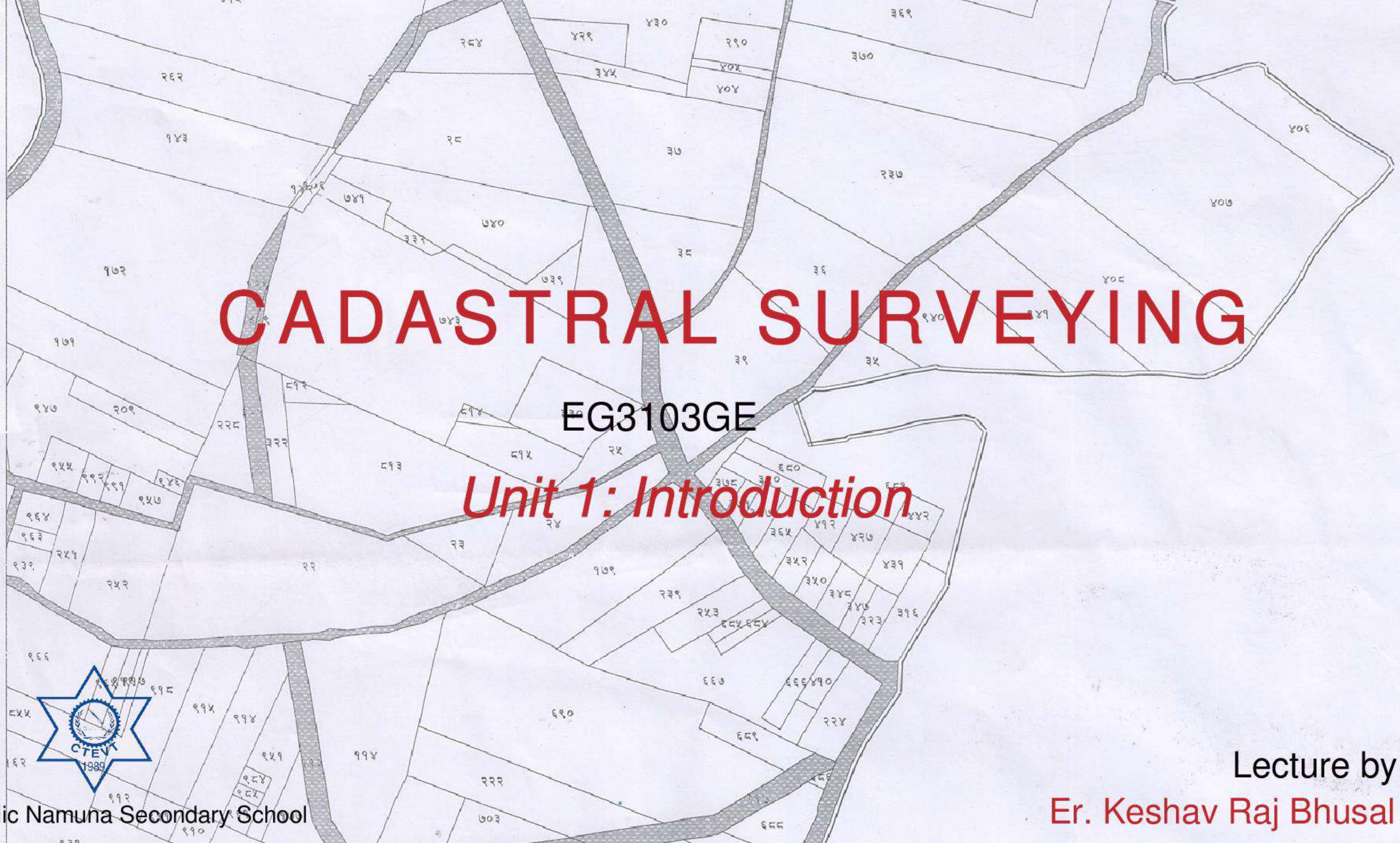

CADASTRAL SURVEYING

EG3103GE

Unit 1: Introduction

Public Namuna Secondary School

Lecture by
Er. Keshav Raj Bhusal

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1. 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 (14^{th} – 18^{th} 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 cadastal 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 cadastal 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

Introduction

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.

Introduction

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

Introduction: Cadastral Components

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

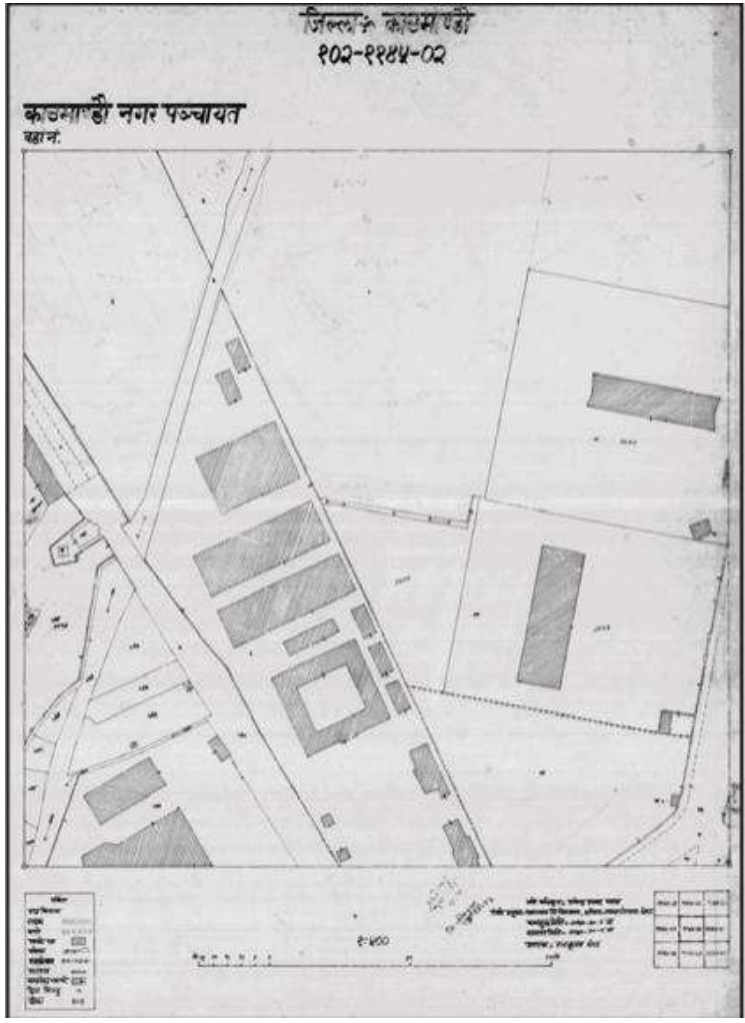


Fig: Cadastral map in controlled sheet
Source: Department of Land Information and Archives

Introduction: Cadastral Components

Types of cadastral map

On basis of control points

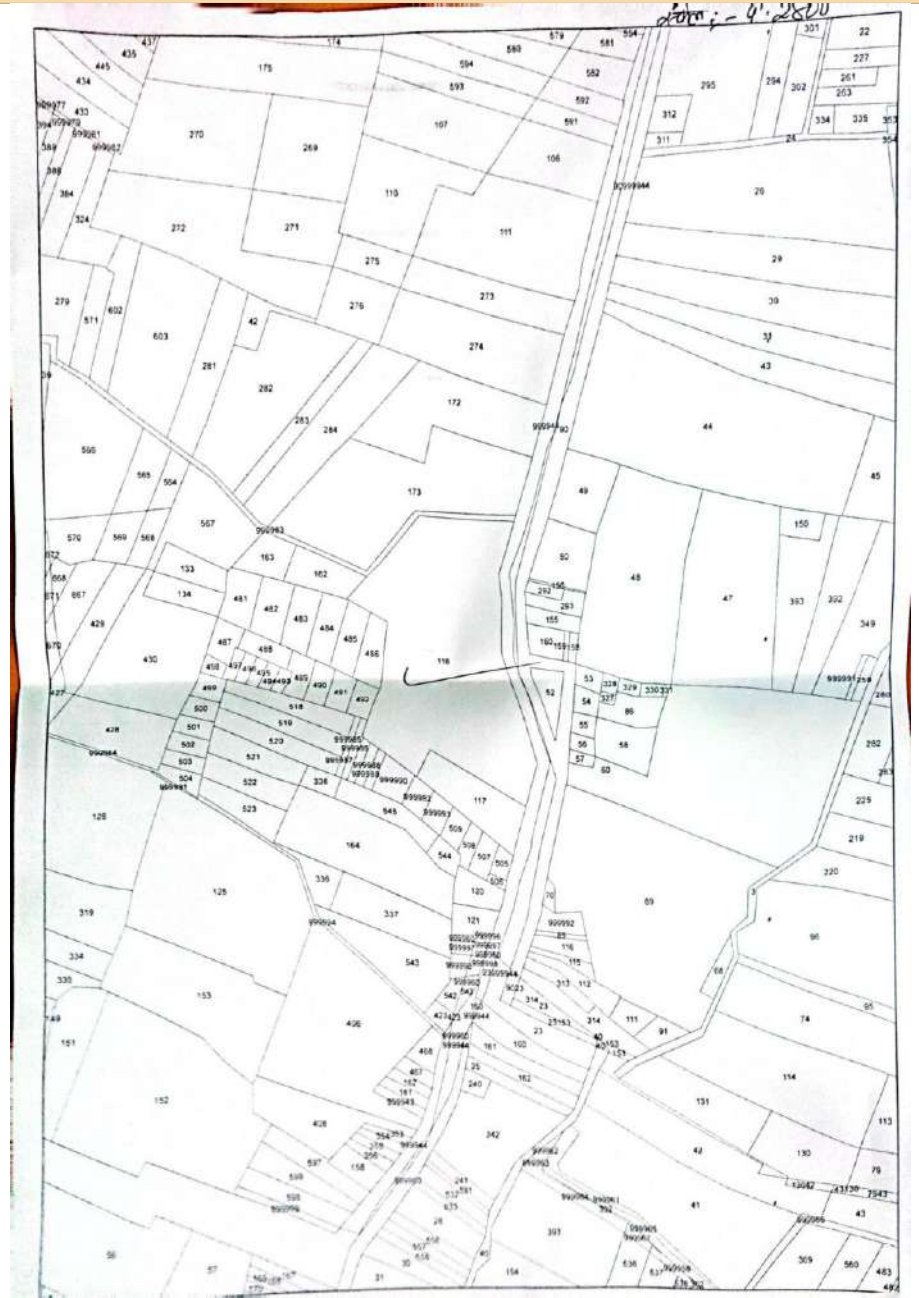


Fig: Map in trig sheet; Source: mapadda.com

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.

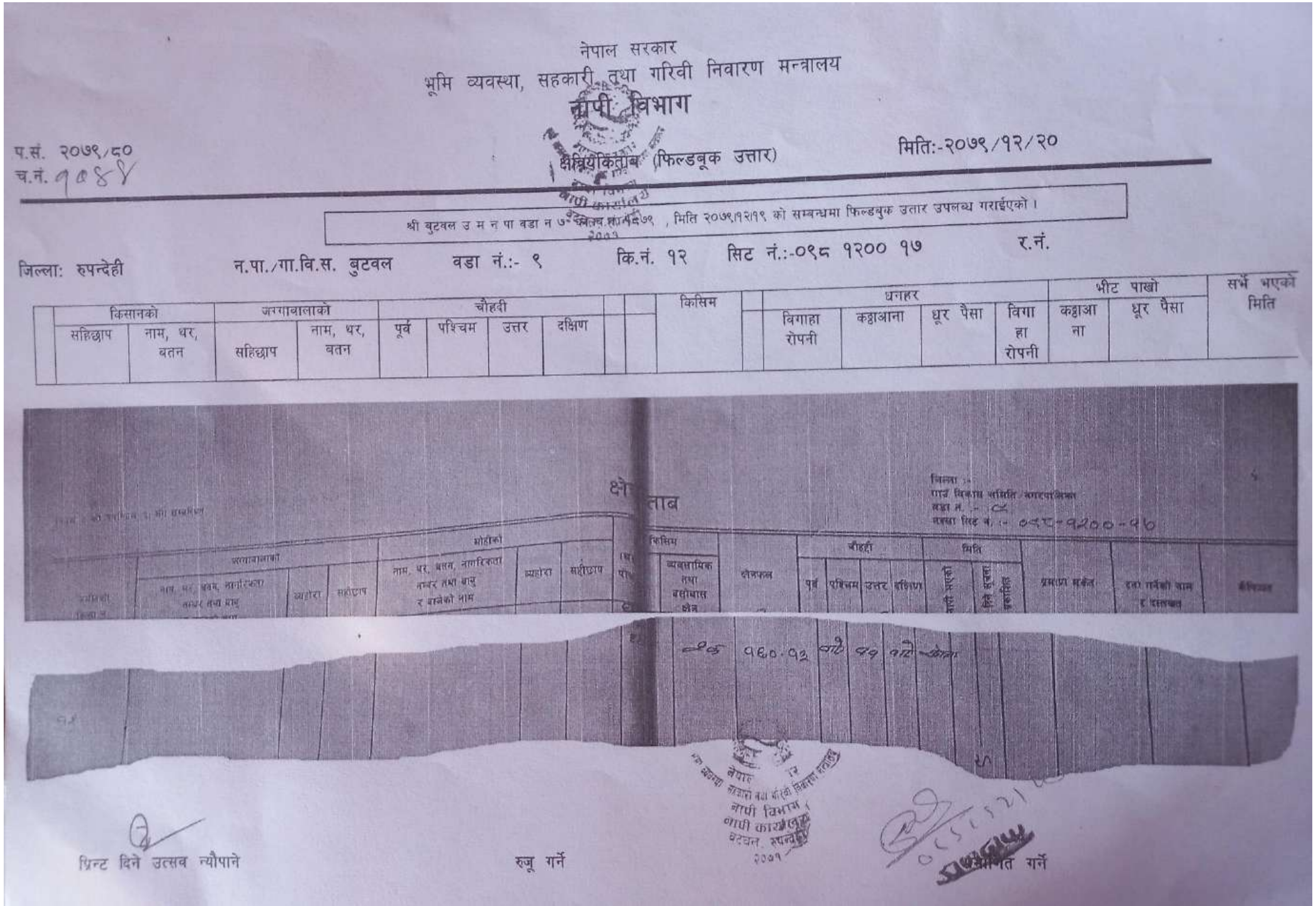
✓ Father's / or husband's name & address.

✓ Description of legal document of land registration.

✓ Land classification, land type, crops, irrigated or non irrigated land, area of the land parcel etc.

Cadastral Components

2. Field book



नेपाल सरकार
भूमि व्यवस्था, सहकारी तथा गरिबी निवारण मन्त्रालय
नापी विभाग

प.सं. २०७९/८०
च.नं. १०८४

क्षेत्रकिताब (फिल्डबुक उतार)

मिति:-२०७९/१२/२०

श्री बुटवल उ म न पा वडा न ७ ... , मिति २०७९।१२।१९ को सम्बन्धमा फिल्डबुक उतार उपलब्ध गराईएको।

जिल्ला: रुपन्देही   न.पा./गा.वि.स. बुटवल   वडा नं.:- ९   कि.नं. १२   सिट नं.:-०९८ १२०० १७   र.नं.

किसानको		जग्गावालाको		चौहद्दी				किसिम	धनहर				भीट पाखो		सर्भे भएको मिति
सहिछाप	नाम, थर, वतन	सहिछाप	नाम, थर, वतन	पूर्व	पश्चिम	उत्तर	दक्षिण		बिगाहा रोपनी	कट्ठाआना	धुर पैसा	बिगाहा रोपनी	कट्ठाआना	धुर पैसा	

प्रिन्ट दिने उत्सव न्यौपाने   रुजु गर्ने   प्रमाणित गर्ने

Source:mapadda.com

Cadastral Components

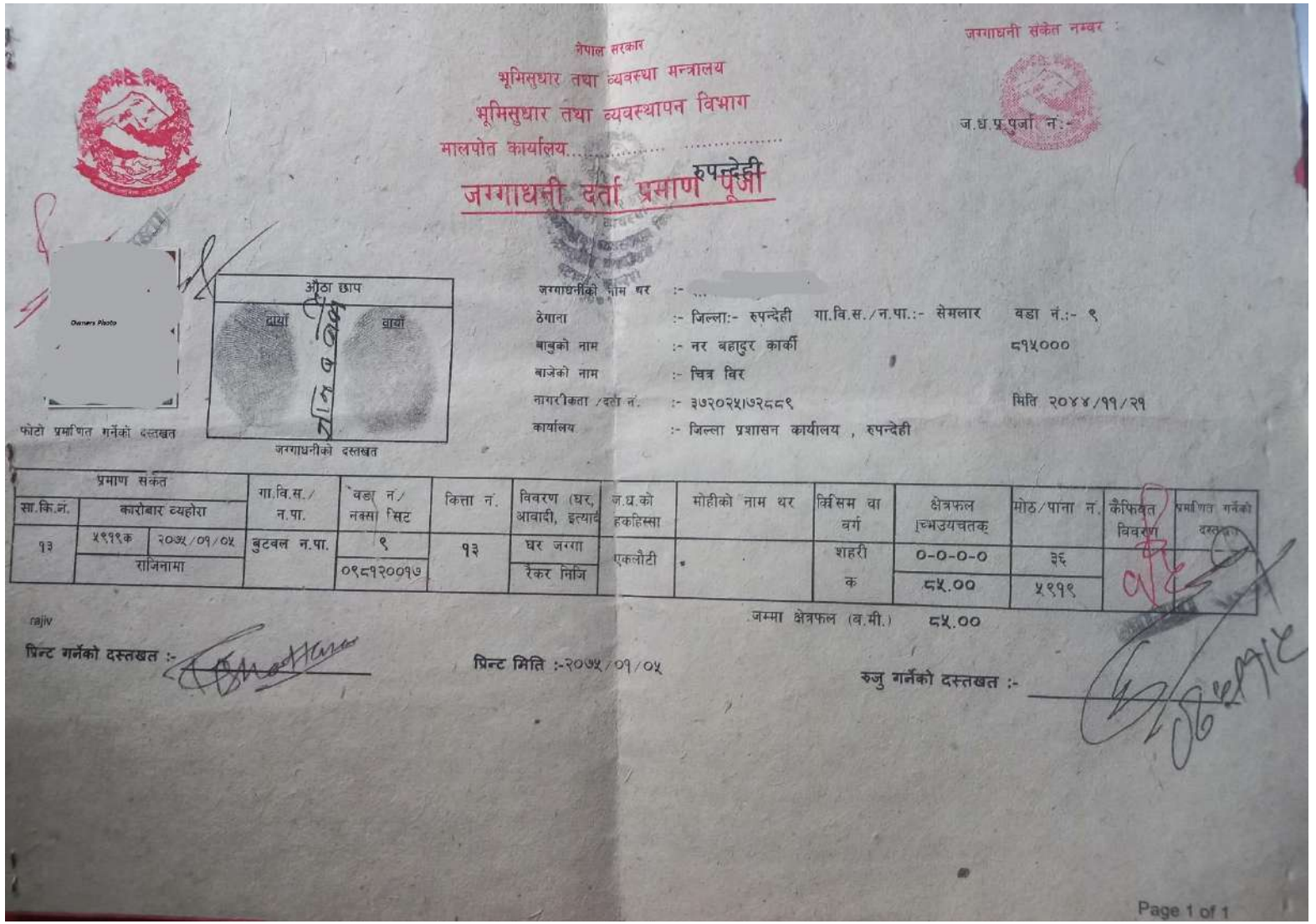
3. Land Ownership Certificate (Title document)

- Two copies of land ownership certifi cate 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)



नेपाल सरकार
भूमिसुधार तथा व्यवस्था मन्त्रालय
भूमिसुधार तथा व्यवस्थापन विभाग
मालपोत कार्यालय.....

जग्गाधनी दर्ता प्रमाण पूर्जा

जग्गाधनी संकेत नम्बर :

ज.ध.प्र.पूर्जा नं.:-

रुपन्देही

Owners Photo

फोटो प्रमाणित गर्नेको दस्तखत

औंठा छाप

बायाँ | दायाँ

जग्गाधनीको दस्तखत

जग्गाधनीको नाम थर :- ...
ठेगाना :- जिल्ला:- रुपन्देही गा.वि.स./न.पा.:- सेमलार वडा नं.:- ९
बाबुको नाम :- नर बहादुर कार्की ८१५०००
बाजेको नाम :- चित्र बिर
नागरीकता /दर्ता नं. :- ३७२०२५।७२८८९ मिति २०४४/११/२९
कार्यालय :- जिल्ला प्रशासन कार्यालय , रुपन्देही

प्रमाण संकेत		गा.वि.स./ न.पा.	वडा नं/ नक्सा सिट	कित्ता नं.	विवरण (घर, आवादी, इत्यादि	ज.ध.को हकहिस्सा	मोहीको नाम थर	किसिम वा वर्ग	क्षेत्रफल (भुउयचतक	मोठ/पाना नं.	कैफियत विवरण	प्रमाणित गर्नेको दस्तखत
सा.कि.नं.	कारोबार व्यहोरा											
१३	५९१९क २०७५/०१/०५ राजिनामा	बुटवल न.पा.	९ ०९८१२००१७	१३	घर जग्गा रेकर निजि	एकलौटी		शहरी क	०-०-०-० ८५.००	३६ ५९१९		

जम्मा क्षेत्रफल (व.मी.) ८५.००

rajiv

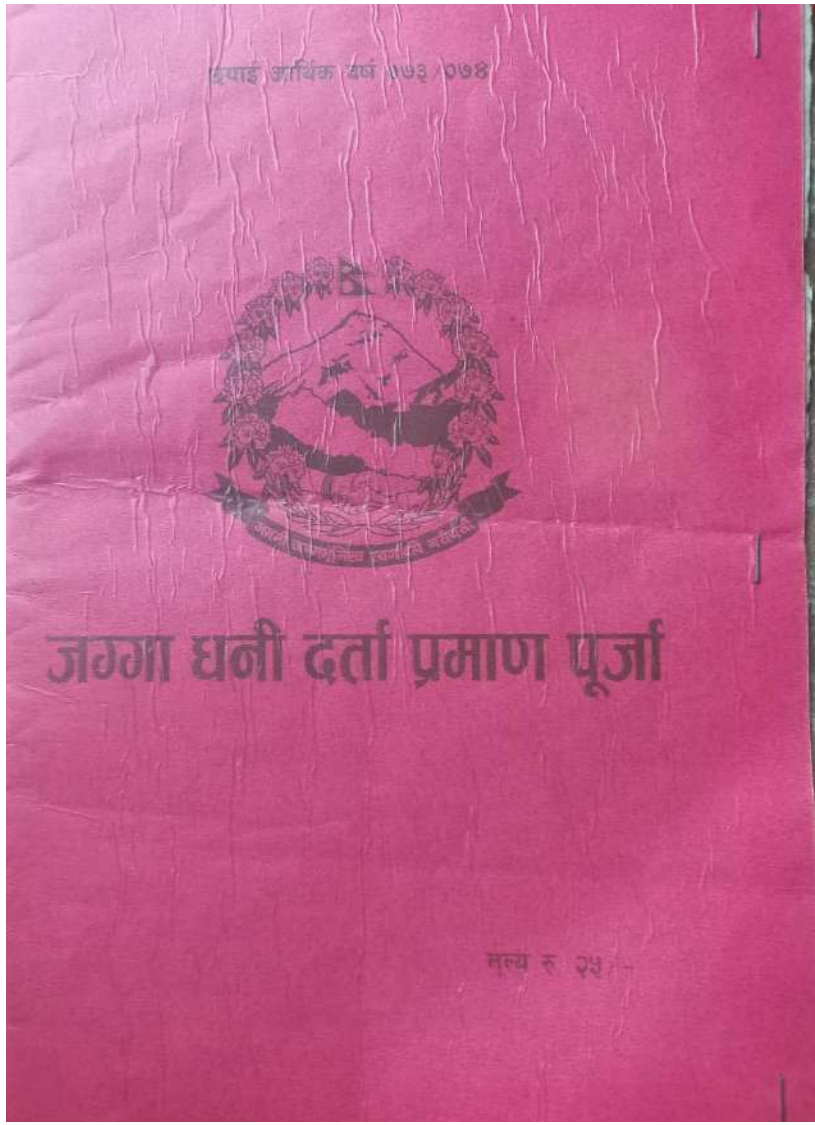
प्रिन्ट गर्नेको दस्तखत :-

प्रिन्ट मिति :-२०७५/०१/०५

रुजु गर्नेको दस्तखत :-

Page 1 of 1

Source :mapadda.com



इयाद आर्थिक वर्ष ०७३/०७४

जग्गा धनी दर्ता प्रमाण पूर्जा

मूल्य रु २५/-

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.

