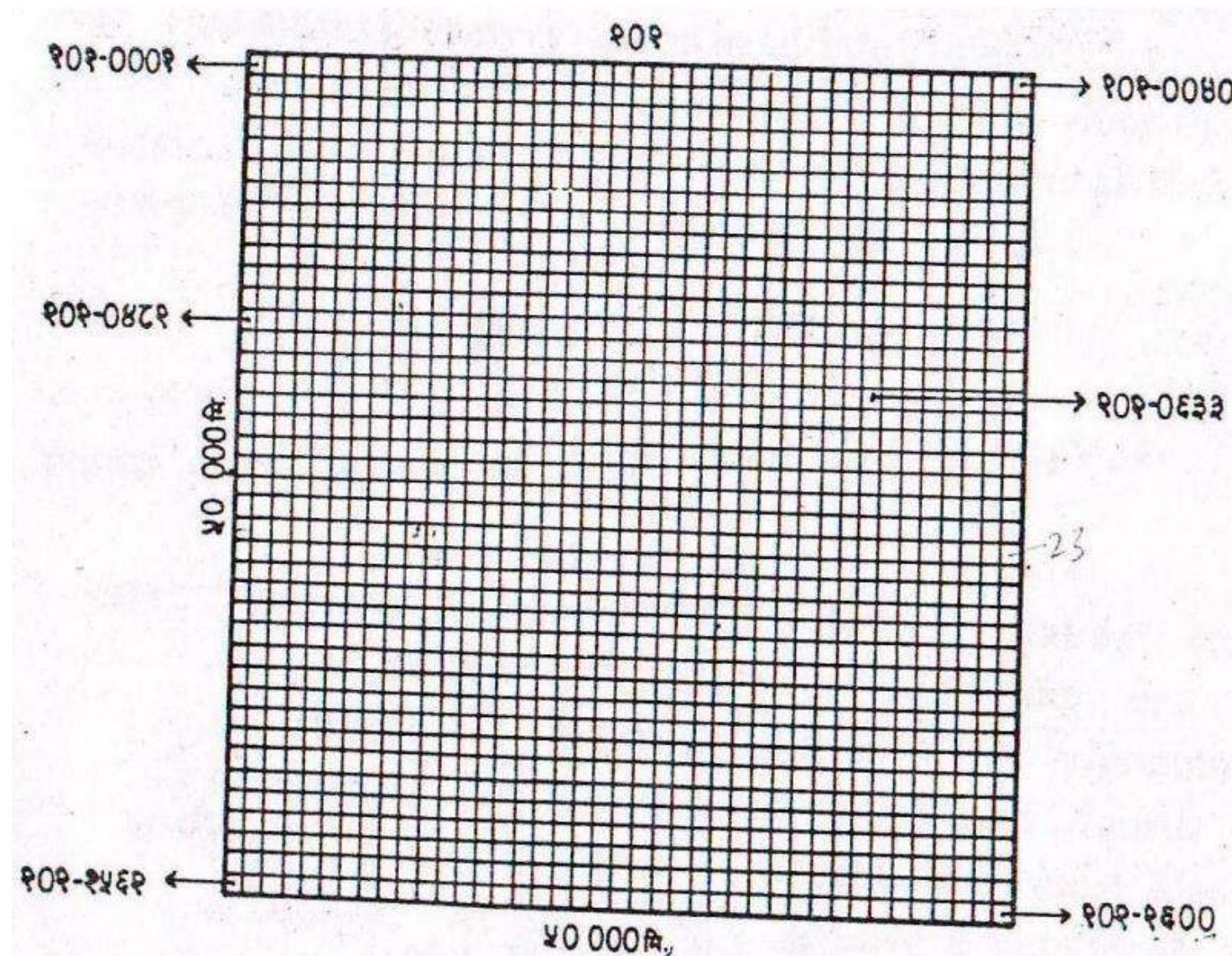
Map Sheet Numbering System

- *For map having scale of 1: 2500*
- Map format 50cm*50cm (map distance)
- Ground area coverage 1250m*1250m
- Each Grid Sheet of (50 Km* 50Km) is further divided into 1600 smaller squares each having area of (1.25 km * 1.25 km) (row= 40 and column = 40).
- Sheet Number 0001 to 1600 (40*40)
- For example, 098-0001

3. Cadastral Maps

Map Sheet Numbering System

- For map having scale of 1: 2500

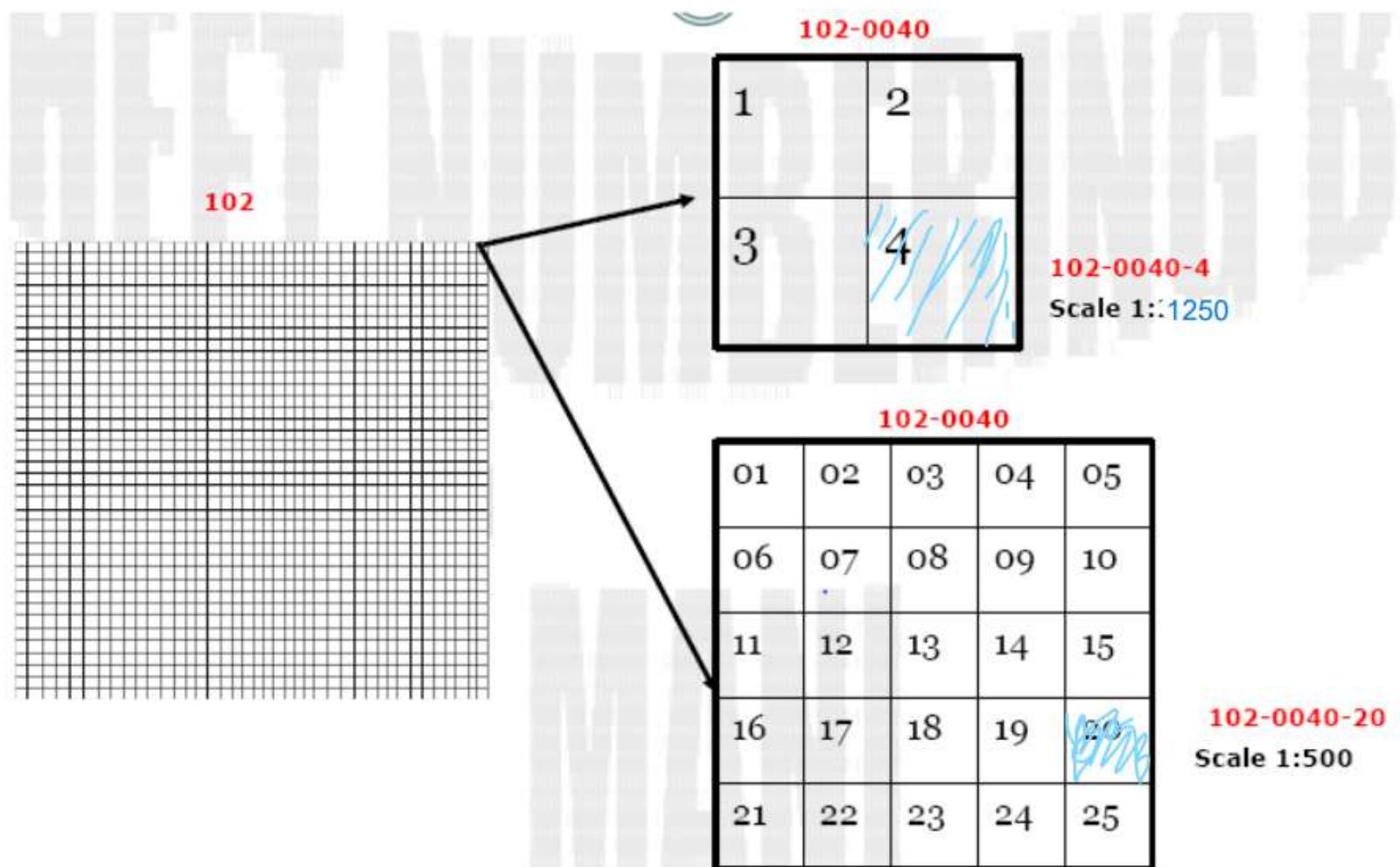


3. Cadastral Maps



Map Sheet Numbering System

- For map having scale of 1: 1250
 - 2rows*2columns = 625m*625m
 - Numbering 1 to 4
- For map having scale of 1: 500
 - 5rows*5columns = 250m*250m
 - Numbering 01 to 25



3. Cadastral Maps



Geodetic control points for cadastral surveying and mapping

- Fourth order control points are used for the cadastral survey in Nepal,
- DOS has established 4th order control point from 3rd order for 47 districts and work is in progress to complete the remaining districts of the country.
- These control points are based on national geodetic control framework which is on the basis of Nepal datum.

3. Cadastral Maps



Different types and scale of cadastral Maps

- Index map
- File map
- Parcel map

File map

- A large scale map which is prepared in a separate sheet during the process of land transaction if the parcel is too small and if it is not possible to plot in the map after fragmentation of the parcel is called a file map.

Parcel map

- A parcel map, also known as a property map or tax map, are maps typically built to identify property boundaries and is a popular data source for industries such as real-estate.
- It consists of a single parcel with boundary dimensions and other information.

3. Cadastral Maps



Different types and scale of cadastral Maps

Index map

- The index map in cadastre typically shows the boundaries and identifying information for individual parcels or land units within a larger geographic area, such as a town, city, or region.
- It helps users quickly locate and identify specific land parcels or properties within the cadastre.

Plotting error

- While plotting the particular map onto a sheet we can plot it with the accuracy of 0.025 cm or 0.01" or 0.25 mm or 1/4 th of 1 mm of the corresponding scale. This means the width of the line made by the pencil makes 0.025 cm on the map resulting discrepancy or deviation between the observed measurements and the plotted representation of the surveyed data on a map in the ground called plotting error.
- While plotting the objects onto the map sheet the plottable error also should be taken into consideration.
- The plotting error is different for different scale of maps.

3. Cadastral Maps



Different types and scale of cadastral Maps

Plotting error

- The plotting error is different for different scale of maps.
- For the scale of 1:500 => 1 cm on map-500 cm on ground
=> 0.025 cm on map- 500×0.025 cm => 12.5 cm on ground.
- For the scale of 1:1250 => 1 cm on map-1250 cm on ground
=> 0.025 cm on map- 1250×0.025 cm => 31.25 cm on ground.
- For the scale of 1:2500
=> 0.025 cm on map- 2500×0.025 cm => 62.5 cm on ground.
- Therefore pottable error for 1: 500.1:1250 and 1:2500 scale are 12.5 cm, 31.25 cm and 62.5 cm respectively.

3. Cadastral Maps



Different types and scale of cadastral Maps

Plotting error

- The plotting error is different for different scale of maps.
- For the scale of 1:500 => 1 cm on map-500 cm on ground
=> 0.025 cm on map- 500×0.025 cm => 12.5 cm on ground.
- For the scale of 1:1250 => 1 cm on map-1250 cm on ground
=> 0.025 cm on map- 1250×0.025 cm => 31.25 cm on ground.
- For the scale of 1:2500
=> 0.025 cm on map- 2500×0.025 cm => 62.5 cm on ground.
- Therefore pottable error for 1: 500.1:1250 and 1:2500 scale are 12.5 cm, 31.25 cm and 62.5 cm respectively.

3. Cadastral Maps



Specifications and Standards of cadastral maps

- Sheet format: 50cm X 50cm
- Sheet type : permatrace(75micron)
- Scale : 1:2500 for open area(agriculture land)
1: 1250 for rare village
1: 500 for dense village or urban area
- Projection: MUTM
- Method: PT/ TS for digital survey
- Plotting error: $\frac{1}{4}$ of 1mm of corresponding scale
- Pencil for plotting: Hard(4H) [Incase of plane table]
- Color: black and white
- Control : National grid base
- Distance between control points- 30m,60m &100m for 1:500, 1:1250 & 1:2500 respectively.

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References:

- <https://www.fig.net/resources/publications/figpub/pub11/FIG%20Statement%20on%20the%20Cadastre.pdf>
- <https://people.utm.my/tlchoon/files/2015/09/1-Introduction-SV.pdf>
- <http://dos.gov.np/office/page/introduction/geodetic>

CADASTRAL SURVEYING

EG3103GE

Unit 4: Graphical Cadastre



Public Secondary School

Lecture by
Er. Keshav Raj Bhusal

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Unit 4: Graphical Cadastre

- 4.1 Plane Table and Accessories,
- 4.2 Plane table setting,
- 4.3 Surveying and mapping,
- 4.4 Inking and tracing of cadastral maps,
- 4.5 Area Computation and checking,
- 4.6 field book and other Document preparation (manual)

4.1 Plane Table and Accessories



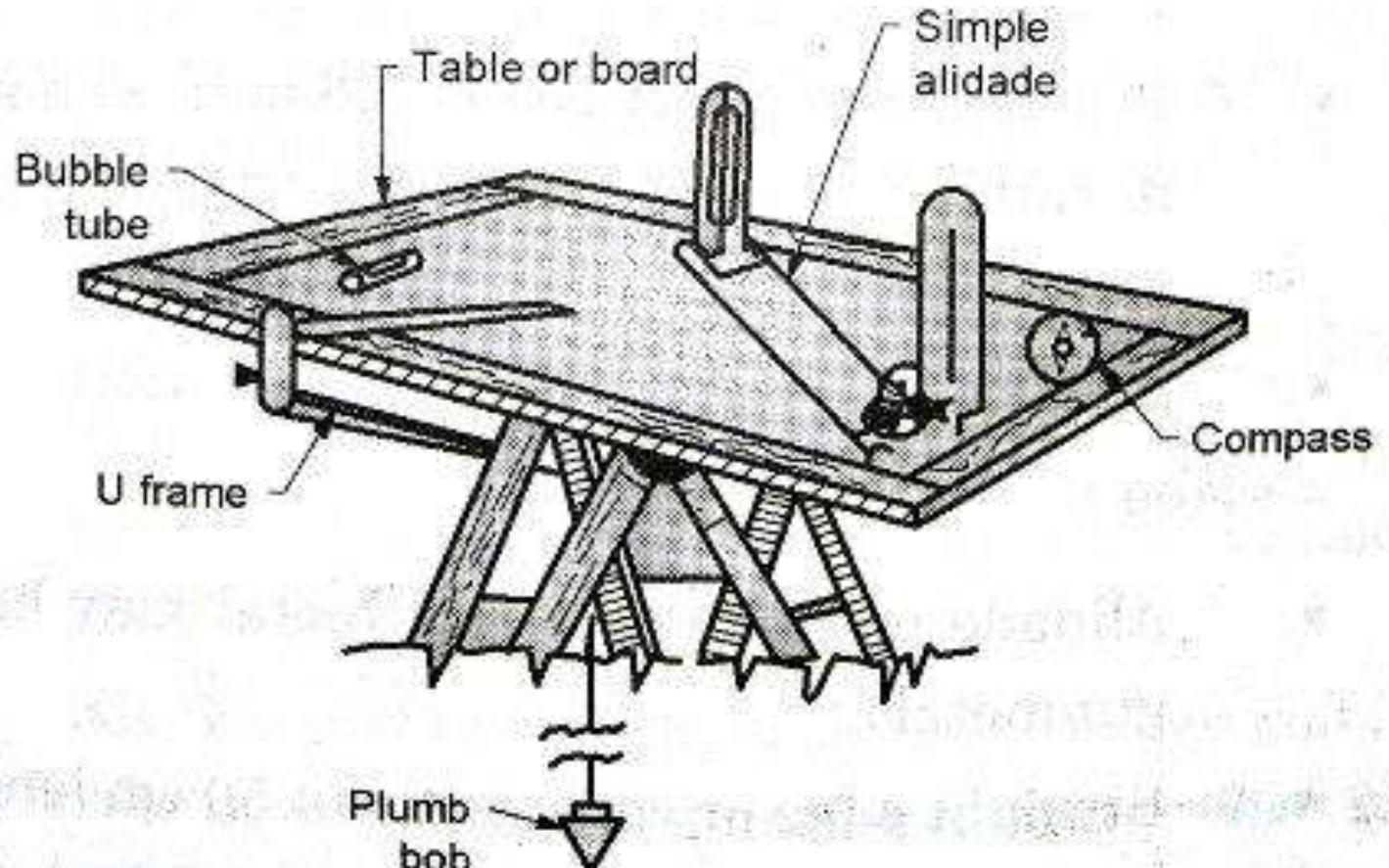
Plane table survey

- Plane table surveying is a graphical method of survey in which the field observations and plotting are done simultaneously.
- It is simple and cheaper than theodolite/total station survey but it is mostly suitable for small scale survey.
- The plan on drawing sheet drawn by surveyor in the field itself so there is chance of occurrence of any mistake is very less.
- It is based on the principle of parallelism.

4.1 Plane Table and Accessories

Parts of plane table

- i. Alidade (simple/telescopic)
- ii. Drawing board
- iii. Plumbing fork
- iv. Spirit level
- v. Compass



Plane Table

Source:

<https://civilengineeringnotes.com/plane-table-surveying/>

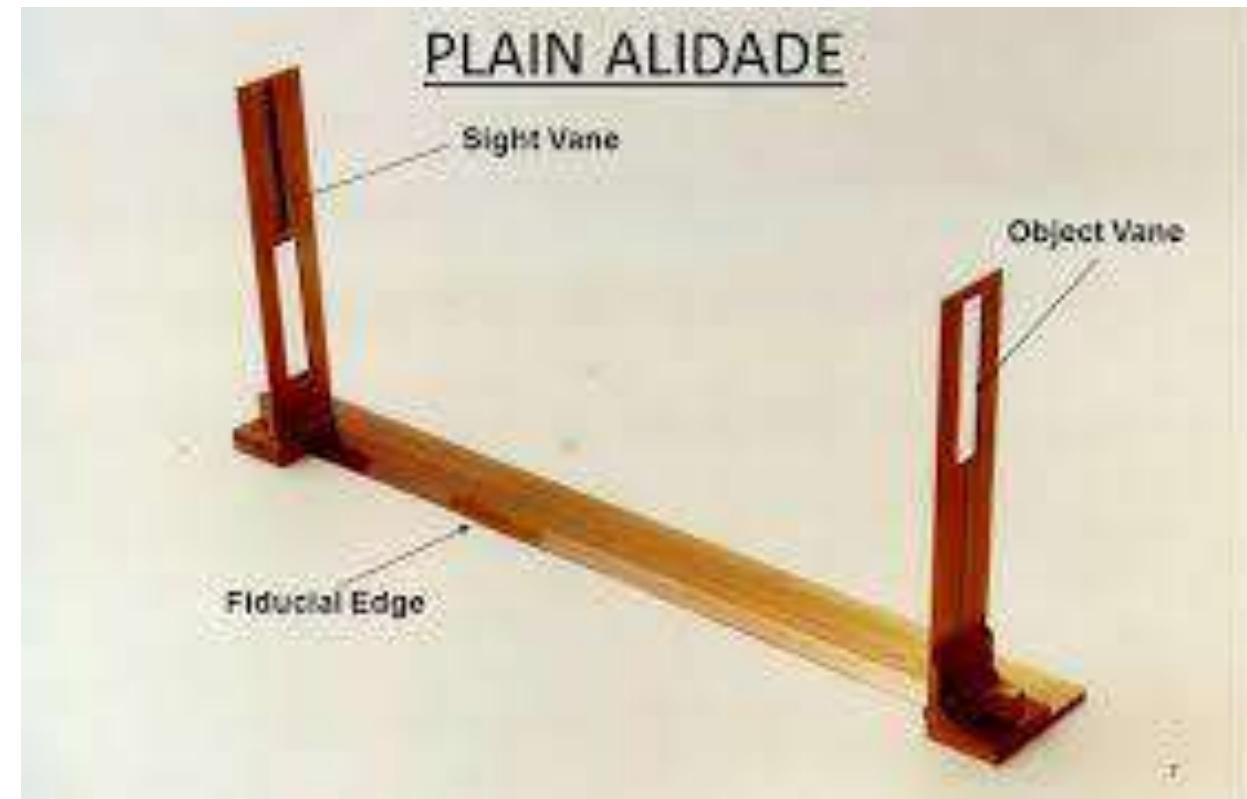
4.1 Plane Table and Accessories



Parts of plane table

Alidade

- The alidade is a ruler with a sight line attached and is used on the plane table for bisecting the object, drawing rays, direction lines, etc.
 - The alidade consists of metal or box wood straight edge or ruler about 50cm long.
-
- It is generally of two types:
 - Simple/Plain alidade
 - Telescopic alidade



4.1 Plane Table and Accessories



Parts of plane table

Alidade

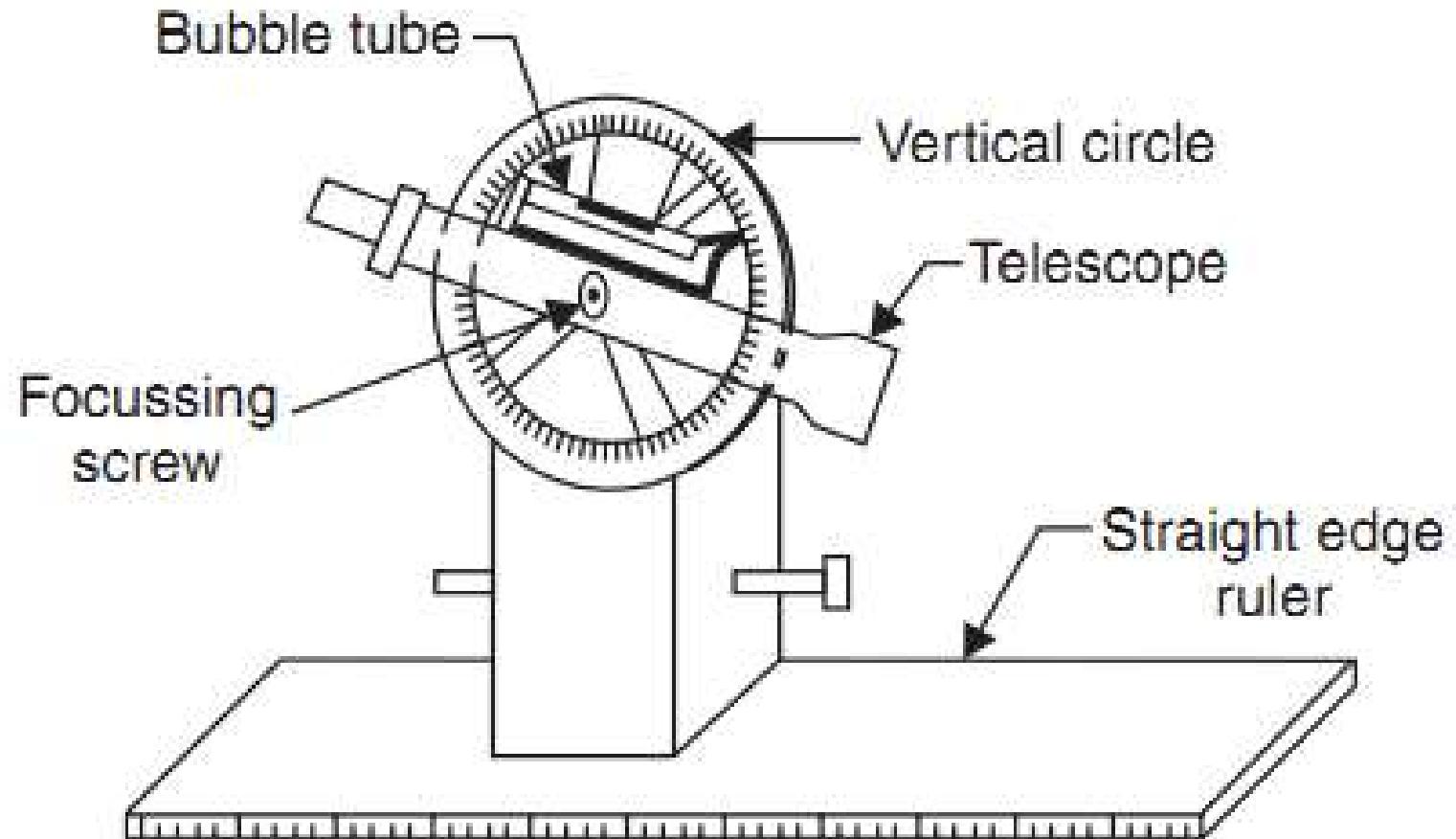
- *Simple alidade:*
 - A sight vane is provided at each end of the ruler. The vane with narrow slit serves as eye vane and the other with wide slit and having a thin wire at its centre serves as object vane.
 - The two vanes are provided with hinges at the ends of ruler so that when not in use they can be folded on the ruler.
 - Plain alidade is not suitable in surveying hilly areas as the inclination of line of sight in this case is limited.
- *Telescopic alidade:*
 - It consists of a telescope mounted on a column fixed to the ruler.
 - The line of sight through the telescope is kept parallel to the bevelled edge of the ruler.
 - The telescope is provided with a level tube and vertical graduation arc.
 - If **horizontal sight** is required bubble in the level tube is kept at the centre.
 - If **inclined sights** are required vertical graduation helps in noting the inclination of the line of sight by providing telescope the range and the accuracy of line of sight

