World of Work

Student Handbook

Volume II:

Mapping and Visual Representation Cluster

Module 1: Mapping and Visual Representation

Module 2 : Geographic Information System (GIS)

Module 3: Urban Planning

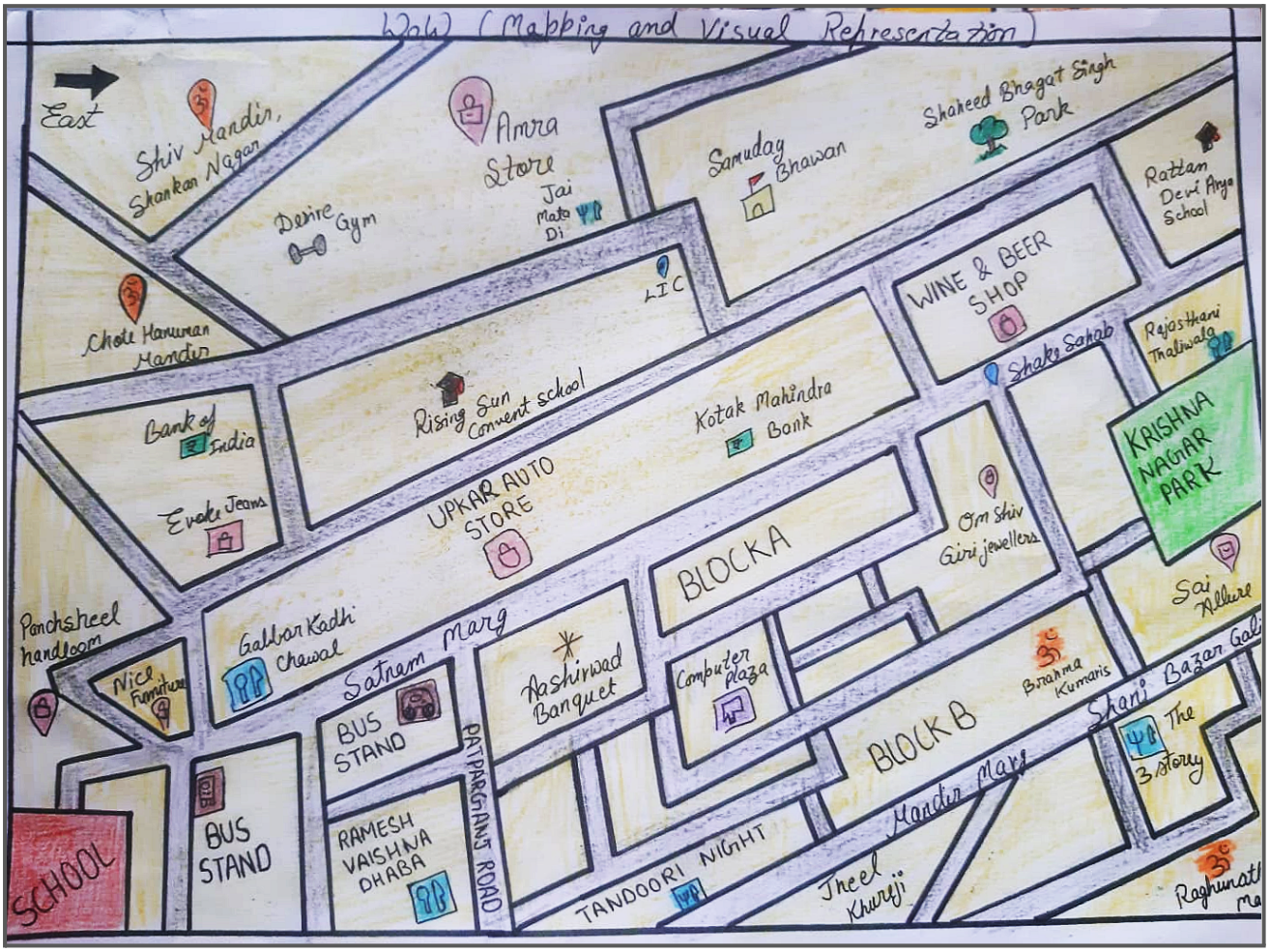

Image showing neighbourhood map submitted by one of the students' groups as part of the project

Led by

World of Work Grade 9 & 10 is a specialised subject in the School of Specialised Excellence, Delhi Board of School Education, designed by **Centre of Excellence in Teacher Education, Tata Institute of Social Sciences (TISS), Mumbai.** The course aims to introduce students to the world of work and develop skills and perspectives through enquiry, projects, and interactions with industry experts. The full set of course material includes lesson plans, teacher professional development guides, students' and teachers' handbooks, and assessments.

Schools of Specialised Excellence are choice-based schools for grades 9 to 12 that allow students to specialise in their chosen fields of study. The Government of NCT of Delhi established Specialised Excellence in 2021 in order to cater to students who have a demonstrated interest and aptitude in specific domains. Schools of Specialised Excellence are affiliated to the Delhi Board of School Education (DBSE). They are designed as per the philosophy of DBSE that centers around moving away from rote memorisation through integrating assessment into the everyday practice of teaching-learning and using assessments for learning rather than restricting them to only being assessments of learning.

The Centre of Excellence in Teacher Education (CETE) at the Tata Institute of Social Sciences Mumbai (http://bit.ly/cetewebsite) aims to enable Right to Quality Education for all children in India by enabling teachers to respond to diverse and changing needs. Built around the central premise that professional qualified teachers can create lasting impact. The Centre focusses on empowering teachers, improving professional development standards, supporting teachers' education ecosystem and advocating to strengthen policy on teaching and teacher education.

Research at the Centre is on themes of quality in teaching, policy and scaling innovations inclusion, curriculum and pedagogy and Ed Tech. Academic teaching programmes include BEd-MEd (Integrated), MA Education, MA Education (Elementary), MA Education and Technology, doctoral research, short term programmes through blended learning and online offerings to enhance capabilities of teachers and teacher education faculty (www.tissx.tiss.edu). Key field action projects are focussed on improving inclusive teaching learning at schools and employing technology thoughtfully in professional development of teachers. The Connected Learning Initiative (www.tiss.clix.edu) was awarded the UNESCO-King Hamad Prize for the use of ICTs in Education in 2018. CETE received seed support from the Pandit Madan Mohan Malaviya National Mission on Teachers and Teaching. Government of India and TATA TRUSTS.

As knowledge partner of the DBSE for the Schools of Specialised Excellence, the CETE has developed the following six clusters of modules for Grade 9th and 10th specialised subject "World of Work". Each cluster comprises a skill/perspective building module and two/one career modules, detailed in a teacher handbook with an accompanying student handbook.

Student and Teacher Handbooks:
Volume I: Transmedia Storytelling Cluster: Transmedia Storytelling, Journalism, and Content Creation
Volume II: Mapping and Visual Representation Cluster: Mapping and Visual Representation, Geographic Information System (GIS) Analyst, and Urban Planning
Volume III: Working with People and Communities Cluster: Working with People and Communities, and Social Work
Volume IV: Enabling Learning Cluster: Enabling Learning, and Teaching
Volume V: Justice and Constitution Cluster: Justice and Constitution, Lawyering, and Public Policy
Volume VI: Research and Critical Thinking Cluster: Research and Critical Thinking, Academic Research, and Marketing Research

World of Work Core team
Lead: Prof. Padma M. Sarangapani
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With inputs from Bhavishyath Counselling
(For the course development team of the modules, please refer to the respective handbooks)

2022-23

Photo Credits for cover page: Artefact created by a student in the module

World of Work

Student Handbook

Mapping and Visual Representation

This handbook belongs to:

Name: _____

Class: _____

Section: _____

Index

Introduction

I.I World of Work

One of the components of the vision for Schools of Specialised Excellence (SoSE) is increasing exposure of students to careers and the world of work. However, career domains today are not straightforward and are becoming exceedingly integrated. Students require a multidimensional and interdisciplinary approach. Separately, the best education globally offers students abundant opportunities for project-based learning, development of higher-order thinking skills and development of soft skills.

The World of Work (WOW) course aims to address all the above requirements during the 9th and 10th grades for the SoSE schools of the Humanities stream. The course is designed as a series of 1 month (16 classroom hours) 'taster' modules that explore different skills and careers in the humanities and social sciences. The modules are designed as a skill module, paired with career modules. Skill modules address a workplace skill that has wide applicability across a range of careers. Each skill module is followed by 2 career modules which are strongly associated with the skill and which develop further on the skill. For example, the Transmedia Storytelling module is followed by Journalism and Content Creation as career modules. Each module is a 16 hour exploration and is delivered via discussions, expert guest speakers ('masterclasses'), digital content, field visits, projects and assignments. These modules are critical in enabling SoSE students to make informed choices and prepare in advance to succeed in their chosen career pathways.

Students learn in various ways in the World of Work course. In developing the modules a priority has been to provide interesting and vivid teaching material including videos and presentations. Classroom discussions are an important part of the session and students learn from each other as well as develop their confidence and spoken communication. Expert guest speakers and field visits offer rare and privileged opportunities to experience a profession. Assignments and project work take them out of the classroom to engage with the environment they live in. These also demand developing time management, creativity, working collaboratively and good presentation skills. All this nurtures students for all round development and at the same time sets them up for success in their chosen area of specialisation.

The role of the teacher in the World of Work is both challenging and rewarding, offering exciting opportunities for professional growth. While teachers may not be subject matter experts, their extensive training positions them as facilitators of student learning. Embracing this role involves stretching boundaries to familiarize themselves with a diverse array of skills and careers within the course. Engaging students in group and individual projects is a key component, requiring teachers to develop new skills in project facilitation and navigate the inherent ambiguity in project evaluation. Classroom discussions, another vital aspect of the course, demand adaptability to various formats.

This journey may necessitate teachers to step out of their comfort zones, letting go of traditional teaching methods in favor of innovative approaches—a humbling yet enriching experience. This presents an opportunity for teachers to explore new content areas and methodologies that can greatly benefit both them and their students. The true rewards lie in witnessing tangible growth and development in students, particularly in areas such as confidence, presentation, and communication. Simultaneously, teachers can anticipate significant personal and professional growth, making the journey in the World of Work an exciting and fulfilling one.

Assessment is an important part of the World of Work. The course is meant to be rigorous and not limited to the level of awareness-raising or exposure. The course delivers specific skills and concepts that the students are expected to understand, internalize and apply. The assessment framework has components of “Knowledge and Understanding”, “Inquiry and Exploration”, “Critical Thinking and Decision Making” and “Presentation and Communication”. Assessment of each module of WOW will draw from the above set of components and be tailored to the module. Internal assessment of the modules will be usually through the module project, while the summative assessment could be through a variety of formats including mini-project or different types of sit-down exams.

I.II Overview of the Curriculum

The World of Work course is designed as a series of 1 month (16 classroom hours) ‘taster’ modules that explore different skills and careers in the humanities and social sciences. The modules are designed as a skill module that is paired with one or more career modules. Skill modules address a workplace skill that has wide applicability across a range of careers. Each skill module is followed by 2 career modules which are strongly associated with the skill and which develop further on the skill. For example, the Transmedia Storytelling module is followed by Journalism and Content Creation as career modules.

The following table gives the full list of modules that will run in the World of Work curriculum.

Skill Area	Career Pathway 1	Career Pathway 2
Transmedia Storytelling	Journalism	Content Creation
Mapping and Visualization	Geographic Information System (GIS) Analyst	Urban Planning
Working with people and communities	Social Work	
Enabling Learning	Teaching	
Justice and Constitution	Lawyering	Public Policy
Research and Critical Thinking	Academic Research	Marketing Research

The first 3 rows show the modules that run in 9th Grade and the next three rows the modules that run in 10th grade.

Below shows the classroom time allocation for the modules and the number of instructional days they will run over.

S.No.	Modules	Suggested time allocation/Instructional days
Grade 9		
1	Unit 1: Transmedia Storytelling	16 hours/12 days
2	Unit 2: Journalism	16 hours/12 days
3	Unit 3: Content Creation	16 hours/12 days
4	Unit 4: Mapping & Visual Representation	16 hours/12 days
5	Unit 5: Geographic Information System (GIS) Analyst	16 hours/12 days
6	Unit 6: Urban Planning	16 hours/12 days
7	Unit 7: Working with People & Community	12 hours/ 9 days
8	Unit 8: Social Work	12 hours/9 days
Grade 10		
9	Unit 9: Enabling Learning	12 hours/ 9 days
10	Unit 10: Teaching	12 hours/ 9 days
11	Unit 11: Justice and Constitution	16 hours/12 days
12	Unit 12: Lawyering	16 hours/12 days
13	Unit 13: Public Policy	16 hours/12 days
14	Unit 14: Research and Critical Thinking	16 hours /12 days
15	Unit 15: Academic Research	16 hours/12 days
16	Unit 16: Marketing Research	16 hours /12 days

Note the exceptions to the standard format: In two skill areas, “Working With People and Communities” and “Enabling Learning”, there is a single career module associated with the skill module. In these two cases, the Skill module runs for 3 weeks and the career module for three weeks. In these cases, the skill and career modules are tightly integrated rather than running as individual modules.

I.III Objectives of the curriculum

- To give the students a very wide area of exploration that leaves them with an understanding of the world of work at large. They are also shown interconnections between modules and clusters and realize the interdisciplinarity of the world of work.
- To develop a range of skills (the skills of the skill modules) that will continue to be useful to students in their future irrespective of the specific career path they choose.
- To give the students sufficient information and engagement with skills, careers and workplaces so that they can start a deeper process of focussed exploration in skills and professions as designed for the 11th & 12th grades. In a few cases, the students will have gained enough clarity from the course that they will make a decision on their own about their career goal and independently plan and work towards reaching it.
- To develop their ability to do independent work and thinking, to deliver projects, and work collaboratively.
- To develop skills of critical thinking and creativity.
- To enhance students' presentation skills in different modes and media.

I.IV Curriculum Framework

The course consists of a sequence of skill and career modules. These modules are grouped into related clusters. A cluster will contain a skill module and 2 (or 1) related career modules.

A skill module introduces the students to a particular skill or skill area that is widely required for many careers. In this course the students are introduced to 5 skill areas in the Social Sciences and Humanities which gives them a good range of knowledge. By practicing these skills, students develop themselves with a wide range of skills. Simultaneously they have the opportunity to find out if they have an aptitude for or interest in that skill. Discovering such interest and aptitude can be an enormous boon to the student - if they find a niche they are happy with, they start exploring and developing on their own and the future unfolds with ease and fulfillment. While it is not possible to develop a skill in-depth in the time available, the engagement with the skill does result in concrete learning outcomes.

Career Modules explore a career that is strongly connected to the skill in that cluster. Career modules explore the career from multiple perspectives:

Skills: The career module builds on the work done in the skill module to develop the skill further in the context of the particular career. For example the Journalism career module will take storytelling to the context of Journalism.

Career Roadmap: The career module will talk about way to join that career ie. what subjects to choose for 11th & 12th grades, what degree courses are appropriate, what are the premier colleges, what communities of practice exist, relevant skills to develop etc.

'A Day in the Life': The career module also gives students an idea of what work in that career looks like. Practitioner interactions are a very effective way to do this.

Is this for me?': The various interactions and experiences of the career module helps the student build some evidence for whether this is the direction they want to take. The intention is not however that the student should decide by the end of 10th grade.

Career modules will have sub-areas or may cover a career *area*. For example, Content Creation is a career area which covers careers in Graphic Design, Content Writing, Film-making and more. Journalism is considered a career, but there are a wide range of sub-options by media and types of writing eg. news reporting, news analysis, photography, video journalism etc.

I.V About this handbook

This Handbook is written to provide the students with all information, support, and guidance they need as they work through World of Work modules. It guides you through the "Mapping and Visual Representation" skill module, "Geographic Information System (GIS) Analyst," and "Urban Planning" career modules under the Mapping and Visual Representation Cluster. It contains the handouts and worksheets that the students will use while going through the module.

Cluster II Module 1: Mapping and Visual Representation

Credits

Module Conceptualization, Authoring and TPD sessions:	Ms. Yemuna Sunny, Independent Consultant Dr. Anu Joy, Assistant Professor, TISS, Hyderabad Dr. M.B. Rajani, Associate Professor, NIAS, Bangalore
Research and Development of Lesson plans:	Ms. Karishma Modi, Senior Research Assistant, Dakshin Foundation
Research and Coordination:	Ms. Tanya Mittal, Program Manager, CETE, TISS, Mumbai

Student Planner

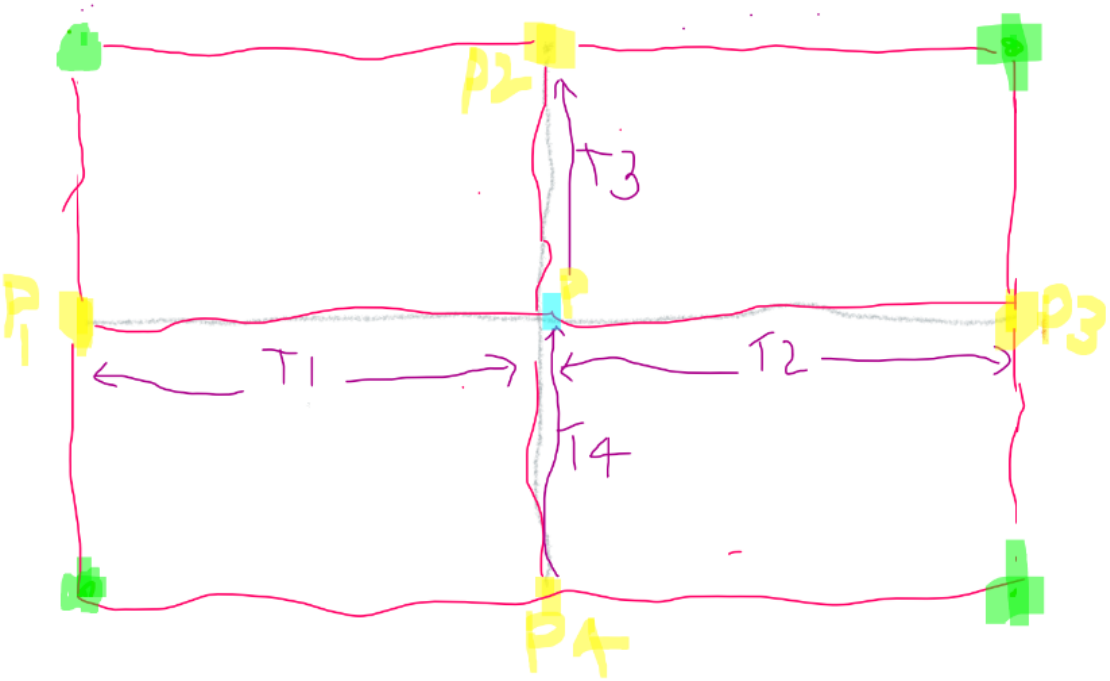
Session	Topic	Objectives and Description
Week 1		
Session 1	What is Mapping? Perspectives of mapping	1. Reading maps and map features 2. Understanding the concepts and techniques of map making 3. Creating a map of immediate surroundings and representing important geographical characteristics in it *In this session, we will discuss what are maps, different perspectives of mapping and mapping our familiar surroundings. We will learn about cardinal directions, coordinates and how to use a compass.*
Session 2	Creating map of local area	1. To understand usage of symbols, colors, legend, scale 2. To create maps of the local area and representing important spatial and geographical characteristics on it *In this session, we will be doing a field visit where you will go out in your school neighbourhood in groups and map an area of approx 800 square metres around the school.*
Session 3	Refining the maps	1. To examine features of the map made each group 2. To compare and contrast the map made by each group 3. To refine and improve the maps 4. To understand map as a tool for visualizations *In this session, we will come back and combine maps on a big chart. We will compare and contrast the maps, give feedback to each other and add more details and layers of information to improve the maps.*
Week 2		
Session 4	Aerial perspective of space	1. Identifying various features on satellite imagery 2. Understanding an aerial perspective of space, neighborhood 3. Understanding spatial relationships *In this session, we will explore the Google Earth Pro software and its different features. After that, you will- 1) identify various features on satellite images, 2) the difference between how things look from above versus from the ground, 3) the spatial relationships between them*

Session 5	Satellite images: their use in making maps	1. Understanding how digital maps are made: - satellite imaging - georeferencing - digitizing features from images 2. Making maps oneself 3. Measuring location, distance and area using digital maps *In this session, we will focus upon satellite images, georeferencing, and digitising the maps. You will explore how to digitize maps from images: maps of school neighbourhood, red fort etc., and measure locations, distances, and area using digital maps*
Session 6	Changes in landscape through the years	1. Understanding changes by examining maps of different dates/seasons/years 2. Major changes in the landscape (airport, dwarka area…etc) 3. Observing land use changes in neighbourhood and other places *In this session, we will focus on understanding the different changes that have taken place in different landscapes over the years. You will look at the changes that have taken place in your neighbourhood, familiar places in Delhi, and other places like Gangotri glaciers, Aral Sea Kazakhstan, on Google Earth Pro.*
Week 3		
Session 7	Varied Contexts of Mapping	1. Exposing students to a wide range of small area, community maps 2. Studying how contexts and objectives for map-making are very different from those of location-representation-scale 3. Exploring how layered spatial understandings reflect concrete life linkages to a place *In this session, we will explore maps of different communities, like maps created by Inuit community of Greenland, maps from Marshall Islands, Clay tablets of Nippur to understand how different contexts and objectives shape maps.*
Session 8	Mapping and colonialism	1. To recall the term “colonialism” and its significance 2. To briefly understand the changes brought on by colonial intentions in the processes and outcomes of mapping *In this session, we will discuss how geographical locations and landscapes of certain regions are beneficial, and may become the reasons for colonialism (coastal territories like Goa, Mahe and Puducherry). We will also discuss the impacts of colonialism, through exploring different maps and reading extracts of The surveying of the highlands of Tibet, Mongolia and Central Asia, and Aztec Migration Scrolls*

Session 9	Mapping people's articulations and planning	1. To understand mapping as articulated by people for planning 2. To examine some of the ways in which mapping is used as a form of resistance *In this session, we will explore the North Dakota protest against the crude oil pipeline and how the activists have established the Sacred Stone Camp in the path of the pipeline to halt its construction. We will also explore mapping of natural resources done by locals, and how it can be beneficial.*
Week 4		
Session 10	Thematic Maps	1. Defining and understanding thematic maps with specific reference to food diversity 2. Mapping global flows and link them to food security 3. Practising representation in the context of food maps *In this session, we will learn about thematic maps by exploring thematic maps of different cuisines, cereals, fisheries, and global flows of fruits like mangoes from different countries to India. We will also discuss food security as defined by United Nations' Committee on World Food Security (CFS) by examining the map showing poverty across the world.*
Session 11	Feedback on Local Area Maps	1. To reflect on the draft of the Neighbourhood maps which the students have made 2. To collaborate using discussion and to use learnings from the four weeks in the completion of Neighbourhood maps 3. To deepen the understanding of mapping and representation by providing opportunities to apply and engage with the content *In this session, we will focus upon providing feedback to each other on the neighbourhood maps, and incorporating them.*
Session 12	Culmination of Local Area Maps	1. To complete the Neighbourhood maps 2. To collaborate using discussion and positive feedback techniques to use learnings from the four weeks in the completion of Neighbourhood maps 3. To deepen the understanding of mapping and representation by providing opportunities to apply and engage with the content *In this session, we will be required to finalise the maps and present them in the class.*

Making the Neighbourhood Map

The plan is to make a map of around 800 sq.m area in the vicinity of the school.



The square represents an area of 800 sq. m. There are 4 transects marked as T1, T2, T3 and T4 which are each equal to 400 metres in length.

Students would be divided into four groups- A, B, C, D

Each group would have around 10 students.

Each group would be assigned sketching/mapping along one transect.

Deciding point P

But before beginning the task, the four groups would, with the help of the teacher, decide on the central point indicated with blue color. This point (P), mutually decided as one of the major points on ground, is the one from which all transects have a common beginning.

So, for group A- the transect chosen could be T1 that starts from P and ends in P1

for group B- the transect chosen could be T2 that starts from P and ends in P2

for group C- the transect chosen could be T3 that starts from P and ends in P3

for group D- the transect chosen could be T4 that starts from P and ends in P4

For details of activity, we here take group A for demonstration. The same sort of activity would be done by the other groups too in their transects:

Before setting out we need a plan. You would need sufficient papers, cardboards for supporting the paper as you draw on the field, pencils, rubber, compass.

Activity at point P

Group A first assembles in point P. Here they keep the paper on the ground and place the compass on top of it. Where does the compass show the north? Without removing the compass from the paper, mark that direction with an arrow using a pencil. Label 'N' to indicate north on the arrow as shown by the compass. Let the paper remain in that position. As you sketch, do not move the paper from that position.

Standing at P and facing the direction of P1, look on both sides.

On the left side- what all can you see? Make a list in your notebooks (each person to do it).

- You might see buildings, landforms, roads, rail lines, large trees, taps, wells, schools, hospitals, colleges, mohalla clinics, shopping areas, slums, water bodies and so on. - You can decide on a symbol for each. These could be either in the form of a picture or a letter like 'S' for shops.
- Decide which of these objects need to be sketched on your paper on which you have marked the north. That is the paper on which the whole group will work.
- How will you sketch? You will need to do some approximation because we are not actually going to measure the distances. Suppose you mark on your paper a faraway building- that is on the left side of P. For example, there could be a prominent tree that is halfway between the building and point P. So approximately halfway between the building and P you can give a symbol T on the paper.
- In your notebooks, write down the name of the objects and the symbol you have given. - Once you have sufficiently sketched the left side of the transect, do the same with the right side.
- You might want to talk to some people around, for instance what is the local name of a place like a dhobi ghat? Or does the vegetable market open every day of the week? What is the situation of water availability in the area?
- These conversations would need to be written down in your notebooks.

Walking along the transect

Now you are set to walk along the transect.

You will have to walk for 100 metres. You would need to decide how to approximate a length of 100 metres. Can you use the mobile phone for this purpose? Or can you make an estimate of how many foot paces would approximately make 100 metres? This is something the teacher and the students can collectively decide.

Once you have walked 100 metres, please stop. Keep your paper with a cardboard support on the ground. You have already marked north on your paper. Keep your compass on top of it. If the alignment is not the same, then slightly shift the paper from underneath so that the north shown by the compass aligns with the arrow that you had earlier marked on the paper to show north.

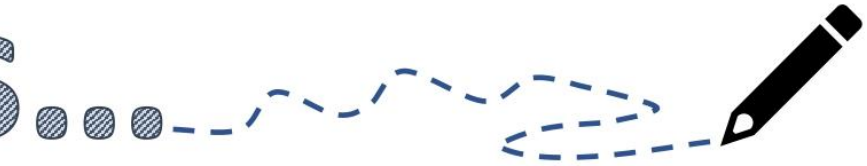
Repeat the sketching activity that you did at point P. You will need to measure 10 cm from P along the transect on the paper. Mark that as your new location. You will first identify objects to be marked on the left side, and make symbols. If you find a same object like a tree to be marked, please use

the same symbol that you did at P. Once you are done with the left side, do the same on the right side of the transect.

You will stop at every 100 metres, measure 10 cm ahead and mark the point on the line in the paper as your new location, and do the same sketching activity after setting the direction with the compass. At every point, different persons from the team can do the sketching, while others converse with people and make notes.

You have sketched along 5 points along the transect T1. You have successfully finished your sketching of the neighborhood along a transect. Keep all your papers, notebooks and so on carefully in the school. These will be required to do further activities in the proceeding weeks.

Activities...

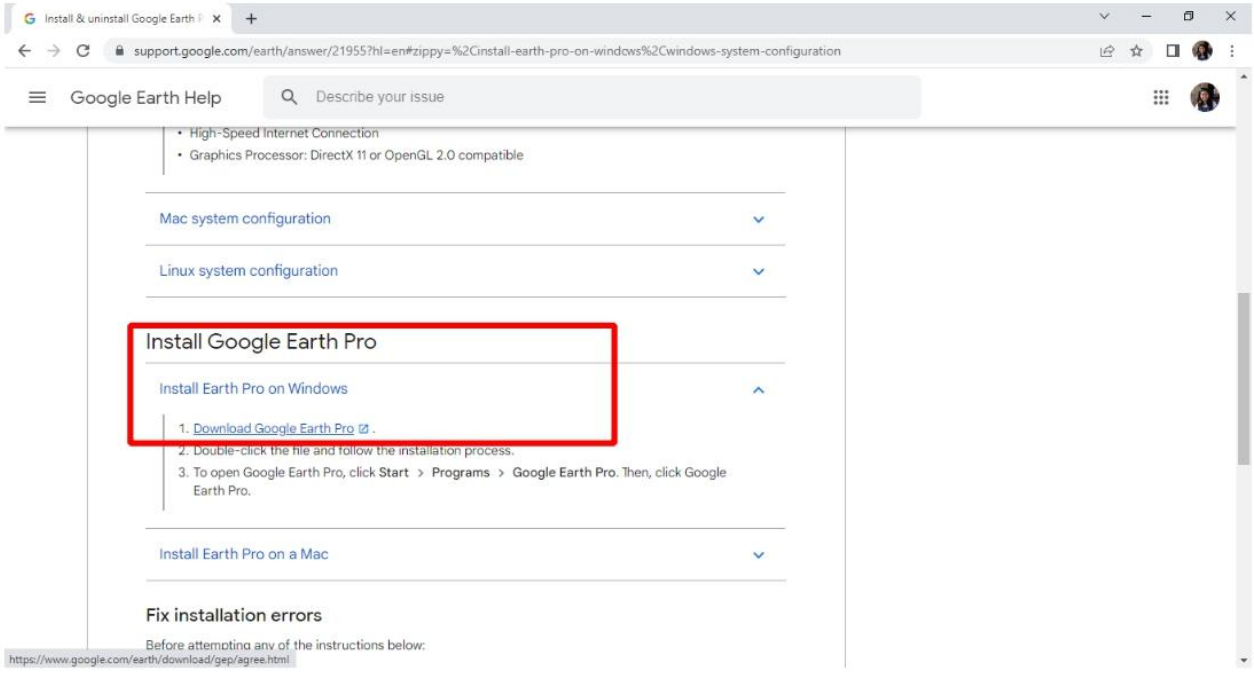


WEEK 2 (Day 4)

Mapping your neighborhood through digital maps

Objective: Understand Google Earth Interface; various features on satellite imagery; aerial perspective of space, neighbourhood and spatial relationships

Google Earth & its Interface



How to install Google Earth

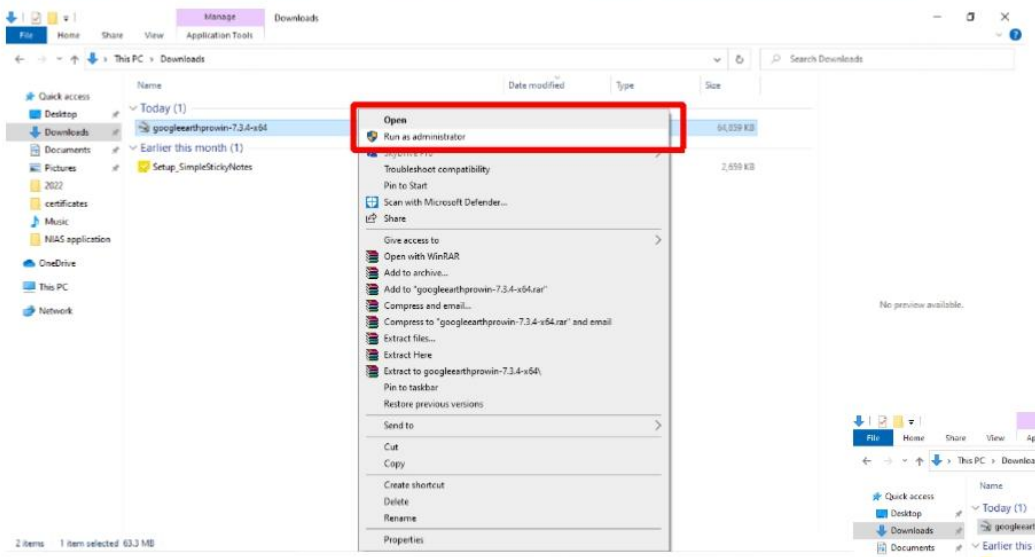
Step 01 Click on the following link-

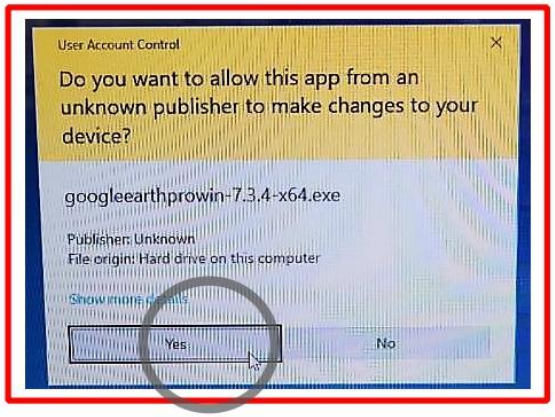
https://www.google.com/earth/versions/#download-pro

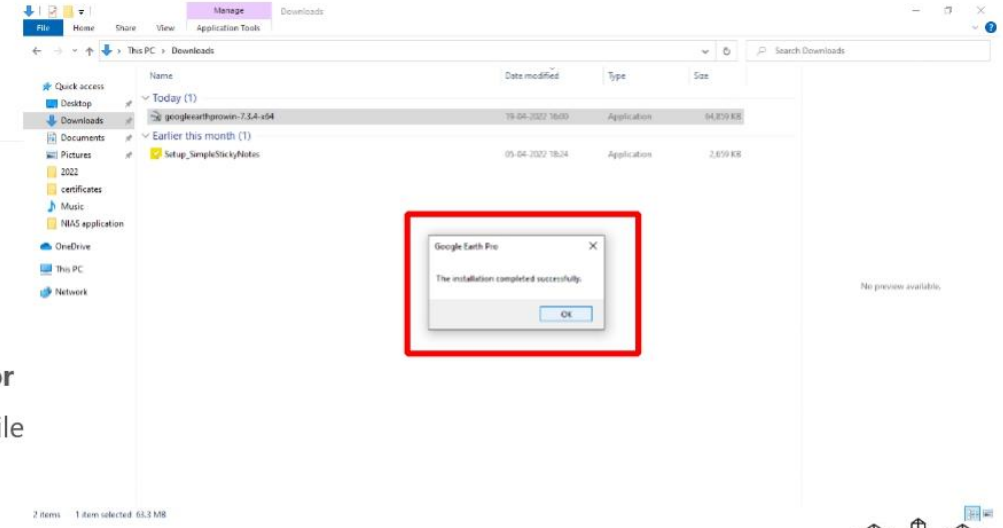
OR you can go to the **Google Earth Website**, to **download** the app

Step 02 **Install** the app after your download is complete.

Google Earth & its Interface





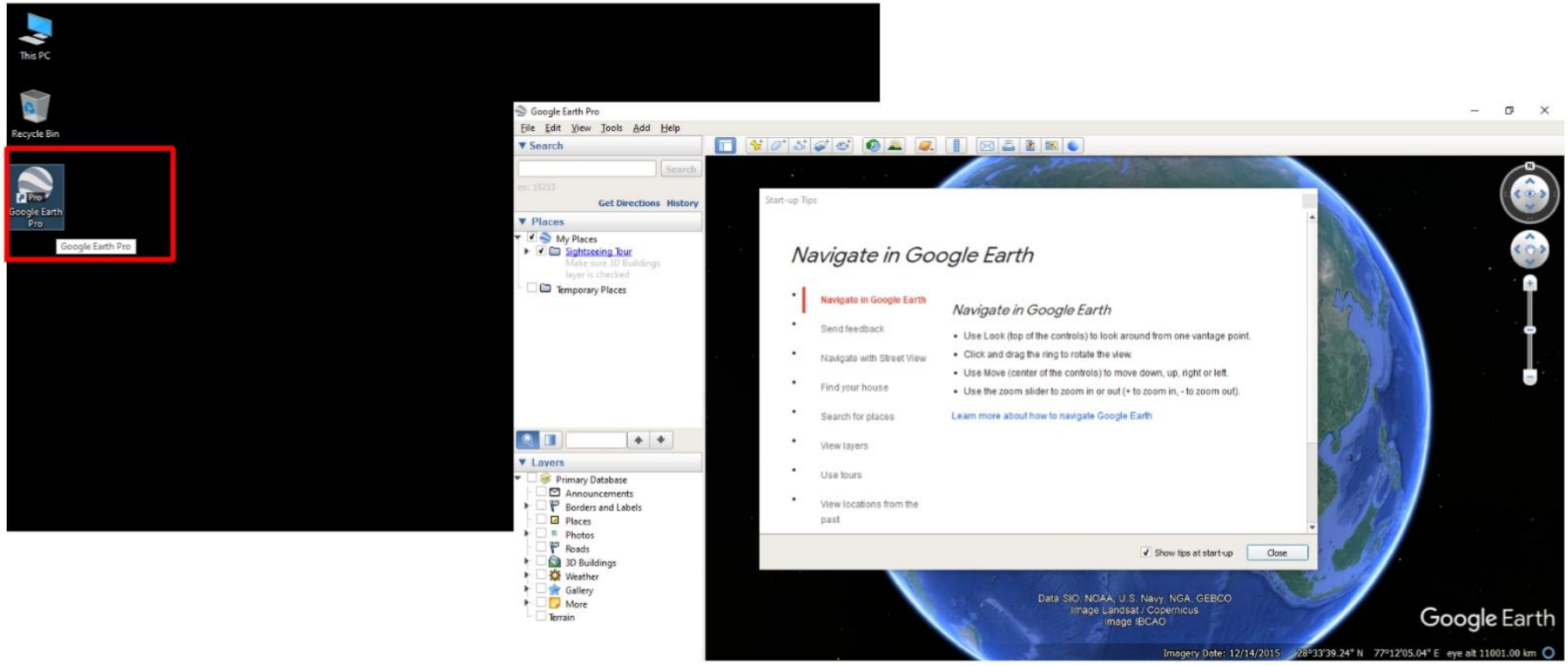


Step 03 **To install Google Earth**< **Go to** the folder where the installer is downloaded. In this case, it is the downloads folder.

Step 04 Right-click on the installer file< **Run as administrator** <Click-on **Yes** when a window prompts the installer file to make changes to your device.

Step 05 Once the installation is complete Click **OK**

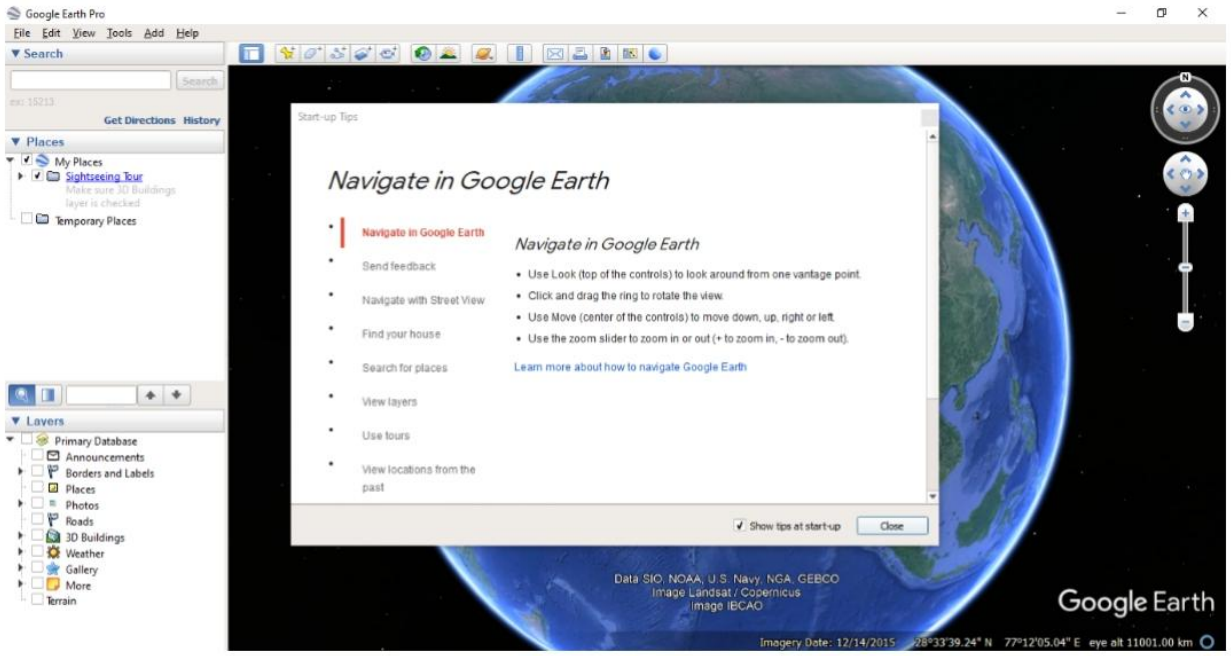
Google Earth & its Interface



Step 06 Open **Google Earth**

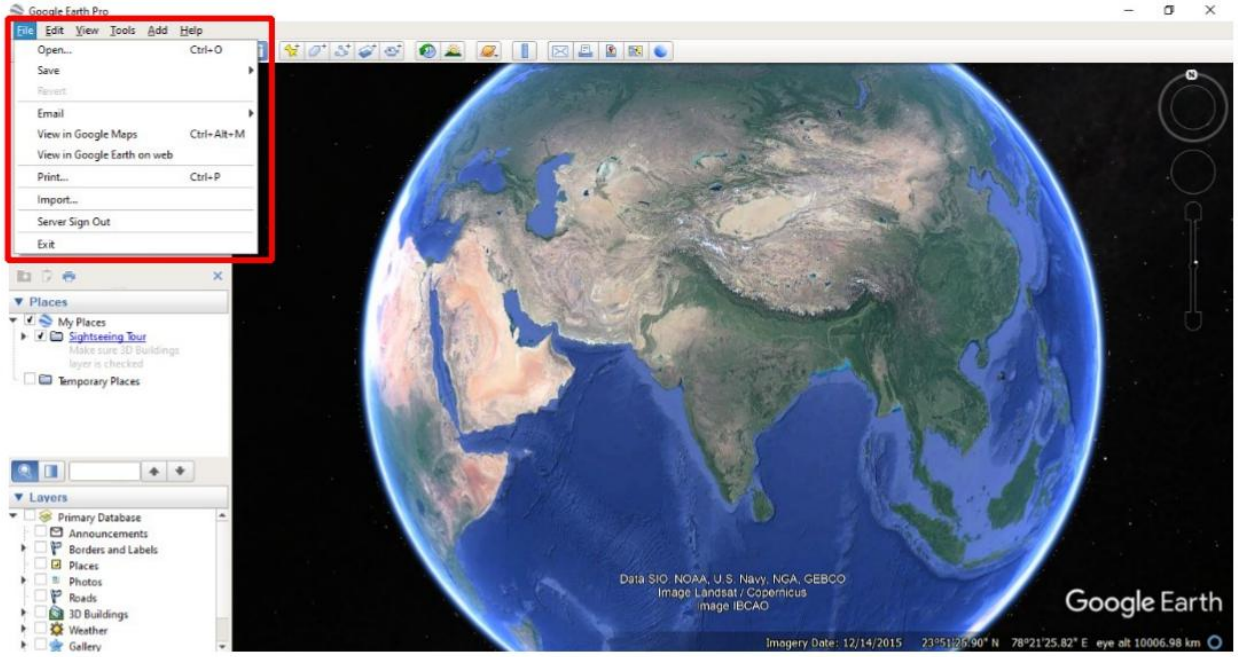
Step 07 You will now be able to see the Google Earth interface.

Google Earth & its Interface



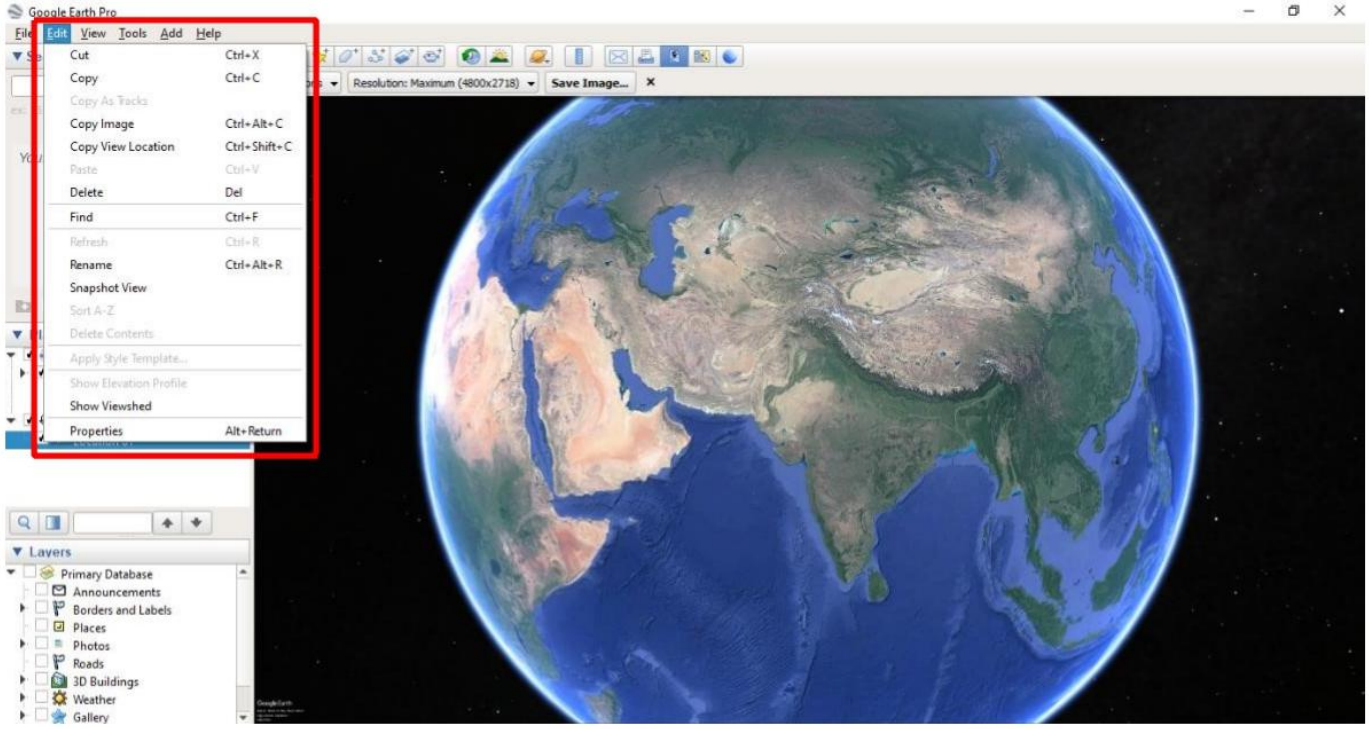
The central part of the workspace allows you to view the satellite imagery of the globe in detail; **the left panel** has the Search tab, **Places panel** and **Layers panel** that allows you to search and visualize locations that have been previously saved and related geographic information, respectively

Google Earth & its Interface



The **File tab** in the main toolbar has options to **Open, Save, Print** and **Import.** You also have options to view the same satellite images on **Google Maps and Google Earth on web**

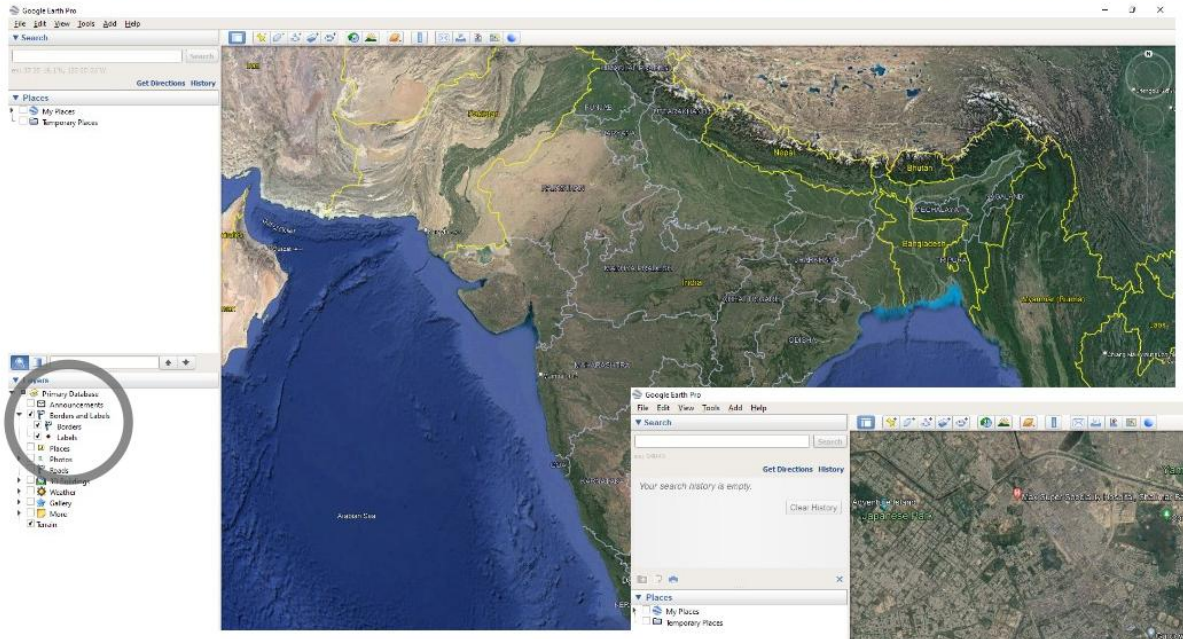
Google Earth & its Interface



The **Edit** tab in the top panel has options like **Cut, Copy, Paste,** and **Delete**. The **Copy** commands has options to **Copy as Tracks, Copy Image, Copy view location**, which allows to you to copy different types of data. There are other option to edit layer, such as, **Rename Show Viewshed** and **Properties.**

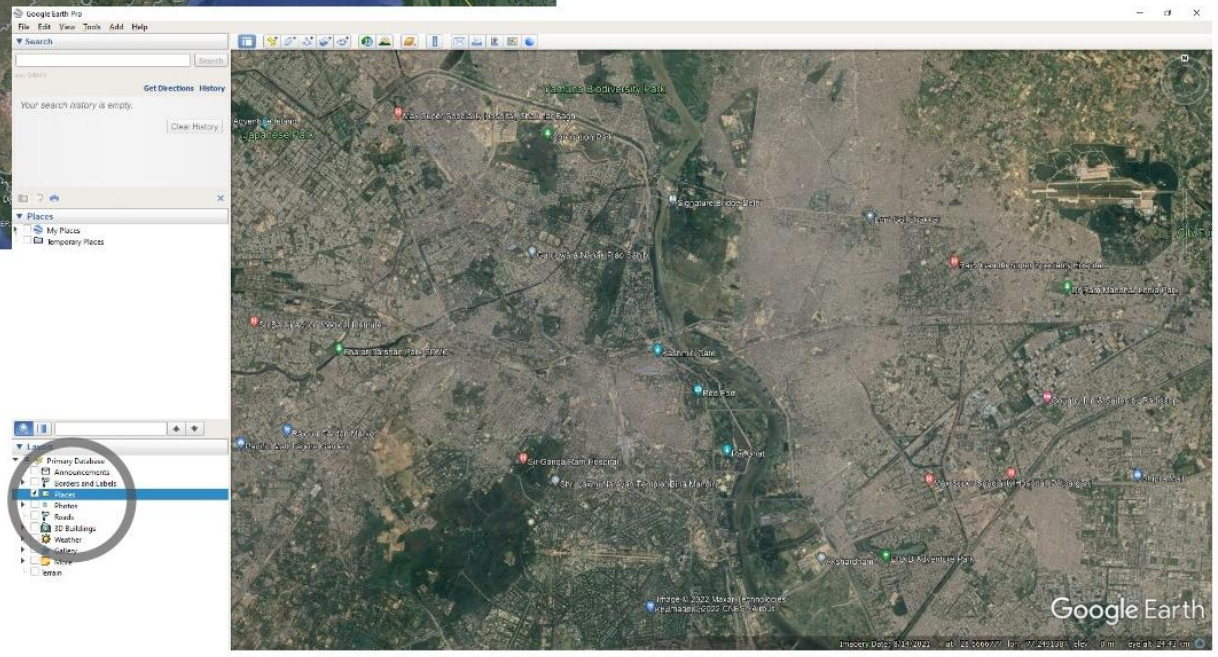
TIP: You can learn and use the shortcut keys for the commands, like **Crtl+C, Crtl+V**, etc.

Google Earth & its Interface

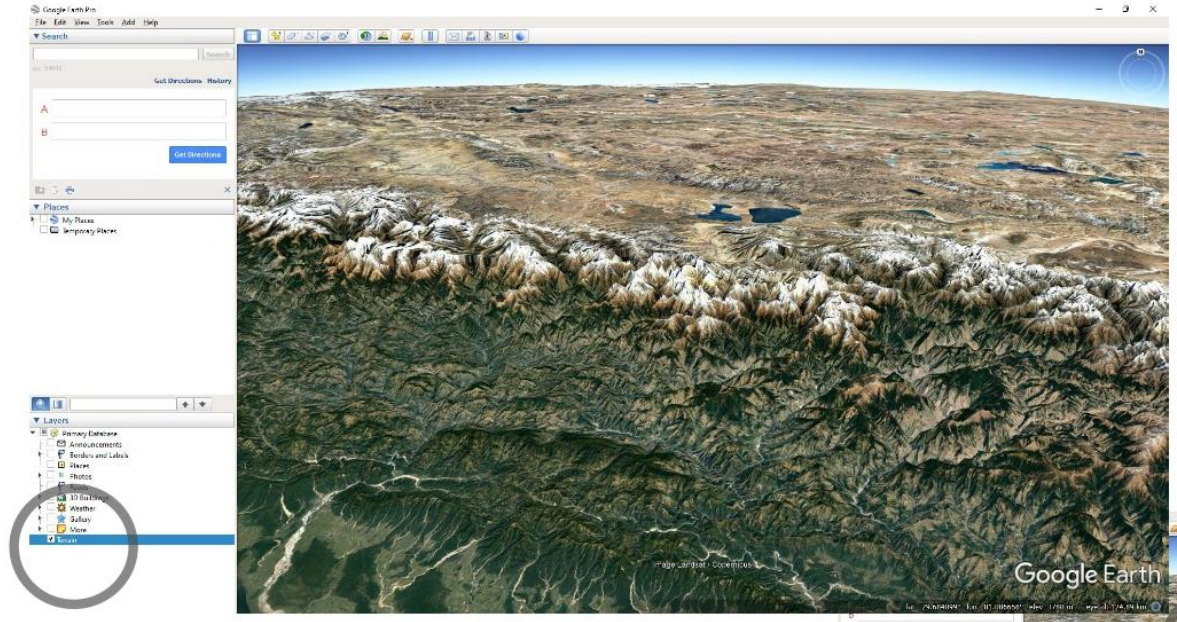


The **Layers** panel on the left has features you can explore. The **Borders and Labels** layer displays the international boundaries, state borders, and names of places at certain zoom levels.

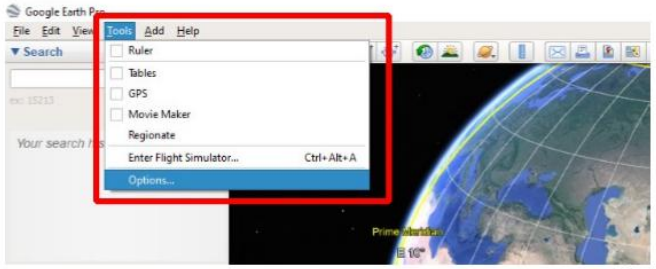
The **Places** layer shows locations of different buildings, and landmark that help you navigate easily .

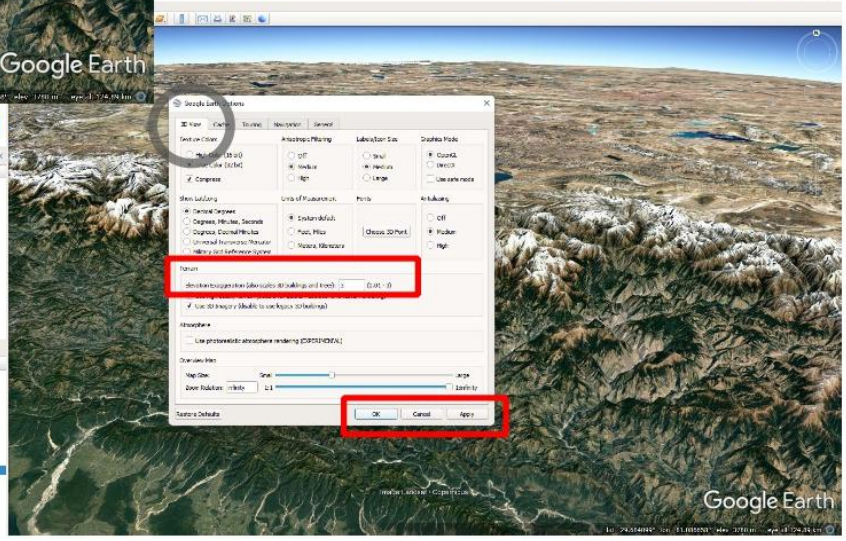


Google Earth & its Interface



The **Terrain** Layer shows the elevation of the geographic regions

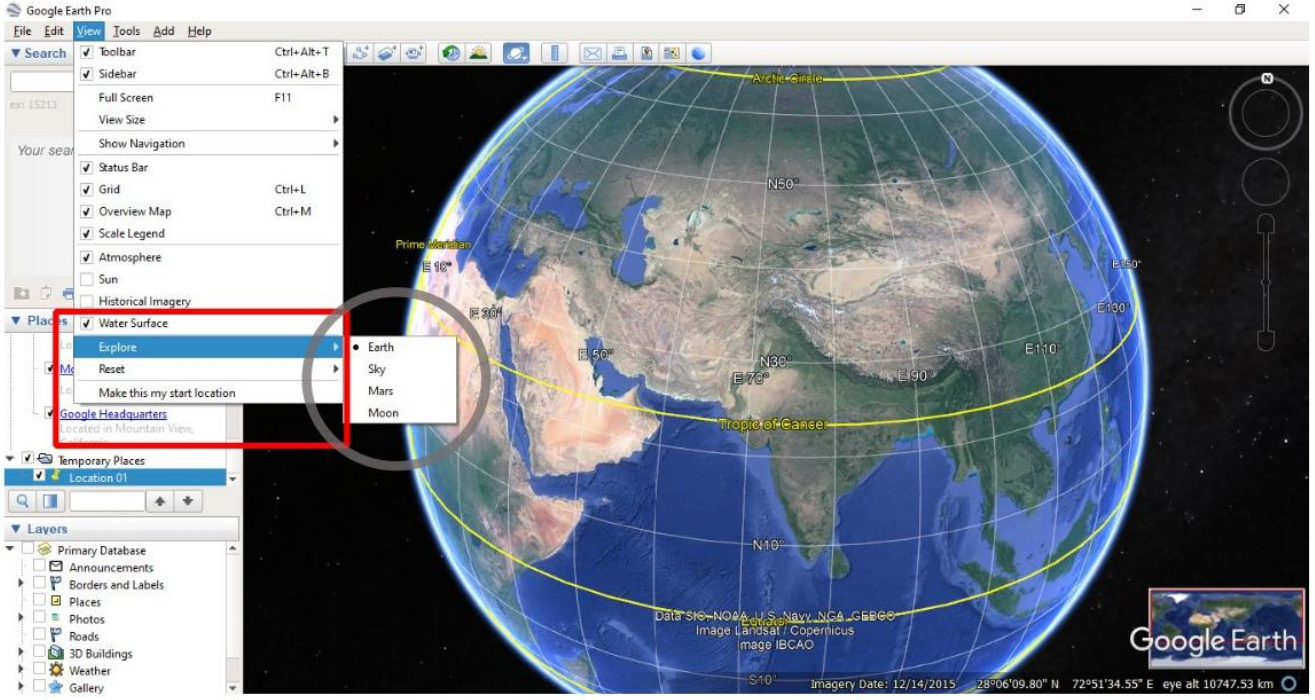


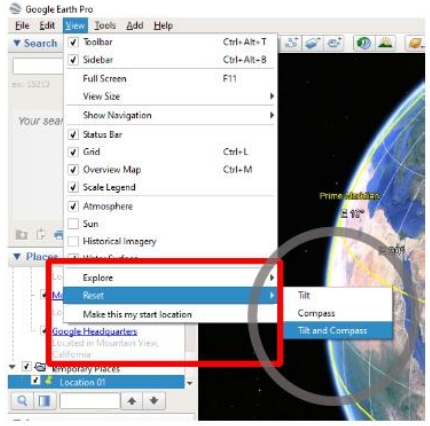


TIP: To view the terrain better, you Click-on **Tools**< **Options**< **3d View**. The **3D View** tab allows you to edit the **Elevation exaggeration of the terrain and other features** on ground (Keep the value at 3 for optimal results).