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 after fragmentation of the parcel.

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

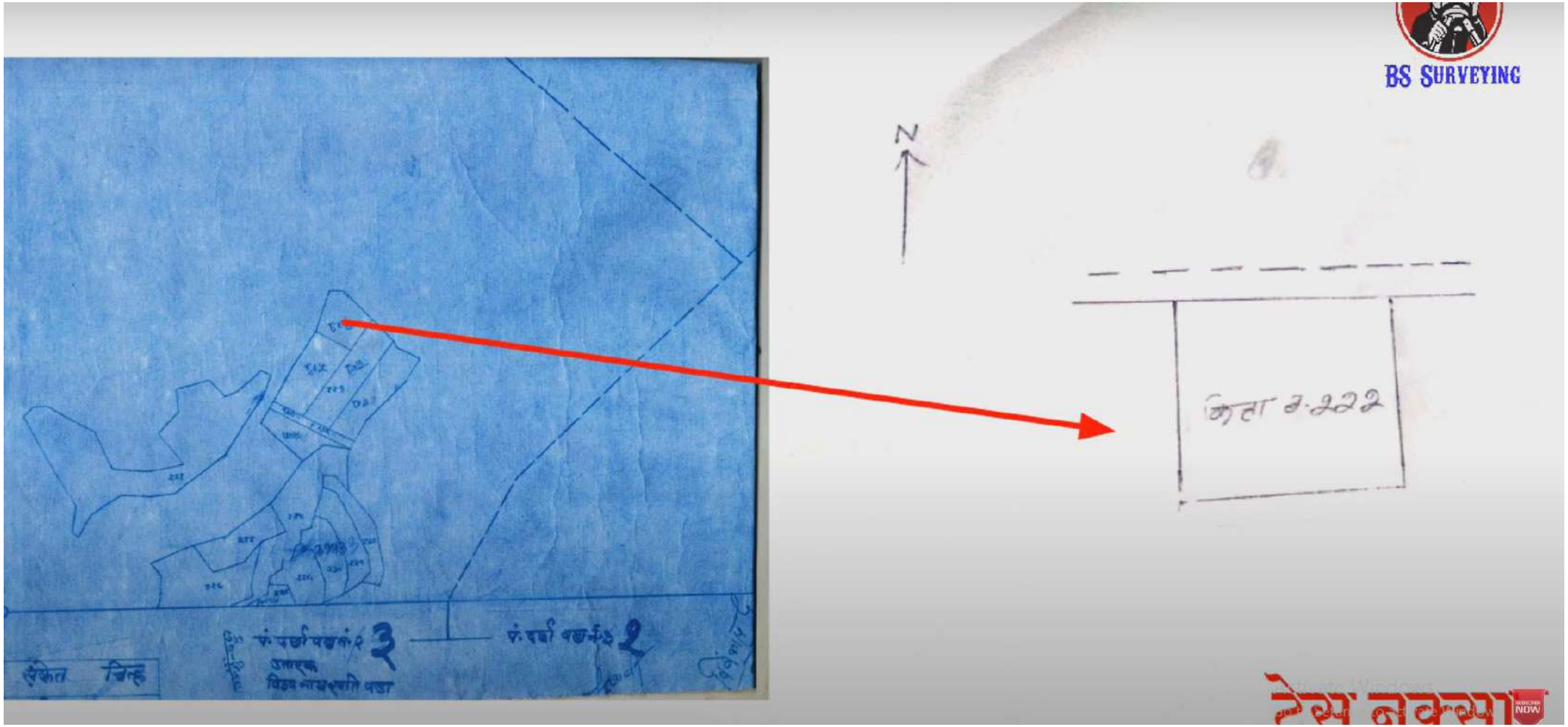
- Terij is the preliminary form containing the information about the parcel containing the information especially about total mapped parcels and total remaining parcels to be mapped.
- It is prepared with the help of preliminary sketches (map).

Introduction

Cadastral Components

Trace map

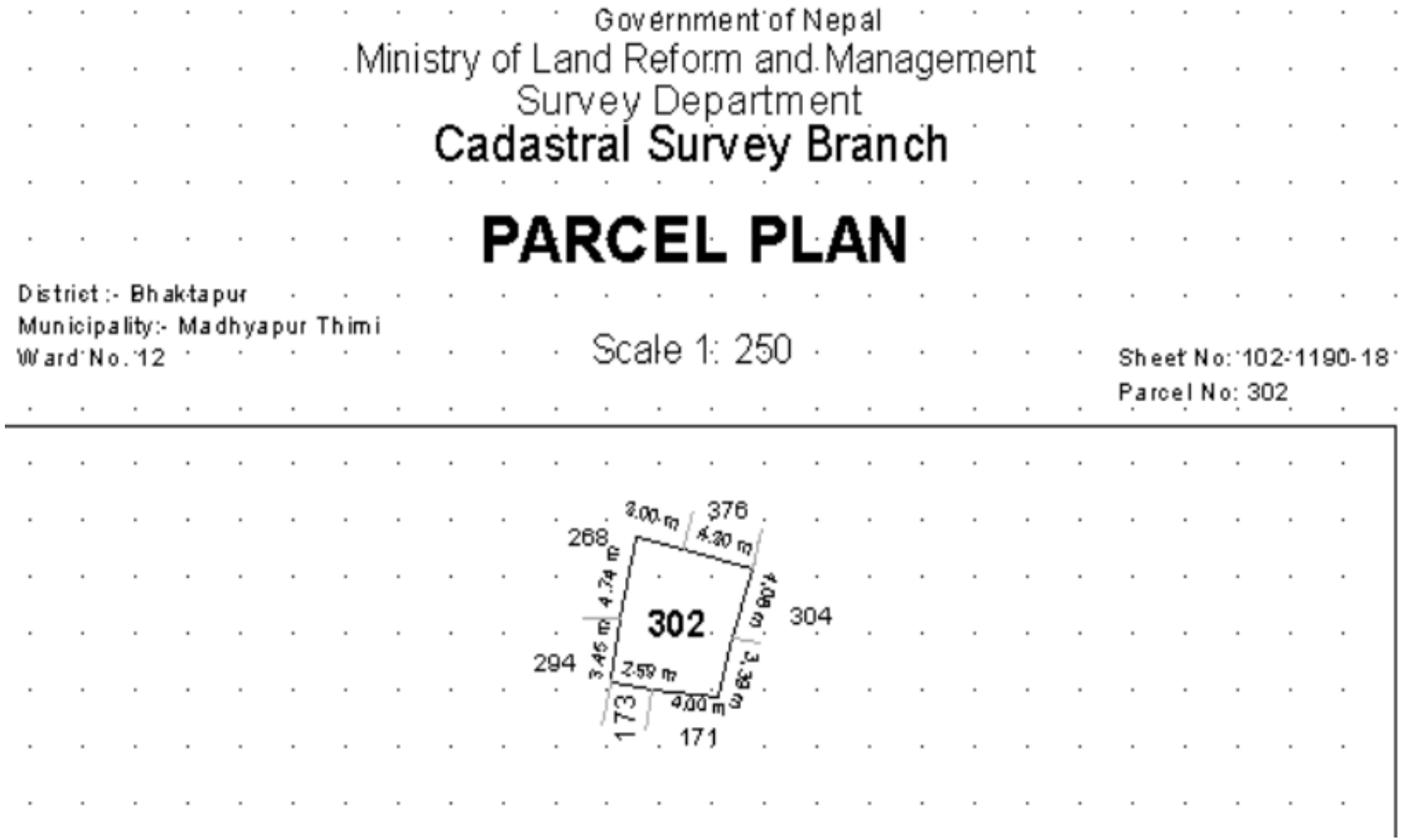
- It is the map which is focused only to a particular parcel.



Introduction

Cadastral Components

Parcel map



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 सवै 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 alloted 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 14/1and 14/2 for a parcel with parcel number 15.

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 सम्झनु 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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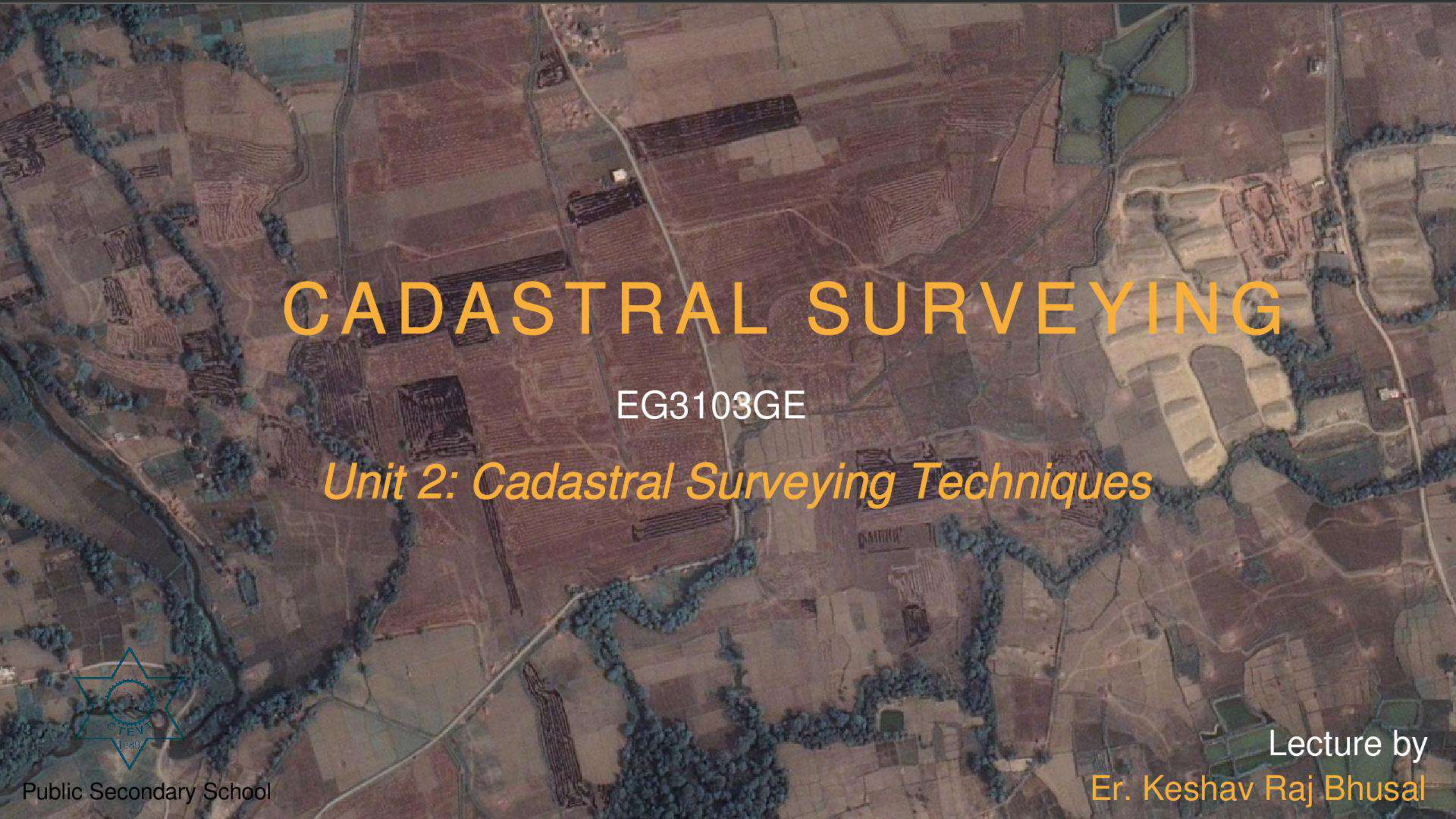

CADASTRAL SURVEYING

EG3103GE

Unit 2: Cadastral Surveying Techniques

Public Secondary School

Lecture by
Er. Keshav Raj Bhusal

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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 ued 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:

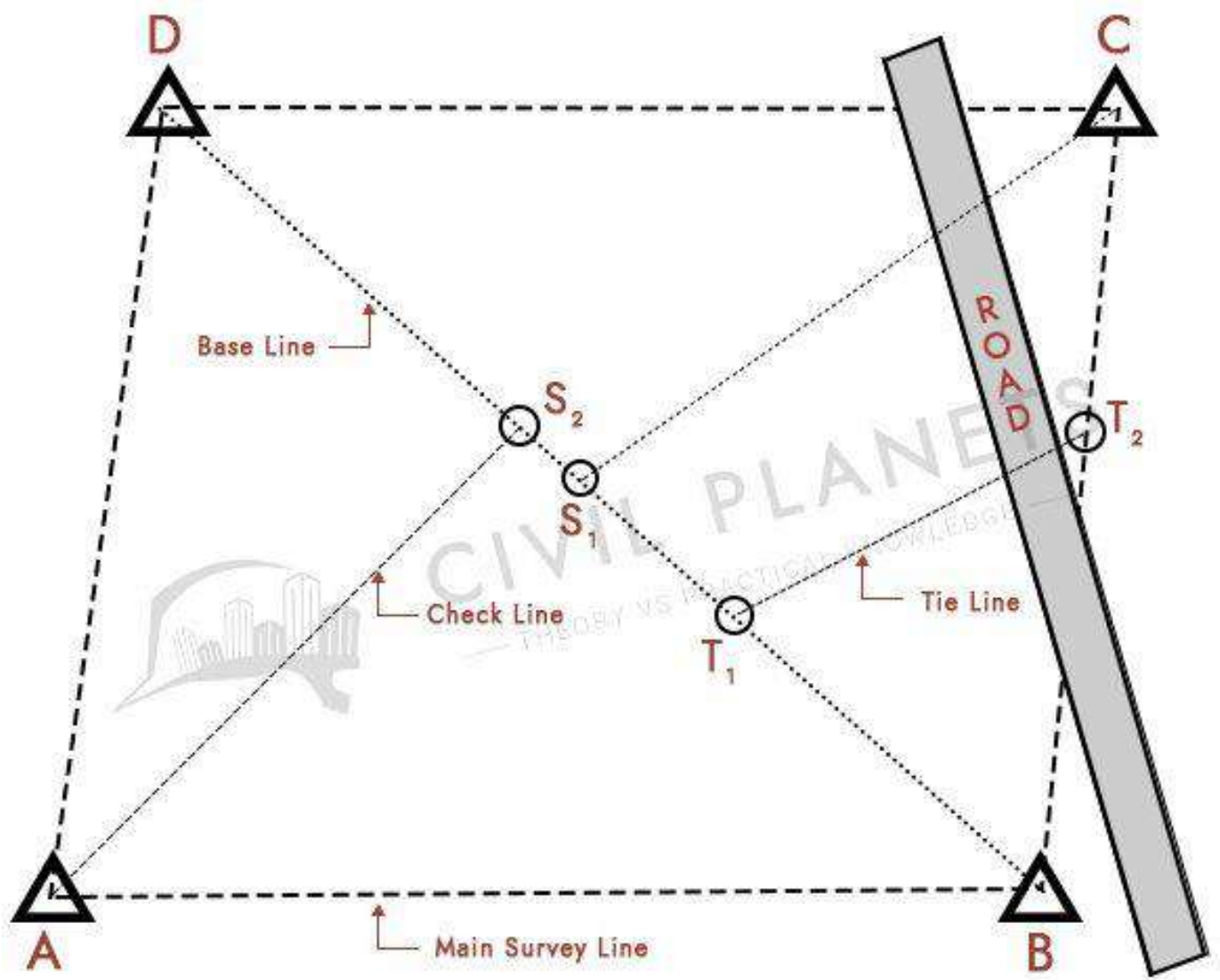
- Station marks, where possible should be tied into a permanent objects so that they may be easily replaced if moved or easily found during the survey.
- In soft ground wooden pegs may be used.

4. Witnessing:

- This consists of making a sketch of the immediate area around the station showing existing permanent features, the position ofthe 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.

Cadastral surveying by using chain/tape

General procedure for chain surveying are:



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.

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.

Cadastral surveying by using Total station

Fig: showing cadastral surveyu using total station.

Source: mapadda.com

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.

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.

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.

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

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.

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.

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.

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.

Cadastral surveying by using Satellite imagery/ Remote Sensing

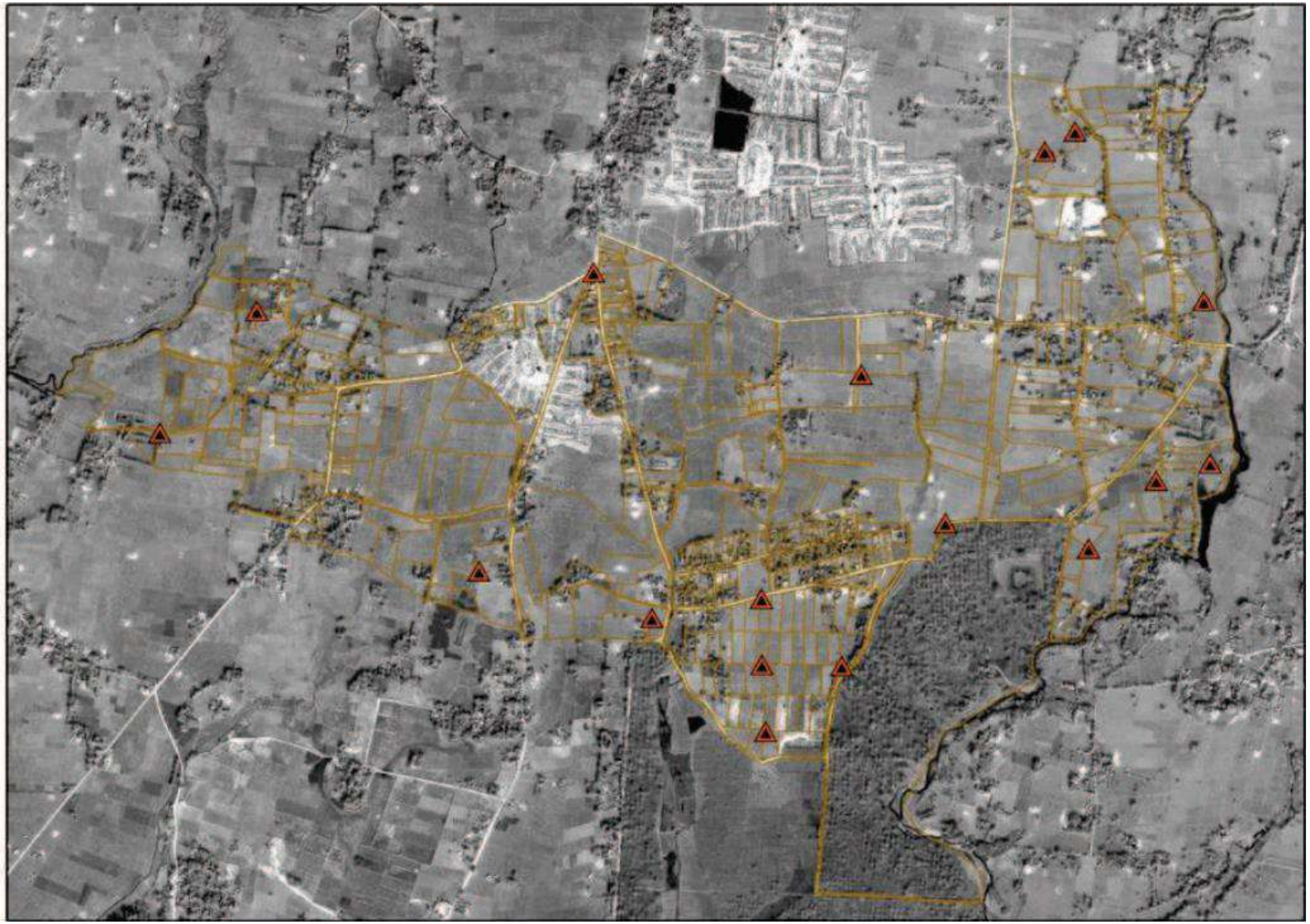


Fig: showing digitalized parcels along with control points.

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

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.

Cadastral surveying by using Satellite imagery/ Remote Sensing

General procedure:

4. Feature Extraction and Digitization:

- It includes dentifying 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.

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

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.

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.

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.
- Ground control stations can be provided even for isolated areas.
- 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.
- Realistic accuracy (with position accuracy of ±1 cm and area accuracy of ± 2 cm 2).
- Simple field operation and appropriate.
- Economically viable.
- Being fast it is time saving.

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.

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.