4.1 Plane Table and Accessories

Parts of plane table

Alidade

- *Telescopic alidade:*



4.1 Plane Table and Accessories



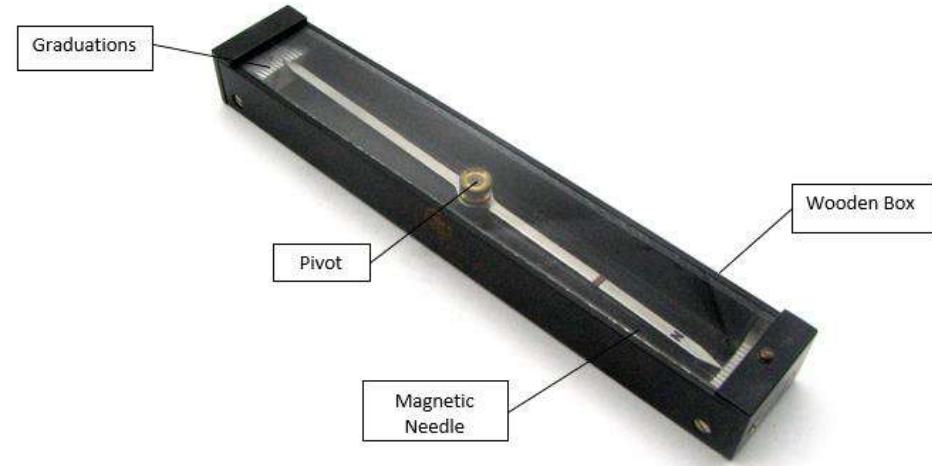
Parts of plane table

Drawing sheet:

- The drawing sheet is fixed on the top of the drawing board upon which map is plotted.

Compass

- The compass is used to mark the direction of the meridian on the drawing sheet.



Spirit level or level tube

- A level tube is used to level the plane table.
- To get perfect level, spirit level should show central position for bubble tube when checked with its positions in any two mutually perpendicular directions.

4.2 Plane table setting



Plane table setting

It consists of following:

- i. Setting up over a station
- ii. Levelling
- iii. Centering
- iv. Orienting

1. Setting up over a station

- At first, the tripod stand is placed over the required station with its legs well apart then table is fixed on it with the help of wing nut.
- The table should be setup at the convenient height for working on the board depending on the surveyors height.

4.2 Plane table setting



Plane table setting

2. Levelling

- It is simply done by adjusting the legs of tripod.
- It is further carried out using spirit level. The table is levelled by placing the spirit level on the board in two positions right angles and getting the bubble central in both the direction.



Source: <http://ce.cet.ac.in/downloads/Study%20Material/Surveying/Plane%20Table%20Surveying.pdf>

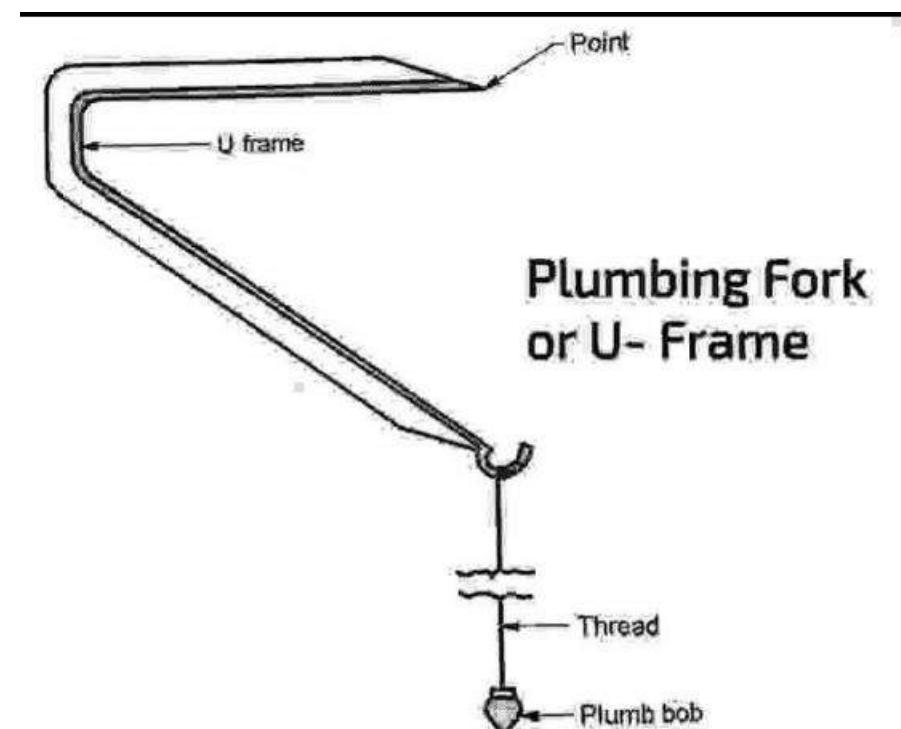
4.2 Plane table setting



Plane table setting

3. Centering

- After setting up and levelling is completed, centering is carried out by means of U-frame and plumb bob.
- The centering of the plane table is done by hanging the plumb bob at one end of U-frame with the help of thread and fixing the other end of U-frame perpendicular to the ground station by fixing the U-frame on the plane table.



Source:

<http://ce.cet.ac.in/downloads/Study%20Material/Surveying/Plane%20Table%20Surveying.pdf>

4.2 Plane table setting



Plane table setting

4. Orientation

- It is the process of keeping the plane table always parallel to the position, which is occupied at the first station.
- It consists of two methods:
 - i. Orientation by magnetic needle
 - ii. Orientation by backsighting

Orientation by magnetic needle

- In this method, the magnetic north is drawn on paper at a particular station.
- At the next station, the trough compass is placed along the line of magnetic north and then the table is turned in such a way that the north direction plotted previously matches with the ends of magnetic needle showing true north .

4.2 Plane table setting



4. Orientation

Orientation by backsighting

- In this method, the orientation is carried out by the back sighting of a particular line.
- Suppose a line is drawn from station A on paper representing line AB on ground.
- Then, the table is centered and leveled at station B and then the alidade is placed along the line ba. The table is turned till the line of sight bisects the ranging rod at A. The table is turned till the line of sight bisects the ranging rod at A.
- This method is better than the previous one and it gives perfect orientation.

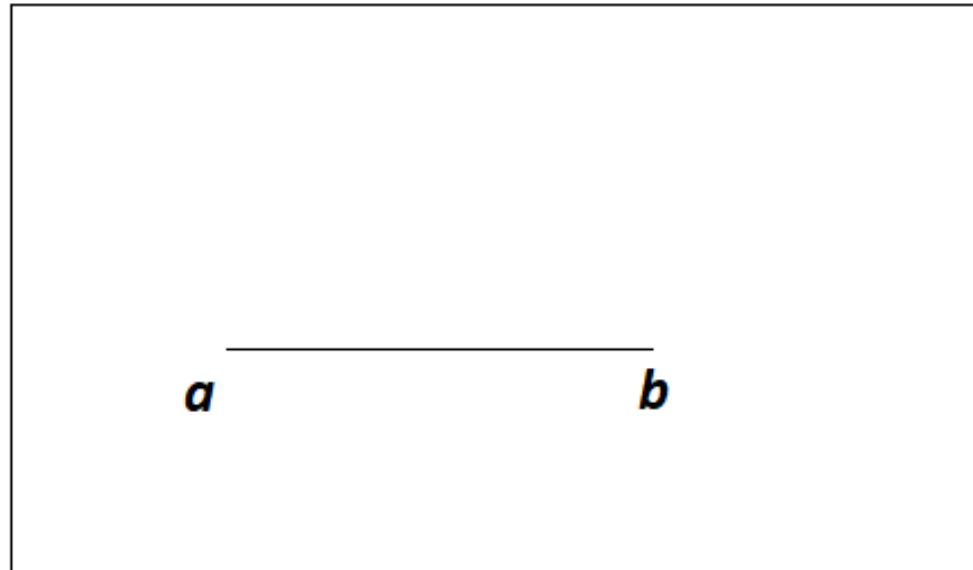


Fig showing plane table being placed first at station A to form line ab and later placed at B and sighted back to A to form line ba



Surveying and Mapping

Methods of plane tabling

Methods of plane tabling can be divided into four distinct methods:

- i. Radiation
 - ii. Intersection
 - iii. Traversing
 - iv. Resection
-
- The first two methods are generally employed for locating the details while other two methods are used for locating the plane table stations.



Methods of plane tabling

Radiation

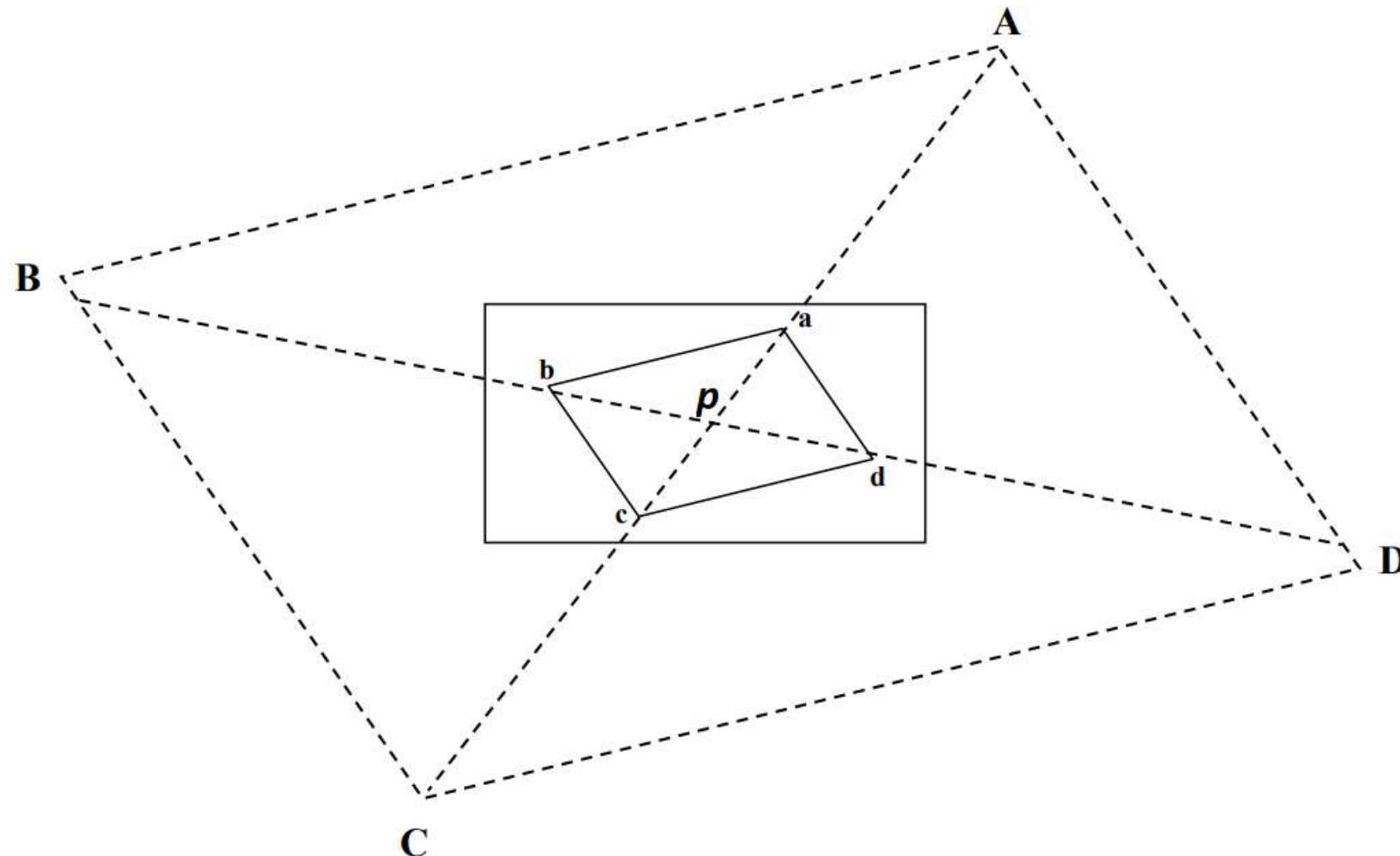
- This is the simplest method and is used specially for detailing.
- The procedure is as follows:
 - i. Select a point P so that all the corners of the traverse ABCD are seen.
 - ii. Carry out the usual temporary adjustments of centering and leveling. Mark the north line on paper.
 - iii. Put the alidade on point P and draw a line of sight for station A.
 - iv. Measure the distance PA on ground and put this length to a suitable scale on paper which will give point a.
 - v. Similarly, obtain points b, c and d on paper by drawing lines of sight for stations B, C and D and measuring the distances PB, PC and PD on ground respectively.
 - vi. Join points a, b, c and d on paper, as shown in figure.
 - vii. For checking the accuracy of work, measure the distances AB, BC, CD and DA on ground and compare them with the lengths ab, bc, cd and da respectively on paper.

Survey and Mapping



Methods of plane tabling

Radiation



Source:
http://eagri.org/eagri50/AE_NG151/lec04.pdf

Fig: Points abcd plotted on table through radiation technique

Survey and Mapping



Methods of plane tabling

Intersection

- The procedure is as follows:
 - i. Select two instrument stations P and Q, such that all the points or details to be located are visible from both the stations.
 - ii. Now set the table on P and make it centered and level.
 - iii. Using the plumbing form locate the ground station on the sheet i.e. p, such that the point p on the sheet is exactly over the point P on the ground.
 - iv. Measure the distance between P and Q.
 - v. Now using the alidade pivoted at P orient the table so that other instrument station Q is sighted and clamp the table and draw a line along the fiducial edge of the alidade according to a suitable scale. This line pq is a base line and hence must be measured and drawn accurately
 - vi. With the alidade pivoted on p sight other details and draw rays as a', b' c', d' etc as shown in Figure 0-1
 - vii. Now shift the table to station Q and make it centered and leveled such that point q on sheet is exactly above the Q on the ground
 - viii. With the alidade placed along line pq orient the table and back sight the station P and clamp the table.
 - ix. With the alidade pivoted on q sight other details and draw rays as a'', b'' c'', d'' etc as shown in Figure 0-2
 - x. The intersection of a', b' c', d', e' with a'', b'' c'', d'', e'' are named as a, b, c, d, e respectively. Join a, b, c, d, e.