Once you have made changes Click **Apply** and **OK**

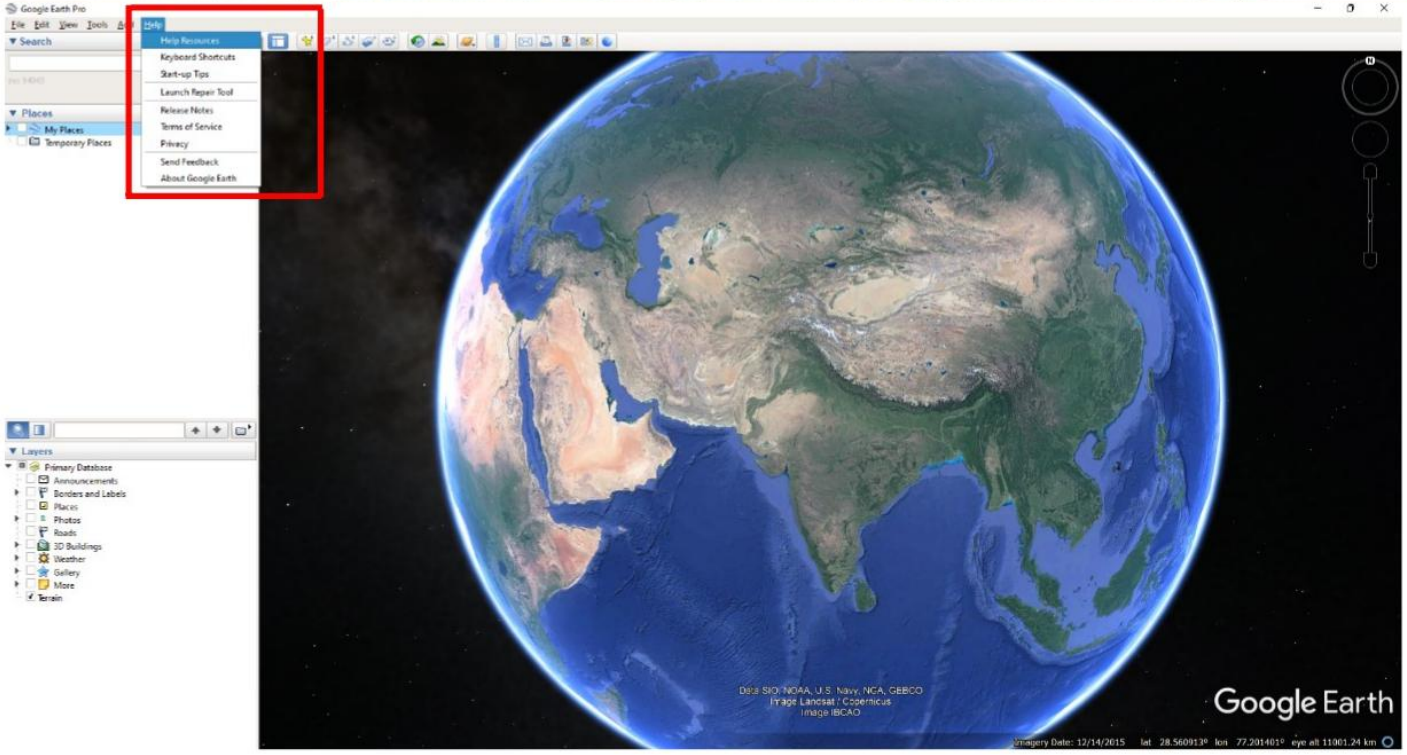
Google Earth & its Interface





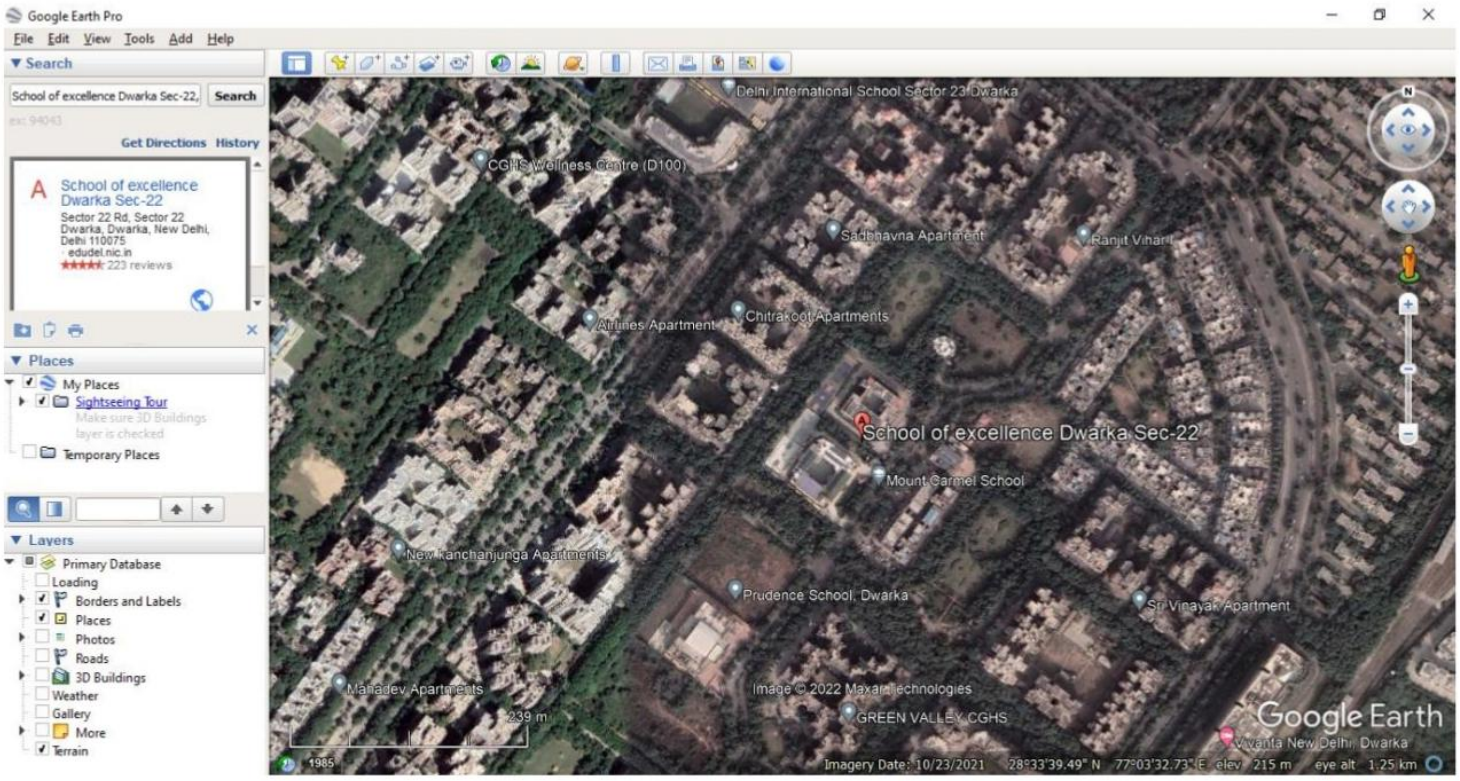
The **Explore** option allows you to not only view Earth from space but you can also explore Moon, and Mars! You can reset your view by using the Tilt and Compass options in **Reset** command. You can also choose a location to make it your start point.

Google Earth & its Interface



Help tab has resources; start-up tips; keyboard shortcuts; among other options. The options has guidelines and tips for you to use the application easily.

Lesson 1: Identifying various features on satellite imagery



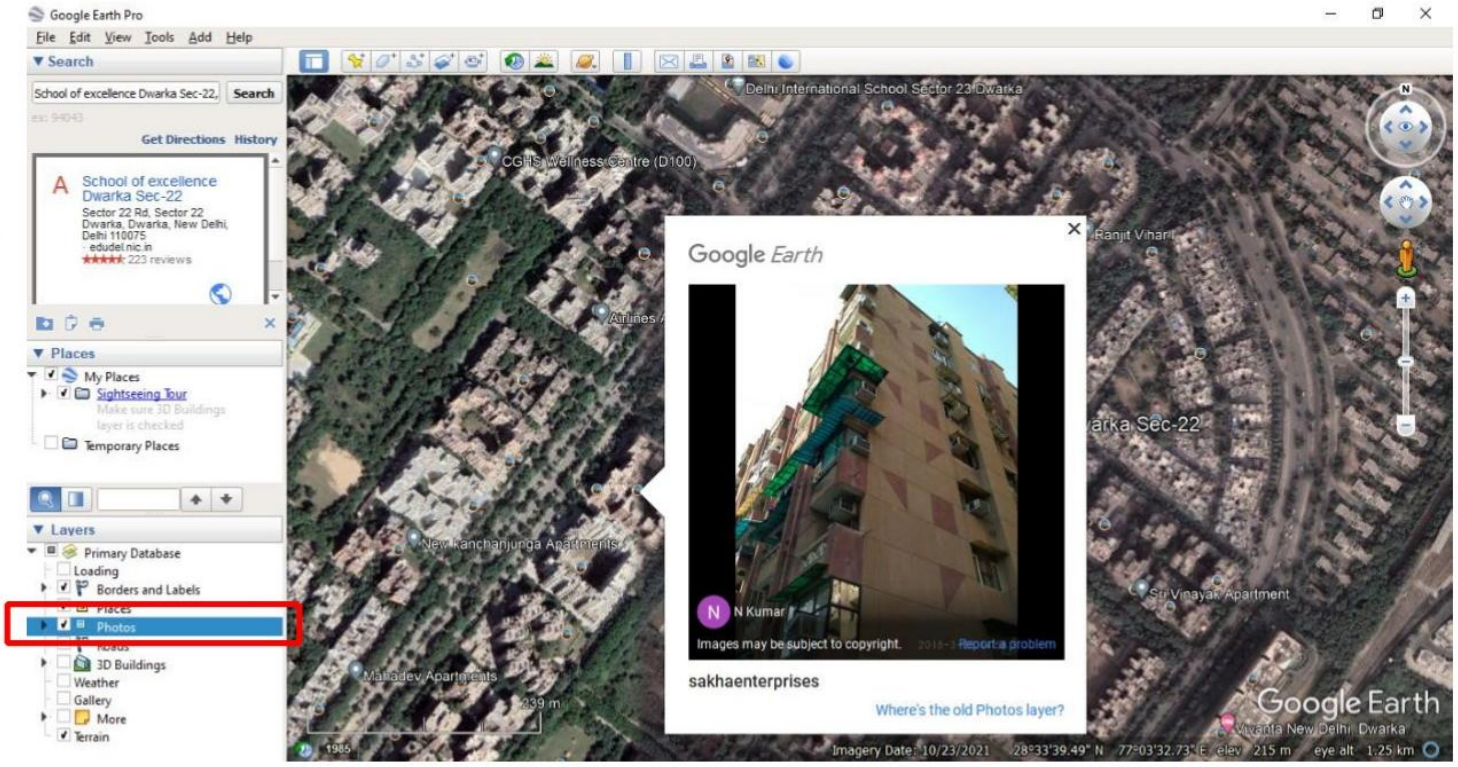
Observe the satellite imagery of your school neighbourhood, you can notice several features, such as, buildings, green patches, open spaces, roads, railway lines, airport, etc. Pan to the right and left of the image to observe more features around your school neighbourhood.

Exercise 1: Make a list 10 features in your school neighbourhood, like a neighbouring building, a landmark, a park, or a playground. Classify the features you have identified into buildings, open spaces, roads, etc

Lesson 2: Understanding an aerial perspective of space, and neighbouhood

Satellite Imagery gives you an aerial perspective of spaces. You can see the rooftops of buildings, the top of the tree canopies and vegetation, etc. this view is vry different from what you can observe from the ground.

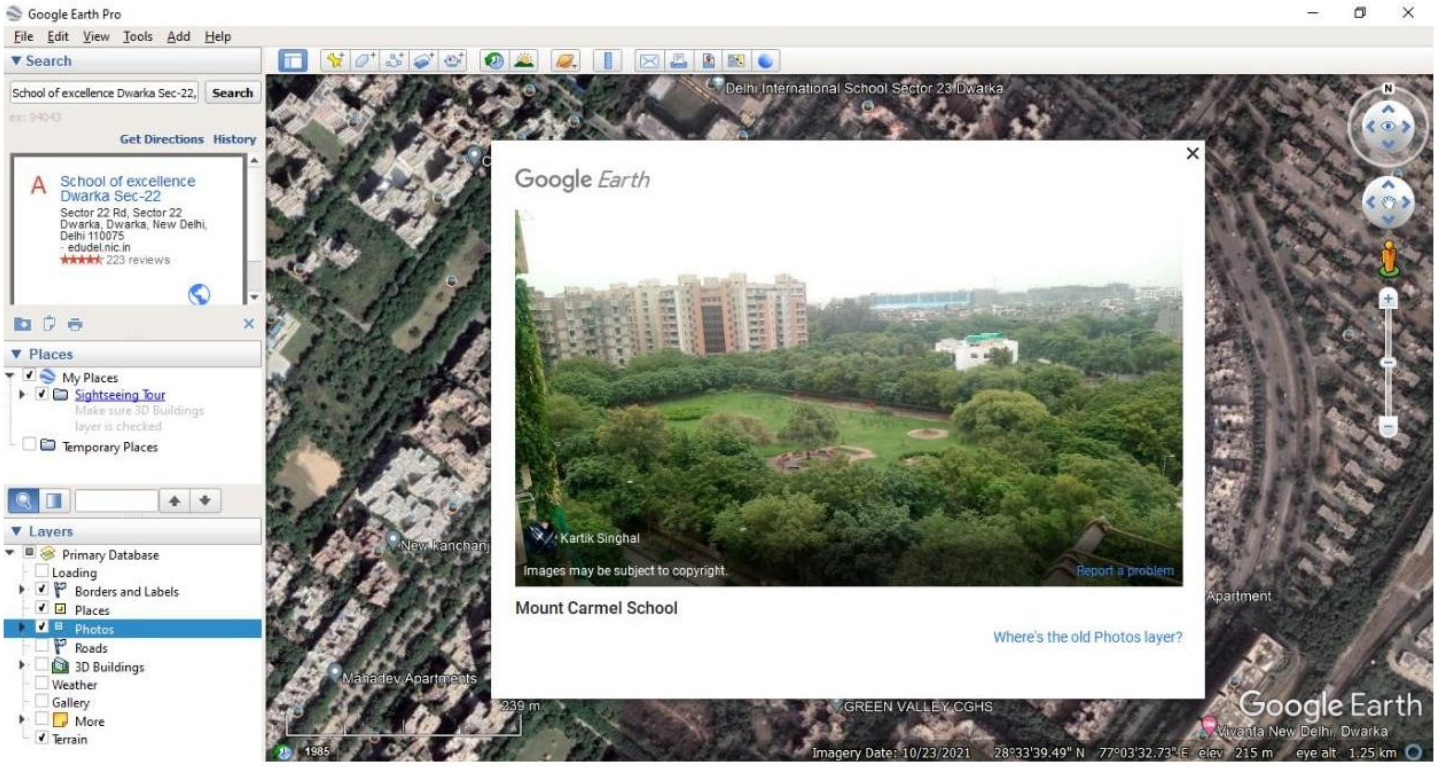
Google Earth allows you to see photographs of places, and see the aerial perspective of the same.



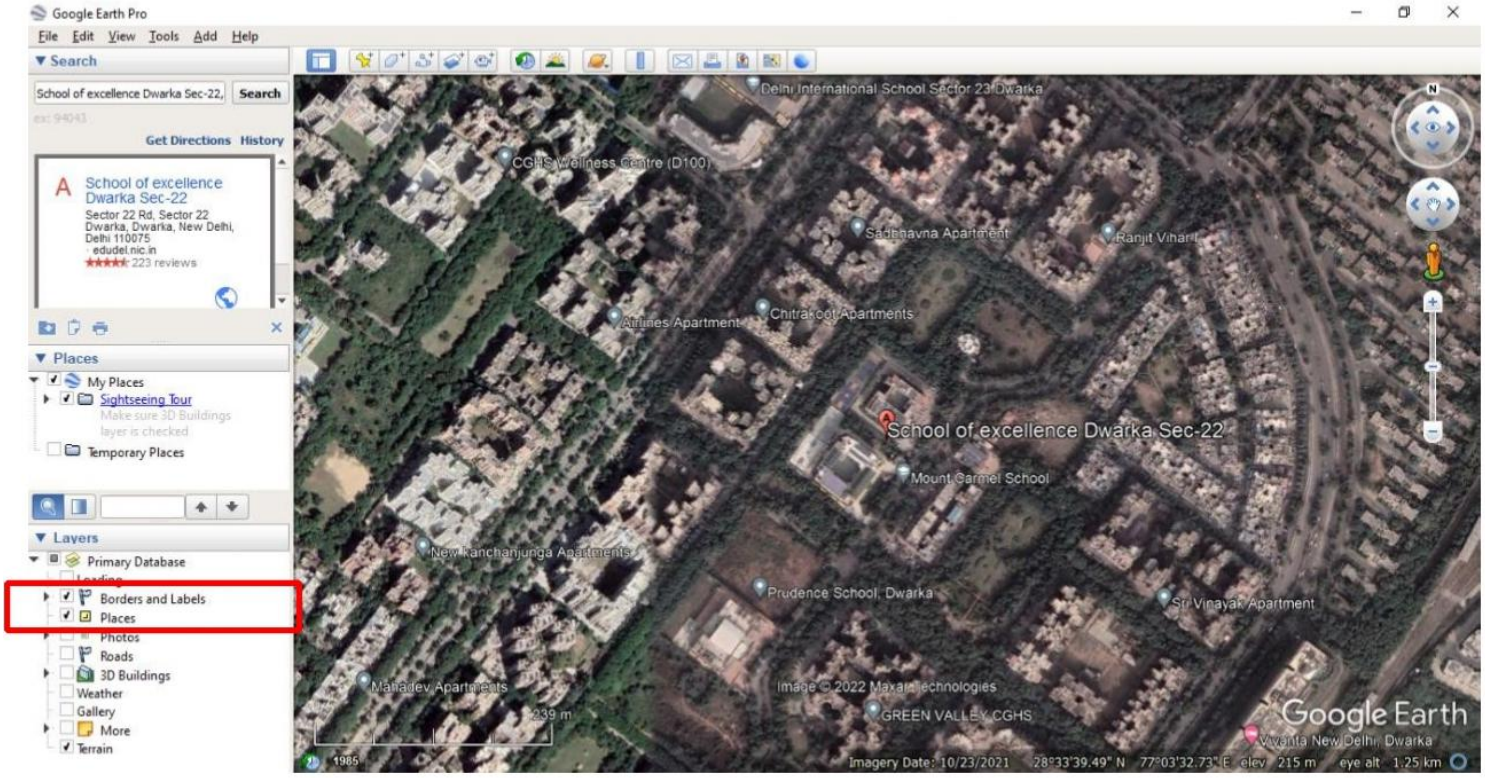
- **Check** the box against **Photos** in the **Layer** panel on the left.
- You can see photographs of certain locations in your school neighbourhood, for example, the image in the satellite imagery shows the photograph of an apartment building, while allowing you to see the building from above.

Lesson 2: Understanding an aerial perspective of space, and neighbouhood

- Another image showing buildings with respect to the greenery around, while allowing you to observe this space from above.



Lesson 3: Understanding Spatial Relationships

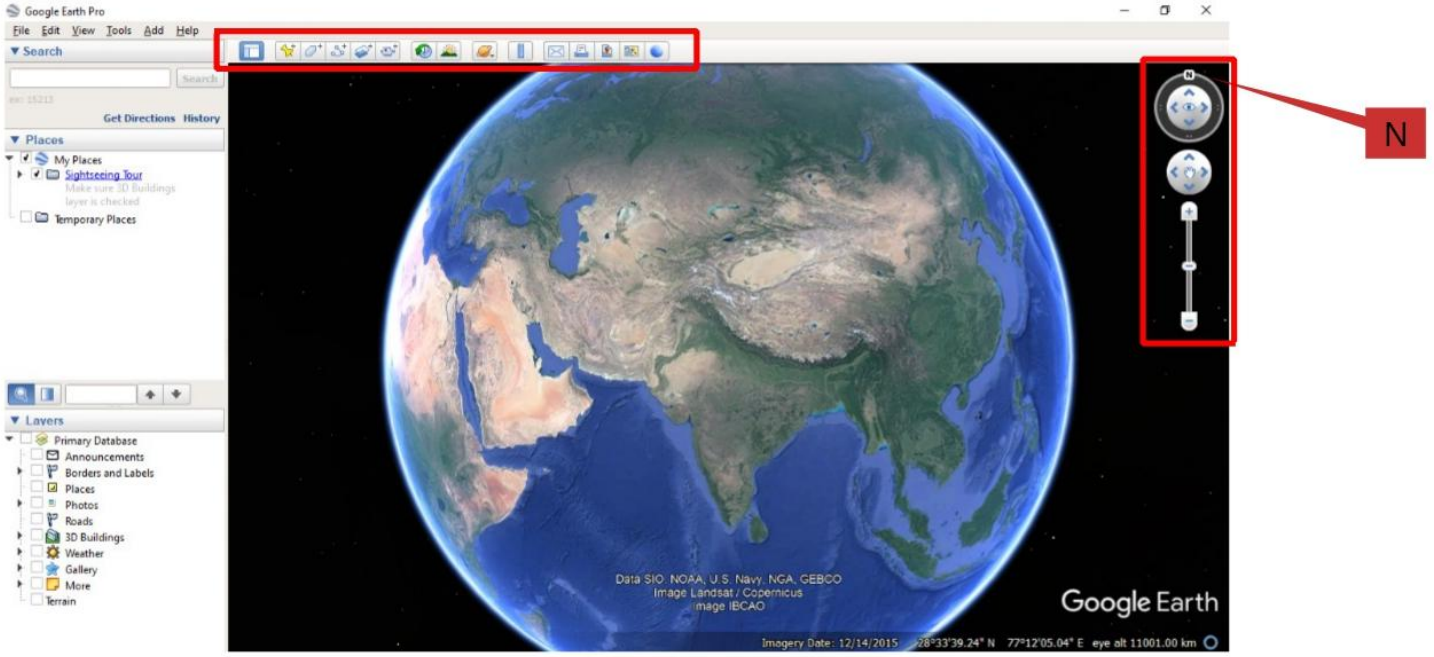


Now that you are familiar with identifying features on the satellite image of your school neighbourhood, let us understand spatial relationships of these spaces. You can observe in the North, West, and South direction of your school, there are apartment buildings, while in the East there is a park.

The **Borders and Labels,** and **Places** in the **Layer** panel on the left, displays location and names of places and landmarks. You can see the type of buildings and important features in your school neighbourhood.

Exercise 2: Pick a building/ location and mark the features located on all its cardinal directions. Also, mark the landmarks around the location you have selected.

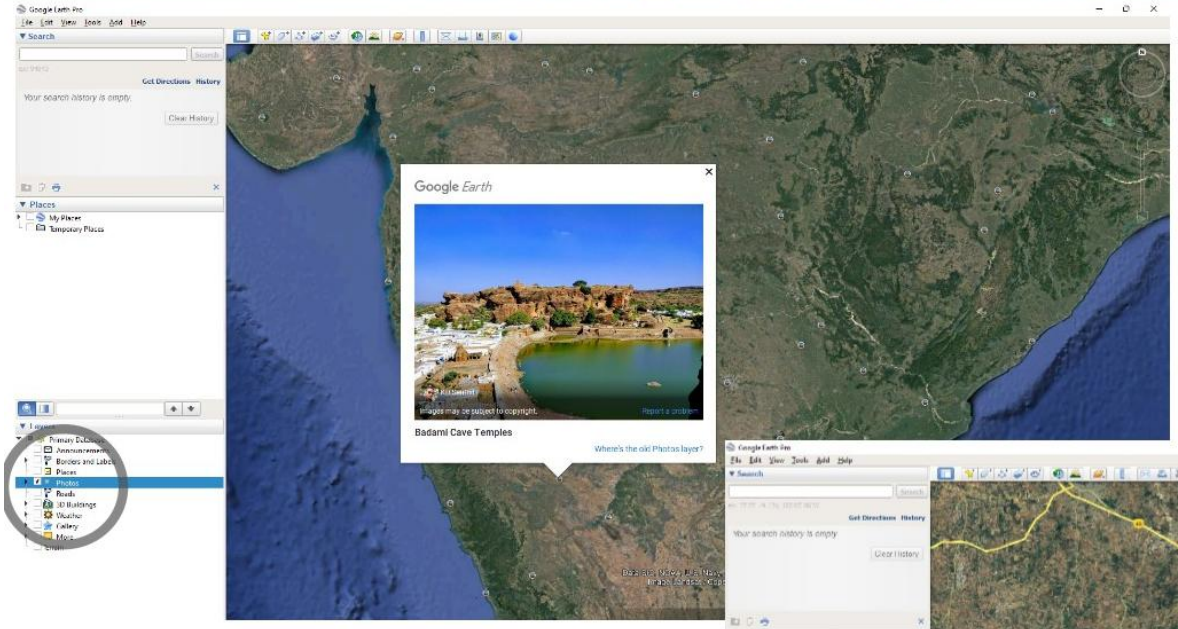
Google Earth & its Interface



The **Top panel** has tools that allows you create maps, measure distances, view places from the past, sunlight across landscapes, view location on Google maps, among other options; the controls on the **right allow you to navigate, zoom-in and out of location**

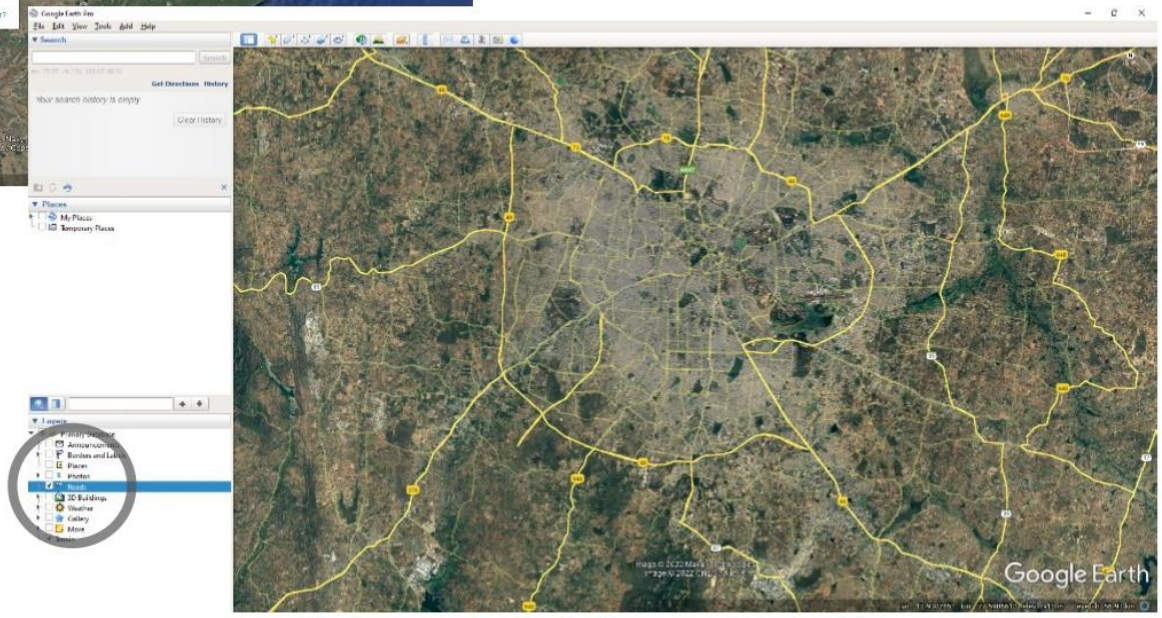
TIP: Click-on the **North** symbol on the compass on the top right corner (the arrow pointing to the icon) to reset the view with North pointing upwards

Google Earth & its Interface

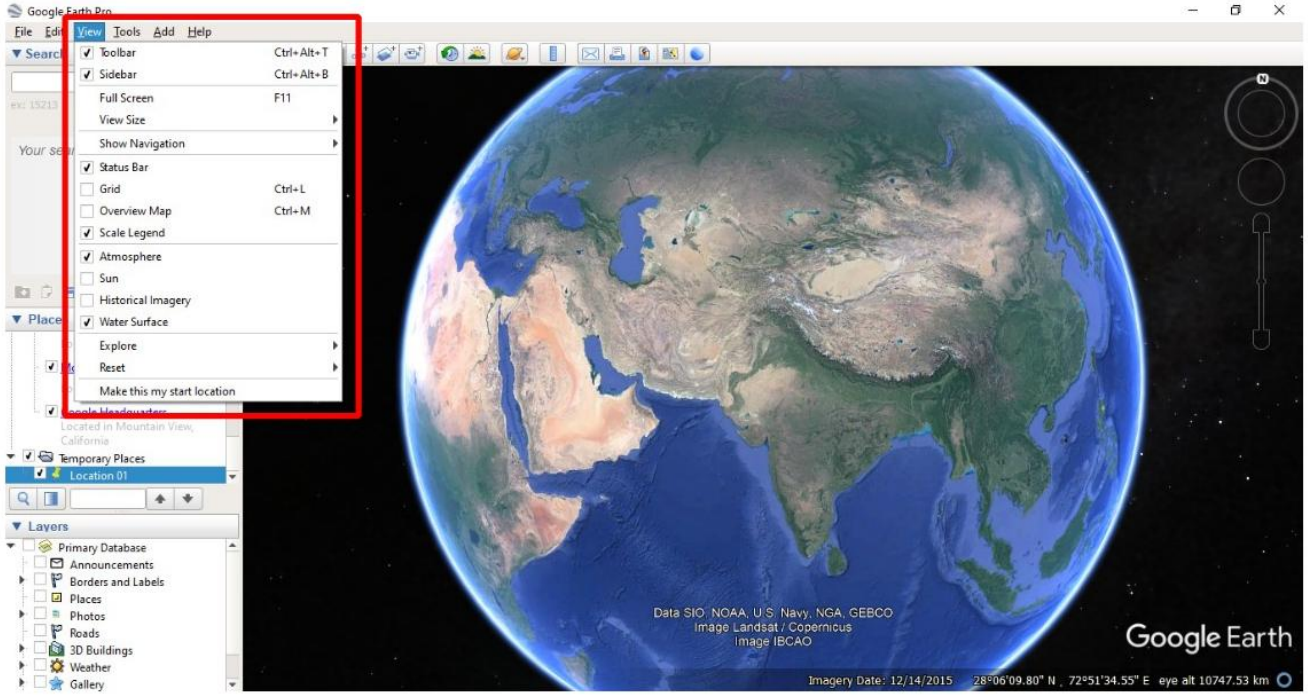


The **Photos** Layer allows you to view photographs of certain locations

The **Roads** Layer displays road networks, pathways, and connectivity to different places.



Google Earth & its Interface

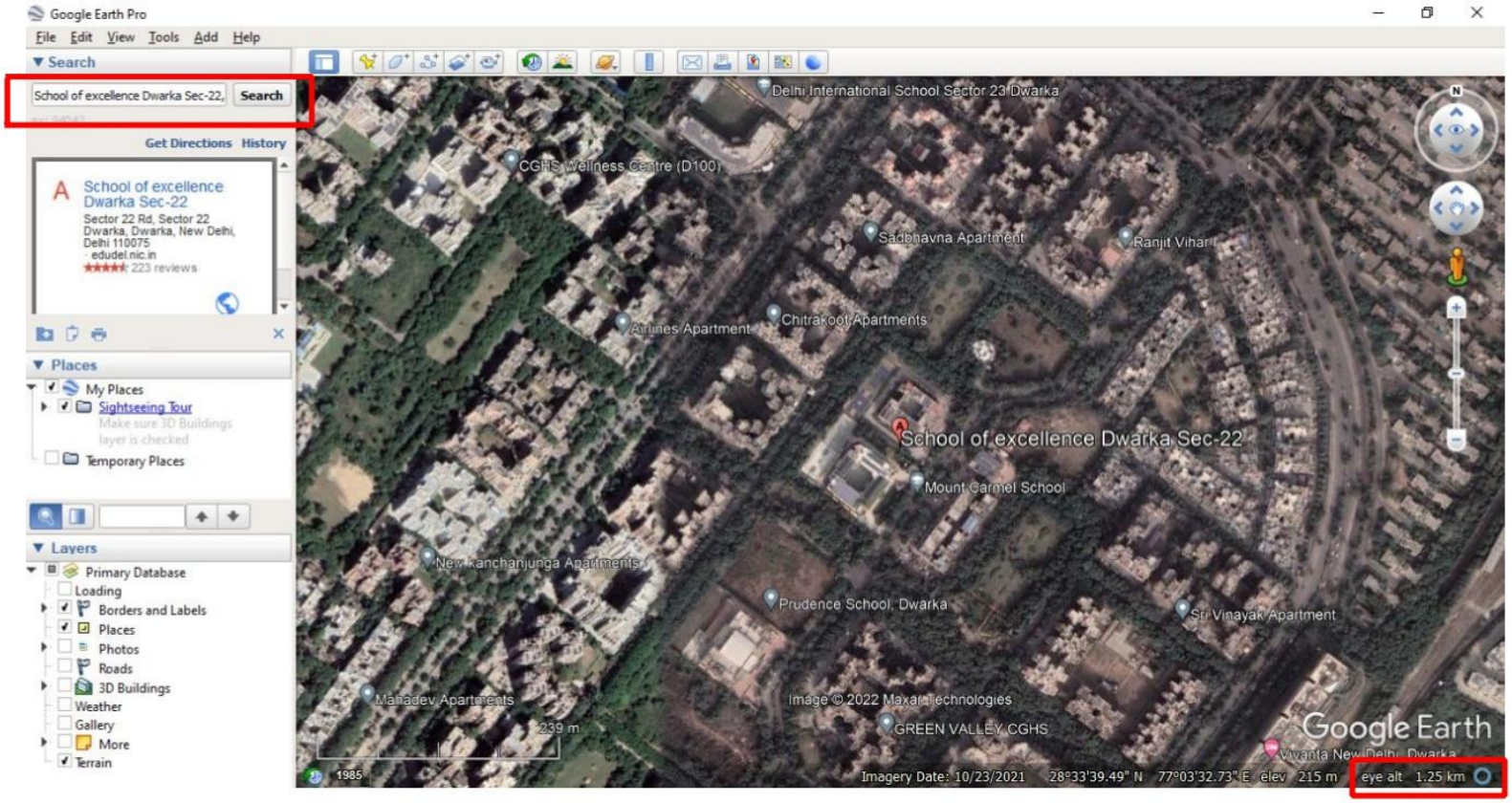


The **View** tab in the top panel allows you to check boxes for the tools you want to appear on the workspace. Some of these are already checked by default. However, you can select some other tools. Options like **Full Screen, Grid, Scale,** and **Overview Map,** are some changes you can make to your workspace that will enable you to read maps better. **Atmosphere, Sun, and Water Surface,** helps to view elements and how they can affect a particular location. **Historical Imagery** helps view locations in the past.

Lesson 1: Identifying various features on satellite imagery

Step 01 **Search** for you school in the tab on the top left corner of the workspace. For example, Search for- **School of Excellence, Dwaraka Sec-22, New Delhi**.

Step 02 Keep the zoom level at a level where the extent of your school neighbourhood is clearly visible (On the bottom right corner, check **Eye-alt** and keep the value between **1km to 2.5 km**)



WEEK 2 (Day-5)

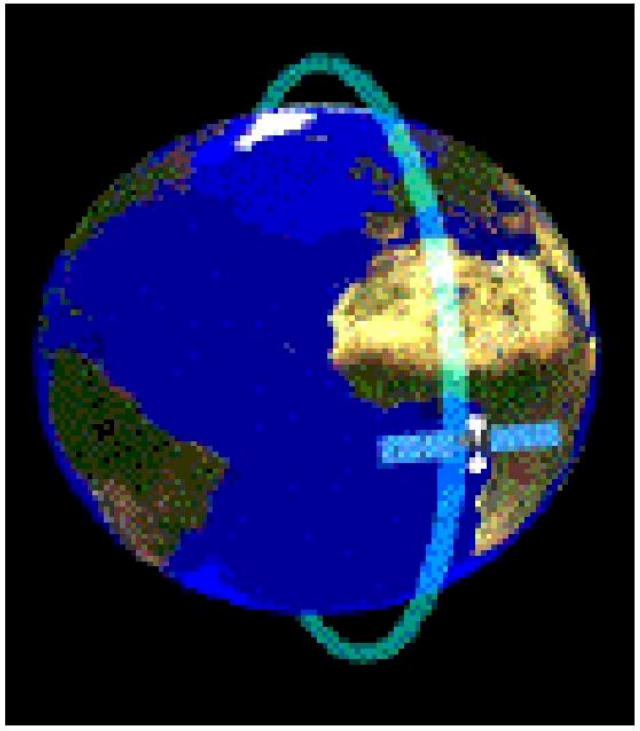
Mapping your neighborhood through digital maps

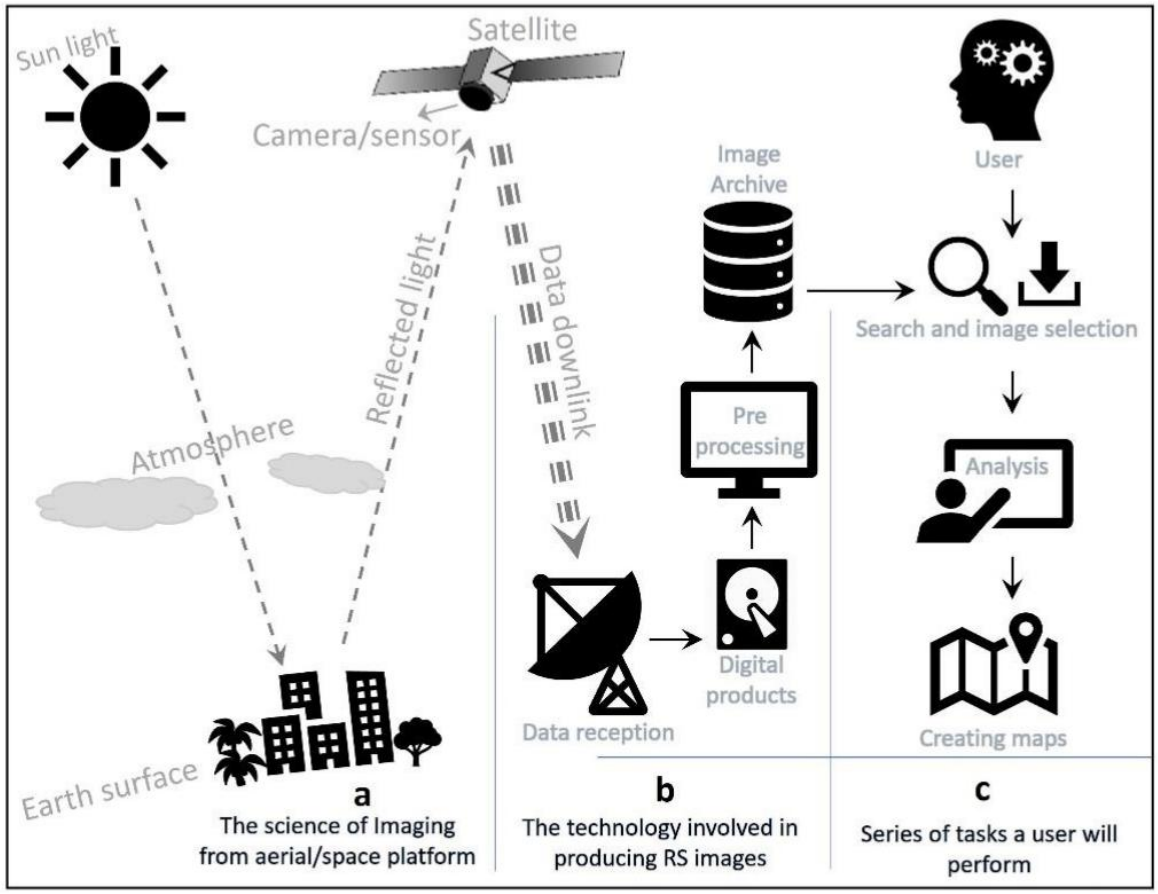
Objective: Learning how to digitize features, and making maps. You also learn how to measuring locations, distances, and area using digital maps.

Theory

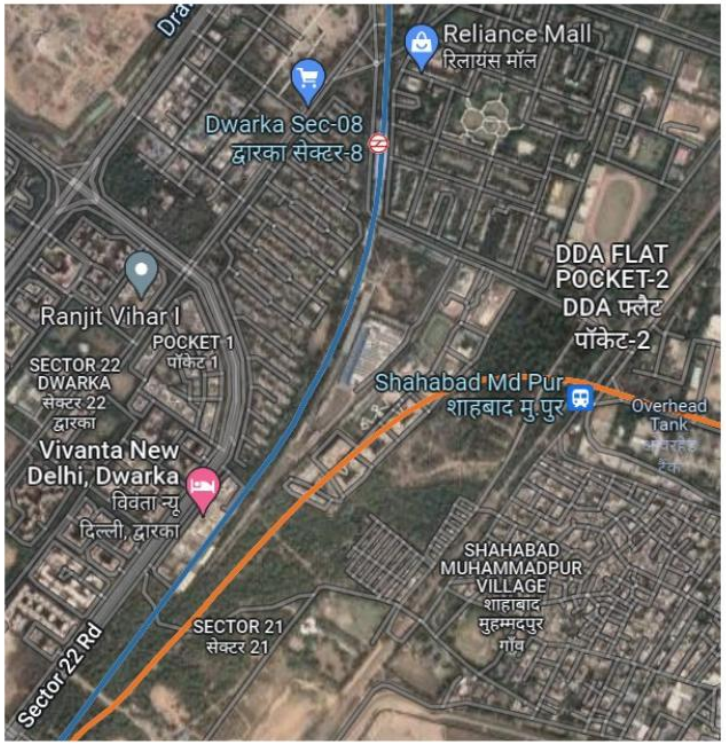
- Concepts one should know:
  - Remote sensing satellites and their orbit
  - What is a satellite images? how are they taken? How do users find them?
  - How are maps made using satellite image?
  - What is georeferenceing?
  - What does georeferencing do to an image?

Satellite that take pictures of the earth surface are called remote sensing satellites. These satellites orbit earth in a polar orbit (i.e. from north pole to south pole) at a height of 600-900 km from earth surface. As the earth is rotating, every orbit of the satellite scans a different patch of earth surface.

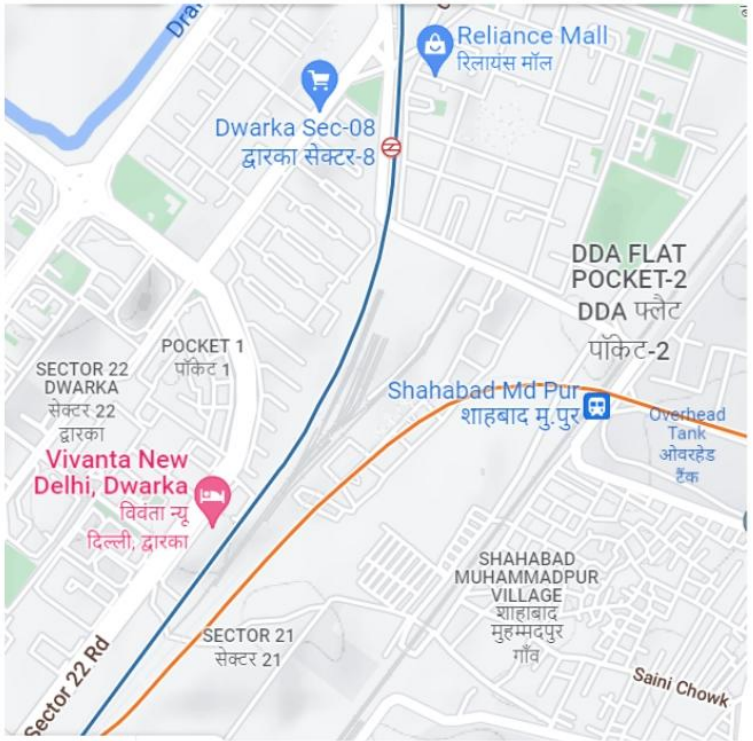




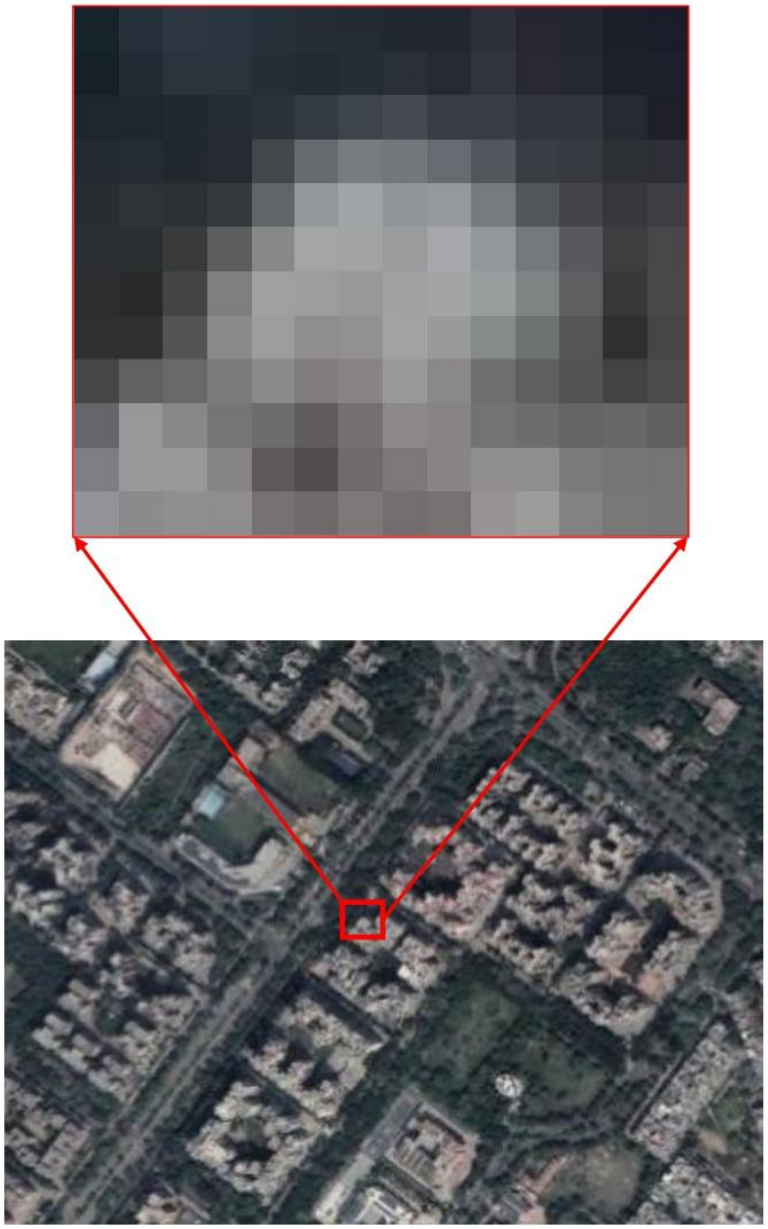
a. Sun's light falls on the earth surface and the reflected light is captured by the camera/sensors aboard satellites (if the atmosphere has obstructions, like for instance clouds/haze, then those will affect quality of image)
b. The data captured by the sensors are in binary format. This data is downlinked to ground stations on earth and processed to form digital images. These images are archived
c. Users can buy/download these images and use them to make maps



Satellite images which shows how earth surface looks can be used as a background over which various features (like roads, railway, buildings, etc) can be traced



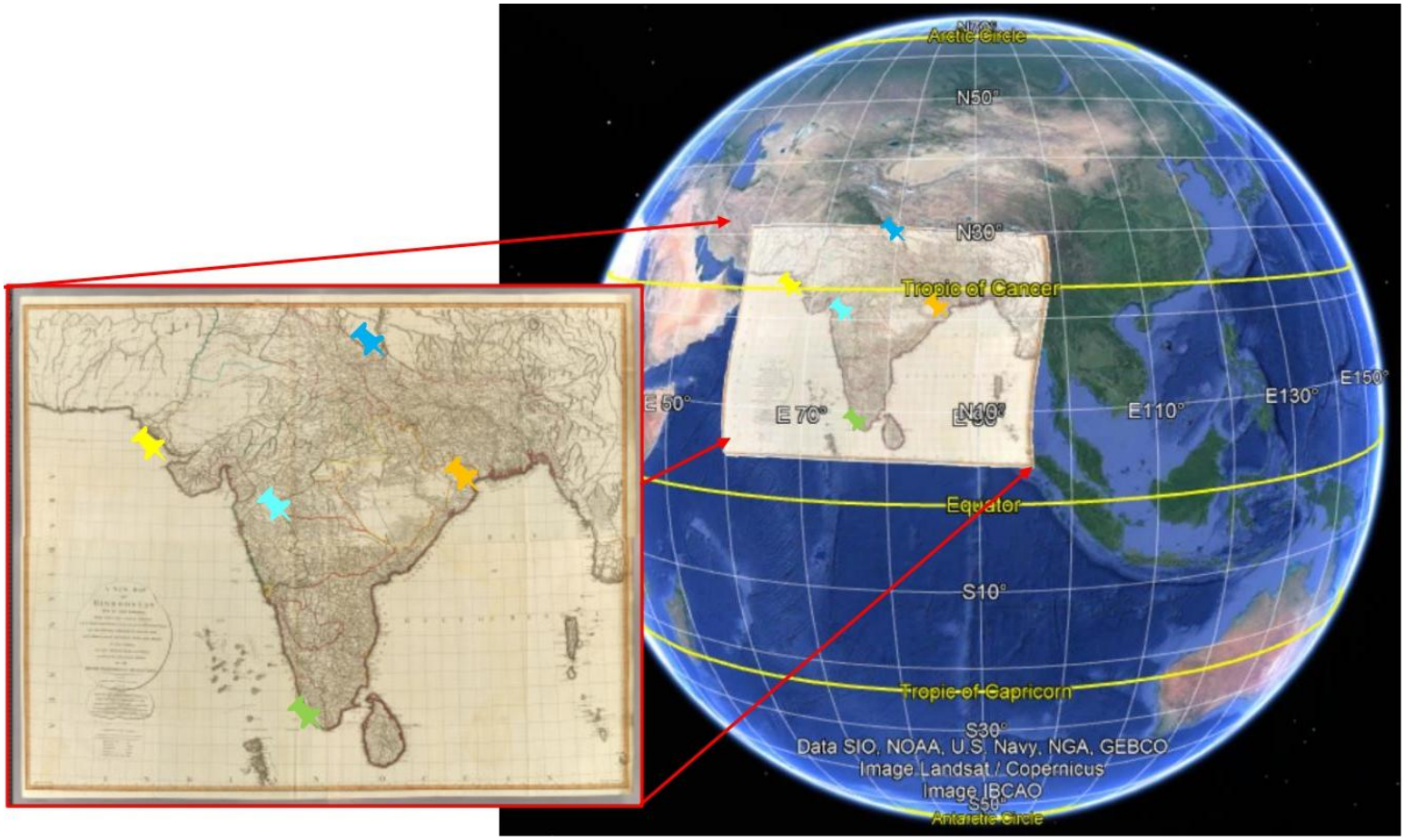
These traced features are used to make maps. Such as the road map above which shows roads, railway lines , railway station etc. Similarly, satellite imagery can be used to make maps of various earth surface feature like, rivers, forests, etc



- However, a raw image is only a matrix of pixels, just like any other digital photographs.
- They do not have information of which part pf earth they belong or what is the sizes of features (like buildings, roads) in the image
- These have to be georeferenced to give them location, scale and dimensions

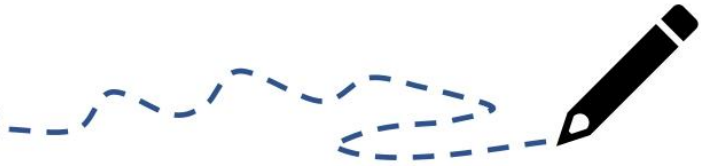
Lat: 22°11'3.18"N Long: 68°49'54.28"E
Lat: 7°56'39.88"N Long: 77°30'59.75"E
Lat: 20°43'36.38"N Long: 86°57'56.95"E
Lat: 28°32'14.61"N Long: 81° 0'19.33"E
Lat: 19°40'56.41"N Long: 75°29'49.18"E

Georeferencing is done by identifying few (min 4) points on the image (for which latitude & longitude coordinates are known or can be acquired)

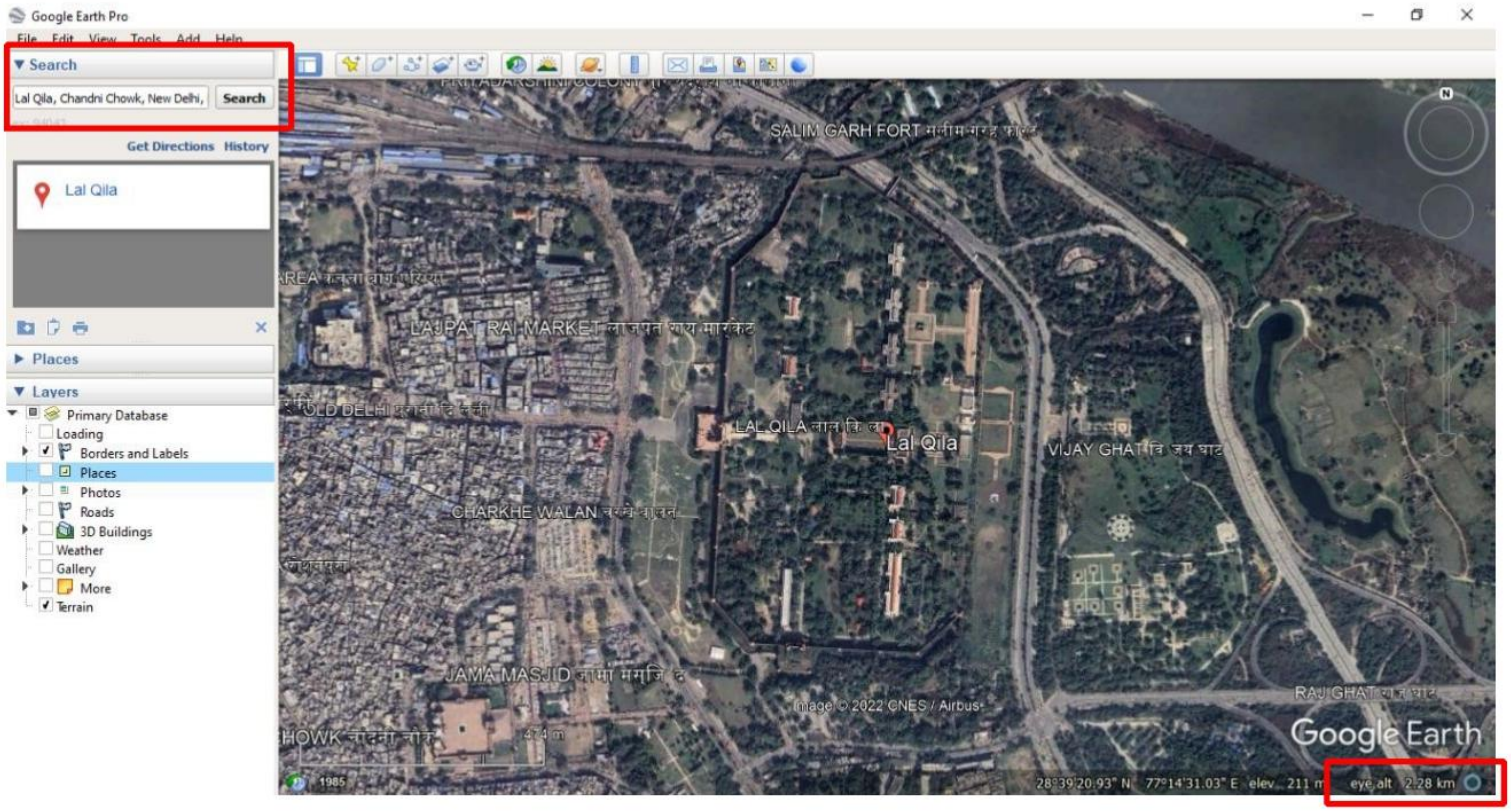


- Once these (min 4) coordinates is attributed to raw images the software can then calculate lat & long for whole image
- After image is georeferenced, measurements (location of features, distance, area) can be made on images
- Google Earth is a geo-portal where all the images have been georeferenced before it is uploaded. Hence it readily provides lat/long of any place and also has functionality to make measurements of distance and area

Activities...