Comparison of different methods

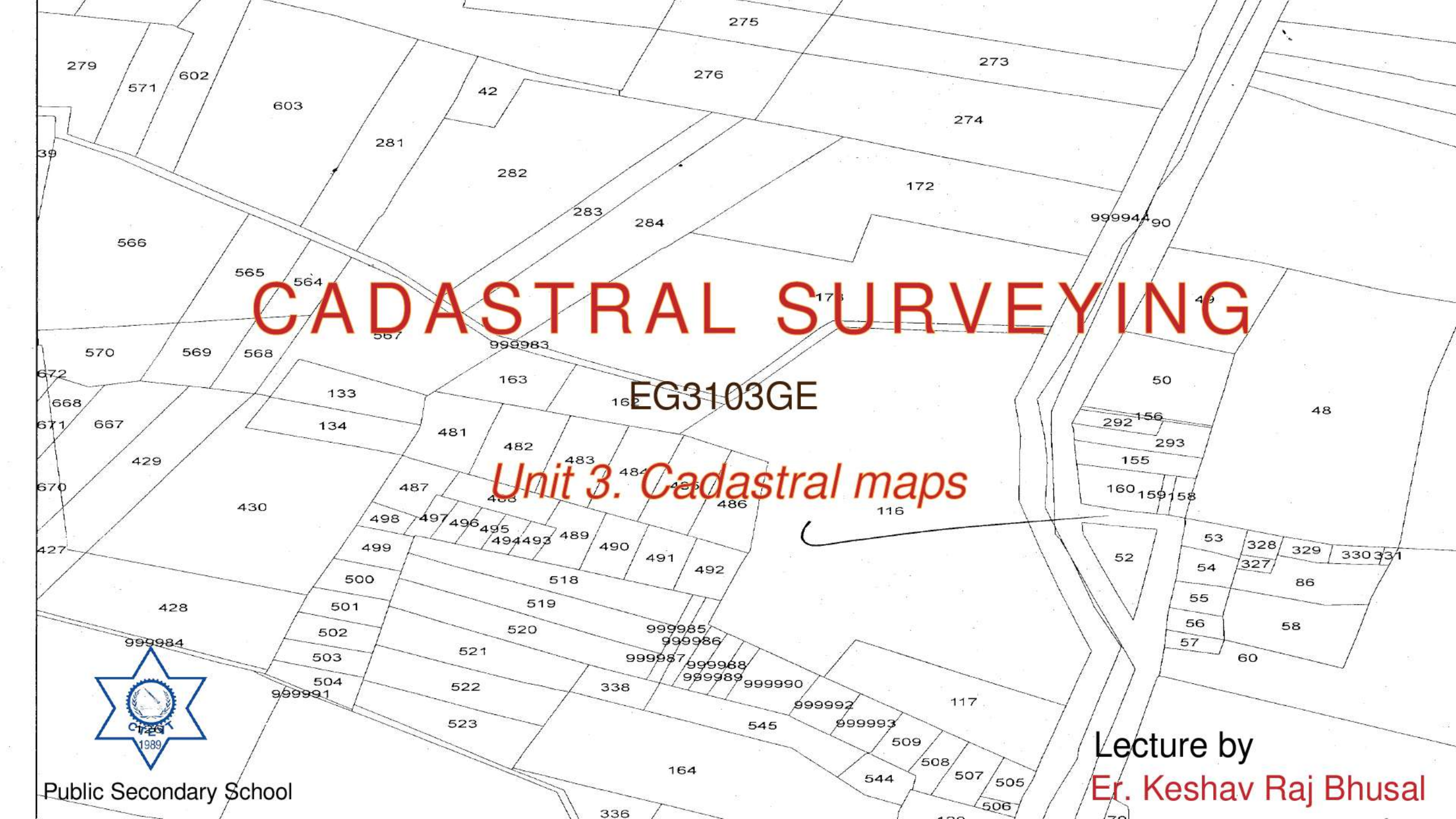
Digital system (Total Station, UAV, Remote sensing, GPS)

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

References

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

Public Secondary School

Lecture by

Er. Keshav Raj Bhusal

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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^{o} longitude.

Map Projection for cadastral maps

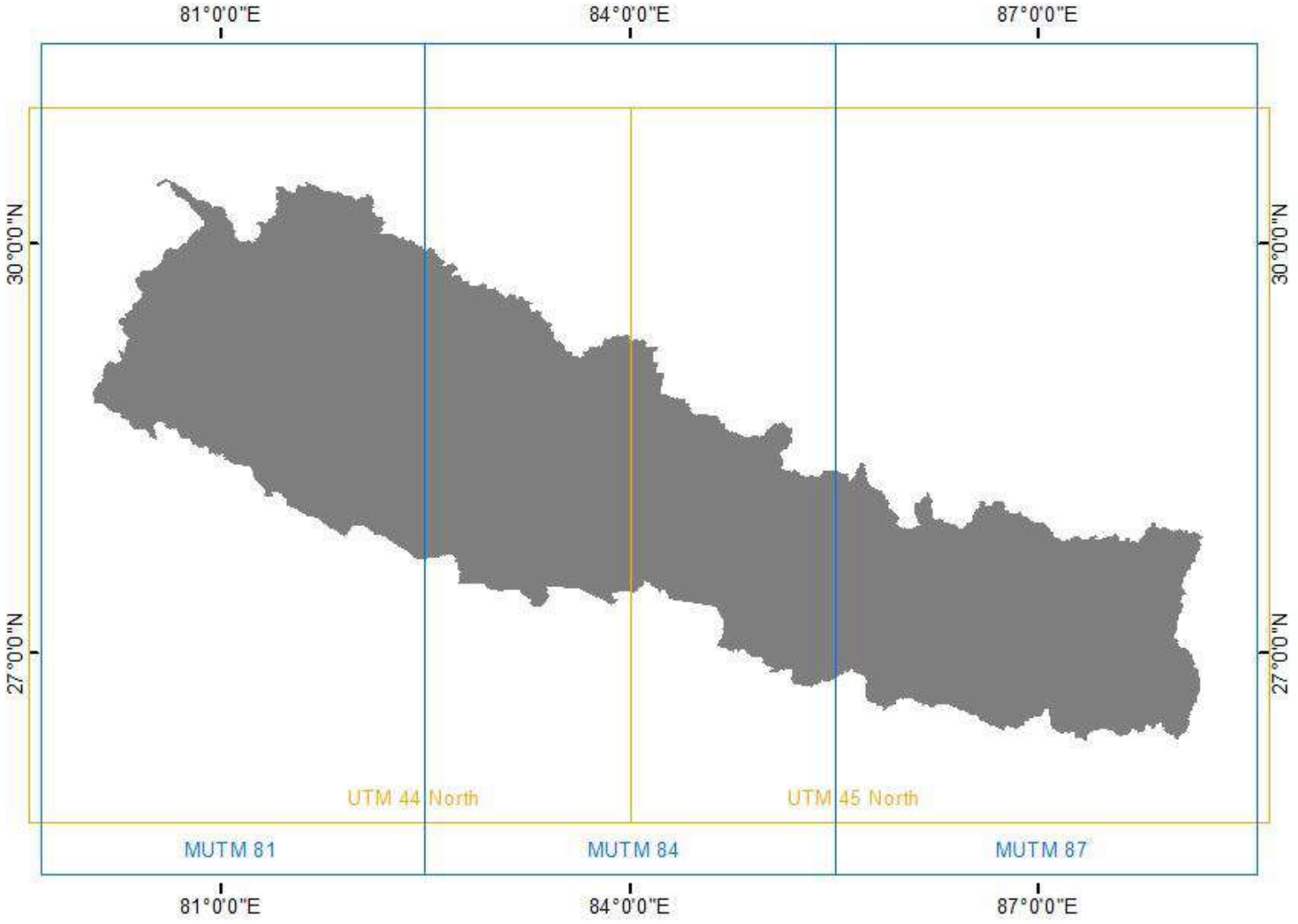


Fig: showing MUTM zones along with 44N zone

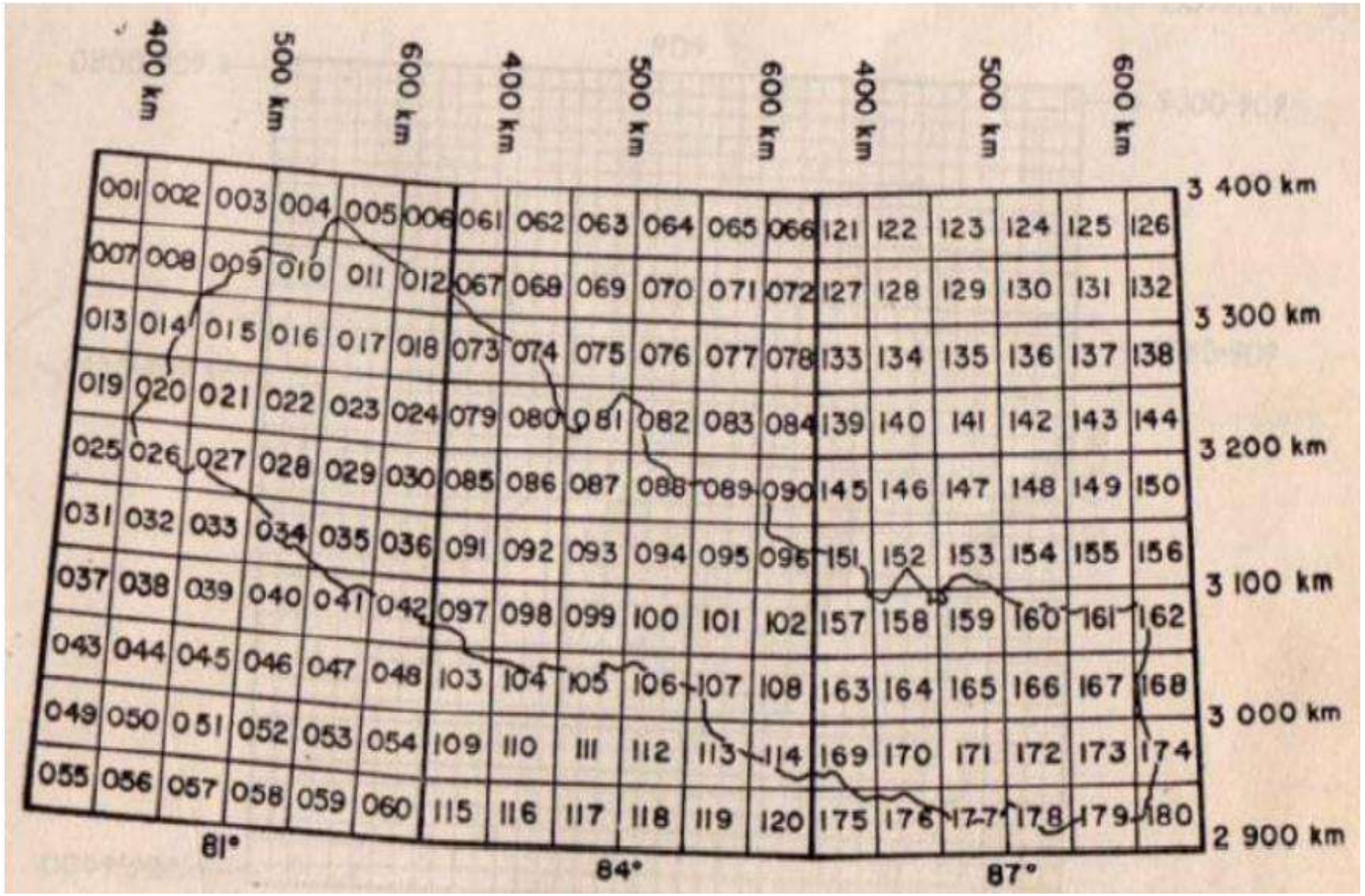
Source: https://spaceappnet.wordpress.com/2020/06/24/coordinate-systems-used-in-nepal/

Map Sheet Numbering System

- The area of 3º longitudes (1º 30'east and 1º 30' west of central meridian) and 5º latitudes (26º to 31º) is taken as 1 Zone. By this way, Nepal is divided into three zones.
- Area of each zone is 300 Km*500 Km.
- Each three zones is divided into grid square 50 Km* 50 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

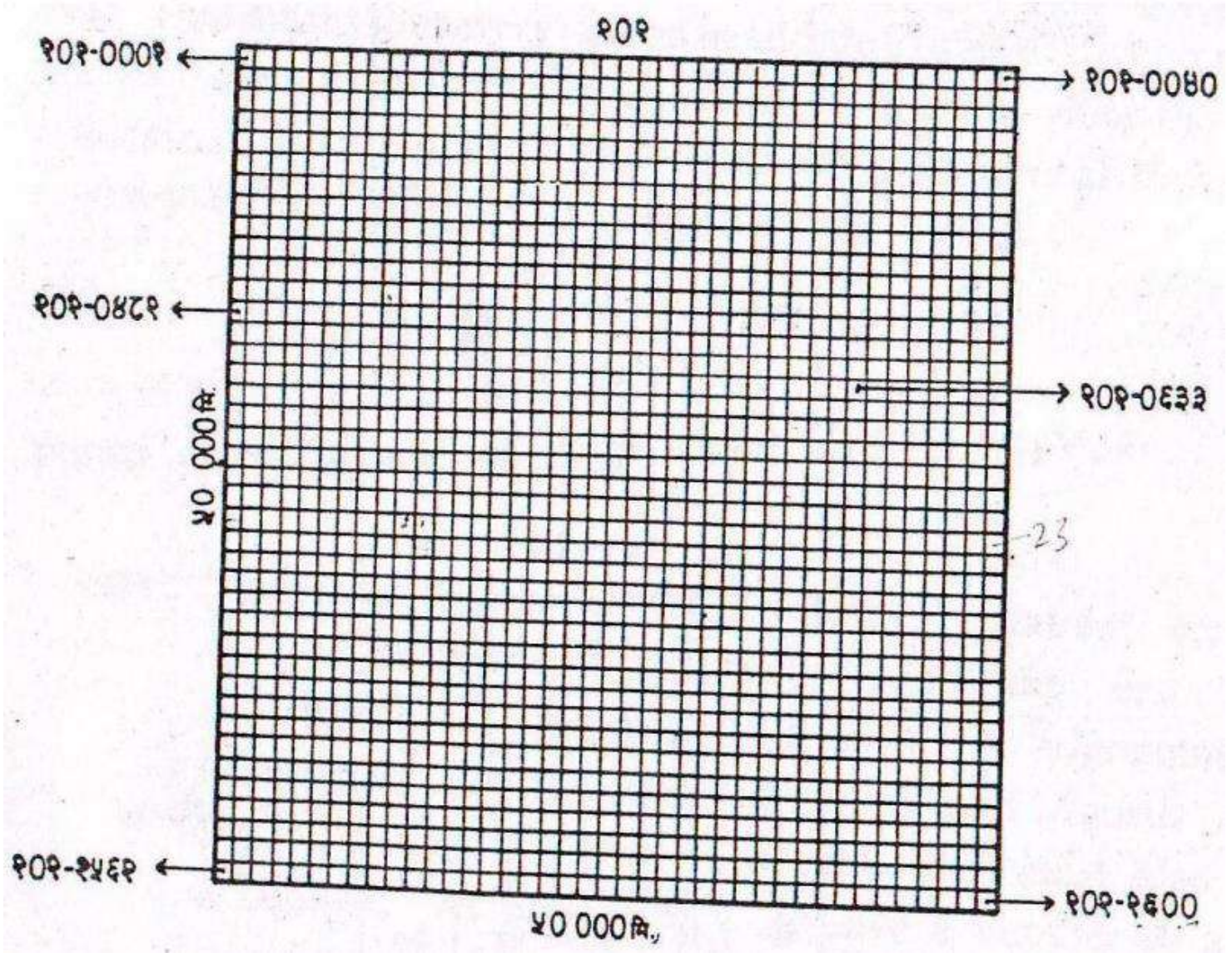
Map Sheet Numbering System

- *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

Map Sheet Numbering System

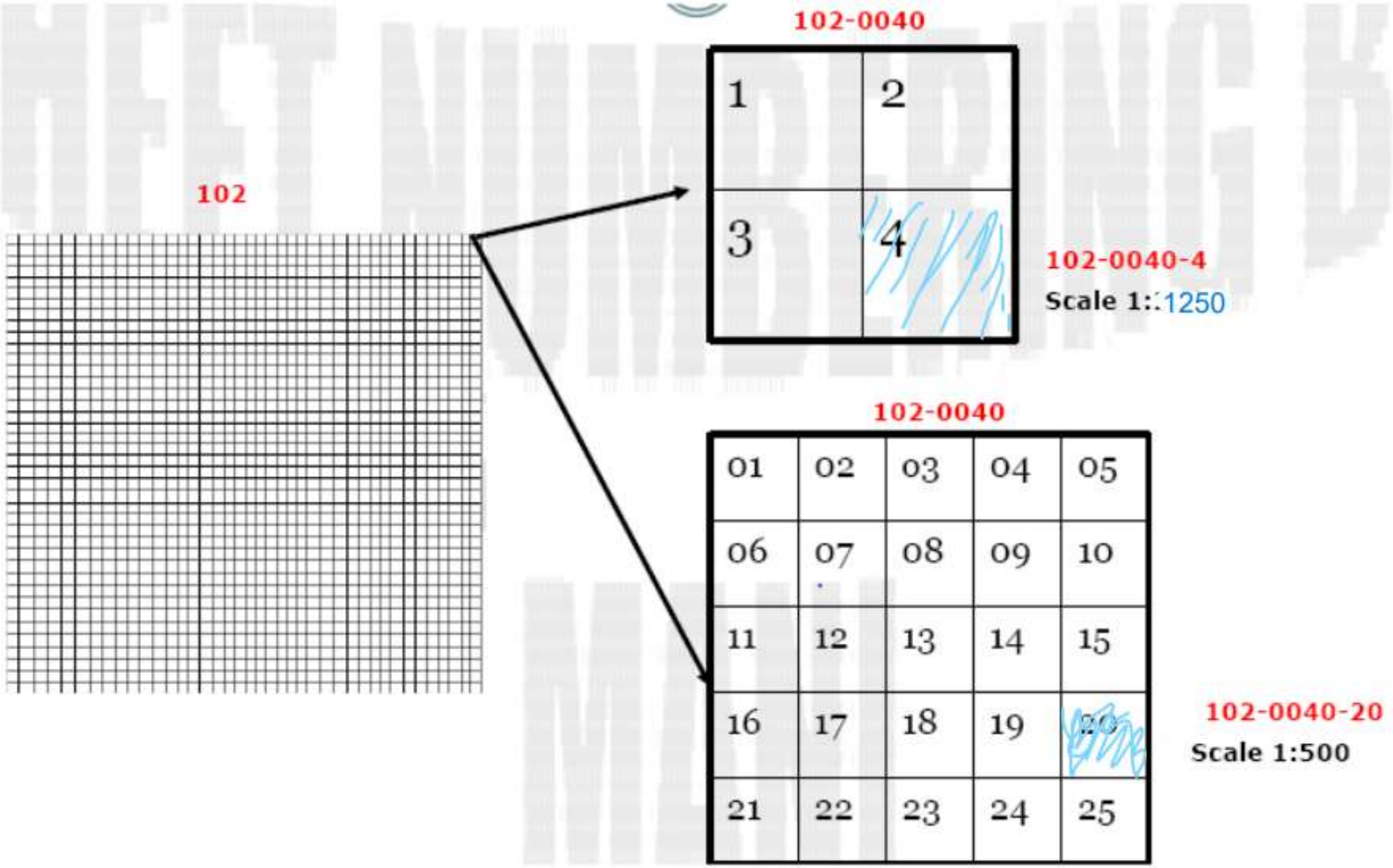
- *For map having scale of 1: 2500*



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*



Geodetic control points for cadastral surveying and mapping

- Fourth order control points are used for the cadastral survey in Nepal,
- DOS has established 4^{th} order control point from 3^{rd} 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.

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 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 consist of a single parcel with boundary dimensions and other information.

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.

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*.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.

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*.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.

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: ¼ 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.