Survey and Mapping

Methods of plane tabling

Intersection

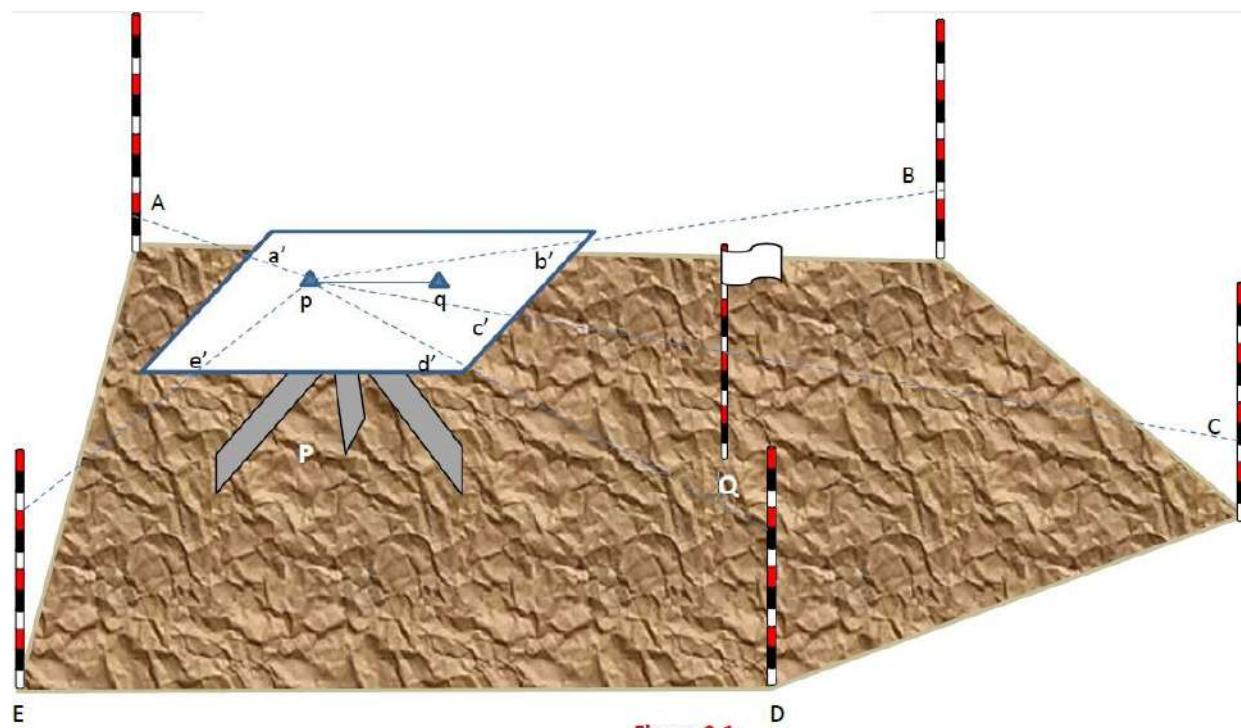


Figure 0-1

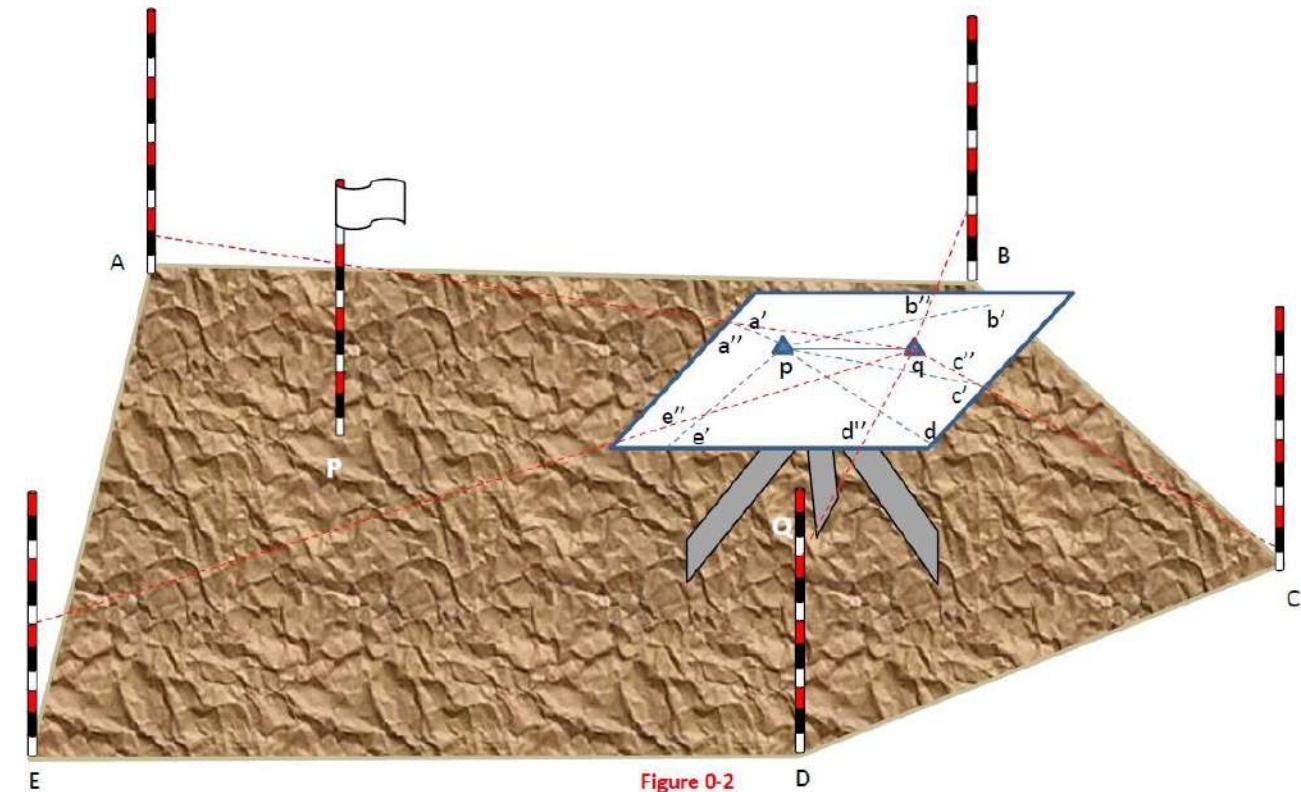


Figure 0-2



Methods of plane tabling

Traversing

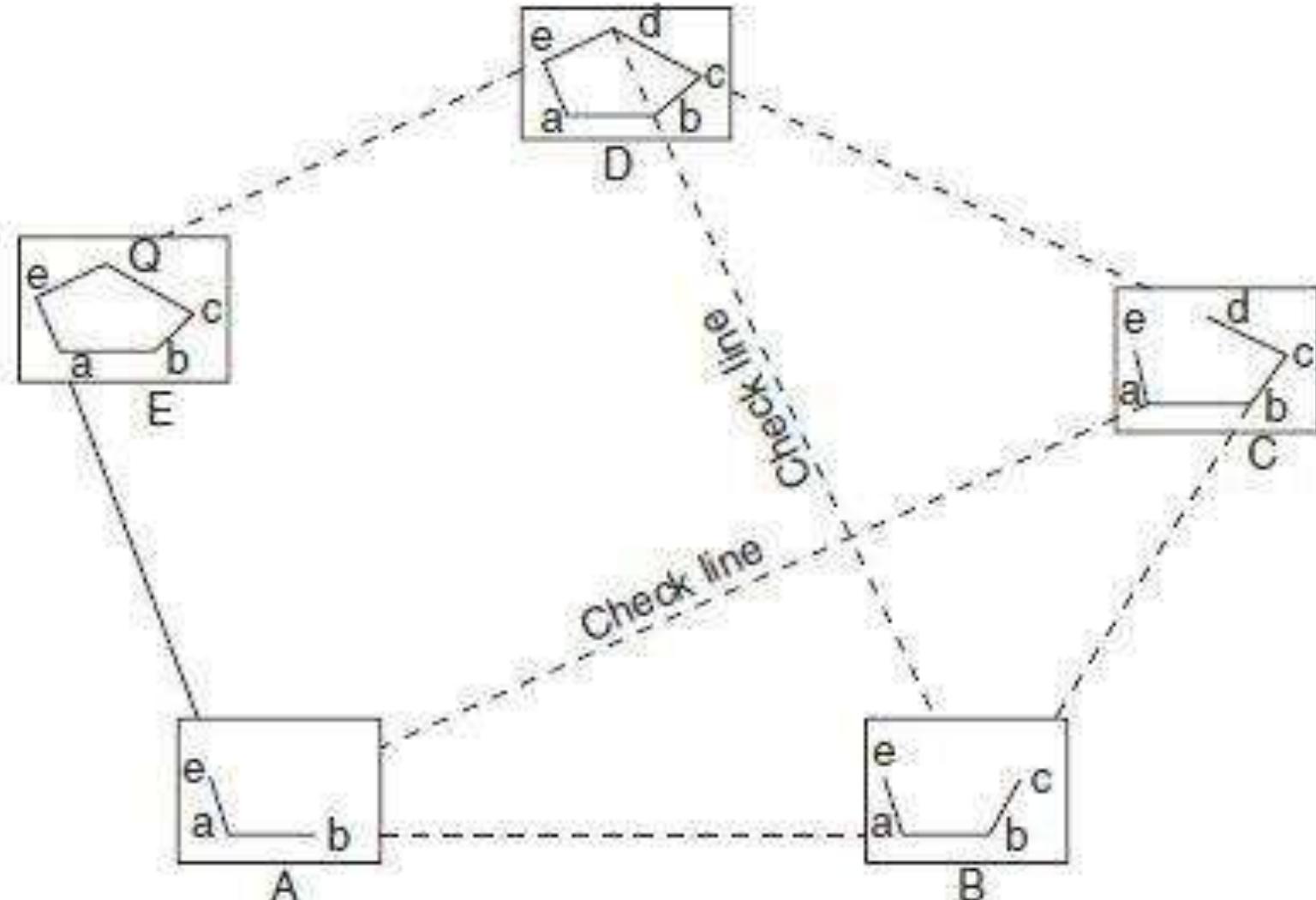
- The general procedure is as follows:
 - i. The plane table is fixed at a location (say A).
 - ii. From that point, a sight is taken toward B and the distance AB is measured and plotted on paper at a suitable scale.
 - iii. The plane table is shifted to station B and sighted toward A (back sighting).
 - iv. Then the point C is sighted from B and the distance is measured. This process is repeated for all the stations.
 - v. Finally, plot the traverse lines on the drawing sheet.

Survey and Mapping



Methods of plane tabling

Traversing



Source:

<https://civiltoday.com/surveying/plane-table-surveying/146-plane-table-surveying-definition-adjustments-methods>.



Methods of plane tabling

Resection (Method of orientation)

- It is the method of locating unknown point with the help of known points through which required detailing can be completed.
- It is of two types. They are:
 - i. The two-point method (Backray method)
 - ii. The three-point method

Two point method

- Finding unknown point with help of two known points.

4.4 Inking and tracing of cadastral maps



Inking cadastral maps

- It includes inking the parcel boundary and features drawn during field survey by using pencil.
- Inking should be correctly done to maintain accuracy.
- Line of inking should be uniform and same width for maintaining the quality of map.
- The thickness of parcel and ward boundary should be different.
- Generally 0.1mm pen is used for inking the parcel boundary and 0.2 mm pen for numbering parcel.
- National and international boundary should be inked with the thicker pen.

Quality of Ink

- Water proof
- Dark and viscous
- Durable for long time
- Fast hardening

4.4 Inking and tracing of cadastral maps



Tracing cadastral maps/ Map Tracing

- It is a method of producing **backup** copy of original map by placing a transparent sheet over original copy and then marking lines on transparent sheet with reference to original.
- Since with time quality of paper maps gets degraded so to have a backup map tracing is done.
- One copy of each trace should be prepared and hand over the documents to survey office and Land revenue office.
- Accuracy and Quality of trace should be based on the original map.

4.5 Area Computation and checking



Area Units for cadastral measurement

- Ropani (508.749 sq.m)
- Bigha (6772.63 sq.m)
- Hector (10000 sq.m)

S.n	Units	Hectare	Bigaha-Kattha-Dhur	Ropani-ana-Pausa-dan	Square meter	Square feet
1	1 hectare	1	1-9-10.6	19-10-2-0	10000	107636.48
2	1 bigaha	0.677263	0-20-0	13-5-0-0	6772.63	72900
3	1 Kattha		0-0-20	0-10-2-2	338.63	3645
4	1 dhur			0-0-2-0.5	16.93	182.25
5	1ropani	0.050874	0-1-10	0-16-0-0	508.74	5476
6	1 ana		0-0-1.87	0-0-4-0	31.79	342.25
7	1paisa			0-0-0-4	7.79	85.56
8	1dam				1.99	21.29

4.5 Area Computation and checking



Method of area computation

1. *Graphical method*

- It includes the use of computing scale and Grid paper, tiles etc.

2. *Use of plotting scale*

- It involves formulating geometric shapes of triangles/rectangles covering the parcel and measuring sides of each geometric figure then using triangle or other area calculation formula.

3. *Using computer*

- It involves scanning and geo-referencing then digitization using GIS software.

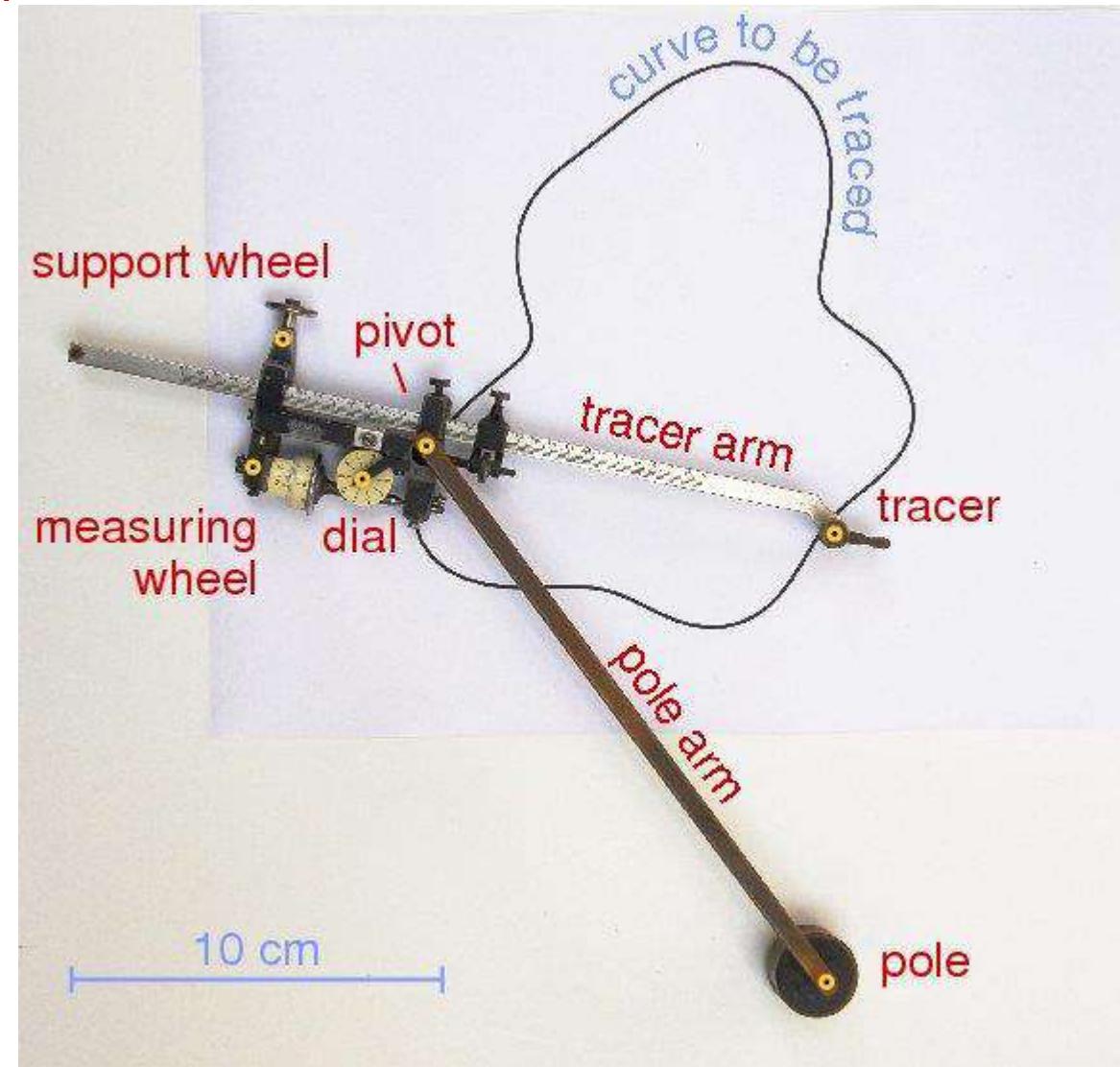
4. *Using planimeter*

- A planimeter is a mechanical or electronic measuring instrument used to calculate the area of a two-dimensional shape.
- It is particularly useful for measuring irregularly shaped areas, such as those found on maps, blueprints, or land surveying documents.

4.5 Area Computation and checking

Method of area computation

4. Using planimeter



Source:

<http://www.ams.org/publicoutreach/feature-column/fcarc-surveying-two>

Assignment



1. How area computation and checking is done for plane table surveying ?

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References:

- <http://ce.cet.ac.in/downloads/Study%20Material/Surveying/Plane%20Table%20Surveying.pdf>
- <http://eagri.org/eagri50/AENG151/lec04.pdf>

CADASTRAL SURVEYING

EG3103GE

Unit 5. Digital Cadastre



Public Secondary School

Lecture by
Er. Keshav Raj Bhusal

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Unit 5: Digital Cadastre

- 5.1 Equipment (Total Station), tools and accessories for data acquisition,
- 5.2 Preparation for data acquisition,
- 5.3 Parcel boundary survey and measurements,
- 5.4 Sketch preparation,
- 5.5 Data download,
- 5.6 Map making
- 5.7 Database preparation,
- 5.8 Field book and other documents (report) preparation,
- 5.9 LIS: Concept and implementation

Table of contents



Digital Cadastre

- Digital cadastre is that system in which the **co-ordinate** of every corner of parcel is recorded and it is managed by computer.
- It is called digital cadastre as data are captured and processing of these data are done in **digital environment**.
- In this method, the cadastral survey is carried out by modern highly accurate instruments and the mapping, recording and archiving process is done in computer.
- It is more **accurate** than graphical method of survey.

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Tools and accessories for data acquisition using Total station

- A total station instrument is a high precision theodolite equipped with EDM (Electronic Distance Measurement) and data logger (external data recorder for the temporary storage) is used to capture the coordinate of each boundary monuments exactly in digital form.
- It is very accurate method as compared to plane table and traditional methods.
- This is highly efficient and effective method of the cadastral surveying and has been in practice in Nepal at the present.
- Economic method for surveying. The cost of operation of this method and traditional plane table remains almost the same if we do not consider the cost of instrument.
- It can be used for multi-purpose cadastre.
- It further gives the improved accuracy of the cadastre and also requires less time for the for data post processing.
- Since it gives the digital data, we don't further need to worry about the digitization of the acquired data.

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Steps of cadastral survey using Total station

1. Preparation for data acquisition

- Check the condition of total station (collimation error, index error etc.)
- Collect the required tools like sets of prisms, pegs or rods, drawing sheets for sketches, old document or maps if place is previously surveyed.
- Check the units of angle and distance measurement in total station, prism constant value and other parameters depending upon device type.

2. Parcel boundary survey and measurements

- It includes placing reflector with prism at each corners of parcels and recording data through total station.
- Before this adjudication is done to make sure of ownership of parcels.

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Steps of cadastral survey using Total station

3. Sketch preparation

- Field sketch is very important aspect of digital cadastral system.
- The sketches with the point numbers are to be sketched on the field.
- Without field sketch it is very difficult for the preparation of database and cadastral map.
- Since cadastral maps are prepared on basis of sketches so it should be prepared with great care and attention.

4. Data download

- After data collection, it has to be downloaded which depends on the type of instrument used in survey.
- Data can be downloaded through cable, pendrive, bluethooth or other medium.
- After downloading data it has to be preprocessed before being able to use in GIS softwares.

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Steps of cadastral survey using Total station

5. Database preparation

- It includes feature preparation from point coordinate data and inserting attributes in attribute table.

6. Map making

- It is prepared in GIS software on applying cartographic principle.
- Map are generally prepared in black and white.
- It includes title and reference, sheet no, sheet index, graphical scale and other map information.

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Steps of cadastral survey using Total station

7. *Field book preparation*

- These days field book is prepared automatically through gis softwares which includes the information related to parcel.
- The area of land, land type and other attribute information related to parcel are inserted from attribute table of respective parcels.

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7. Field book preparation

Source:
<https://mapadda.com/>

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Steps of cadastral survey using Total station

8. Descriptive document preparation

- Two copies of landowner certificate is prepared.
- One copy is official copy termed as Jagga Dhani Darta Shresta which is kept at District Revenue office and another copy is given to landowner termed as Jagga Dhani Darta Purja.

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LIS

- LIS stands for Land Information System.
- A land Information System is a **tool** for legal, administrative and economic decision-making and an **aid** for planning and development which **consists** on the one hand of a database containing spatially referenced land-related data for a defined area, and on the other hand of procedures and techniques for the systematic collection, updating, processing and distribution of the data.
- It is a computer based system that enables to acquire, manage, retrieve, analyze, display land records efficiently.
- Similar to a GIS, LIS is designed specifically to create, visualize, analyze, report and publish land-based data such as parcel information, zoning, land use, ownership and general property information.
- It is a GIS-based system concerned with capturing, storing, analyzing and retrieving land and cadastral information.
- A typical LIS consists of cadastre as a primary component, maintained by unit of government responsible for tracking land ownership, control and is parcel based (PBGIS).

Assignment

a. Write short note on

- NeLIS
- MeroKitta

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References:



CADASTRAL SURVEYING

EG3103GE

Unit 6: Cadastral Surveying and Registration Procedure in Nepal



Public Secondary School

Lecture by
Er. Keshav Raj Bhusal

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Unit 6. Cadastral Surveying and Registration Procedure in Nepal

- 6.1 Notification,
- 6.2 Densification of Control Points,
- 6.3 Adjudication,
- 6.4 Field book preparation,
- 6.5 Land Classification,
- 6.6 Area Computation,
- 6.7 Registration of Ownership
- 6.8 Registration system adopted in Nepal
- 6.9 Ownership certificate and other document Preparation,
- 6.11 Handing Over of cadastral data

Cadastral Survey Procedure and Workflow



Cadastral Survey Procedure and Workflow

1. Area selection
2. Notice published in gazette
3. Planning
4. Notification and awareness/Interaction with local community
5. Establishment/Desnsification of control points
6. Adjudication, Boundary delineation and monumentation, Surveying and Land Classification at once
7. Preparation of records
8. 7 days notification and Registration
9. Descriptive document preparation(terij/shresta/purja)
10. Land owner certificate(purja) distribution
11. Hand over map and records to District Survey Office and District Land Revenue Office

Cadastral Survey Procedure and Workflow



1. Area selection

- Cadastral survey area selection criteria:
 - a. *Condition of cadastral maps and land records:*
 - If those map documents and attribute documents are not intact and are in deteriorated condition, then there is need of new set cadastral documents.
 - b. If maps are prepared in free sheet(island maps) based on local control points. Then to prepare new cadastral map based on national network of control points of that district/area, cadastral survey is carried out.
 - c. Some area has been hugely urbanized and there is lots of change in natural and artificial details. And if maps are in small scale, then to account for urbanization and changed details, large scale cadastral maps need to be prepared.
 - d. When value of land of certain place has increased highly, tiny portion of land matters a lot and there would be lots of land dispute cases, then cadastral maps need to be prepared with very high accuracy.



2. Notice published in gazette

Cadastral mapping notification is published in gazette.

A **government gazette** (**official gazette**, **official journal**, **official newspaper** or **official diary**) is a **periodical publication** that records the business and proceedings of a government and has been authorised to publish public or legal notices. It is usually established by **statute** or **official action** and publication of notices within it, whether by the government or a **private party**, is usually considered sufficient to comply with legal requirements for public notice.^[1]

- The intention of publishing government decision in gazette is to make those decision legal and official. After the decision is published in gazette, the respective organizations and people would cooperate to carry out cadastral survey successfully.

Cadastral Survey Procedure and Workflow



2. Notice published in gazette



नेपाल राजपत्र

नेपाल सरकारद्वारा प्रकाशित

खण्ड ६६) काठमाडौं, कालिक २९, गते, २०७३ साल (अतिरिक्ताङ्क १२

भाग २

नेपाल सरकार

कानून, न्याय तथा संसदीय मामिला मन्त्रालय

नेपालको संविधानको धारा २९६ को उपधारा (१) वमोजिमको व्यवस्थापिका-संसदले बनाएको तत्त्व लेखिए वमोजिमको ऐन संबंधारणको जानकारीको लागि प्रकाशन गरिएको छ ।

संवत् २०७३ को ऐन नं. १८

नेपाल सरकारको अर्थ सम्बन्धी प्रस्तावलाई कार्यान्वयन गर्न बलेको ऐन प्रस्तावना : नेपाल सरकारको आर्थिक वर्ष २०७३/७४ को अर्थ सम्बन्धी प्रस्तावलाई कार्यान्वयन गर्नको निमित्त राजस्व संकलन गर्ने, कर घटाउने, बढाउने, छुट दिने तथा राजस्व प्रशासन सम्बन्धी प्रचलित कानूनलाई संशोधन गर्ने बान्धनीय भएकोले,

नेपालको संविधानको धारा २९६ को उपधारा (१) वमोजिमको व्यवस्थापिका-संसदले यो ऐन बनाएको छ ।

नेपाल राजपत्र नेपाल सरकारको आधिकारीक प्रकाशन हो । मन्त्रिपरिषद्वाट जारी गरिने सम्पूर्ण सूचना, ऐन, नियम, अध्यादेश तथा सरकारी निर्णयहरुको प्रकाशन यस विभागबाट गरिन्छ । विभिन्न प्रकारका महत्वपूर्ण सरकारी निर्णयहरुलाई वैधानिकता दिने तथा नागरिकहरुलाई ऐन, नियमको दायरा भित्र राखे सरकारी पत्र नेपाल राजपत्र वि. स. २००८ साल देखि हालसम पनि नेपाल सरकार सूचना तथा संचार मन्त्रालय अन्तर्गत रहेर मुद्रण विभागले प्रकाशन गरी आमजनसमुदायलाई सरकारी निर्णयहरुको लिखित जानकारी दिई नागरिकहरुको सूचनाको हक सम्बन्धी अधिकार प्रदान गर्दै आइरहेको छ ।

Fig: showing sample of gazette

Cadastral Survey Procedure and Workflow



3. Planning

- Survey office and survey team establishment in project site.
- Survey office held a meeting among local stakeholders and discussing about the surveying and land use classification categories.
- Gathering old existing records from (land revenue office, land reform office, trust, forest etc).
- Survey teams are formed(team leader-1,inspector-2,amin-9).
- Team specified for particular VDC or Ward.
- Preparation(instruments, sheets and other accessories).
- Starting date for survey is declared.



4. Notification

- Publication of 15 days notice by survey team.
- The notice should include the exact date of start of the survey and should be pasted in area nearby respective local level ward, Gaupalika office and other public places.
- Local people and local government units are informed about the cadastral survey/mapping.
- Awareness to the local people about cadastral mapping.
- Interaction with local community.