Lesson 1: Digitizing features from images



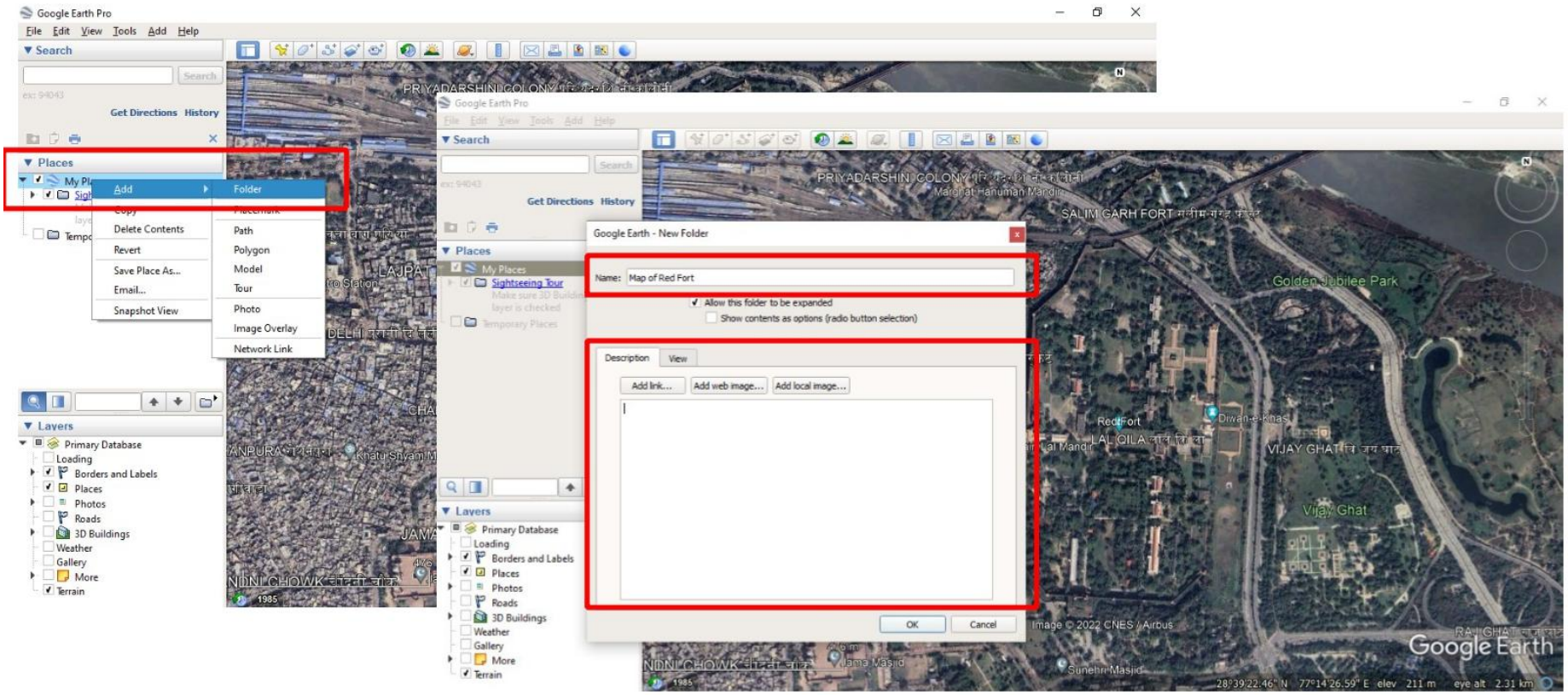
Lets consider the Red Fort and the area immediately surrounding it. Observe the different features on this satellite image by applying what you learnt in your previous lesson.

Now we will learn how to mark these features using the tools available on Google Earth.

Step 01 **Search** for Lal Qila, New Delhi. This will zoom into the extent of Lal Qila and remain at an eye-alt of 2.3 Km.

Make sure the **Borders and Labels** is checked

Lesson 1: Digitizing features from images

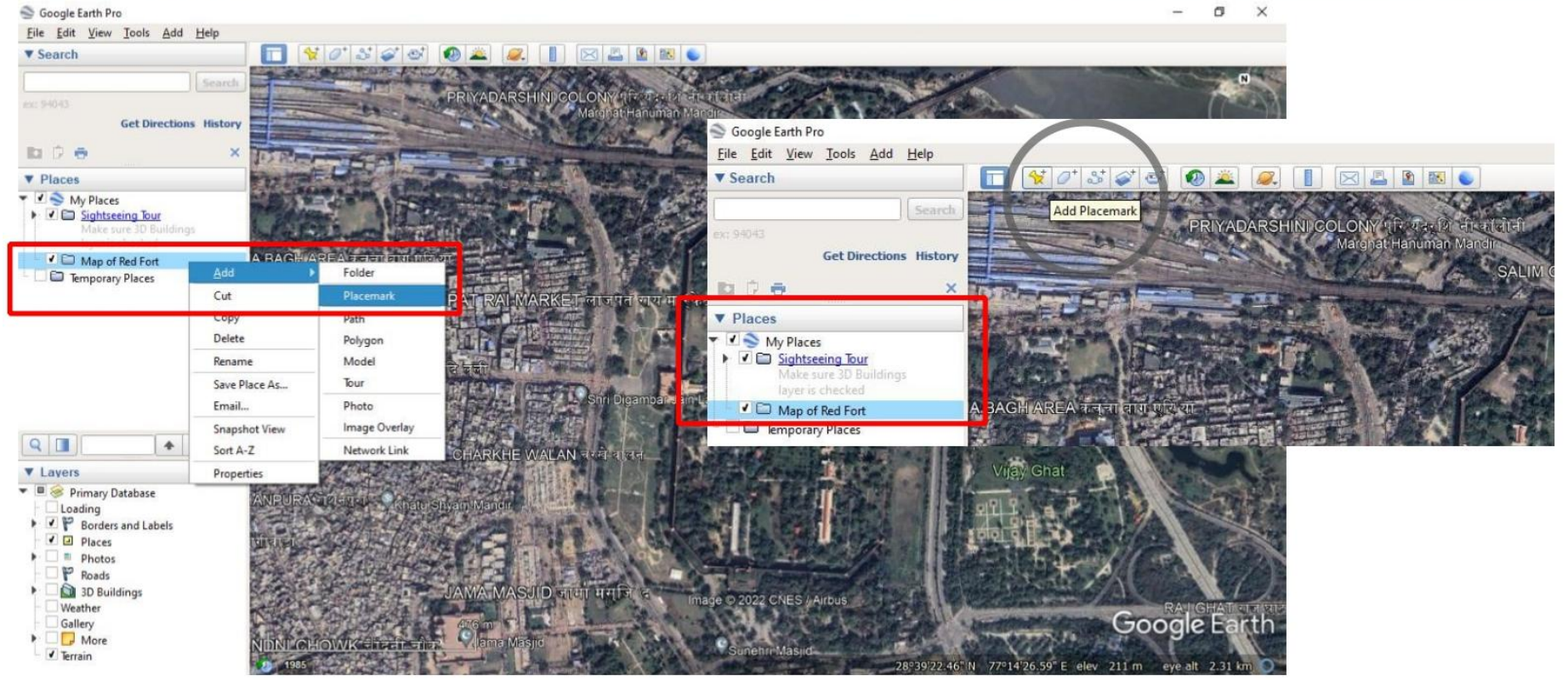


Step 02 Right-click on **My Places**< in the drop- down menu Click **Add**< Click-on **Folder**

Step 03 A **New Folder** window will pop-up, where you can enter the **Name** of the folder in which you want to create the layers, and you can add a **Description** if you prefer.

Step 04 Click **OK** after you have entered the details

Lesson 1: Digitizing features from images

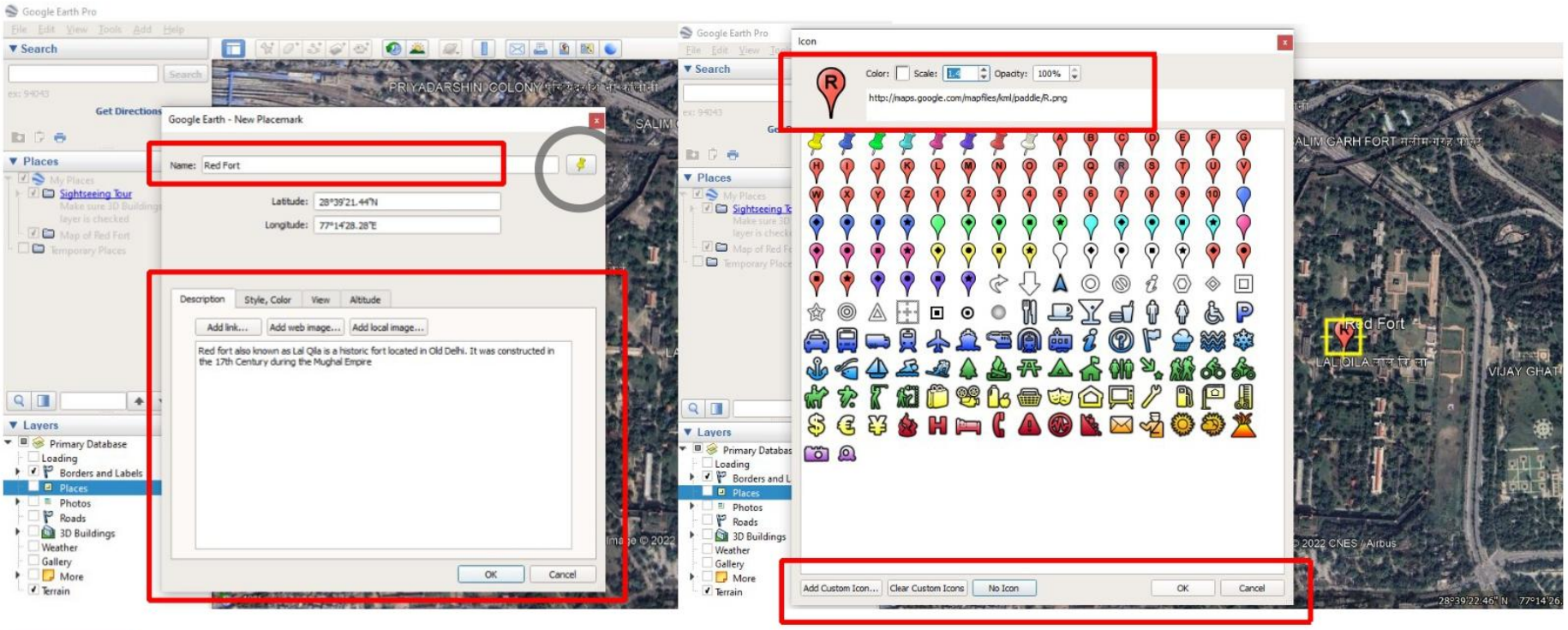


Step 05 Right-click on new **Folder** you have created (in this case its called **Map of Red Fort**)< in the drop- down menu Click **Add**< Click-on **Placemark**

OR

You can Select the **Map of Red Fort layer** in the **Places** panel on the left< Click-on the **Add Placemark** icon on the top toolbar panel

Lesson 1: Digitizing features from images

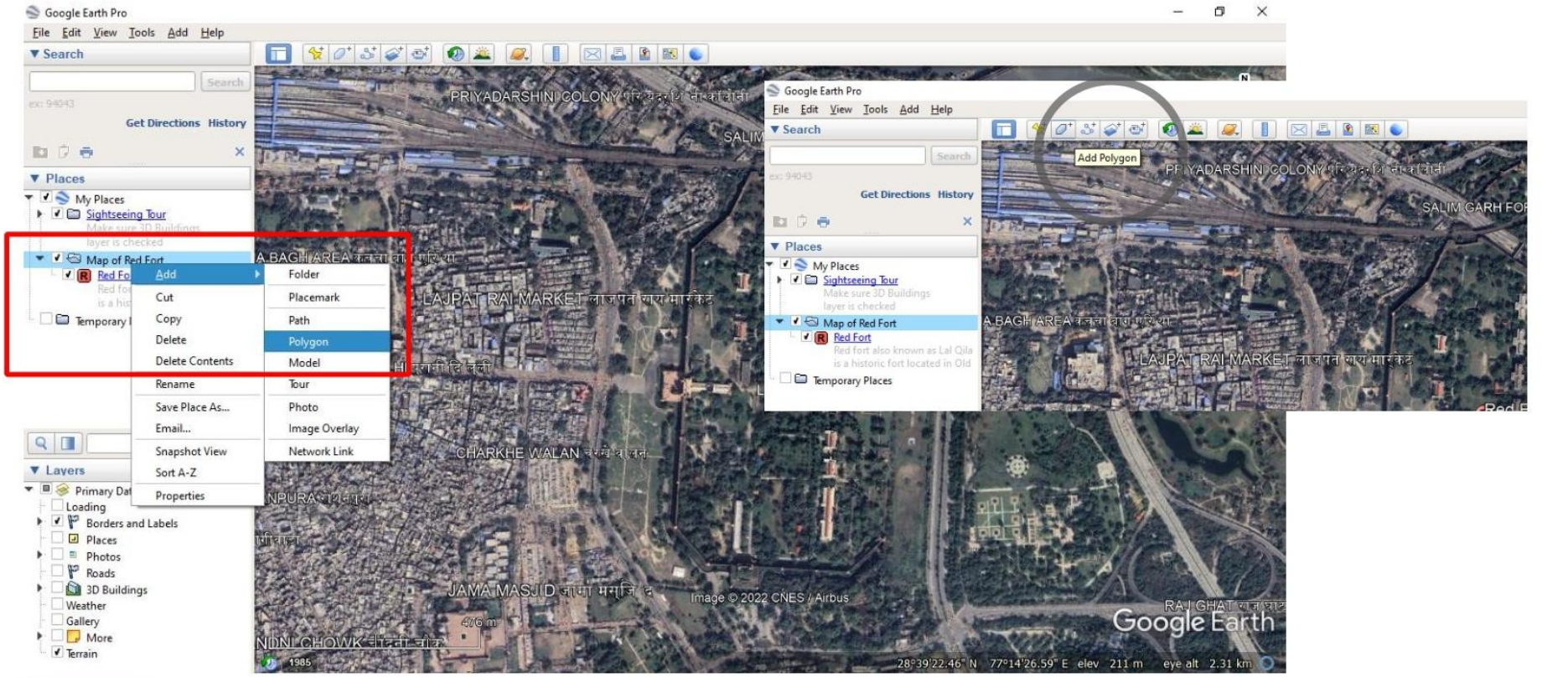


Step 06 A **New Placemark** window will pop-up, where you can enter the **Name** of the placemark (in this case its called **Red Fort**), and you can add a **Description**.

Step 07 You choose a different icon type and size by clicking the **placemark symbol** on the button on the right of the name tab

Step 08 An **Icon** window will pop-up displaying various symbols you can choose from for you placemark; you can also change the size and opacity of the icon. This window also allows to customize the icon by adding a symbol you have saved on your computer/drive. Click **OK** after you have selected an icon of your choice.

Lesson 1: Digitizing features from images

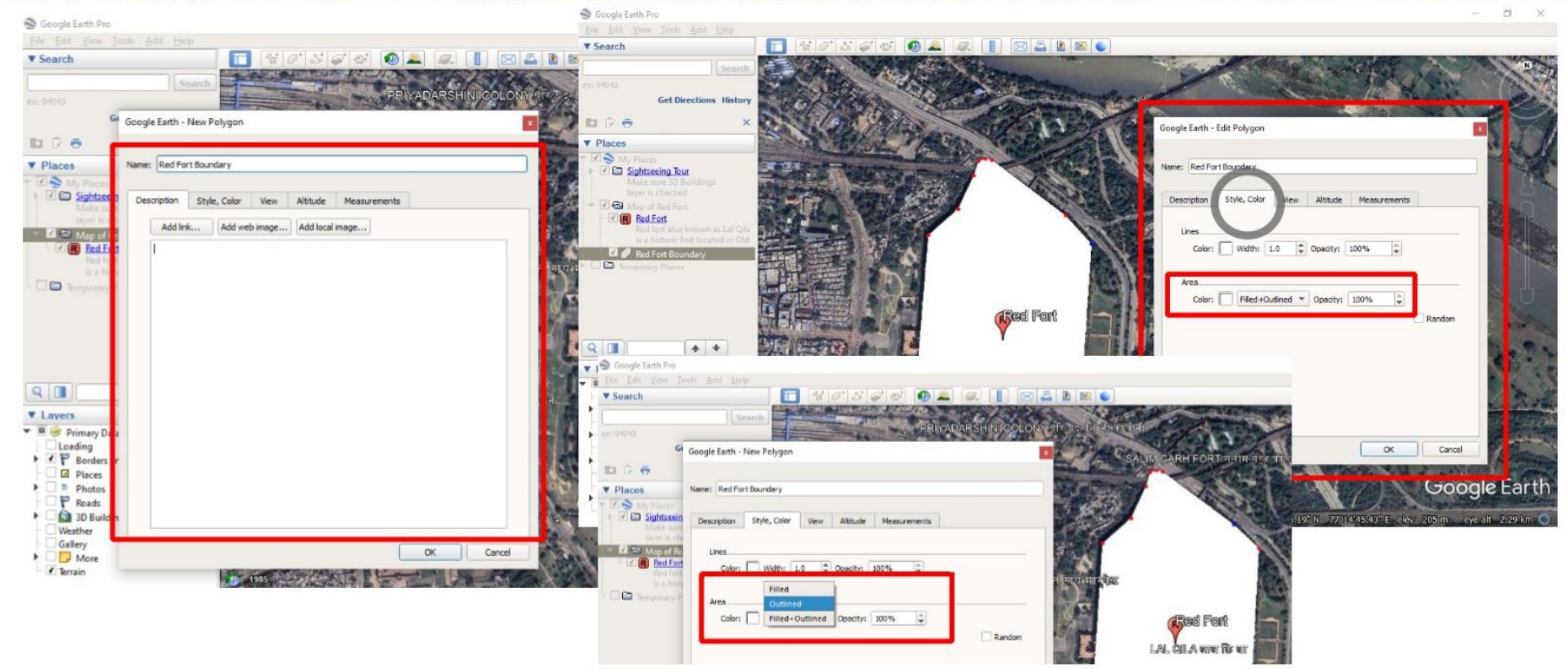


Step 09 Right-click on new **Folder** you have created (in this case its called **Map of Red Fort**)< in the drop- down menu Click **Add**< Click-on **Polygon**

OR

You can Select the **Map of Red Fort layer** in the **Places** panel on the left< Click-on the **Add Polygon** icon on the top toolbar panel

Lesson 1: Digitizing features from images



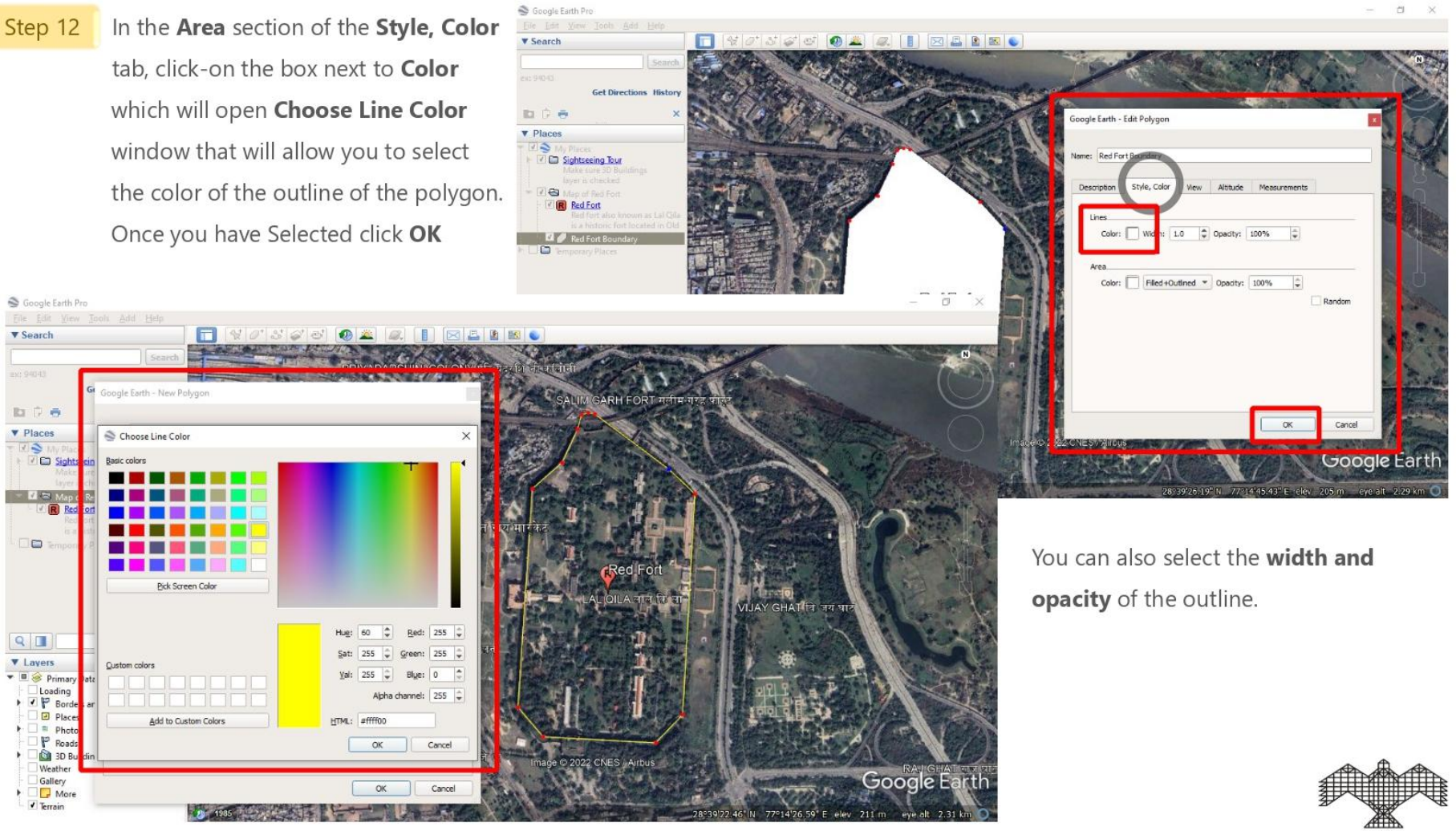
Step 10 A **New Polygon** window will pop-up, where you can enter the **Name** of the polygon (in this case its called **Red Fort Boundary**), and you can add a **Description**.

Step 11 Choose the **Style, Color** tab next to the **Description** tab, and below the **Name** Tab. This option allows you to change the color, width, and opacity of the polygon and its outline. In the **Area** section, click-on the drop-down menu of the **Filled+Outlined** option< choose the **Outlined** option to view only the outline of the polygon

Lesson 1: Digitizing features from images

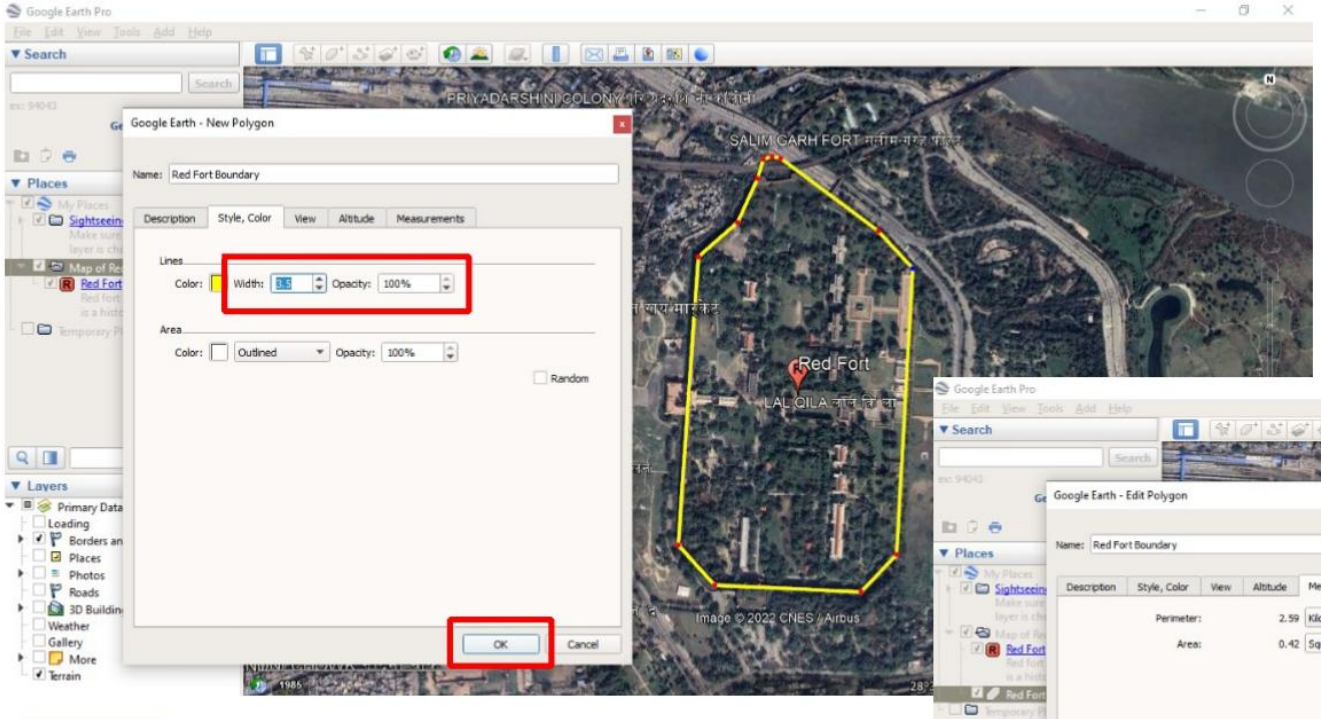
Step 12

In the **Area** section of the **Style, Color** tab, click-on the box next to **Color** which will open **Choose Line Color** window that will allow you to select the color of the outline of the polygon. Once you have Selected click **OK**

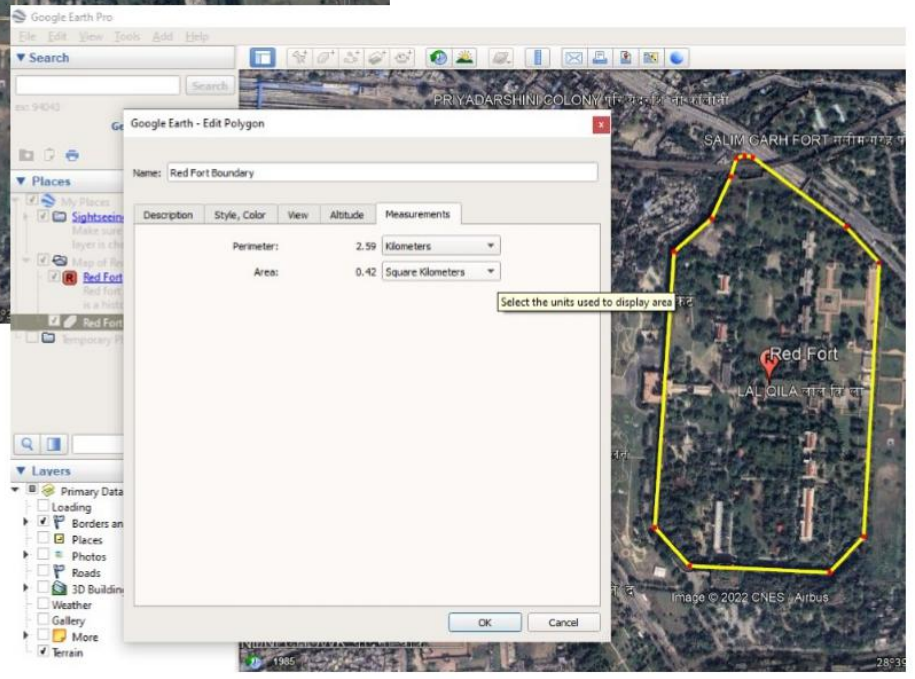


You can also select the **width and opacity** of the outline.

Lesson 1: Digitizing features from images

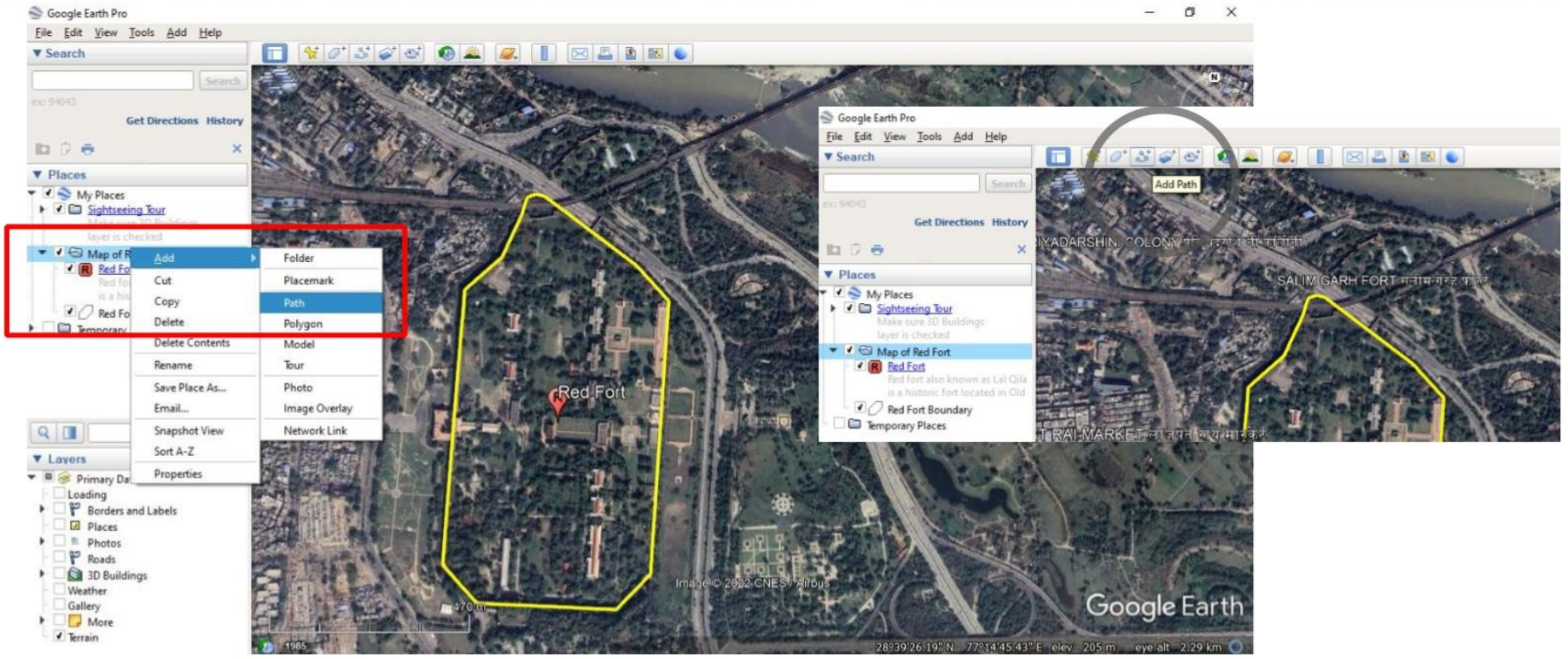


You can also select the **width and opacity** of the outline.



Step 13 In the **Measurements** tab, you can view the **Perimeter** and **Area** of the polygon. You can change the units by clicking on the drop-down menu of the perimeter and area tabs. Click **OK** once you have made the changes

Lesson 1: Digitizing features from images



Step 14 Right-click on new **Folder** you have created (in this case its called **Map of Red Fort**)< in the drop- down menu Click **Add**< Click-on **Path**

OR

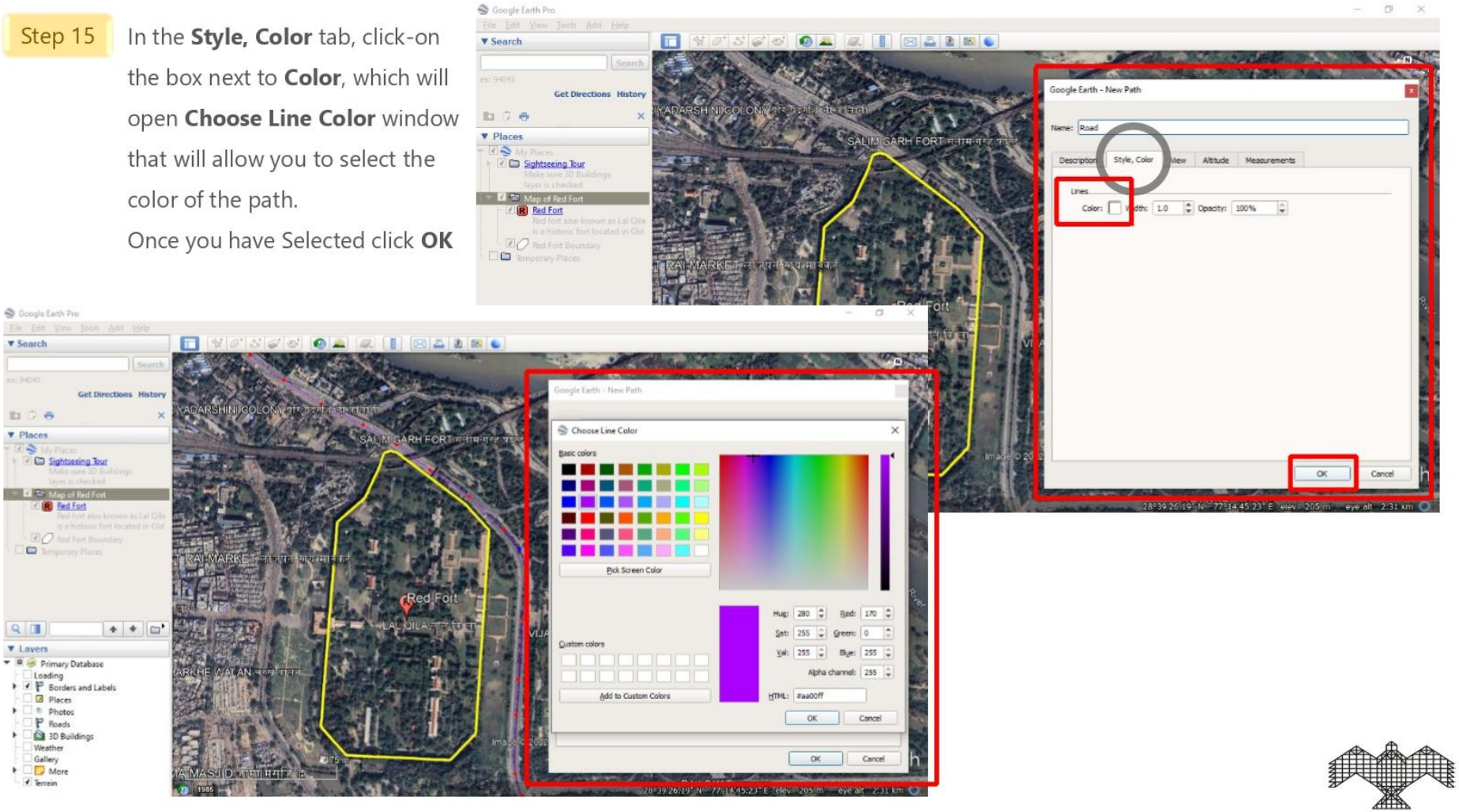
You can Select the **Map of Red Fort layer** in the **Places** panel on the left< Click-on the **Add Path** icon on the top toolbar panel

Lesson 1: Digitizing features from images

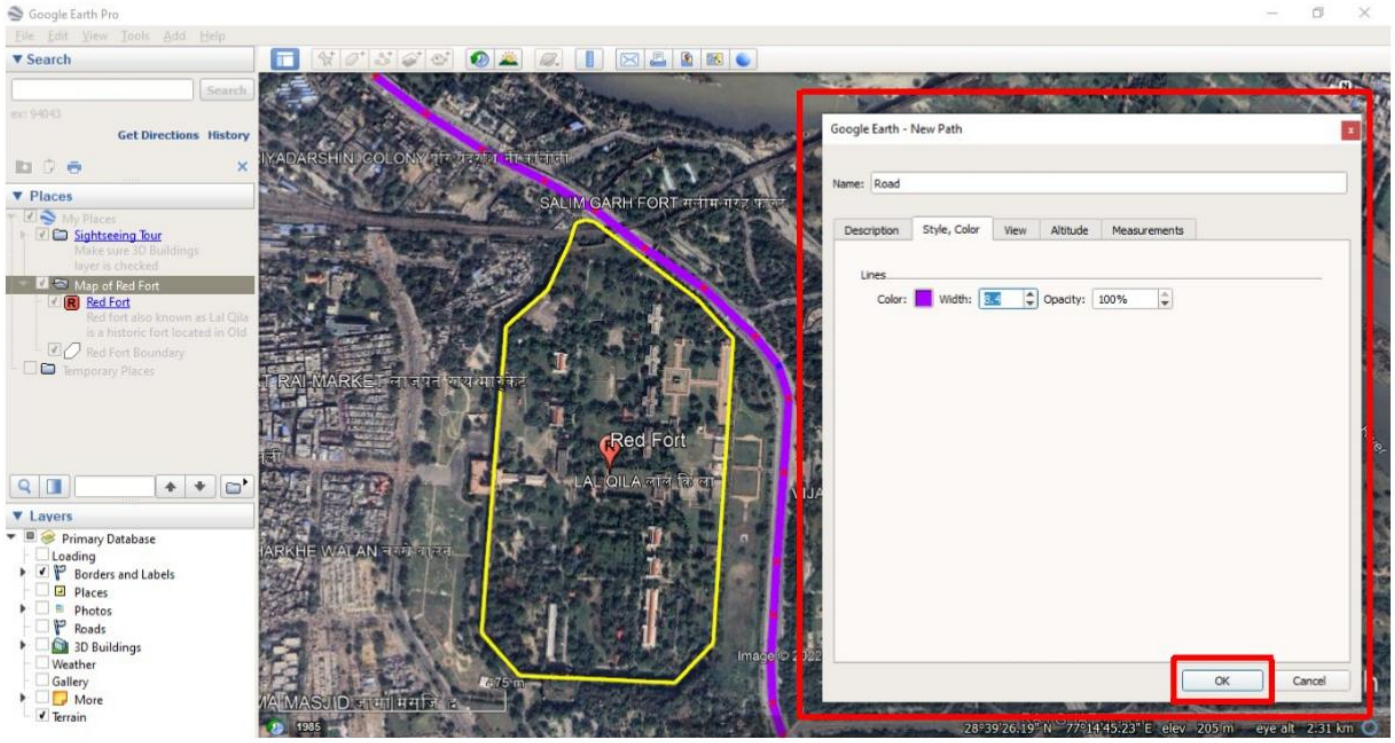
Step 15

In the **Style, Color** tab, click-on the box next to **Color**, which will open **Choose Line Color** window that will allow you to select the color of the path.

Once you have Selected click **OK**

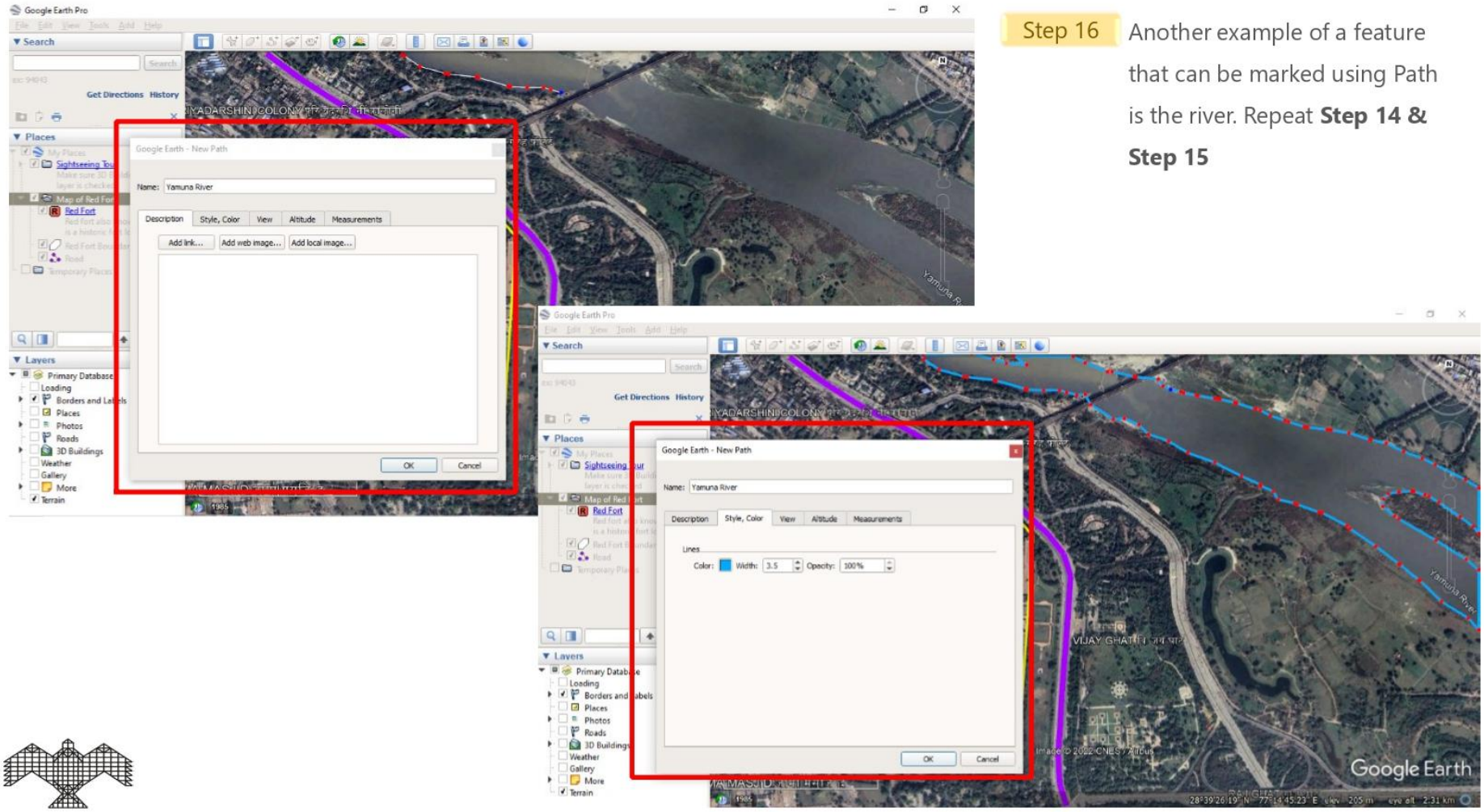


Lesson 1: Digitizing features from images



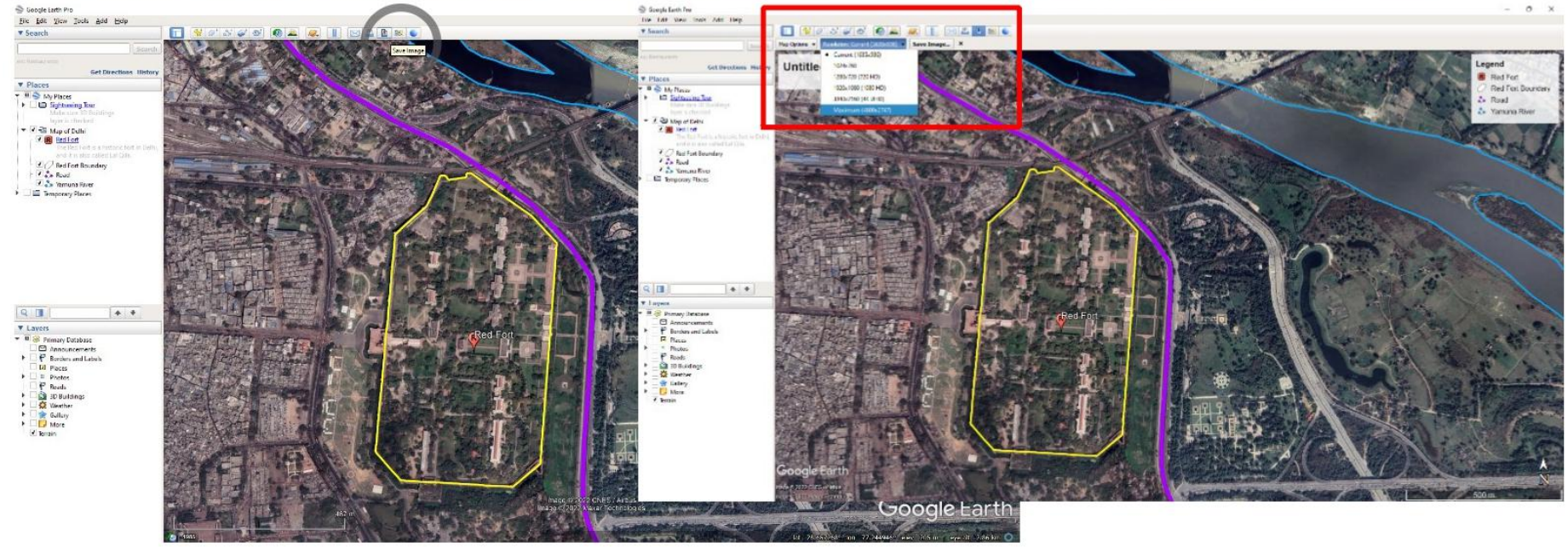
You can also select the **Color**, **width**, and **opacity** of the line. Click **OK** once you have made the changes

Lesson 1: Digitizing features from images



Step 16 Another example of a feature that can be marked using Path is the river. Repeat **Step 14 & Step 15**

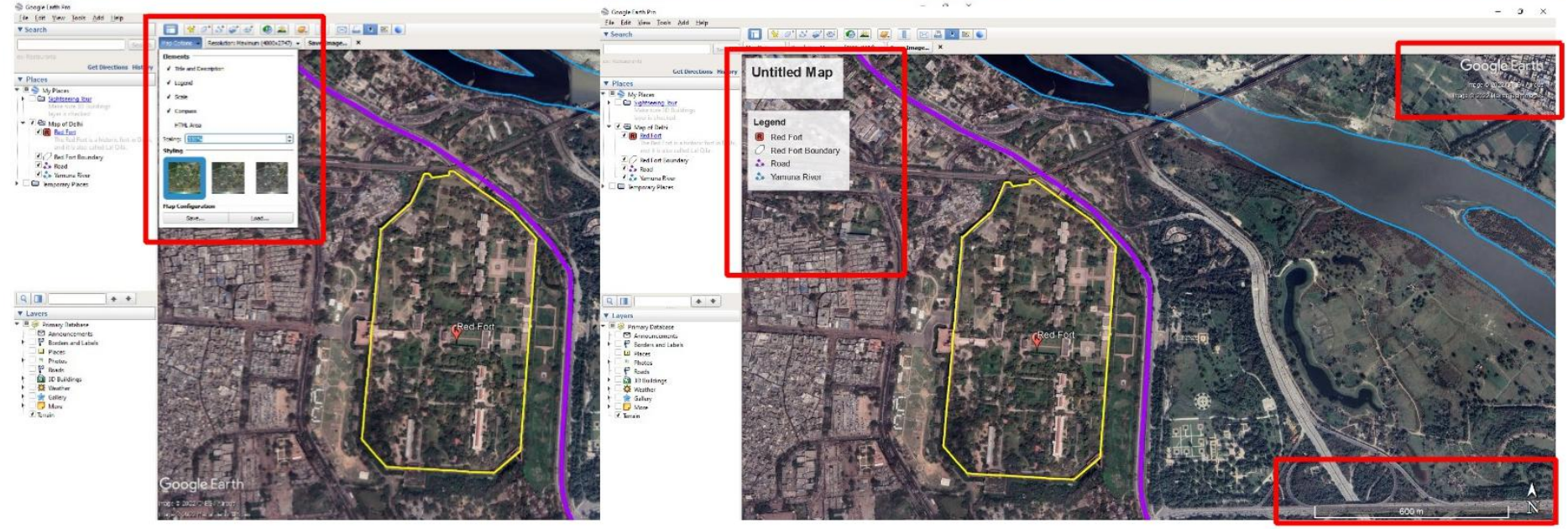
Lesson 1: Digitizing features from images



Step 17 You can **Save** the map that you have created as an image. Click-on the **Save Image** icon on the top toolbar in the workspace. This option will display a few options on the screen, like, a title, Legend, North arrow, and scale. These options displayed on the map are important as they allow you read the map accurately.

Step 18 In the **Resolution** tab, you can choose a map resolution you prefer and the image you save will be in this resolution. In this example, **Maximum** resolution is used.

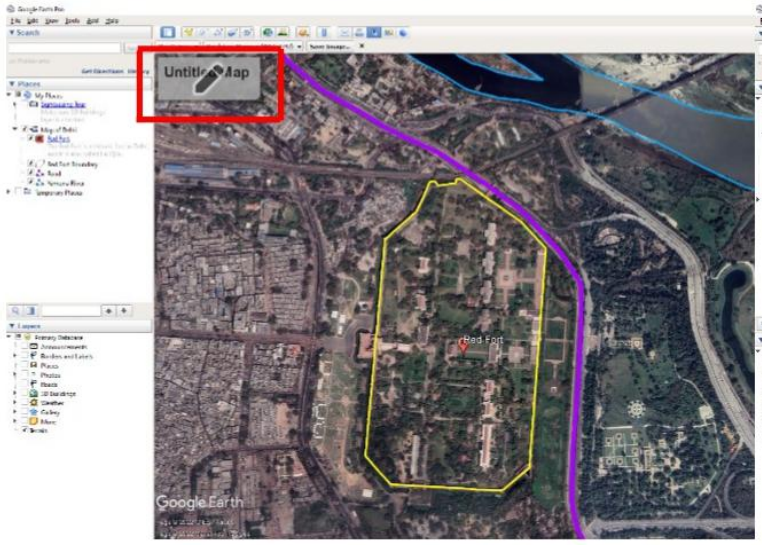
Lesson 1: Digitizing features from images

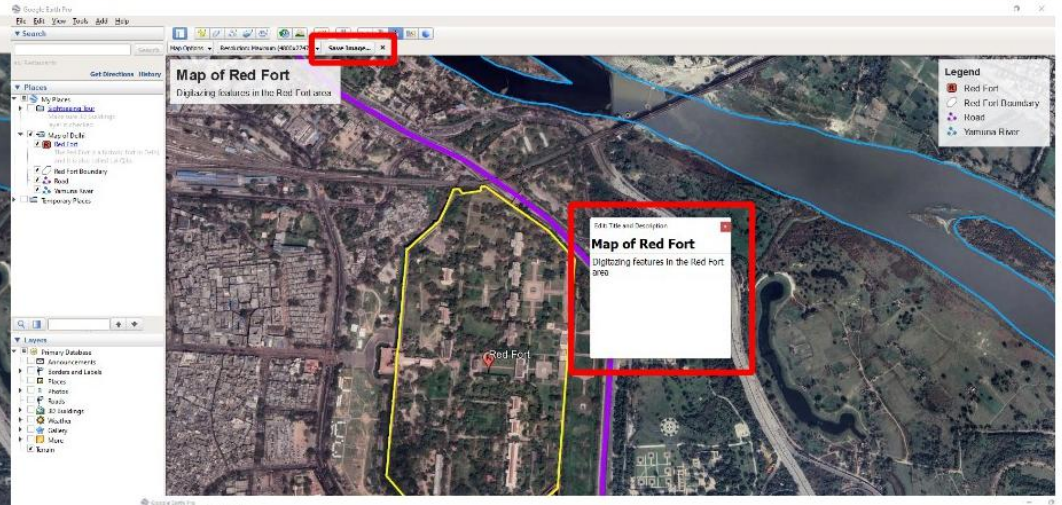


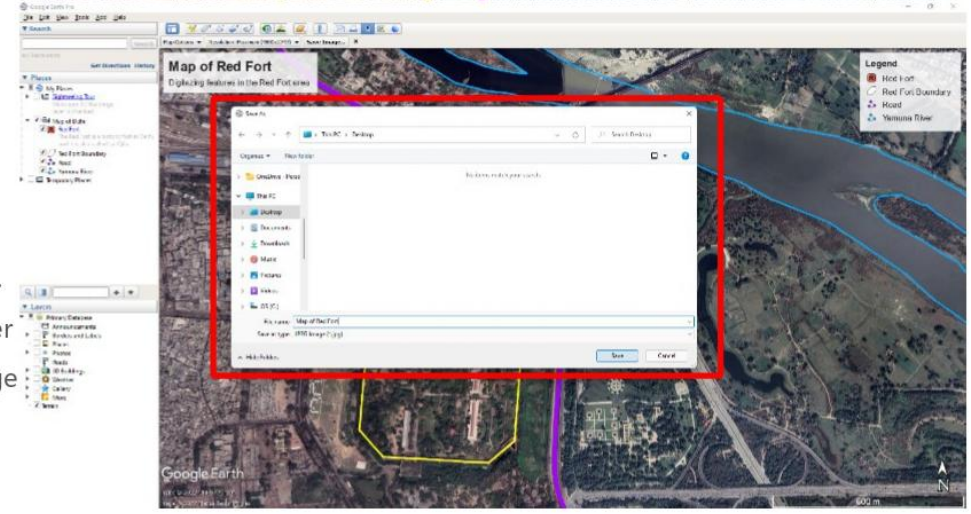
Step 19 In the **Map Options** tab, the drop-down menu will allow you to choose the options you want displayed on your map. For instance you can add/ remove the **Title** if you don't want it. You can also change the scale of the options displayed using the **Scaling** tab. The scale is based on the resolution of the image you choose. Once you have made the changes click anywhere outside the drop-down menu.

Step 20 The **Title**, **Legend**, **Scale**, and other options can be moved around on the map, and this allows you to create your own map layout

Lesson 1: Digitizing features from images





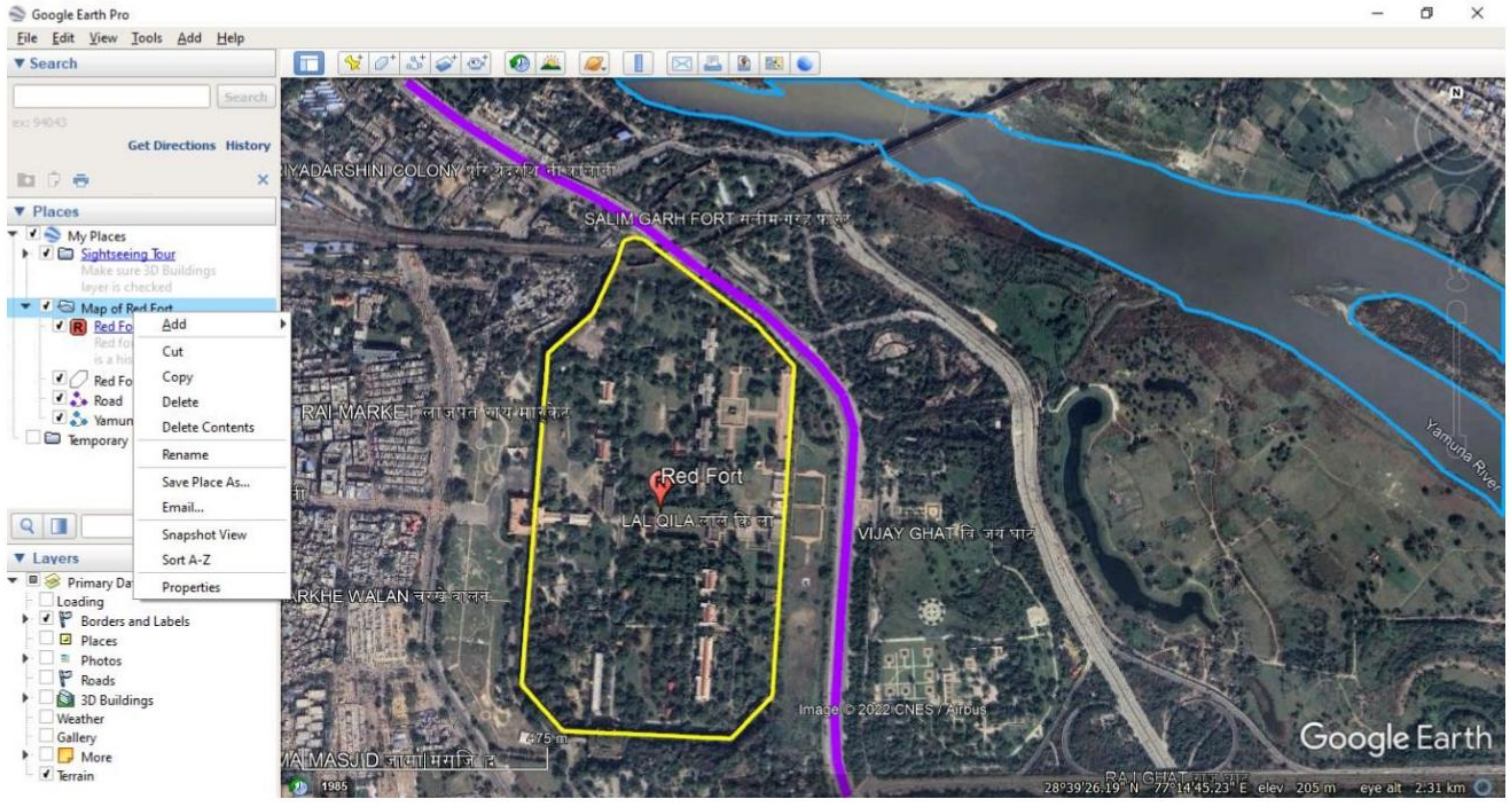


Step 21 Click-on the **Title** block on the top of the map layout. A window will pop-up that will allow you to **Edit the Title and Description** of the map. Once you have made the changes click anywhere outside the **Edit** window.