References

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

Table of contents

4.1 Plane Table and Accessories

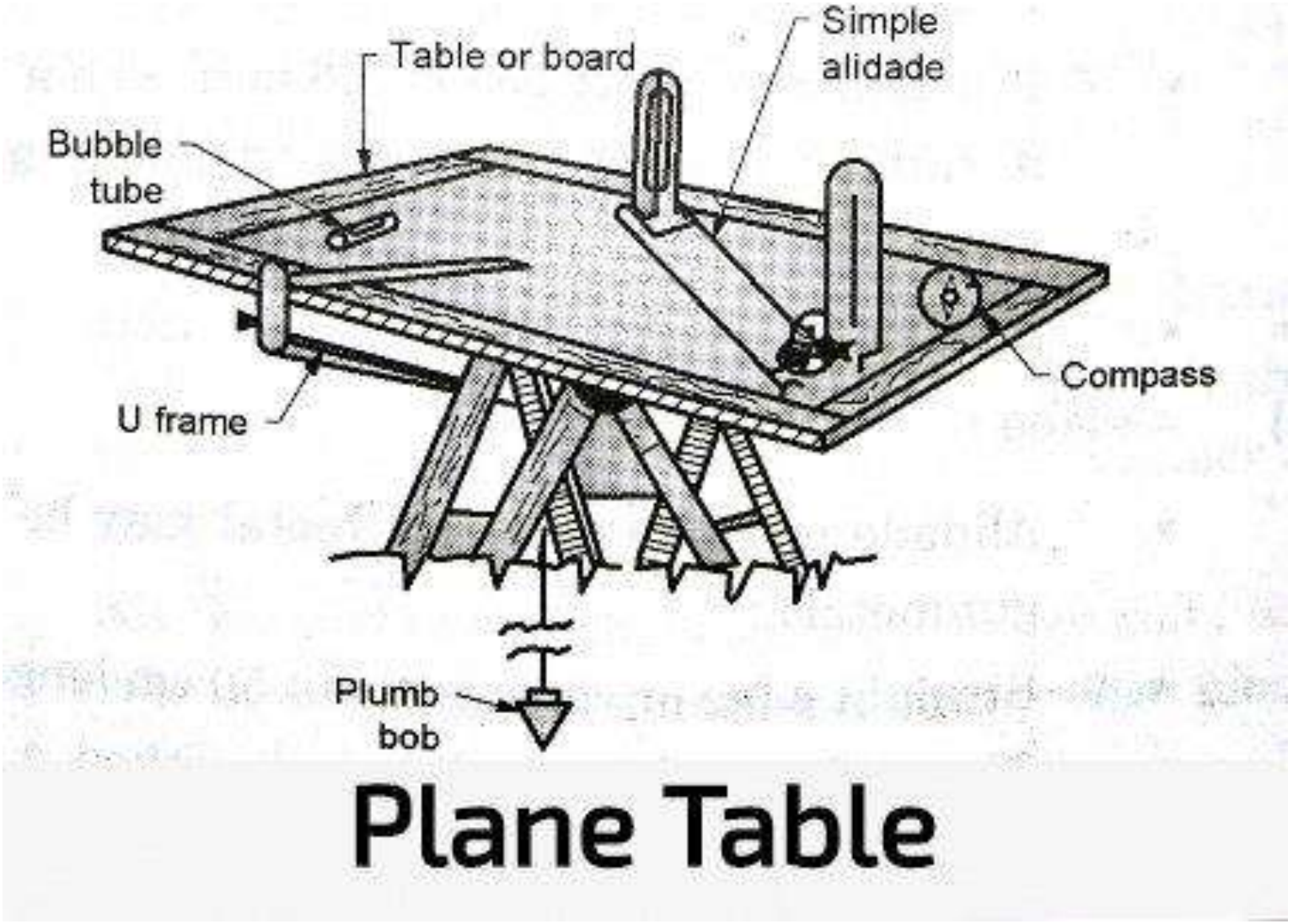
Plane table survey

- 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



Source: https://civilengineeringnotes.com/plane-table-surveying/

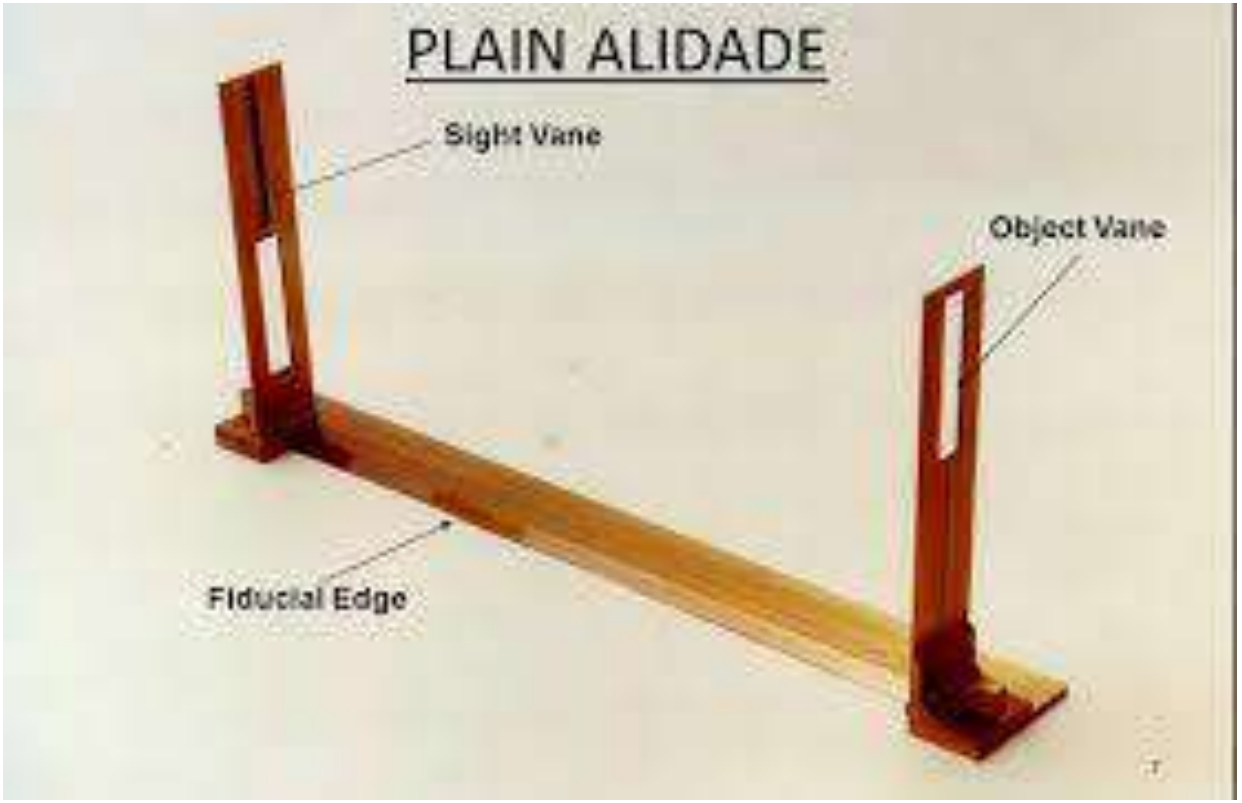
4.1 Plane Table and Accessories

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



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

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 th 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:*

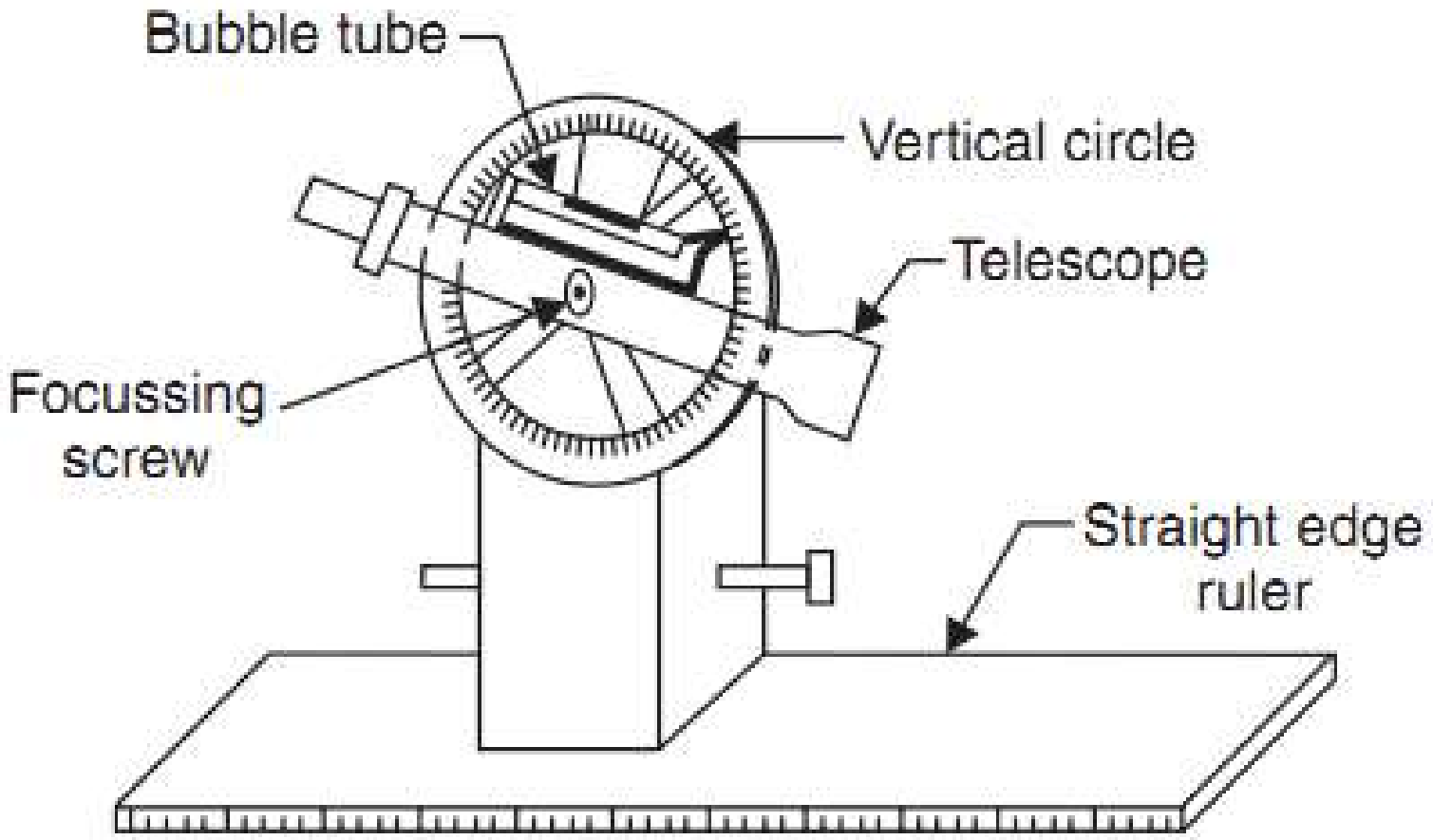
- It consists of a telescope mounted on a column fixed to the ruler.
- The line of sight through the telescope is kept parallel to the bevelled edge of the ruler.
- The telescope is provided with a level tube and vertical graduation arc.
- If horizontal sight is required bubble in the level tube is kept 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:*



Source: https://theconstructor.org/surveying/plane-table-survey-equipments/6474/

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.

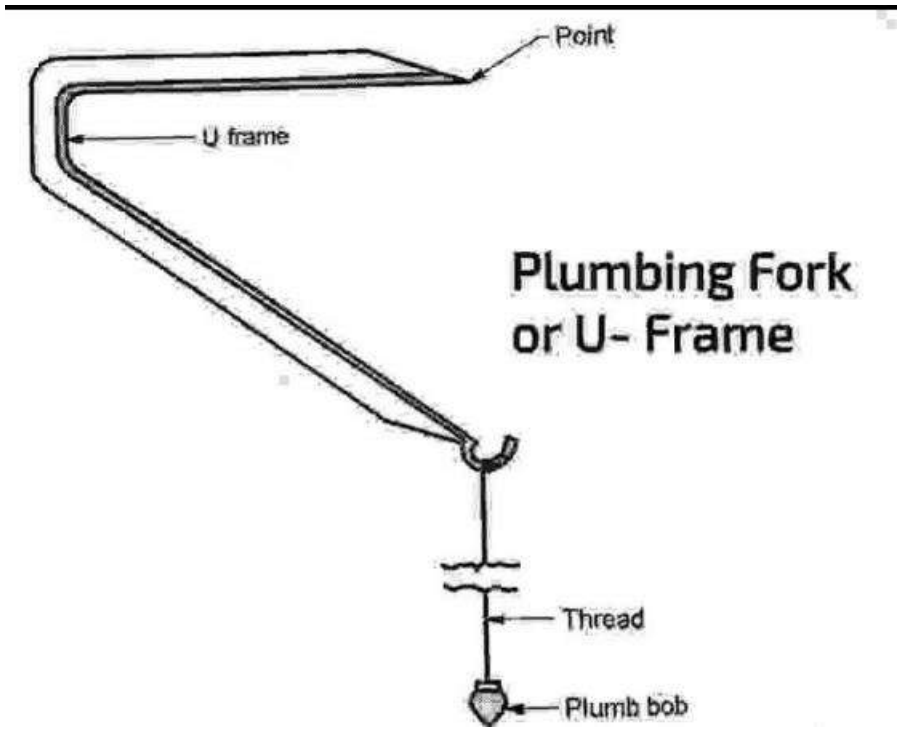
Source: http://ce.cet.ac.in/downloads/Study%20Material/Surveying/Plane%20Table%20Surveying.pdf

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.

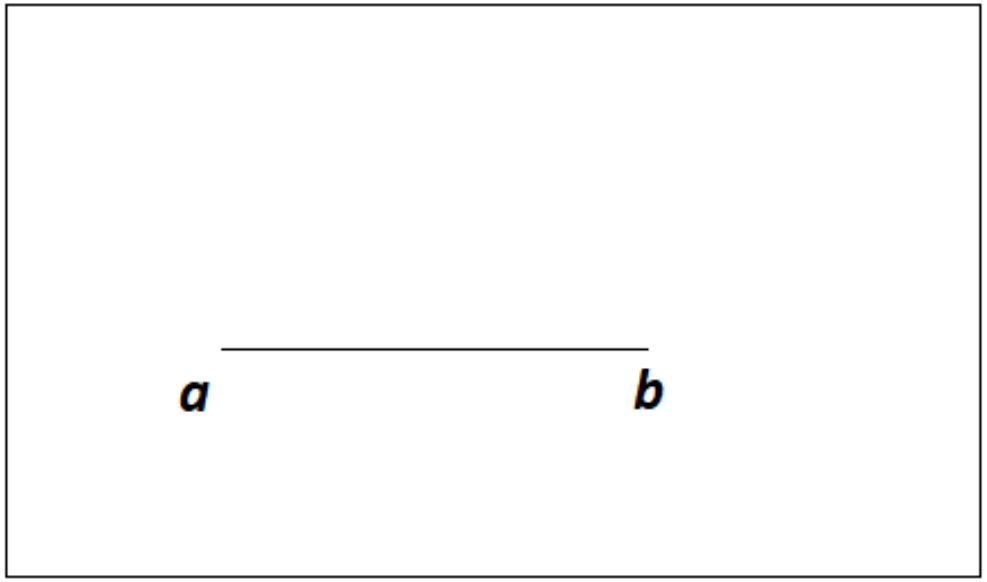


Fig showing plane table being placed first at station A to form line ab and later placed at B and sighted back to A to form line ba

Surveying and Mapping

Methods of plane tabling

Methods of plane tabling can be divided in to 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 dram 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.

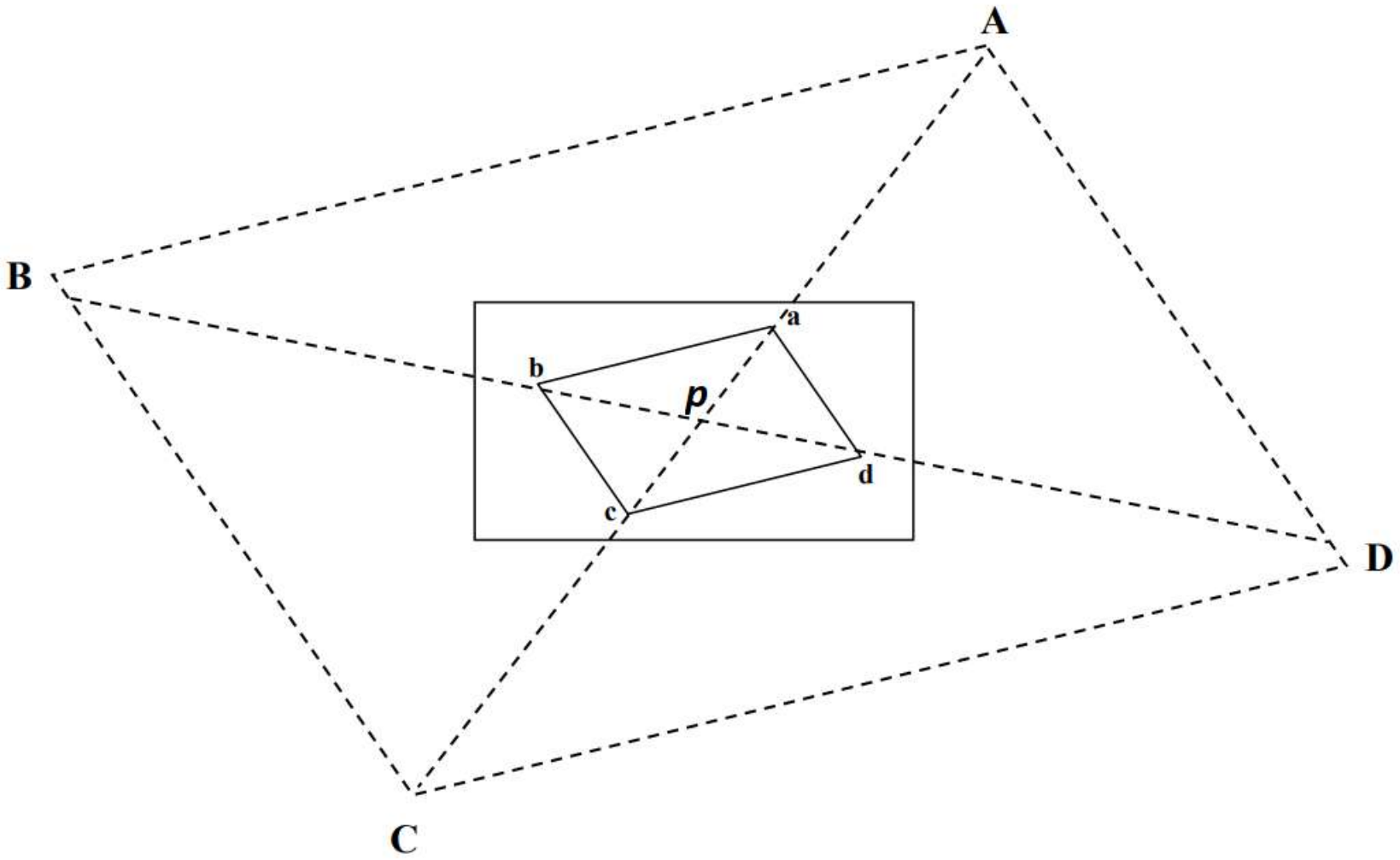
v. Similarly, obtain points b, c and d on paper by drawing lines of sight for stations B, C and D and measuring the distances PB, PC and PD on ground respectively.

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.

Methods of plane tabling

Radiation



Source:
http://eagri.org/eagri50/AENG151/lec04.pdf

Fig: Points abcd plotted on table through radiation technique

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 fidicual 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.

Methods of plane tabling

Intersection

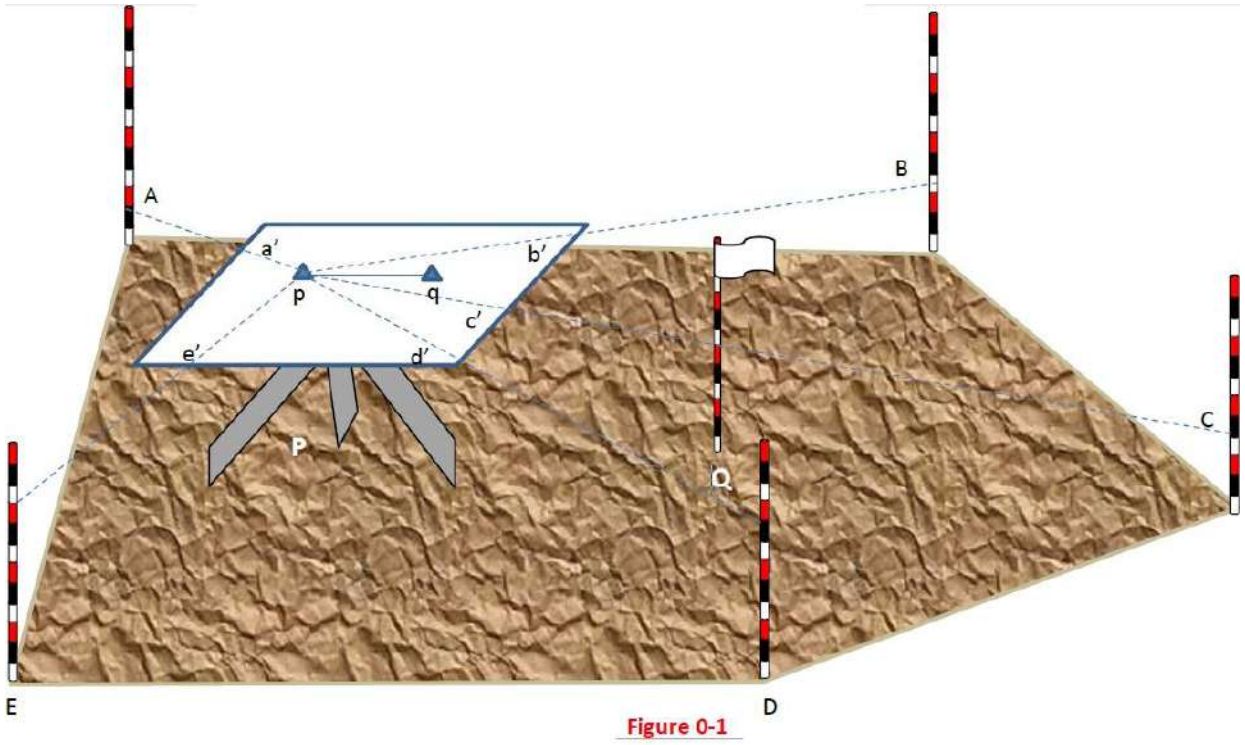


Figure 0-1

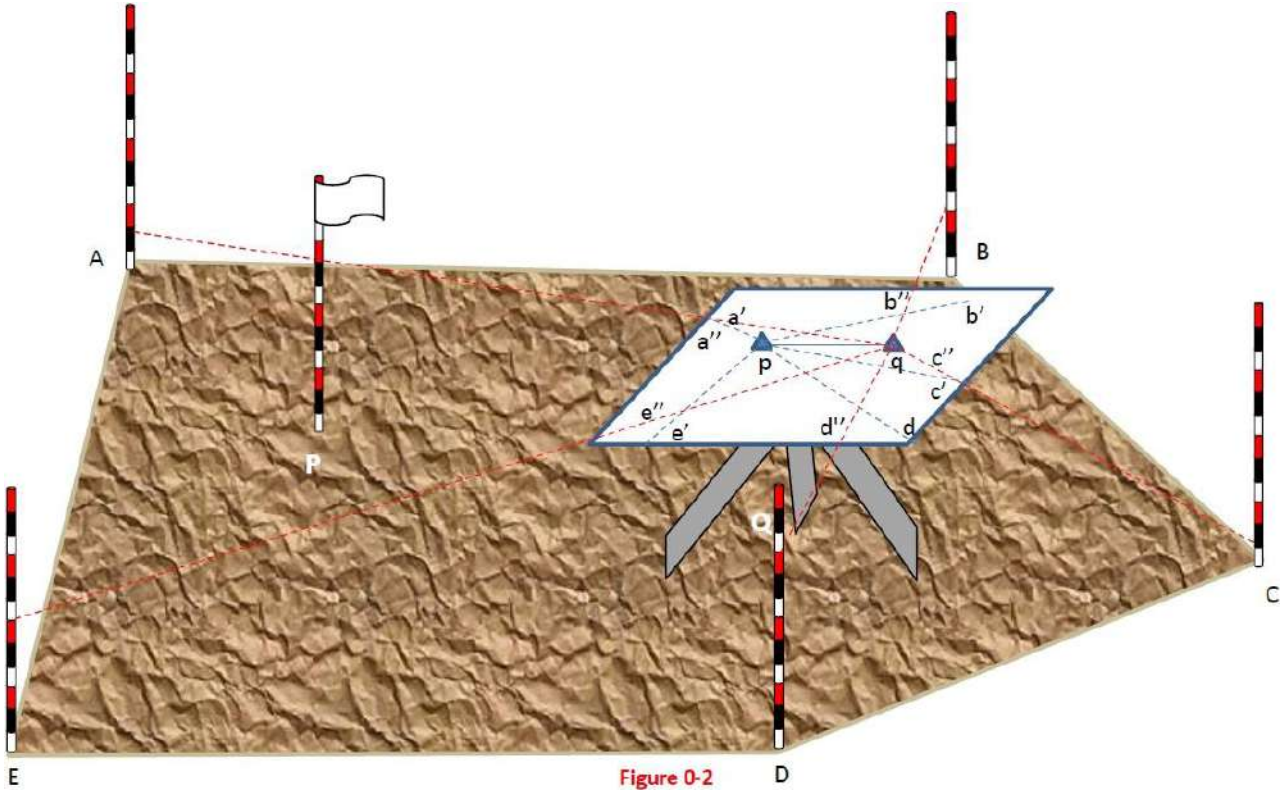


Figure 0-2

Source: https://www.aboutcivil.org/plane-tabling-intersection-method.html#:~:text=In%20this%20method%20a%20base,accuracy%20of%20the%20base%20line.