➤ ऐनको दफा ६ (१) वमोजिम नापी टोलीले जग्गा नाप जाँच गर्ने क्षेत्र र नाप जाँच शुरु गरिने मिति सहित उल्लेख गरी सम्बन्धित नगरपालिका वा गाउँ विकास समितिको सम्बन्धित वडामा सबैले देख्ने स्थानमा जग्गा नाप जाँच हुनु भन्दा १५ दिन अगाहै नियमावली २०८८ को अनुसूचि १ वमोजिमको ढाँचामा सूचना प्रकाशन गर्ने । उक्त सूचना गा.वि.स.तथा न.पा. कार्यालयहरूमा लिखित रूपमा वुभाई वुभिको भरपाइ गराउने । अन्य कार्यालयहरूमा सूचना पाटीमा सूचना टाँस भएको मुचुल्का फायलगरी राख्ने । मानिसहरु आवत जावत गर्ने स्थानमा पनि सूचना टाँस गर्ने ।

➤ नापी टोलीले नाप जाँच हुने गा.वि.स. वा नगरपालिकाका वडामा गाई पायक पर्ने ठाउँमा आफ्नो कार्यालय खडा गरी नाप जाँचको कार्य हुन लागेको विषयमा सम्बन्धित वडाका जग्गाधनीहरूलाई नाप जाँचको विषयमा जानकारी गराइ व्यापक प्रचार प्रसार गर्ने ।



4. Notification

६. सूचना दिने र जग्गामा प्रवेश गरी काम शुरु गर्ने : (१) कुनै जग्गामा नियन्त्रण विन्दु स्थान खडा गर्न परेमा वा कुनै जग्गा नापी वा जाँच गर्न परेमा कमसेकम पन्थ दिन अगावै नियन्त्रण विन्दु स्थान खडा हुने वा नाप जाँच हुने जग्गाको जग्गावाला, मोही, संधियारहरु, सम्बन्धित जिमिदार, पटवारी र गाउँ विकास समिति वा नगरपालिकालाई सूचना दिनुपर्छ ।

स्पष्टीकरण : यस उपदफाको तात्पर्यको लागि कुनै जग्गावाला, मोही संधियार जिमिदार पटवारीलाई सूचना दिंदा त्यसरी नियन्त्रण विन्दु स्थान खडा हुने वा नाप जाँच हुने जग्गा भएको क्षेत्रको वा सो जग्गावाला वा मोही वसेको क्षेत्रको धेरै जनाको आवत-जावत हुने मुख्य ठाउँहरुमा सो कुराको सूचना टाँसी दिनु पर्याप्त हुनेछ ।

तर गाउँ विकास समिति वा नगरपालिकालाई लिखित सूचना दिनु पर्छ ।

Fig: Jagga NapJach Ain Dafa 6



5. Establishment/Densification of Control Points

- These days local levels along with respective National Land Commission themselves hire consultants for the establishment of control points (mainly through DGPS technique).
- The densification of control points is done using third order control point established by Geodetic Survey Branch.
- After establishing new control point description card of that control point also should be done as per the specification provided by National Land Commission.
- The densification of such controls is done commonly through traversing, resection and intersection method.
-

Unit 7. Cadastral Surveying and Registration Procedure in Nepal

5. Establishment/Densification of Control Points

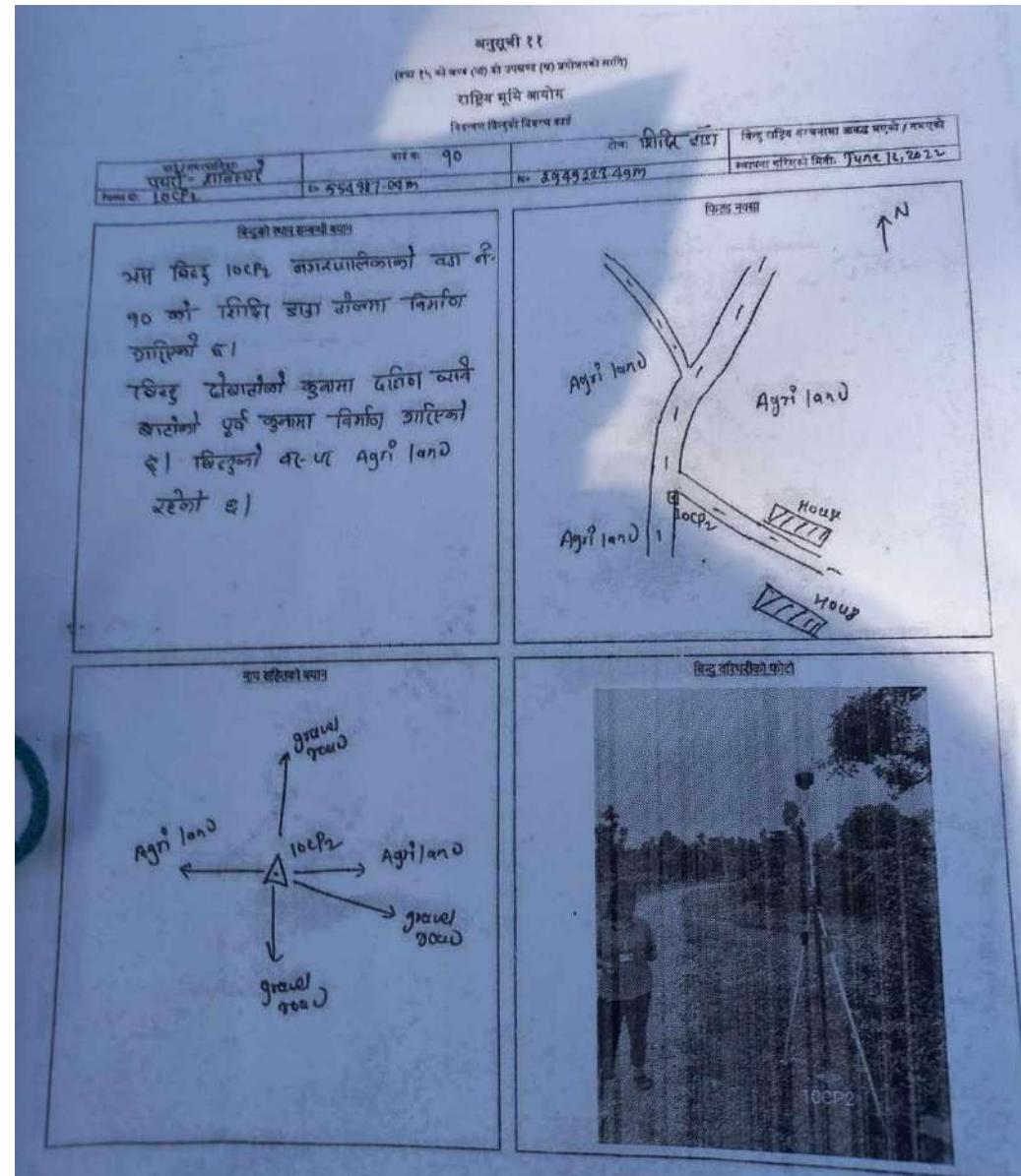


Fig: showing sample of D-card of control point.

Source: mapadda.com



6. Adjudication

- Adjudication is the process of **legally** recognizing the ownership over a particular unit of land.
- After adjudication, the ownership is then formally documented in the land register, and will be the legal evidence of that owner owns that tract of land.
- In adjudication process, the landowner, tenants, notary, adjacent parcel owners, representative from local government unit and aged and experienced people and the survey team formalized the ownership over the property land based on their mutual understanding.
- The agreement between adjoining parcel neighbors with their signature is recorded on paper, termed as **muchulka**.
- Parcel boundary adjudication is the main cadastral process of land registration.
- The function of land adjudication is to resolve disputes and uncertainties pertaining to who owns what property, it may focus solely on problems that exists when property is first formalized and also useful to solve many problems that arise after formalization.



6. Adjudication

Types of adjudication:

- a. Systematic adjudication
- b. Sporadic adjudication

Systematic adjudication

- If the adjudication is done systematically for all parcels of a town/village or district then it is called systematic adjudication.
- It is time consuming and requires more resources.
- This type of adjudication is done in systematic approach of cadastral survey.

Sporadic adjudication

- If the adjudication is done randomly and for only specific or required parcels then it is called sporadic adjudication.
- It is less time consuming and requires less resources.
- This type of adjudication is done in sporadic approach of cadastral survey.



6. Adjudication

Procedures/Steps of adjudication

1. Notification by letter for public campaign and discussions.
2. Public campaign and open discussions.
3. Formation of cooperation committee.
4. Notification about the cadastral survey site.
5. Collection of records/ proofs.
6. Adjudication of Public and Government land (In the presence of Municipality and District Cadastral Office representatives).
7. Adjudication of private and other lands.
8. Dispute resolution by agreement.
9. Make agreement between adjoining parcel neighbors and record their signature on field record termed as **muchulka**.
10. Demarcation of parcel boundary with boundary marks.
11. Allow time for objections, appeals, and the rectifications on land adjudication.



7. Boundary demarcation, monumentation, and Surveying

- The result of adjudication is:
 1. The proof of ownership is made
 2. The demarcation of parcel boundary.
- Then the defining corners of parcel boundary are identified and those corners are monumented using wooden peg, iron pipe etc.
- And then parcel boundary is surveyed using PT or TS.



Land classification

- जग्गा (नाप जाँच) ऐन २०१९ अनुसार कुनै ठाउँको वा क्षेत्रको जग्गा नाप जाँच गरिने जग्गालाई सो जग्गाको उपभोगको साथै सार्वजनिक कार्य र सामुदायिक प्रयोजनको आधारमा जग्गाको वर्गीकरण गर्ने कार्यलाई जग्गाको किसिम वर्गीकरण भनिन्छ ।
- नाप जाँच गरिने जग्गालाई सो जग्गाको उपयोगको आधारमा देहाय वमोजिम दुइ क्षेत्रमा विभाजन गरिएको छ ,
 - (क) कृषि क्षेत्र
 - (ख) व्यवसायिक तथा वसोवास क्षेत्र
- कृषि क्षेत्र: भन्नाले कृषि उत्पादन (अन्नवाली, नगदेवाली, वागवानी आदी) पशुपालन, निज जग्गामा भएका वृक्षारोपण वा वनवाटीका समेत भएका जग्गाहरूलाई जनाउँदछ ।
- व्यवसायिक तथा वसोवास क्षेत्र: भन्नाले विभिन्न उद्योग व्यापार शिक्षा, स्वास्थ्य, संचार र मनोनन्जन, आदी व्यवसाय संचालन हुने तथा सबै किसिमको वमासेवार क्षेत्रलाई जनाउँछ ।



8. Preparation of records: (Cadastral Map, preliminary Terij)

- The plotting work is done in field in case of plane table survey i.e the map is prepared in the field.
- After these field work completion of single sheet of that ward or whole ward, map is inked. And parcel numbering is done.
- In case of data obtained through T.S map is prepared in GIS software.

- Along with plotting, the preliminary Terij and sketch is prepared in the field.
- The preliminary terij contains all the firsthand information collected on the field. These information are:
 - Description of owners and tenants.
 - Description of legal document of land registration.
 - Land classification, land type, crops, irrigated or non irrigated land etc.

8. Preparation of records: Field Book

- (९) नियमावलीको अनुसूची ३ बमोजिमको फिल्डबुक तयार गर्न नाप नक्सा गर्ने कर्मचारीले नाप नक्सा गरि जग्गाधनी तथा मोहीको नाम, थर, वतन, तीन पुस्ते, नागरिकता नम्बर, जारी भएको मिति र जिल्ला उल्लेख गरि अनुसूची ३ बमोजिमको प्रारम्भिक तेरीज तयार गर्नुपर्नेछ । यस्तो तेरीज तयार गर्दा साविक जग्गाधनी दर्ता प्रमाण पूर्जा र नागरिकताको प्रमाणपत्रलाई आधार मानी नाप जाँच गर्ने क्षेत्रमा नै सम्पन्न गर्नुपर्नेछ ।
- (१०) नाप जाँच भई कायम कित्ताहरुको प्रारम्भिक तेरीजको आधारमा क्षेत्रीय किताबको प्रत्येक कित्ताको महलमा तोकिएका विवरणहरु जस्तै जग्गाधनी र मोहीको नाम थर, वतन, तिनपुस्ते, नागरिकता नम्बर, जारी मिति र जिल्ला, विरह, किसिम, क्षेत्रफल, चौहटी, नाप नक्सा भएको मिति, प्रमाण संकेत आदि विवरण भरी स्थानीय निकायको प्रतिनिधि, नाप नक्सा गर्ने अमिन/सर्भेक्षक, चेकजाँच गर्ने सर्भेक्षक र टोली प्रमुखले सहीछाप गर्नु पर्नेछ ।
- (११) नाप नक्सा गरि फिल्डबुकमा कुनै कित्ताको विरह कायम गर्दा जग्गा कुन प्रयोजनमा रहेको छ, सो विरह स्पष्ट लेख्नुपर्नेछ । विरह लेख्दा खेत (धनहर), भिट, पाखो, बगैचा, वन, पर्ती, पोखरी, खोला, नदी, नहर, कूलो वाटो सडक, राजमार्ग जे छ, स्पष्ट लेख्नुपर्नेछ । यो कार्य नाप जाँच भएकै क्षेत्रमा लखी सम्पन्न गर्नुपर्नेछ ।



8. Preparation of records: Field Book

(१४) फिल्डबुकको प्रमाण संकेत महलमा जग्गाको साविक कुन प्रमाण (लगत) वाट हकभोग भएको हो सो र पुनः नाप नक्सा भएको ठाउँमा साविक गा.वि.स./नगरपालिका, वडा नम्बर, सिट नम्बर र कित्ता नम्बर स्पष्टसँग लेखुपर्नेछ ।

Unit 7. Cadastral Surveying and Registration Procedure in Nepal

8. Preparation of records: Field Book

अनुसूची — ३

(नियम ४ को उपनियम (३) सँग सम्बन्धित)

नेपाल सरकार

भूमिसुधार तथा व्यवस्था मन्त्रालय

नापी विभाग

..... नं. नापी गोद्धारा

..... नं. नापी टोली

जिल्ला:-

गाउँ विकास समिति/नगरपालिका:-

बडा नं:-

नक्सा सिट नं:-

क्षेत्रीय किताब

किता नं.	जग्गावालाको			मोहीको			विरह (घर, बगैँचा, पोखरी आदि)	किसिम कृषि क्षेत्र तथा वसोवास क्षेत्र	क्षेत्र फल	चौहटी				नापी भएको मिति	प्रमाण संकेत	दर्ता गर्नेको नाम र दस्तखत	कैफि यत
	नाम, थर, बतन, बाबु र बाजेको नाम	व्यहोरा	सहीछाप	नाम, थर, बतन, बाबु र बाजेको नाम	व्यहोरा	सहीछाप				पृ.	प.	उ.	द.				

.....
गाउँ विकास समिति वा
नगरपालिकाका सदस्यको दस्तखत

.....
अमीनको दस्तखत

.....
नापी निरीक्षकको दस्तखत

.....
टोली प्रमुखको दस्तखत
Go to Setting

Unit 7. Cadastral Surveying and Registration Procedure in Nepal



9. 7days notification and Registration

- After completion of cadastral map and field book preparation 7 days notice is published. This 7days notice has following details as shown below.

अनुसूची - २
(नियम ४ को उपनियम (२) संग सम्बन्धीत)
नेपाल सरकार
भूमिसुधार तथा व्यवस्था मन्त्रालय
नापी विभाग
..... नापी कार्यालय / नापी गोश्वारा
..... नं. नापी टोलीवाट प्रकाशन गरिएको सूचना

मिति देखि गाडा विकास समिति नगरपालीका वार्ड नं. को नाप नक्सा गर्दा जग्गाधनीहरु वा सधियारहरुले देखाए वमोजिम नाप नक्सा भई देहायका व्यक्तिहरुको नामको देहाय वमोजिमका कित्ताहरु यस नापी टोलीवाट नापी भए अनुसार जग्गाधनी र मोहीको नामावली प्रकाशित गरिएको छ । उक्त नामावलीमा कसैको चित नवुभेमा सात दिन भित्र लिखित निवेदन गर्नु होला । अन्यथा यसै अनुसार जग्गा दर्ता गरिनेछ ।

जग्गा धनिको नम थर र वतन	जग्गाधनीको वावुको नाम	मोहीको नाम, थर र वतन	कित्ता नं.	धेनफल	किसिम	जग्गाधनीको हक हिस्सा	कैफियत



9. 7days notification and Registration

- Within this 7 days, If there are any corrections to be made on land records as shown in above fig published by survey team or survey office, respective parcel owner can file complaints.
- The corrections should be done within next 7 days after the 7days notification deadline.
- From the 8th day of 7days notification, the first registration process is commenced for those parcels without complaints. Registration being started(land owner come to signature in field book and confirm each and every entity(information about his parcel) of parcel.
- Registration work is continued for few days.
- Survey office/team gives a written document as your parcel became registered.



9. Second time Registration notice:

- In case if the landowner does not come for registration of land within the first registration time frame this notice is published for the registration.
- Within 15 days of this notice publication; land owner should registered their land.
- IF the land owner doesnot come for registration within this time such land information is registered by survey team on the field book on basis of ownership documents (muchulka, terij etc.) within presence of ward representative. दफा द(क)
- In case the landowner is not satisfied by the registration done by the survey team, h/she can file complain in the court within 6 months of being informed about registration.



10. Descriptive document preparation(terij/shresta/purja)

- Terij document is prepared for all the registered parcels. Terij contains all the landowners within the particular VDC or municipality in alphabetical manner.
- Two copies of landowner certificate is prepared. One copy is official copy termed as Jagga Dhani Dara Shresta and another copy is given to landowner termed as Jagga Dhani Darta Purja.
- Land owner certificate (Jagga Dhani Darta Purja) Distribution.
- Hand over map and records to District Survey Office and District Land Revenue Office.



11. Handing over of cadastral data

- After 60 days of Land owner certificate distribution:
 - Field books, Cadastral maps, terij, area forms prepared by the Survey Goswara are handed over to District Survey Office and
 - Land owner Shresta to Land Revenue Office (DLRO)

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References:



CADASTRAL SURVEYING

EG3103GE

Unit 8: Updating and Archiving Cadastral Documents



Public Secondary School

Lecture by
Er. Keshav Raj Bhusal

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Unit 8. Updating and Archiving Cadastral Documents

- 8.1 Parcel subdivision,
- 8.2 Parcel history maintenance,
- 8.3 Plot register maintenance,
- 8.4 Database updating and maintenance,
- 8.5 Procedures at Survey offices

Updating and Archiving Cadastral Documents



Cadastral documents includes:

Spatial component consists of:

- Cadastral map
- Parcel map (parcel plan)
- File map
- Index maps

Attribute component consists of:

- Field book
- Terij
- Shresta
- Purja
- Plot register

Updating and Archiving Cadastral Documents

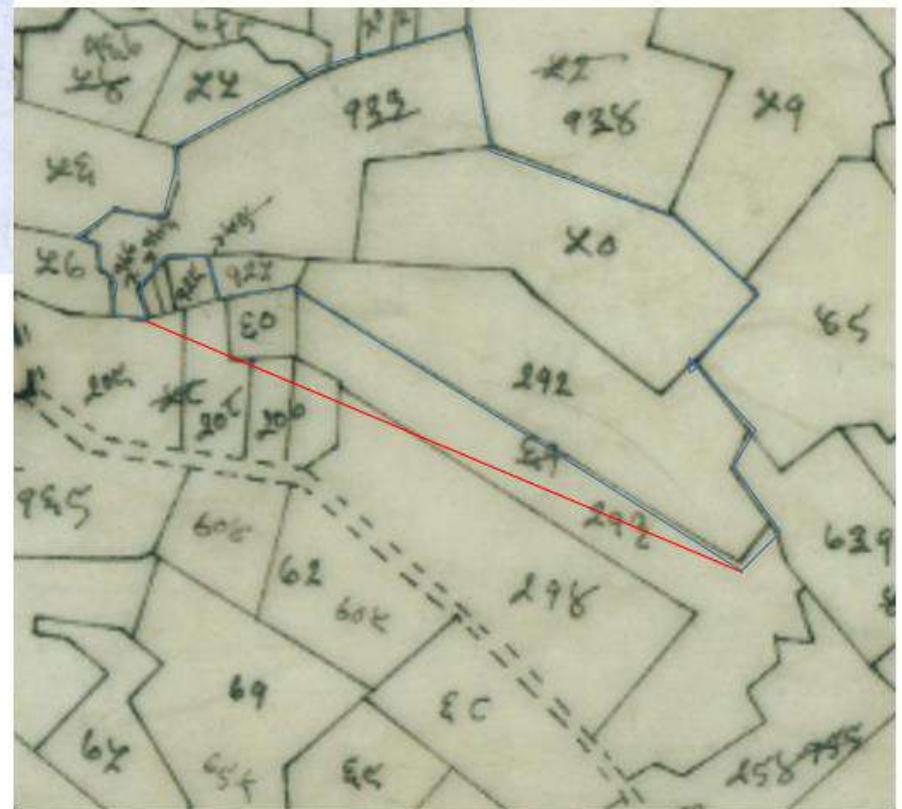


Parcel subdivision

- It is the process of dividing a parcel into two or more new parcels.
 - जग्गा खरिद विक्रि, बक्सपत्र, अंशवण्डा, नामसारी (दा.खा.) अदालती फैसला, आधिग्रहण, प्रकृतिक प्रकोप जग्गा नाप नक्सा गर्दा जग्गाको स्वामित्वमा आंशीक रूपमा परिवर्तनहुने भएमा नापी कार्यालयको तर्फबाट कित्ताकाट गर्नु पर्ने हुदाँ यस्तो अवस्थामा म.हा.न.पा./न.पा./गा.वि.स. वार्ड नं. कित्ताकाट गर्नु पर्ने कित्तानम्वर क्षेत्रफल र तर्फ समेत खुलेको लिखत सम्बन्धित मालपोत कार्यालयबाट आदेश सहित प्राप्त हुन आएमा उक्त आदेश अनुसार क्षे.फ. तर्फ दिने, लिने व्यक्ति आदी चेकगरी माग वमोजिम कित्ता टुक्रा पार्ने र नाप जाँच हुदा सिमाना निश्चित गरी निश्चित माननापको सिटमा प्लट गरी कित्ता नम्वर दिने कार्यलाई कित्ता काट मनिन्छ ।

Updating and Archiving Cadastral Documents

Parcel subdivision



Updating and Archiving Cadastral Documents



Parcel subdivision

- जव कुनै जग्गा नापजाच हुदा वा किनवेच गर्दा कित्ता काट गर्दा र नापनक्सा गरी नया कित्ता नम्वर राख्ने तरिका भिन्ना भिघन्नै देशमा विभिन्न प्रणाली अपनाइएको पाइन्छ । जुन यसप्रकारका छन्
 - क) Fraction system
 - ख) Filiation system
 - ग) Free Numbering or independent numbering system.



Parcel subdivision

Fractional System

- In this system of parcel numbering, parcel number is sub-divided into two parcels as 14/1 and 14/2 for a parcel with parcel number 14.

Filiation System

- In this system of parcel numbering, parcel is sub-divided into two parcels using sub-script.
- For example, consider a parcel 14 then after division, it is numbered as 14a and 14b respectively.

Free Numbering System

- In free parcel numbering system, when parcel is sub-divided into two parcels and suppose the greatest parcel number in that map sheet is 350 then new number is given as suppose 351 and 352 for a parcel 15. and parcel no 15 is removed.
- It is also called random numbering system and Nepal follows this system of parcel numbering.