Step 22 After making the necessary changes, click-on Save Image. A Save As window will pop-up and this allows you to enter a file **Name**, choose a **File Type (.jpg)**, and save the image in a specific location on the computer/ drive.

Click **Save** once you have entered the details.

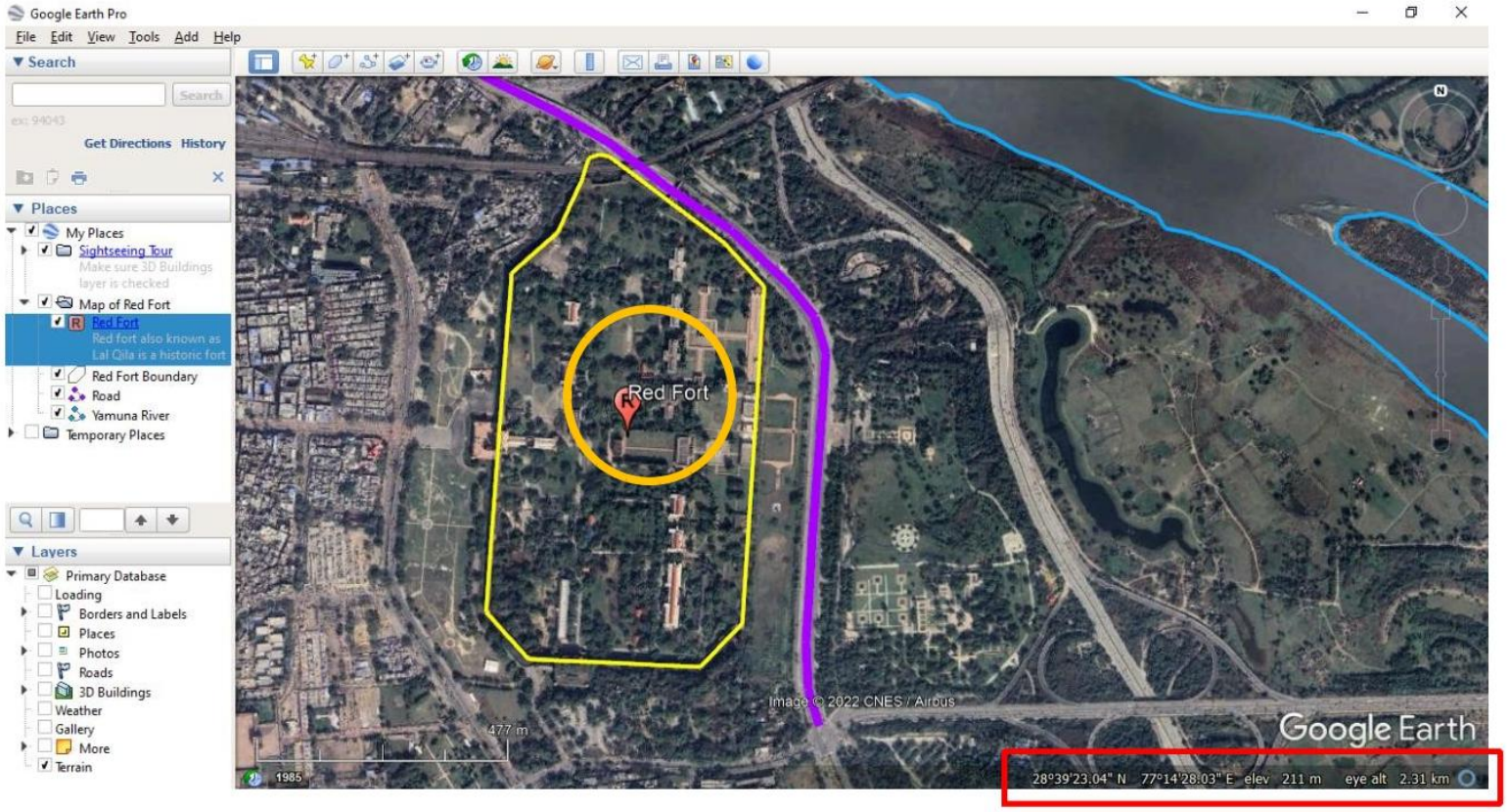
Lesson 1: Digitizing features from images



You have now created a map by digitizing features Lal Qila area of New Delhi.

Exercise 1: Digitize features in your school neighbourhood (for example, School of Excellence, Dwaraka Sec-22, New Delhi) using Point/ Placemark, Path, Polygon, and create a map. Once you have created the map save it as an image.

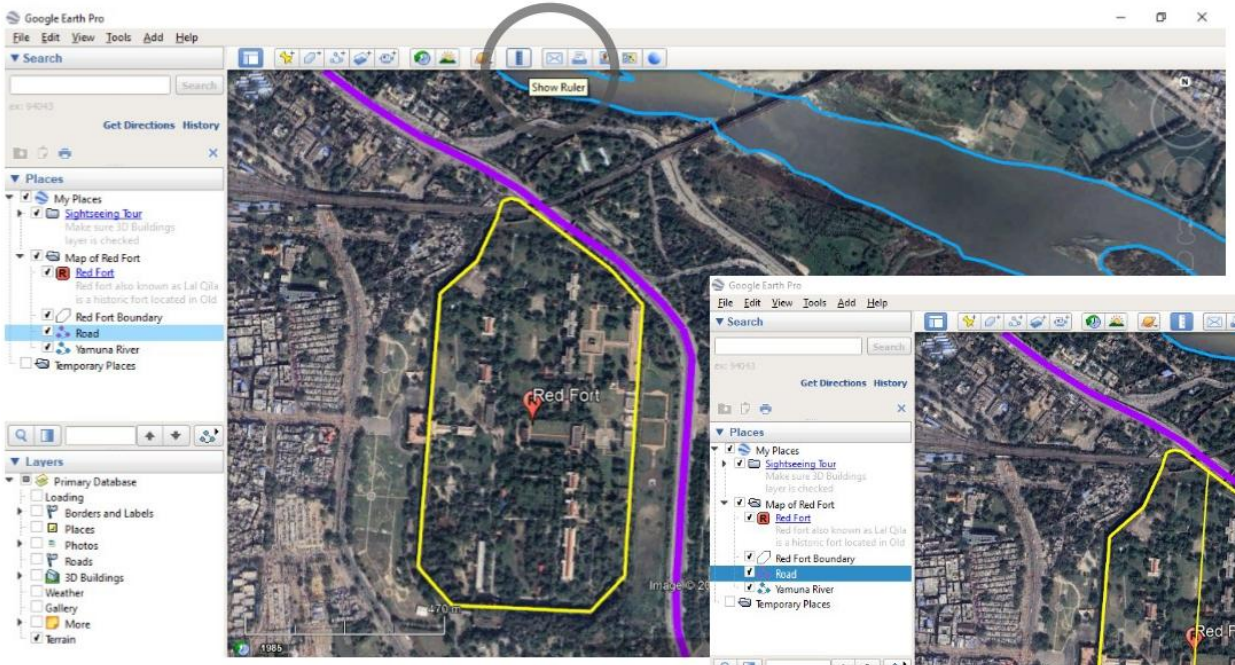
Lesson 2: Measuring locations, distances, and area using digital maps



In this lesson you will how to measure different features on satellite imagery.

Step 01 Hover over the Placemark on Red Fort, and on the bottom right corner you will be able to see the latitude, longitude, and elevation of the placemark

Lesson 2: Measuring locations, distances, and area using digital maps



Step 02

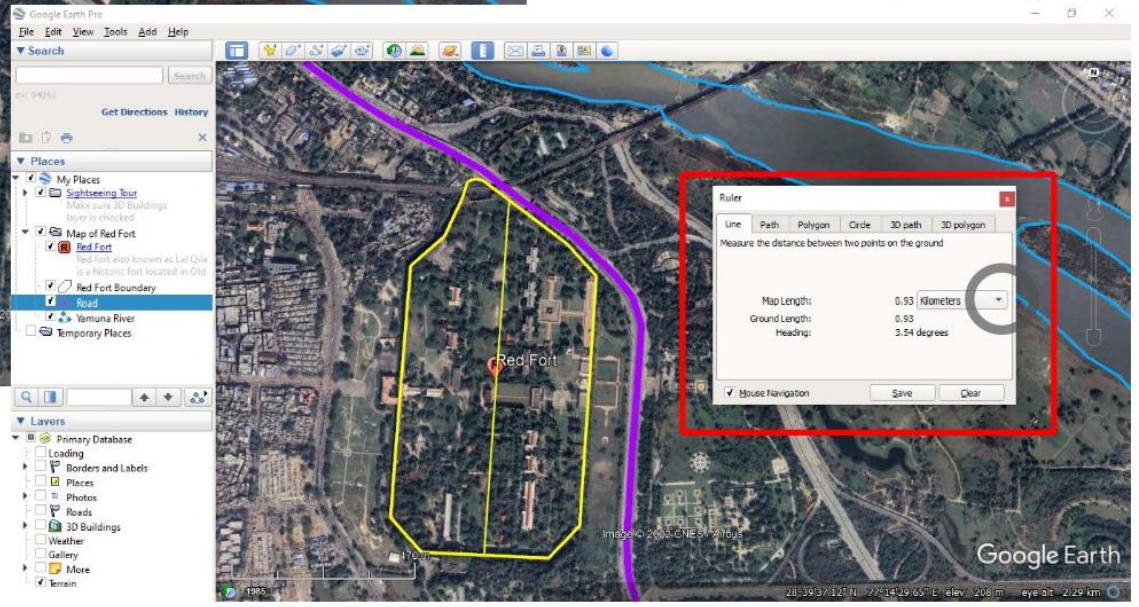
Select **Ruler** icon on the top toolbar of the workspace.

A **Ruler** window will pop-up.

Select the **Line** tab and on the screen mark points along the north-south direction of the Red Fort boundary.

You will be able to se the length of line you have drawn.

In the **Map Length** tab, the drop-down menu in units, you can select the units of measurement (like metres, kilometres, etc)

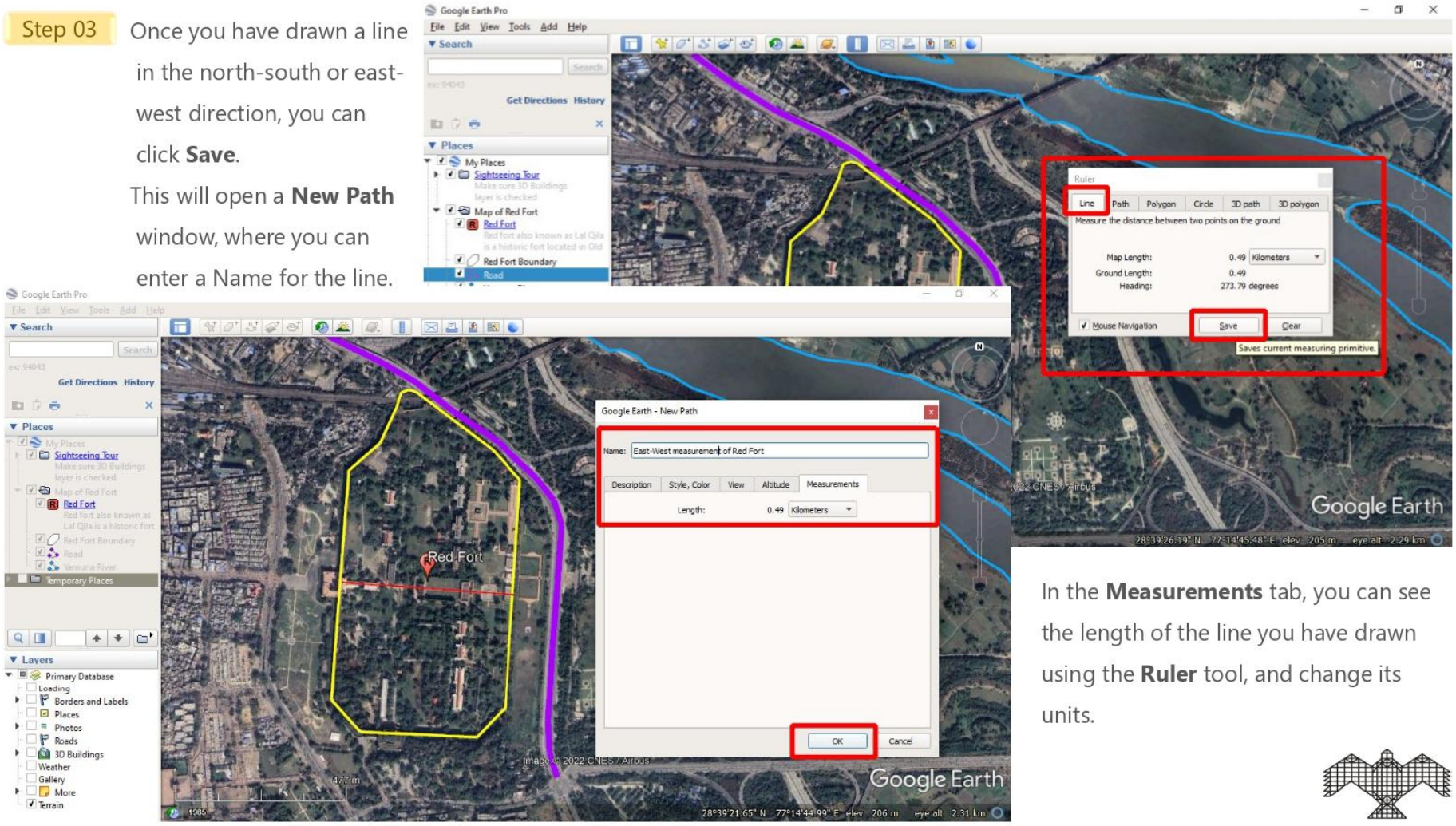


Lesson 2: Measuring locations, distances, and area using digital maps

Step 03

Once you have drawn a line in the north-south or east-west direction, you can click **Save**.

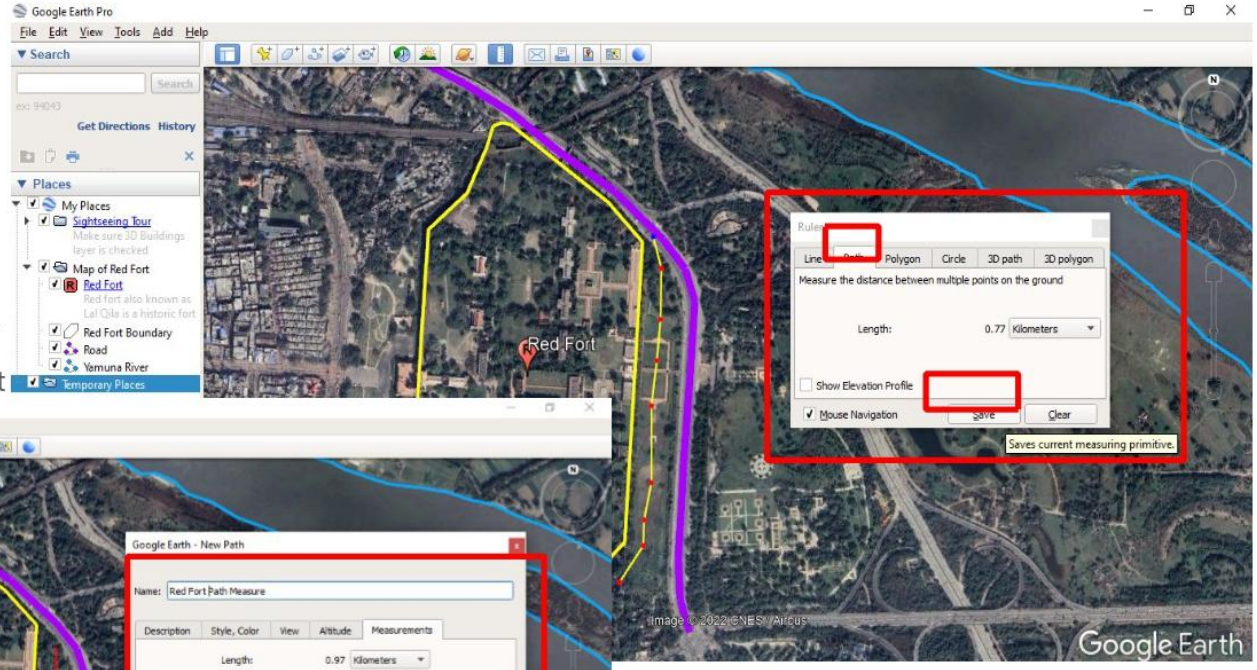
This will open a **New Path** window, where you can enter a Name for the line.

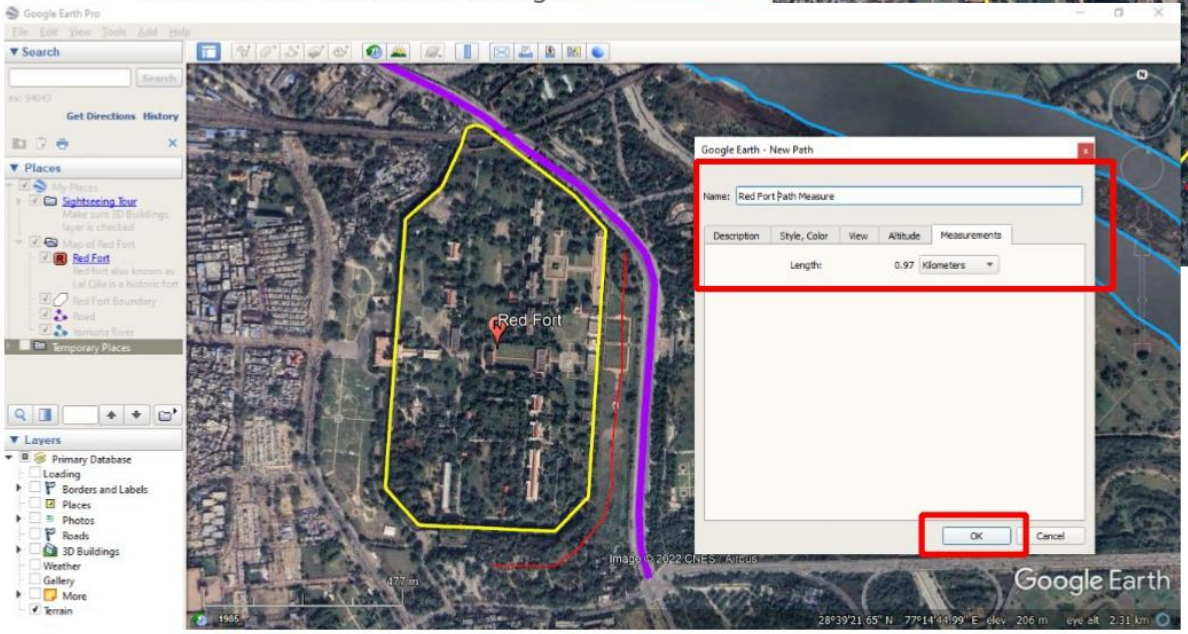


In the **Measurements** tab, you can see the length of the line you have drawn using the **Ruler** tool, and change its units.

Lesson 2: Measuring locations, distances, and area using digital maps

Step 04 In the **Ruler** window, select the **Path** tab and on the screen mark points of a path you would like to measure (for example, along the Red Fort boundary). The **Path** option allows you to draw a line in haphazard pattern or along any direction that need not be straight

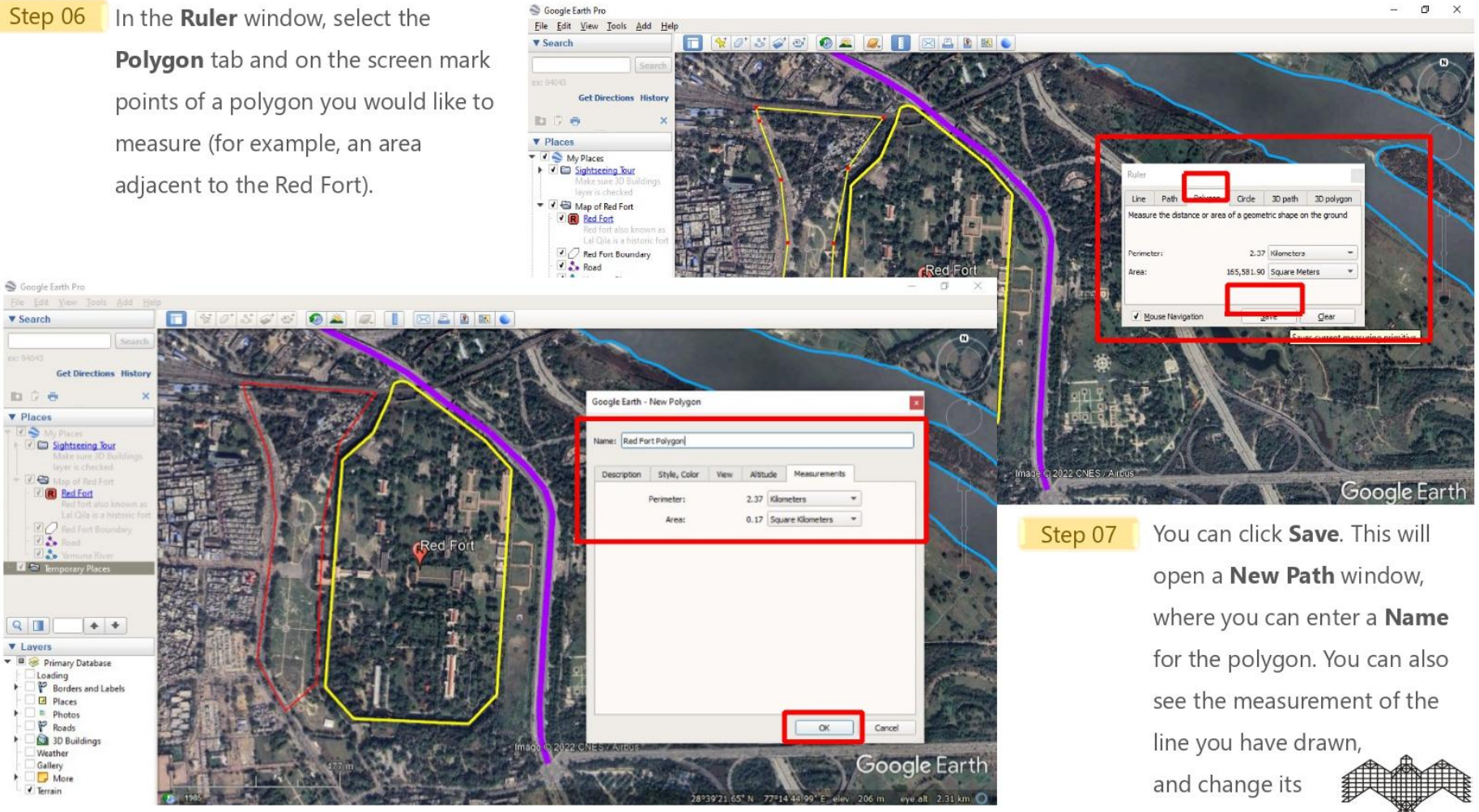




Step 05 You can click **Save**. This will open a **New Path** window, where you can enter a **Name** for the Path measure. You can also see the measurement of the line you have drawn, and change its units.

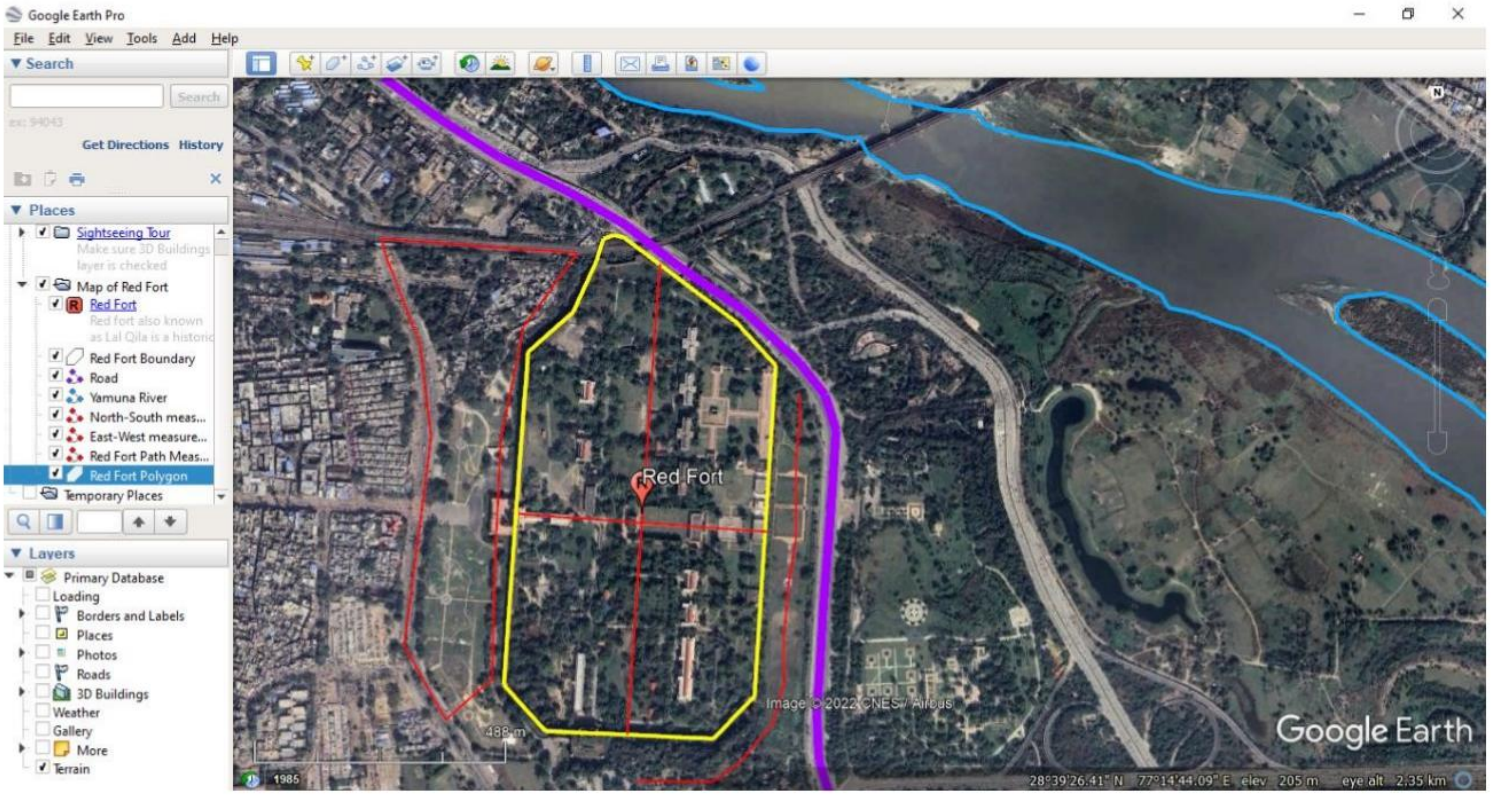
Lesson 2: Measuring locations, distances, and area using digital maps

Step 06 In the **Ruler** window, select the **Polygon** tab and on the screen mark points of a polygon you would like to measure (for example, an area adjacent to the Red Fort).



Step 07 You can click **Save**. This will open a **New Path** window, where you can enter a **Name** for the polygon. You can also see the measurement of the line you have drawn, and change its units.

Lesson 2: Measuring locations, distances, and area using digital maps



You can now measure locations, distances, and areas of feature you have marked on the map.

Exercise 2: Mark the location of your school (for example, School of Excellence, Dwaraka Sec-22, New Delhi) by recording the latitude, longitude, and elevation.

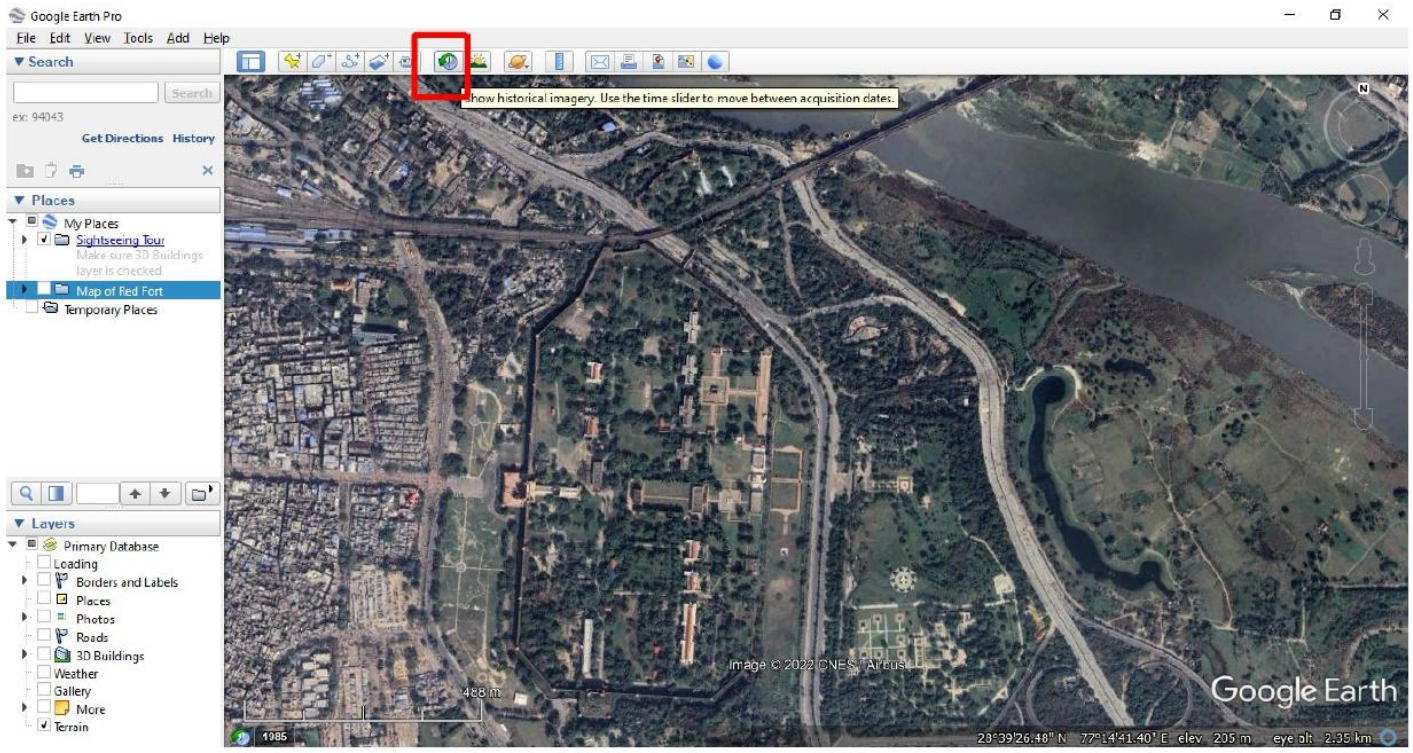
- You can then measure the path you take to school either by walk, drive, or the bus.
- Measure the distance between your school and the nearest bus stop.

WEEK 2

Mapping natural and man-made changes in different places

Objective: Understanding changes by examining maps of different dates/ seasons/ years; observing landuse changes; and other natural and man-made changes that have taken place in different parts of the globe.

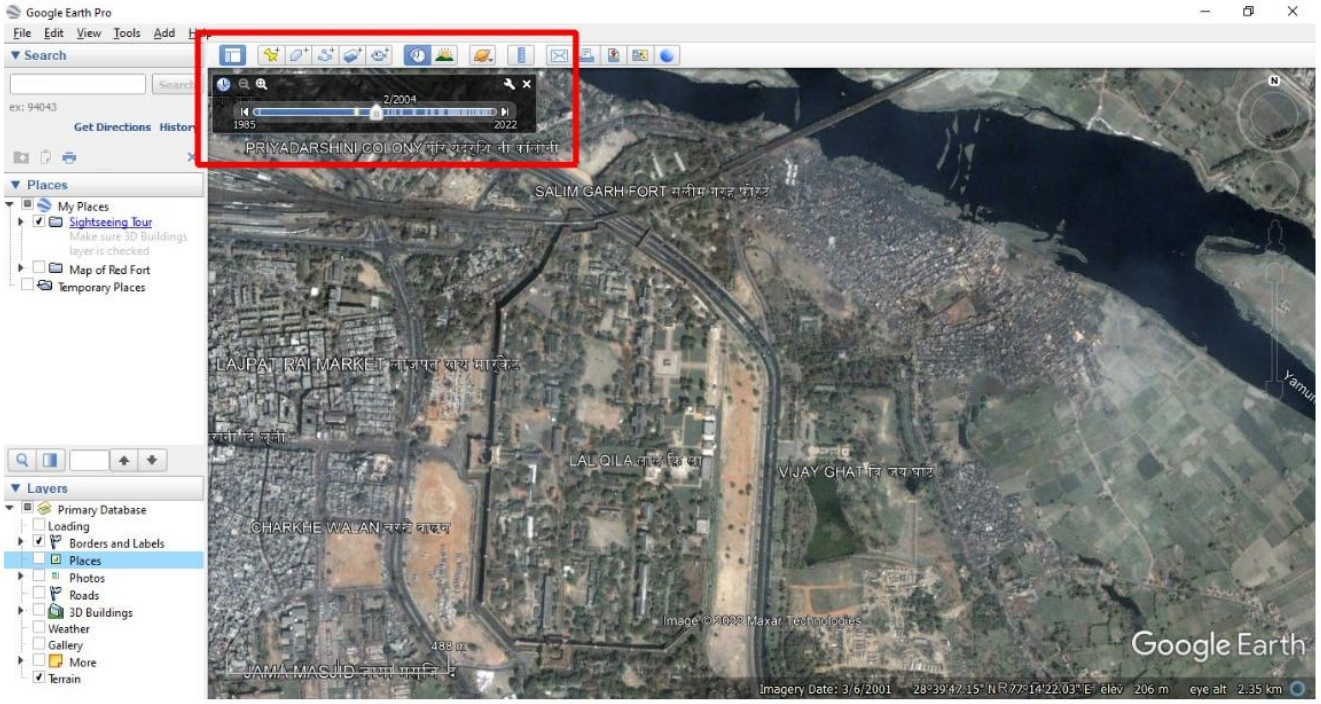
Lesson 1: Understanding changes by examining maps of different dates/ seasons/ years, and observing the landuse/ landcover changes



You can analyze and understand natural and man-made changes that have taken place over time, in different places, on satellite imagery. Changes like movement of a river course, melting of ice-caps, growth pattern in urban areas, changes in shorelines, etc.

Step 01 Zoom into Lal Qila, New Delhi, and on the top toolbar click-on the **historical imagery** icon.

Lesson 1: Understanding changes by examining maps of different dates/ seasons/ years, and observing the landuse/ landcover changes



Step 02 This will open a timeline window on the top left corner of the workspace. The timeline allows you to view satellite imagery of the past by manually sliding the control to any month or year. You can observe the changes that have taken place in geographic regions over the past three decades.

In the previous slide you can see what Lal Qila and the surrounding area looks like from space, in the present day. With historic imagery you can see what it looked like in the past. For example, in the image above you see what Lal Qila and the surrounding area look like in February 2004. Some major changes you can observe are the areas outside the fort boundary, which are vacant, and developments have taken place after 2004.

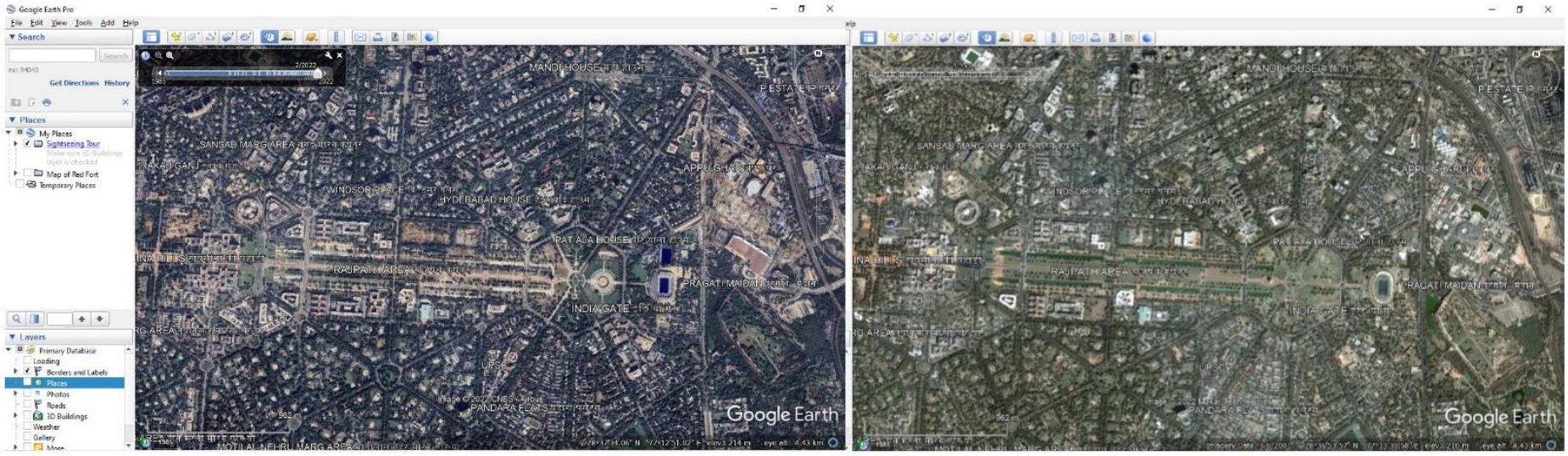
Lesson 1: Understanding changes by examining maps of different dates/ seasons/ years, and observing the landuse/ landcover changes

Let's take another example of Delhi International Airport. This slide shows images of the airport in different time periods. Observe the changes that have taken place over time.

Exercise 1: What changes have taken place starting from 2001?

- Which year did the airport expand?
- What has happened to the immediate surroundings of the airport?

Lesson 1: Understanding changes by examining maps of different dates/ seasons/ years, and observing the landuse/ landcover changes

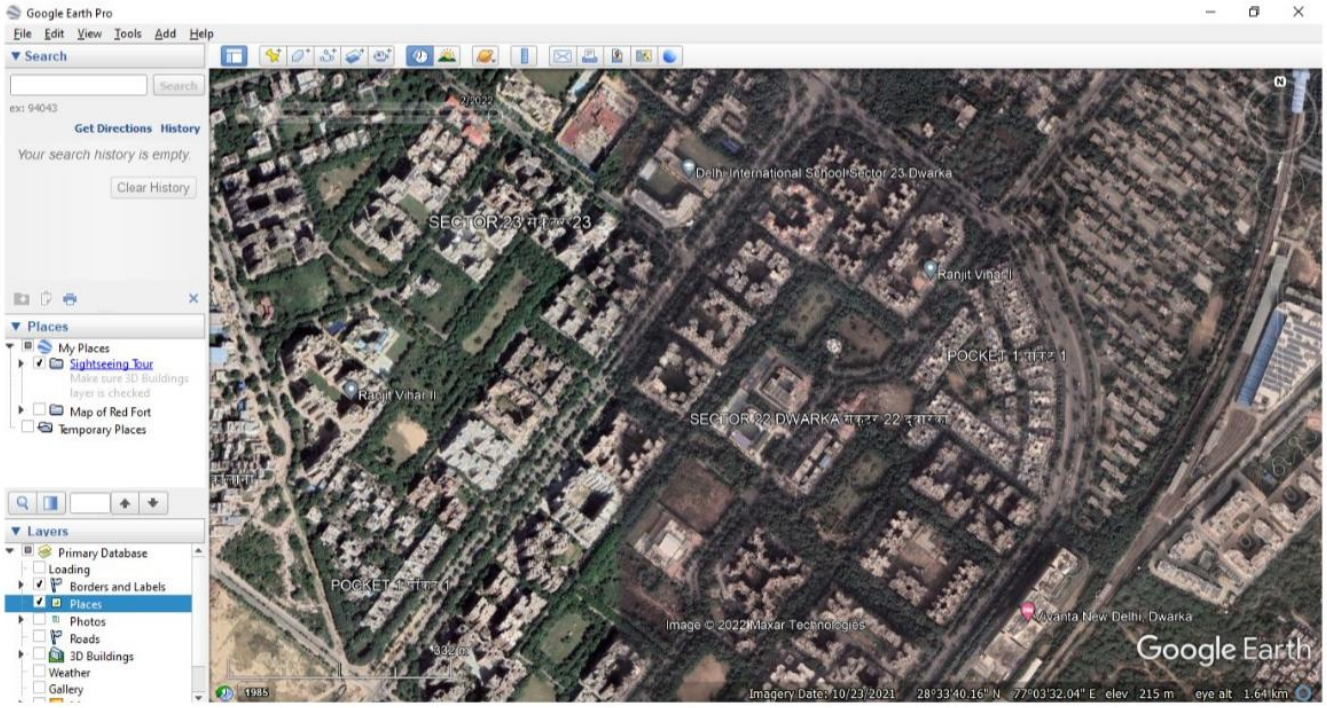


An example of historical imagery of the **Rajpath** in Delhi show the changes that have occurred in landcover in the recent times. Observe the changes in open spaces that has taken place recently.

Exercise 2: What changes have taken place in this area in the last two years?

- Describe the changes in landuse/ landcover of the area in the recent times.
- When are can you start to see major changes taking place in this area?
- What do you think are the reasons for the changes that have occurred in this area?

Lesson 1: Understanding changes by examining maps of different dates/ seasons/ years, and observing the landuse/ landcover changes

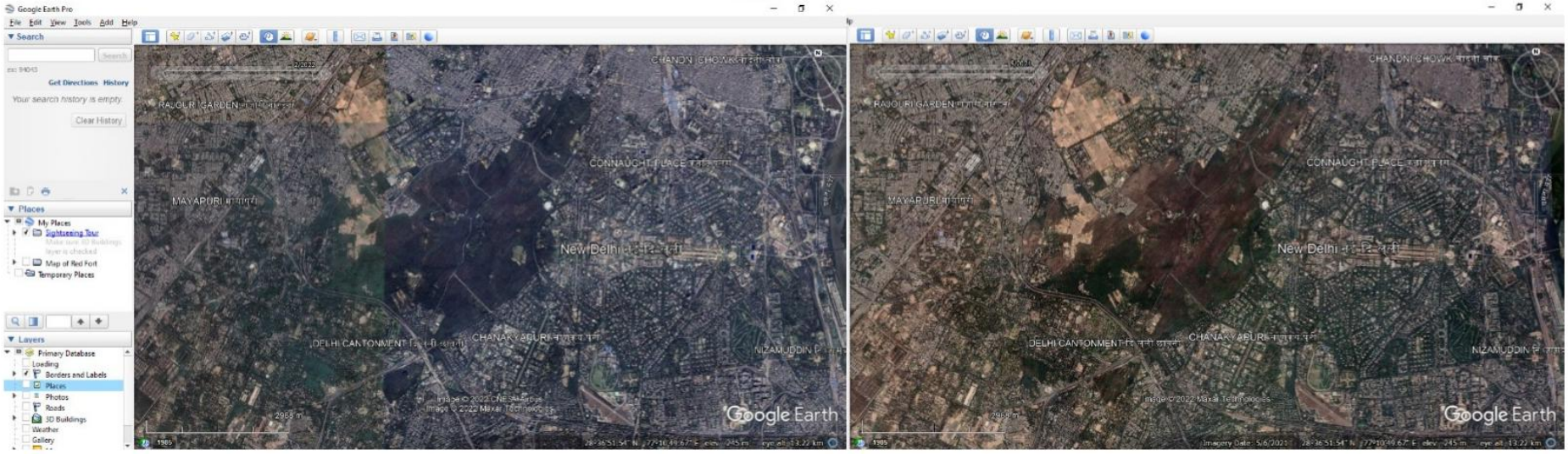


Consider the example of your school neighbourhood (for instance, School of Excellence, Dwaraka Sec-22, New Delhi). With the help of **historical imagery** option see the changes that have taken place in the past few years.

Exercise 3: Enquire with anyone you know (like your school watchman, or a vendor in the neighbourhood) about the changes in the area they have observed in the past few decades. Make note of it

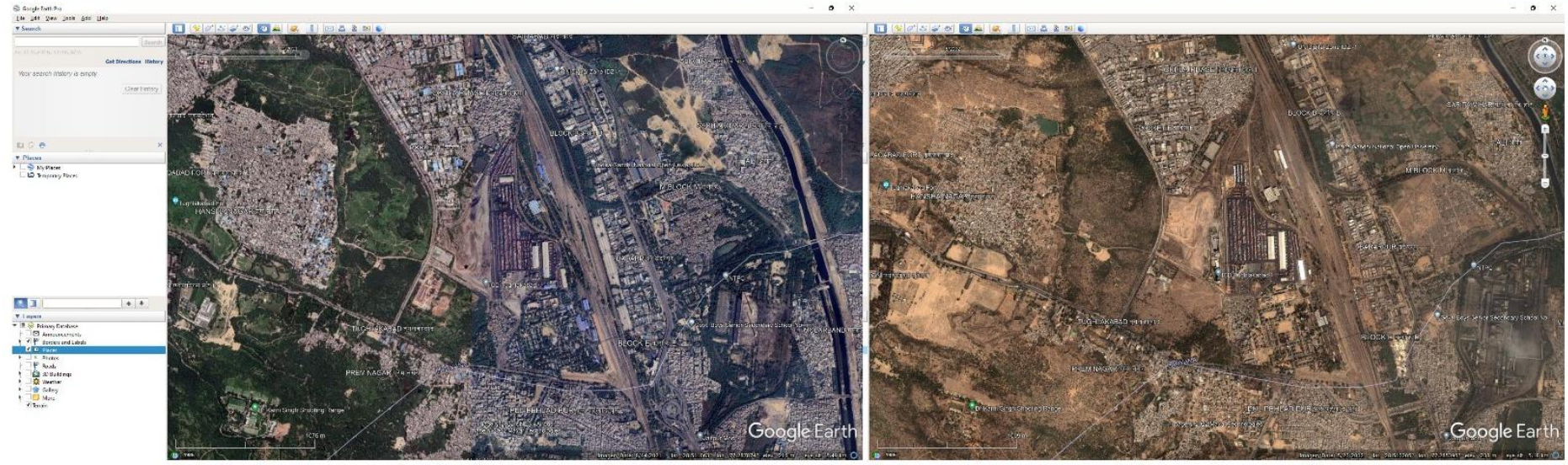
- What changes do you observe in the landuse/ landcover of the area since 2001.
- When (what date) can you start to see major changes taking place in this area?
- What do you think are the reasons for the changes that have occurred in this area?

Lesson 1: Understanding changes by examining maps of different dates/ seasons/ years, and observing the landuse/ landcover changes



This is a reserve forest in the central part of New Delhi. With the help of **historical imagery** you can see the seasonal variations. The left image is from February 2022 and the right image is from May 2021.

Lesson 1: Understanding changes by examining maps of different dates/ seasons/ years, and observing the landuse/ landcover changes

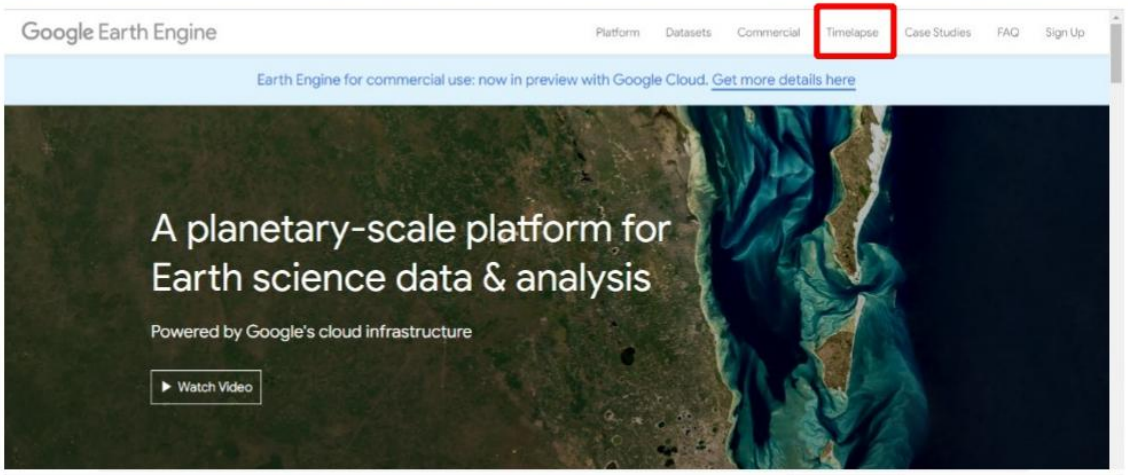


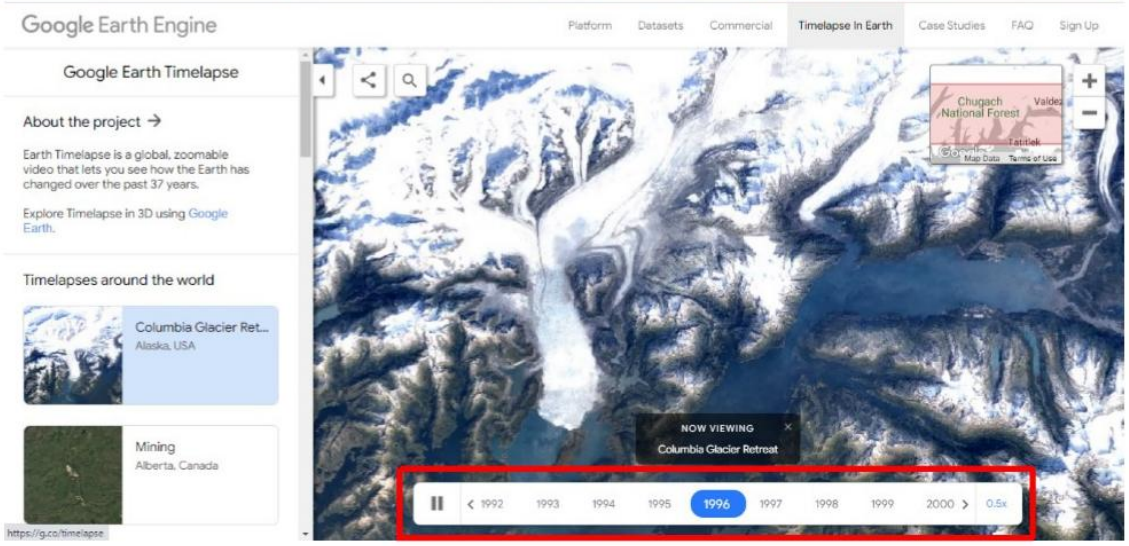
This is another example of a Garbage dump in Tughlakabad. Use **historical imagery** option to see the changes that have taken place in the past few years. Observe the change in open/green spaces over time and see the seasonal changes that have taken place

Exercise 4: What changes have taken place starting from 2002?

- Describe the changes in landuse/ landcover of the area since 2002.
- When (which date) can you start to see major changes taking place in this area?
- What do you think are the reasons for the changes that have occurred in this area?

Lesson 2: Observing other natural & man-made changes that have taken place in different parts of the globe.



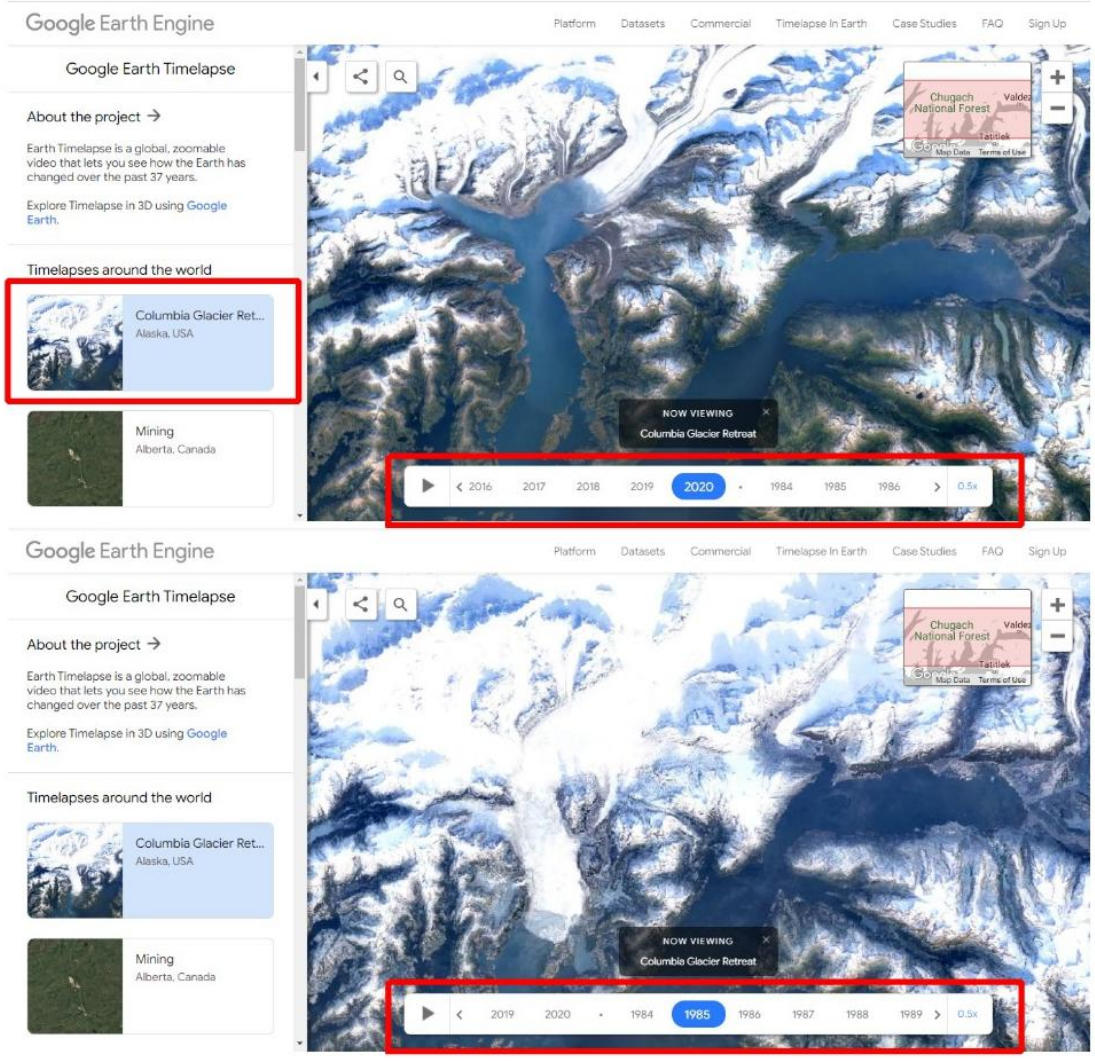


You can observe some the natural and man-made changes that have taken place over time, on satellite imagery with the help of an online platform called **Google Earth Engine**. Explore the site but for our lesson, here's a link to access the website- https://earthengine.google.com/

Step 01

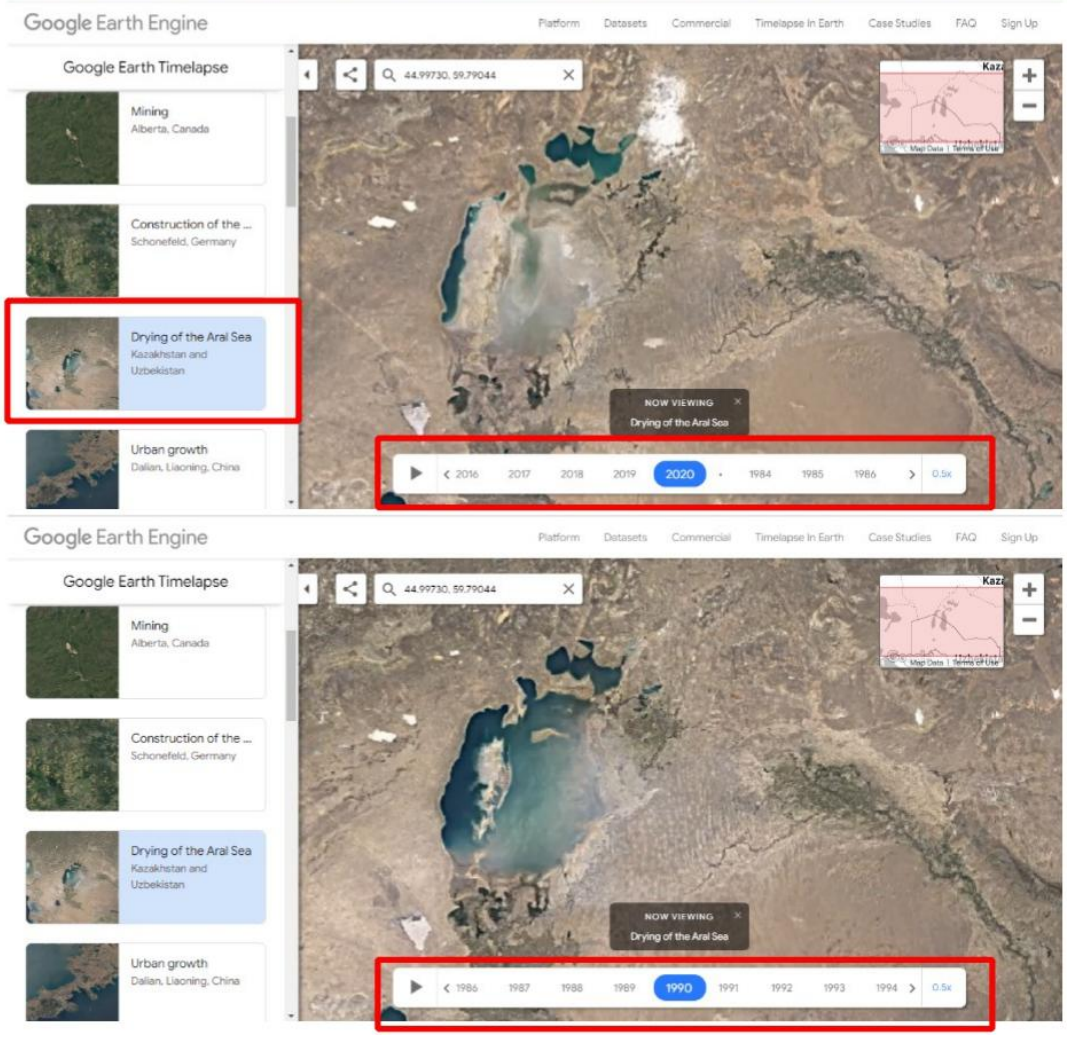
The link above takes you to the **Google Earth Engine** homepage. Click-on the **Timelapse** tab on the top right corner of the page. This takes you to the **Google Earth Timelapse** page that displays timelapse animation of different geographic regions from the year 1985 through 2020. The timelapse video allows you to see the changes that have occurred in a particular place from 1984. You can also pause the animation and click on a particular year to view what the place looked liked.