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.

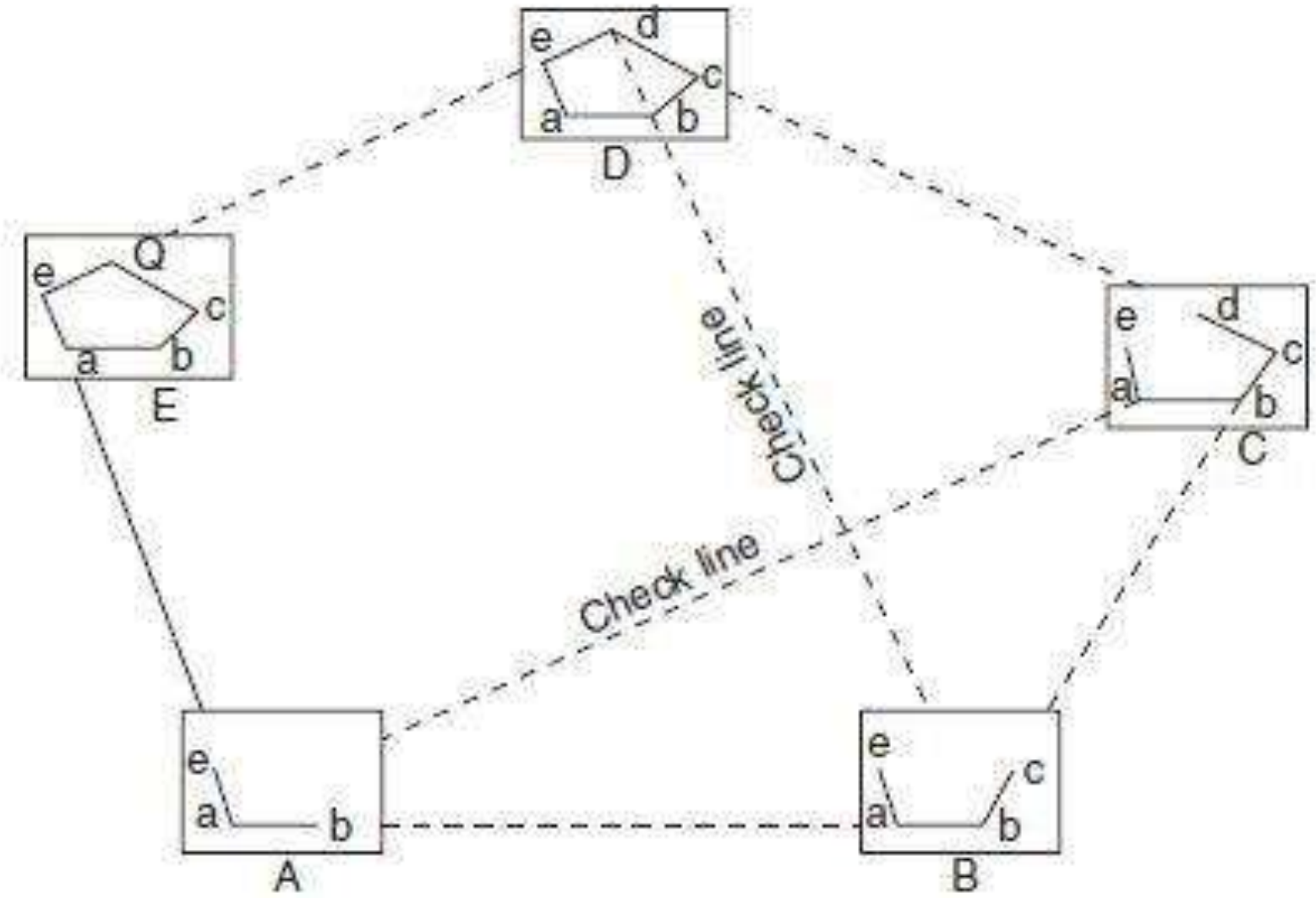
iii. The plane table is shifted to station B and sighted toward A (back sighting).

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.

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 0.2mm pen is used for inking the parcel boundary and detail.
- 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	1Kattha		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.

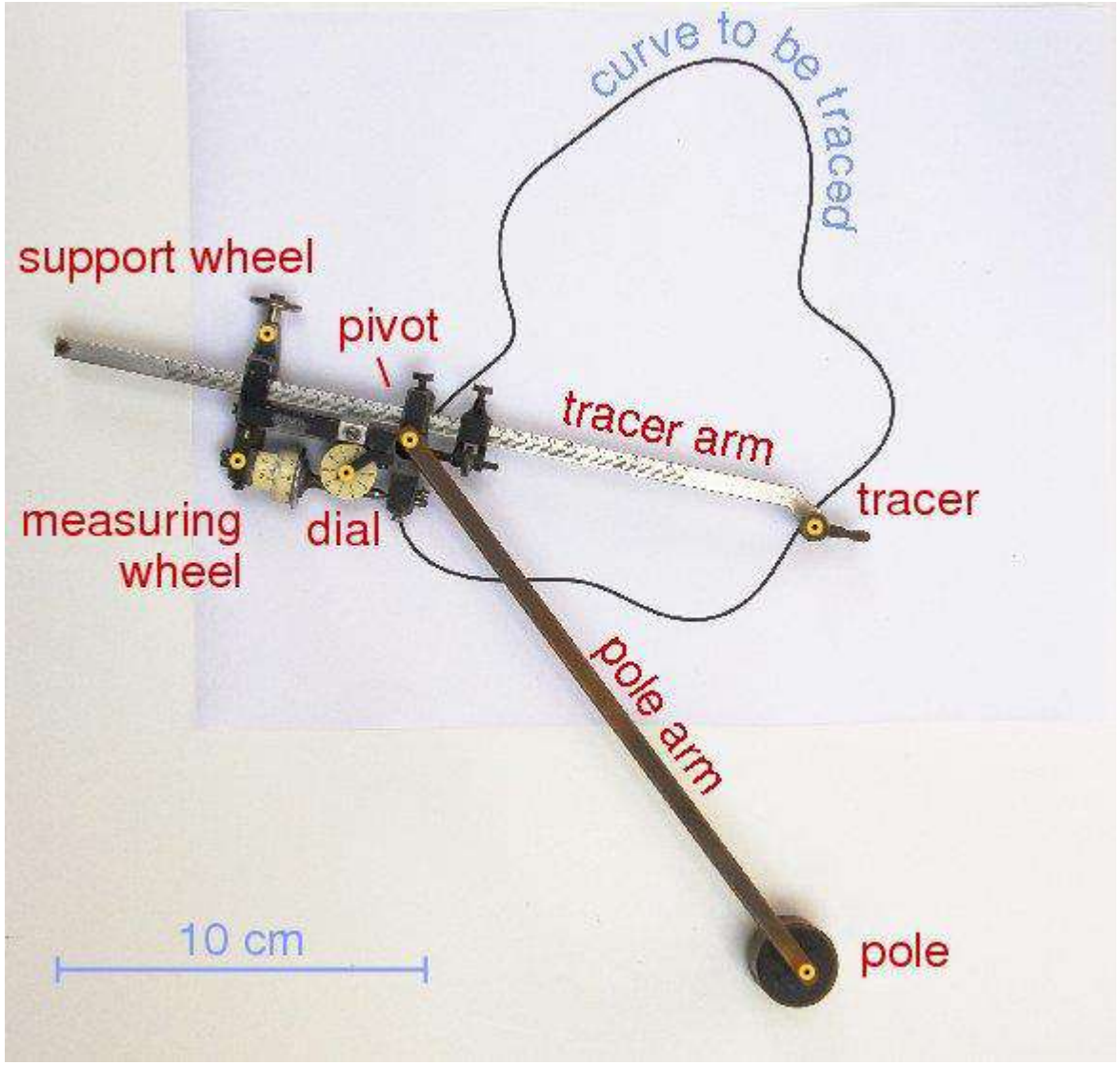
4. Using planimeter

- 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

Assginment

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

References

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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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.

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.

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.

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.

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

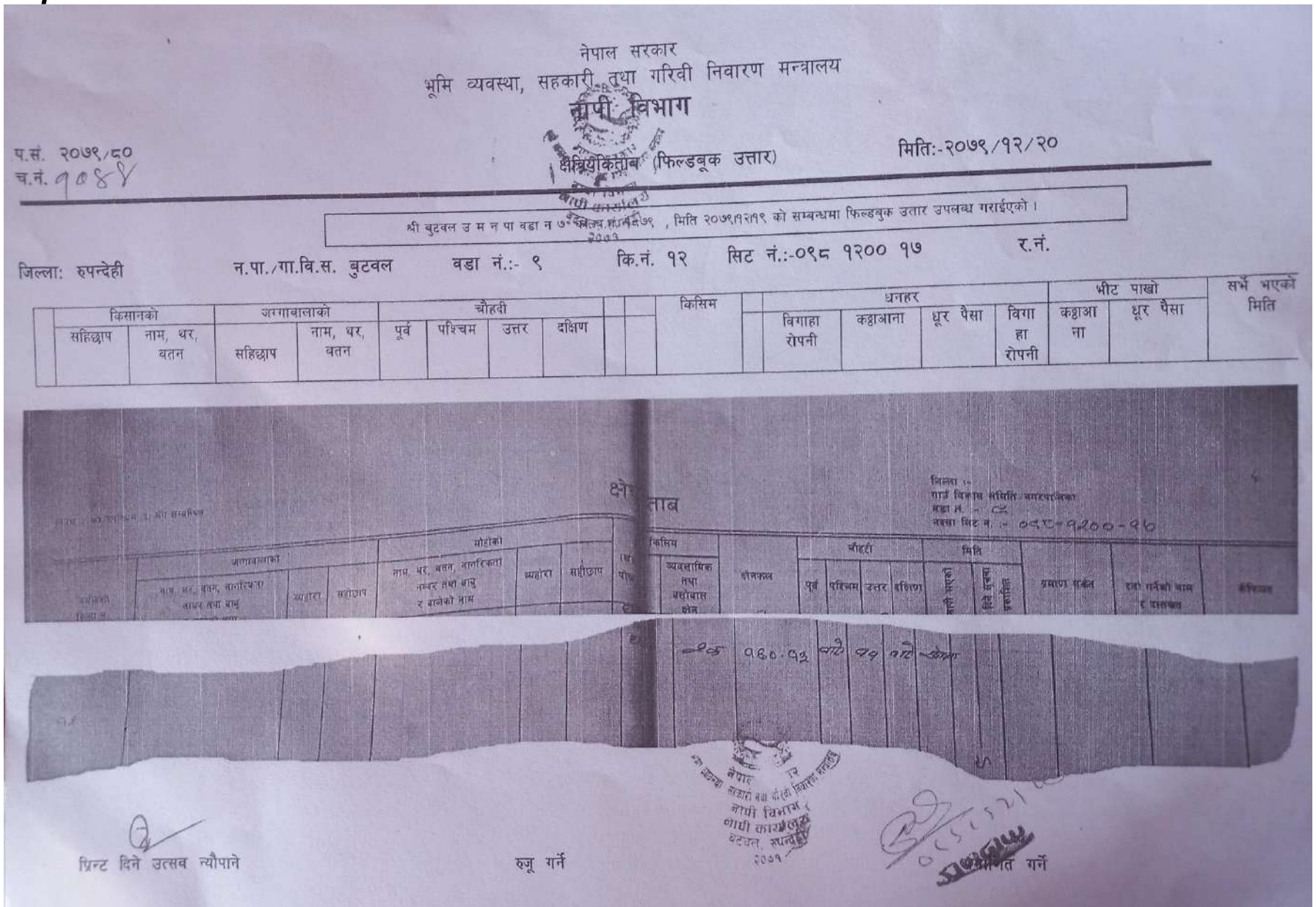
- It is prepared in GIS software on applying cartographic principle.
- Map are generally prepared in black and white.
- It includes title and reference, sheet no, sheet index, graphical scale and other map information.

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.

7. Field book preparation



नेपाल सरकार
भूमि व्यवस्था, सहकारी तथा गरिबी निवारण मन्त्रालय
नापी विभाग

प.सं. २०७९/८०
च.नं. १०८४

क्षेत्रियकिताब (फिल्डबूक उत्तार) मिति:-२०७९/१२/२०

श्री बुटवल उ म न पा वडा न ७ [illegible]२०७९ , मिति २०७९।१२।१९ को सम्बन्धमा फिल्डबुक उतार उपलब्ध गराईएको ।

जिल्ला: रुपन्देही न.पा./गा.वि.स. बुटवल वडा नं.:- ९ कि.नं. १२ सिट नं.:-०९८ १२०० १७ र.नं.

किसानको		जग्गाबालाको		चौहदी				किसिम	धनहर				भीट पाखो		सर्भे भएको मिति
सहिछाप	नाम, थर, वतन	सहिछाप	नाम, थर, वतन	पूर्व	पश्चिम	उत्तर	दक्षिण		विगाहा रोपनी	कट्ठाआना	धूर पैसा	विगाहा रोपनी	कट्ठाआना	धूर पैसा	

Source: https://mapadda.com/

Steps of cadastral survey using Total station

8. Decriptive 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.

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).

References:

CADASTRAL SURVEYING

EG3103GE

Unit 6: Land Registration

Public Secondary School

Lecture by
Er. Keshav Raj Bhusal

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6.1 Basic concept of registration

Land Registration

- Land registration is the official, systematic process of managing information about land tenure(owner, rights, value, use etc).
- It is the process of recording legally recognized interests (ownership and/or use) in land.
- It refers to a record created and maintained by the state, rather than by private enterprise, it may be publicly accessible, to a greater or lesser extent, and the state may guarantee its accuracy.

Why land registration?

1. Legal Ownership

- Land registration establishes a clear and recognized legal ownership of a property.
- It provides an official record of who owns the land, which helps prevent disputes and conflicts over property rights.

Why land registration?

2. Property Transactions

- Land registration facilitates the smooth transfer of property ownership.
- It provides a reliable and verifiable proof of ownership, which is essential for buying, selling, or mortgaging land.
- Buyers can have confidence in the transaction, knowing that the property's ownership is properly documented.

3. Protection of Property Rights:

- Land registration serves as a safeguard for property rights.
- It offers legal protection against unauthorized claims, encroachments, or illegal transfers.

4. Dispute Resolution:

- Land registration provides a mechanism for resolving disputes related to land ownership.
- If there is a conflict over property rights, the registered documents serve as evidence in legal proceedings.

Why land registration?

5. Land Use Planning and Management:

- By documenting land ownership and boundaries, land registration enables governments to allocate land resources efficiently, promote sustainable development, and regulate land use activities.
- It aids in the identification of public lands, protected areas, and areas designated for specific purposes such as agriculture, residential, commercial, or industrial use.

Principles of land registration

1. Booking principle

- Change in right gets effective only after booking.
- It implies that a change in real rights on an immovable property, especially by transfer, is not legally effectuated (put into force or operation) until the change or the expected right is booked or registered in the land register.

2. Consent principle

- Change in right is possible only after the permission of existing right owner.
- It implies that the real entitled person who is booked as such in the register must give his consent for a change of the inscription (a thing inscribed, as on a monument or in a book) in the land register.

Principles of land registration

3. Principle of publicity

- The publicity principle is concerned with the accessibility of information on real rights by third parties.
- It implies that the legal registers are open for public inspection.

4. Principle of speciality (specificity) of Principle of determination

- It implies that in land registration, and consequently in the documents submitted for registration, the concerned subject (man) and object (i.e. real property) must be unambiguously identified.

6.2 Types of registration

Types of land registration

- Conveyancing
  - Informal conveyancing/ Oral conveyancing
  - Private conveyancing
- Registration of deeds
- Registration of title

6.2 Types of registration

Types of land registration

Conveyancing

- It is the act of transferring property title from one person to another.

Informal Conveyancing

- If the transactions of property rights are made informally, without any written evidence then it is called informal conveyancing.

6.2 Types of registration

Types of land registration

Private Conveyancing

- If the transactions of property rights are made informally with written evidence then it is called private conveyancing.
- In such a system, land transactions are handled by private arrangements without reference to any public register and it does not provide any information to the state.
- Interests in land are transferred by the signing, sealing and delivery of documents between private individuals with no direct public notice, record or supervision.
- Private conveyancing is generally regarded as inefficient and potentially dangerous since it can be subject to fraud as there is no easy proof that the vendor is the true owner.

6.2 Types of registration

Types of land registration

Private Conveyancing

- व्यक्तिगत रुपमा लेनदेन गरी खडा गरेको कागजपत्रबाट कारोवार भएको खरीद बिक्रीलाई घरसारको लिखतबाट भएको खरीद बिक्री भनिन्छ । यस्तो कारोवार हुदा सरकारी कार्यालय स्थित जग्गाको लगत पुस्तिका (Register) मा दर्ता गराउने गरिदैन । समाजमा सामाजिक सम्बन्धका आधारमा एक दुईजना प्रतिष्ठित व्यक्तिहरुको रोहवरमा यस्तौ लिखत तयार पार्ने चलन थियो । हाल यो विधि प्रचलनमा छैन ।

6.2 Types of registration

Types of land registration

Registration of deeds

- Deed: A legal document signed and sealed and delivered to affect a transfer of property and to show the legal right to possess it.
- If the transactions of property rights are made formally with written evidence in presence of government authority then it is called deed registration.
- Under this system of registration a copy of the transfer document is deposited in a deeds registry. (recognized by the state).
- The transaction is officially recorded but does not ensure its legal consequence.
- This process helps ensure transparency, prevent fraud, and facilitate the transfer of property.

6.2 Types of registration

Types of land registration

Registration of deeds

- जग्गा सम्बन्धी कारोवार अड्डामा गएर सम्पन्न गराउने र अड्डाको रोहवरमा कारोवार सम्बन्धी कागजपत्र एक प्रति नक्कल अड्डामा राख्ने गरी भएको कारोबारलाई लिखत दर्ता लगत (Registration of Deeds) भनिन्छ ।
- यसको मुख्य उद्देश्य अड्डामा दर्ता गरेको लिखतलाई अड्डामा दर्ता नगरेको लिखितको तुलनामा कानूनी मानयता दिनु हो ।

6.2 Types of registration

Types of land registration: Registration of deeds

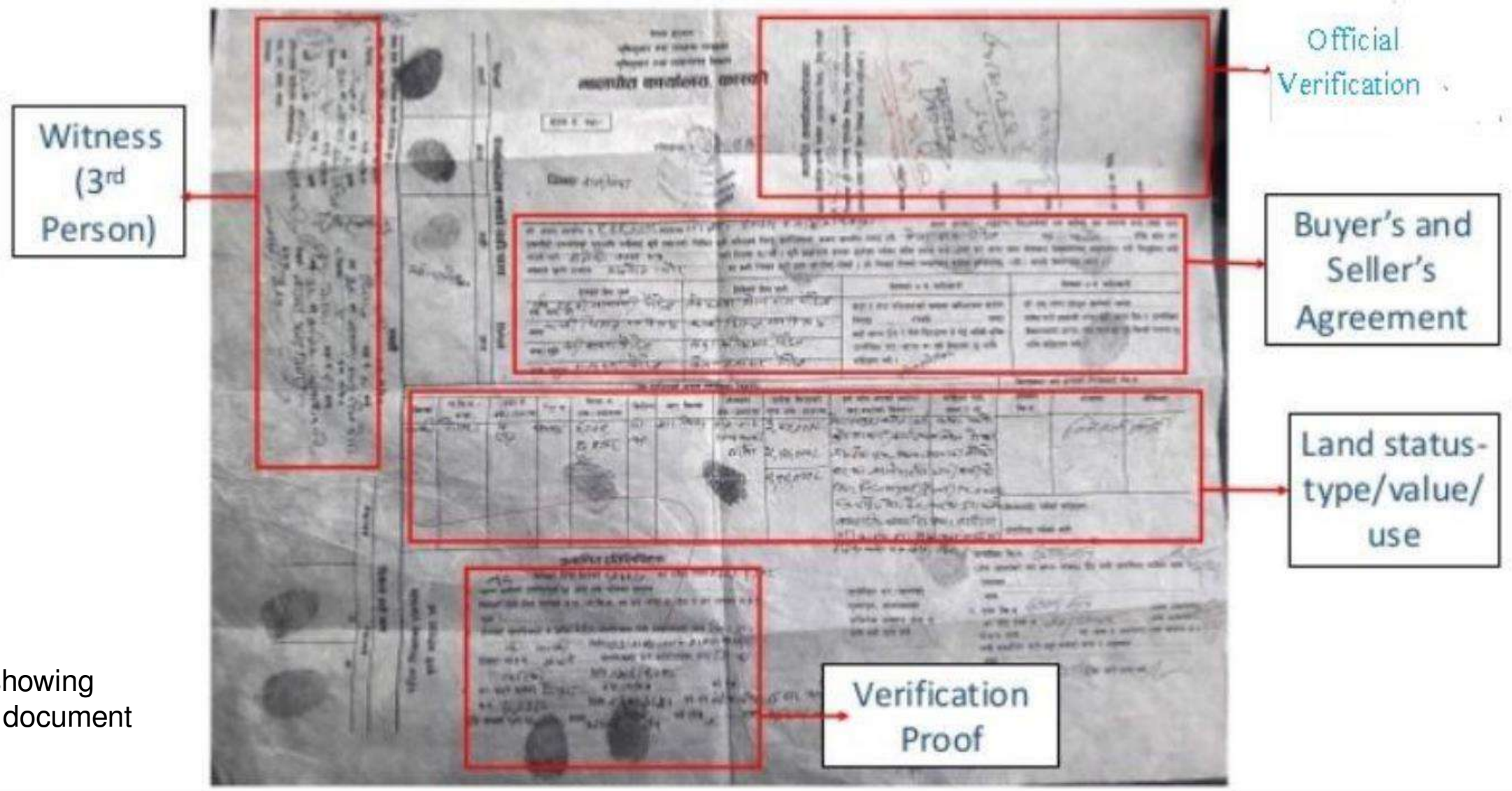

Fig: showing deed document

6.2 Types of registration

Types of land registration

Registration of title

- The transaction is officially recorded, legal consequences are ensured and state guarantee is ensured.
- In this system each land parcel is identified on a map and the rights associated with it are recorded on the register.
- State takes responsibility in case of any consequences regarding the land.
- Registration of title was designed to overcome the defects of deeds registration and to simplify the process of executing property transactions.