Updating and Archiving Cadastral Documents

Plot register maintenance,

- Plot register is an information of each parcel which has been fragmented. The main information in the plot register are the newly established parcel numbers along with the mother parcel number, the area of each fragmented parcels and how the parcels has been fragmented.
- कित्ता काट गरि सकेपछि साविक कित्ता (शुरुको कित्ता) बदर गर्नु पछ्छ। सो कित्ताको कैफियत महलमा मालपोत कार्यालयको र.नं.(प्राप्त भएपछि) र नापी शाखाको को लिखित वमोजिम बदर भई कित्ताहरु कायम भएको व्यहोरा उल्लेख गर्ने ।
- सो कित्ता बदर भई कायम हुन आएका नयाँ कित्ताहरु प्लट रजिष्टरमा अंकित गर्नु पदछ। यसरी नयाँ कित्ता कायम गर्दा प्लट रजिष्टरमा भएको अन्तिम कि.नं.वाट अगाडी क्रमशः नम्वर दिने ।

Updating and Archiving Cadastral Documents

Plot register maintenance,

- कि.नं.कायम गर्दा पहिलो नम्बर केतालाई र पछिल्लो नम्बर विकेतालाई दिनु पर्दछ ।
- नयाँ कायम भएका कित्ताहरुको कैफियत महलमा कि.न वदर भै कायम हुन आएको भनी मालपोत कार्यालयको र नापी शाखाको द.नं.... समेत उल्लेख गर्ने ।
- कायम गरिने प्लट रजिस्टरको ढाँचा जग्गा नाप जाँच नियमावली २०५८ को अनुसूची १३ वर्मोजिमको हुनु पर्दछ र सो ढाँचामा उल्लेख भएका सम्पूर्ण विवरणहरु अनिवार्य रूपमा उल्लेख गर्ने ।

Updating and Archiving Cadastral Documents

Plot register maintenance,

- अमीनले आफूले कित्ताकाट गरेको सम्पूर्ण विवरणहरु आफ्नो कित्ताकाट डायरी कायम गरी उत्त डायरीमा उल्लेख गर्ने ।
- कि.का.गरी प्लट रजिस्टर कायम गरि सकेपछि, पुनः एक पटक नक्सा, प्लट रजिस्टर, कि.का.डायरी र लिखत आदेश भिडाई रुजु गर्ने ।
- सम्पूर्ण विवरण ठिक भएमा अमीनले आफूले हस्ताक्षर गर्नु पर्ने स्थानहरुमा हस्ताक्षर गरी सम्पूर्ण कागजात नापी निरिक्षक समक्ष प्रस्तुत गर्ने

Updating and Archiving Cadastral Documents



Plot register maintenance,

- नापी निरिक्षकले अमीनले पेश गरेका सम्पूर्ण कागजातहरु अध्ययन गरी मालपोत कार्यालयबाट प्राप्त लिखित वमोजिम काम कारबाही भए नभएको १००% चेक गरी सर्भेक्षक समक्ष पेश गर्ने ।
- नापी निरिक्षकले उपरोक्त वमोजिम चेक गरी सबै कार्य दुरुस्त पाइएमा सर्भेक्षक समक्ष कागजातहरु प्रस्तुत गर्ने ।
- यदी उपयुक्त वमोजिम गरेको नपाइएमा सो प्रकृया पुरा गर्न अमीनलाई अहाउने ।

Updating and Archiving Cadastral Documents

File Map

- नक्सामा कित्ताकाट गरी नयाँ कायम हुन आउने कित्ताहरु स्पष्ट देखाउन नसकिने अवस्था भएमा फायल नक्सा बनाउने ।
- ब्द्वसाइजको कस्तीमा ७५ माइक्रोन वाक्लो ड्राफिटङ्ग फिल्ममा, आवश्यकता अनुसार ठूलो माननापमा प्लटगरी कित्ताकाट गर्ने । फायल नक्साको सिरमा जिल्ला, न.पा./गा.वि.स., वडा नं., नक्साको सिट नम्वर, माननाप आदी लेख्ने ।
- फायल नक्सा बनाई कित्ताकाट गरेको अवस्थामा सक्कल नक्सा एवं ट्रेस नक्सामा सो कित्तामा पुनः कित्ताकाट नगर्ने ।
- प्रत्येक फायल नक्सालाई नम्वर कायमगरी न.पा./को बेगला बेगलै वार्ड र गा.वि.स.को बेगला बेगलै फायलमा राख्ने ।
- फायल नक्सा तयार गरेको कित्ताको विवरण र फायल नक्सा नम्वर सम्बन्धित प्लट रजिष्टरको सम्बन्धित कित्ताको महलमा उल्लेख गर्ने
- फायल नक्साको पुच्छारमा दाहिने तिर फायल नक्सा गर्ने अमीन, जाँच गर्ने नापी निरिक्षक तथा सर्भेक्षक र प्रमाणित गर्ने शाखा प्रमुखको नाम स्पष्ट रूपमा लेखि नाम सहितको दस्तखतगरी मिति समेत जनाउनुको साथै बेगलै रजिष्टर तयारगरी अभिलेख राख्ने र सो रजिष्टरलाई अन्य प्राविधिक श्रेस्ता सरह अनिवार्य रूपमा वर वुभारथ गर्ने व्यवस्था मिलाउने ।
- एक पटक फायल नक्सा तयार भै प्रमाणित भै सकेपछि सो फायल नक्सा सक्कल नक्सा सरह नै लागू हुने हुँदा त्यस पछिका सम्पूर्ण जग्गा सम्बन्धि कारोबार त्यसै फायल नक्सावाट नै गर्ने ।
- कार्यालय प्रमुखवाट प्रमाणित नभएको फायल नक्सालाई मान्यता नदिने र त्यस्तो किसिमको फायल नक्सावाट कारोबार नगर्ने ।
- एउटै कित्ताको एक पटक भन्दा बढी फायल नक्सा नवनाउने । एक पटक भन्दा बढी फायल नक्सा बनाइएको पाइएमा वा फायल नक्सामा स्पष्ट नाम सहित दस्तखत नगरेको भेटिएमा, फायल नक्साको स्पष्ट अभिलेख नराखिएको भेटिएमा कार्यालय प्रमुख सहित संलग्न कर्मचारीहरूलाई विभागीय कारवाही गर्ने ।
- कुनै कित्ताको फायल नक्सा तयार गरि सकेपछि पुनः एक पटक सक्कल नक्सामा भएको क्षेत्रफल र फायल नक्सामा भएको कित्ताको क्षेत्रफल निकाली चेक जाँच गर्ने ।
- कुनै कारणवस सक्कल नक्सामा कित्ताको क्षेत्रफल भन्दा फायल नक्साको क्षेत्रफल फरक परेको पाइएमा सक्कल नक्साको क्षेत्रफललाई मान्यता दिई सोही वमोजिम सुधार गर्नु पर्ने छ र गलत फायल नक्सा बनाउने कर्मचारीलाई कारवाही गर्नु पर्नछे ।

Updating and Archiving Cadastral Documents

Parcel Plan / Parcel Map

- प्रत्येक कित्ताहरुको अलग अलग नक्सा बनाइन्छ । कित्ता नक्सा बनाउनुको उदेश्य अनुरूपको यसको परिभाषा हेर्दा, यसरी बनाएको साधारण नक्सालाई कित्ता नक्सा(parcel plan) नभनी, यसरी तैयार गरेको नक्सामा प्रत्येक कित्ता सिमानहरुको नाप समेत उल्लेख हुनु पर्छ । यसरी कित्ताको तस्विर बनाई सिमानाहरुको नाप उल्लेख गरेको नक्सालाई कित्ता नक्सा (parcel plan) भनिन्छ । नापी शाखा, नापी गोशवारा को कार्यविधि २०६०
- नापी विभागका माहानिर्देशकले तोकेको ठाँउमा सम्बन्धित जग्गावाला, सम्बन्धित गाँउ विकास समिति वा नगरपालिकाको प्रतिनिधि, उपस्थित संधियारहरु समेत रोहवरमा राखी छुट्टाइएको सिमानाअनुसार सिमा चिन्ह खडा गर्न लगाई प्रत्येक वेरला वेरलै कित्ता नक्सा बनाउन सक्ने व्यवस्था गरिएको छ । (जग्गा नाप जाँच नियमावली २०५८ को नियम २२ को उपनियम (ज))
- आफ्नो कित्ता जग्गा (तोकिएको नगरपालिका क्षेत्र) कित्ता नक्सा बनाउन निवेदन दिएमा फिल्डमा गई नाप नक्सा गरी प्रत्येक कित्ताको नाप सहितको कित्ता नक्सा बनाउने यसरी फिल्डमा जानु पर्दा, प्रत्येक कित्ताको लागि जग्गा नाप जाँच नियमावली २०५८ को नियम ३३ अनुसारको दस्तुर लिने र कित्ता नक्सा प्रत्येकको रु ३० दस्तुर लिई प्रतिलिपी उपलब्ध गरउनु पर्ने व्यवस्था गरिएको छ ।

Updating and Archiving Cadastral Documents



Maintenance of land record

- कित्तानापीमा फिल्ड कार्या गरेर Land record तयार गर्ने काम समाप्त भै सकेपछि फिल्ड कार्यवाट तयार भएका record हरुलाई धेरै समय सम्म जस्ताको तस्ता नविग्रेन दिई राख्नु सबै भन्दा महत्वपूर्ण कार्य हुन्छ ।
- कित्तानापी फिल्ड कार्यवाट तयार भएका register हरु जिल्ला स्थीत नापी कार्यालय र मालपोत कार्यालयको जिम्मा रहने भएकोले नापी कार्यालयले जिल्ला भरीको नक्सा, फिल्डवुक, कित्ता श्रेस्ताहरु (प्लटरजिष्टर) को संरक्षण तथा सम्वर्धन गरी क्रमवद्ध तरिकाले चाहेको अवस्थामा उपलब्ध हुन सक्ने गरी ननासिने नविग्रने गरी सुरक्षित साथ राख्नु पर्दछ ।

Updating and Archiving Cadastral Documents



Maintenance of land record

- नापी शाखाले आफुसंग भएका सम्पूर्ण नक्सा, फिल्डवुक, प्लटरजिष्टरहरुको जतन साथ सम्भार गरी राख्ने ।
- नापी कार्यालय संग भएका सक्कल नक्सा, ट्रेश नक्सा फायल नक्सा कित्ता नक्सा फिल्डवुक प्लट रजिष्टर कुन कुन कति संख्यामा छन् सबै विवरणहरु एउटा रजिष्टरमा तयार गरि सो विवरण बेला बेलामा अध्यावधिक गर्दै जाने ।
- ती मध्ये जीर्ण नक्सा कतिछन् ? प्रत्येक महिना कति कुन कुन नक्सा ट्रेश गर्नु पर्ने हो विवरण तयार गरी ट्रेश गर्नु पर्ने नक्साहरुको सूची बनाई क्रमशः ट्रेश गर्दै जाने ।
- यसरी नक्सा ट्रेस गरी सकेपछि ट्रेस गरेको नयाँ नक्सालाई प्रचलनमा :याउनु अघि उक्त नक्सामा ट्रेश गर्ने व्यक्ती अमिन, चेक जाँच गर्ने निरिक्षक (सर्भेक्षक) र कार्यालय प्रमुखले सम्पूर्ण रूपमा जाच गरी आआफ्नो नाम थर तथा सहिछाप गरी मिति जनाएर कुन नक्सा वाट ट्रेस भएको हो सो विवरण समेत खोली प्रमाणित गर्नु पर्दछ । साथै जुन नक्सावाट उक्त ट्रेस तयार भएको हो , सो नक्सामा यस नक्सावाट ट्रे गरी नयाँ नक्सा तयार भै लागू भै सकेको भन्ने विवरण लेखि सूरक्षित तया अभिलेखमा राख्ने र उक्त नक्सा प्रयोग नगर्ने ।

Updating and Archiving Cadastral Documents



Maintenance of land record

- वारम्वार प्रयोगमा आइरने भएको कारणवाट जिर्ण भैसकेका प्लट रजिष्टरहरु पनि क्रमशः नयाँ उतार गर्दै जाने ।
- नक्सा ट्रेश गर्ने र प्लट रजिष्टर उतार गराई दुरुस्त राख्ने कार्यको जिम्मा नापी कार्यालयका प्रमुखको हुन्छ ।
- फिल्डवुक तथा प्लट रजिष्टरहरु सुरक्षित राख्न वाइणिडङ्ग गरेर सुरीषत च्याक, दराजमा राख्ने ।
- सक्कल नक्सा र ट्रेस नक्साहरु व्यवस्थित तरिकाले राख्न अमिलाई प्लान चेष्टको व्यवस्था हुनेछ ।

Updating and Archiving Cadastral Documents



Maintenance of land record

- अमिनलाई आफ्नो फांटको सक्कल नक्साहरूलाई एकातर्फ र ट्रेश नक्साहरूलाई अर्कोतर्फ म.न.पा./न.पा./गा.वि.स. र वार्ड नं. र ट्रिग सिट नं. सिलसिलावद्व मिलाई नक्साहरु नदोव्याई र नभाँची राख्नु पर्दछ ।

Updating and Archiving Cadastral Documents

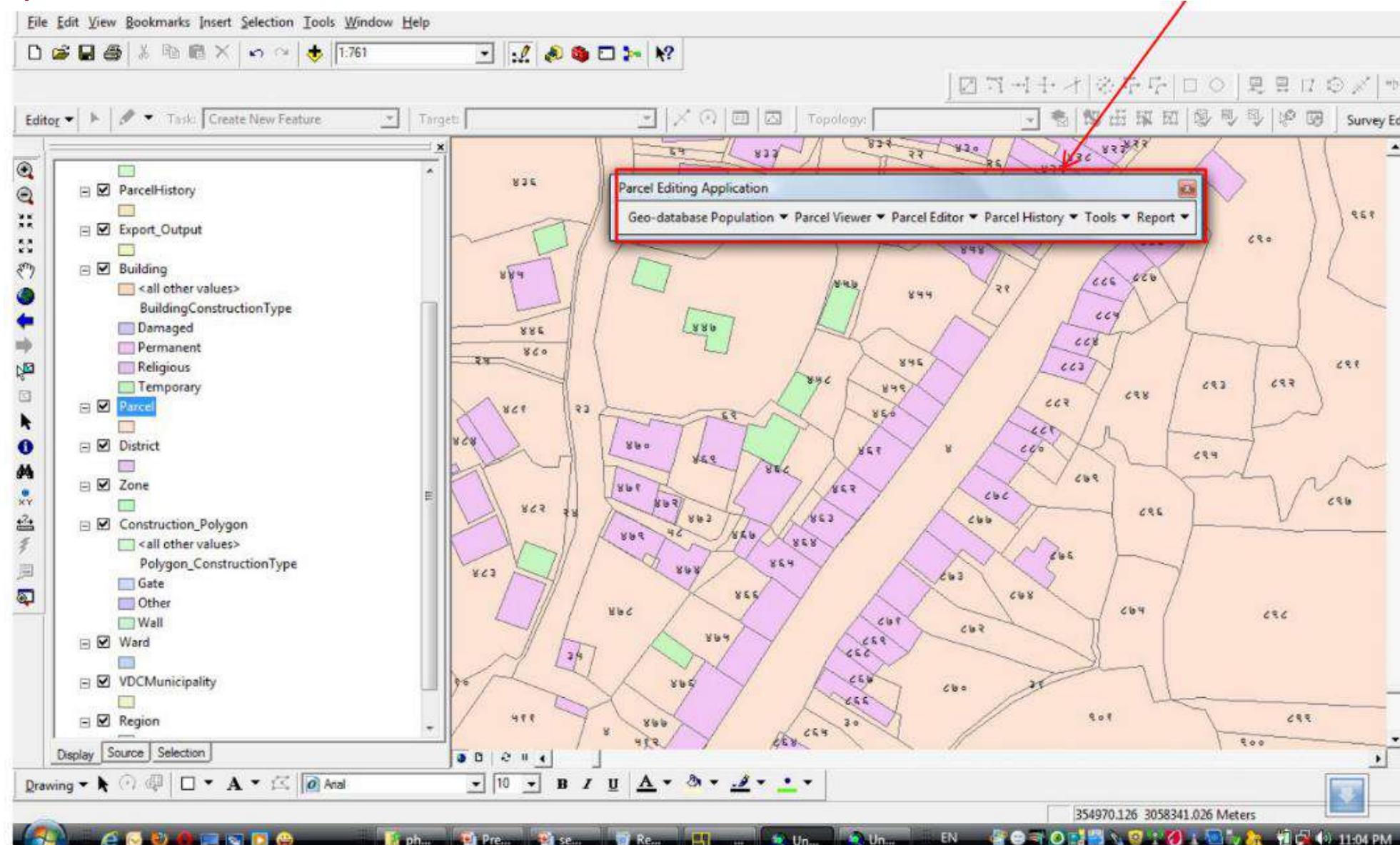


Database Update and Maintenance

- Database is maintained daily and data are updated according to the changes occurred in the details of previous parcel.
- Cadastral database are maintained and updated by district survey office after parcel subdivision.

Updating and Archiving Cadastral Documents

Database Update and Maintenance



Updating and Archiving Cadastral Documents

Database Update and Maintenance

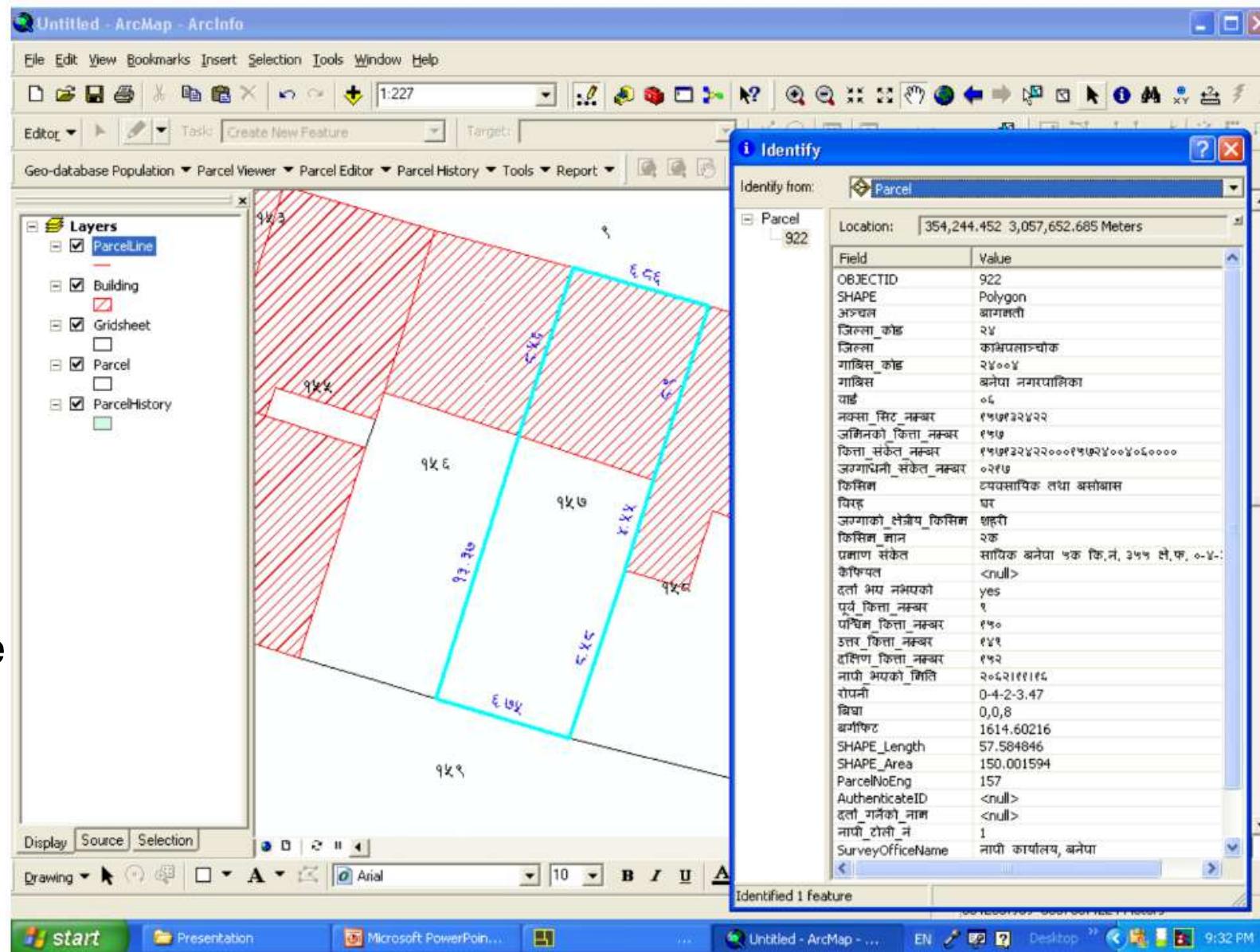


fig: showing attribute
information of
selected parcel

Updating and Archiving Cadastral Documents

Database Update and Maintenance

- (९) भू-सूचना तथा अभिलेख विभागबाट कार्यालयमा हस्तान्तरण भई आएका डिजिटल डाटा हालको नक्सा अनुसार अद्यावधिक गर्दा नक्सालाई आवश्यकता अनुसार पूर्ण वा आंशिक रूपमा स्क्यान तथा Geo-reference गरि अद्यावधिक गर्नु पर्नेछ । यसरी अद्यावधिक गर्दा कित्ता नम्बर नभएको, दोहोरो परेको वा अन्य त्रुटी भएको भए सो समेत सच्याउनु पर्नेछ ।
- (१०) भू-सूचना तथा अभिलेख विभागबाट कार्यालयमा हस्तान्तरण भएका डिजिटल डाटा Geo-reference नमिलेमा वा कार्यालयमा रहेका नक्सासँग मेल नखाएमा त्यस्तो नक्सा पुनः पूर्ण रूपमा स्क्यान गरेर डिजिटाइजेसन गरि डाटाबेस तयार गर्नुपर्नेछ ।
- (११) कार्यालयले उपदफा (९) र (१०) बमोजिम अद्यावधिक भएको डाटाबेस प्रयोग गरी अनिवार्य रूपमा डिजिटल प्रविधिबाट सेवा प्रवाह गर्ने र कार्यालय आफैले Hard Copy Map Scan गरी वा Digital प्रविधिबाट नापनक्सा गरी उत्पादन गरेको डिजिटल डाटा को डाटाबेस तयार भए पछि सोही आधारमा डिजिटल प्रविधिबाटै सेवा प्रवाह गर्नु पर्नेछ । Hard Copy Map Scan गरी Digital Data उत्पादन गर्दा Ao size को Scanner प्रयोग गरी Map Scan गर्ने र Perfect Georeferencing भएपछि मात्र Digitization गरि geodatabase तयार गर्नु पर्नेछ । डिजिटल प्रविधिबाट सेवा प्रवाह गरेका कार्यालयहरूले मासिक रूपमा डाटा व्याकअप गरि राख्नु पर्नेछ र त्रैमासिक रूपमा सो डाटाको व्याकअप विभागमा पठाउनु पर्नेछ ।

Updating and Archiving Cadastral Documents



Database Update and Maintenance of digital data

(१३) डिजिटल डाटाको भण्डारण र सुरक्षाको प्रबन्ध नापी अधिकृत ले मिलाउनु पर्नेछ ।

Updating and Archiving Cadastral Documents



Works of survey offices

- कित्ताकाट (parcel subdivision)
- नापी गर्ने छूट भएको जग्गा नाप नक्सा गर्ने
- नक्सा दूरी अंकित गर्ने
- (कित्ता नक्सा वनाउने) Parcel Plan/Parcel map
- नक्सा ट्रेस उता/ (Map tracing)
- फिल्ड रेखाकान्न
- टायल चेक
- नक्सा/फिल्डवुक/प्लट रजिष्टरको सम्भारा।
- विविध कार्यहरु

Updating and Archiving Cadastral Documents



Procedure at survey office

Once Land Revenue Office sends request for land information or parcel subdivision at District Survey office then following steps are followed.

1. The request is verified.
2. Registration of parcel-sub division order.
3. Order to the concerning section.
4. Checking deeds.
5. Parcel identification and area check.
6. Field verification.
7. Parcel sub-division and temporary update.
8. Checking parcel sub-division plan.
9. Submission of parcel subdivision plan.