Lesson 2: Observing other natural & man-made changes that have taken place in different parts of the globe.



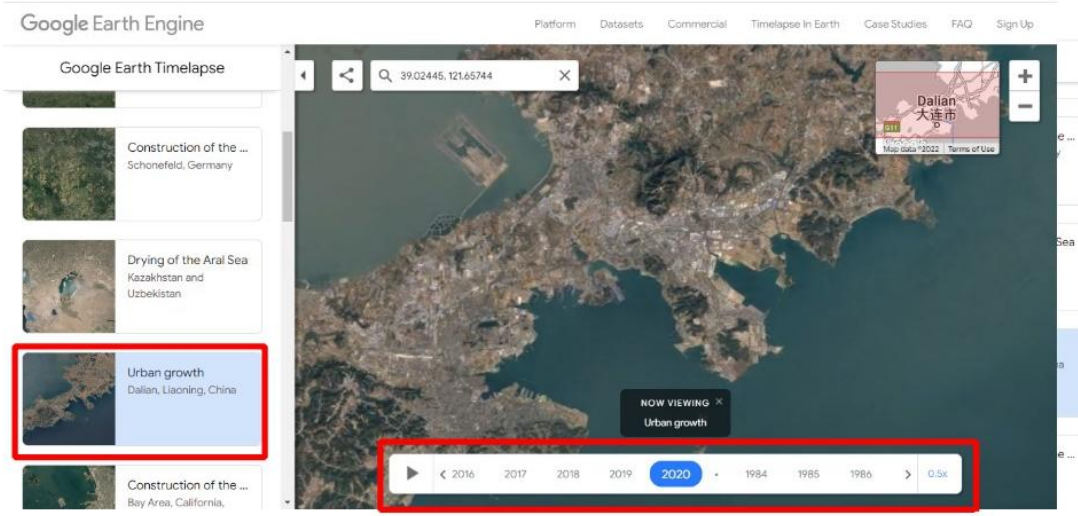
This page allows you to view a few examples of **Timelapses around the world**. The images shown here is an example of the Columbia Glacier Retreat. The first image is of the Glacier in the year **2020** and the image below is of the Glacier in the year **1985.** Observe the melting of glaciers that has occurred in this region over the past few years.

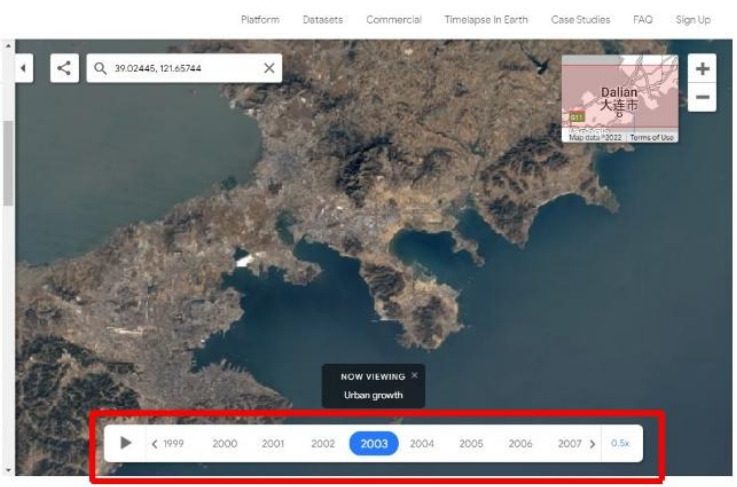
Lesson 2: Observing other natural & man-made changes that have taken place in different parts of the globe.

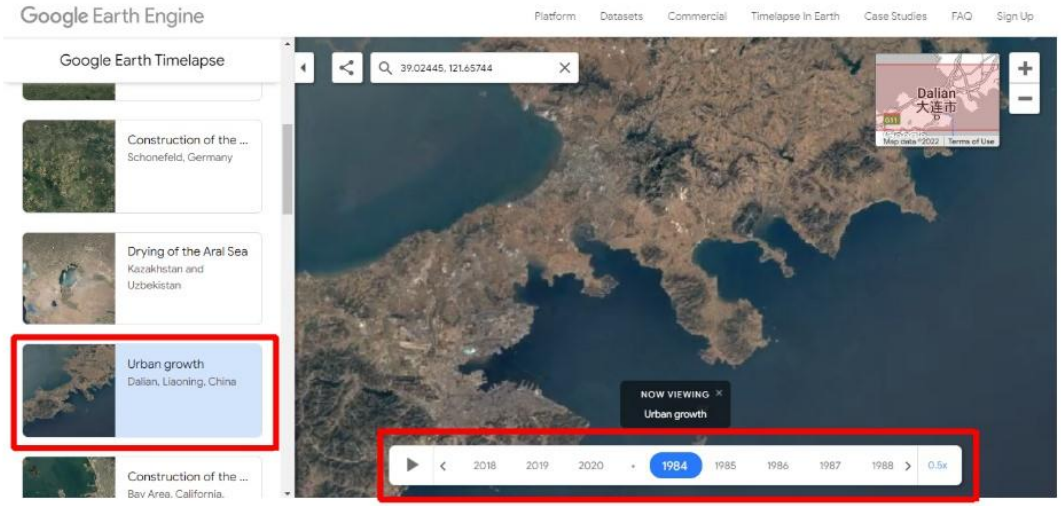


Another interesting example is the Drying of Aral Sea**.** Observe the change in the extent of the sea that has occurred over the past few years.

Lesson 2: Observing other natural & man-made changes that have taken place in different parts of the globe.

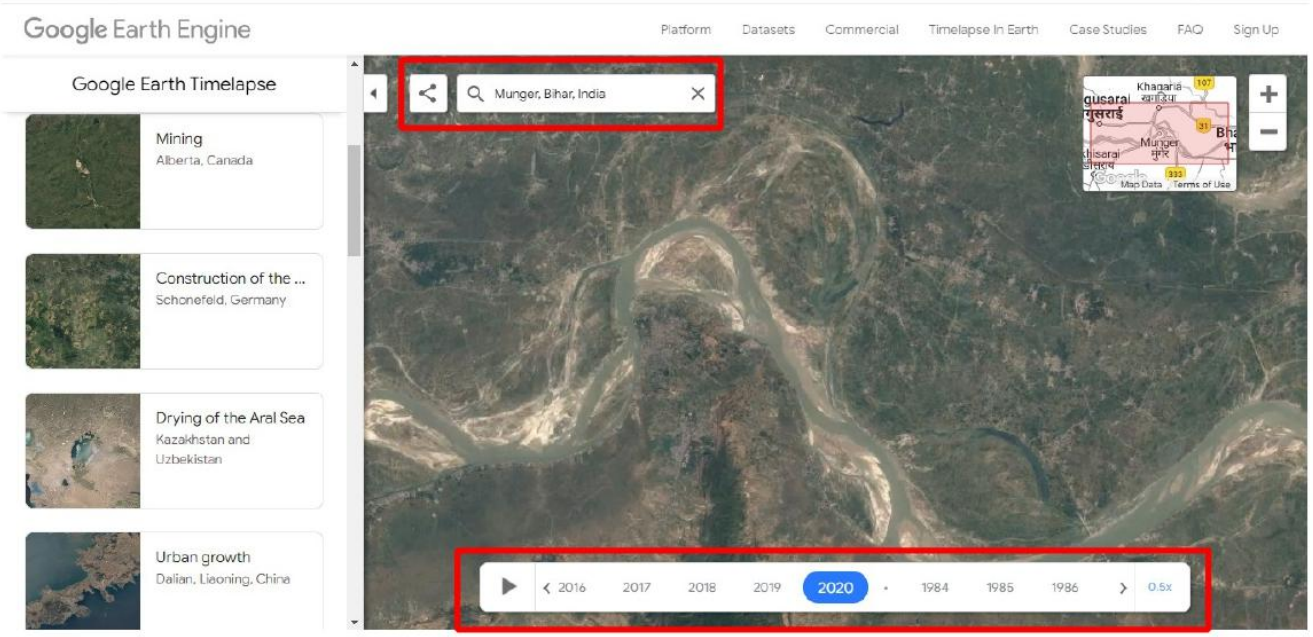






An example of Urban Growth of Dalian, Liaoning, China. The images here show urban growth at various stages from **2020** to **1984**. You can observe that from **2003** the region started experiencing massive urban growth including land reclamation.

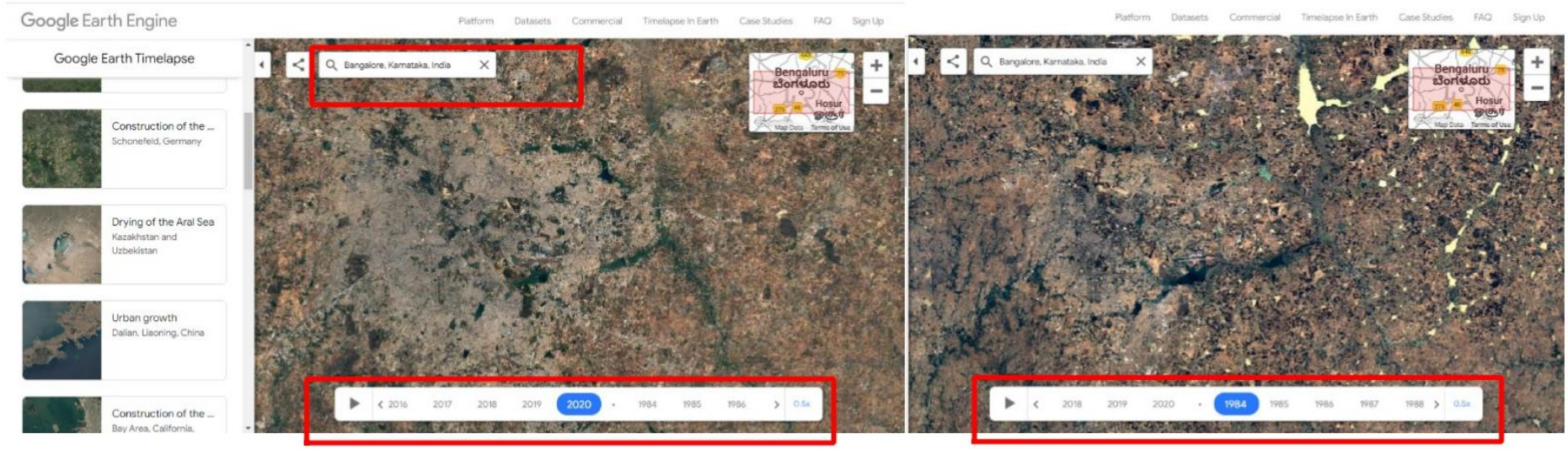
Lesson 2: Observing other natural & man-made changes that have taken place in different parts of the globe.



Exercise 1: Search for **Munger, Bihar**

- What changes do you observe in the course of the river from 1984 to 2020?
- What other changes do you observe in the timelapse video? Record the year in which there is a significant change

Lesson 2: Observing other natural & man-made changes that have taken place in different parts of the globe.



Exercise 2: Search for **Bangalore, India**

- What changes do you observe in the urban growth pattern of Bangalore from 1984 to 2020?
- Observe and record landuse/ landcover changes that have occurred over the years? Record the year in which there is a significant change in the growth pattern.

Varied contexts of mapping

In Week 1, you had made maps of your neighbourhood. Based on that, answer the following questions:

- While you were collecting information to create your map, what interested you the most?

- Why did this interest you? Can you give two good reasons?

Why do people make maps?

People develop relationships with the spaces they live in. For many groups or communities these spaces are more than just the source of resources and livelihood. For many peoples around the world for whom their ancestral homes are living beings with rights and feelings—like people—and, as such, "maps" are the representations of these relationships with the places.

In Week 1, you had made maps of your neighbourhood. Based on that, answer the following questions:

- While you were collecting information to create your map, what interested you the most?
- Why did this interest you? Can you give two good reasons?

A. Maps in the Inuit community of Greenland

Map 1

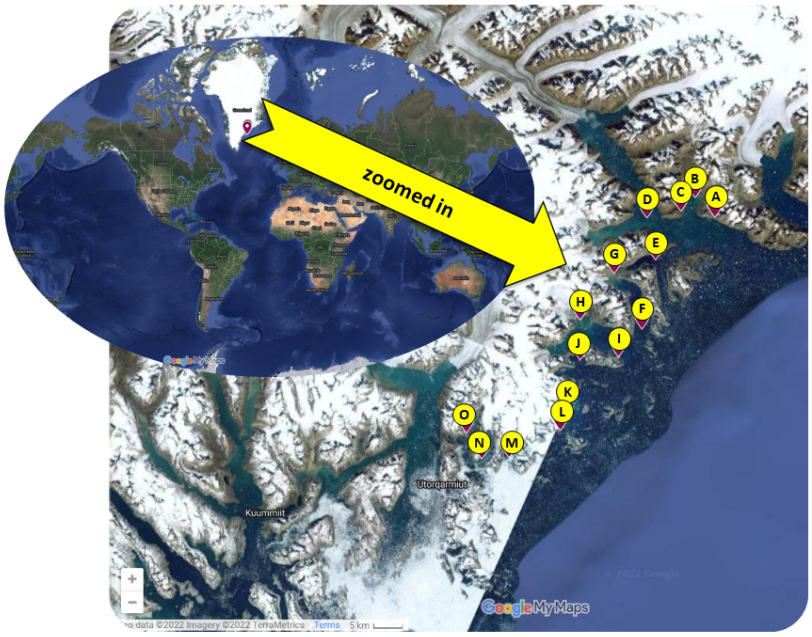
The Tunumiit people live in Greenland. Mapping is part of their way of life reflecting their intimate familiarity with the land and it's nature.

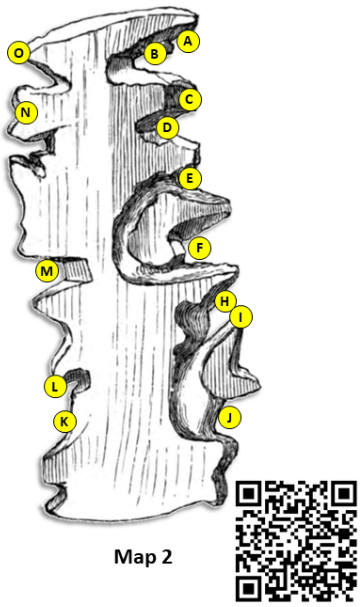
The Tunumiit people are seafarers. A Tunumiit person called Kunit gave a small wooden artefact to a Danish explorer called Holm. This was a Tunumiit map with rich information about the coastlines that they frequently sailed around. It was a map carved on driftwood showing their imagery of the land. This was like a tool of reference for their younger generation, to help them learn to orient themselves in their journeys. In their everyday journeys, they had map imageries in their heads, and did not carry the map around with them.

(Refer to Map 1 on the left)

Kunit described the coastline in great detail. He elaborated on the land- and sea-scape and indicated where and when they would need to carry their boats over some land to reach the next accessible waterway. In Map 1, the locations of seven important islands along the eastern coast of Greenland are seen, where the Tunumiit people live. The shape and indentations of the artefact convey the relative positions of the islands.

Using another artefact titled Map 2—Kunit elaborated the route along the unbroken coastline shown along the two edges of the map. Use the QR code to look at the map on Google Maps.





Map 2

- What are your reflections on the fact that the Inuit people recalled every detail of their coastlines?

B. Maps from Marshall Islands

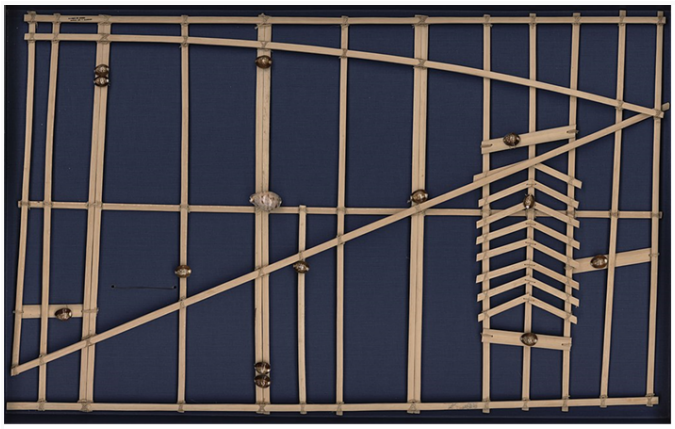
The Pacific Ocean is dotted with many island groups that cannot be seen on a small-scale map such as a globe or a world map. The Marshall Islands is one such group of islands.

- Locate the Marshall Islands. Enter the following link into your browser:

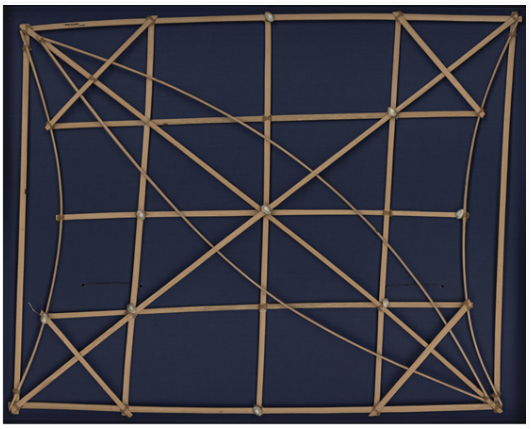
  https://tinyurl.com/y2uyku56, or use the QR code.

The communities living in the various atolls comprising the Marshall Islands used to undertake long-distance travel between islands by different kinds of canoes. This practice was declining by the late 19th century.

The Marshallese used to voyage within the atolls across at least 250 km up to 740 km across water. Moreover, they also sailed over 12 days to islands beyond the atolls. There are records of voyages between atolls comprising 300 to 400 people. The navigators on these voyages did not consult maps and charts while on the voyage but they and their apprentices—the youngsters of the community—would remember the land and water layout. They made maps using coconut palm sticks, fibres and cowrie shells, and classified as “meddo” or “mattang” depending on their functions.



Map 3



Map 4

Meddo (Map 3) was made for piloting instructions, showing the relative locations of islands and ocean phenomena like swells and currents. Mattang (Map 4) was made to communicate phenomena affecting the oceans such as swell movements of the water, wind patterns and the interactions of waves. For example, the intersections of the coconut sticks indicated disturbed waters and the cowrie shells indicated the location of islands.

The Marshallese were known to have been pushed into unfamiliar waters and unfamiliar territories by strong winds. However, even after these drift voyages, they were able to return to their home islands

- Reflect on the creation of knowledge and their sharing through the example of the Marshallese “stick charts”.

- **Group work** – You have made a map of your neighbourhood. Suppose you are to work on it further to make it very relevant like the Marshallese maps, what are the important processes and knowledge that we would need to garner? Can you make a list of information that you would add to your neighbourhood map? Complete the list below:

i . Ground water situation

ii . Traffic flow.

iii . _____

iv . _____

- What are the different aspects that could make the map relevant and richer for the different groups of people living in the neighbourhood?

- The Marshallese built canoes of various sizes and functions, which were equipped by outriggers that helped them sail in strong winds.

  i. From other sources, and with the help of your teacher can you find out what 'outriggers' are? How do they help in navigation?

- **Home work**- You can collect information about outriggers from different parts of the world like Southeast Asia, Madagascar, and other places between Australia and Asia. Share information in class and hold a discussion.

C. Clay tablet map of Nippur, Iraq

Mesopotamia—lying between the Tigris and the Euphrates rivers—is popularly considered to be a site where cities as we know them began to emerge. Mesopotamia was known for the emergence of early cities. Nippur was one such city, located in present-day Iraq.

Map 5

So far, we have been looking at maps of communities or groups of people. Historically such communities had given way to states or kingdoms and new concepts like ownerships of territories. Kingdoms and their rulers formed armies to conquer other lands and to protect their kingdoms from the attacks of kings of other kingdoms. With the formation of the state, the decisions on relationships with nature and on production were made by the rulers. People had to follow orders from the rulers. The rulers started to keep large numbers of records and documents. This change in society brought in changes in the ways in which maps were made. Here we take the example of a map made in the form of a clay tablet- See map 5.

What does it show?

- land in the centre of the city for a palace
- waterways within and outside the city
- fields that provided grains to the priests
- fields that belonged to neighbouring villages and cities.
- the fertile and arid lands

There is a purpose in the making of every map. Here, the maps that the rulers got made were records that stated the value of different parts of the territory and the land uses. One of the primary foci of the clay tablets of Mesopotamia was property taxation. Taxes were paid to the rulers by the people in the form of a portion of their crop yield or in the form of some produce. The taxes were used by the rulers for purposes like maintaining the army and for trade with other kingdoms.

- In comparing the Inuit and Marshallese maps with that of Nippur, please complete the table given below:

Issues/Maps	A. Inuit and Marshallese maps	B. Nippur map
Purpose of mapping		
Livelihood/economic production		
Relations with nature		

- **Group work**: Divide the class into groups of 4 or 5 students. In each group, discuss the following questions and write down/draw the reflections of the group on a chart paper. This can be presented by each group in the class:
- A and B in the table above represent two types of society.

i. How are decisions on relations with nature made in each case?

ii. How does that decide the purpose and process of mapping?

iii. What socio-economic situation decides what is to be mapped?

Mapping and Colonialism

What is colonialism?

Colonialism is the situation in which one country exerts physical power over the territory of another country. Several European countries had made colonies in the other continents of the world from the 16th century onwards. You know that the British had made the Indian subcontinent its colony. Some relatively territories like Goa, Pondicherry (now known as Puducherry) and Mahe remained as French and Portuguese colonies.

In the 16 th century, the Portuguese and Spanish empires were the first ones who started colonies across different continents, covering vast territories around the globe. During the late 16th and 17th centuries, England, France and the Dutch Republic also established colonies. There was a lot of competition between the different European countries.

- Use an atlas or a google map to find out each of the places mentioned in the above passages.

- Can you figure out why coastal territories like Goa, Mahe and Puducherry became some of the first colonial areas in the subcontinent?

The coloniser controlled the resources and the people in the territories. They exploited the natural resources and took it to their countries, they manufactured goods and sold them to the colonised areas. They created an economy for their own benefit and employed people from the colonised areas for the

same purpose. The colonised peoples and countries lost their independence to run their country and to organise their own economy.

Prior to that during the Mughal rule in most parts of the Indian subcontinent, they had merged with the region, becoming part of the territory. They did not take away resources to another country. That is why there is a notable difference between that and colonialism. During the British period that lasted for more than four centuries in the subcontinent, resources were transported to Europe not only from the subcontinent, but also from other colonised regions in different continents of the world. This huge inflow of wealth in to Europe was the most important aspect that created the 'industrial revolution' in Western Europe, in which technology was used to create goods in factories on large scale.

Let us see what role maps played in the process of colonialism.

Mapping: Co-creation of knowledge

The British had not come to the subcontinent with an already well- developed tradition of mapping. In fact, the mapping traditions of the region was quite comparable to that of Europe. Edney has studied about mapping in colonial times and wrote a book in 2006 called 'Mapping the territory'. He notes that in the 1760s, when large-scale survey work was being undertaken in the Indian subcontinent by the British colonisers, there was no unified detailed map of the British Isles with the notable exception of a map of Scotland. And prior to the nineteenth century there exists over two hundred maps, mainly of north western, central and western parts of South Asia, though there were no composite maps of the subcontinent.

Many of the mapping surveys that the British did in the subcontinent were conducted through the already existing techniques and person power of the region. Mapping had evolved more than before during the Mughal rule. Gazetteers and manuals were used for administration and revenue collection. The astrolabe, produced by Arab instrument makers, was widely used by astronomers at least since the early fourteenth century to measure terrestrial and celestial co-ordinates. The coastal surveying from Britain was also adapted for mapping the subcontinent. The 'Survey of India', an institution created by the British in the Indian subcontinent conducted extensive mapping exercises and made large numbers of maps.

- From the passage, can you explain what is called ‘co-construction’ of mapping knowledge?

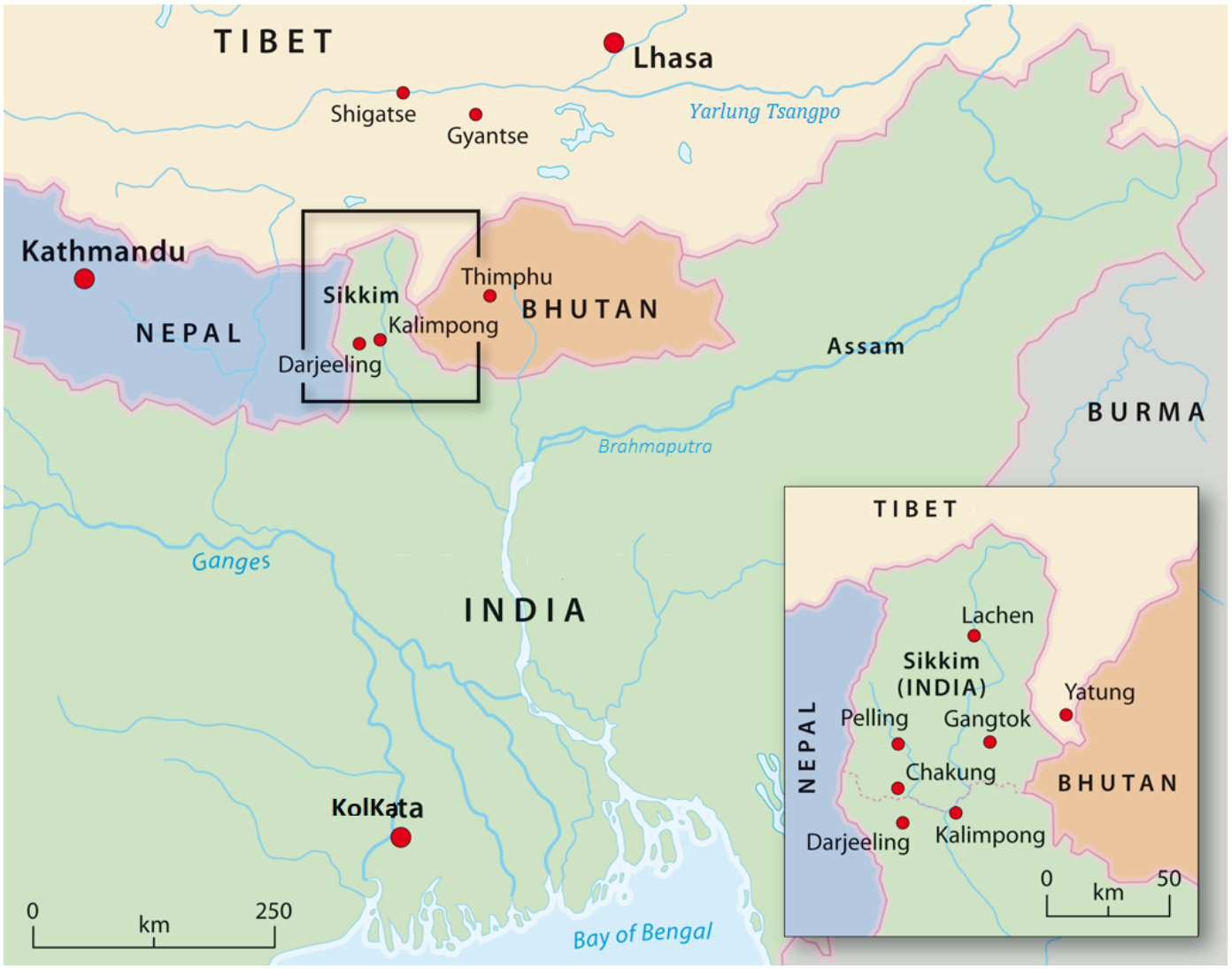
- Why was mapping the colony important for the coloniser? Tick the ones you think are correct:

- To have a record of the resources in the colony
- To serve the colonised people
- To inform the British queen of the length and breadth of the Indian subcontinent
- To develop mapping skills

Group work- Read more on these, discuss with your teachers and friends and hold a debate in class.

The surveying of the highlands of Tibet, Mongolia and Central Asia

Kinthup, a tailor turned explorer from Darjeeling, had set out for Tibet in 1880. He had been dispatched on a mission by the British government, and ordered to find out as much as he could about the Yarlung Tsangpo river.



Although trade with Tibet was in full swing, very little was known about the region or the river at the time, and so Kinthup and others—disguised as monks and trained in topographical survey-making—went to Tibet. Through very difficult journeys Kinthup tried to find out whether the Tsangpo and the Brahmaputra rivers were the same. How did they do it?

Kinthup accompanied a Chinese Lama who was sent to 'throw marked logs into the Tsang-po ...having previously arranged for watchers to be stationed at the junction of the Dehang and Brahmaputra rivers. As the logs came down by the course it was settled beyond doubt that the rivers known by the names Tsang-po in the higher reaches and Brahmaputra in Assam were actually the same rivers.

Kinthup photographed in 1914 (Source: Wikimedia commons accessed 23.4.22)

In the years 1865 to 1885 - Nain Singh and Kishen Singh were sent as explorers of these uplands by the Survey of India. It was not easy for Europeans to survey the highlands because they were looked upon with a lot of suspicion. Even Nain Singh and Kishen Singh had to dress and act like simple travellers to not attract suspicion. They disguised themselves as Buddhist monks. They carried rosary and prayer wheel which were also used in recording. After every hundred paces of walking, they counted a small bead of the rosary, and after every thousand paces, they counted a large bead. That way they could calculate the distance walked. The prayer wheel was fitted with long strips of paper on which they took notes without attracting notice.

- **Group work**- This exercise can be done by dividing the class in to different groups. Using google maps and other sources, find out the landscape of the region shown in the map above. Make a legend for the map by making your own symbols and colours for the following:

  Land above 7000 metres

  Between 5000 and 7000 metres

  Between 2000 and 5000 metres

Making use of the symbols mark out in the map the areas with these different elevations.

Homework:

- Can you now figure out the direction in which the river is flowing? Indicate through arrows.
- Label Bay of Bengal in the map.
- Your own innovations and creativity can be enhanced. Do you think the map you made in Week 1 can have better and varied, colourful symbols? If so, you can rework on them.

Migration scrolls of the Aztec people

The Europeans made colonies in different parts of the world. Before the British made colonies in the Indian subcontinent, the Spaniards colonised the Central American region. The Aztecs were people who lived in Central Mexico before the arrival of the Spaniards. In Aztecs culture, language evolved in a painted form. In their language, “Nahuatl”, the word for “painter,” translates to “painter-writer.” In their painted script they created manuscripts, censuses, land registers, and tax and tribute documents, and histories.

They have an interesting migration story that is a painting- writing of their being forced to migrate from their lands to Tenochtitlan, which is today’s Mexico City. The painting- writing given below is the first of a series of a migration scroll. They drew and painted it in amatl paper made from the inner bark of trees.

See ‘Codex Boturini’ of early 16th century, 19.8 x 25.4 cm by scanning the code given below:

You can see a person moving from an island by rowing a canoe in a lake. The wavy outline of the lakeshore indicates that the place where two persons are sitting is an island in the lake.

You can see footprints. Those are the land areas and it is also an indication of the directions to which the people migrated.

In spite of colonial occupation of their lands, the people continued to record histories and make maps in the painted form. Unlike the earlier times, in colonial times they expressed their feelings on their rights to the lands through the paintings that were often like maps. Although many things changed in their lands because it became a colony controlled by the Spaniards, the painted language of the people adapted and addressed new situations.

- Why do you think colonialism by the Spaniards forced the Aztec people to migrate?

- In the Aztec migration scroll, what are the main issues or points that the map makers intend to tell or communicate?

- How are the purposes of this map different from other maps you have seen?

- From the above example, can we say that maps are made through certain 'points of view'? Have a discussion in class.

Homework: In the cases of both the Aztec migration scrolls and the maps of the Tibetan highlands, people took part in mapping. But there is a sharp difference between these maps. Let us figure that out by filling up the following table:

Questions	Aztec map	Maps of Tibetan highlands
What does the map show?		
Purpose of the map		
Which is the coloniser's mapping? Why?		
Which is the colonised people's mapping? Why?		

A Protest Map

North Dakota is a state in the USA. The Sioux people lived in the land before the Europeans started to occupy them. The name Dakota was given to the place by the Sioux people. The region was first inhabited by a number of Native American peoples or groups, who were hunters and farmers. Europeans occupied the region and it became a fur-trading area. They changed the landscape into large farms and ranches. The native population became a minority as the fur trade attracted French, Canadian, English, Scots and Americans to North Dakota. Mining of lignite is done in Dakota, and by early part of the 21st century, oil drilling increased.

- Find out Dakota in a google map. What sort of region is it? Do you get any clue on why fur became a prominent trade item here after the advent of the Europeans?

- See the link indicated below: https://decolonialatlas.wordpress.com/2016/09/07/dakota-access-pipeline-indigenous-protest-map From the link you have seen the 'Protest map' of peoples of Dakota. What are they protesting against?

- How does the map bring forth their protest? Use the following points and any other you can find to derive how the map is shaped to represent protest:

- The map uses indigenous place names.

- See the translations of the indigenous place names. You can make a sketch of the map in your notebook. Label them with the translated names of places. What reflections do you make to mark that people are protesting through the map?
- What are your reflections on how the indigenous people have named the Dakota access pipeline (shown as black dots in the map)?
- The map is oriented to the south on the top part of the paper. They have opted to use their own mapping traditions, and not use the north being marked on the top part of the paper.
- Why does the 'sacred stone' become important? What implications does this have in representing indigenous culture?
- The map is under 'decolonial media license'. What implications can you find in this name? What does 'decolonial' mean?

- In the map you made in Week 1, can you incorporate local area names, perhaps those that were coined by people at some earlier times? If so, also reflect on what they indicate- some shape of landforms or the relations of people with nature, for example a part of the river bank could be called 'dhobi ghat'?

People's Resource mapping and Planning

People's resource mapping and planning was experimented in Kerala through the people's campaign for the ninth 5-year plan. This was initiated by KSSP (Kerala Shastra Sahitya Parishad). KSSP organised village Science forums and libraries. The aim was to move towards self-reliant development with campaigns on 'power to the people' in 1989. It was realised that data bases on land, water and human resources, expert knowledge on local planning, and people's participation were the most important aspects for such development. Resource mapping became an important exercise. The first attempt was made in Vazhiyoor panchayat of Malappuram district of Kerala. This emerged from a long-drawn struggle of the people against pollution in the Chaliyar river.

The cadastral map was used as a base for the resource mapping by people. This emerged as a collective work of people from the locality and experts from 'Centre for Earth Science Studies', Trivandrum. Thematic maps were made on the scale 1: 12500. Landforms, surface material, ground water potential and depth to bedrock were the themes. The volunteers added more details like land use. Scientists prepared environmental assessment maps from which ideas of sustainable development could be derived. In 1991 many maps were ready. These maps data on natural aspects as well as on socio-economics of households. In short, the experiment was to search for a development perspective. Working committees were formed

to deal with agriculture, health, education, irrigation, energy, fisheries, animal husbandry, communication and so on. The movement was from people's resource mapping to people's planning.

- Find out from other sources:

i. What is a thematic map?

ii. Was the map you made in Week 1 a thematic map or not? Why?

iii. What is a cadastral map?

- The map made in Kerala for people's plan was in the scale 1: 12500. How can you compare the scale with that of the map that you made in Week 1? Which map can show more details?

_____

- Read the brief article by opening the link below:
https://www.downtoearth.org.in/coverage/where-a-community-maps-its-resources-29784

i. Why is a combination of people's knowledge and expert knowledge important?

ii. How can such a combination help to create better development?

- **Group activity** –On the basis of the data collected by you on the landforms as well as socio-economic aspects of the area that you mapped in Week 1, make a plan for the area that will take care of people's (1) water requirements (2) schooling (3) health? (You can add on to this list according to the specific nature of the area you mapped)

- **Homework:** Use google maps to find out the course of the Chaliyar river. The river meets the Arabian sea at Beypore, one of the oldest ports and ship building centres of Kerala.

Thematic mapping

You are already familiar with what thematic maps mean. Here are some interesting thematic maps for you. It's all about food! Food is essential for our life, and people across the world don't eat the same sort of food. A wonderful variety and range of cuisines are seen across the world. These are derivations from the flora and fauna, and also the ways in which societies have made traditions and cultures of cooking that are sometimes simple, and sometimes very nuanced, skilled and even artistic. These involve a lot of labour, understanding of nature and the human body, and creativity.

Maps of cuisines

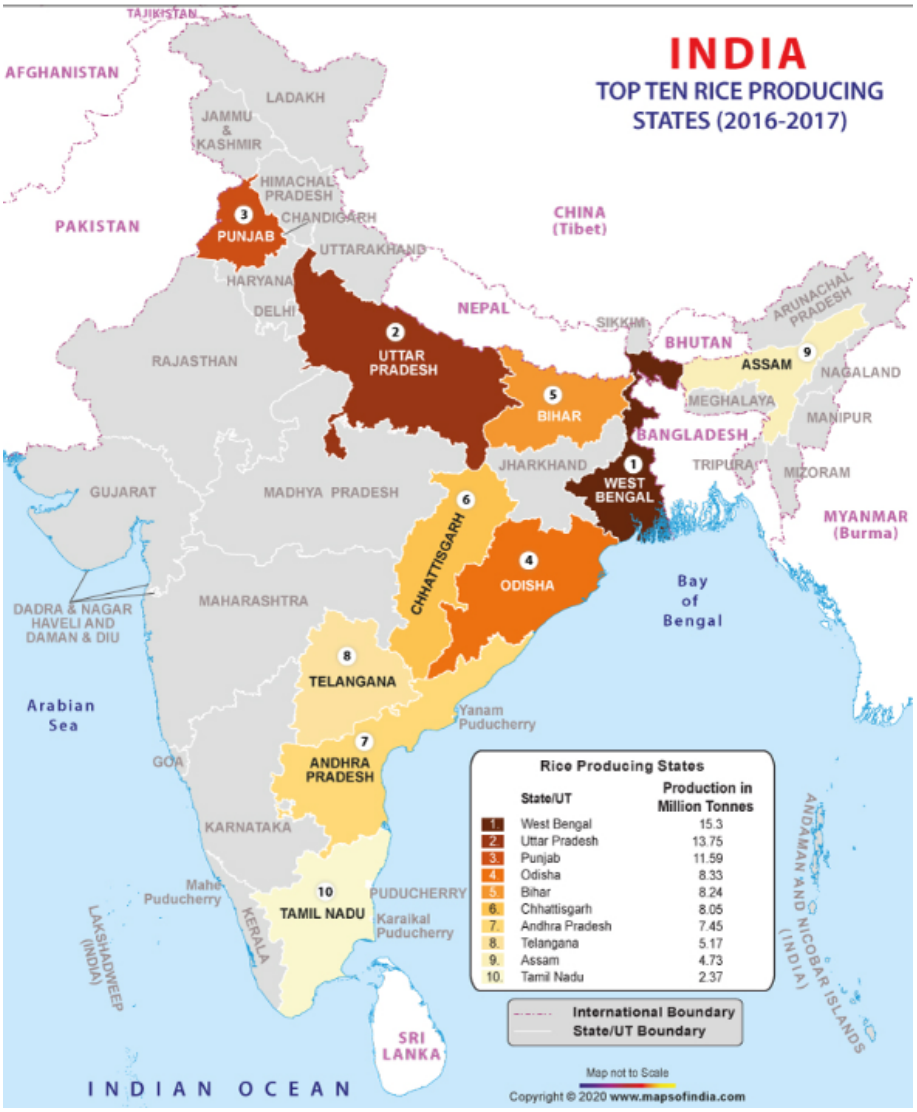
Here are three interesting maps of food- one of sweets, another of biryani, and the third one of street foods in India. Of course, these show only some varieties where the map makers have made interesting representations. Look carefully at the details provided by the maps.


BIRYANI
MAP OF INDIA
the better india
Kashmiri Biryani
Tahari
Mutanjan Biryani
Mughlai Biryani
Awadhi Biryani
Achari Biryani
Rampuri Degi Biryani
Jodhpuri Kabuli
Muradabadi Biryani
Kampuri Biryani
Kanpur Biryani
Murshidabadi Mahi Biryani
Memoni Biryani
Kolkata Biryani
Kolhapuri Biryani
Kataki Biryani
Degh Ki Biryani
Bombay Biryani
Doodh ki Biryani
Kalyani Biryani
Hyderabadi Biryani
Donne Biryani
Beary Biryani
Bhatkali Biryani
Dindigul Biryani
Thalassery Biryani
Ambur Biryani
Rawther Biryani

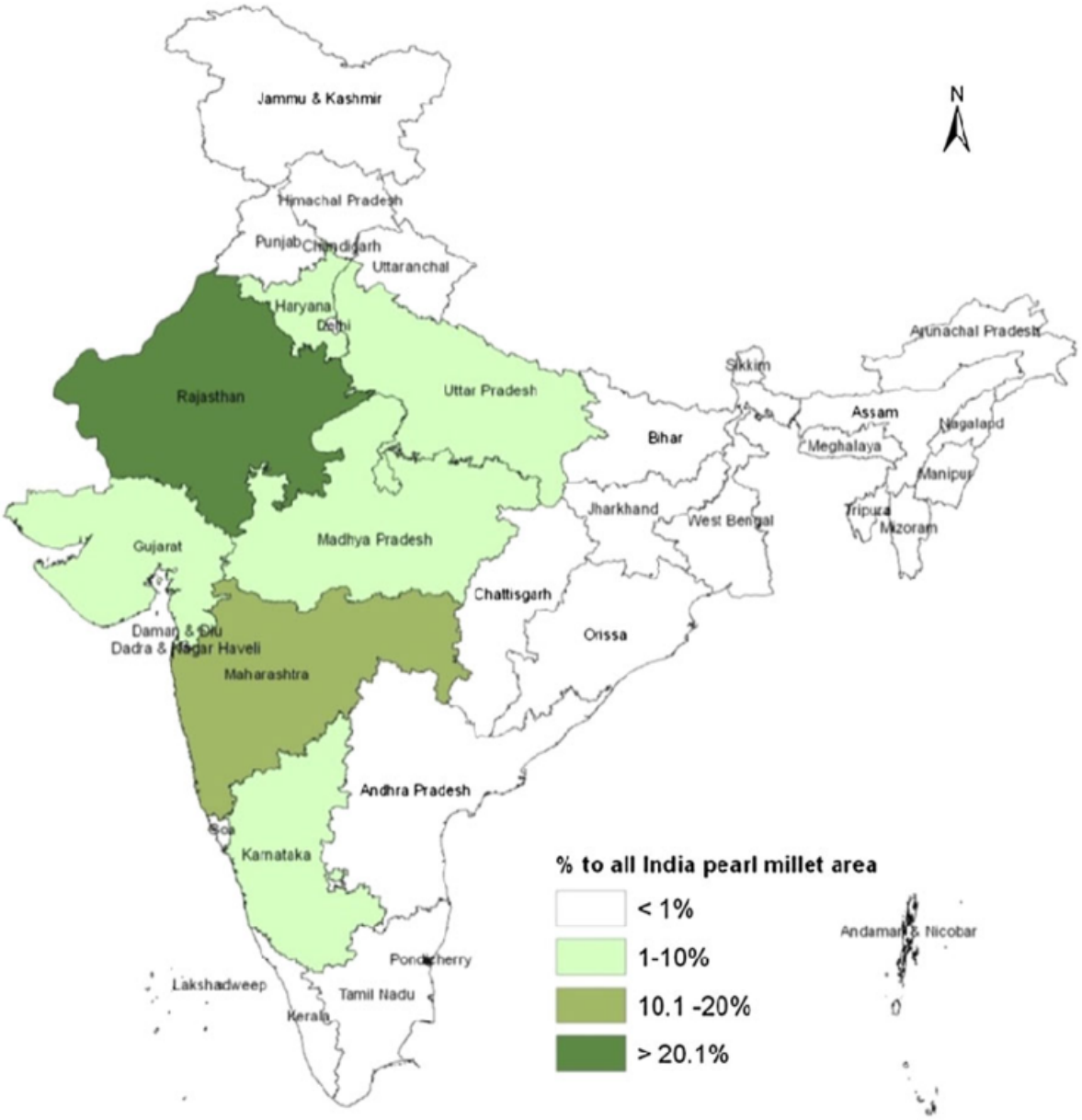

the better india
Kalari Kulcha
Chole Bhature
Sidu
Bun Tikki
Dung Po
Phagshapa
Dahi Samosa
Bedhai
Khar
Galho
Litti Chokha
Mawa Kachori
Kelli chana
Jadoh
Poha Jalebi
Dhuska
Barra
Bai
Jalebi Fafda
Kathi Rolls
Muya Awandru
Cheela
Dahibara Aloo Dum
Vada Pav
Ros Omelette
Mirapakaya Bajji
'Variety' Dosa
Paddu
Pazham Pori
Street Food
Map Of India

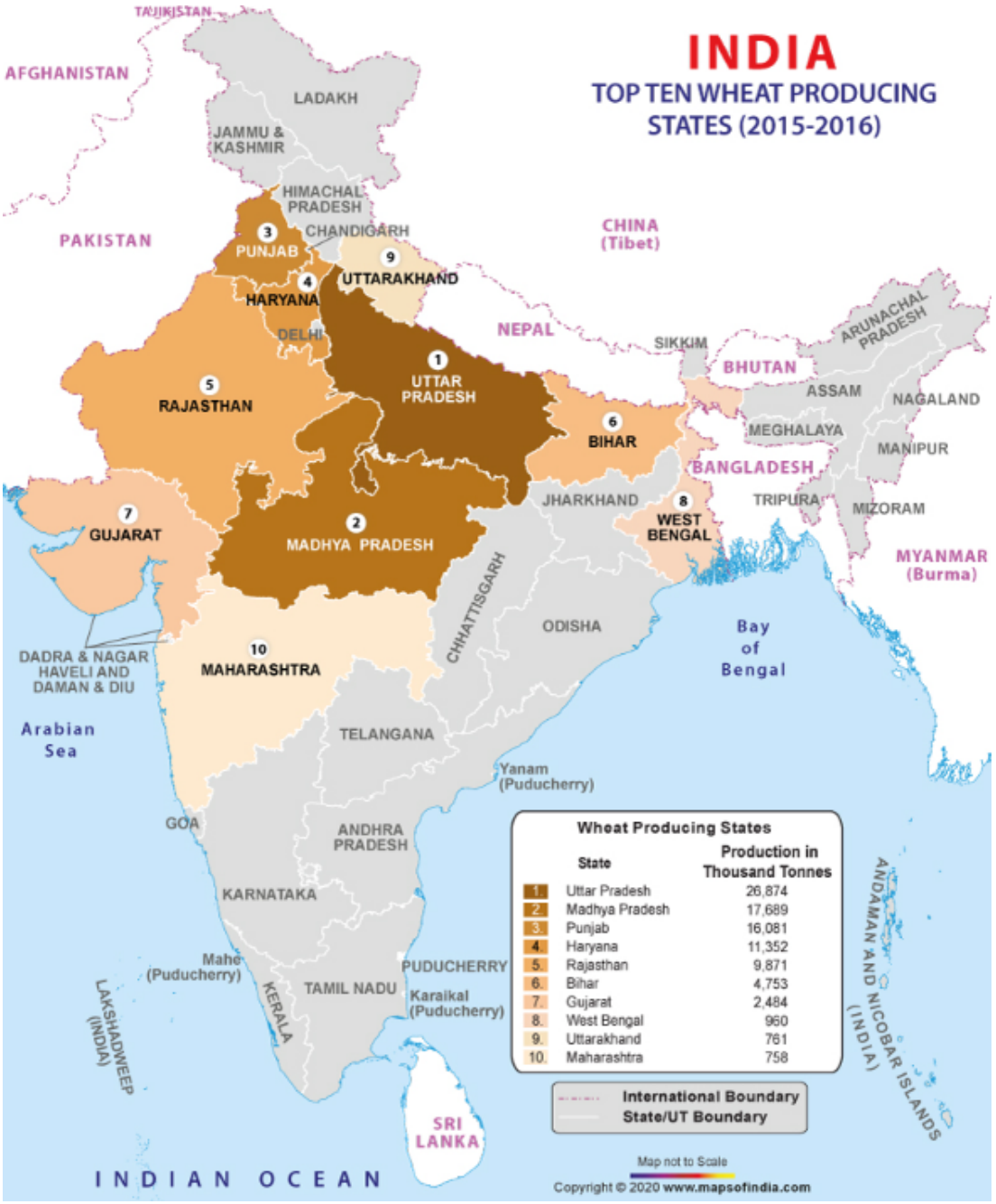
Maps of staple cereals

Given below are three maps of the most common staple cereals in India.



Top Millets Producing States of India





Multiple ingredients make our food

Food that we eat is derived from plant, animal and fungal origins, and gives us nutrition. Cereals form only a part of our food.

Fisheries

Class work: Refer to other sources and:

(1) Fill in the blanks below:

India has a large coastline of around ------ km with ------ fishing villages, and ----- traditional fish landing centres. Apart from domestic consumption, India is a major global supplier of fish.

(2) Mark the following places on the map: Veraval, Mumbai, Mangalore, Cochin, Tuticorin, Chennai, Vishakhapatnam, Bhubaneshwar, which are some of the larger fish landing centres of the country.

Global flows

There are about 1500 varieties of mangoes in India. The country accounts for nearly 50% of global mango supply.

Mango is a tropical fruit. Arab and Persian traders of the 9th and 10th centuries took mangoes from Asia to East Africa. You must have heard of Ibn Batuta, a **Moroccan** traveller of the 14 th century. He mentioned mangoes that he saw in Mogadishu, which was an important port of **Somalia**.

The Portuguese people who had colonised **Goa** took the mango from there to eastern and western parts of Africa. From West Africa it was taken to **Brazil** in the 16th and 17 th centuries. In the 18th century it spread to the **Carribean** and to eastern **Mexico.**

The mango reached Mexico also by another route. The **Portuguese** took the mango from **Philippines** in the 16th century to western Mexico. In the 19th century mangoes were introduced to Florida.

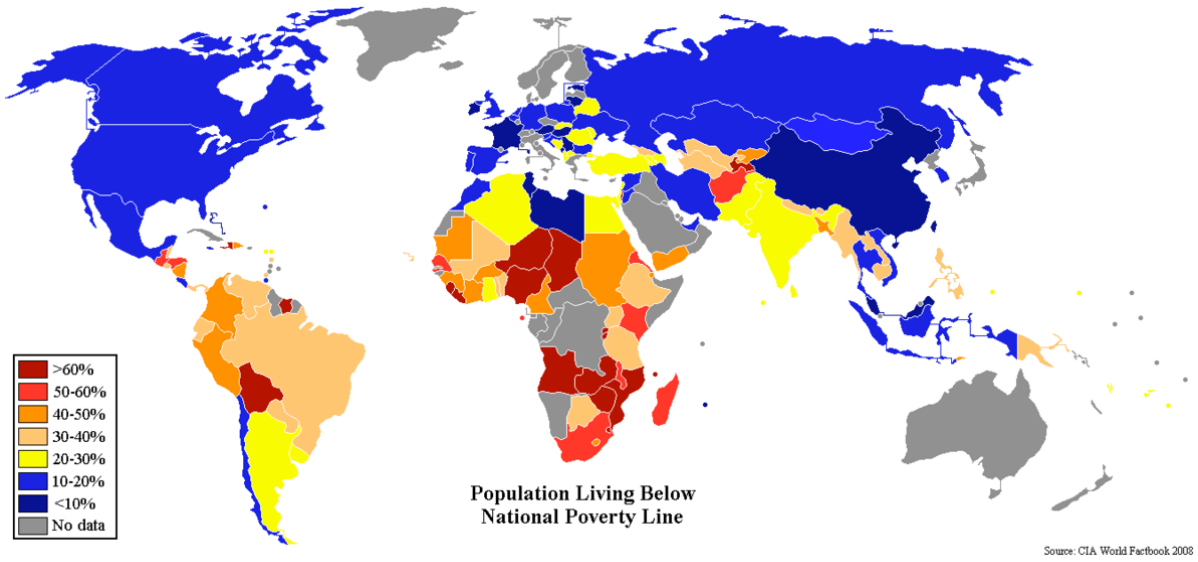
Food security

You had read about food security in the 9th grade. The United Nations' Committee on World Food Security defined that all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their food preferences and dietary needs for an active and healthy life.

In spite of the varieties of food produced around the world, why is it that some people are deprived of sufficient food? How can you link it to the lesson on poverty that you learnt last year?

Even when production increases, why is it that only some people get the benefits? How does wealth flow in the socio- economic system?

Given below is a map showing the shades of poverty/affluence across the world. This map gives us an opportunity to bring in history, geography, economics, politics and sociology together.



Sustainable Development Goals

In 2015, the United Nations General Assembly set up the 'Sustainable development goals'.

These goals are intended to be achieved across the world by 2030. Every nation is supposed to make all efforts to achieve these. You can see that the first goal states – 'No poverty'.

- Do you think everyone needs to live well?
- How can that be made possible?
- What are your ideas of possibilities?
-

Share your response below:

_____

_____

_____

_____

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Recapping the activities on the neighbourhood map

In week 1 you had made a field visit to make a neighbourhood map. In the following two weeks, you added on to it in class through the following activities:

- Suppose you are to work on it further to make it very relevant like the Marshallese maps, what are the important processes and knowledge that we would need to garner? Can you make a list of information that you would add to your neighbourhood map? Complete the list below:

- 1.Ground water situation
- 2. Traffic flow. 3.-------- 4.----------

- Your own innovations and creativity can be enhanced. Do you think the map you made in Week 1 can have better and varied, colourful symbols? If so, you can rework on them.

- In the map, incorporate local area names, perhaps those that were coined by people at some earlier times? Do these names indicate- some shape of landforms or the relations of people with nature, for example a part of the river bank could be called 'dhobi ghat'?

- Is your map a thematic map or not? Why?

- Make a plan for the area that will take care of people's (1) water requirements (2) schooling (3) health? (You can add on to this list according to the specific nature of the area you mapped)

Deciding on common symbols

In the class the four groups A, B, C and D who made the parts of the neighbourhood map, will sit separately in respective groups. The teacher would list out the various objects that each group had mapped. She would also look at the symbols they have made. These would be different for different groups. The exercise now is to come to some common understanding regarding each symbol. From each group some symbols can be selected to be standardised for the use of the entire neighbourhood map that will be formed by bringing together the four transect maps into a single frame.

Combining the four transects

On the basis of the plan of neighbourhood map in Week 1, there were four transects. On the basis of that sketch, we now need to combine the transects. This can be done in one of the following ways:

1. Draw the transects cutting at right angles at point P on a tracing sheet. Now trace out the details from each sheet. There would be some overlap of objects sketched in the central area around P. After the tracing is done, it can be glued on top of a white drawing sheet. The symbols would need to be cut and stuck on the right places on the map. You can even use stickers or small bindis for some symbols. It would be very creative if you can make beautiful symbols, colour them and then fix them in the right places. Roads, rail etc can be shown with dark coloured pens or sketch pens.

OR

2. If you can procure a tracing table, this would be more enhancing because you can then directly work on a large drawing sheet. With the help of the tracing table, you can trace all details of the four transects into a single drawing sheet. That will enable ease of drawing and colouring than is possible on a tracing sheet. Each group can draw their part of the transect on the sheet after the teacher had made the transect intersect at right angles on the drawing sheet. If this is how you are able to work, then you can draw the symbols with your hand in the correct places, and use colours on it.

OR

3. Yet another way would be to scan the four maps together after fitting them along the transects and glueing them to form a single large map. You can then scan your symbols too. You can work further on the computer, and copy-paste the symbols on to the correct places on the map.

Whichever method you use, note that the following points need to be taken care of: **Direction** - Indicate north direction on the map

Make a **legend** where you show the symbols and indicate what they represent. You can also show a **scale**.

How do you do it?

You had divided each transect into 5 parts and each partition was of a length of 10 cm. This means that you have represented your 500 metres on ground with 50 cm.

The scale of the map is calculated as the actual length on ground divided by length with which it is represented on the paper (your map):

500 metres divided by 50 cm

500 x 100 cm divided by 50 cm= 1000

This means the ratio between the actual ground and the map is 1: 1000
1000 cm on the ground is represented by 1 cm in your map

Or in other words- 10 metre on the ground = 1 cm on the map.

This can be written/typed out in one corner of the map.

Your map is ready

Your map is now ready to be displayed in your classroom or school. As map makers you can now perhaps talk more about the making of maps.

What interested you most in the process of map making? Why?

The report on your neighbourhood is ready

Remember that apart from making a map, you had also been talking to people and later thinking about what plans could possibly be made for the local area through which you made transects and thought about the problems and possible solutions of people living in the area.

You can write these down after a discussion in class where the teacher along with the entire class can decide on the main points and then write them down as a report brought out by the students and teacher in your own neighbourhood.

Now you have a report along with a map, planned and made by the students and teacher!