Demerits

- It is expensive and cumbersome to implement.
- It needs involvement of (expensive) private practitioners, like land surveyors, lawyers/notaries, planners, valuers etc.
- High accuracy instrument for survey.

References

References:

CADASTRAL SURVEYING

EG3103GE

Unit 7. Cadastral Surveying and Registration Procedure in Nepal

Public Secondary School

Lecture by

Er. Keshav Raj Bhusal

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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

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 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.

2. Notice published in gazette

नेपाल राजपत्र

नेपाल सरकारद्वारा प्रकाशित

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

भाग २

नेपाल सरकार

कानून, न्याय तथा संसदीय मामिला मन्त्रालय

नेपालको संविधानको धारा २९६ को उपधारा (१) बमोजिमको व्यवस्थापिका-संसदले बनाएको तल लेखिए बमोजिमको ऐन सर्वसाधारणको जानकारीको लागि प्रकाशन गरिएको छ।

संवत् २०७३ को ऐन नं. १८

नेपाल सरकारको अर्थ सम्बन्धी प्रस्तावलाई कार्यान्वयन गर्न बनेको 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 गर्न वाञ्छनीय भएकोले,

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

नेपाल राजपत्र नेपाल सरकारको आधिकारीक प्रकाशन हो। मन्त्रिपरिषद्बाट 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 राख्ने सरकारी पत्र नेपाल राजपत्र वि. स. २००८ साल देखि हालसम्म पनि नेपाल सरकार सूचना तथा संचार मन्त्रालय अन्तर्गत रहेर मुद्रण विभागले प्रकाशन गरि आमजनसमुदायलाई सरकारी निर्णयहरुको लिखित जानकारी दिई नागरिकहरुको सूचनाको हक सम्बन्धी अधिकार प्रदान गर्दै आइरहेको छ।

Fig: showing sample of gazette

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 सम्वन्धित नगरपालिका वा गाउँ विकास समितिको सम्वन्धित वडामा सवैले देख्ने स्थानमा जग्गा **नाप जाँच हुनु भन्दा १५ दिन अगावै** नियमावली २०५८ को अनुसूचि १ वमोजिमको ढाँचामा सूचना प्रकाशन गर्ने । उक्त सूचना गा.वि.स.तथा न.पा. कार्यालयहरुमा लिखित रुपमा वुझाई वुझि लिएको भरपाइ गराउने । अन्य कार्यालयहरुमा 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 गई पायक पर्ने ठाउँमा आफ्नो कार्यालय खडा गरी नाप जाँचको कार्य हुन लागेको विषयमा सम्वन्धित वडाका जग्गाधनीहरुलाइ 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 पन्ध्र दिन अगावै नियन्त्रण विन्दु स्थान खडा हुने वा नाप जाँच हुने जग्गाको जग्गावाला, मोही, संधियारहरु, सम्वन्धित 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 desification of such controls is done commonly through traversing, resection and intersection method.

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5. Establishment/Densification of Control Points

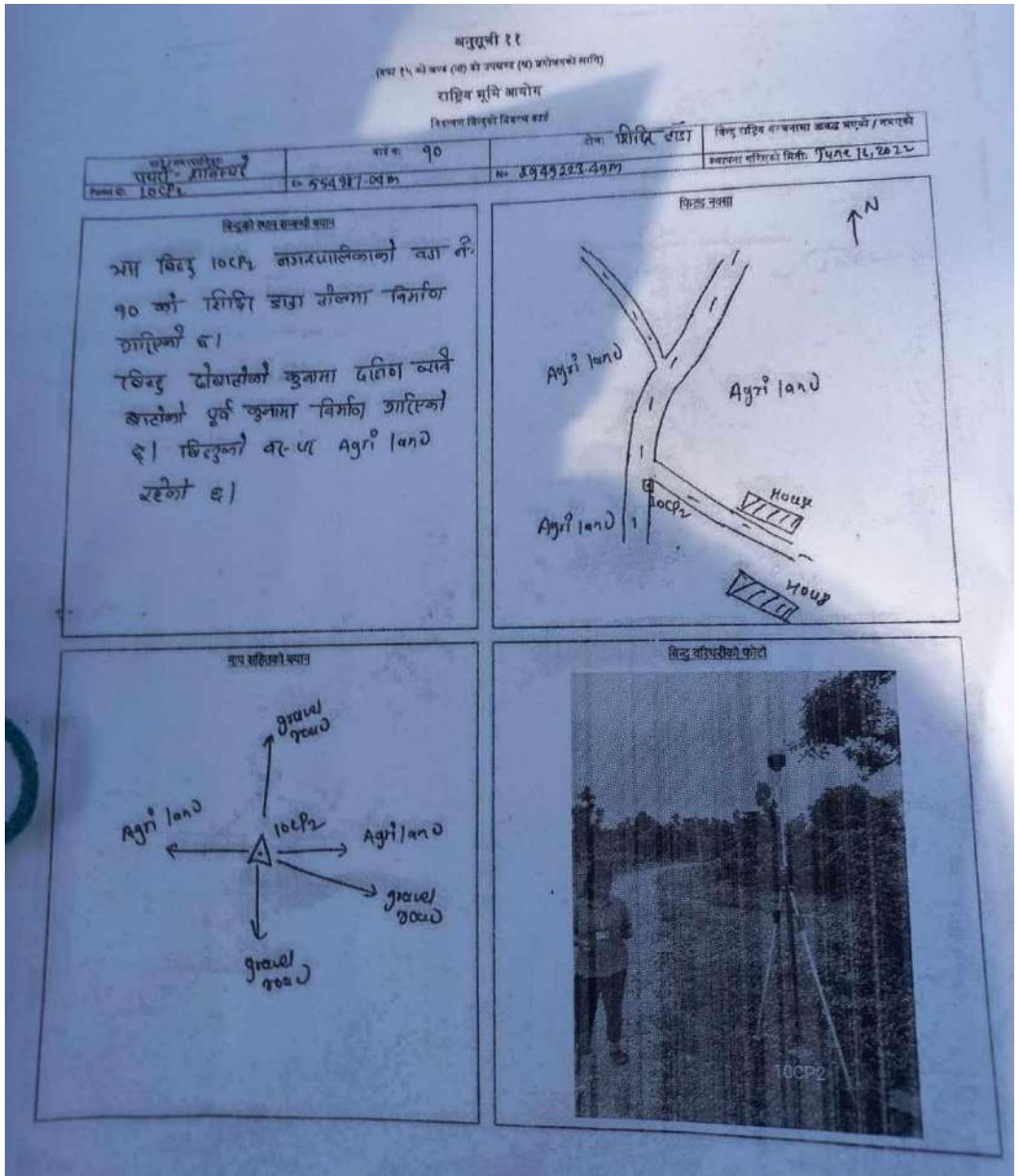


Fig: showing sample of D-card of control point.

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.
- 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.
- 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 सामुदायीक प्रयोजनको आधारमा जग्गाको वर्गिकरण गर्ने कार्यलाई जग्गाको किसिम वर्गिकरण भनिन्छ ।

- नाप जााच गरिने जग्गालाई सो जग्गाको उपयोगको आधारमा देहाय वमोजिम दुइ क्षेत्रमा विभाजन गरिएको छ ,

  (क) कृर्षि क्षेत्र
  (ख) व्यवसायिक तथा वसोवास क्षेत्र

- कृषि क्षेत्र: भन्नाले कृषि उत्पादन (अन्नवाली, नगदेवाली, वागवानी आदी) पशुपालन, निजि जग्गामा भएका वृक्षारोपण वा वनवाटीका समेत भएका जग्गाहरुलाई जनाउँदछ ।

- व्यवसायिक तथा वसोवास क्षेत्र: भन्नाले विभिन्न उद्योग व्यापार शिक्षा, स्वास्थ्य, संचार र मनोनन्जन, आदी व्यवसाय संचालन हुने तथा सवै किसिमको वमासेवार क्षेत्रलाई जनाउछ।

8. Preparation of records: Cadastral Map

- 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.

8. Preparation of records: Field Book

(९) नियमावलीको अनुसूची ३ वमोजिमको 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 ।

(१२) 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, चौहद्दी, 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।

(१३) 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 ।

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 गोश्वारा

.....नं. नापी टोली

जिल्लाः—

गाउँ विकास समिति/नगरपालिकाः—

वडा नंः—

नक्सा सिट नंः—

क्षेत्रीय किताब

कित्ता नं.	जग्गावालाको			मोहीको			बिरह (घर, बगैंचा, पोखरी आदि)	किसिम		क्षेत्र फल	चौहद्दी				नापी भएको मिति	प्रमाण संकेत	दर्ता गर्नेको नाम र दस्तखत	कैफियत
	नाम, थर, वतन, बाबु र बाजेको नाम	व्यहोरा	सहीछाप	नाम, थर, वतन, बाबु र बाजेको नाम	व्यहोरा	सहीछाप		कृषि क्षेत्र	व्यवसायिक तथा बसोबास क्षेत्र		पू.	प.	उ.	द.				

....

गाउँ विकास समिति वा नगरपालिकाका सदस्यको दस्तखत

....

अमीनको दस्तखत

....

नापी निरीक्षकको दस्तखत

....

टोली प्रमुखको दस्तखत

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 ..... देखी ..... गाउा 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 नवुझेमा सात दिन भित्र लिखित निवेदन गर्नु होला । अन्यथा यसै अनुसार जग्गा दर्ता गरिनेछ ।

जग्गा धनिको नम थर र वतन	जग्गाधनीको वावुको नाम	मोहिको नाम, थर र वतन	कित्ता नं.	क्षेत्रफल	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 ६(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.

Settlement of Civil Cases and Disputes

- (४) उपनियम (२) वा (३) वमोजिम कसैले जग्गाधनी दर्ता प्रमाण पूर्जा नपाएमा वा पाए पनि त्यसमा चित्त नबुझेमा सोको कारण सहित सोही क्षेत्रको जग्गाधनी दर्ता प्रमाण पूर्जाको वितरण प्रारम्भ भएको मितिले वा जग्गाधनी दर्ता प्रमाण पूर्जा पाएको मितिले साठी दिनभित्र सम्बन्धित नापी गोश्वारामा उजूर गर्न सक्नेछ ।
- (५) उपनियम (४) वमोजिम पर्न आएको उजुरीमा आवश्यक छानविन गरी नापी गोश्वाराले जग्गाधनी दर्ता प्रमाण पूर्जा दिनु पर्ने भए जग्गाधनी दर्ता प्रमाण पूर्जा दिनु पर्नेछ र सच्याउनु पर्ने भए सच्याई अर्को जग्गाधनी दर्ता प्रमाण पूर्जा दिनु पर्नेछ ।
- (६) उपनियम (५) मा जुनसुकै कुरा लेखिएको भए तापनि उपनियम (४) वमोजिम परेको निवेदनमा छानविन गर्दा ऐनको दफा ६ को उपदफा (७) वमोजिम हकभोग वा तेरो मेरो सम्बन्धी प्रश्न उठेको कारणबाट जग्गाधनी दर्ता प्रमाण पूर्जा दिन वा सच्याउन नमिल्ने भए अदालतबाट सो कुराको निर्णय भई आएका बखत सोही वमोजिम हुने व्यहोरा स्पष्ट रुपमा खुलाई नापी गोश्वाराले उजुरवालालाई तुरुन्त निस्सा दिनु पर्नेछ ।

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)

CADASTRAL SURVEYING

EG3103GE

Unit 8: Updating and Archiving Cadastral Documents

Public Secondary School

Lecture by

Er. Keshav Raj Bhusal

Table of contents

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

Works of survey offices

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

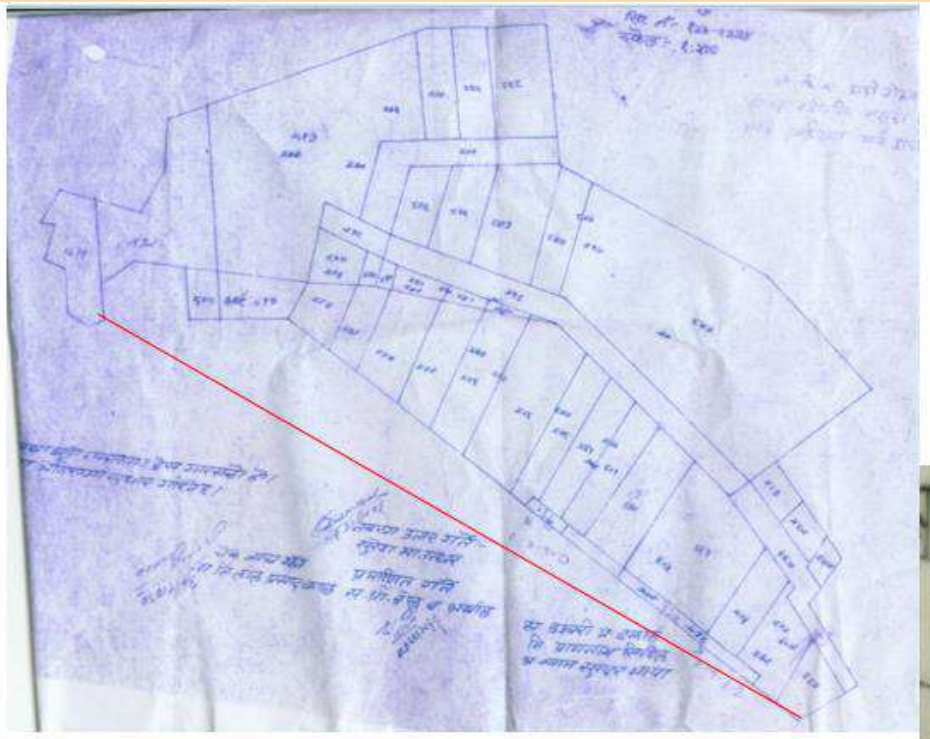
Parcel subdivision

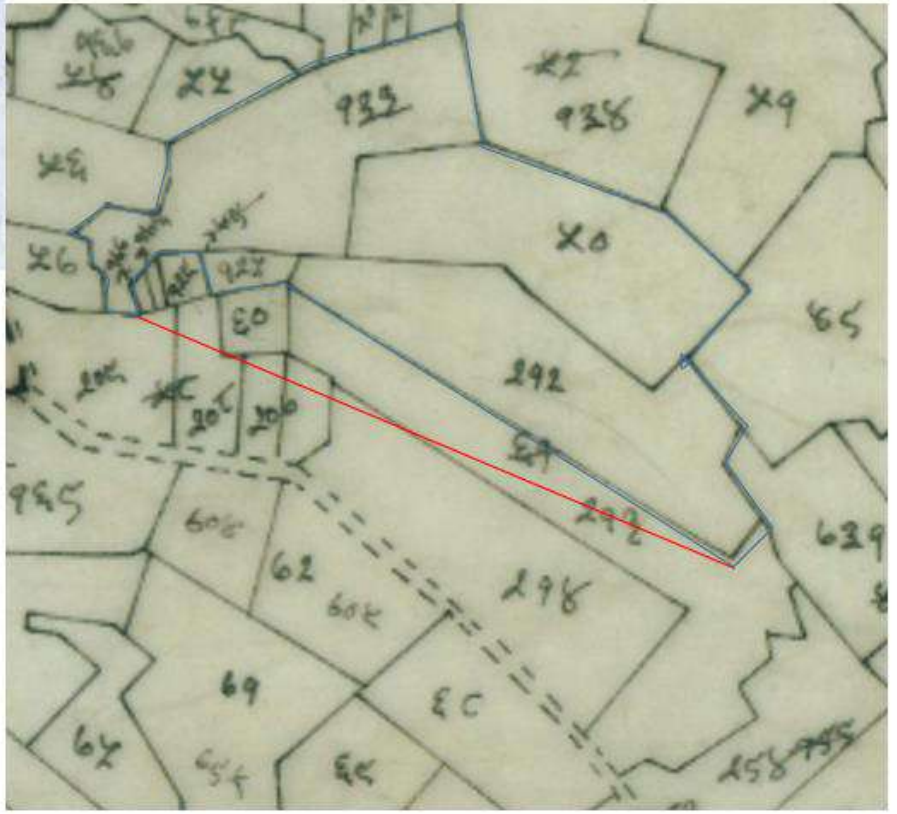
- It is the process of dividing a parcel into two or more new parcels.

- जग्गा खरिद विक्रि, बकसपत्र, अंशवण्डा, नामसारी (दा.खा.) अदालती फैसला, आधिग्रहण, प्रकृतिक प्रकोप जग्गा नाप नक्सा गर्दा जग्गाको स्वामित्वमा आंशीक रुपमा परिवर्तनहुने भएमा नापी कार्यालयको तर्फवाट 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 कार्यालयवाट 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 ।

Unit: 8 Updating and Archiving Cadastral Documents

Parcel subdivision





Parcel subdivision

- जव कुनै जग्गा नापजाच हुदा वा किनवेच गर्दा कित्ता काट गर्दा र नापनक्सा गरी नयाा 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 14/1and 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.

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) वदर गर्नु पर्छ । सो कित्ताको कैफियत महलमा मालपोत कार्यालयको र.नं.(प्राप्त भएपछि) र नापी शाखाको को लिखत वमोजिम वदर भई कित्ताहरु कायम भएको व्यहोरा उल्लेख गर्ने ।
- सो कित्ता वदर भई कायम हुन आएका नयाँ कित्ताहरु प्लट रजिष्टरमा अंकित गर्नु पदछ । यसरी नया ं कित्ता कायम गर्दा प्लट रजिष्टरमा भएको अन्तिम कि.नं.वाट अगाडी क्रमश: नम्वर दिने ।

Plot register maintenance,

- कि.नं.कायम गर्दा पहिलो नम्बर क्रेतालाई र पछिल्लो नम्बर विक्रेतालाई दिनु पर्दछ ।
- नयाँ कायम भएका किल्लाहरुको कैफियत महलमा कि.न बदर भै कायम हुन आएको भनी मालपोत कार्यालयको र नापी शाखाको द.नं..... समेत उल्लेख गर्ने ।
- कायम गरिने प्लट रजिष्टरको ढाँचा जग्गा नाप जाँच नियमावली २०५८ को अनुसूची १३ बमोजिमको हुनु पर्दछ र सो ढाँचामा उल्लेख भएका सम्पूर्ण विवरणहरु अनिवार्य रुपमा उल्लेख गर्ने ।

Plot register maintenance,

- अमीनले आफूले कित्ताकाट गरेको सम्पूर्ण विवरणहरु आफ्नो कित्ताकाट डायरी कायम गरी उक्त डायरीमा उल्लेख गर्ने ।
- कि.का.गरी प्लट रजिष्टर कायम गरि सकेपछि, पुनः एक पटक नक्सा, प्लट रजिष्टर, 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

Plot register maintenance,

- नापी निरिक्षकले अमीनले पेश गरेका सम्पूर्ण कागजातहरु अध्ययन गरी मालपोत कार्यालयवाट प्राप्त लिखत वमोजिम काम कारवाही भए नभएको १००% चेक गरी सर्भेक्षक समक्ष पेश गर्ने ।
- नापी निरिक्षकले उपरोक्त वमोजिम चेक गरी सवै कार्य दुरुस्त पाइएमा सर्भेक्षक समक्ष कागजातहरु प्रस्तुत गर्ने ।
- यदी उपयुर्क्त वमोजिम गरेको नपाइएमा सो प्रकृया पुरा गर्न अमीनलाई अह्राउने ।

File Map

- नक्सामा कित्ताकाट गरी नयाँ कायम हुन आउने कित्ताहरु स्पष्ट देखाउन नसकिने अवस्था भएमा फायल नक्सा वनाउने ।
- ब्द्धसाइजको कम्तीमा ७५ माइक्रोन वाक्लो ड्राफ्टिङ्ग 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 वनाई कित्ताकाट गरेको अवस्थामा सक्कल नक्सा एवं ट्रेस नक्सामा सो कित्तामा पुनः कित्ताकाट नगर्ने ।
- प्रत्येक फायल नक्सालाई नम्वर कायमगरी न.पा./को वेग्ला वेग्लै वार्ड र गा.वि.स.को वेग्ला वेग्लै फायलमा राख्ने ।
- फायल नक्सा तयार गरेको कित्ताको विवरण र फायल नक्सा नम्वर सम्वन्धित प्लट रजिष्टरको सम्वन्धित 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 रुपमा लेखि नाम सहितको दस्तखतगरी मिति समेत जनाउनुको साथै वेग्लै रजिष्टर तयारगरी अभिलेख राख्ने र सो रजिष्टरलाई अन्य प्राविधिक श्रेस्ता सरह अनिवार्य रुपमा वर वुझारथ 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 सम्वन्धि कारोवार त्यसै फायल नक्सावाट नै गर्ने ।
- कार्यालय प्रमुखवाट प्रमाणित नभएको फायल नक्सालाई मान्यता नदिने र त्यस्तो किसिमको फायल नक्सावाट कारोवार नगर्ने ।
- एउटै कित्ताको एक पटक भन्दा वढी फायल नक्सा नवनाउने । एक पटक भन्दा वढी फायल नक्सा वनाइएको पाइएमा वा फायल नक्सामा स्पष्ट नाम सहित दस्तखत नगरेको भेटिएमा, फायल नक्साको स्पष्ट अभिलेख नराखिएको भेटिएमा कार्यालय प्रमुख सहित संलग्न कर्मचारीहरुलाई 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 वनाउने कर्मचारीलाई कारवाही गर्नु पर्नछे ।