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References:



CADASTRAL SURVEYING

EG3103GE

Unit 9. Cadastral organizations and their roles in Nepal



Public Secondary School

Lecture by
Er. Keshav Raj Bhusal

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Unit 8: Cadastral organizations and their roles in Nepal

- 9.1 Concerned Ministry,
- 8.2 Survey Department,
- 8.3 Department of Land Reform and Management
- 8.4 District Survey Offices,
- 8.5 District Land Reform and Revenue Offices,
- 8.6 Judicial and Quasi-judicial bodies
- 8.7 Local Governments
- 8.8 Role of 3 levels of governments in cadastre development

Cadastral organizations and their roles in Nepal



Concerned Ministry

- The concerned ministry for all cadastral activities in Nepal is **The Ministry of Land Management, Cooperatives and Poverty Alleviation (MoLMCPA)**.
- It is responsible for land administration and management activities which ensures efficient and effective administration and sustainable management of available land resources throughout the country.
- The ministry, then called Ministry of Land Reform and Management, was merged with the Ministry of Cooperatives and Poverty Alleviation to form the Ministry of Agriculture, Land Management and Cooperatives in February 2018, but was reopened and renamed as a separate ministry in August 2018 as the Ministry of Land Management, Cooperatives and Poverty Alleviation.



Government of Nepal
Ministry of Land Management, Cooperatives and Poverty Alleviation
Singhadurbar, Kathmandu, Nepal

Cadastral organizations and their roles in Nepal



Concerned Ministry

- *There are six departments working under MoLMCPA. They are:*

1. Department of Survey
2. Department of Land Management and Archieve
3. Department of Co-operatives
4. Land Management and Training Center
5. Co-operative Training and Research Center
6. National Land Commission

Cadastral organizations and their roles in Nepal



Concerned Ministry: *MoLMCPA*

- Ministry of Land Reform and Management (MOLRM), being the core ministry looking after the land administration and management activities, is responsible for ensuring efficient and effective administration and sustainable management of available land resources.
- It is also the prime responsibility of the ministry to provide effective and efficient service delivery to the general public.
- Furthermore, ensuring the availability of all kinds of geo-information products, which is the foundation of land administration and management activities, is the other principal responsibility of the ministry.
- Handling National and international issues related to land.
- Maintenance of the coordination between the various departments of the ministry.
- Purpose the bills related to the land for the cabinet verification.
- Formulate plans and policies for the development of land in the country.

Cadastral organizations and their roles in Nepal



Concerned Ministry:

Objectives of MoLMCPA

- Scientific Land Reform for equitable access to land.
- Optimal use of land for sustainable development.
- Protection of state and Guthi(trust) land for the benefit of the people at large.
- Good land administration system for public satisfaction.
- Efficient and effective organization to serve the people better.
- Modernized mapping services for modern Nepal.
- Land Information System for e-Governance.
- National Spatial Data Infrastructure for optimal utilization of public fund.
- Qualified human resources and adequate infrastructure for delivering quality services.

Cadastral organizations and their roles in Nepal



1. Department of Survey:

- Survey Department, under the Ministry of Land Management, Cooperatives and Poverty Alleviation is the only National Mapping Organization (NMO) of Nepal.
- The Department was established in 2014.
- It is the core organization working in the production, dissemination, and regulation of geospatial information in the country.
- The Department comprises of mainly four divisions.. They are:
 - a. Cadastral Survey Branch
 - b. Geodetic Survey Branch
 - c. Topographical Survey and Land Use Management Division
 - d. Geographic Infrastructure Information Division
- Besides this there are 131 district survey offices, 7 special survey offices and 1 digital cadastral survey office under survey department running in Nepal.



1. Department of Survey:

Geodetic Survey Branch

- Geodetic Survey Division was established in 25 September 1970 in the name of the Trigonometrical Survey Branch which was then engaged to establish a triangulation network throughout the country.
- Trigonometrical survey Branch was later renamed as Geodetic Survey Division with a view to encompass its various activities of Precise Leveling, Astronomy, Gravity and other Geodetic Survey work in the country.
- Geodetic Survey Division is now actively engaged in producing geodetic, gravimetric and altimetric (height) data required for the preparation of maps and geo-information products including cadastral information of the country.

Cadastral organizations and their roles in Nepal



1. Department of Survey:

Geodetic Survey Branch

Objectives:

- a. To establish and maintain higher order (first, second and third order) geodetic ground control network throughout the country.
- b. To establish lower order ground control points and provide map sheets with ground control to prepare a large-scale cadastral maps of the country.
- c. To establish and maintain leveling network in the country.
- d. To establish and maintain a gravity network and determine the gravity anomaly of the country.
- e. To promote the research works in the field of geodesy and astronomy in the country.
- f. To archive the different types of ground control points data as well as other geodetic information products and provide services for Development Projects.

Cadastral organizations and their roles in Nepal



1. Department of Survey:

Cadastral Survey Branch

- This division deals primarily with the land property mapping, identifying land types as well as scientifically maintaining the land records for Land Information System uses.
- It's main mission is to prepare a complete, reliable and up-to-date cadastral database of the country.

Functions:

- a. To carry out the necessary works for the re-survey and village block mapping work being carried out in different districts as well as to carry out other works related to the survey.
- b. To monitor whether the survey offices have done the work of survey map as per the Land (Survey Measurement) Act 2019 and to check Land owner Shrestha and Land owner Certificate.
- c. To provide opinion to the Department of Survey for the solution of problems related to land administration and land management.
- d. To develop the software required for the cadastral work.
- e. To study and recommend the technical instruments, tools, software and other materials used in the survey work.
- f. Scanning, digitizing and collecting ammonia map, field book collection and plot register scanning.

Cadastral organizations and their roles in Nepal



1. Department of Survey:

Cadastral Survey Branch

Functions:

- g. To make available the digital data (map, field book and plot register) in the records as per the rules as demanded by the Survey Office and the user organization or body. And so on...

Cadastral organizations and their roles in Nepal



1. Department of Survey:

Topographical Survey and Land Use Management Division

- It is mainly responsible for preparing and updating topographical base maps, land resources maps, district maps, administrative maps , thematic maps, landuse maps etc. and provide services as well as information.

It has got five major sections:

a. Photogrammetric and Remote Sensing Section

- To manage and provide services for satellite images, aerial photography(orthophoto), taking aerial photographs of the proposed areas, UAV mapping, LIDAR surveying etc.

b. Field section

- To manage, formulate and mobilize the teams and its members to various field work.

c. Cartographic and Printing Section

- To prepare and update the topographical base maps of the country,districts maps, administrative map of Nepal and other necessary thematic maps as well as print maps and charts.



1. Department of Survey:

Topographical Survey and Land Use Management Division

It has got five major sections:

d. Land use Expert Section

- To prepare and update the landuse maps/data

e. Border Section

- To manage border documents, to prepare border maps and assist in border surveying and delineating international boundaries of the country with neighboring countries

Cadastral organizations and their roles in Nepal



1. Department of Survey:

District survey offices:

- District Survey offices are under department of survey and are categorized into five classes based on the responsibilities of their works.
- Survey offices under the category “Ka” and Kha” are entitled to carry out mapping works (previously undertaken by the Survey Goswara offices) as well have responsibilities of updating land records.
- The survey offices under the category “Ga”, “Gha” and “Nga” are limited to undertake updating exercises of the land records only.
- Besides these offices Special survey offices at Arghakhachi, Palpa,Siraha,Jhapa and Chainpur Sankhuwasava are established.

Category "Ka" : Dillibazar, Parsa, Banke, Rupandehi, Kailali, Sarlahi, Jhapa, Kaski, Biratnagar

Category "Kha" : Lalitpur, Bhaktapur, Chabahil, Kalanki, Sunsari, Saptari, Siraha, Dhanusa, Mahottari, Rautahat, Bara, Chitwan, Makawanpur, Nawalparasi, Kapilbastu, Dang, Bardiya, Kanchanpur

Category "Ga" : Kawasoti, Belbari, Lahan, Damak, Tikapur, Udayapur, Kavre, Surkhet, Tanahun, Doti, Dhankuta, Syangya, Palpa, Ilam, Dhading, Nuwakot, Sindhupalchowk, Parbat

Category "Gha" : Baglung, Sindhuli, Gulmi, Arghakhanchi, Dailekh, Salyan, Pyuthan, Baitadi, Dadeldhura, Dolakha, Ramechhap, Gorkha, Lamjung

Category "Nga" : Myagdi, Bhojpur, Panchthar, Solukhumbu, Khotang, Okhaldhunga, Khandbari, Chainpur, Rukum, Rolpa, Taplejung, Terathum, Darchula, Bajhang, Rasuwa, Jajarkot, Achham, Mustang, Manang, Bajura, Jumla, Humla, Mugu, Dolpa, Kalikot



1. Department of Survey: *District survey offices:*

Major works of district survey offices:

- संग्रह (Collection)
- संरक्षण (Preservation)
- अध्याबधिक (Updating)
- जग्गा प्रशासन कार्यमा प्राविधिक सहयोग (Technical assistance in land administration works)

Cadastral organizations and their roles in Nepal



1. Department of Survey: *District survey offices:*

Major works of district survey offices:

- जिल्लास्थित नापी कार्यालयहरूले निकायहरूबाट प्राप्त हुने नक्सा, फिल्डबुक (क्षेत्रीय किताव) र किता श्रेस्ता (प्लट रजिष्टर) हरूको संग्रह गरी राख्नु पर्दछ ।
- नापी कार्यालयले जिल्लाभरीको नक्सा, फिल्डबुक, किता श्रेस्ताहरू (प्लटरजिष्टर) को संरक्षण तथा सम्बर्धन गरी क्रमबद्ध तरिकाले चाहेको अवस्थामा उपलब्ध हुन सक्ने गरी ननासिने, नविग्रने गरी सुरक्षित साथ राख्नु पर्दछ ।
- मालपोत कार्यालयबाट पारित लिखत, राजिनामा, बक्सपत्र आदिबाट हक हस्तान्तरण हुने कार्य र हक बेहकमा मुद्दा चली अदालतबाट भएको निर्णय, फैसला बमोजिमको कार्य र सरकारी योजना बमोजिम अधिग्रहण भएको जग्गा जस्तै:- राजमार्ग, रेलवे, हवाई मार्ग, नहर र अन्य प्रयोजनको लागि प्राप्त गरिएका जग्गाको सरकारको निर्णय बमोजिम लिखत प्राप्त भई मालपोत कार्यालयबाट लेखि आएको आधारमा नक्सा अध्यावधिक राख्नु पर्दछ ।
- प्राविधिक कामको जिम्मा लिई स्वच्छ जग्गा प्रशासनको कार्यमा सम्बन्धित मालपोत कार्यालयलाई आवश्यक सहयोग उपलब्ध गराउने दायित्व पनि नापी कार्यालयको हुन्छ ।

Cadastral organizations and their roles in Nepal



1. Department of Survey: *District survey offices:*

Major works of district survey offices:

- जग्गा खरीद विक्री वक्स पत्र अंश वण्डा, नामसारी, अदालती फैसला, अधिग्रहण, प्राकृतिक प्रकोप आदी कारणले गर्दा जग्गाको स्वामित्वमा आंशिक रूपमा परिवर्तन हुने भएमा नापी कार्यालयको तर्फबाट कित्ताकाट गर्नु पर्ने हुँदा यस्तो अवस्थामा : कित्ताकाट गर्नु पर्ने कित्ता नम्बर, क्षेत्रफल र तर्फ समेत खुलेको लिखित सम्बन्धित मालपोत कार्यालयबाट आदेश सहित प्राप्त हुन आए पछि नापी कार्यालयले कित्ताकाटको कार्यवाही शुरु गर्ने ।
- नक्सामा कित्ताकाट गरी नयाँ कायम हुन आउने कित्ताहरु स्पष्ट देखाउन नसकिने अवस्था भएमा फायल नक्सा बनाउने ।
- मालपोत कार्यालयबाट प्राप्त लिखित वमोजिम कित्ताकाट गरी, दुई प्रति कित्ता काट ट्रेस तयारगरी मालपोत कार्यालयमा पठाउने ॥
- अदालत, मालपोत कार्यालय जस्ता निकायहरुबाट कित्ताको लम्बाई चौडाई खुलाउन माग भएमा नक्साको कित्ता भित्र दूरी अंकित गरी पठाउने ।

Cadastral organizations and their roles in Nepal



2. Department of Land Management and Archive (DOLMA)

- It is the only Department of Government of Nepal (GoN) which undertakes Land Reform, Land Administration and Management functions through its nations wide distributed district land revenue offices, also known as Mal Adda or Malpot.
- It was formerly called Department of Land Reform and Management (DOLRM).
- There are 110 Land Revenue Offices and 21 Land Reform and Land Revenue offices all over the country.

Objectives:

- a) Deliver better services to the general public on land ownership administration through its district offices.
- b) Safeguard land ownership records to help increase in the productivity and alleviate poverty by protecting access to land among stakeholders.
- c) Collect revenue from land taxes and fees.
- d) Develop a robust and efficient land information system to automate land records and procedures.



2. Department of Land Management and Archive (DOLMA)

District Land Revenue office

- District land revenue offices are the district level offices under the department of Land reform andmanagement. These offices are responsible for the day to day land administration works.
- The major tasks of land revenue offices are perform general day to day works of public regarding the land administration, management of land records and planning and data management.

Cadastral organizations and their roles in Nepal



2. Department of Land Management and Archive (DOLMA): *District Land Revenue office*

- यस कार्यालयले सम्पादन गर्ने प्रमुख कार्यहरू :
- जग्गा प्रशासनसम्बन्धी (**related to land administration**)
- छुट जग्गा दर्ता गर्ने,
- जग्गा रोक्का तथा फुकुवा गर्ने,
- अर्धन्यायिक निकायले गर्ने जग्गा प्रशासनसम्बन्धी निर्णय गर्ने,
- गुठी कार्यालय नभएको जिल्लामा गुठीको जग्गा प्रशासन सम्बन्धी कार्य गर्ने,
- भूमिसुधार कार्यालय नभएको जिल्लामा भूमि सुधारसम्बन्धी कार्य गर्ने ।
- **अभिलेख व्यवस्थापन (management of land records)**
- जग्गाधनी दर्ता श्रेस्ताको सुरक्षा व्यवस्थापन, अद्यावधिक तथा मर्मत सुधार गर्ने,
- जग्गाधनी दर्ता किताब खडा गर्ने,
- रोक्का लगत व्यवस्थापन गर्ने ।
- **योजना तथा तथ्याङ्क (planning and data management)**
- कार्यक्रम तर्जुमा तथा कार्यान्वयन गर्ने,
- मासिक, चौमासिक तथा वार्षिक कार्यप्रणाली मन्त्रालय तथा विभागमा पठाउने,
- मन्त्रालय तथा विभागलाई आवश्यक भू—सूचना प्रवाह गर्ने

Cadastral organizations and their roles in Nepal



2. Department of Land Management and Archive (DOLMA): *District Land Revenue office*

- जग्गाको हदबन्दी तथा बिक्री वितरणसम्बन्धी कार्यहरू गर्ने,
- मोहीको लगत अद्यावधिक राख्ने,
- अर्धन्यायिक निकायले गर्ने जग्गा प्रशासनसम्बन्धी निर्णय गर्ने
- जग्गाधनी र मोहीलाई जग्गा बाँडफाँड गर्ने,
- जग्गाधनी र मोही बीचको अन्य विवादहरू समाधान गर्ने,
- अनिवार्य बचत तथा ऋण असुलीसम्बन्धी कार्यहरू गर्ने,
- कर्मचारी प्रशासन तथा आर्थिक प्रशासनसम्बन्धी कार्यहरू गर्ने।



3. National Land Commission

- भूमि सम्बन्धी ऐन, २०२९ को दफा ५२क. को उपदफा (३) र दफा ५२ख. को उपदफा (६) बमोजिमको अधिकार प्रयोग गरी नेपाल सरकारले भूमिहीन दलित, भूमिहीन सुकुम्बासीलाई जग्गा उपलब्ध गराउने तथा अव्यवस्थित बसोबासीलाई व्यवस्थापन गर्ने प्रयोजनको लागि राष्ट्रिय भूमि आयोग गठन गरेको छ । नेपाल राजपत्रमा २०७८ | ०५ | २५ गते राष्ट्रिय भूमि आयोग गठन आदेश २०७८ प्रकाशित भएको छ ।
- गठन आदेश अनुसार अध्यक्ष, उपाध्यक्ष सहित ९ सदस्यीय राष्ट्रिय भूमि आयोग गठन हुने व्यवस्था रहेको छ । आयोगको काम, कारबाहीलाई सहयोग, समन्वय र सहजीकरण गर्न आवश्यकता र औचित्यको आधारमा जिल्ला स्तरमा जिल्ला समितिको व्यवस्था गरेको छ । जिल्ल समितिमा अध्यक्ष सहित ९ जना पदाधिकारीको व्यवस्था रहेको छ ।
- भूमिहीन दलित, भूमिहीन सुकुम्बासी र अव्यवस्थित बसोबासीको आवास तथा भूमिमाथिको पहुँच र स्वामित्व स्थापित गराई देशबाट भूमिहीनताको अन्त्य, भूमिको महत्तम उपयोग र जनमुखी एवं न्यायपूर्ण भूमि व्यवस्था स्थापित गर्ने योगदान गर्ने ।



3. National Land Commission

Purpose:

1. Identification, verification and documentation of landless Dalits, landless squatters and unorganized residents.
2. To end landlessness and land-based exploitation and discrimination from the country by establishing necessary action plans, standards, procedures, schedules and systems by establishing access and rights to housing and land for landless Dalits, landless squatters and unorganized residents.
3. Providing land for agriculture with ownership to landless Dalits, landless squatters and unorganized residents involved in agriculture. Establishing land as a means of production and supporting the upliftment of the standard of living of farmers who have access to and ownership of land by making scientific and maximum use of available land.
4. Planned relocation of actual landless Dalits and landless squatters living in hazardous or law-prohibited locations.
5. Completing the unfinished tasks of the past commissions and committees by creating necessary procedures.
6. In carrying out the tasks of the Commission, to make necessary contact, coordination and cooperation with the local level, state government and Nepal government.
7. Contribute to the long-term solution of the multi-faceted problems related to land through the work, duties and rights mentioned in the commission order as well as other tasks prescribed by the Government of Nepal.



Local Authority

- Local authority are the local government which includes the nagarpalika and gaupalika. The constitution has assigned some of the rights to the local bodies regarding the process of the land administration and management.

Some of the tasks of local government are:

- a. Local taxes (wealth tax, house rent tax, land and building registration fee).
- b. Distribution of house and land ownership certificates.
- c. Landless squatters management.

Cadastral organizations and their roles in Nepal



Local Authority

Some of the tasks of local government are:

- (२) स्थानीय स्तरका संघ, संस्थाको दर्ता तथा नवीकरण।
- (५) उपदफा (१) र (३) मा उल्लिखित अधिकारका अतिरिक्त गाउँपालिका तथा नगरपालिकाको अन्य काम, कर्तव्य र अधिकार देहाय बमोजिम हुनेछ:-
 - क. भूमि व्यवस्थापन
- (१) सङ्घीय तथा प्रदेश कानूनको अधीनमा रही स्थानीयस्तरको भू-उपयोग नीति, योजना, कार्यक्रम तर्जुमा र कार्यान्वयन,
- (२) सङ्घीय तथा प्रदेशको मापदण्डको अधीनमा रही व्यवस्थित वस्ती विकासका कार्यक्रमको तर्जुमा र कार्यान्वयन, एकीकृत वस्ती विकासका लागि जग्गाको एकीकरण तथा जग्गा विकास र व्यवस्थापन,
- (३) स्थानीयस्तरमा अव्यवस्थित वस्तोबास व्यवस्थापन।

Cadastral organizations and their roles in Nepal



Local Authority

Some of the tasks of local government are:

- ४. जम्मा धनी दर्ता प्रमाणपुर्जा वितरण
- (१) स्थानीय जम्माको नाप नक्सा, कित्ताकाट, हालसाविक, रजिष्ट्रेशन नामसारी तथा दाखिल खारेज,
- (२) जम्मा धनी दर्ता प्रमाणपुर्जा वितरण तथा लगत व्यवस्थापन,
- (३) भूमिको वर्गीकरण अनुसारको लगत,
- (४) सार्वजनिक प्रयोजनका लागि जम्मा प्राप्ति, मुआब्जा निर्धारण तथा वितरणमा समन्वय र सहजीकरण,
- (५) नापी नक्सा तथा जम्माको स्वामित्व निर्धारण कार्यमा समन्वय र सहजीकरण,
- (६) जम्मा धनी दर्ता प्रमाणपुर्जा वितरण सम्बन्धी अन्य कार्य ।

Cadastral organizations and their roles in Nepal



Role of 3 levels of governments in cadastre development

Role of central government in cadastre

1. Scientific Land Reform for equitable access to land.
2. Optimal use of land for sustainable development.
3. Protection of state and Guthi(trust) land for the benefit of the people at large.
4. Good land administration system for public satisfaction.
5. Efficient and effective organization to serve the people better.
6. Modernized mapping services for modern Nepal.
7. Land Information System for e-Governance.
8. National Spatial Data Infrastructure for optimal utilization of public fund.
9. Qualified human resources and adequate infrastructure for delivering quality services
10. भूउपयोर सम्बन्धी नीबि ०० प्रिखस्त बिकास नीबि संघको

Cadastral organizations and their roles in Nepal



Role of 3 levels of governments in cadastre development

Role of province government in cadastre

- भमूम विस्थापन, जग्गाको असभलेख
- गठु विस्थापन
- भमूम नीमि र सो सम्बन्धी कानून

Role of local government in cadastre

- Same as in earlier slides

Judicial and Quasi-judicial bodies



Judicial bodies

- Judicial body refers to any public organization or branch of government responsible for the administration of justice or the enforcement of laws.
- It refers to Supreme court, district court and appellate court.

Role of judicial bodies in cadastre

Judicial and Quasi-judicial bodies



Quasi-Judicial bodies

- Quasi-judicial authority refers to the decision-making power granted to administrative bodies or officials that allows them to perform functions similar to those of a court of law.
- These bodies or officials are entrusted with the responsibility of impartially adjudicating disputes, interpreting and applying laws, and making determinations that affect the rights, interests, and privileges of individuals or organizations.
- Some of the quasi-judicial bodies of Nepal are:
 1. Home Affairs Administration (Chief District Office)
 2. Land Administration (Land Revenue and Land Reform office)
 3. Forest Administration (National Park and Wildlife Preservation Office)
 4. Local bodies Administration (District Development Committee)
 5. Palika (Gaupalika, Nagarpalika)
 6. Labour Administration (Labour and Employment Promotion Department)

Cadastral organizations and their roles in Nepal



Assignment

Q. N 1: Write short note on Land Records Information Management System(LRIMS)

Table of contents



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Quasi-Judicial bodies

- <https://www.linkedin.com/pulse/understanding-quasi-judicial-authority-balancing-power-jaya-sinha>
- <https://bistasarojlaw.blogspot.com/2017/02/quasi-judicial-bodies-in-nepal-study-of.html>

CADASTRAL SURVEYING

EG3103GE

Unit 9: Modern Cadastre and Case Studies of Some Countries



Public Secondary School

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Unit 9: Modern Cadastre and Case Studies of Some Countries

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3D cadastre

- 3D cadastre, also known as three-dimensional cadastre, refers to a land administration system that incorporates three-dimensional(length, width, and height) spatial information in addition to the traditional two-dimensional cadastral data.
- Benefits of 3D cadastre include improved accuracy in representing complex spatial relationships, better support for urban planning and development, and enhanced decision-making capabilities for land management.
- It can be particularly valuable in densely populated urban areas where land use is dynamic and multifaceted.