Cluster II Module 2: Geographic information system (GIS) Analyst

Credits

Module Conceptualization, Authoring and TPD sessions:	Mr. Shubham Mishra, Visiting Faculty (Geoinformatics), GIS Consultant & Urban Planner Ms. Swati Grover, Visiting Faculty (Geoinformatics) & GIS Consultant Niharika Dadoo, Independent Consultant
Research and Coordination:	Himanshu Pippal, Project Manager, Bhavishyath Counselling
Overall Supervision:	Vijay Krishna, Founder, Bhavishyath Counselling)

Student Planner

Session	Topic	Objectives and Description	Readings
Week 1			
Session 1	**Exploring GIS Maps**	1. Describe the importance of GIS in making informed decisions. 2. Introduce students to GIS discipline and uses. *In this session, the students will get a basic understanding of GIS, and different elements of a map through a brainstorming session as well as looking at some YouTube videos on this subject.*	Handouts for Student and YouTube Videos • https://www.youtube.com/watch?v=LHDCRjAxpI0 • https://www.youtube.com/watch?v=AGWbKVp0rWc • https://www.youtube.com/watch?v=6abN99ONmpQ • https://www.youtube.com/watch?v=-ZFmAAHBfOU
Session 2	**Understanding Types of GIS Maps**	1. Explore different Types of GIS maps. 2. Understanding the patterns & Relationships of GIS Maps *In this session, the students will explore different types of GIS maps and understand their use and purposes.*	• Handout for students • Internet demo of the BharatMaps Website
Session 3	Basic concepts of GIS	1. Familiarization with basic GIS concepts 2. Components of GIS Systems 3. What is Latitude and Longitude *This session will look at some of the basic concepts of GIS and apply them to real world situations.*	• Handout for students • Google Map • Google Earth • GIS_Week1_Handbook_D3 A1
Week 2			
Session 1	Introduction to ArcGIS Online	1. Creation of a public account on ArcGIS.com 2. Familiarization with the interface of ArcGIS Online	• GIS_Week2_Handbook_D1 A1 • GIS_Week2_Handbook_D1 A2

		This session of the GIS module is entirely hands-on in nature. The students will learn some practical aspects of GIS on an online software called ArcGIS Online. To use it, they will first create a free public account and then explore its interface to familiarize themselves with its tools.	
Session 2	Hands-on with GIS using ArcGIS Online	1. Learning to visualize and symbolize different geo-spatial geometries in ArcGIS Online 2. Learning to import different geo-spatial file formats in ArcGIS Online 3. Learning to convert geo-spatial data between different formats 4. Learning to create a basic web-map and its customization *In this session, the students will learn to plot and symbolize different types of geometries (point, line and polygon) on ArcGIS Online. They will learn different ways of visualizing the same data as well as inter-operate between different geo-spatial software. The final outcome of this session will be an interactive web-map.*	• GIS_Week2_Handbook_D2 A1 • GIS_Week2_Handbook_D2 A2 • Google Earth Pro • http://www.convertkml.com/
Session 3	Adding Qualitative Data in ArcGIS Online	1. Learning to add qualitative information to the web-map 2. Learning to add images to features in the web-map *In this session, the students will learn how they can add qualitative information, such as detailed descriptions as well as photographs and images to a web-map.*	• GIS_Week2_Handbook_D3 A1 • GIS_Week2_Handbook_D3 A2
Week 3			
Session 1	Introduction to	1. Learn about what is a StoyMap	• What is a Story Map? • Lecture_Handout_Day1

	Storymaps	2. Learn about the different components of a StoryMap *In this session, the students will learn what a StoryMap with the help of a brainstorming session as well as looking at web page on this subject. They will also be introduced to the project for this module and divided into Groups of 5 for this.*	
Session 2	Hands-on with Storymaps	1. Become thorough about the components of a StoryMap 2. Explore some examples of StoryMaps and learn from them 3. Learn to plan StoryMaps *In this session, the students will explore the different components of the StoryMaps by looking at some examples of StoryMaps from the ArcGIS StoryMaps Gallery. They will also plan their own StoryMap by making some notes and listing down the components. They will also be provided with a list of topics on which they can make a StoryMap for their project.*	ArcGIS StoryMaps Gallery ● Sounds of the Wild West: An audio tour of Montana's four major ecosystems ● Mapping the spread of Covid-19 ● Mapping Mount Everest ● Plan_your_StoryMap.docx ● Some_Ideas_for_the_Project.docx ● Lecture_Handout_Day2.docx
Session 3	Create your own StoryMap	1. Start making a StoryMap of your choice *In this session, the students will start making a StoryMap of their choice.*	● GIS_Week3_Handbook_D3 **A1**
Week 4			
Session 1	GIS Application	1. To provide a holistic GIS approach to the understanding of the interactions and inter-linkages between the earth's elements 2. To provide insights into the use of GIS in our daily lives. *This session will provide an overview to the students of different fields and areas where*	● Videos on this subject from YouTube. ● https://www.youtube.com/watch?v=BMCyfKzZC5c ● https://www.youtube.com/watch?v=J-31pLWwNMQ ● Handout for Students

		GIS can be applied and how it can be used in a practical manner.	
Session 2	Exploring GIS as a Career Option	1. The students will be exposed to various dimensions of GIS and the existing and emerging career options in this field. 2. To develop creative thinking among students and make them technology-savvy so that they could be ready to join the Geospatial industry *In this session, the students will be made aware of the various career options that exist in the GIS and related fields.* *The students will also present their StoryMaps at the end of the session.*	Videos on this subject from YouTube. ● Climate Scientist: https://www.youtube.com/watch?v=snJkwwtYbFg ● GIS Forester Analyst: https://www.youtube.com/watch?v=Sa9rXunC6gs ● GIS Manager: https://youtu.be/msJOEbuLQMk ● GIS App Developer: https://youtu.be/kxtg9jtefXM Handout for Students
Session 3	Latest trends in GIS Technology	1. To make aware of students of upcoming trends in GIS technology 2. To get knowledge of related GIS Technologies such as Remote Sensing, Drones and LiDAR *The final session will impart information on the latest trends in the GIS field. The students will be shown YouTube videos of related fields like remote sensing, drones and LiDARS to make them aware of the state-of-the-art technology in this domain.*	Videos on this subject from YouTube. ● https://www.youtube.com/watch?v=J-31pLWwNMQ&t=4s ● https://www.youtube.com/watch?v=sBI3MIbzIBA ● https://www.youtube.com/watch?v=rsP86OkhnPI ● https://www.youtube.com/watch?v=tsjVQprGZEk ● https://www.youtube.com/watch?v=vuh9OX2E6ek ● https://youtu.be/H2-Yp30TGk4 ● https://youtu.be/zREAEdXzOcw Handout for Students

Exploring GIS Maps

Introduction

What is a Map?
A Map is a model of the planet Earth shown on a flat surface. Maps are useful because you can carry them with you. A Map is also a diagrammatic representation of an area of land or sea showing physical features, cities, roads etc.
What is GIS?
GIS stands for Geographic Information Systems.
To put it in a more strict definition, GIS is a system of computer software, hardware, data, procedures and personnel combined to help, manipulate, analyze, and present information that is tied to a geographic location.
What is the value of GIS?
The value of a GIS comes when you can answer questions related to location, patterns, and conditions
Is GIS a map?
Not exactly. It contains maps or better can create maps. Think GIS as a set of systems and services that help you store, analyze, process and share geolocated data

Why do we need GIS Maps?

- To represent a larger area than we can see
- To show a phenomenon or process we can't see with our eyes
- To present information concisely
- To show spatial relationships

Importance of GIS in making Maps

- GIS Maps are better maintained in a standard format
- Revision and updating of maps are easier and can be done regularly
- Geospatial data and information are easier to search, analyze and represent
- Geospatial data can be shared and exchanged freely
- It reduces costs and increase efficiency of the manpower skills and the project.
- Improved decision making – decisions are made easier because specific and detailed information is presented about one or more locations.

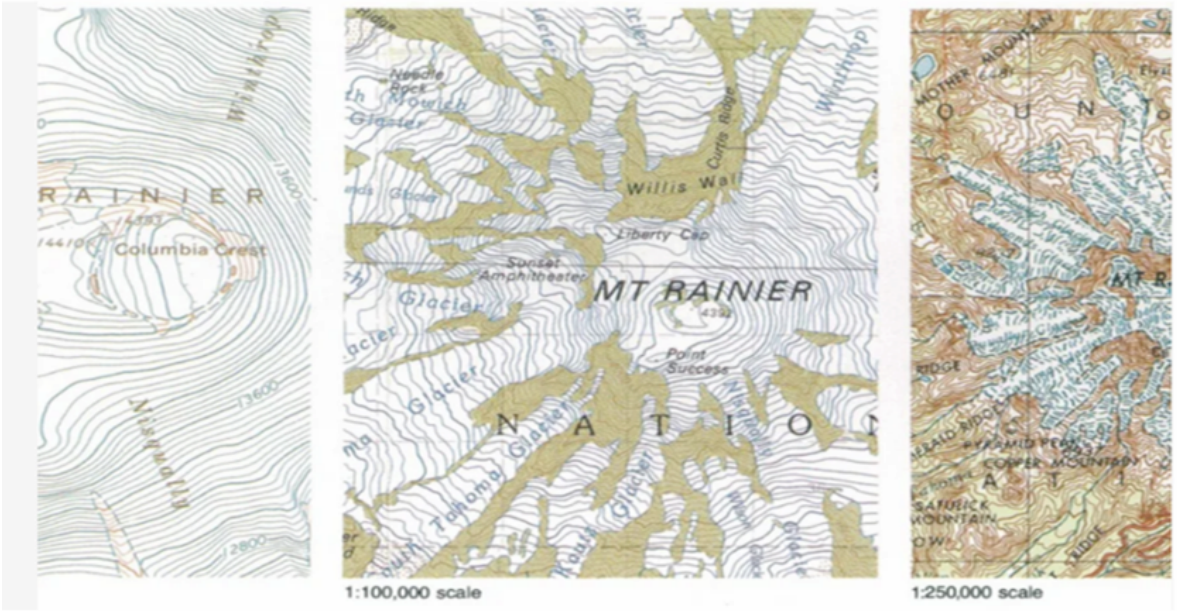
Elements on a Map

- Every Map has five basic important elements
- Title - Tells you about the purpose of the Map
- Legend/Key - Shows you what symbols on the map mean
- Compass Rose - it's a directional arrow that showed cardinal directions on a Map
- Scale – It is shown in both standard and metric measurements and shows distance between objects on the Map
- Inset Map – It is a smaller map that shows a larger area of land around the map.

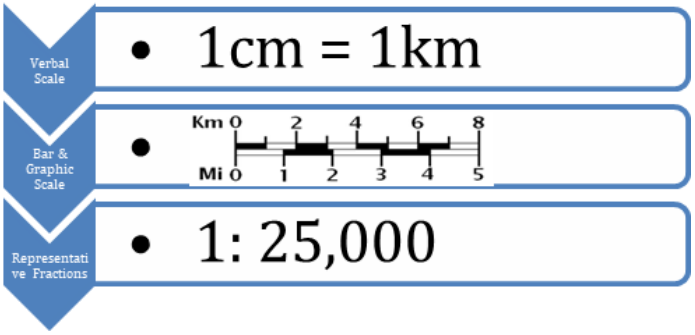
Scale of Map

- Map scale refers to the relationship (or ratio) between the distance on a map and the corresponding distance on the ground. For example, on a 1:100000 scale map, 1cm on the map equals 1km on the ground.

- Map scale units will most often be in one of two measurements systems. The map scale may show metric units such as meters or kilometers.
- Map scales are used to determine physical distance and size of geographical area.
- This helps in navigation because it allows the user to determine the actual distance between places and also helps in understanding the general size of an area,



Representation of Map Scale



Understanding the Scale on Maps

- Map is always represented by a scale. Scale is the relationship between the size of a feature on a map and the actual size of that object in the real world.

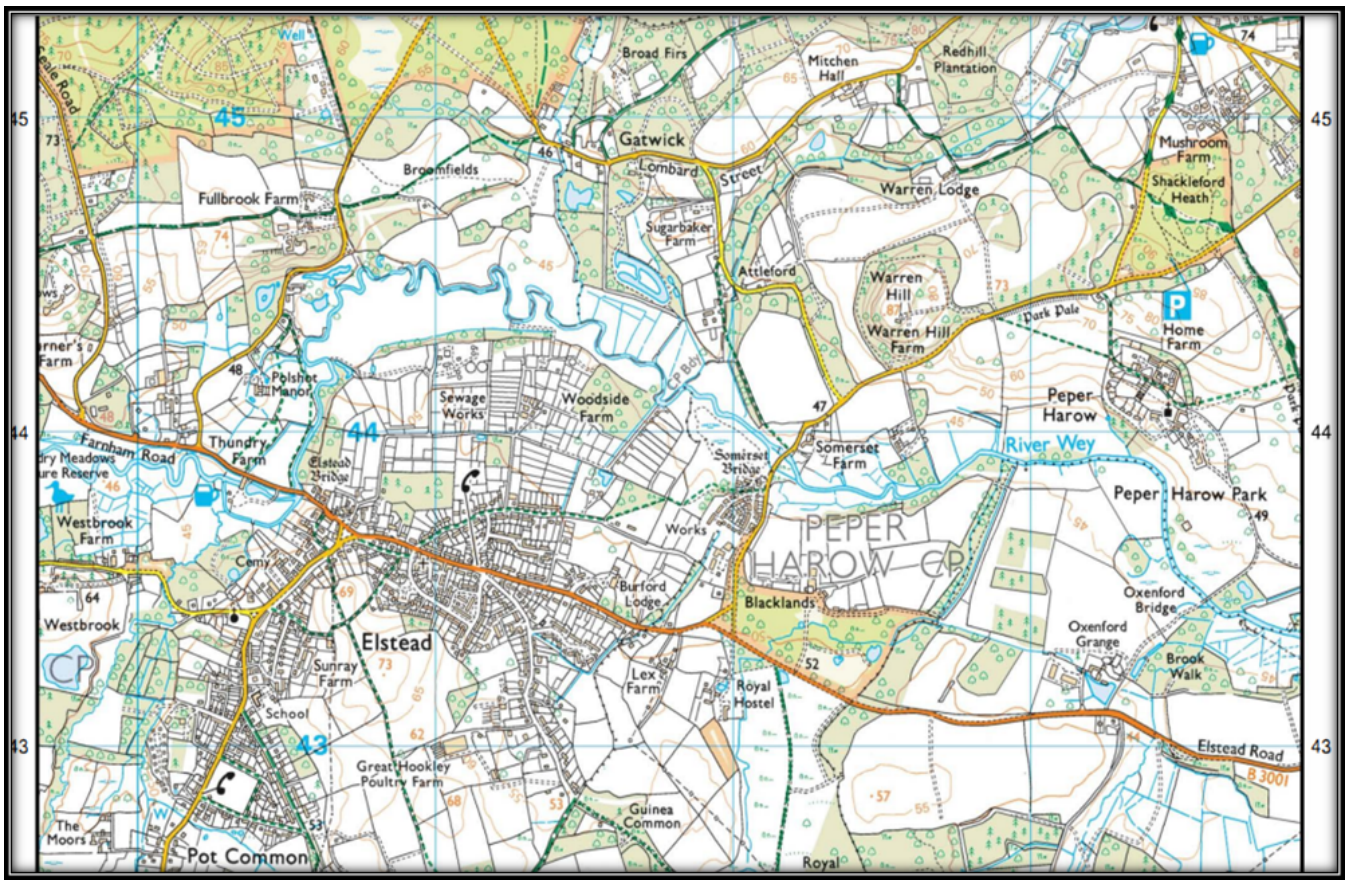
Let us look at different scaled maps from Largest Scale to Smallest Scale to understand the variation of size of the earth feature or landscape from the real world.

	Scale	Ground distance of 1cm on map
Largest	1:10000	100 m
	1:25000 (Local Scale)	250 m

Smallest	1:50000	500 m
	1:100000	1 km
	1:250000	2.5 km
	1:1 million	10 km
	1:2.5 million	25 km
	1.5 million	50 km
	1.10 million	100 km

1: 1000 Scale Map Topographic Map

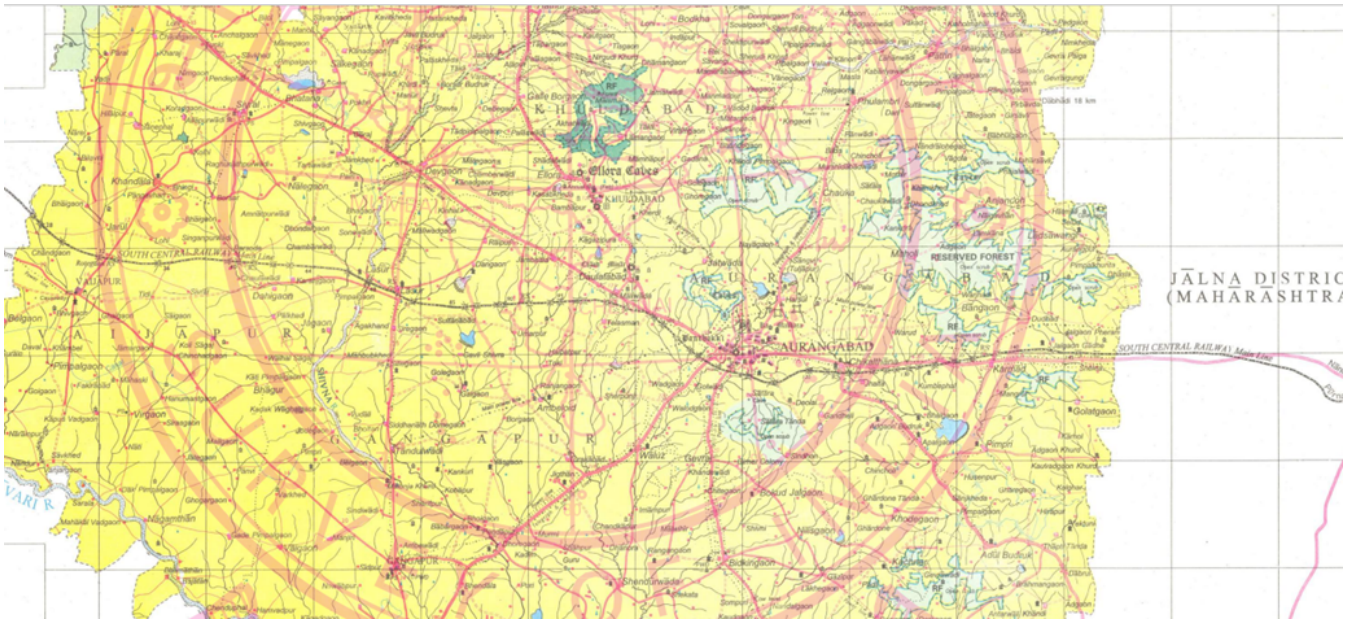
1:25000 Scale Map



1:50000 Scale Map (Toposheet)

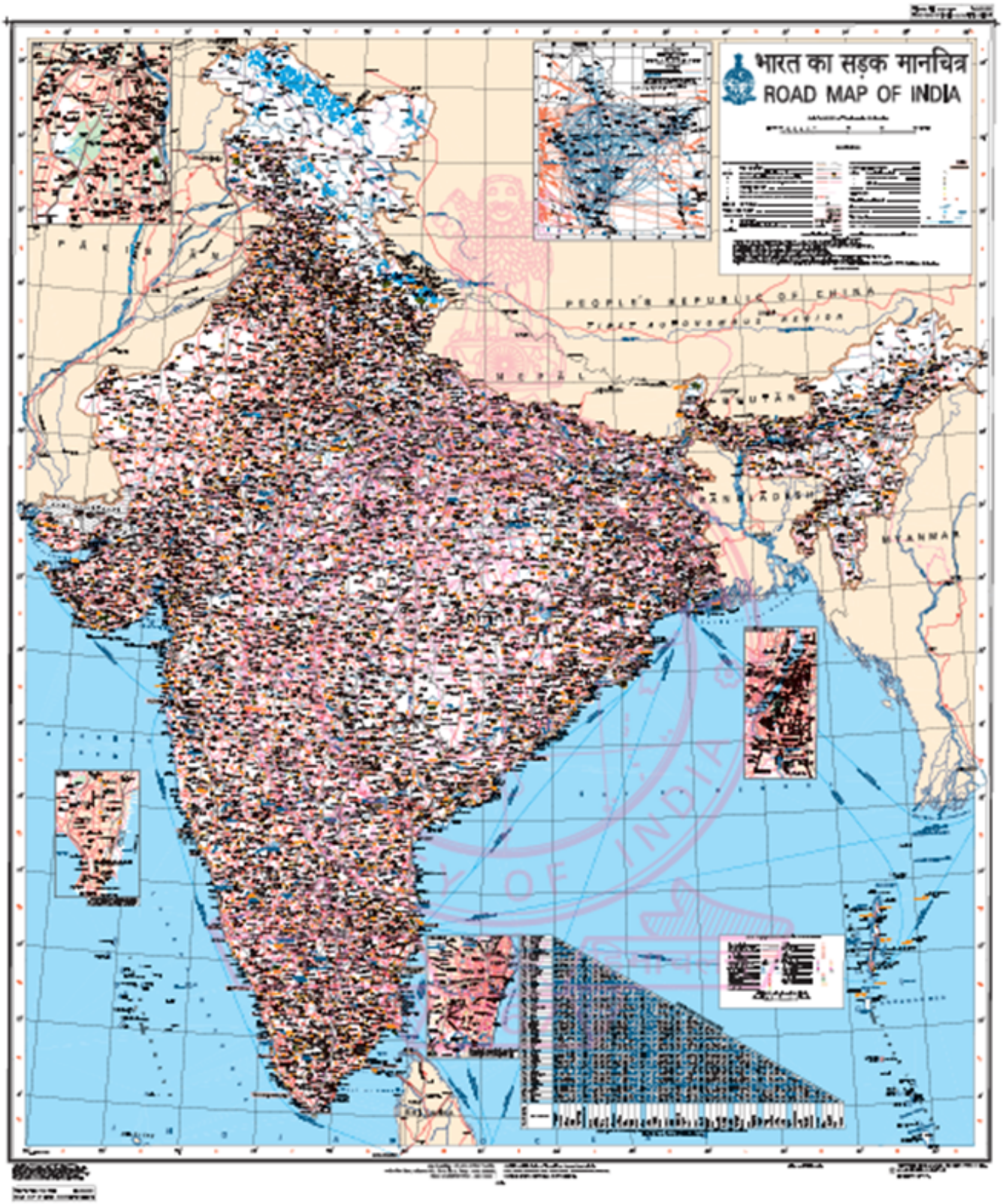
1: 100000 Scale Map Toposheet

1:250000 Scale Map

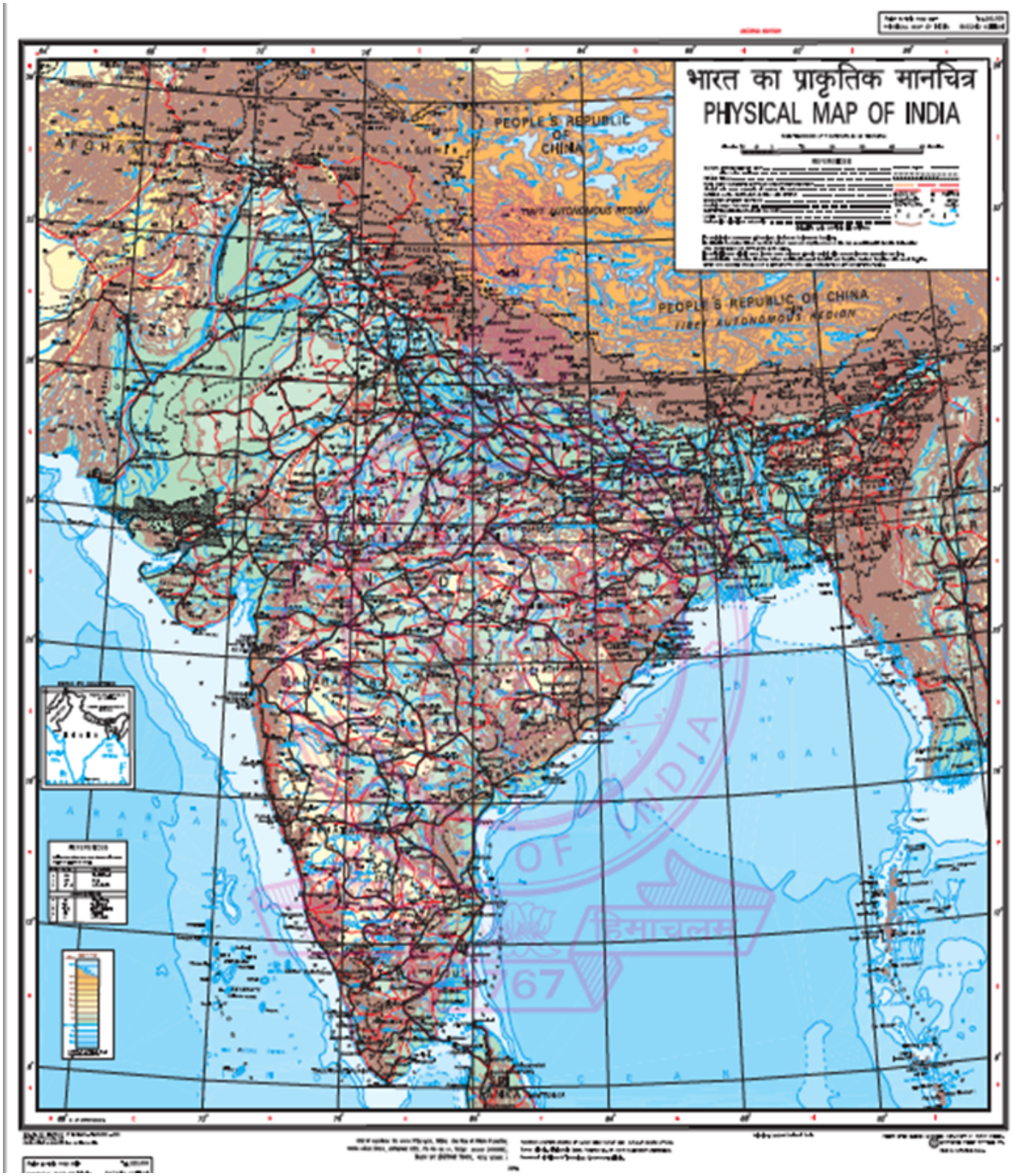


1: 2,5,00,000 Scale Map: Road Map of Delhi, and parts of Haryana, Rajasthan and Uttar Pradesh

1:4000000 Scale Road Map of India



1:4000000 Scale Physical Map of India



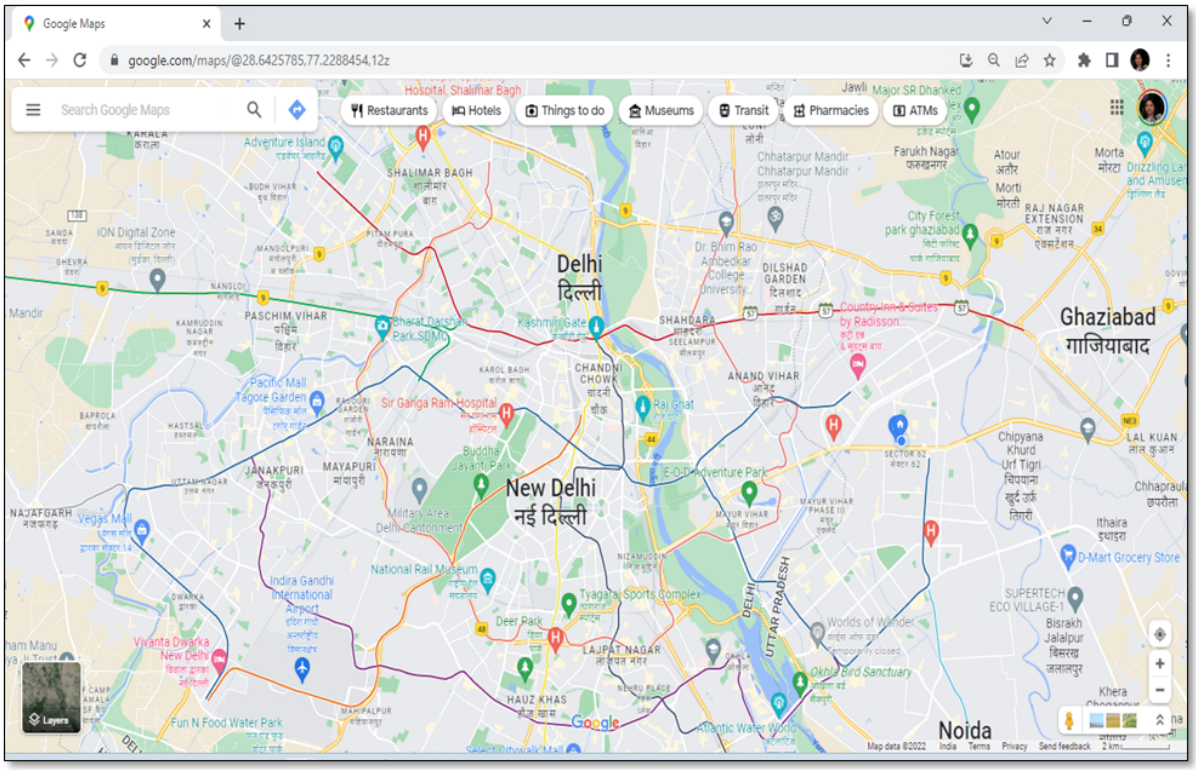
Understanding Types of GIS Maps

What is a Web Map?

- "Web map" often implies a map that is not simply on the web, but rather one that is powered by the web. Web maps are built with the technology of the web, such as HTML, JavaScript, and CSS.
- Web maps are online maps created with a web-based GIS software that provides a way to work and interact with geographic content organized as layers. They are shared on the web and across smartphones and tablets.

Example – Google Map

- In Google Map you can grab and pan the map and zoom in or out.
- Google was a major pioneer of this type of map with the introduction of their map service in 2005.

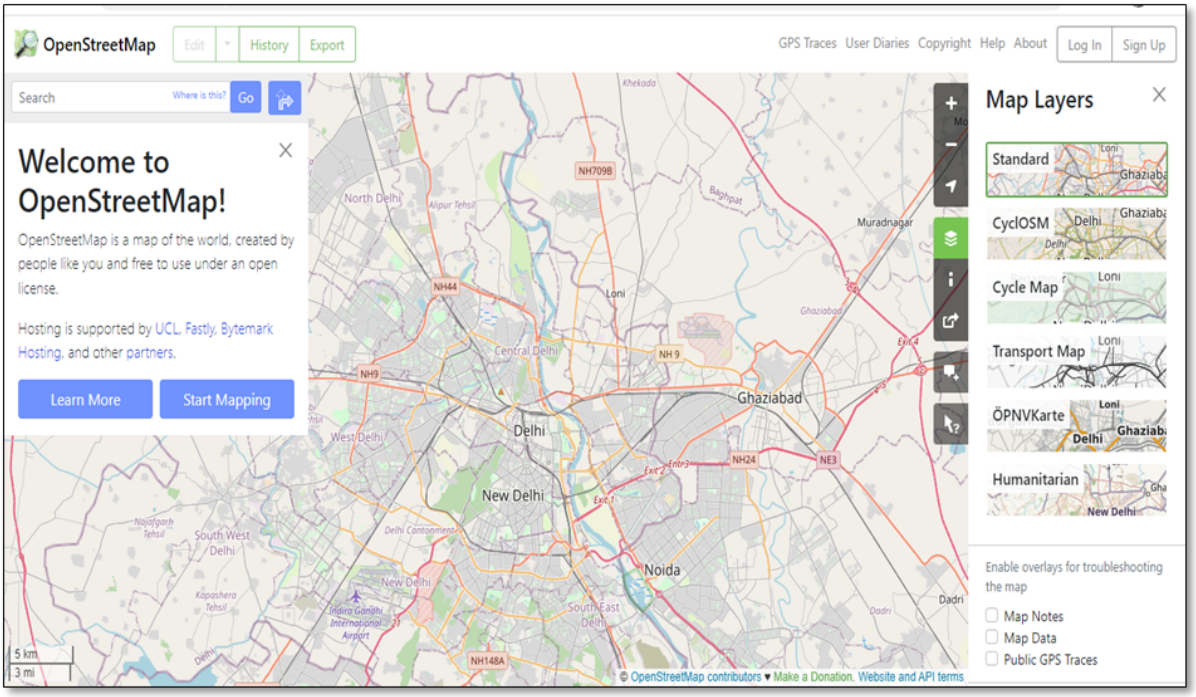


What is a Digital Map?

- A digital map is on a computer but may or may not be accessible by internet and is relatively static. Digital maps are nothing but the digital image of the real-world along with topography. It's an electronic map where you can see all geological features, including human-made features like roads, through a Graphical User Interface.
- Digital maps are more modern. You can find places of interest right on the map. You can find ATM, Hotels, Famous landmarks, and almost everything from the physical world. The electronic maps also provide different views such as satellite view, virtual view, and hybrid view.

Example – Openstreets Map

- Different computer programs and smartphone applications provide digital maps for its users for better navigation.
- They also provide street-level data as well as three-dimensional imagery to see the world virtually.

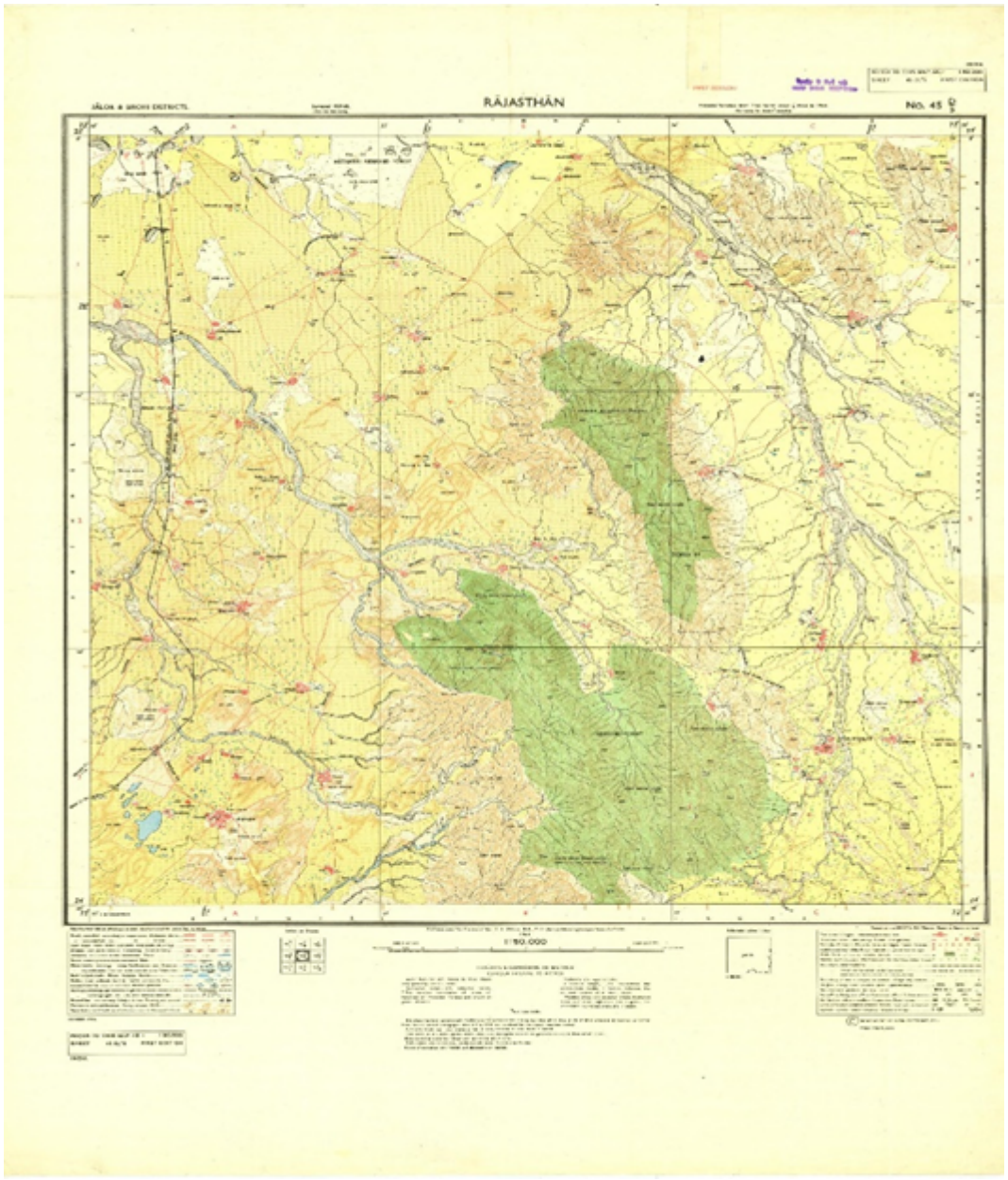


Types of GIS Maps

- Topographic Map
- Base Map
- Cadastral Map
- Thematic Map

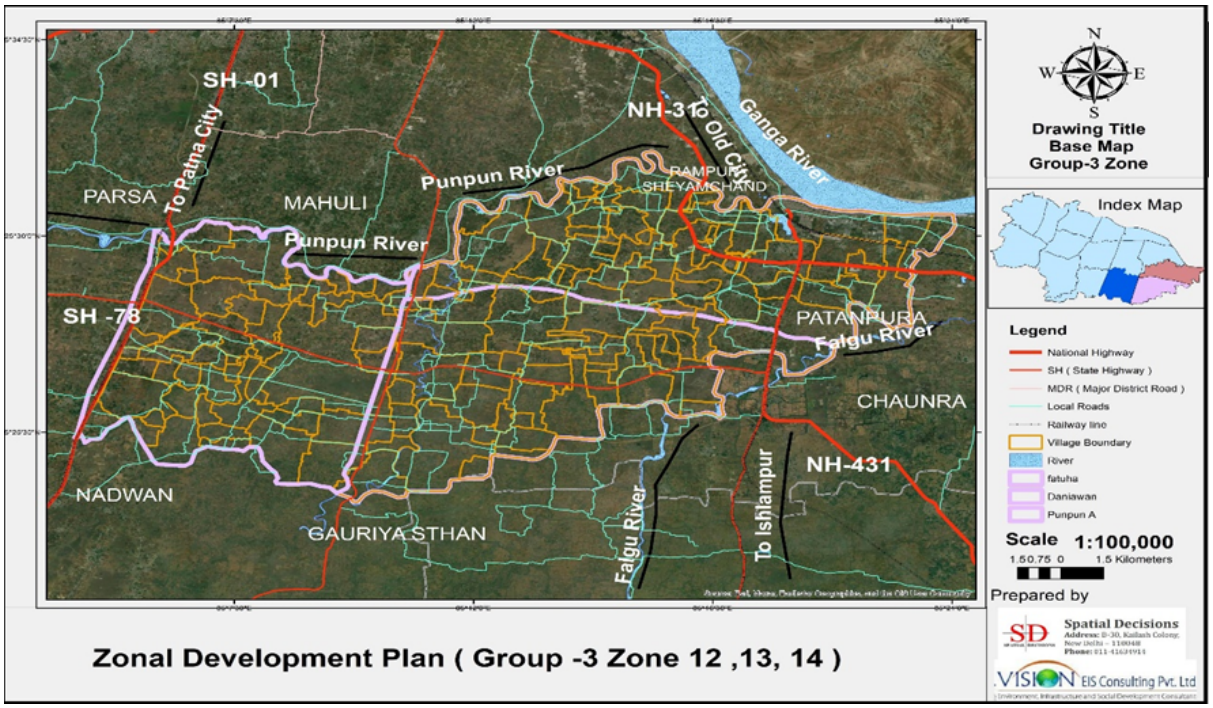
Topographic Map

- A map of a small area drawn on a large scale depicting detailed surface features both natural and manmade. Relief in this map is shown by contours.
- Topographical maps, also known as general purpose Toposheets maps, are drawn at relatively large scales.
- These maps show important natural and cultural features such as relief, vegetation, water bodies, cultivated land, settlements, and transportation networks, etc.



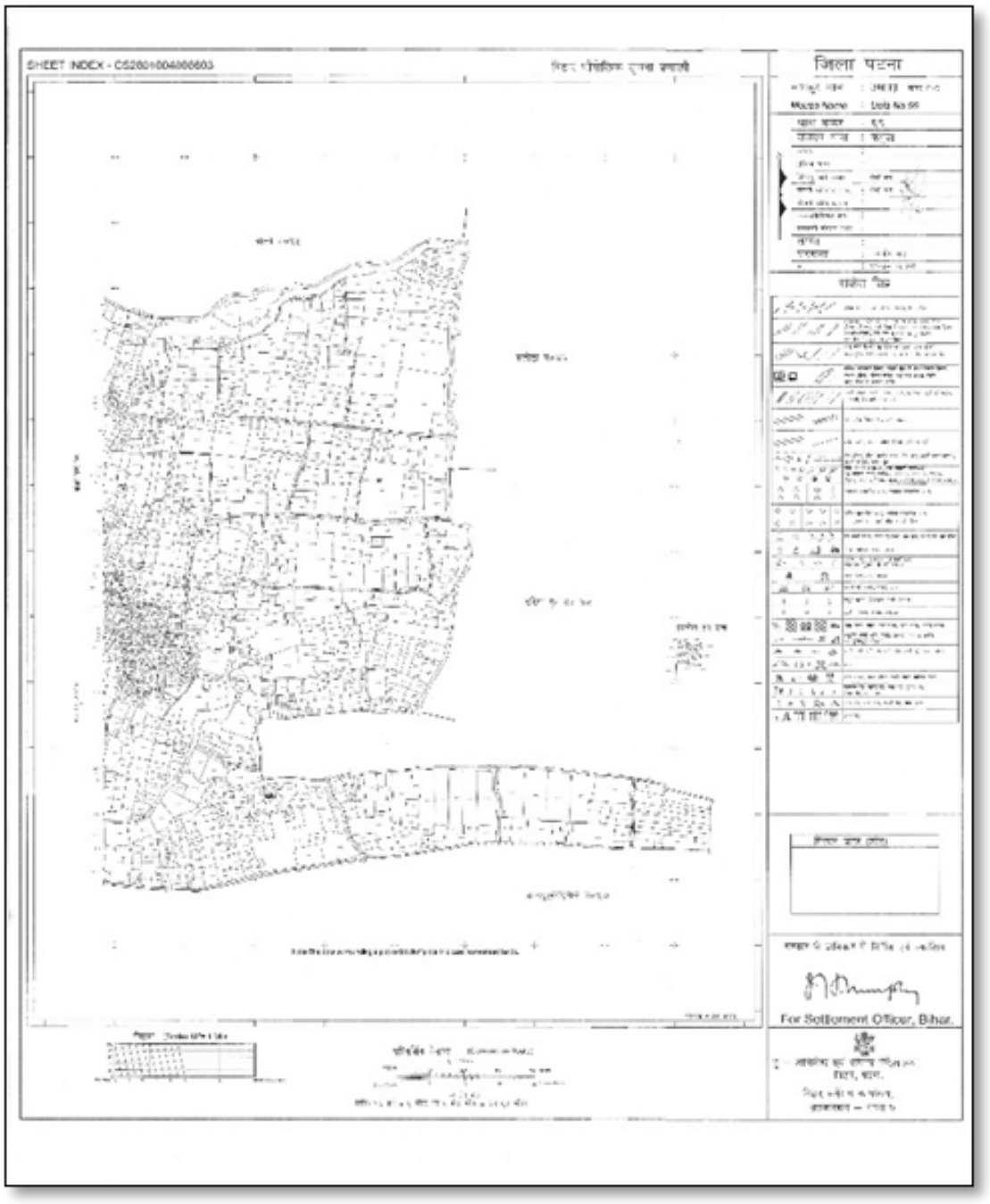
Base Maps

- Base maps serve as a reference map on which you overlay data from layers and visualize geographic information. An individual base map can be made of multiple feature, raster, or web layers. Base maps are the foundation for your maps and provide context for your work.
- They make it possible for your users to find places of interest near them by giving them reference information in geographic space. Base maps usually provide location references for features that do not change often like boundaries, rivers, lakes, roads, and highways.



Cadastral Maps

- Cadastral Maps, also referred to as Bhu Naksha or Khasra Maps, are a digital form of land records that show all the boundaries of different parts of land pieces based on their length, area, and direction. With these maps, you can view the ownership status of land pieces in different regions based on your requirements.
- Cadastral Maps are maintained by the government at the state and central levels in India. Cadastral Maps provide you with detailed information, so you must use them in case you need any details related to land records.
- Details of cadastral Map include - Boundaries of land parcels, Ownerships of land pieces, Certificate of title numbers, Section or lot numbers, Adjoining and adjacent street names, Selected boundary dimensions, Survey district names, Positions of existing structures and Unique identifying numbers for parcels.



Thematic Map

- A thematic map is a type of map that portrays the geographic pattern of a particular subject matter (theme) in a geographic area. Thematic maps are single-topic maps that focus on specific themes or phenomena, such as population density, rainfall and precipitation levels, vegetation distribution, and poverty.
- This usually involves the use of map symbols to visualize selected properties of geographic features that are not naturally visible. The purpose of a thematic map is to depict data with a location to identify spatial patterns and relationships.

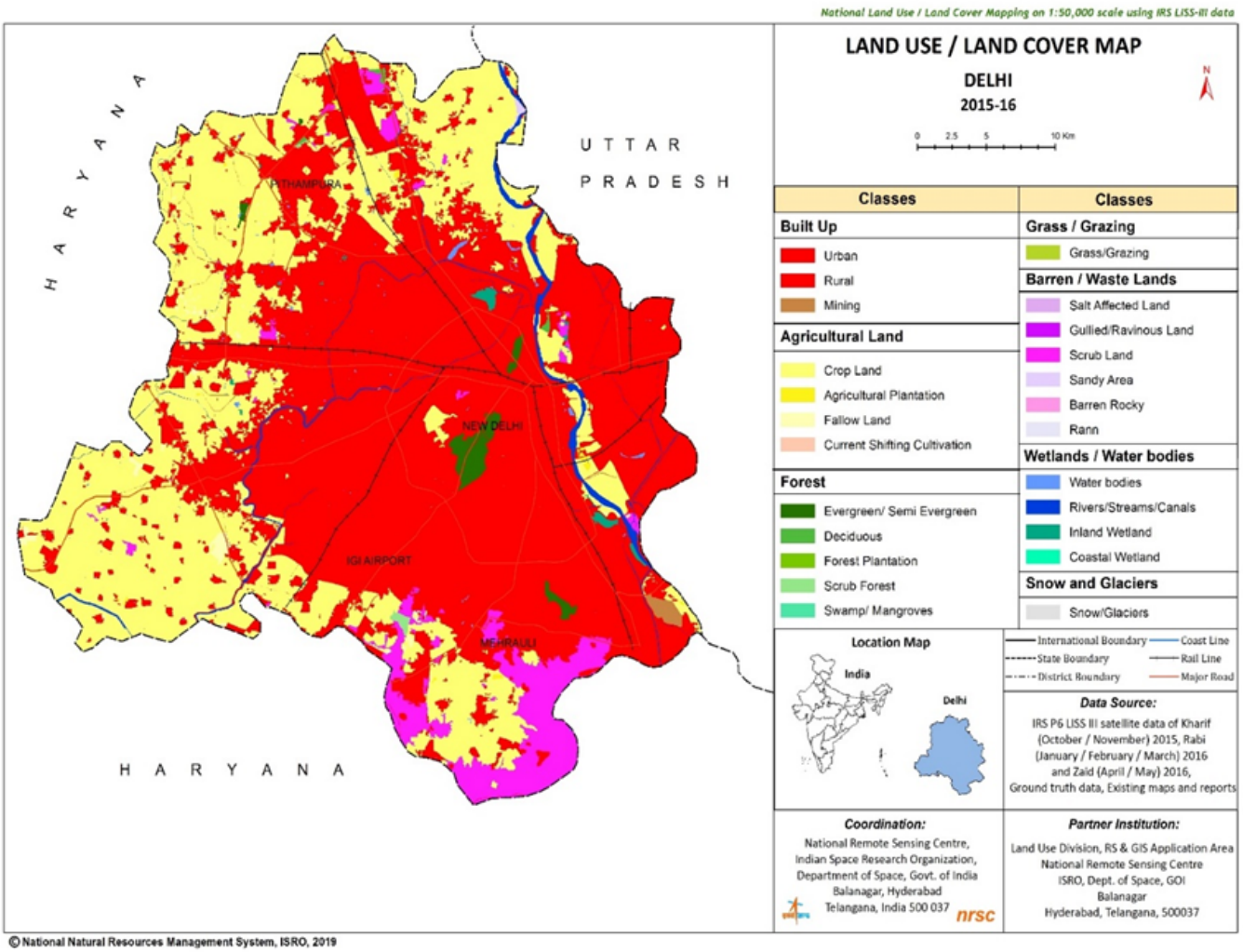
Let's do an activity understanding these patterns and relationship through Thematic Maps

Thematic Maps are usually made with a single purpose in mind to understand the spatial distribution of one or two attribute data sets. Let us check out a few thematic maps for the patterns and relationship representing the datasets and depending on what exactly needs to be visualised.

Category Maps

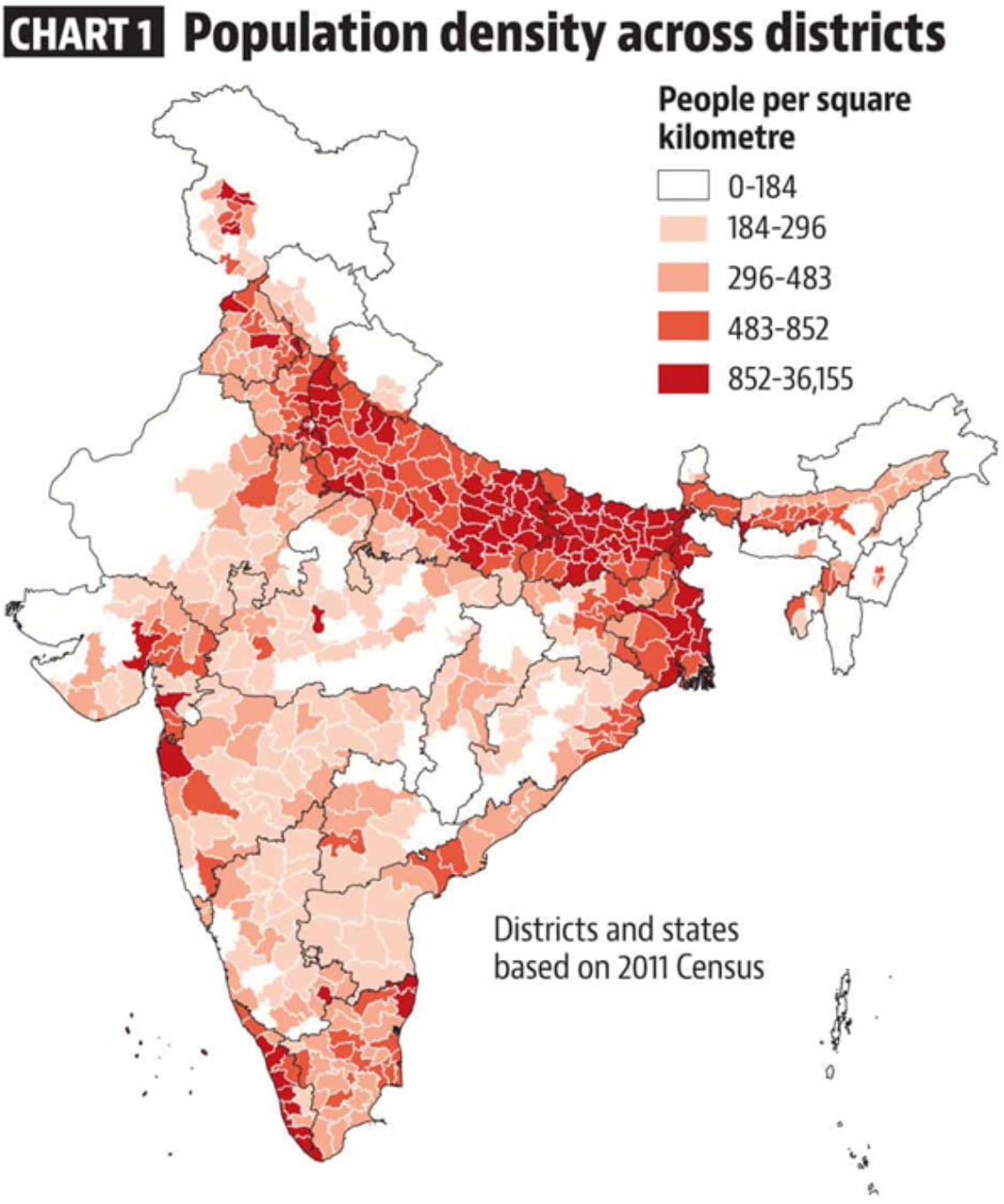
When you need to understand exactly which portions on the map correspond to which data segment, there is nothing else like a category GIS map. A specific attribute is assigned its own distinct color. The result is a convenient map of differently colored patches, each representing a particular category.

Example – Land Use Land Cover Map



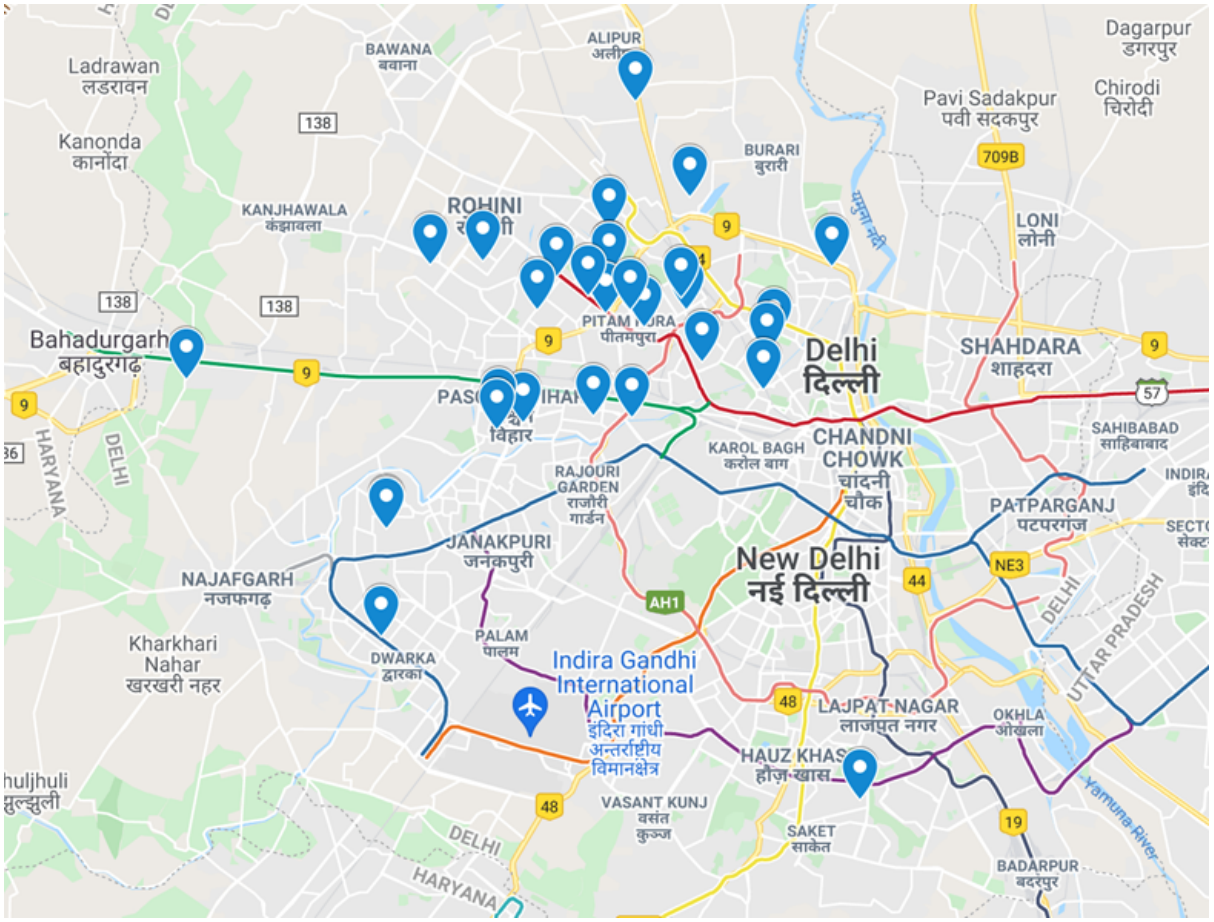
Choropleth Map (Map by Quantities)

Choropleth maps are among the most prevalent types of thematic maps. Choropleth maps represent quantitative data that is aggregated to areas. It is color-coded but uses different shades of the same color to show the variety in quantities of something depicted on the map. It is a perfect GIS mapping solution to the problem of visualizing a lot of detailed data spread over a large area.
Example – Population Density Map



Location Map

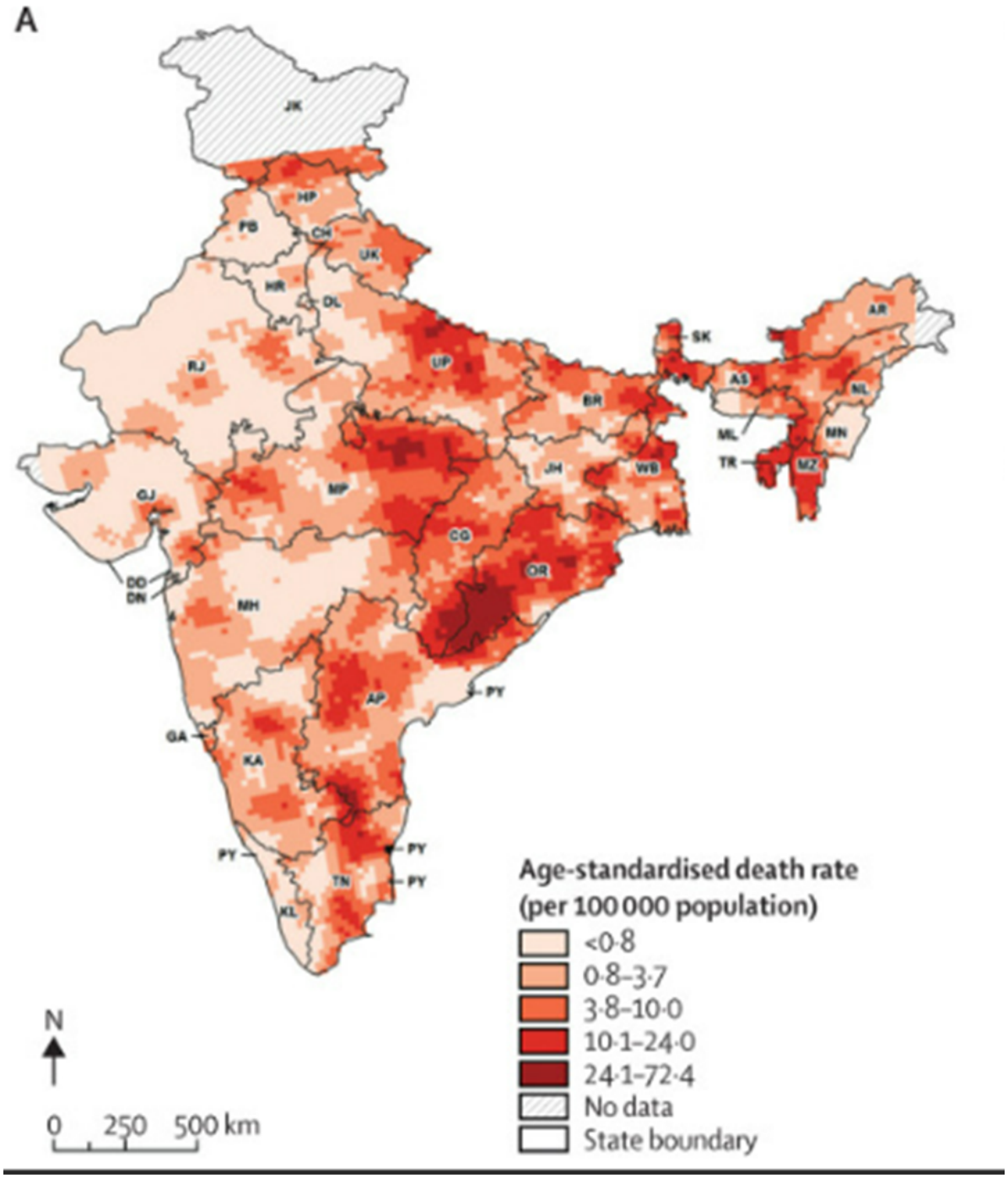
Location Map means a map depicting the location of the resource referenced in the application delineated in relation to named local streets, at a scale that depicts the resource in its entirety and enough surrounding area to locate the resource on other map sources.
Example – Location Map of Schools in Delhi



Cluster Maps

Cluster maps are a great tool for determining how many data points are located in a specific region. This type successfully combines the use of colors, shapes, and labels to cluster densely packed points of data together. In other words, there are too many points to be displayed individually on the GIS map, so they are fused into a single cluster point for convenience.