Parcel Plan / Parcel Map

- प्रत्येक कित्ताहरुको अलग अलग नक्सा वनाइन्छ । कित्ता नक्सा वनाउनुको उदेश्य अनुरुपको यसको परिभाषा हेर्दा, यसरी वनाएको साधारण नक्सालाई कित्ता नक्सा(parcel plan) नभनी, यसरी तैयार गरेको नक्सामा प्रत्येक कित्ता सिमानहरुको नाप समेत उल्लेख हुनु पर्छ । यसरी कित्ताको तस्विर वनाई सिमानाहरुको नाप उल्लेख गरेको नक्सालाई कित्ता नक्सा (parcel plan) भनिन्छ। नापी शाखा, नापी गोश्वारा को कार्यविधि २०६०
- नापी विभागका माहानिर्देशकले तोकेको ठाँउमा सम्वन्धित जग्गावाला, सम्वन्धित गाँउ विकास समिति वा नगरपालिकाको प्रतिनिधि, उपस्थित संधियारहरु समेत रोहवरमा राखी छुट्टाइएको सिमानाअनुसार सिमा चिन्ह खडा गर्न लगाई प्रत्येक वेग्ला वेग्लै कित्ता नक्सा बनाउन सक्ने व्यवस्था गरिएको छ । (जग्गा नाप जाँच नियामावली 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।

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 सवै 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 उपलव्ध हुन सक्ने गरी ननासिने नविग्रने गरी सुरक्षित साथ राख्नु पर्दछ ।

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 रुपमा जाच गरी आआफ्नो नाम थर तथा सहिछाप गरी मिति जनाएर कुन नक्सा बाट 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 ।

Maintenance of land record

- वारम्वार प्रयोगमा आइरने भएको कारणवाट जिर्ण भैसकेका प्लट रजिष्टरहरु पनि क्रमश 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 वाइण्डिङ्ग गरेर सुरीषत च्याक, दराजमा राख्ने ।
- सक्कल नक्सा र ट्रेस नक्साहरु व्यवस्थित तरवले राख्न अमिलाई प्लान चेष्टको व्यवस्था हुनेछ ।

Maintenance of land record

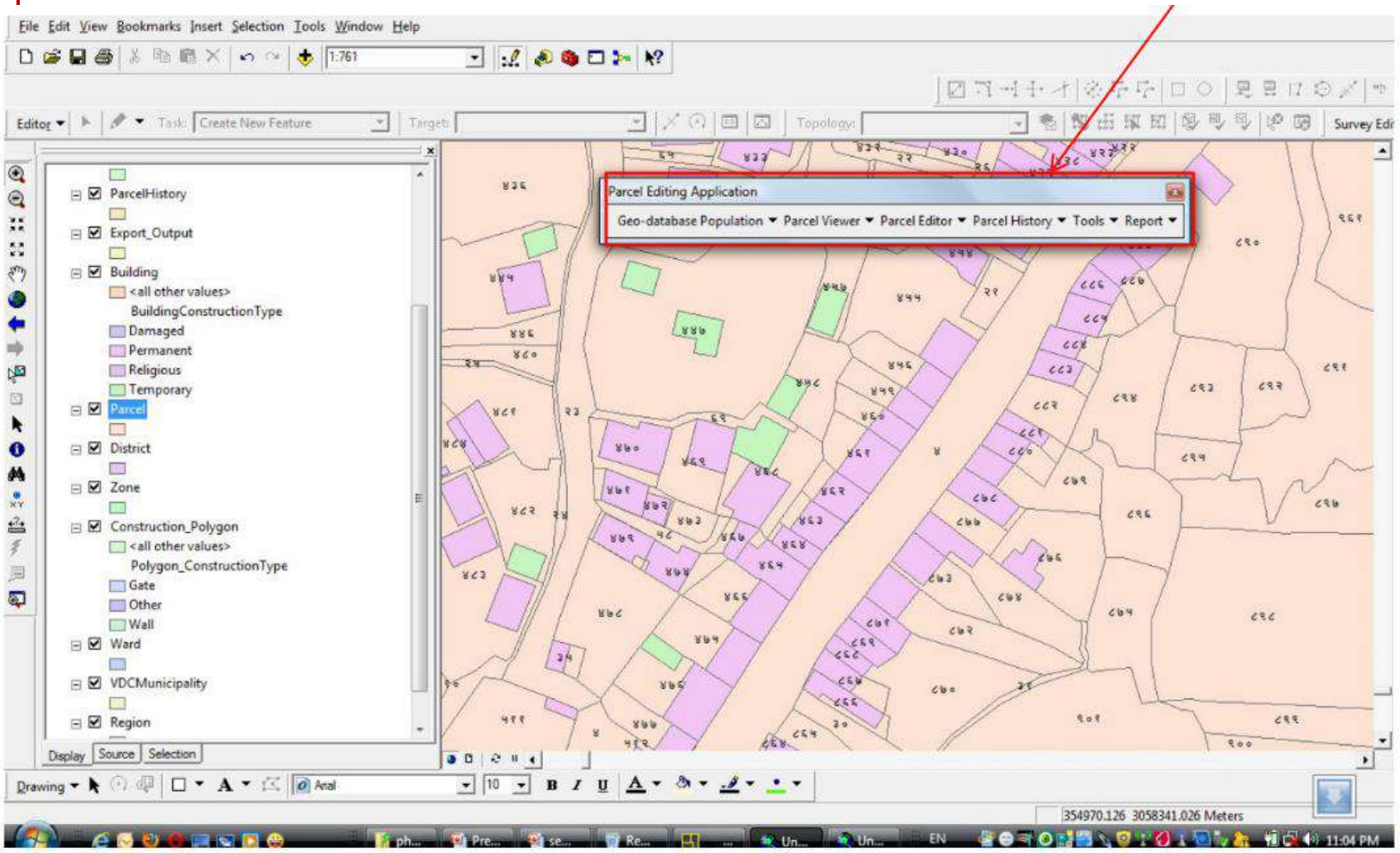
- अमिनलाई आफ्नो फांटको सक्कल नक्साहरुलाई एकातर्फ र ट्रेश नक्साहरुलाई अर्कोतर्फ म.न.पा./न.पा./गा.वि.स. र वार्ड नं. र ट्रिग सिट नं. सिलसिलावद्ध मिलाई नक्साहरु नदोव्र्याई र नभाँची राख्नु पर्दछ ।

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.

Unit: 8 Updating and Archiving Cadastral Documents

Database Update and Maintenance



Database Update and Maintenance

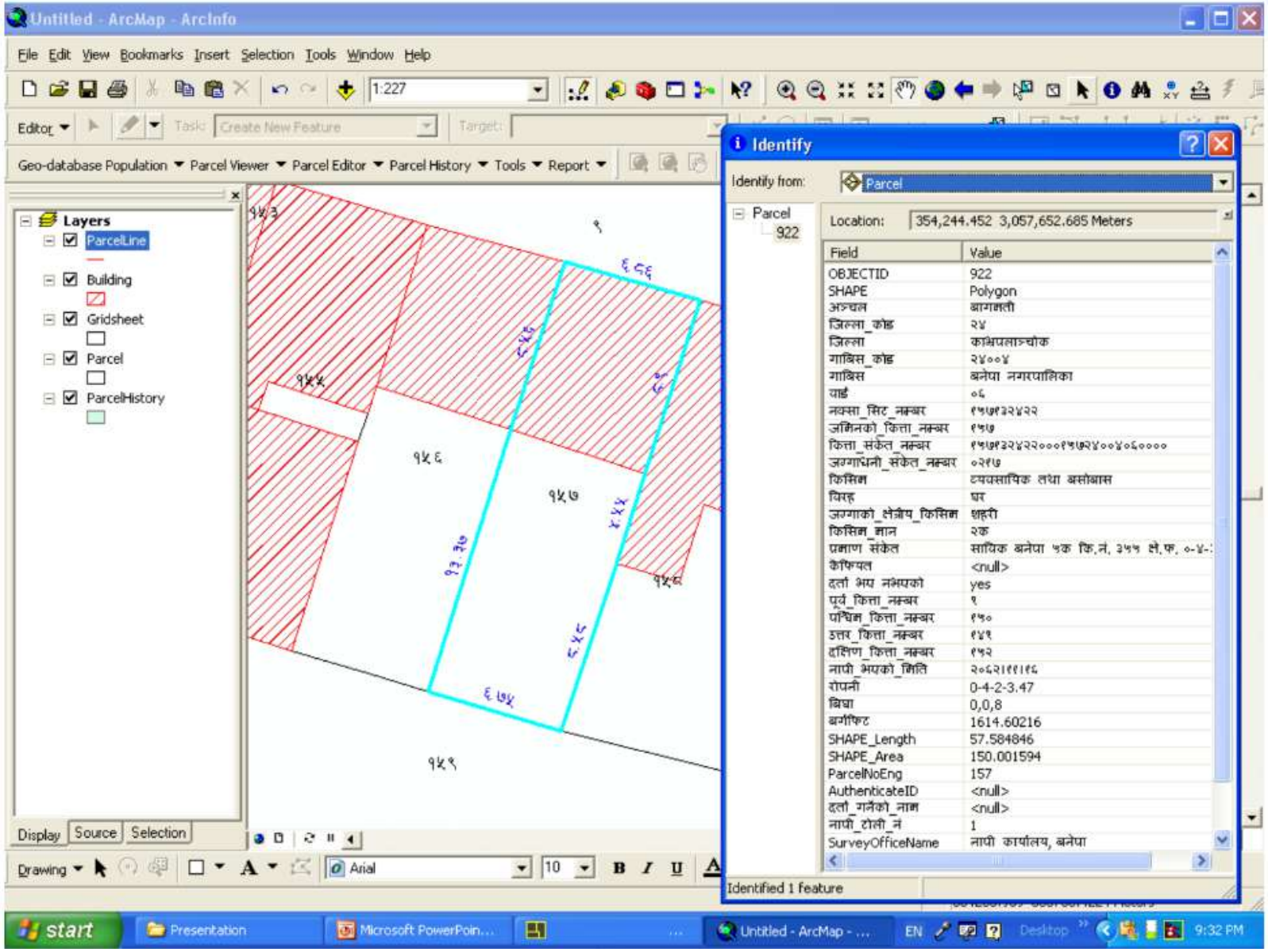


fig: showing attribute information of selected parcel

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 रुपमा 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 रुपमा स्क्यान गरेर डिजिटाइजेसन गरि डाटावेस तयार गर्नुपर्नेछ ।

(११) कार्यालयले उपदफा (९) र (१०) बमोजिम अद्यावधिक भएको डाटाबेस प्रयोग गरीअनिवार्य रुपमा डिजिटल प्रविधिबाट सेवा प्रवाह गर्ने र कार्यालय आफैंले Hard Copy Map Scan गरी वा Digital प्रबिधिबाट नापनक्सा गरी उत्पादन गरेको डिजिटल डाटा को डाटाबेस तयार भए पछि सोही आधारमा डिजिटल प्रविधिवाटै सेवा प्रवाह गर्नु पर्नेछ । Hard Copy Map Scan गरीDigital Data उत्पादन गर्दा Ao size को Scanner प्रयोग गरीMap Scan गर्ने र Perfect Georeferencing भएपछि मात्र Digitization गरि geodatabase तयार गर्नु पर्नेछ । डिजिटल प्रविधिबाट सेवा प्रवाह गरेका कार्यालयहरुले मासिक रुपमा डाटा व्याकअप गरि राख्नु पर्नेछ र त्रैमासिक रुपमा सो डाटाको व्याकअप विभागमा पठाउनु पर्नेछ ।

Database Update and Maintenance of digital data

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

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.

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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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 Co-operatives 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.

Cadastral organizations and their roles 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 to 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 surveing 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.

Cadastral organizations and their roles in Nepal

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

Cadastral organizations and their roles in Nepal

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 कार्यालयहरुले निकायहरुबाट प्राप्त हुने नक्सा, फिल्डबुक (क्षेत्रीय किताव) र कित्ता श्रेस्ता (प्लट रजिष्टर) हरुको संग्रह गरी राख्नु पर्दछ ।
- नापी कार्यालयले जिल्लाभरीको नक्सा, फिल्डबुक, कित्ता श्रेस्ताहरु (प्लटरजिष्ट्रर) को संरक्षण तथा सम्वर्धन गरी क्रमवद्ध तरिकाले चाहेको अवस्थामा उपलव्ध हुन सक्ने गरी ननासिने , नविग्रने गरी सुरक्षित साथ राख्नु पर्दछ ।
- मालपोत कार्यालयबाट पारित लिखत, राजिनामा, बक्सपत्र आदिबाट हक हस्तान्तरण हुने कार्य र हक बेहकमा मुद्धा 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 अध्याबधिक राख्नु पर्दछ ।
- प्राविधिक कामको जिम्मा लिई स्वच्छ जग्गा प्रशासनको कार्यमा सम्वन्धित मालपोत कार्यालयलाई आवश्यक सहयोग उपलव्ध 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 वकस पत्र अंश वण्डा, नामसारी, अदालती फैसला, अधिग्रहण, प्राकृतिक प्रकोप आदी कारणले गर्दा जग्गाको स्वामित्वमा आंशिक रुपमा परिवर्तन हुने भएमा नापी कार्यालयको तर्फवाट कित्ताकाट गर्नु पर्ने हुँदा यस्तो अवस्थामा . कित्ताकाट गर्नु पर्ने कित्ता नम्वर, क्षेत्रफल र तर्फ समेत खुलेको लिखत सम्वन्धित मालपोत कार्यालयवाट 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 वनाउने ।
- मालपोत कार्यालयवाट प्राप्त लिखत वमोजिम कित्ताकाट गरी, दुई प्रति कित्ता काट ट्रेस तयारगरी मालपोत कार्यालयमा पठाउने ॥
- अदालत, मालपोत कार्यालय जस्ता निकायहरुवाट कित्ताको लम्वाई चौडाई खुलाउन माग भएमा नक्साको कित्ता भित्र दूरी अंकित गरी पठाउने ।

Cadastral organizations and their roles in Nepal

2. Department of Land Management and Archieve (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 help increase 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.

Cadastral organizations and their roles in Nepal

2. Department of Land Management and Archieve (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 Archieve (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 कार्यप्रगति 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 Archieve (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 ।

Cadastral organizations and their roles in Nepal

3. National Land Commission

- भूमि सम्बन्धी ऐन, २०२१ 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 2078 प्रकाशित भएके छ।
- गठन आदेश अनुसार अध्यक्ष, उपाध्यक्ष सहित ९ सदस्यीय राष्ट्रिय भूमि आयोग गठन हुने व्यवस्था रहेको छ। आयोगको काम, कारबाहीलाइ 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 गर्न योगदान गर्ने ।

Cadastral organizations and their roles in Nepal

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.

Cadastral organizations and their roles in 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, motor vehicle tax), land revenue collection.

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 हुनेछः–

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 बस्ती विकासका कार्यक्रमको तर्जुमा र कार्यान्वयन, एकीकृत बस्ती विकासका लागि जग्गाको एकीकरण तथा जग्गा विकास र व्यवस्थापन,

(३) स्थानीयस्तरमा अव्यवस्थित बसोबास व्यवस्थापन ।

Cadastral organizations and their roles in Nepal

Local Authority

Some of the tasks of local government are:

ढ. जग्गा धनी दर्ता प्रमाणपुर्जा वितरण

(१) स्थानीय जग्गाको नाप नक्सा, कित्ताकाट, हालसाविक, रजिष्ट्रेशन नामसारी तथा दाखिल खारेज,

(२) जग्गा धनी दर्ता प्रमाणपुर्जा वितरण तथा लगत व्यवस्थापन,

(३) भूमिको वर्गीकरण अनुसारको लगत,

(४) सार्वजनिक प्रयोजनका लागि जग्गा प्राप्ति, मुआब्जा निर्धारण तथा वितरणमा समन्वय र सहजीकरण,

(५) नापी नक्सा तथा जग्गाको स्वामित्व निर्धारण कार्यमा समन्वय र सहजीकरण,

(६) जग्गा धनी दर्ता प्रमाणपुर्जा वितरण सम्बन्धी अन्य कार्य ।

Assignment

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

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References:

CADASTRAL SURVEYING

EG3103GE

Unit 10. Modern Cadastre: example of developed cadastre

Public Secondary School

Lecture by

Er. Keshav Raj Bhusal

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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 practise 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".

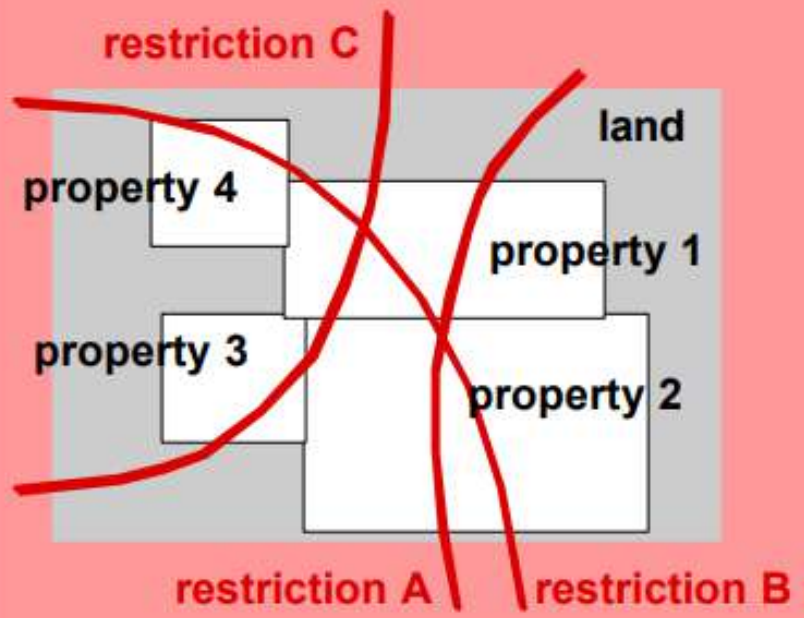
- The concept of this vision is that, by 2014 all the detail information regarding land should be visualized by the cadastre.
- Since, the world population and the consumption of land is increasing and hence to ensure the security for having lands, all facts related to land should be clearly realized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



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)

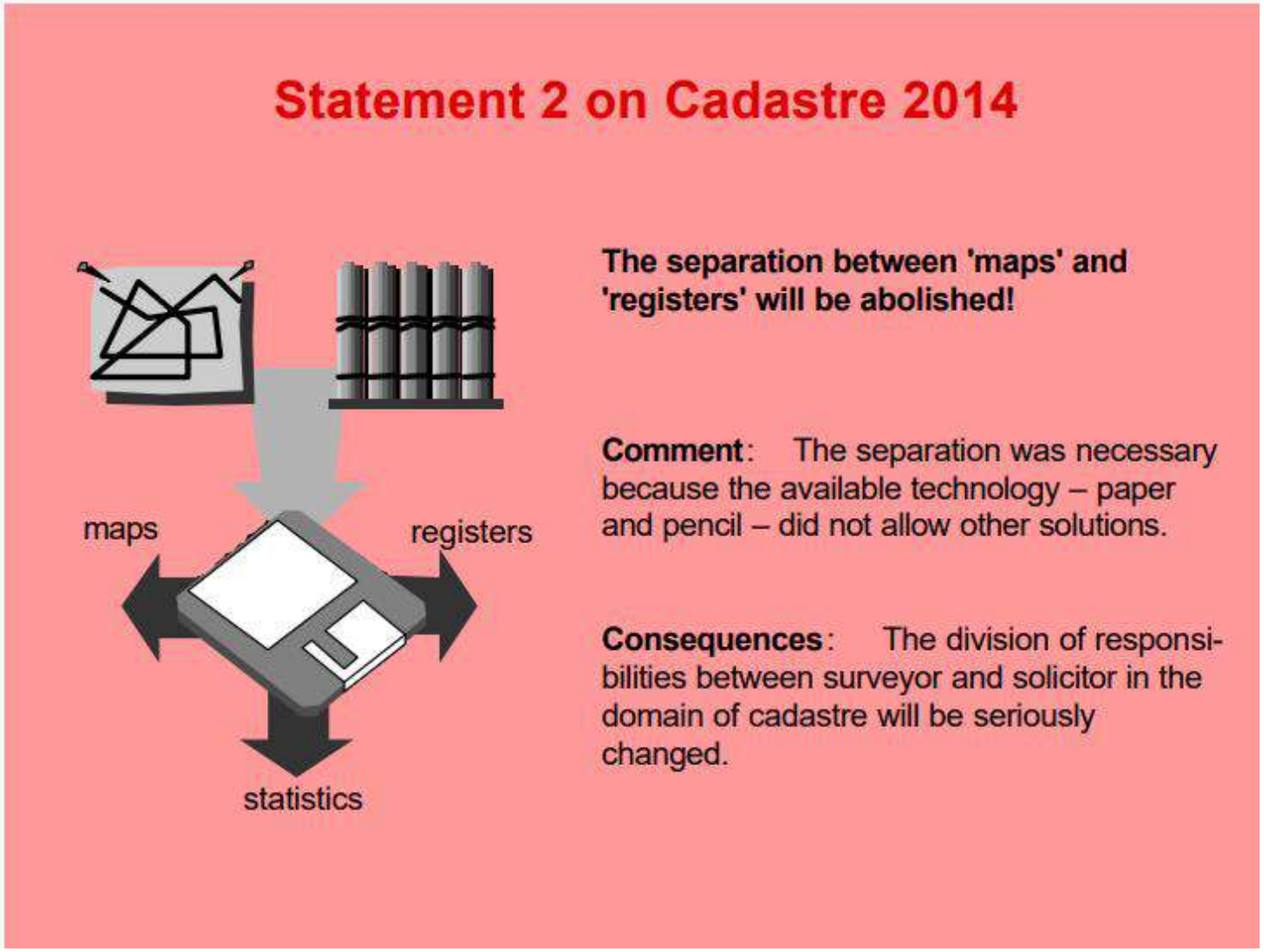
Cadastre vision 2014

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".



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

Cadastre vision 2014

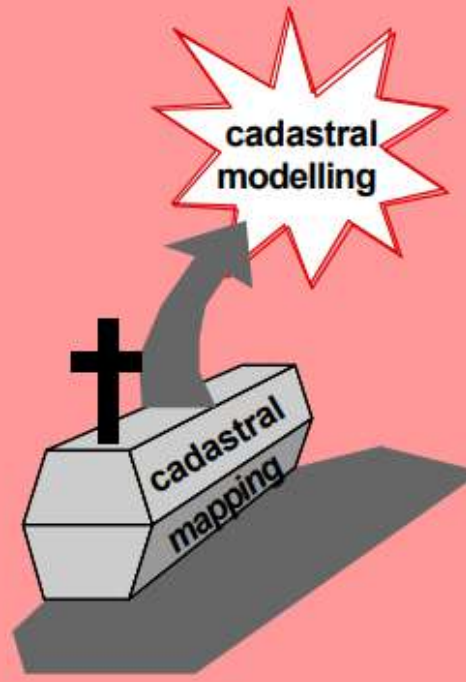
Vision III: "The cadastral mapping will be dead! Long live modeling!"