Need of 3D cadastre

- Many of the Housing Companies are involving in the construction of multistory building to sell the apartments. The owners of the apartments are unable to register the ownership and mortgage the properties. The general public is not assured of his/her property situation in the as is condition. So, appropriate measures should be immediately adopted to resolve such problems by the concerned authorities.



Current legal provisions of 3D cadastre in Nepal

- Although Land (Survey and Measurement) Act, 2019 incorporates the possibility of registration of distinct ownership on the floors or apartments, the format of Register Book and Ownership Certificate does not have the provision of registering or providing ownership certificate of an apartment/flat.
- The existing format of Land Register Book and Ownership Certificate indicates that the ownership on the land parcel, on which the building is erected, remains with the owner of the ground floor, but not with the owner(s) of upper floor(s).
- The provisions included in the Land Administration Directive, and Land (Survey and Measurement) Act do not address the registration of distinct ownership in the housing units (apartment/flat) of Joint Residential Buildings.
- The Ownership of Joint Residence Related Act and its Regulations, although a number of provisions of rights, restriction and responsibilities have been included, do not address the way of their registration.
- Measurement of height is not taken into account. Adjudication of property unit is not documented in the legal framework.
- Existing system does not take into account the other areas like underground parking places, underground market places, overhead bridges, etc where the 3D component plays an important role.



FIG (International Federation of Surveyors)

- FIG is the premier international organization representing the interests of surveyors worldwide.
- It is a federation of the national member associations and covers the whole range of professional fields within the global surveying, geomatics, geodesy and geo-information community.
- It provides an international forum for discussion and development aiming to promote professional practice and standards.
- FIG was founded on July 18, 1878 in Paris by delegates from seven national associations - Belgium, France, Germany, Great Britain, Italy, Spain and Switzerland - and was known as the Fédération Internationale des Géomètres.
- It is a UN-recognized non-government organization (NGO), representing more than 120 countries throughout the world, and its aim is to ensure that the disciplines of surveying and all who practice them meet the needs of the markets and communities that they serve.
- Technical work of FIG is led by ten different commissions with individual themes.



FIG (International Federation of Surveyors)

Commissions of fig

- a. Commission 1 - Professional Practice
- b. Commission 2 - Professional Education
- c. Commission 3 - Spatial Information Management
- d. Commission 4 – Hydrography
- e. Commission 5 - Positioning and Measurement
- f. Commission 6 - Engineering Surveys
- g. Commission 7 - Cadastre and Land Management
- h. Commission 8 - Spatial Planning and Development
- i. Commission 9 - Valuation and the Management of Real Estate
- j. Commission 10 - Construction Economics and Management



Cadastre vision 2014

- This vision was decided to develop on future cadastre in 20th ordinary congress in 1994 by 7th commission: Cadastre and land management.
- Accordingly, the work group was formed to develop the vision according to this decision which published a report named "Cadastre 2014 - A Vision for A Cadastral System in the Future" in 1998.
- This report has underlined the view on how cadastre will be develop and how it will look like in the following twenty years.
- The report contained six statements which deals with the public rights and restrictions, integration of services, the digital format and data model, Public-Private Partnership in surveying and the economic sustainability.



Cadastre vision 2014

The cadastre vision 2014 are:

1. Vision I: "The Cadastre 2014 will show the complete legal situation of land including public rights and restriction".
2. Vision II: "The separation between maps and records would be abolished".
3. Vision III: "The cadastral mapping will be dead! Long live modeling!".
4. Vision IV: "Paper and pencil-cadastre will have gone".
5. Vision V: "Cadastre 2014 will be highly privatized! Public and private sector are working together!"
6. Vision VI: "Cadastre 2014 will be cost recovering".



Cadastre vision 2014

Vision I: "The Cadastre 2014 will show the complete legal situation of land including public rights and restriction".

- The concept of this vision is that, by 2014 all the detail information regarding land should be visualized by the cadastre.
- Since, the world population and the consumption of land is increasing and hence to ensure the security for having lands, all facts related to land should be clearly realized by the cadastral systems.



Cadastre vision 2014

Vision I: "The Cadastre 2014 will show the complete legal situation of land including public rights and restriction".

Statement 1 on Cadastre 2014

Cadastre 2014 will show the complete legal situation of land, including public rights and restrictions!

The diagram shows a large area labeled 'land' divided into four smaller rectangular plots labeled 'property 1', 'property 2', 'property 3', and 'property 4'. A red line, representing a 'restriction C', cuts across properties 1, 2, and 3. Another red line, representing 'restriction A', cuts across properties 1 and 2. A third red line, representing 'restriction B', cuts across properties 1 and 3. The areas where the restrictions overlap are shaded grey.

Comment: The population of the world is growing. The consumption of land is increasing. The absolute control of the individual or of legal entities of land is increasingly being restricted by public interest. To provide security of the land tenure, all facts about land must be made obvious by the cadastral system of the future.

Consequences: A new thematic model is necessary. Surveyors must take into consideration public law.

Source: (A VISION FOR A FUTURE CADASTRAL SYSTEM Jürg Kaufmann • Daniel Steudler, 1998)



Cadastre vision 2014

Vision II: "The separation between maps and records would be abolished".

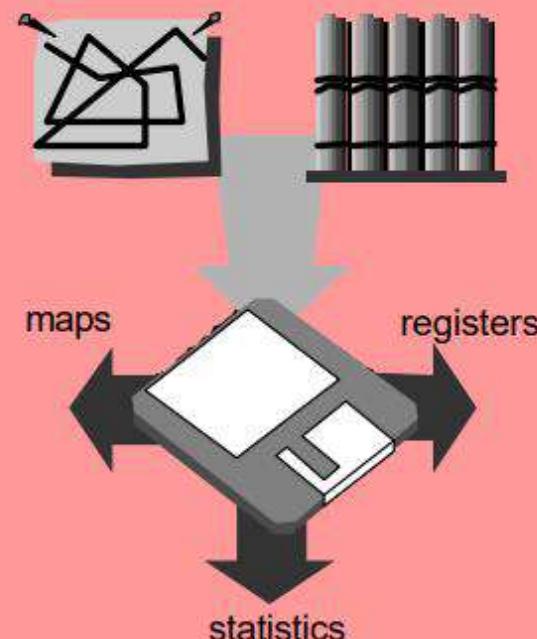
- In some countries (like Nepal) there are two organizations responsible for land records and cadastral data service and management. It was necessary because of the technologies adopted at that time were traditional and mainly papers and pencils.
- But now, more advancement in the technology have come. Hence, entities of single service need not to disintegrated today. This also support in efficiency of land administration services in accordance with land governance.



Cadastre vision 2014

Vision II: "The separation between maps and records would be abolished".

Statement 2 on Cadastre 2014



The separation between 'maps' and 'registers' will be abolished!

Comment: The separation was necessary because the available technology – paper and pencil – did not allow other solutions.

Consequences: The division of responsibilities between surveyor and solicitor in the domain of cadastre will be seriously changed.

Source: (A VISION FOR
A FUTURE
CADASTRAL SYSTEM
Jürg Kaufmann • Daniel
Steudler, 1998)



Cadastre vision 2014

Vision III: "The cadastral mapping will be dead! Long live modeling!"

- The concept of this vision is that, there must be flexibility in the scale during mapping and different scales has to be represented by different data model.
- Advanced modern technology can create maps of different scales and registers in different forms from the same data so that there would not be any draftsman and cartographers in the cadastral field.

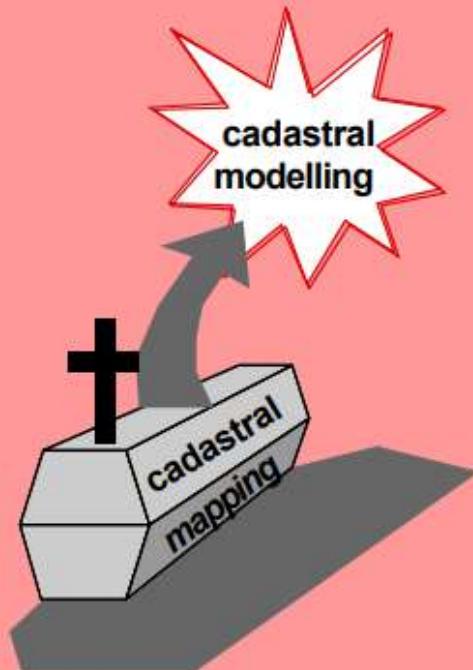


Cadastre vision 2014

Vision III: "The cadastral mapping will be dead! Long live modeling!"

Statement 3 on Cadastre 2014

The Cadastral mapping will be dead!
Long live modelling!



Comment: Maps have always been models, but the available technology did not allow for the use of these models in a flexible manner. So in mapping flexibility had to be brought in by different scales. Different scales had to be represented by different data models.

Modern technology allows the creation of maps of different scales and registers in different forms from the same data model.

Consequences: In 2014 there will be no draftmen and cartographers in the domain of cadastre.

Source: (*A VISION FOR A FUTURE CADASTRAL SYSTEM*
Jürg Kaufmann • Daniel Steudler, 1998)



Cadastre vision 2014

Vision IV: "Paper and pencil-cadastre will have gone".

- In the past, paper and pencils were used to prepare the cadastral data. With due advancement in the technology, it has been replaced by computers and machines.
- Hence the concept of this vision is, all the cadastral activities will be conducted by computers and there will not be any paper and pencil used in cadastral field.

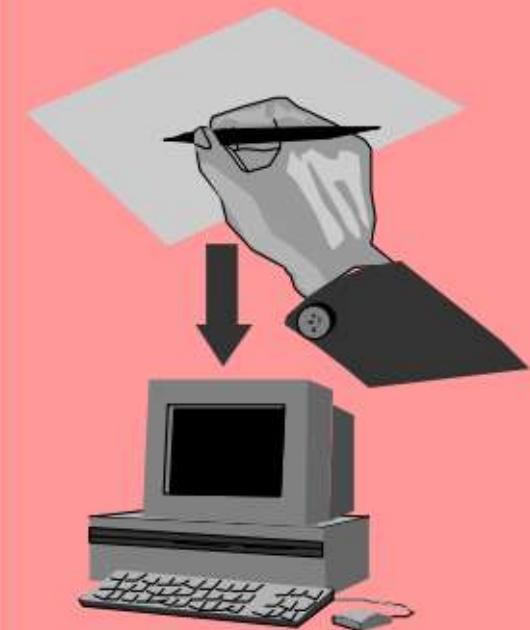


Cadastre vision 2014

Vision IV: "Paper and pencil-cadastre will have gone".

Statement 4 on Cadastre 2014

'Paper and pencil - cadastre' will have gone!



Comment: Geomatics technology will be the normal tool for cadastral work. Real low-cost solutions are only possible when this technology is used in combination with lean administrative procedures.

Developed, developing, and transitional countries need models of the existing situation to resolve the problems of population, environment and reasonable land use.

Consequences: The modern cadastre has to provide the basic data model. Surveyors all over the world must be able to think in models and to apply modern technology to handle such models.

Source: (*A VISION FOR
A FUTURE
CADASTRAL SYSTEM*
Jürg Kaufmann • Daniel
Steudler, 1998)



Cadastre vision 2014

Vision V: "Cadastre 2014 will be highly privatized! Public and private sector are working together!"

- The concept of this vision is that, there must be **Public Private Partnership (PPP)** in cadastral system where private sector can conduct the task like preparation of deeds, warrants, registries and the public sector can focus on registration, supervision & monitoring of private sector, control and ensuring security.

Statement 5 on Cadastre 2014

Cadastre 2014 will be highly privatized! Public and private sector are working closely together!



Comment: Public systems tend to be less flexible and customer oriented than those of private organizations.

Free economies demand flexibility in land markets, land planning and land utilization. Flexibility may be provided better by private institutions. For necessary security, however, public involvement is indispensable.

Consequences: The private sector will gain in importance. The public sector will concentrate on supervision and control.

Source: (*A VISION FOR A FUTURE CADASTRAL SYSTEM*
Jürg Kaufmann • Daniel Steudler, 1998)



Cadastre vision 2014

Vision VI: "Cadastre 2014 will be cost recovering".

- There is a huge difference between the total sum of the cost for land tax and land administration service and the cost of cadastral data acquisition.
- The concept of this vision is that, at least a part of costs necessary for the cadastral data acquisition and processes must be taken back from the customers.

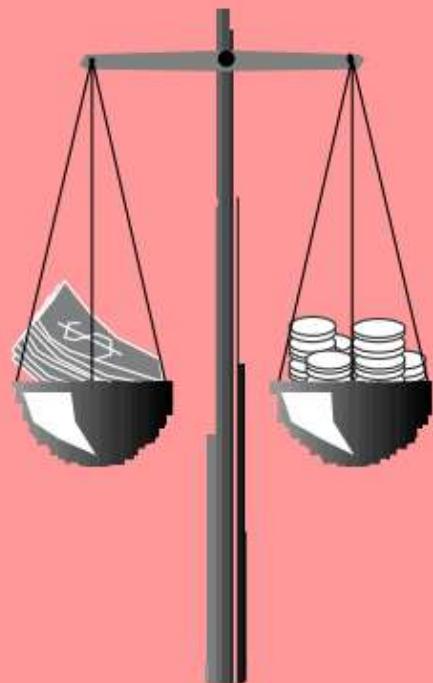


Cadastre vision 2014

Vision VI: "Cadastre 2014 will be cost recovering".

Statement 6 on Cadastre 2014

Cadastre 2014 will be cost recovering!



Comment: Cadastral systems need considerable investment. But the land documented and secured by the cadastre represents a multiple of the investment. The investment and operation costs have to be paid back at least partially by those who profit.

Consequences: Cost/benefit analysis will be a very important aspect of cadastre reform and implementation. Surveyors will have to deal more with economic questions in future.

Source: (*A VISION FOR A FUTURE CADASTRAL SYSTEM*
Jürg Kaufmann • Daniel Steudler, 1998)



Performance of Nepal on cadastre 2014

1. Performance on vision first statement (legally recognize all restrictions and rights on the land and to ensure the legal security of these rights and restrictions)

- In Nepal, complete documentation of the legal situation of land has been addressed.
- The surveyor verifies and validates the information about the land object during adjudication and conducting first registration. The land parcels are delineated and all rights and restrictions are recorded and registered to provide the tenure security.
- Approximately 95% of the cadastral survey has been completed where legal rights and restrictions has also been recorded. Remaining 5% includes village blocks whose survey were done already but its individual parcel are now being identified and again re-survey of such blocks are being undertaken.



Performance of Nepal on cadastre 2014

2. Performance on vision second statement (to abolish the separation of maps and registers)

- In Nepal, this vision has not been achieved.
- Initially during first registration, both collection of land records and cadastral survey are conducted by SO. But afterwards, land registers are handed over to DLRO and cadastral plans are kept with SO itself.
- During land transaction, deed registration is conducted by DLRO and parcel sub-division if necessary are done at SO. Both the offices are performing the task on their own separate system and separated business workflow.



Performance of Nepal on cadastre 2014

3. Performance on vision third statement (cadastral modeling than cadastral mapping)

- Since all the paper maps of all district have been digitalized, cadastral maps of any scale can be produced according to requirement. Like for urban area, larger scale (1:500) maps can be produced and for rural area reduced scale (1:1250) cadastral maps can be produced as per the requirement.
- However, in most of the SOs, parcel sub-division is not being conducted in digital data due to limited vocational education of operator but only in paper maps which has created the outdated digital cadastral database.



Performance of Nepal on cadastre 2014

4. Performance on vision forth statement (Paper and pencil free cadastre)

- This vision has not been achieved to full extent in Nepal despite the digital cadastral data availability.
- Since we are not in position of conducting digital transaction fully in all the survey office, we are still using paper maps and pens to update cadastral maps.
- Parcel Editor produces digital cadastral maps and records land registries. But the system does not support parcel sub-division. SAEx can conduct parcel sub-division but does not support first registration and record land registry.



Performance of Nepal on cadastre 2014

5. Performance on vision fifth statement (Public-Private Partnership)

- In Nepal, no private surveyors are involved in cadastral data acquisition. All the process are conducted by government surveyors from Survey Offices.
- If anyone wants to know their land-like area's status, they can request any private surveyor. Nevertheless, that is only for their personal information and affirmation of their land. It cannot use for legal purposes.
- During the land transaction, some private writers or notary helps in preparing deeds.
- Besides, private sectors are fully involved in the system development of land information systems.



Performance of Nepal on cadastre 2014

6. Performance on vision sixth statement (Cost recovery cadastral survey)

- There is huge investment of money for cadastral data acquisition from Government of Nepal. The only get back of this investment are the land tax and revenue during land transaction which are very nominal in comparison to total investment of cadastral data acquisition. Hence, cadastral survey in Nepal is not cost recovery.
- Even though government is charging a considerable sum for registration title but a slow cadastral survey, updating, mapping, and distributing ownership certificate by district survey and land revenue office increases the cost of the work which again is not cost recovery.



Cadastre vision 2034

- In the study named "Beyond Cadastre 2014" presented by Bennett and others in 2010 FIG congress and published in July 2010 GIM International journal, they defined six statements for Cadastre 2034 within the scope of the role and structure of cadastre.

Those statements are:

1. Move from approximate boundary representation towards survey-accurate boundary representation.
2. Focus shift from purely parcel-based systems towards systems of layered property objects.
3. Expansion from 2D approaches to include the third (height) and fourth (time) dimensions.
4. Updating and accessing of cadastral information in real time.
5. Making national and state-based cadastres interoperable at regional and global levels.



Cadastre vision 2034

Survey accurate cadastre

- A Survey Accurate Cadastre (SAC) would require every boundary to be defined on the ground by a Registered Surveyor and accurately coordinated.
- For such cadaster the level of precision would be high but the method of compilation would not be economically realistic.



Source:
https://www.fig.net/resources/monthly_articles/2011/june_2011/june_2011_bennett_rajabifard_et_al.pdf



Cadastre vision 2034

3D/4D Cadastre

- 3D cadastre also includes information about the height or elevation of land parcels along with the traditional two dimensions length and width.
- 4D cadastre refers to the integration of time as the fourth dimension into traditional land administration and cadastral systems. This involves tracking changes in land ownership, land use, and other relevant cadastral information over time.
- Addition of 3D/4D will reduce administrative friction caused by misinformation and poor understandings of property interests. Consequently, planning and development times will be greatly reduced.

5D cadastre

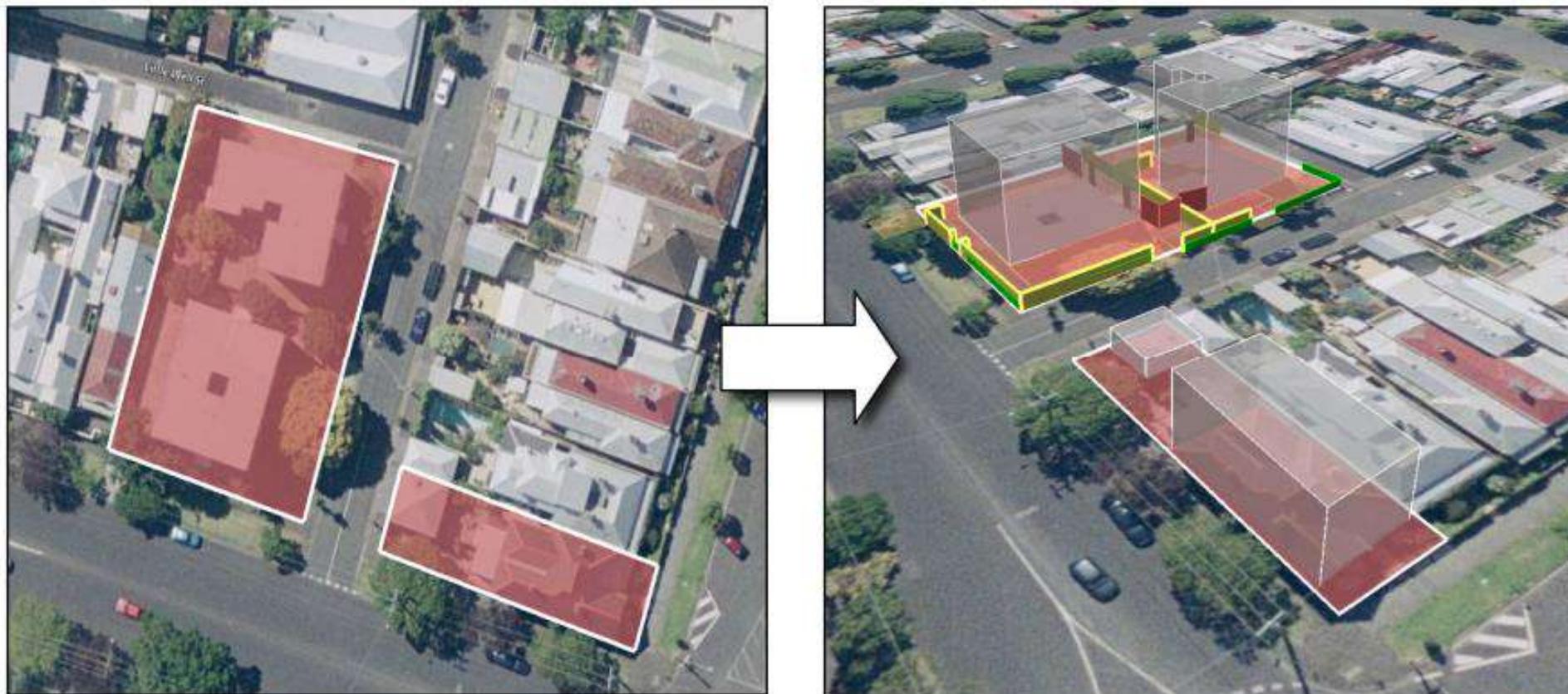
- It involves the legal and institutional constraints and regulations associated with land parcels. This includes zoning laws, land-use regulations, property rights, and other legal aspects that influence land administration.