Example - Geographical variation in age-standardised death rates, and high-mortality and low-mortality clusters from acute abdominal conditions in Indians aged 0–69 years



Introduction of Bharat Maps

This will be a live demo Bharat Map website. An Internet Connection will be required along with Desktop and projection for demo.

Website: Bharat Maps (https://bharatmaps.gov.in)

This website gives an insight of Digital India Program that aims to establish end to end geo-spatial electronics delivery systems as part of Mission Mode Projects in e-Governance domain and envisages "National GIS Mission" as core foundation of location based Electronic Delivery of Services for Planning & Governance. This website created has Multi-Layer GIS Platform named "Bharat Maps" which depicts core foundation data as "NICMAPS", an integrated base map service using 1:50,000 scale reference data from Survey of India, ISRO, FSI, RGI and so on. This encompasses 23 layers containing administrative boundaries, transport layers such as roads & railways, forest layer, settlement locations etc., including terrain map services.

Basic Concepts of GIS

What is GIS?

GIS = Geographic Information System
A GIS integrates hardware, software and data for capturing, managing, analysing, and displaying all forms of geographically referenced information.

Geographical Information System (GIS) is a tool that provides the means to gather and use geographic data to support planning and development functions. A digital map is more valuable than the conventional printed map on paper because a large amount of other data can be combined with a digital map. This helps in better analysis of information and can also be represented in the form of graphs and thematic maps. It is possible to synthesize a large amount of different data, attach it to different layers of information, and utilize and regain the data in a more valuable form with the help of GIS software. It provides a powerful way for scientists and society to plan and develop, and it also helps them answer their questions.

For collecting, storing, analyzing, and managing geographically referenced data and their attribute information, Geographical Information System (GIS) is a vital tool. This system is competent at storing, editing, integrating, analyzing, sharing, and displaying spatial information.

Basic Components of GIS
GIS provides a platform for input, management, manipulation, analysis, and displaying spatial and non-spatial data on the same platform by the utilization of a computer system. Software, hardware, data, users, and methods are the main components of GIS that are essential for various operations.

Software
To store, analyze, and display geographic information, some functions and tools are needed, and GIS software consists of these tools. These tools include software needed to input and output GIS data, a database management system (DBMS), query, analysis, and visualization tools, and a graphical user interface (GUI) for easy access to tools. There are both commercial software and open-source software available in the field of GIS. For instance, Arc/Info, Intergraph, MapInfo, Gram++, etc., are commercial software, and AMS/MARS, etc., are open-source software.

Hardware
GIS works on the hardware of the computer; in other words, it is the physical part of the computer on which GIS operates, which is divided into input and output devices. GIS hardware ranges from centralized computer servers to personal computers, desktops, or laptops.

People

GIS technology is of limited value without the people who manage the system and develop plans for applying it to real-world problems. People are involved in all phases of the development of a GIS system and in collecting data. They include cartographers and surveyors who create the maps and survey the land and geographical features. They also include system users who collect the data, upload the data to the system, manipulate the system, and analyze the results. GIS users range from technical specialists who design and maintain the system to those who use it to help them perform their everyday work.

Methods

A successful GIS operates according to a well-designed plan and business rules, which are the models and operating practices unique to each organization. Different methods, like models and other tools that are necessary for different types of analysis, are built into GIS software, and this is the key behind the success of any GIS software.

Data

Data is the most important part of the GIS system. In GIS, both tabular and spatial data can be used, which are collected by oneself or purchased from commercial data providers. Data such as top sheets, maps, satellite imagery, and aerial photography are types of spatial data. These data are georeferenced with the help of latitude and longitude values, so that each pixel of maps, photographs, etc. has some geographical coordinate that gives them spatial location and values. These spatial data also have attribute data, which are in tabular form. Like population, agricultural production, number of urban centers, utility services, etc.

The data in a GIS can be classified into two main categories:

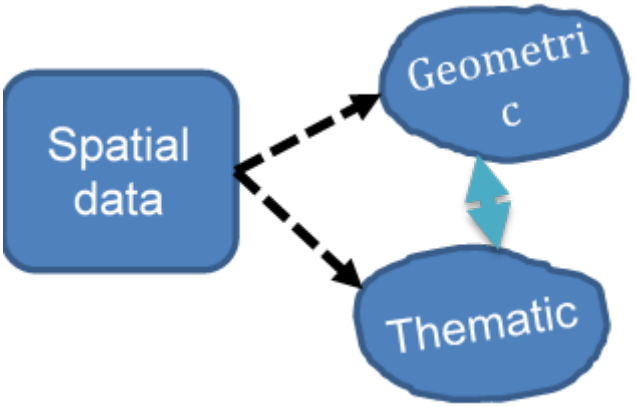
Spatial data - Describes the absolute and relative location of geographic features. Spatial data is also called geographic data that is identified by geometry, geographic location, and attribute that describes its characteristics, such as a forest, ocean, town, and others. The location and geometry of geographic features are stored in the form of coordinates (Latitude and Longitude) and topology. Spatial data manipulation or analysis is done with the help of attribute data in the GIS environment that can be mapped. Principally, there are three spatial data components that need to be stored for GIS data:

- geometric data,
- thematic data, and
- a link identification (ID) for the geometric and thematic component.

Attribute data or Non-spatial data

- Describes characteristics of the spatial features.
- These characteristics can be quantitative and/or qualitative in nature.

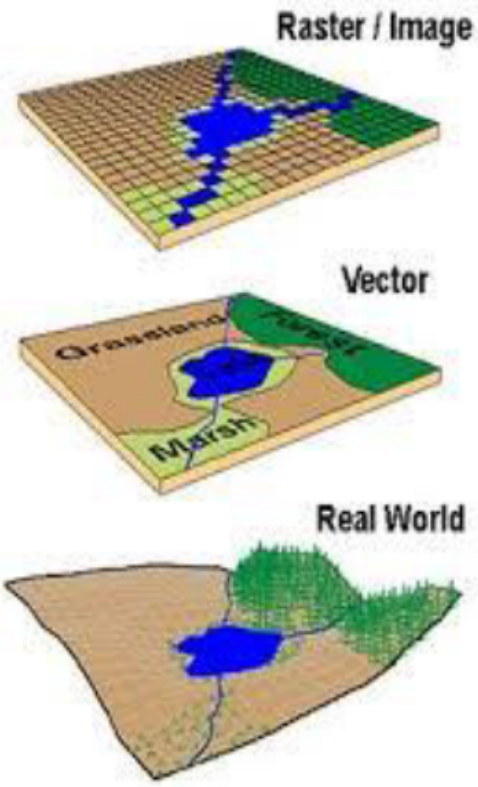
Non-spatial data (also called attribute or tabular data) describe the characteristics of features associated with vector data. It is stored in a database file (.dbf) and usually managed by Database Management Systems (DBMS) in the GIS environment. A unique identification number is used by the database to link the non-spatial data with spatial data.



Concept of Vector & Raster

GIS data represents real world objects (e.g. roads, land use, elevation, trees, waterways, etc.) There are two broad methods or formats to store spatial data in the GIS platform. They are:

- Raster data
- Vector data

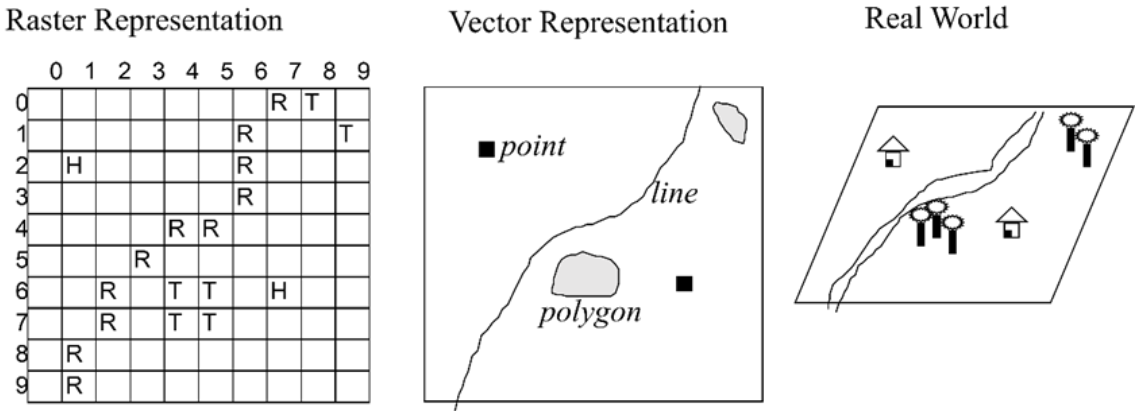


Raster: Raster data is in pixel form where the entire study area is divided into regular grids of cells in a particular format and sequence, i.e., row by row from the top-left corner. Each cell has a certain value.

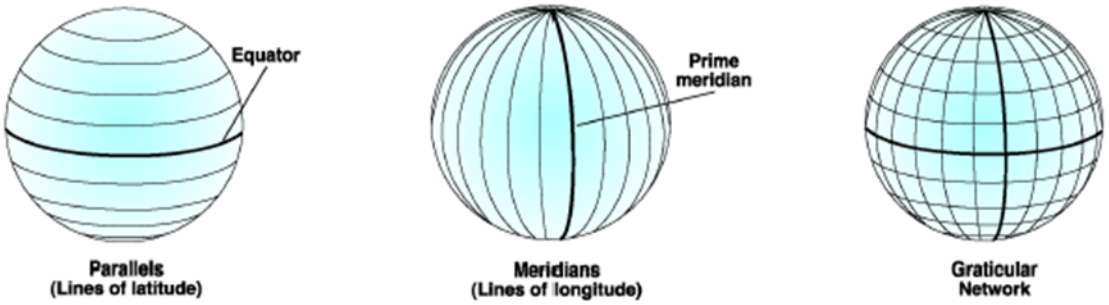
Every location in the study area corresponds to a cell in raster format, and a layer is formed by a set of cells with their associated values.

In raster format, a single cell represents a point. A sequence of neighboring cells represents a line, and a collection of contiguous cells represents a polygon. The size of all cells in raster format is the same, determining its resolution. A Cartesian matrix is produced as cells in raster format and arranged in rows and columns. The x-axis of the matrix is parallel to the row of raster data, and the y-axis is parallel to the column, with a unique row and column address for each cell.

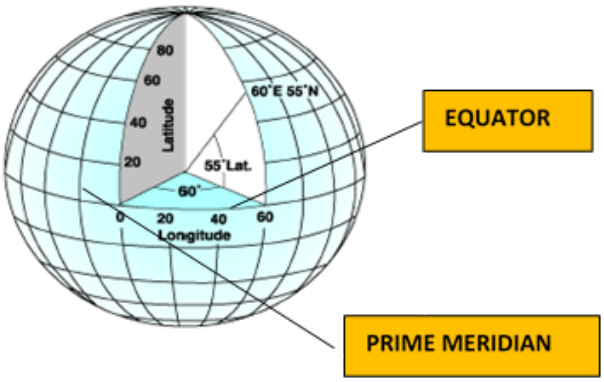
Vector: In the vector data model, every feature is represented in the form of a point, line, and polygon (Fig. 2). For instance, wells are represented by a point, rivers by a line, and lakes represented by a polygon with x and y locations. There is only one x and y location for a point; a line feature is saved as an array of several x and y pairs, and a polygon is also stored as a series of x and y locations, but in the case of a polygon, starting and ending points are the same.



What is Latitude & Longitude?
Latitude and longitude are parameters or coordinate system by means of which the position or location of any place on Earth's surface can be determined and described.



- A point on the earth is referenced by longitude and latitude values, angles expressed in degrees. Latitude and longitude are measured in degrees, minutes and seconds (DMS) or decimal degrees (DD)



- Longitude: angle measured on the sphere from the prime meridian. Longitude ranges between -180° (or 180 west) and +180° (or 180 east). All meridians are halves of great ellipses (often called great circles), which converge at the North and South Poles. The meridian of the British Royal Observatory in Greenwich, in southeast London, England, is the international prime meridian.
- Latitude: angle measured from the equator. Latitude ranges between -90° (or 90° south) and +90° (or 90° north). Lines joining points of the same latitude trace circles on the surface of Earth called parallels, as they are parallel to the Equator and to each other. Above and below the equator the latitude lines (circles) gradually become smaller. Only along the equator one degree of latitude represents the 111.12 Kilometers)

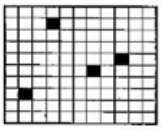
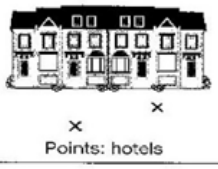
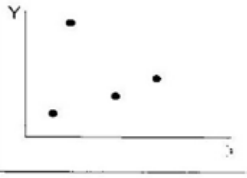
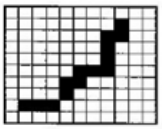
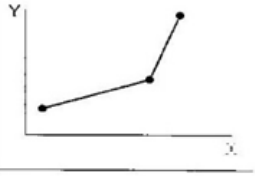
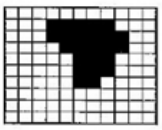
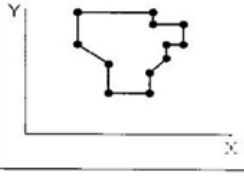
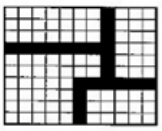
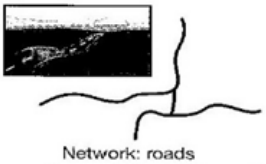
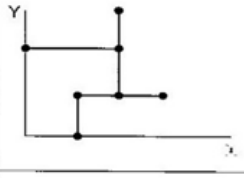
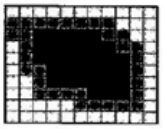
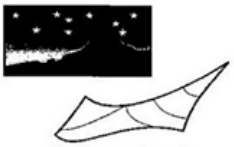
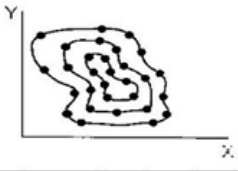
<u>Understanding the real-world features with respect to GIS entities.</u>

When we say GIS Entities, it means every feature on the ground is represented by a Point Line Polygon

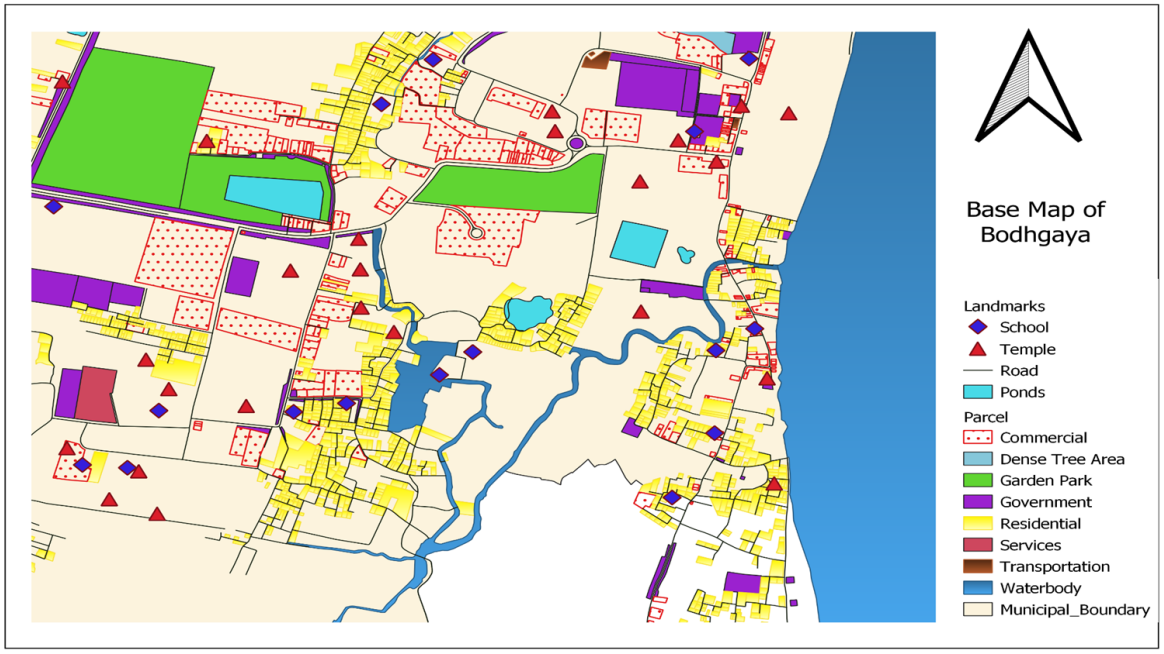
For example

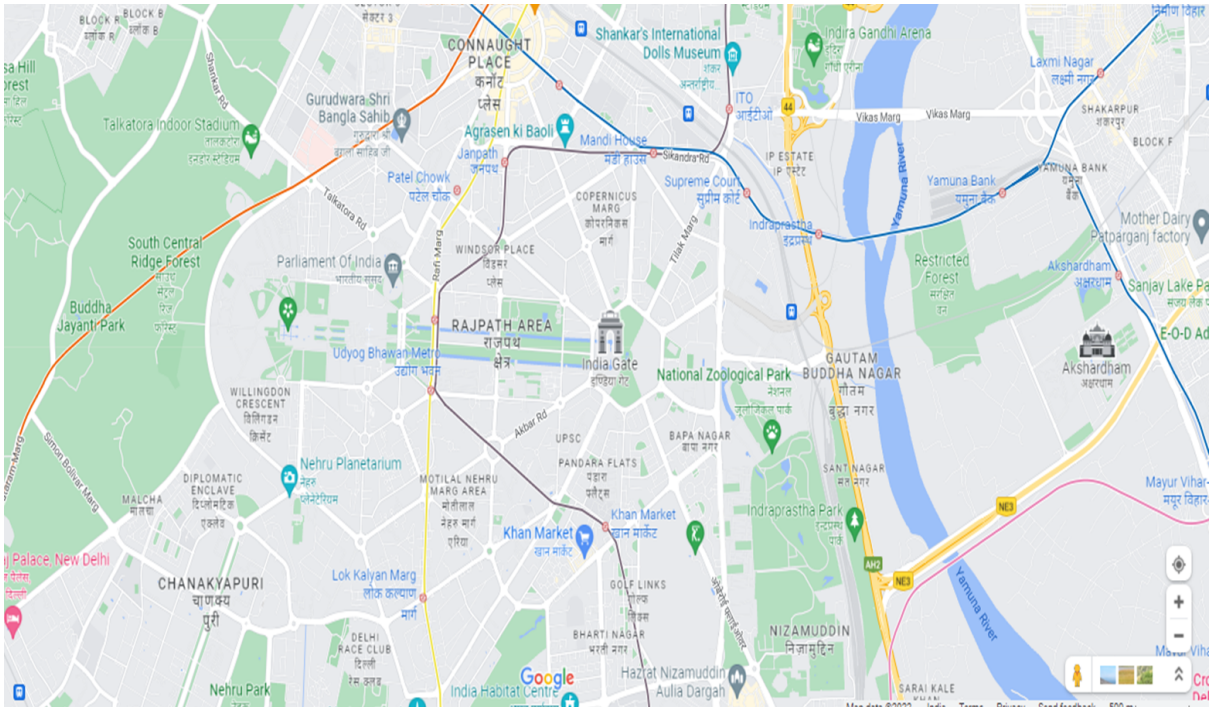
Electric Pole or a location of a school can be a point on the map
School Building area boundary can be represented as a Polygon on the map
Roads and Railways can be represented as line on the map

A) In the following table let us see how a point, line and polygon are represented in the vector and raster form.

Raster	Real World	Vector	Answers
			**POINT**
			**LINE**
			**POLYGON**
			**POLY-LINES** **(NO OF LINES TOGETHER)**
			**POLYGON**

A) In the following Map please identify the GIS Entities and the Real-World Features





Identification of Latitudes & Longitudes from Google Maps

Introduction – Geospatial Data Preparation for ArcGIS Online

Now that you are familiar with some basic concepts of GIS, it's time to start preparing a dataset that we will use later in a web-based GIS software called ArcGIS Online. Since most of you are familiar with Delhi, we are going to work with data from Delhi itself. You are provided with a CSV file with a list of some of the monuments of the city (figure 1). The list contains the name of the monument and some attributes of each. The file also contains columns of latitudes and longitudes which do not contain any values right now. You will need to fill these columns by getting the latitude and longitude of each monument from Google Maps.

S_No	Monument_Name	Type	Century	Era	Photograph	Latitude	Longitude
1	India Gate	Memorial	20th	British			
2	Akshardham	Temple	21st	Post Independence			
3	Raj Ghat	Memorial	20th	Post Independence			
4	Kotla Firozshah	Fortress	15th	Tughlaq			
5	Red Fort	Fort-Palace	17th	Mughal			
6	Fatehpuri Masjid	Mosque	17th	Mughal			
7	Ghiyasuddin Tughlaq's Tomb	Tomb	13th	Tughlaq			
8	Hauz-e-Shamsi	Waterbody	13th	Slaves			
9	Humayun's Tomb	Tomb	16th	Mughal			
10	Iron Pillar	Pillar	4th	Gupta			
11	Isa Khan's Tomb	Tomb	16th	Sur			
12	Jama Masjid	Mosque	17th	Mughal			
13	Jantar Mantar	Observatory	18th	Mughal			
14	Lotus Temple	Temple	20th	Post Independence			
15	Kushak Mahal	Hunting Lodge	14th	Tughlaq			
16	Malcha Mahal	Hunting Lodge	14th	Tughlaq			

Figure 1: Monuments of Delhi with some attributes

Instructions to identify the Latitude/Longitude

Open your web browser and type in maps.google.com in the browser window and hit Enter on your keyboard.

Your browser window will now display the homepage of Google Maps (figure 2).

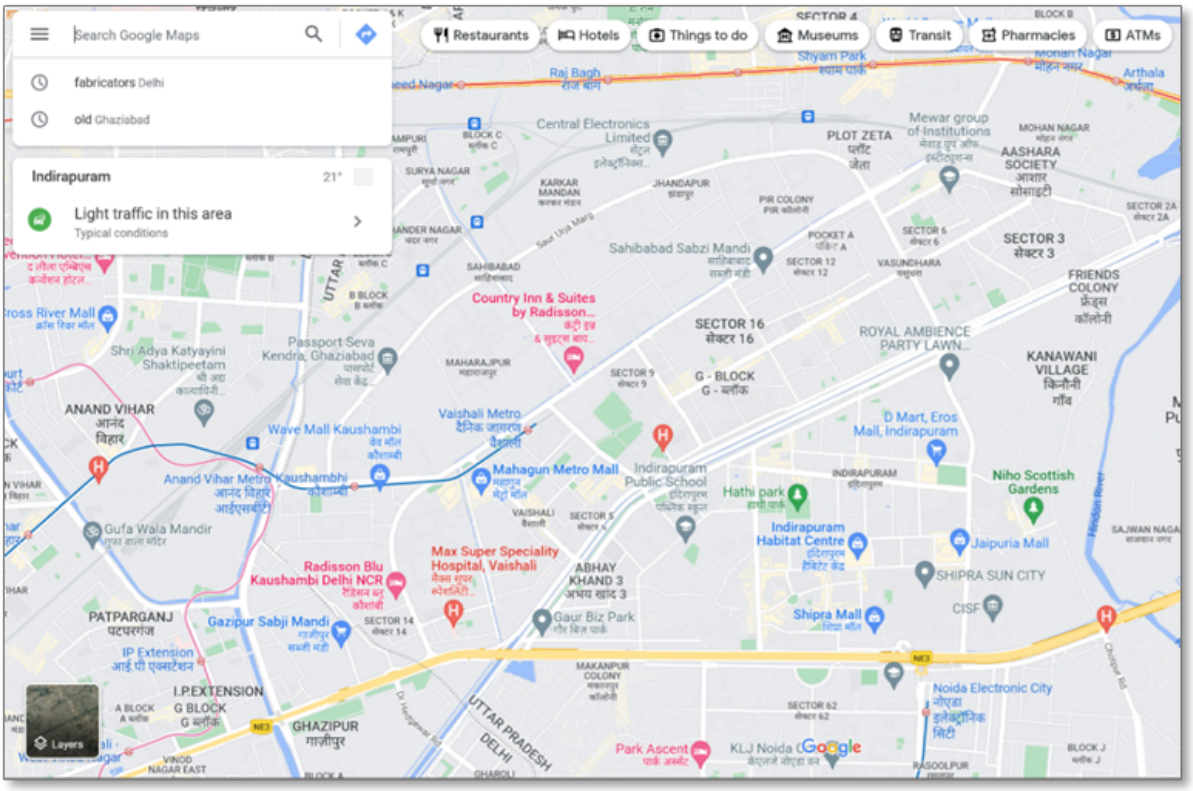


Figure 2: Google Maps interface

In Google Maps 'Search Box', type in the name of any monument and hit Enter on the keyboard. Google Maps will automatically zoom on to that location (figure 3).

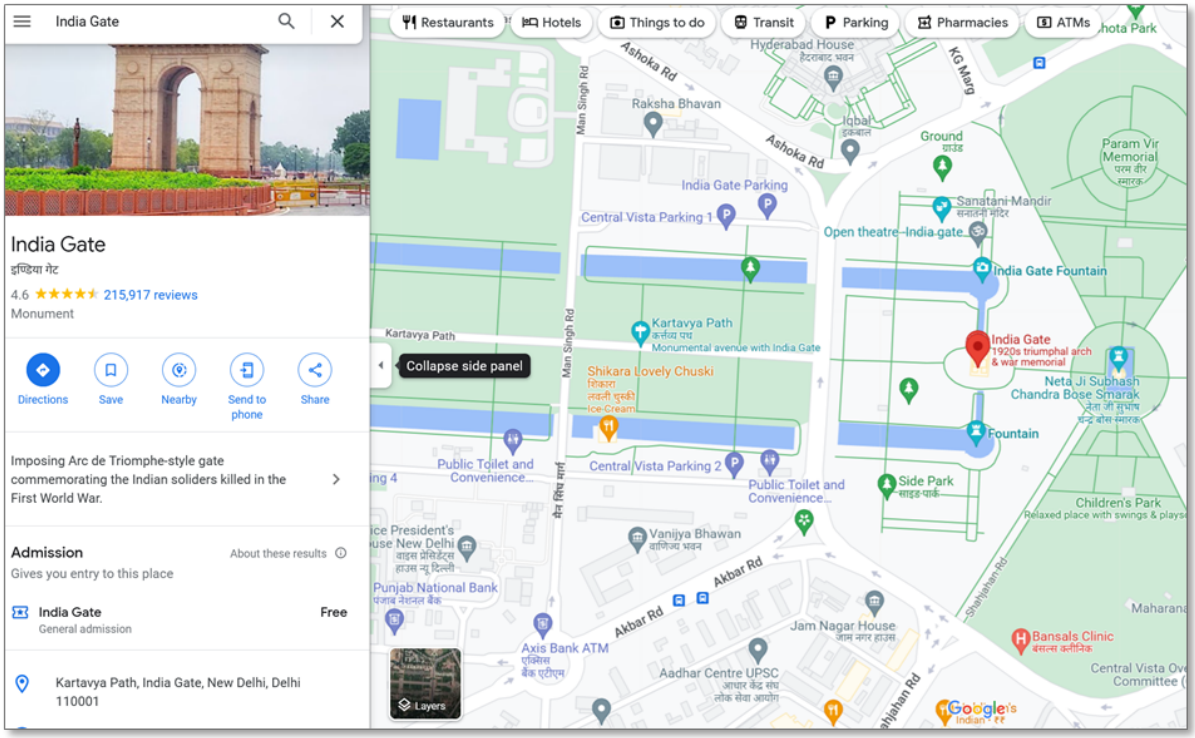


Figure 3: India Gate on Google Maps

Once you have zoomed in on a monument in your list, the next task is to find the latitude and longitude of that place. To this right click on the marker representing the monument (figure 4).

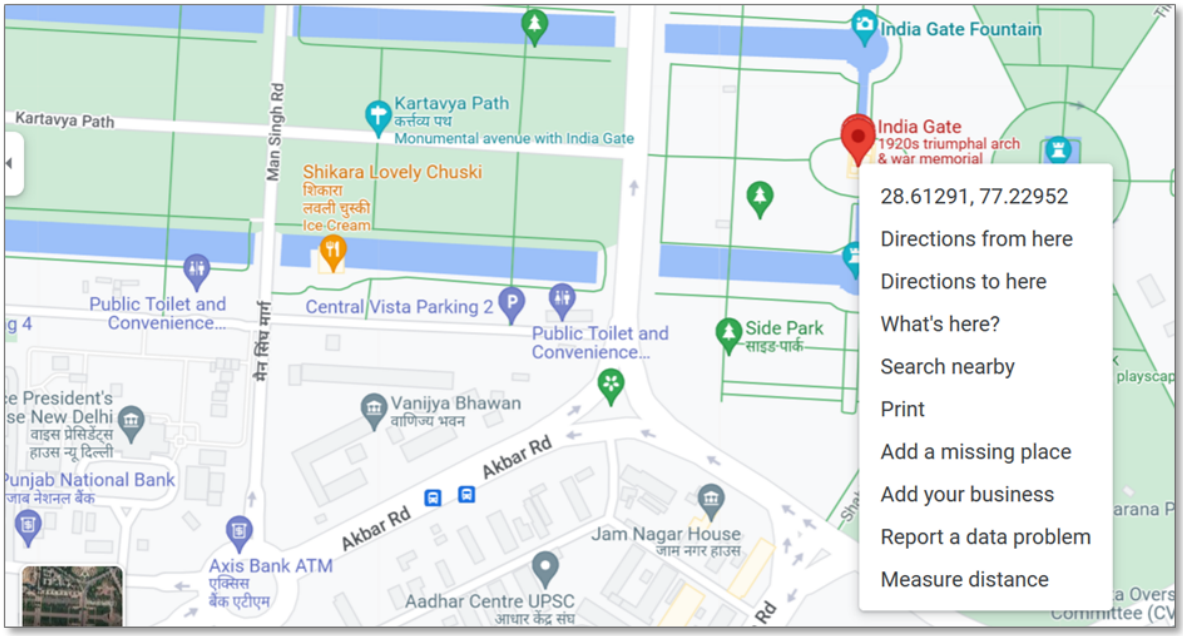


Figure 4: Latitude and Longitude of India Gate

In figure 4, we can see that on right clicking a feature on the map, a table opens-up. The first entry in this table is the latitude and longitude of the location. Next, left click on it and it will automatically get copied to the clipboard.
Now go back to MS Excel and paste the copied values in the appropriate columns (figure 5).

S_No	Monument_Name	Type	Century	Era	Photograph	Latitude	Longitude
1	India Gate	Memorial	20th	British		28.612911982344375, 77.22952042637132	
2	Akshardham	Temple	21st	Post Independence			
3	Raj Ghat	Memorial	20th	Post Independence			
4	Kotla Firozshah	Fortress	15th	Tughlaq			
5	Red Fort	Fort-Palace	17th	Mughal			
6	Fatehpuri Masjid	Mosque	17th	Mughal			
7	Ghiyasuddin Tughlaq's Tomb	Tomb	13th	Tughlaq			
8	Hauz-e-Shamsi	Waterbody	13th	Slaves			
9	Humayun's Tomb	Tomb	16th	Mughal			
10	Iron Pillar	Pillar	4th	Gupta			
11	Isa Khan's Tomb	Tomb	16th	Sur			

Figure 5: Latitude and Longitude for India Gate copied to CSV file

Since both these values were copied together from Google Maps, we need to do some manual editing to ensure that the correct value is filled in the appropriate column. The first value is the latitude, and the second value is the longitude. After you have pasted the value in the Latitude cell, you can remove the longitude value from the cell by simply erasing it in the Formula Bar (figure 6).

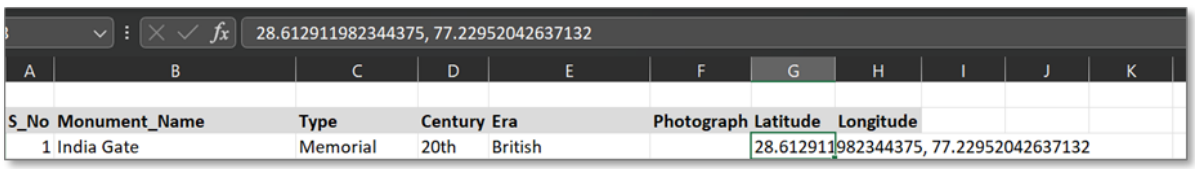


Figure 6: Editing the latitude value

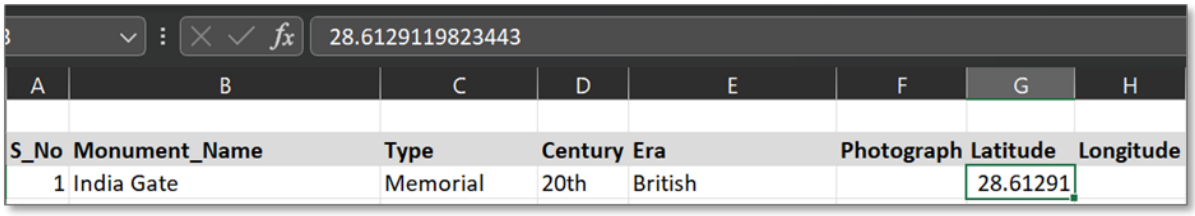


Figure 7: Latitude value after editing

Now that we have edited the value in the Latitude cell, we need to do the same for longitude. Select the longitude cell and paste the copied coordinates.

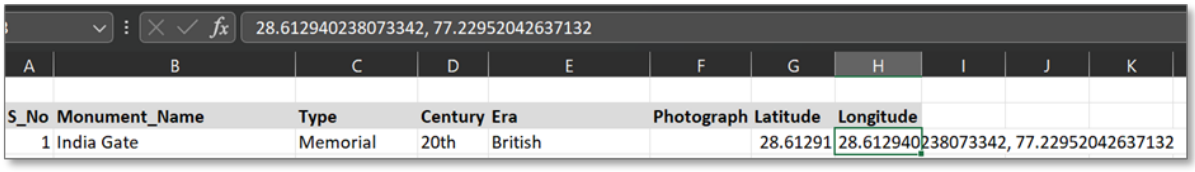


Figure 8: Editing the longitude value

Now go the Formula Bar and erase the latitudinal value to only have the longitude in the cell.

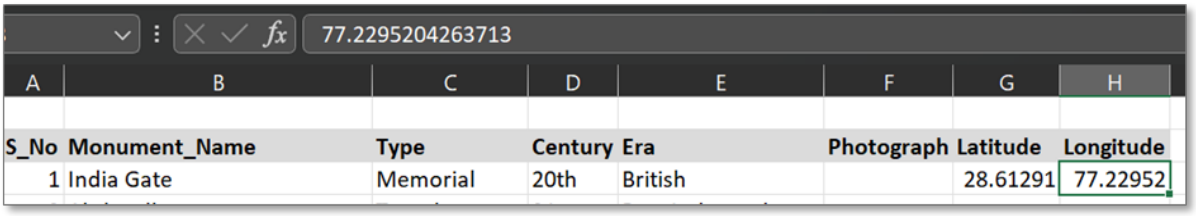


Figure 9: Latitude and longitude values for India Gate

We now have latitude and longitude values for our first monument, India Gate.

Time for a task!

1. Repeat this process for the remaining 24 monuments to get latitudes and longitudes for all of them. Once you have done this, the CSV file will be ready for visualization in ArcGIS Online.

Practical GIS with ArcGIS Online

INTRODUCTION TO ARCGIS ONLINE

ArcGIS Online is a cloud-based mapping and analysis tool. It can be used to make maps, collaborate, analyze, and share data. This tool is available at three different hierarchical levels. The first is a Public Account, which is the free version of the tool. It comes with all the basic tools for uploading geo-spatial data and creating web maps and apps. The second level is a Developers' Account which is also free up to certain credits and gives more flexibility in designing web maps and apps. The third and the highest level is an Organizational Account which is meant for organizations and enterprises and is the paid version of the tool. For these exercises we are going to use the Public Account.

Activity 1: Create public account on ArcGIS.com | Time Required: 10 Minutes
Open your web browser and type in www.arcgis.com in the browser window and hit Enter on your keyboard.
Your browser window will now display the homepage of ArcGIS.com (see figure 1).

Figure 1: ArcGIS.com homepage

Click on Sign in (figure 2).

Figure 2

You will now be taken to the ArcGIS Online sign in page which can be seen in figure 3. Since we do not have an account yet, click on Create an account at the bottom of the dialog box.

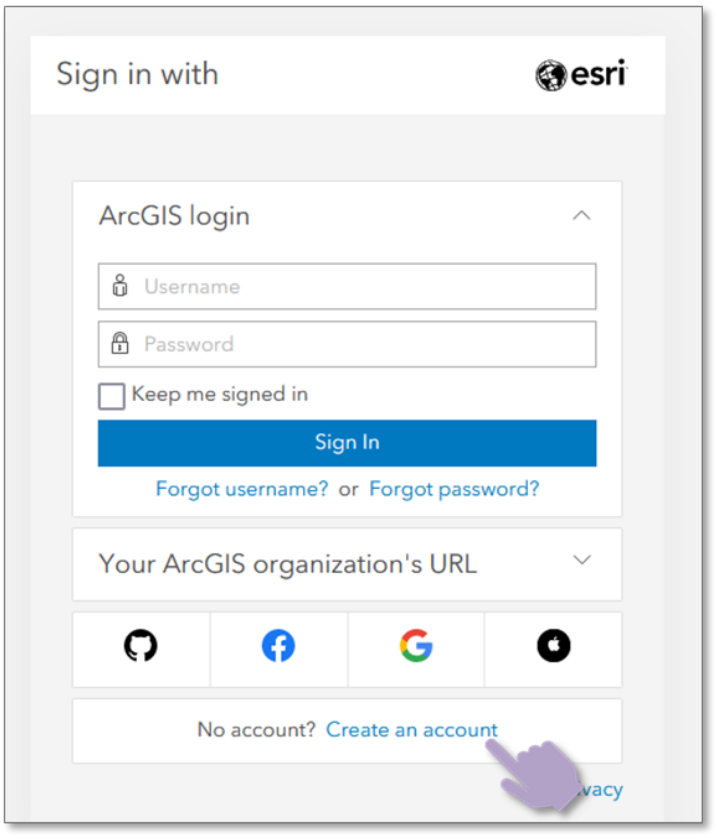


Figure 3

The next page gives the information about the different types of ArcGIS Online accounts that can be opened. Click on Create an ArcGIS Public Account.

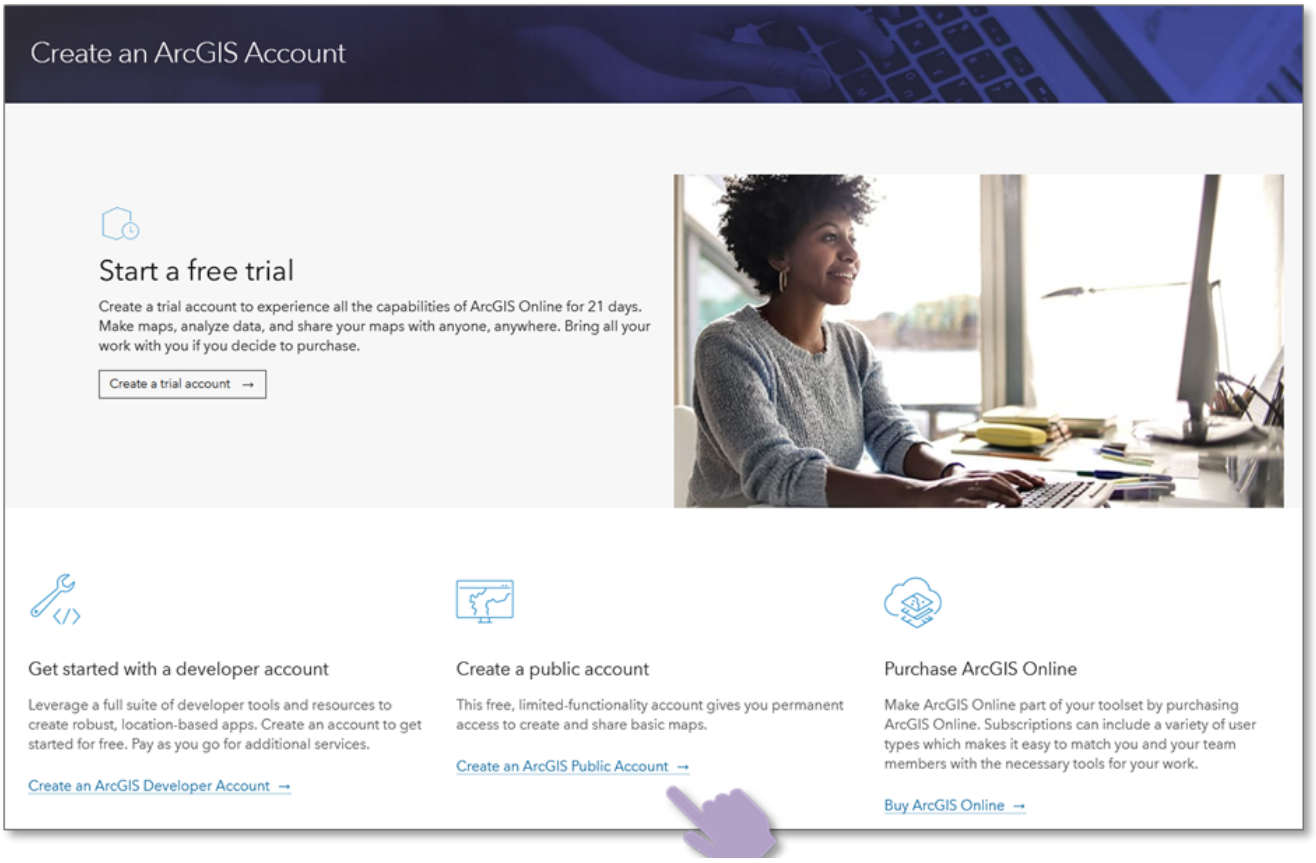


Figure 4: Creating an ArcGIS public account

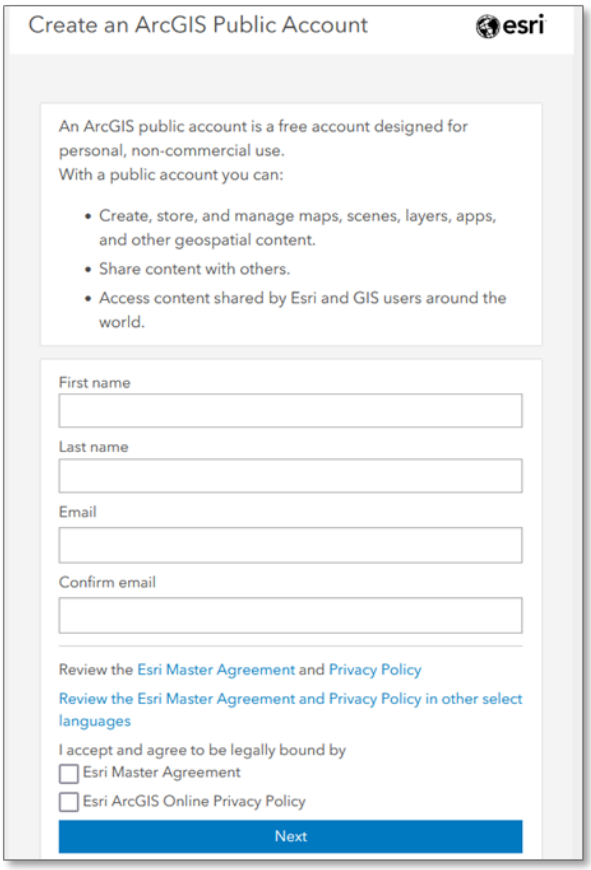


Figure 5: Personal details for creating the public account

On filling up the form you will receive an activation link in your email. Click it to complete account activation.

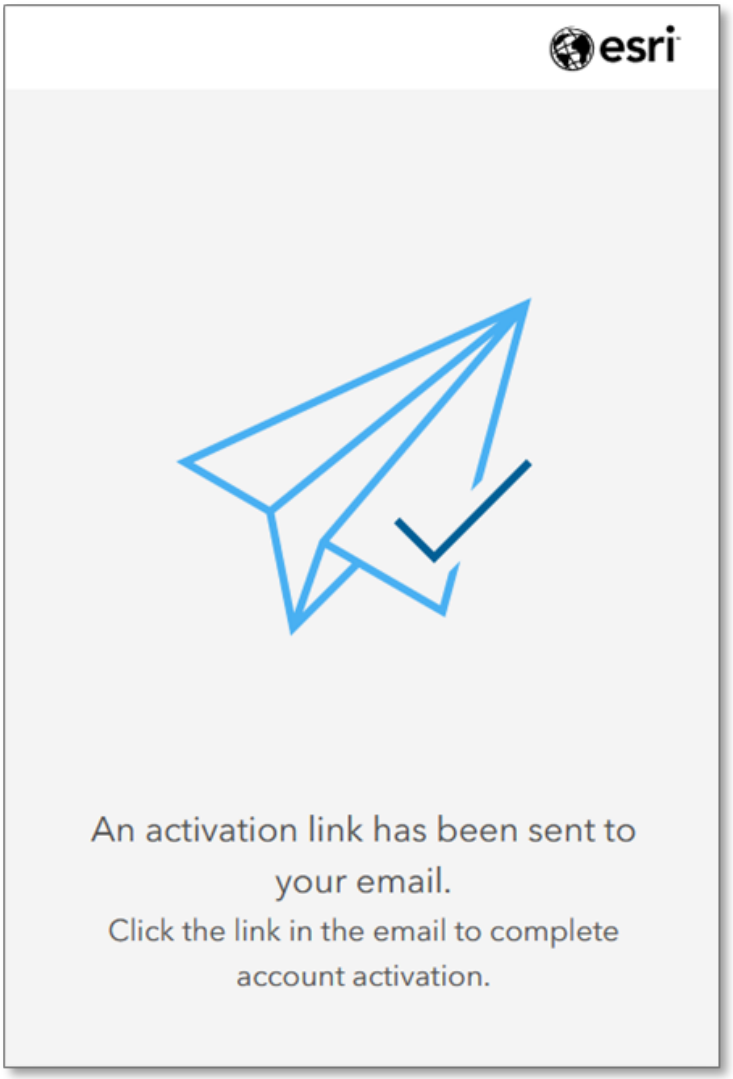
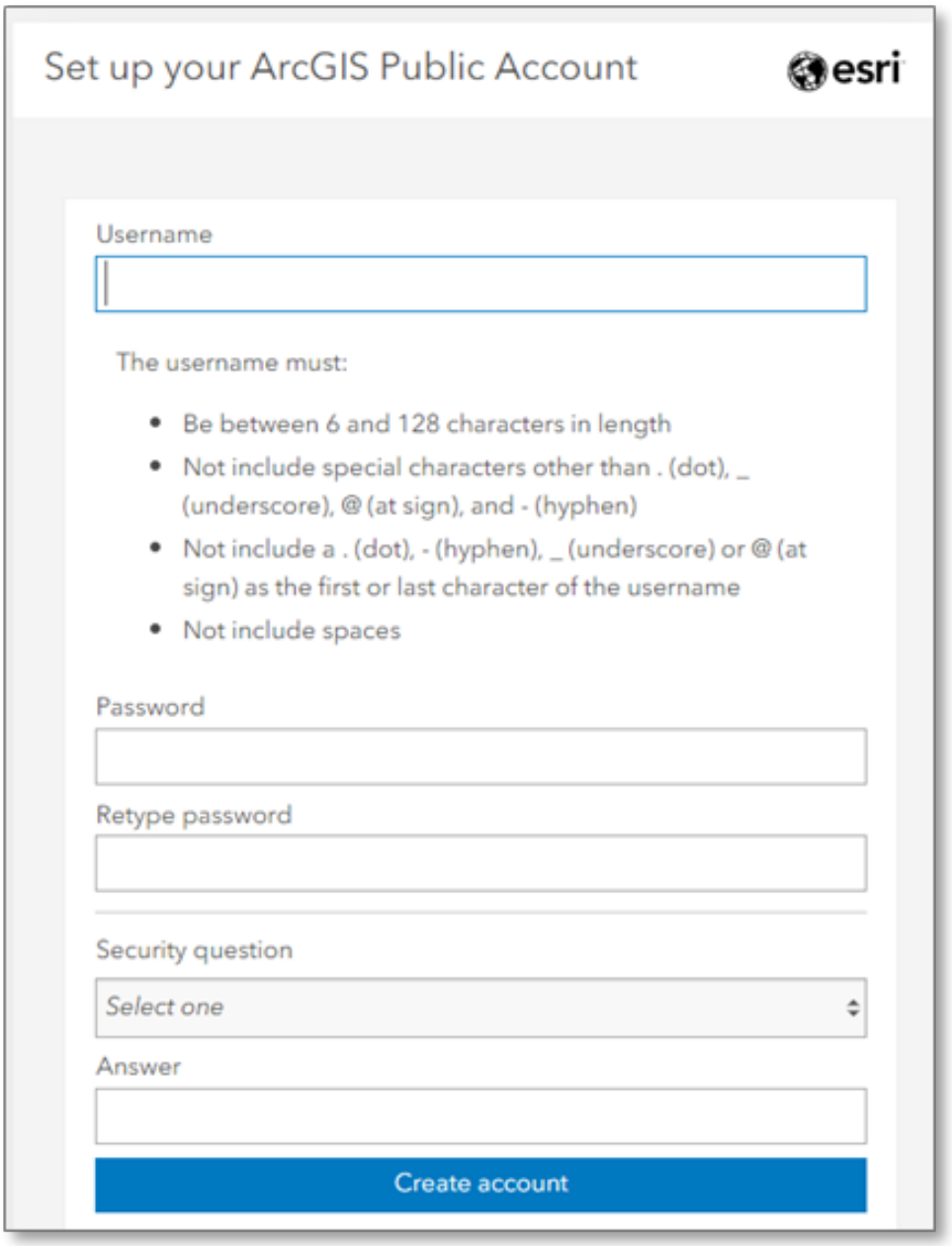


Figure 6: Receipt of public account activation link

On clicking the link, you will be taken to another web page to set up your ArcGIS public account. Fill the form and your ArcGIS Online Public Account is ready to use!



Introduction to ArcGIS Online

Congratulations on setting up your ArcGIS Online Public Account! It's time to Sign In into your account and familiarize ourselves with its interface and some tools. This will help us later in plotting, symbolizing, and visualizing spatial data on this platform.

Activity 2: Explore ArcGIS Online Interface and Understand its Basic Tools | Time Required: 35 Minutes
Go to www.arcgis.com and click Sign In. Fill in your Username and Password, click Sign In again and you are logged into your ArcGIS public account. Your homepage will look like what we can see in figure 1. Click on the Map tab.

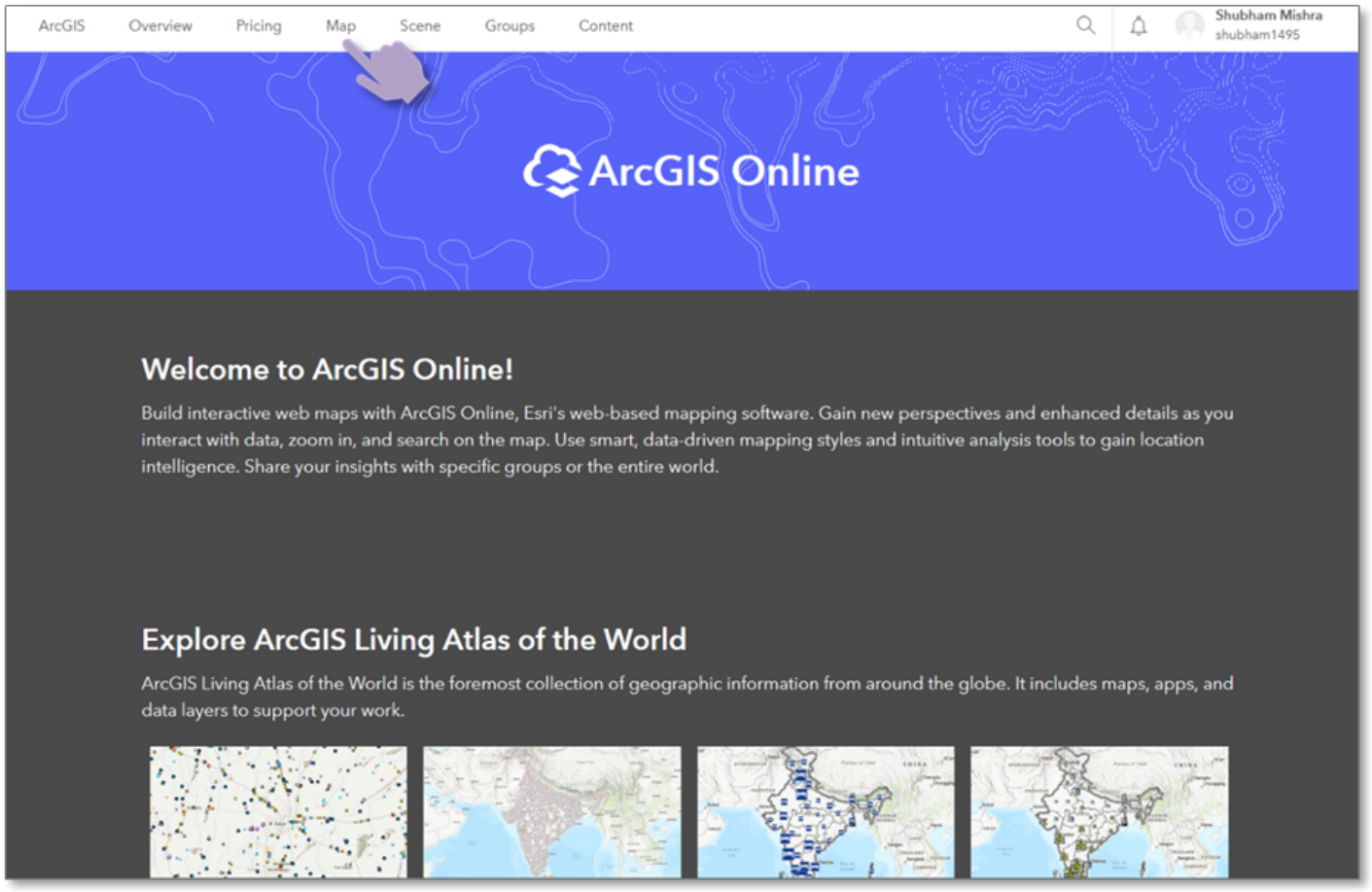


Figure 1: Tabs on the homepage

We will now find ourselves on the 'My Map' page. This is where we add our spatial data, symbolize it and create a web-map.

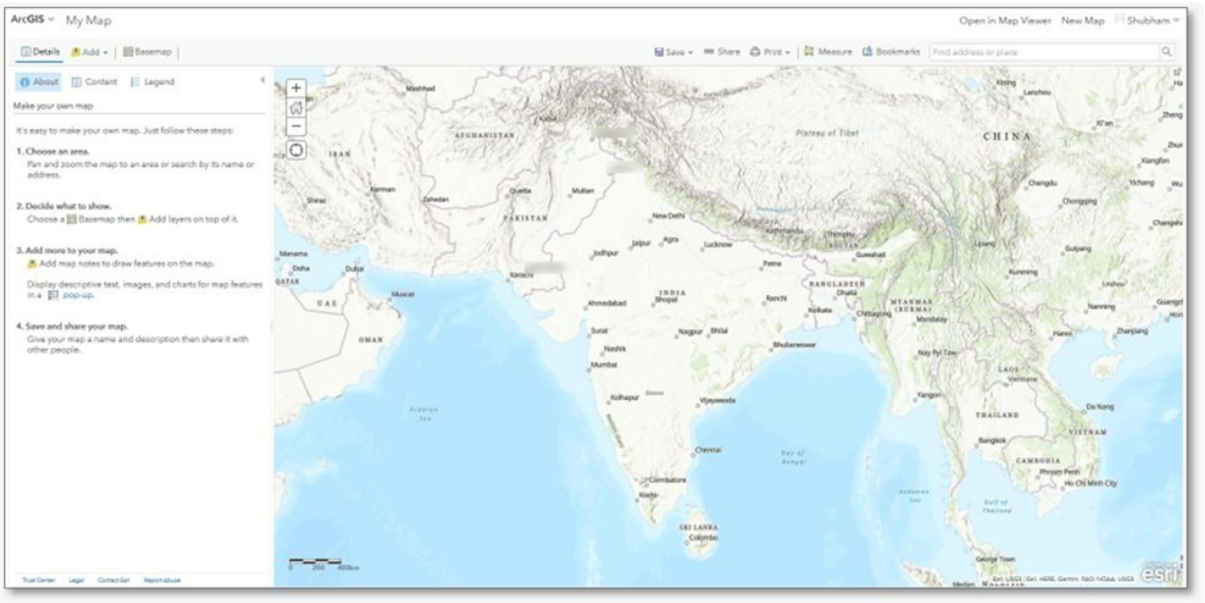


Figure 2: The My Map page

Let us now explore this interface in detail. The ‘About’ tab (figure 3) on the left gives us a quick overview of how we can make a map. Since we have not added any spatial data to our map yet, the ‘Content’ and the ‘Legend’ tabs are blank at the moment.