- 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 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

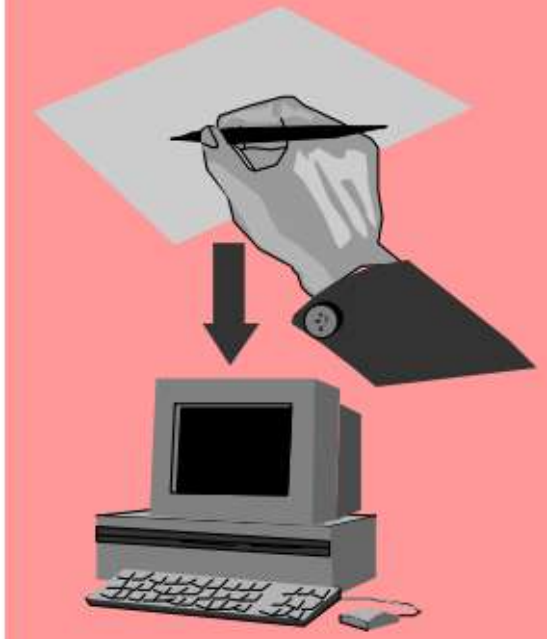
Vision IV: "Paper and pencil-cadastre will have gone".

- 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.

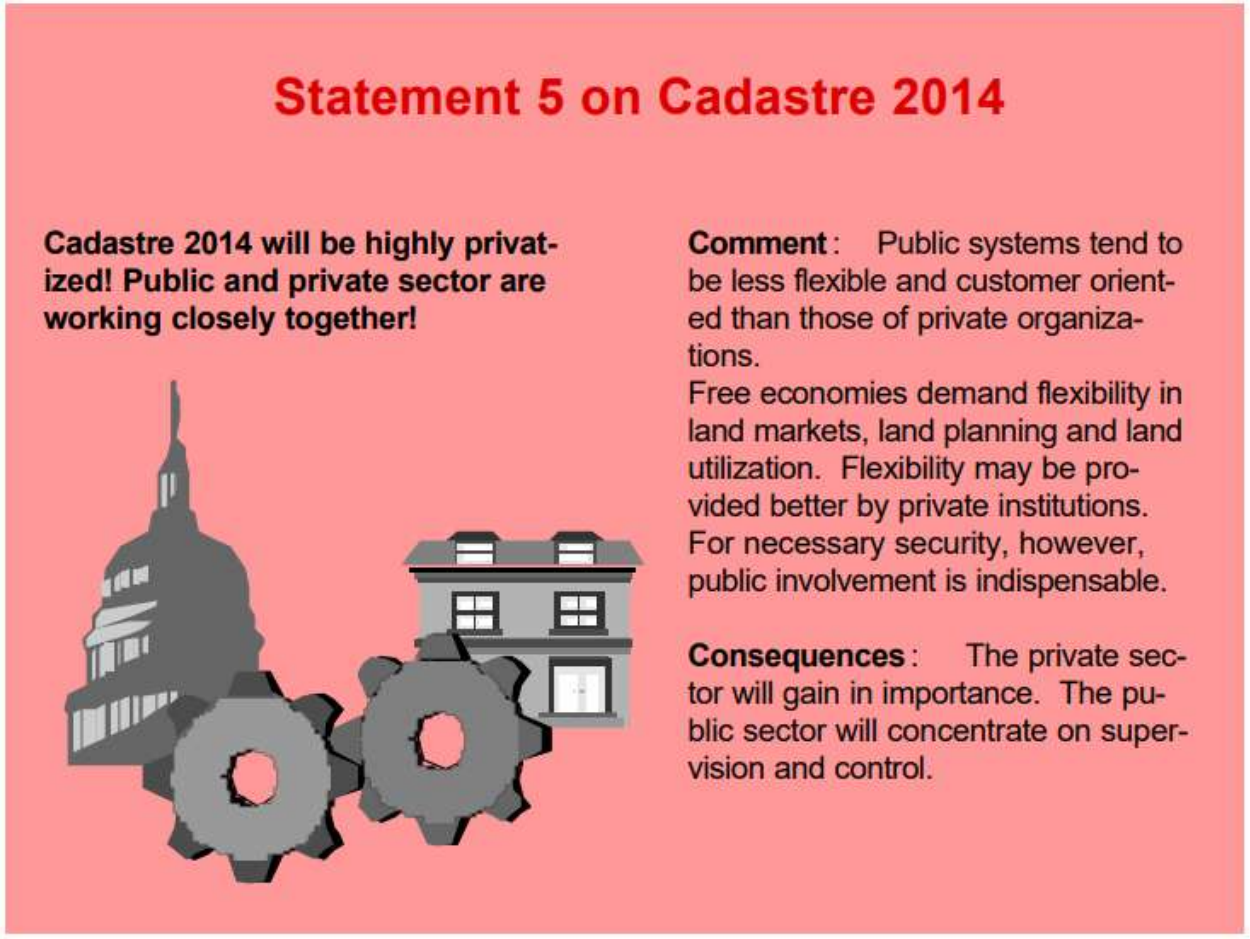
Consequences: The modern cadastre has to provide the basic data model. Surveyors all over the world must be able to think in models and to apply modern technology to handle such models.

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 me 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.



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

Cadastre vision 2014

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

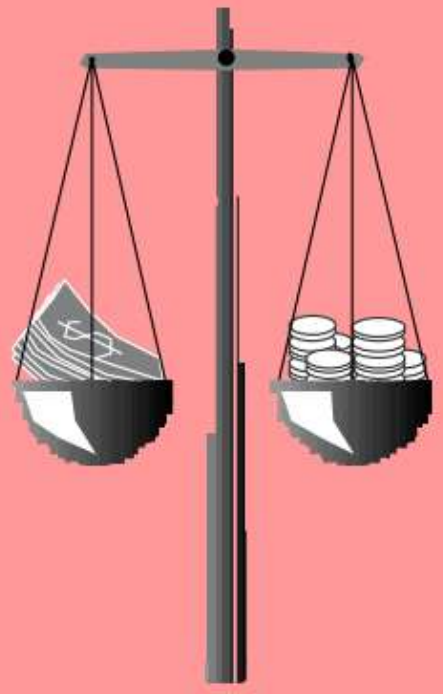
- There is a huge difference between the total sum of the cost for land tax and land administration service and the cost of cadastral data acquisition.
- The concept of this vision is that, at least a part of costs necessary for the cadastral data acquisition and processes must be taken back from the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

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 six 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.
6. Inclusion in property interests, now designed around strict bearings and distances or Cartesian coordinates, of modelled organic natural environment by enabling fuzzy and dynamic boundary definitions.

10.2 Cadastral system around the world

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 sevice.

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.

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):

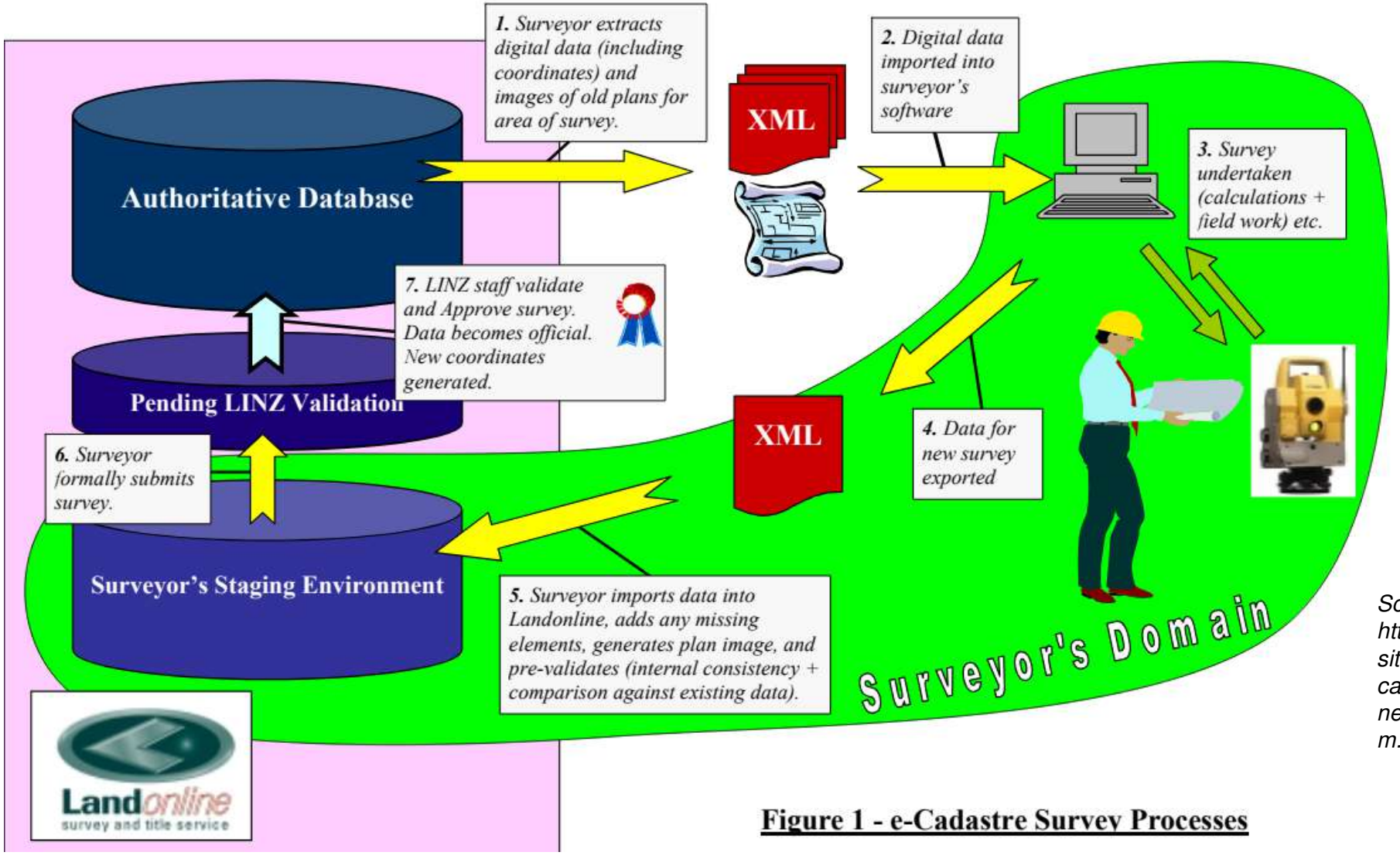


Figure 1 - e-Cadastre Survey Processes

Source: https://www.linz.govt.nz/sites/default/files/cust/e-cadastreautomationofthenewzealandsurveysystem.pdf

10.2 Cadastral system around the world

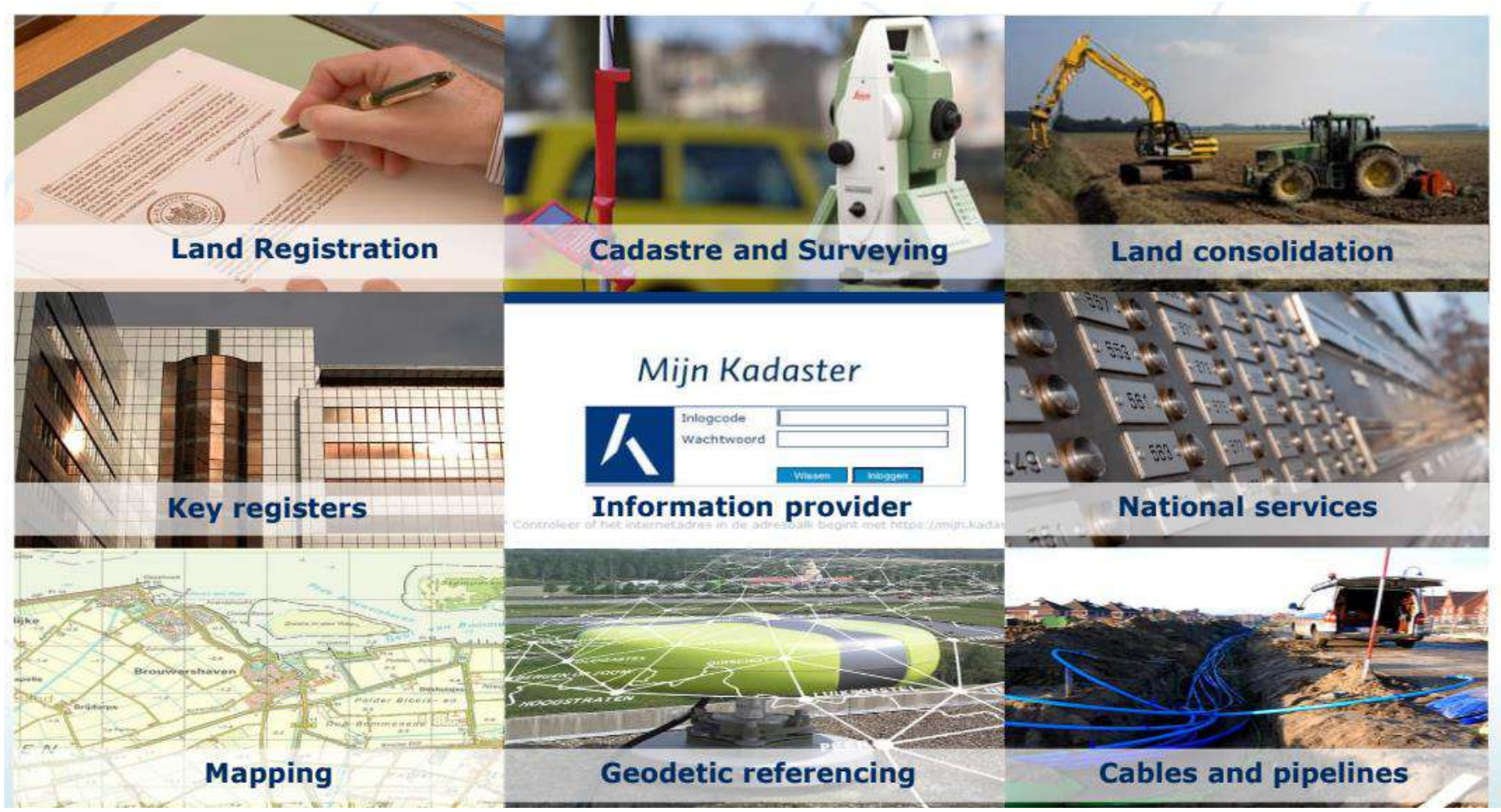
Kadaster

- 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 it's 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

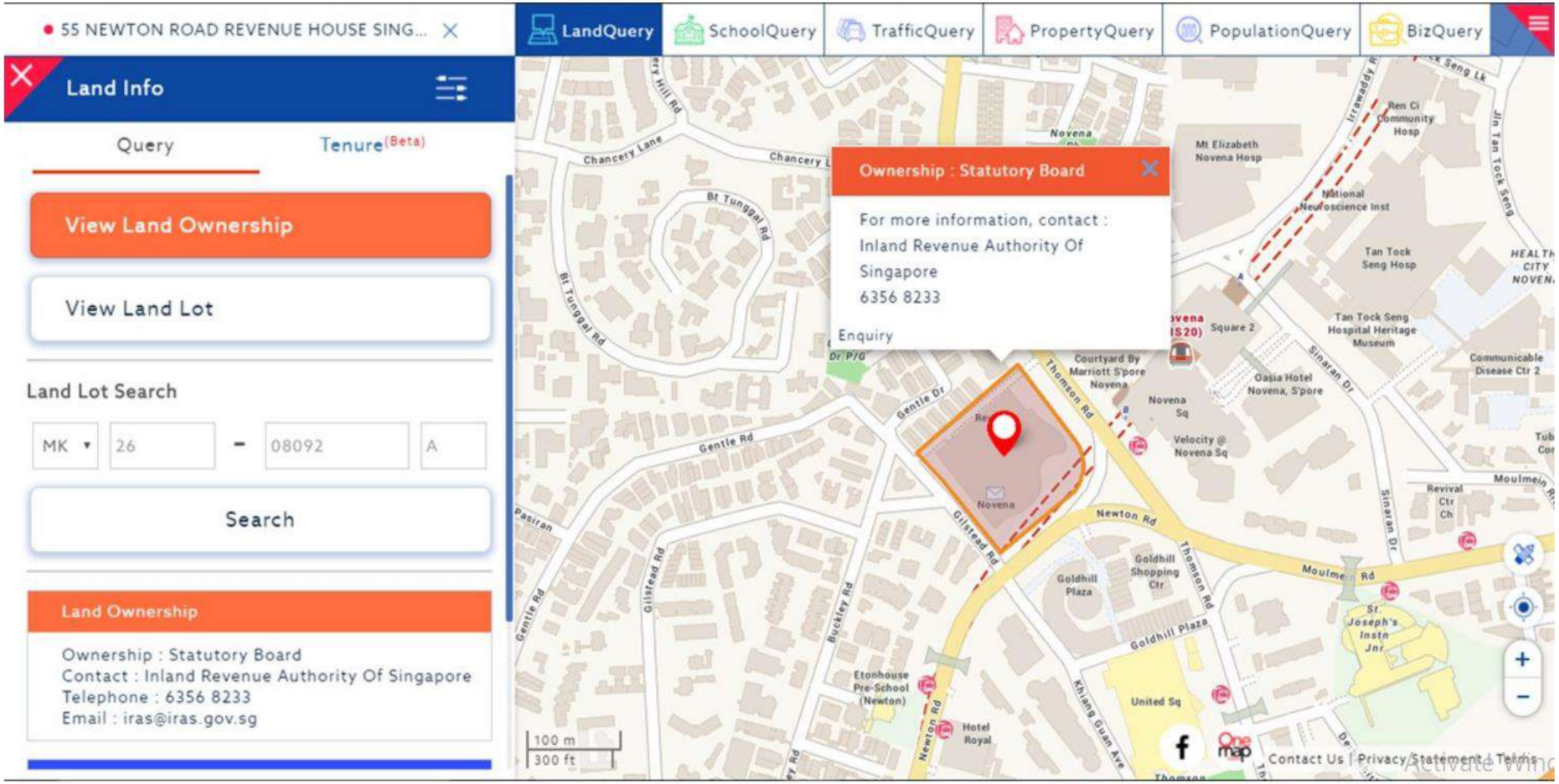
- It is the authoritative national map of Singapore with the most detailed and timely updated information developed by the Singapore Land Authority.
- OneMap can be used to obtain street-level geospatial information, or narrowed to specific query such as land ownership, the nearest schools and demographic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



Find land ownership and land lot number with LandQuery

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

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

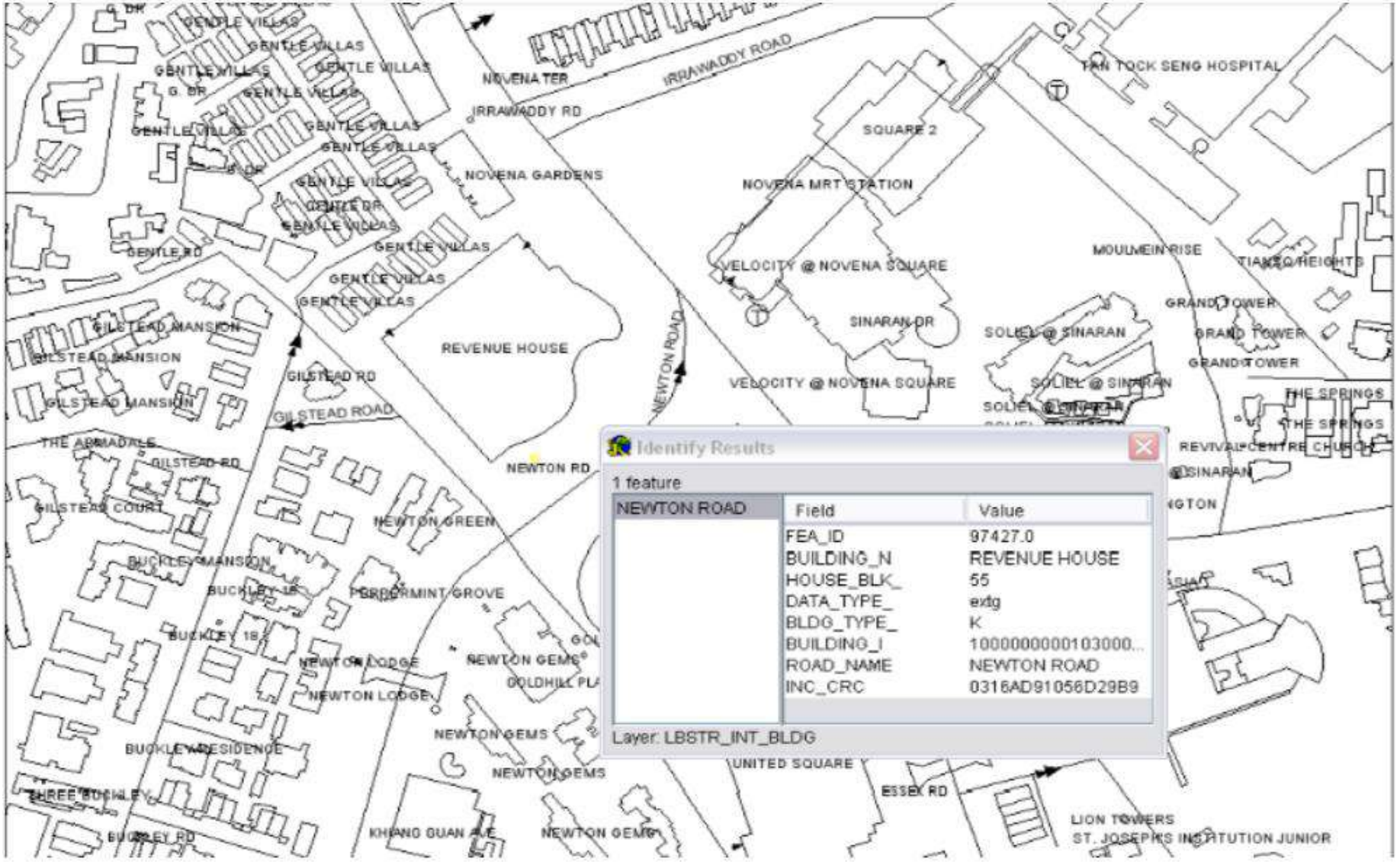


Fig: showing street level data service provided through SLA.

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

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