Cadastre Vision-2034



Cadastre vision 2034

3D/4D Cadastre



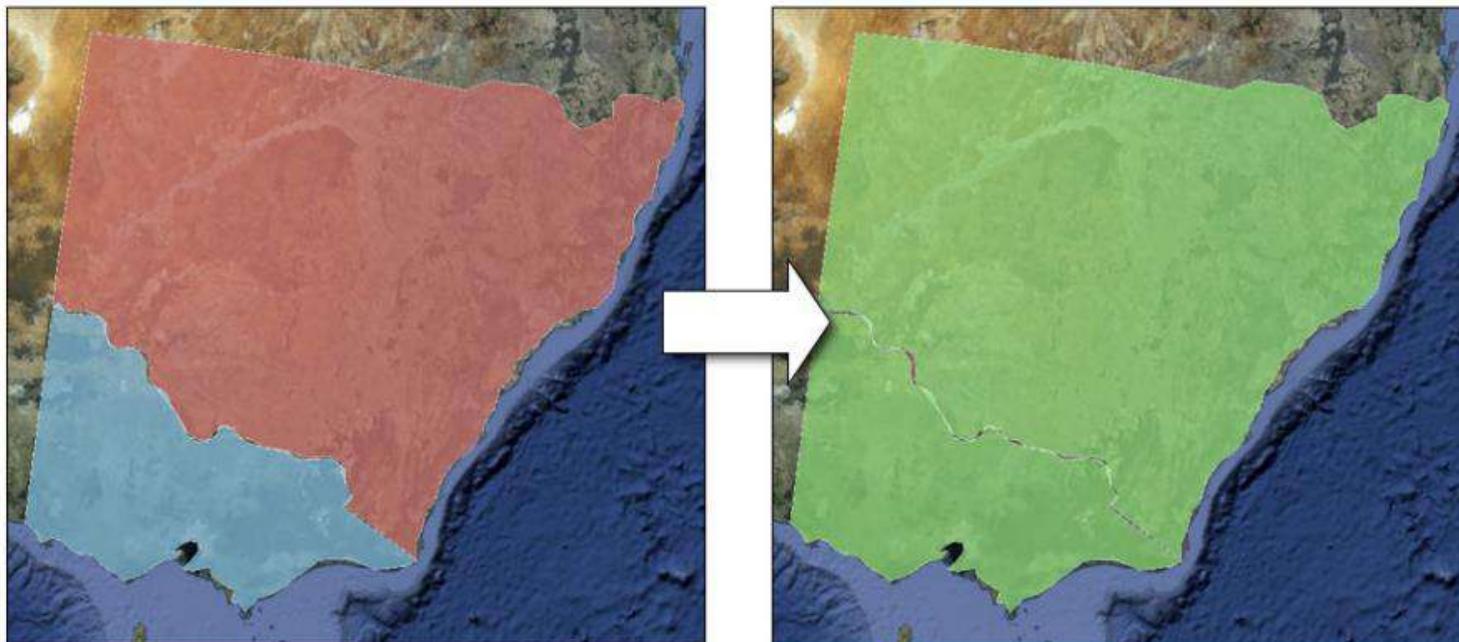
Source:
https://www.fig.net/resources/monthly_articles/2011/june_2011/june_2011_bennett_rajabifard_et_al.pdf



Cadastre vision 2034

Global Cadastre

- It refers to interoperable cadastre having linkage to regional and global cadastral networks.
- It is useful for better understanding of relationship between land markets, environmental management.



Source:
https://www.fig.net/resources/monthly_articles/2011/june_2011/june_2011_bennett_rajabifard_et_al.pdf

Fig: Interoperable cadastral systems allow management of economic and environmental concerns at regional and international level



Cadastre vision 2034

Object oriented Cadastre

- Object-oriented cadastre is an approach to land administration and cadastral systems that leverages object-oriented principles, which are commonly associated with software development, to model and manage information about land parcels and related spatial data.

- It includes:

i. Objects:

- Land parcels, properties, and other cadastral entities are represented as objects. These objects involves both the spatial geometry and non-spatial attributes of the land, making it a holistic representation

ii. Classes:

- In the context of cadastral systems, classes may represent different types of land parcels, such as residential, commercial, or agricultural.

iii. Relationship

- Relationships: Object-oriented cadastre systems can model relationships between different cadastral objects, such as adjacency between parcels, ownership relationships, and other spatial or legal connections.



Modern cadastre

- It refers to a digital, computerized land information system used to manage and record information about real property ownership and boundaries.

Features of modern cadastre

1. Digital Mapping:

- It refers to the use of Geographic Information Systems (**GIS**) to create and maintain precise digital maps of land parcels and their boundaries.
- This enables more accurate and accessible spatial data.

2. Real-Time Data Access:

- The information in modern cadastre systems is often accessible in real-time, enabling immediate access to **up-to-date** land records, property boundaries, and ownership information.



Modern cadastre

Features of modern cadastre

3. Multi-Purpose Cadastre:

- Modern cadastres are designed to serve multiple purposes beyond land registration.
- They can support land administration, urban planning, environmental management, taxation, and various other land-related decision-making processes.

4. Web-based Applications:

- Web-based interfaces and online portals are common in modern cadastre systems, making it easier for citizens, professionals, and government officials to access land-related information and services from any device with an internet connection.
- For example; mero kitta which provides online parcel map service.



Modern cadastre

Features of modern cadastre

5. Standardization and Interoperability:

- Modern cadastre systems often stick to international standards, facilitating interoperability with other land administration systems and promoting data sharing between different organizations and agencies.

6. Improved Security and Privacy:

- Digital cadastre systems implement robust security measures to protect sensitive land-related data and ensure that only authorized individuals have access to specific information.

10.2 Cadastral system around the world



Future trends in Modern cadastre

1. Use of cloud technology, web and mobile services

- It promotes faster and cheaper data creation, management and maintenance.
- It also provides the capability of real-time storage of very large data volumes.

2. VGI (Volunteered Geographic Information)

- The crowdsourced draft cadastral maps obtained through crowdsourcing through use of [openstreetmap](#) and other tools can be low-cost, fast, and free of gross errors.
- The use of VGI could fulfil the urgent societal and governmental needs and requirements through the establishment of a fast and low cost LAS, which in turn is aiming to improve transparency and provide support to the national economy.

10.2 Cadastral system around the world



Current trends in Modern cadastre

3. 3D cadastre

- Traditional cadastral systems typically deal with two-dimensional land boundaries. However, with the advancement of technology, there's a growing interest in 3D cadastre, which includes not only horizontal boundaries but also vertical information, such as building heights and underground property rights.

10.2 Cadastral system around the world



Land Information New Zealand (LINZ)

- Land Information New Zealand (LINZ) is the government department responsible for managing and providing land and property information in New Zealand.
- It plays a crucial role in land administration, cadastral surveying, geospatial data management, and land-related policy development.

Some of the functions of LINZ are:

a. Cadastral Surveying:

- LINZ is responsible for maintaining and updating the official survey and title records for all land parcels in New Zealand. It manages the cadastral survey system, ensuring that property boundaries are accurately defined and recorded.

b. Crown Property Management:

- It also manages and administers Crown-owned land and property, ensuring it is used in accordance with government policies and objectives.

10.2 Cadastral system around the world



Land Information New Zealand (LINZ)

Some of the functions of LINZ are:

c. Property Valuation:

- LINZ provides property valuation information to support government decision-making and the property market.
- d. It ensures that New Zealand has high quality databases for its survey, mapping, hydrographic and property activities.

e. Marine and Coastal Area:

- LINZ plays a role in managing New Zealand's marine and coastal area, ensuring its sustainable use and protection.

f. Spatial Data Infrastructure:

- LINZ is involved in developing and maintaining the country's spatial data infrastructure, which includes standards, protocols, and systems for sharing geospatial data across different government agencies and organizations.

10.2 Cadastral system around the world



Cadastral system of New Zealand

- New Zealand's cadastral system is managed by **Land Information New Zealand (LINZ)**, a government agency responsible for maintaining land-related information, including property boundaries and land titles.
- Cadastral surveys are carried out by licensed cadastral surveyors in accordance with standards set by the Surveyor-General and are lodged with Land Information New Zealand for approval. Once approved, surveys of private land can be used for the issue of new titles.
- New Zealand has multipurpose cadastral system. The New Zealand Cadastre serves many different purposes and is used by various groups of people, including government agencies, local governments, property owners, and the general public.
- 3D cadastre is the next concept what LINZ is trying to add in New Zealand's cadastral system.

10.2 Cadastral system around the world



Cadastral system of New Zealand

Landonline (Cadastral Information System):

- Landonline is an **online** platform developed by LINZ that allows users to access and manage cadastral data electronically.
- It contains digitalized records--title documents and survey maps.
- It is a online portal where surveyors, lawyers, conveyancers and other property professionals can securely search, lodge and update title dealings and survey data and conduct property transactions.

Some of the services that landonline provides are:

a. Title Information:

- Users can search for and view information about land titles, including ownership details, legal descriptions, and encumbrances.

b. Cadastral Maps:

- LandOnline provides access to digital cadastral maps, allowing users to view property boundaries and spatial data

10.2 Cadastral system around the world



Cadastral system of New Zealand

Landonline (Cadastral Information System):

Some of the services that landonline provides are:

c. Survey Data:

- Users can access survey data and plans that define property boundaries and legal descriptions.

d. Property Transactions :

- Information about property sales, transfers, and other transactions can be accessed through LandOnline.

e. GIS Data Access:

- Geographic Information System (GIS) data related to land parcels, boundaries, and other spatial information may be accessible through LandOnline.

f. Online Applications:

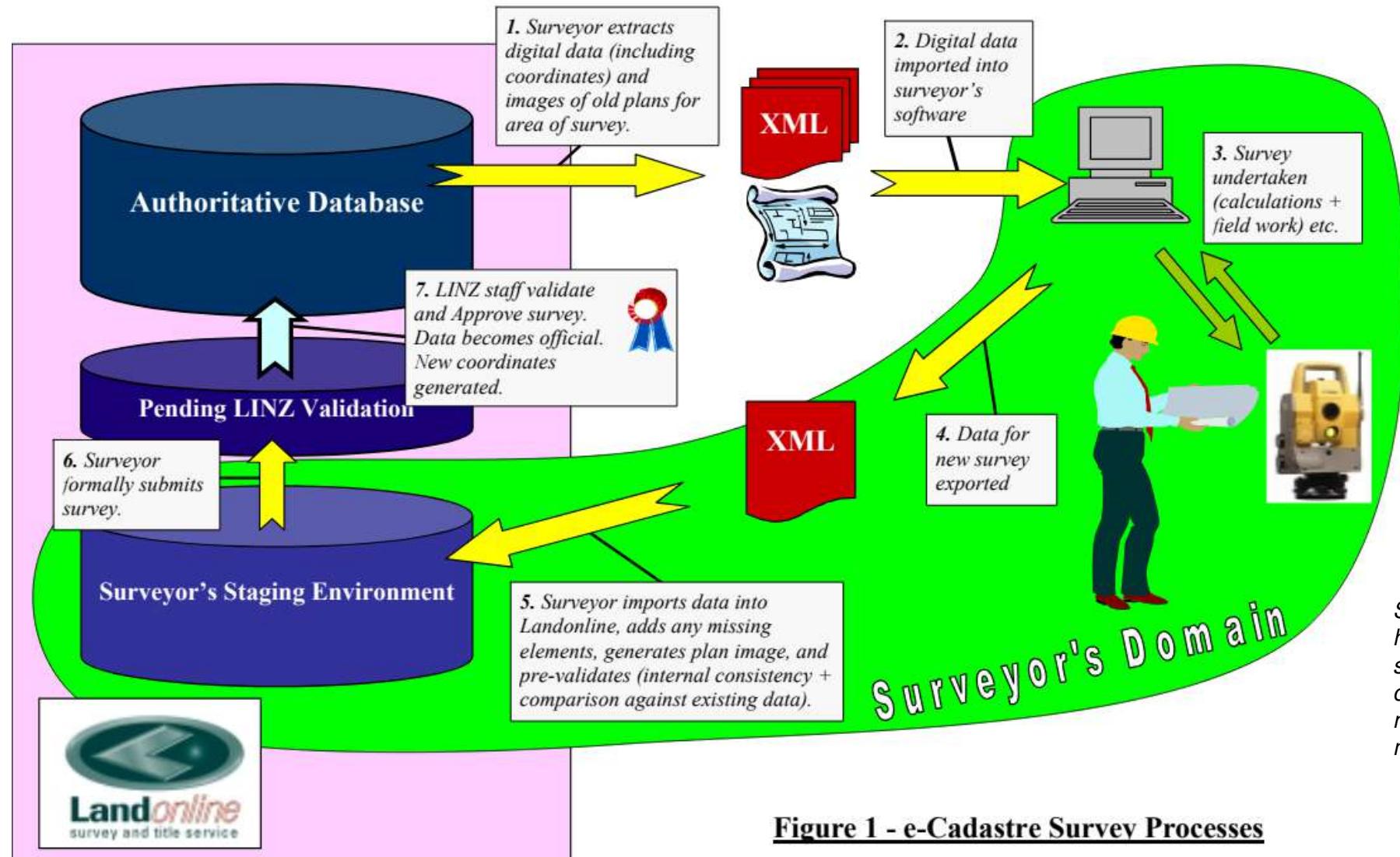
- Some online services and applications related to property transactions and land management might be available through LandOnline.

10.2 Cadastral system around the world



Cadastral system of New Zealand

a. Landonline (Cadastral Information System):



10.2 Cadastral system around the world



Kadaster

- The Netherlands' Cadastre, Land Registry and Mapping Agency – in short Kadaster – collects and registers administrative and spatial data on property and the rights involved.
- Kadaster provides certainty with transparency regarding ownership and the use of property and space.
- It is also responsible for national mapping and maintenance of the national reference coordinate system. Furthermore, it is an advisory body for land-use issues and national spatial data infrastructures.

10.2 Cadastral system around the world



Kadaster

- Kadster key roles and tasks includes:



Source:
<https://unece.org/sites/default/files/2022-04/Kadaster%20Strategy%20-%20WPLA%20webinar%202022-02-03.pdf>

10.2 Cadastral system around the world



Kadaster

The main function of kadaster are as follows:

National facilities

- Besides information from its own registrations, Kadaster also provides information from registrations of other parties.
- For them, Kadaster maintain so-called national facilities, by means of which they provide access to the data. Examples are the facilities for addresses and buildings, cables and pipelines, and energy labels.

Information provision:

- The information products from the registrations and national facilities come in various shapes and forms, such as: data files, formal documents or maps.
- Clients are able to acquire them through personal contact, by phone or through the Internet

10.2 Cadastral system around the world



Kadaster

The main function of kadaster are as follows:

International activities:

- Kadaster also carries out international activities.
- They share their knowledge and skills with their country partners. Kadaster collaborates with international universities and organisations to share knowledge.

Registration:

- It collects and registers administrative and spatial data on property and the rights involved.
- It also includes registration of real estate, topography, ships, aircraft and telecom networks.

Customized work and advice

- It also provide customised work and advice, predominantly to authorities.
- This refers to data selections and aggregations.
- Authorities obtain customised information which helps them develop spatial planning policies.

10.2 Cadastral system around the world



Cadastral system of Netherland

- The cadastral system in Netherland is handled by Kadaster; The Netherlands' Cadastre, Land Registry and Mapping Agency.
- It plays a crucial role in maintaining records related to land ownership, boundaries, and property rights throughout the country.
- The key features of the Dutch cadastral system include:

a. Digital Land Registration:

- The Netherlands has moved towards a fully digital cadastral system, making it easier to manage and access land-related information.
- This digital system includes detailed maps, records of ownership, and information about property boundaries

b. Land Transactions:

- Any changes in property ownership or legal status are recorded in the cadastral system. This includes information about buying, selling, mortgaging, or subdividing land..

10.2 Cadastral system around the world



Cadastral system of Netherland

- The cadastral system in Netherland is handled by Kadaster; The Netherlands' Cadastre, Land Registry and Mapping Agency.
- It plays a crucial role in maintaining records related to land ownership, boundaries, and property rights throughout the country.
- The key features of the Dutch cadastral system include:

c. Public Access:

- The Dutch cadastral system is transparent and accessible to the public. Anyone can access land information, property ownership details, and maps from the Kadaster's database.

d. Spatial Data Infrastructure:

- The Dutch cadastral system is part of the larger spatial data infrastructure of the country, which includes geographic information systems (GIS) and mapping technologies.

10.2 Cadastral system of Singapore



The Singapore Land Authority (SLA)

- The Singapore Land Authority (SLA) is a statutory board under the Ministry of Law which optimises land resources of Singapore for its economic and social development.

Mission

- To ensure effective use of land resources and data for the economic and social development of Singapore by:
 - i. Optimising land and space utilization.
 - ii. Safeguarding property ownership.
 - iii. Promoting the use of land and space data.

Roles

- i. Manager of State land and properties
- ii. Regulator of cadastral survey and land Registration
- iii. Creator and provider of land information

10.2 Cadastral system of Singapore



The Singapore Land Authority (SLA)

- Some of the services provided through SLA includes:

a. *Integrated Land Information Service (ILIS)*

- It is a one-stop online portal which allows users to search and purchase land and property-related information such as property ownership, survey plans and road line plans.

b. *OneMap*

- It is the authoritative national map of Singapore with the most detailed and timely updated information developed by the Singapore Land Authority.
- OneMap can be used to obtain street-level geospatial information, or narrowed to specific query such as land ownership, the nearest schools and demographic data at/around a location

10.2 Cadastral system of Singapore

The Singapore Land Authority (SLA)

- Some of the services provided through SLA includes:

b. OneMap

The screenshot shows the OneMap interface. At the top, there is a header bar with various service icons: LandQuery, SchoolQuery, TrafficQuery, PropertyQuery, PopulationQuery, BizQuery, and a menu icon. Below the header, the main content area is divided into two sections: a sidebar on the left and a map on the right.

Land Info Sidebar:

- A red button labeled "55 NEWTON ROAD REVENUE HOUSE SING..." with an "X" icon.
- A blue header bar with "Land Info" and a three-dot menu icon.
- A "Query" button and a "Tenure (Beta)" link.
- A large orange button labeled "View Land Ownership".
- A white button labeled "View Land Lot".
- A "Land Lot Search" section with input fields for MK (MK), number (26), and lot number (08092), followed by a search button.
- A "Land Ownership" section containing the following text:

Ownership : Statutory Board
Contact : Inland Revenue Authority Of Singapore
Telephone : 6356 8233
Email : iras@iras.gov.sg

Map Area:

- A detailed map of the Novena area in Singapore, showing streets like Newton Rd, Gilstead Rd, Gentle Rd, and Chancery Lane.
- A red highlighted area on the map, with a callout box titled "Ownership : Statutory Board" containing contact information for the Inland Revenue Authority of Singapore.
- A red location pin is placed on the map near the highlighted area.
- Other map features include a scale bar (100 m / 300 ft), a north arrow, and zoom controls (+/-).
- Map credits at the bottom: "OneMap", "Contact Us", "Privacy Statement", "Terms & Conditions", and "Go to Settings to ...".

Source:
<https://www.sla.gov.sg/geospatial-development-and-services/onemap>

Find land ownership and land lot number with LandQuery

10.2 Cadastral system of Singapore



The Singapore Land Authority (SLA)

- Some of the services provided through SLA includes:

c. *View my property information:*

- It is a service provided by SLA for property owners to view the titles information ("Land Titles") and certified plans ("Plans") of their property free of charge.
- It also allows property owners to submit electronically, requests to update the correspondence address for their property.
- It provides information on the property such as tenure, area, property address, ownership, encumbrances such as caveats and mortgages.

10.2 Cadastral system of Singapore



The Singapore Land Authority (SLA)

- Some of the services provided through SLA includes:

d. Digitised Land Information

- It is a service provided by SLA where businesses can apply for a licence to use the digitised land information to meet their business needs or to create products and services e.g. GIS enterprise solutions, location-based services, navigation products, mapping applications, spatial analysis etc.
- The geo-data/ database/ dataset/ information available are: street directory, address point, digitised cadastral, road network, building outline etc. They are available in various formats like .shp, .dxf etc.

10.2 Cadastral system of Singapore

The Singapore Land Authority (SLA)

d. Digitised Land Information

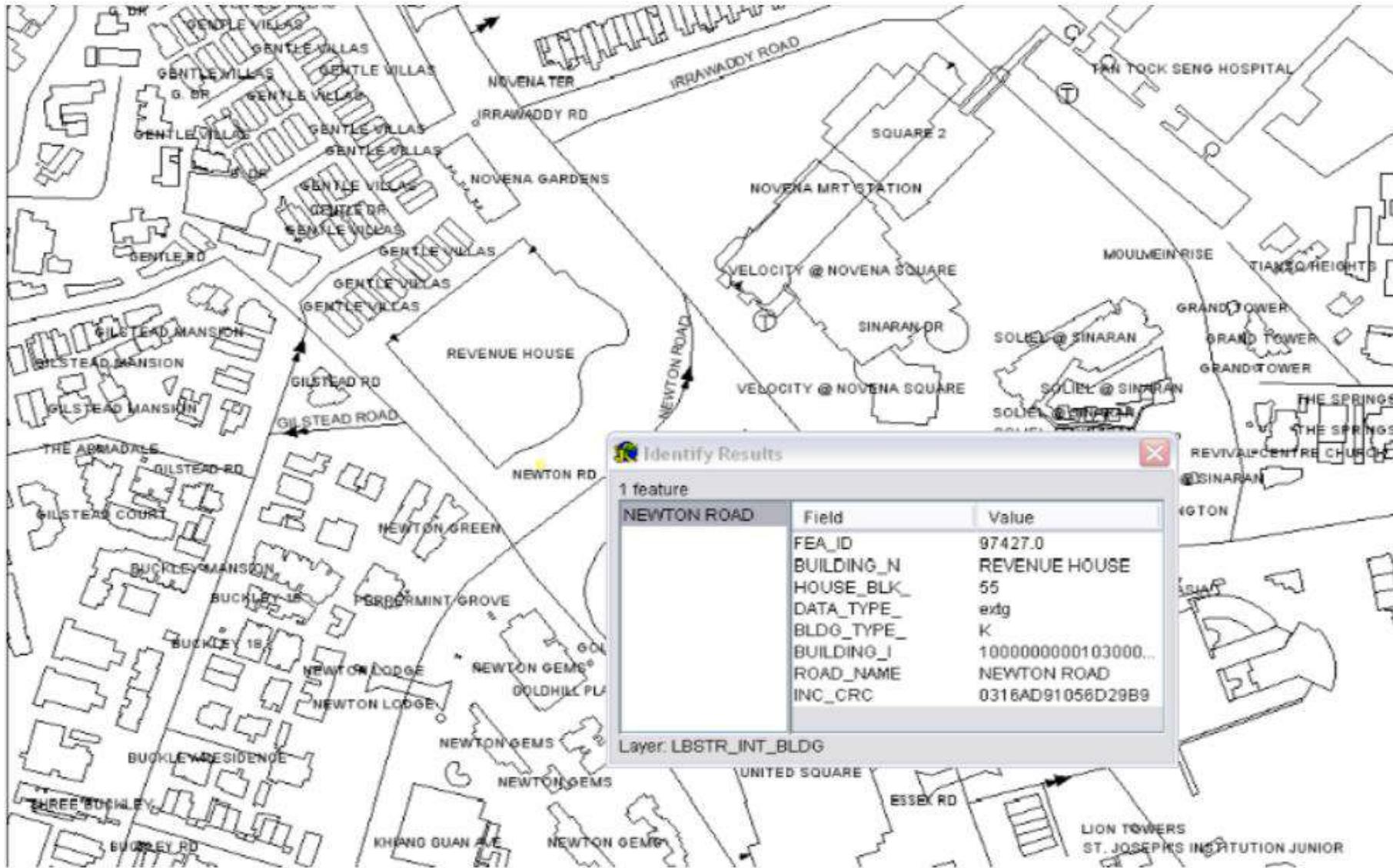


Fig: showing street level data service provided through SLA.

Source:
<https://www.sla.gov.sg/geospatial-development-and-services/digitised-land-information>

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