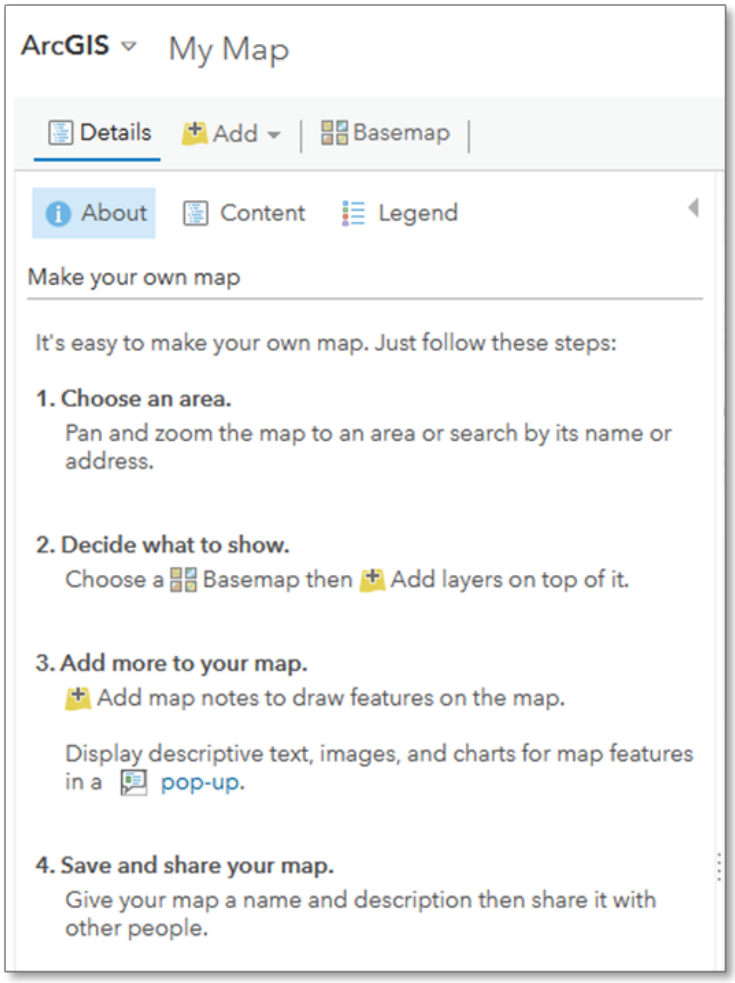


Figure 3: The 'About' tab in My Map

On the right side, the 'Map Window' comes with a physical map of India as default (figure 4). On the top-left corner of the map, you will find some controls to navigate the map.

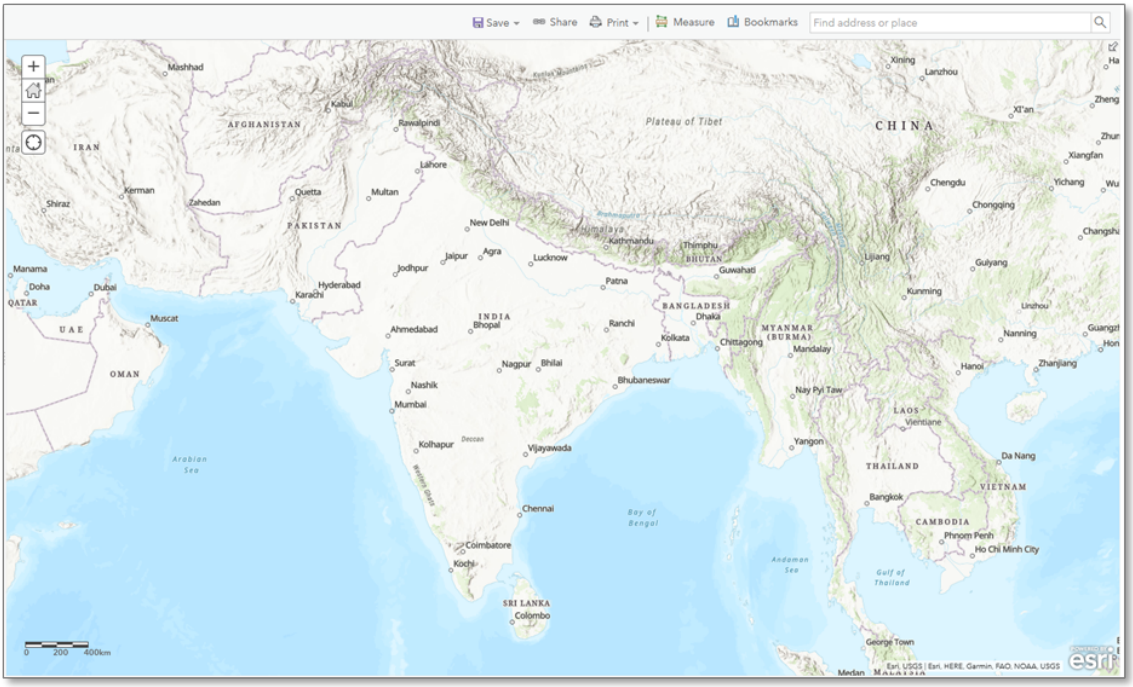


Figure 4: The default map in the Map Window

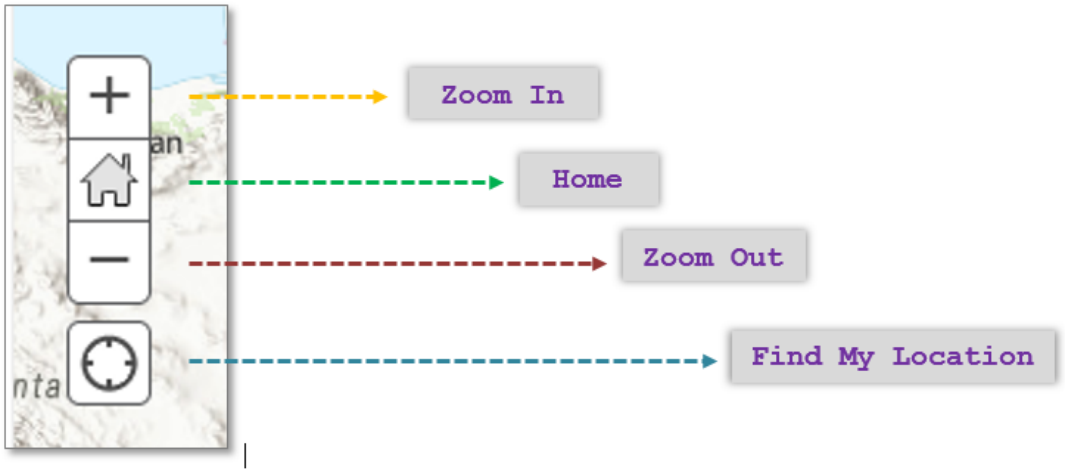


Figure 5: Navigation tools

Time for some tasks!

1. Use the appropriate navigation tool to zoom into Delhi.
2. What do you think will happen if you click the **'Home'** button after you have zoomed into Delhi?
   _____
3. What is the function of **'Find My Location'** button?

_____

Now that we have zoomed into Delhi, the ‘Map Window’ will look something like what we see in figure 6.

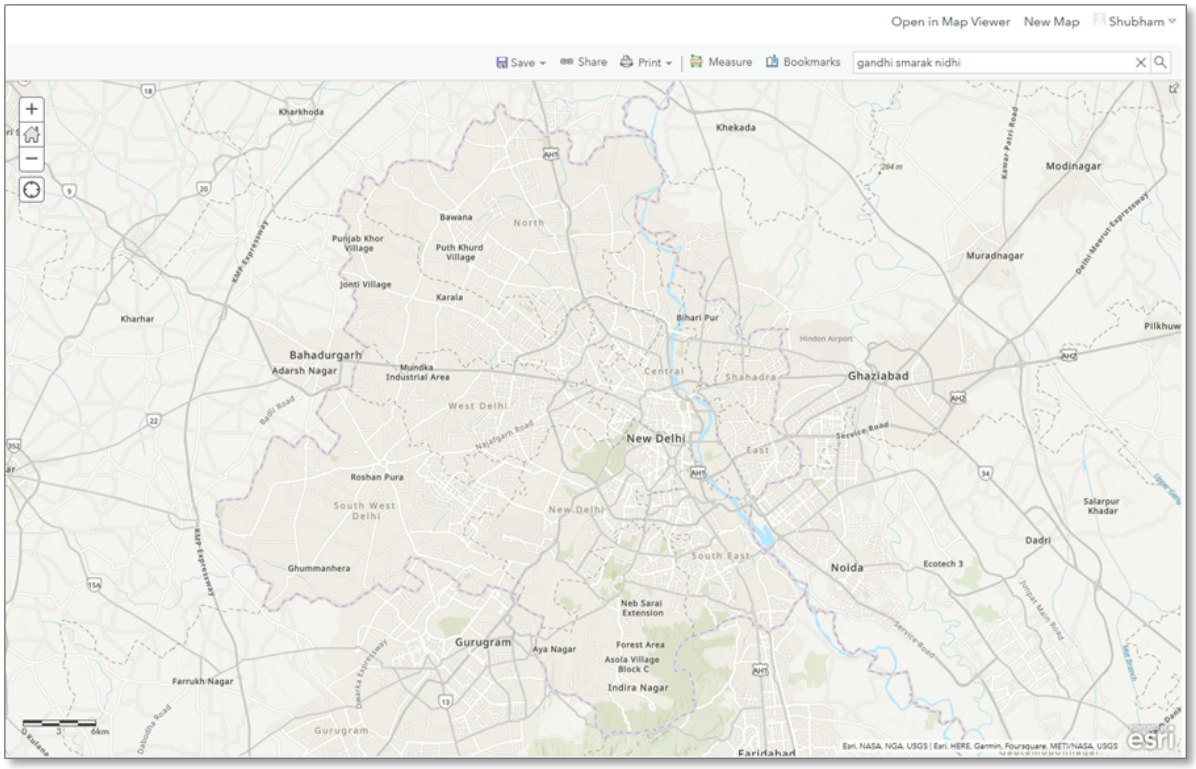


Figure 6: A zoomed in view of Delhi

Click on Bookmarks to create a bookmark for Delhi (figures 7 & 8).

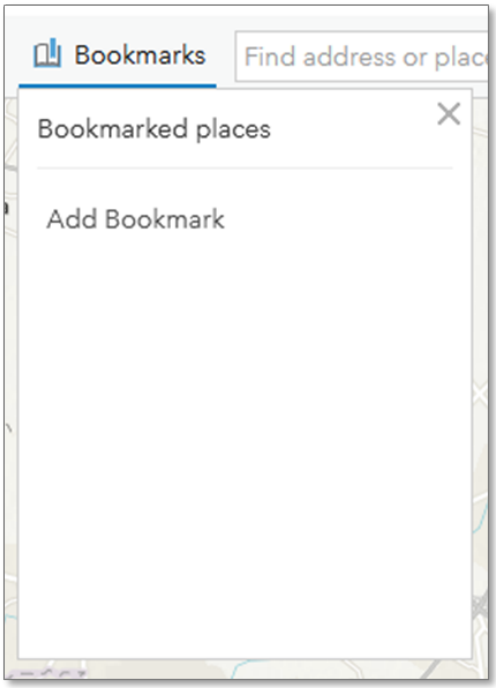


Figure 7: Add a Bookmark

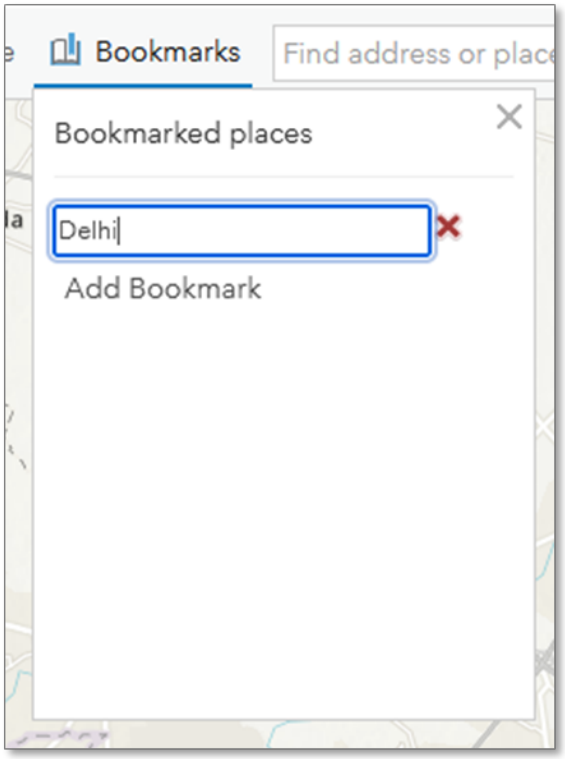


Figure 8: Bookmark added

Time for another task!

1. Click the **'Home'** button.
2. Go to **'Bookmarks'** and select the bookmark that you have just created. What do you think will happen?
   _____

As we have learnt earlier, maps are drawn to scale, and this makes it possible for us to measure distances, areas, and locations on them. Let us use the 'Measure' tool to explore this further.

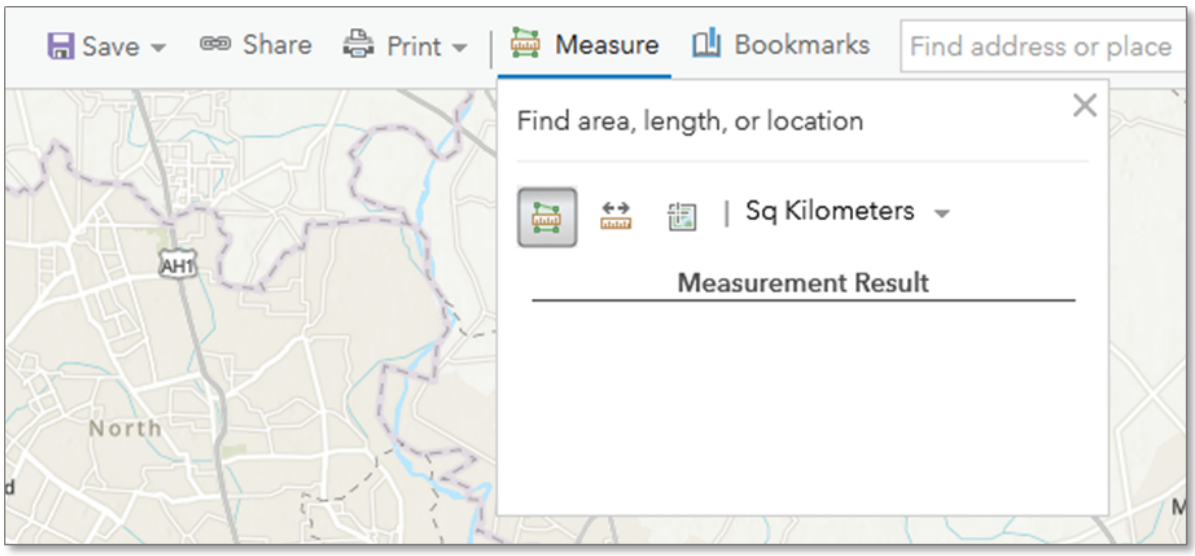


Figure 9: Measurement tools

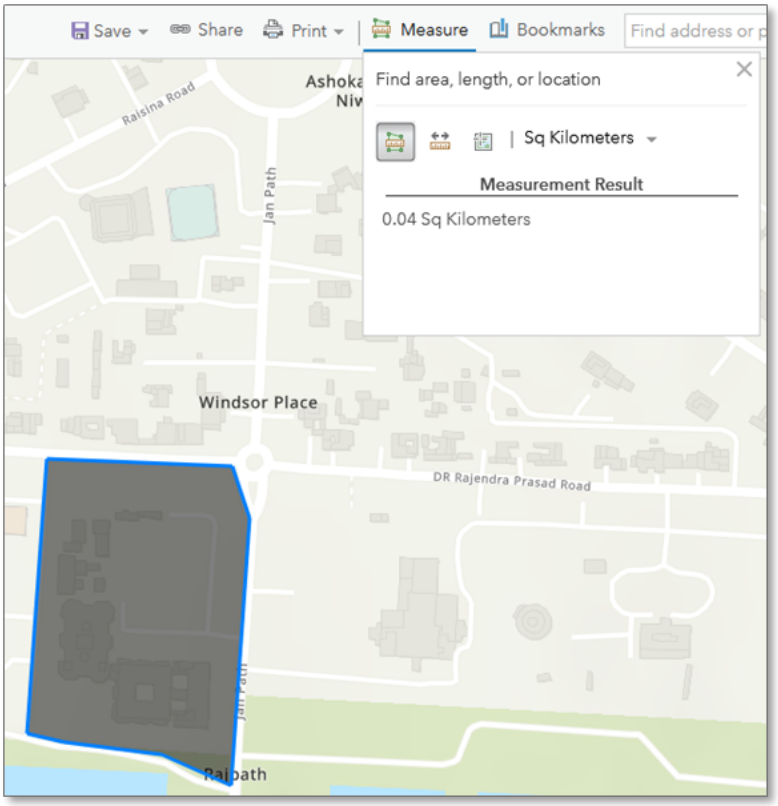


Figure 10: Measuring areas

You can change the units of measurement by clicking the drop-down arrow next to 'Sq Kilometers'.

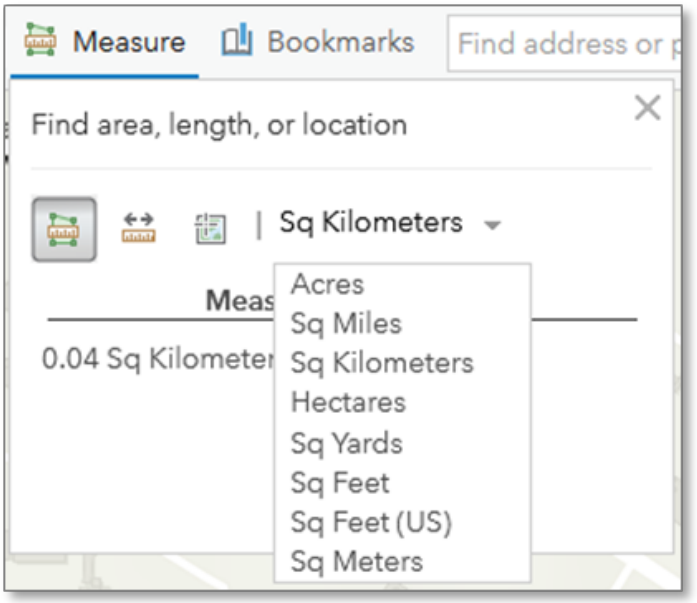


Figure 11: Unit selector

One final task for this session!

1. Use the **'Distance'** measurement button.
2. Use the **'Location'** button to check latitude and longitude of different places on the map.

Use the ‘Bookmark’ to go to the zoom level of Delhi. We will now explore the different basemaps available to us from the ‘Basemap Gallery’.

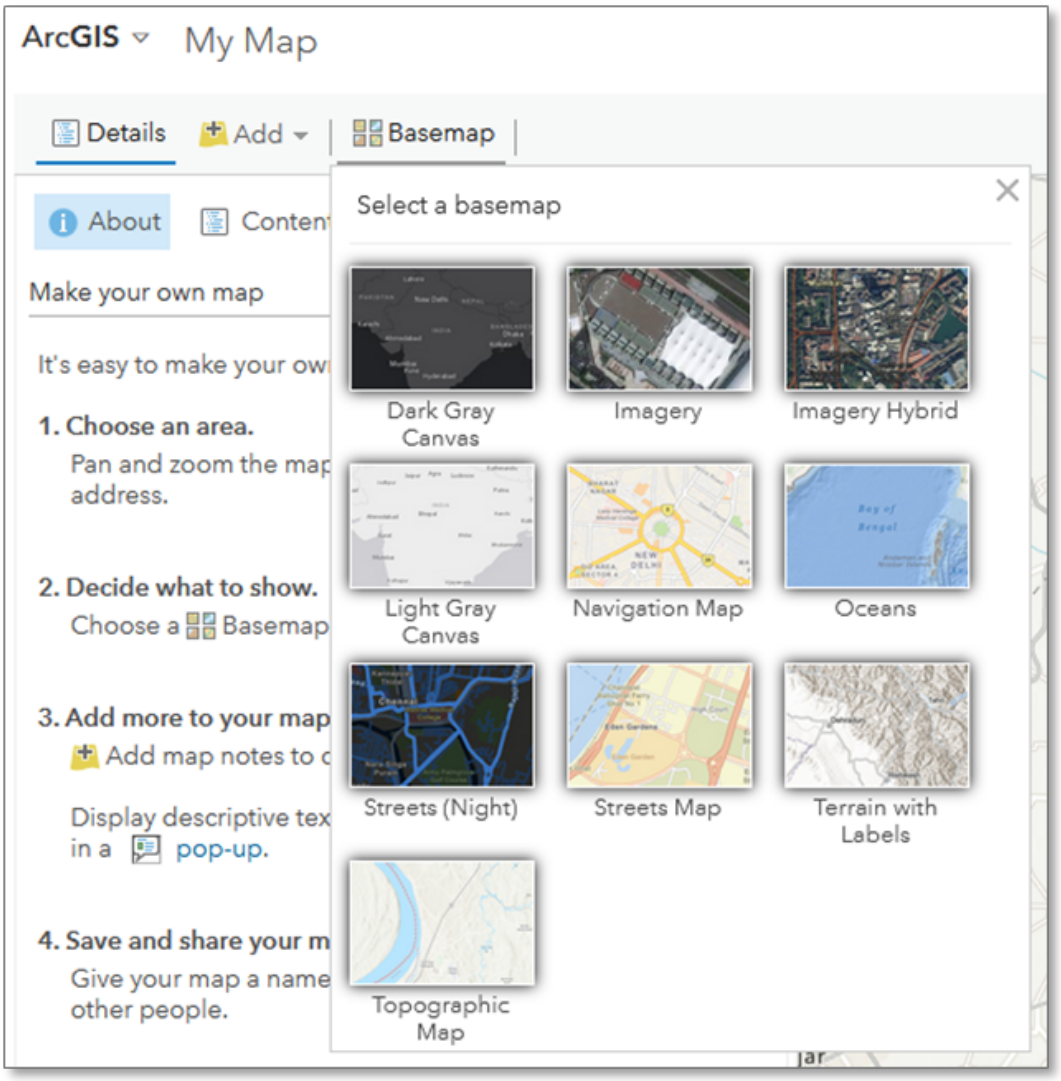


Figure 12: The Basemap Gallery

Select any basemap from the Gallery and see how your map changes!

Figure 13: 'Streetmap' basemap for Delhi

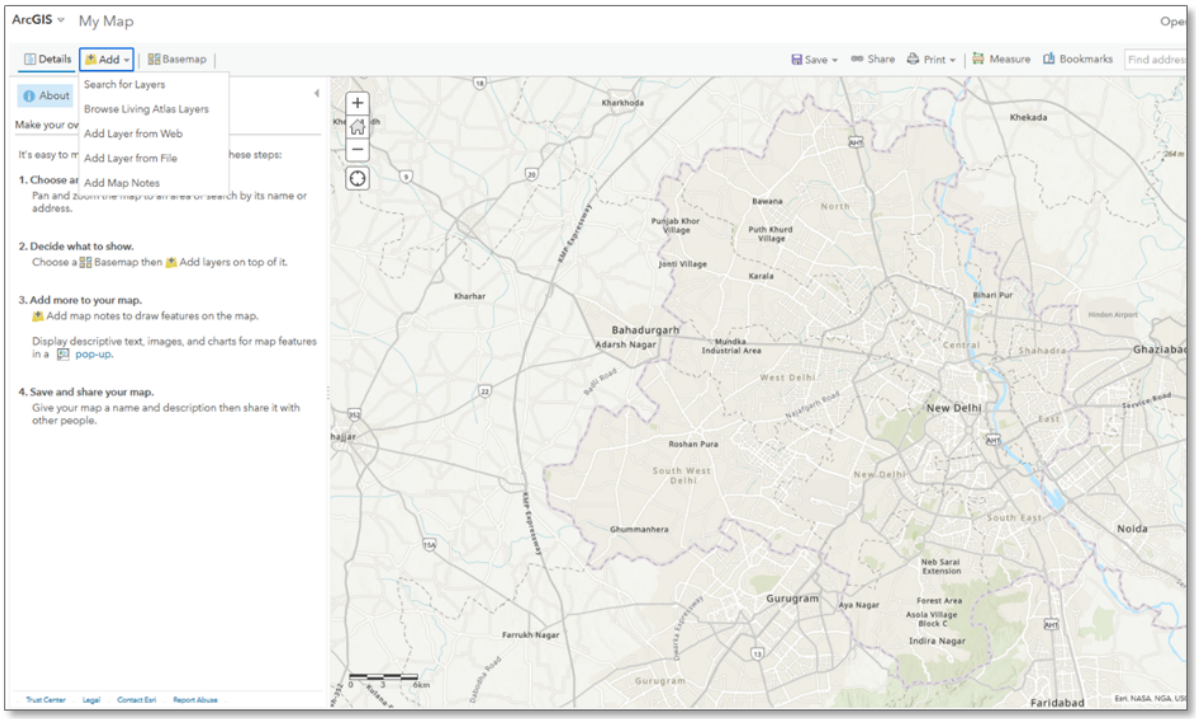
Select other basemaps too from the gallery and examine their pros and cons for your map.
Now that we are somewhat familiar with the interface of ArcGIS Online, we can start plotting and visualizing some geo-spatial data.

Hands-On with GIS Using ArcGIS Online-1

Now that you have visualized and symbolized point features on ArcGIS Online, we will do the same with line and polygon geometry. However, adding these geometries is not as straightforward as adding points since lines and polygons cannot be saved as CSV files. The usual method is to create shapefiles in a GIS package like QGIS and upload them directly. But since we are not using QGIS in this program, the only option in front of us is to digitize lines and polygons in Google Earth, save them as GML, convert them into shapefiles using a free online converter and upload the files. Since ArcGIS Online does not allow uploading KML files from the desktop, they need to be converted first.

Activity: Visualizing and Symbolizing Vector Data (Points) in ArcGIS Online

Sign In into your ArcGIS Online account. On the 'My Map' page click on the 'drop-down arrow' on the Add tab. Click again on Add Layer from File.



The resultants dialogue box (figure 2) lists the type of spatial data that can be imported in ArcGIS Online. Click on Browse and locate the CSV file of Delhi's monuments whose coordinates you had filled earlier in this module.

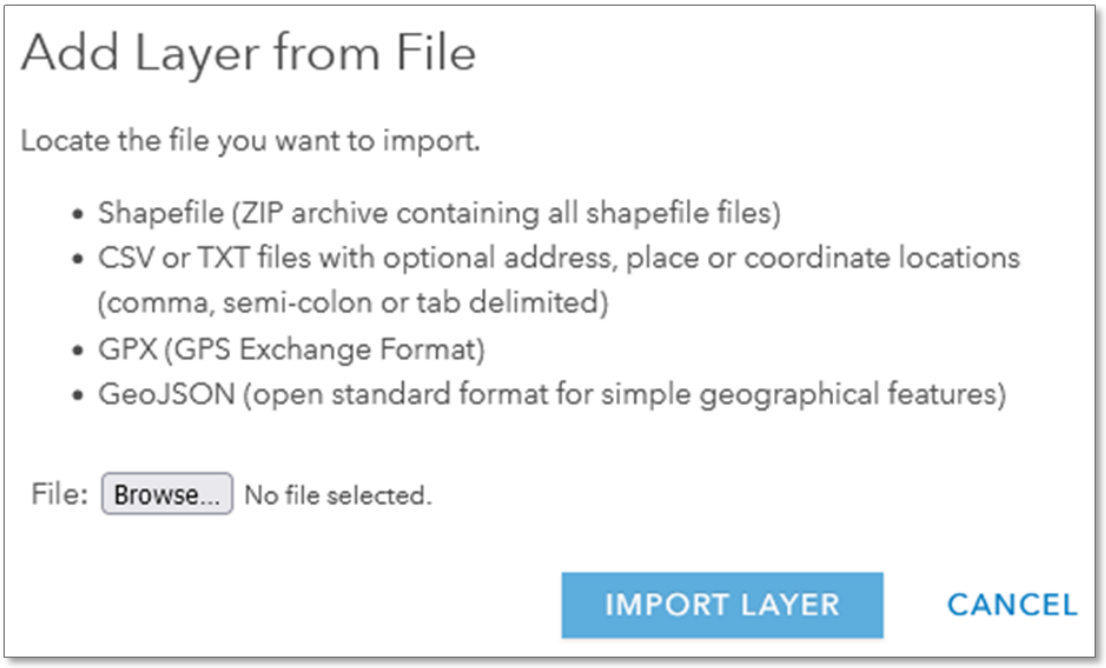


Figure 2: Import Layer dialogue box

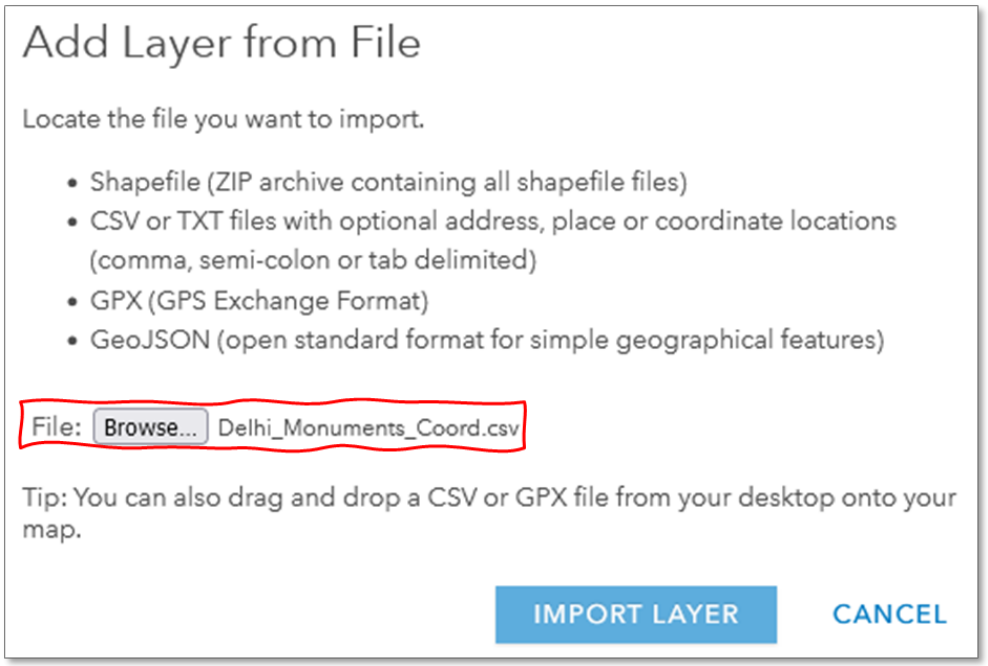


Figure 3: CSV file ready to import

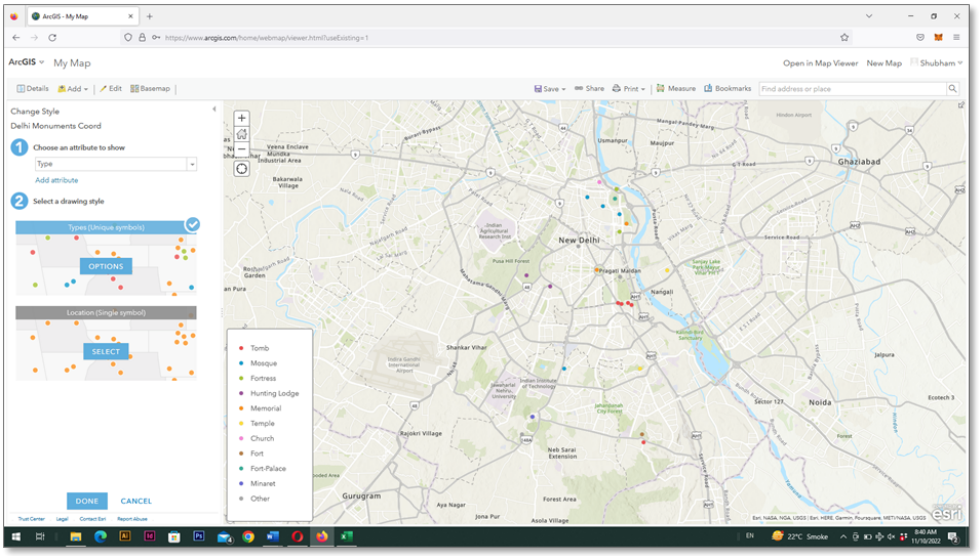


Figure 4: Monuments of Delhi plotted in ArcGIS Online

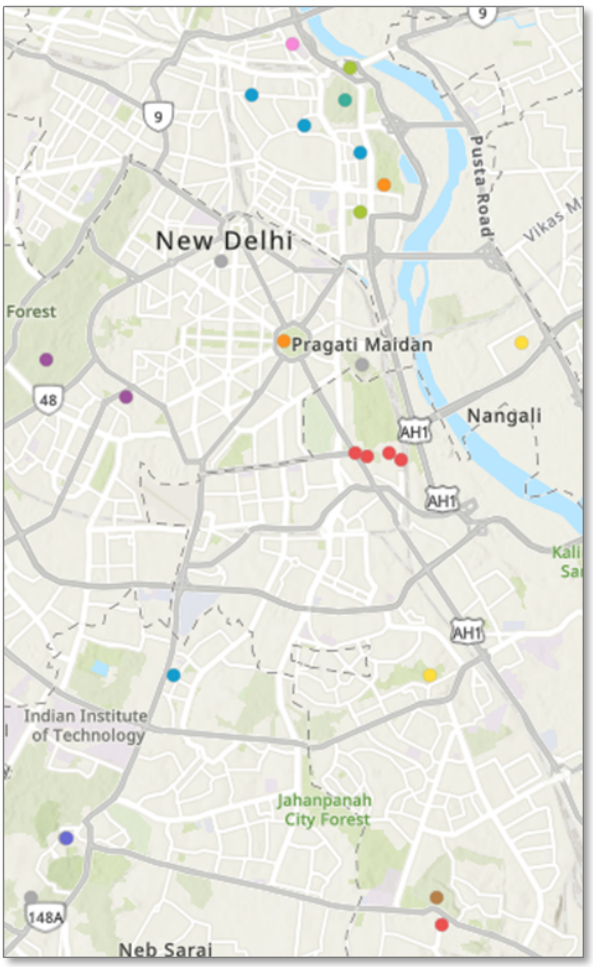


Figure 5: Zoomed in view of Delhi monuments

The left side of the 'My Map' webpage gives us two different options of symbolizing data (figure 6). We can either display our data based on one of its attributes (Century, Era and Type in our case) or as a single symbol in which all the locations will be shown by the same color and symbol irrespective of their various attributes.

We will now explore all the options available to us for displaying our data.

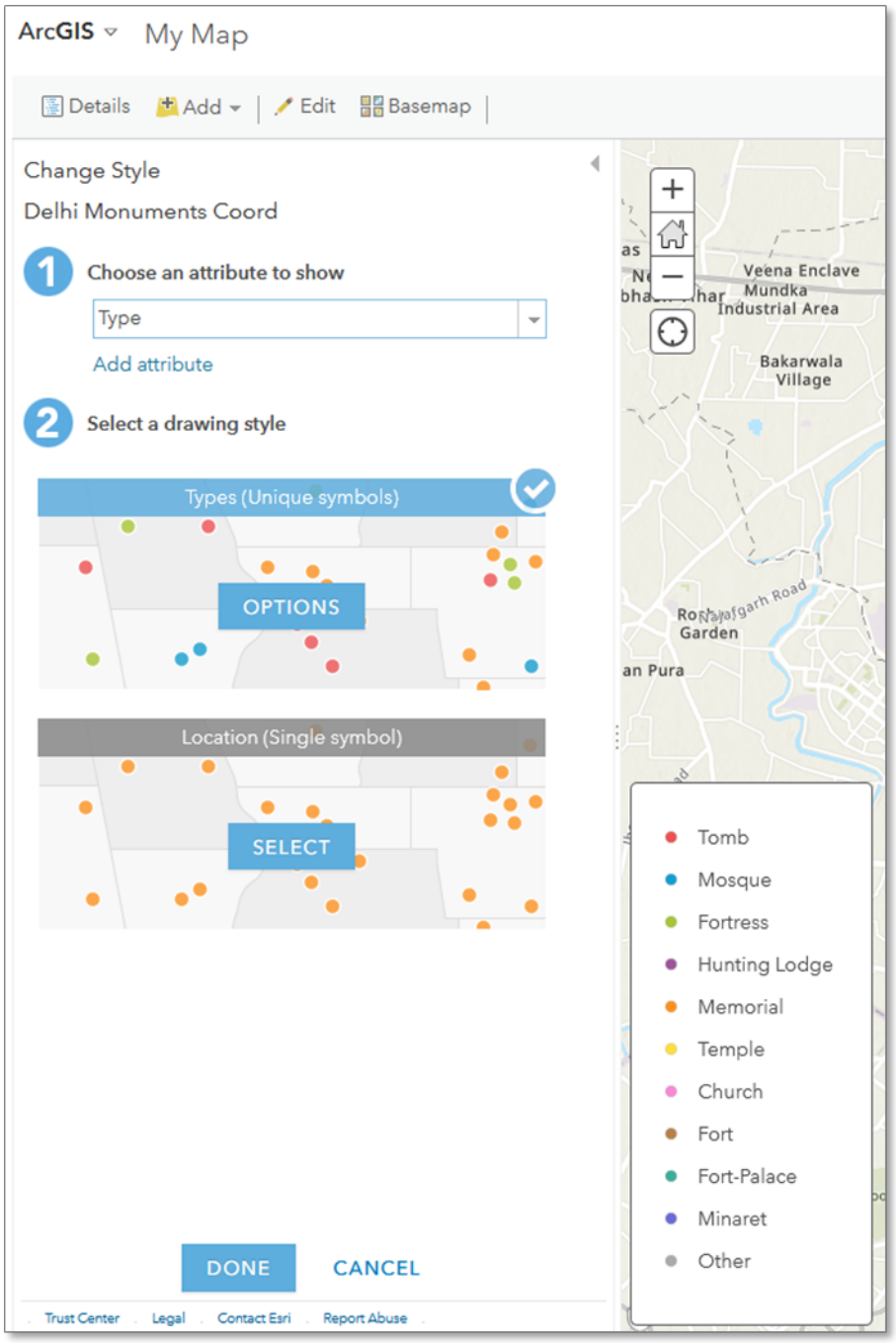


Figure 6: Selecting a method for visualizing spatial data

Click on the drop-down arrow for Choose an attribute to show box and select show location only.

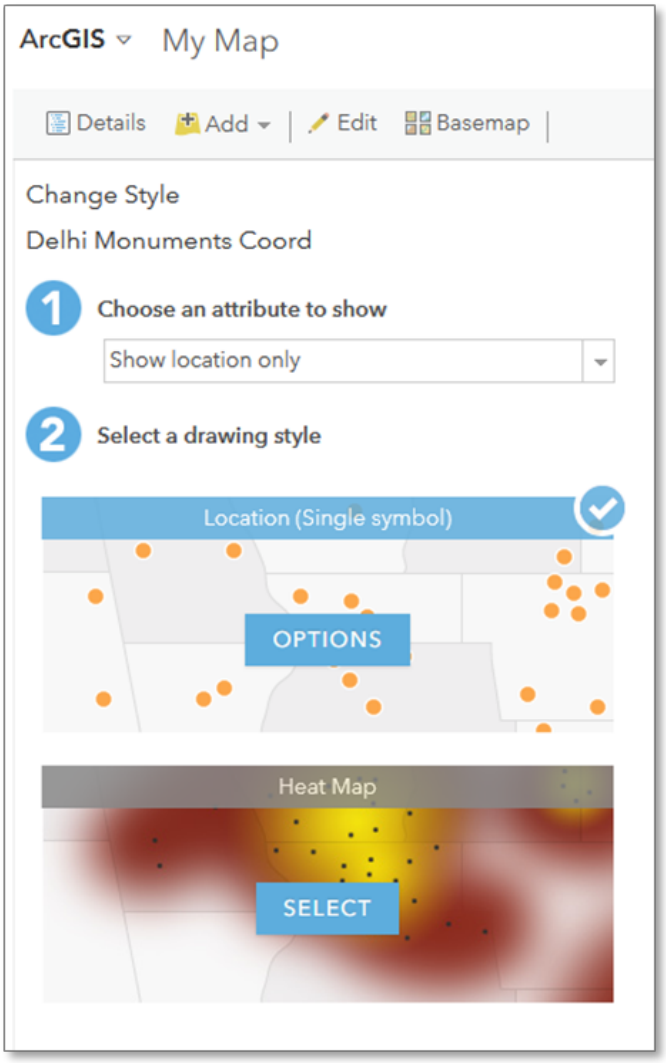


Figure 7: Showing the monuments by 'Show Location Only'

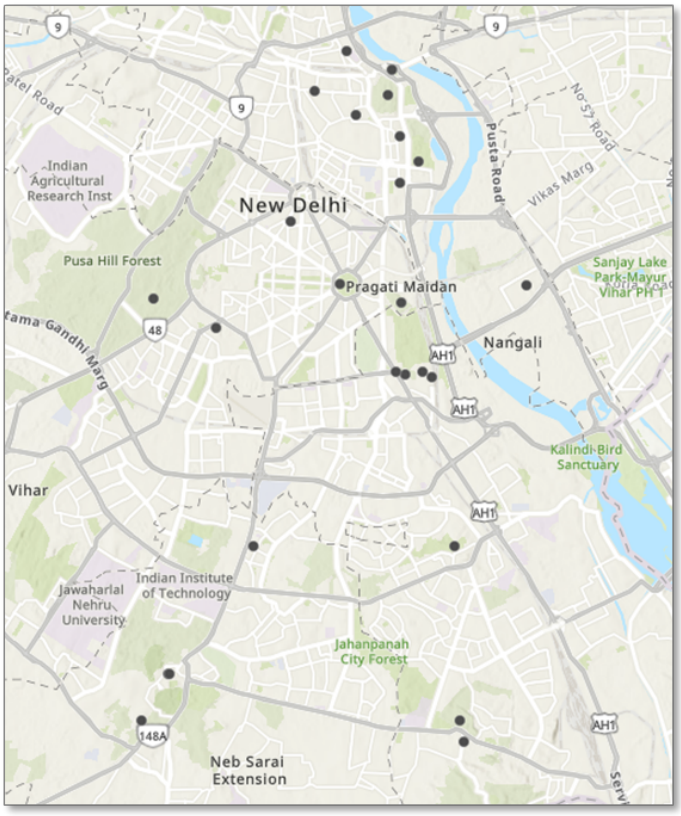


Figure 8: All monuments displayed in a single color and shape

Click Options to experiment with shape and symbol size.

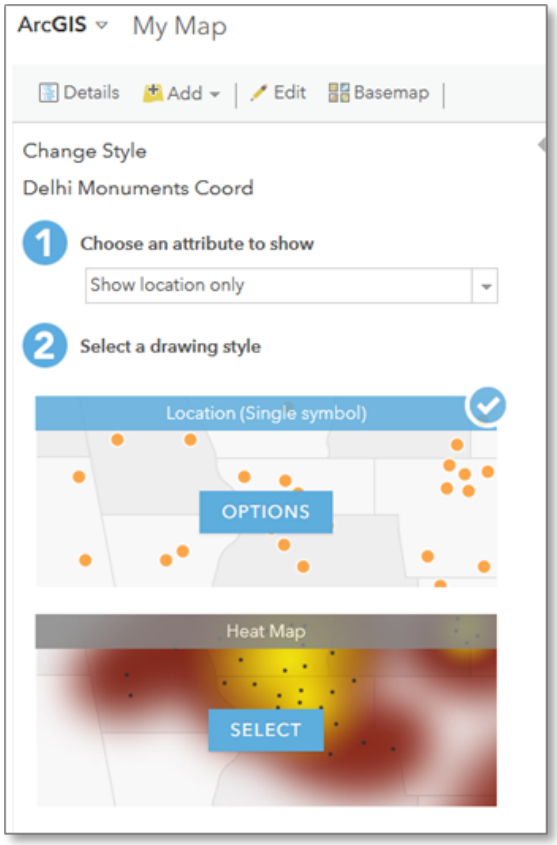


Figure 9: Accessing the options

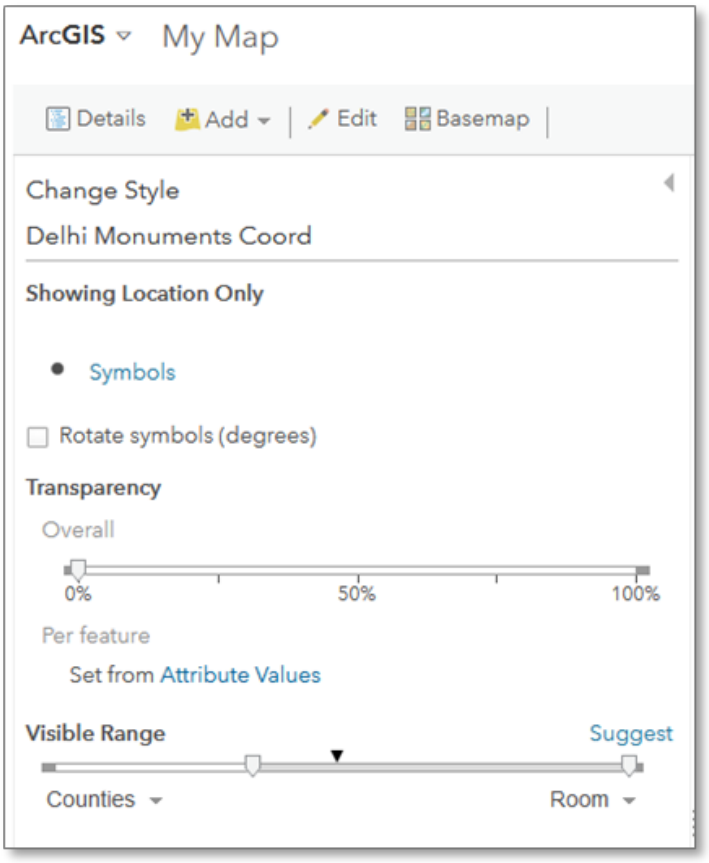


Figure 10: Options for displaying data

Figure 10 shows the different settings for displaying data. You can adjust the transparency of the data and its visible range. Click on Symbols to select the shape and size of symbols as well as the fill and outline color (figure 11).

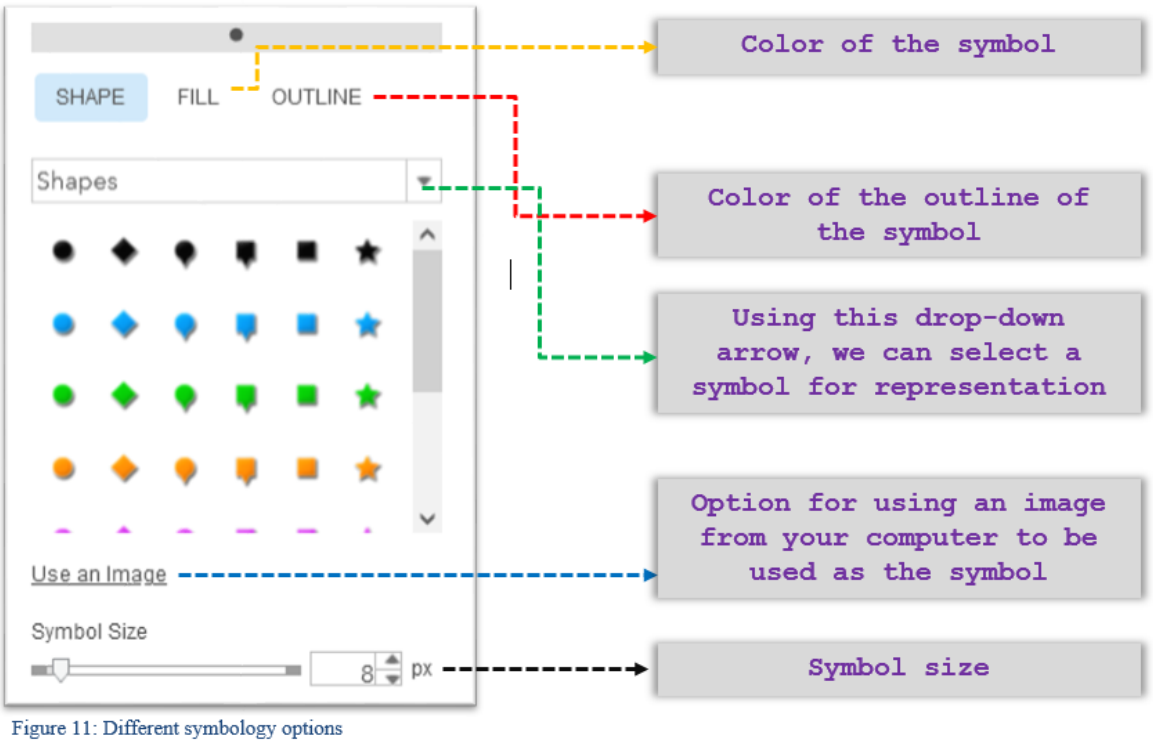


Figure 11: Different symbology options

Time for a task!

1. Experiment with different symbols to find an appropriate one for Delhi's monuments.

Once you are satisfied with the choice of your symbol click OK on the left side panel (figure 12) and then on DONE (figure 13).

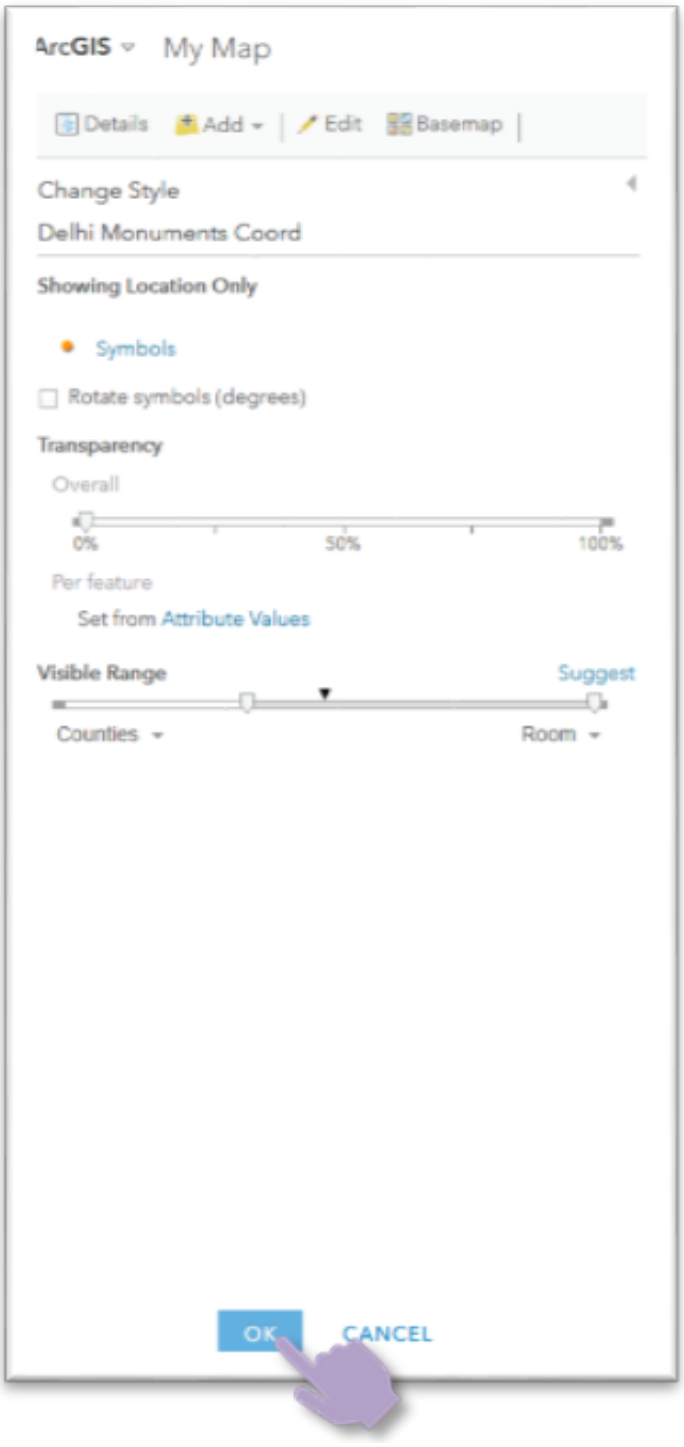


Figure 13: Configuring symbology options

Figure 12: Finalizing symbology

Now that we have finalized the symbology, we have a web map that shows the monuments of Delhi, but we still do not know their names. This problem can be overcome by adding Labels to the location of the monuments. To add the labels, on the left side panel, first click on the Content tab, then on the Three Dots under the layer name and then finally on Create Labels.

We can now see the labels on the map and some options to further streamline them. This includes selecting the attribute for creating the label, the font, font size and style, color and its alignment. Figure 14 shows these various options.

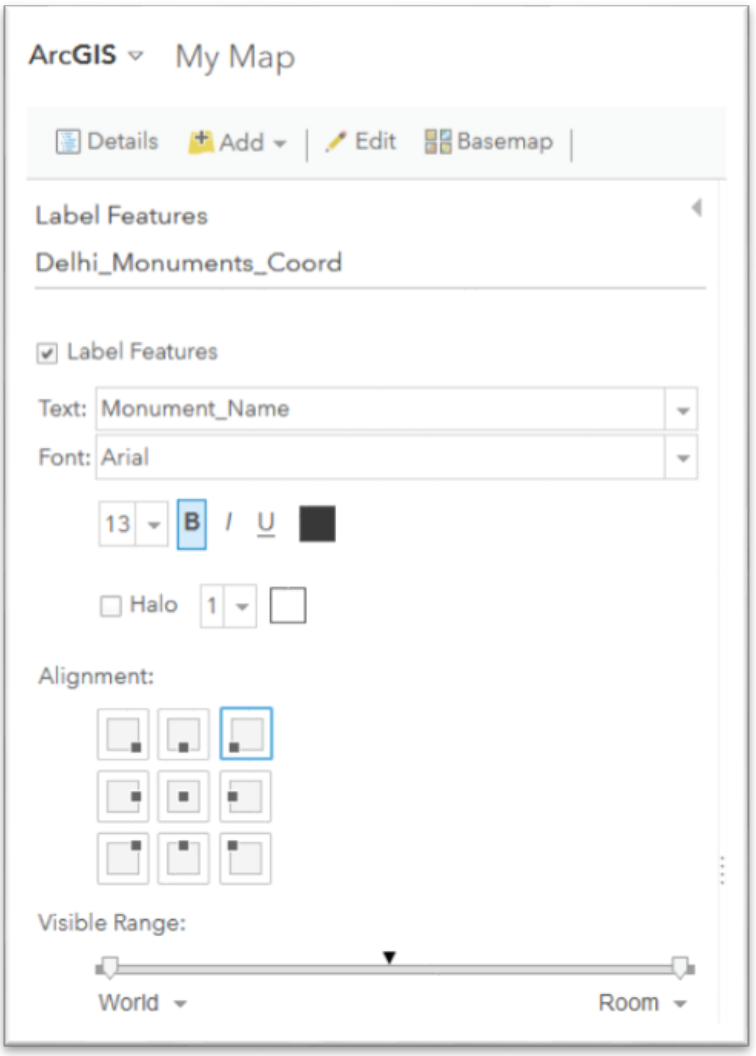


Figure 14: Options for styling labels

Your map at this stage should look somewhat like what you can see in figure 15.

Figure 15: Monuments with labels

ArcGIS Online also allows you to view the attributes of the spatial data as 'pop up'. An example of the same has been shown in figure 16.

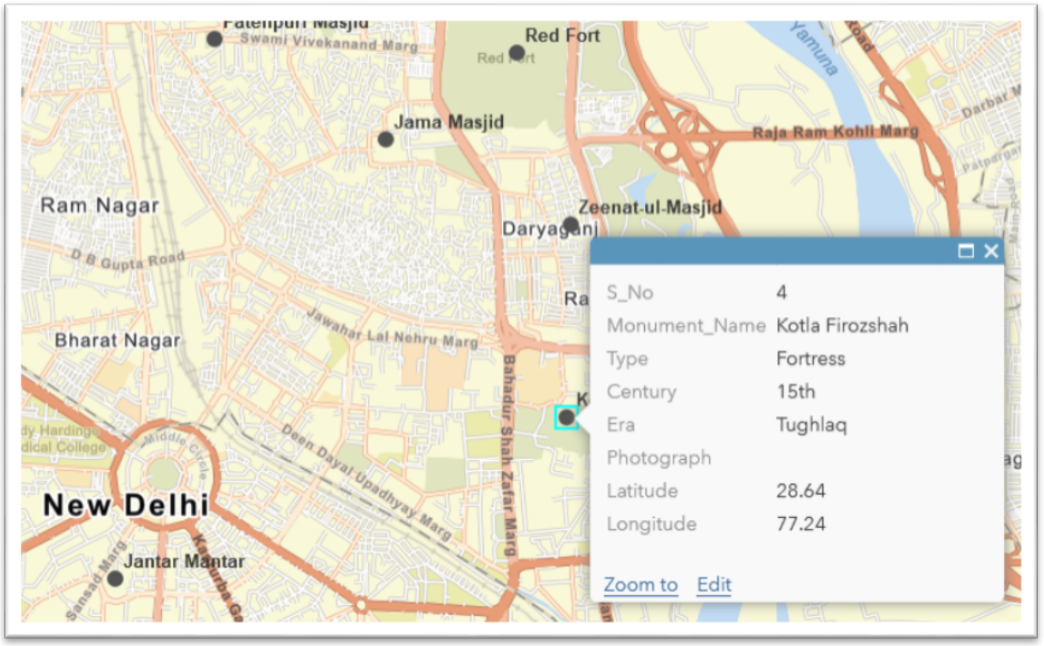


Figure 16: Pop up showing attributes of a monument

In figure 16, we can notice that while the pop up gives us some useful information about the monument, it can be edited a bit to make its appearance better. For instance, 'S_No' is not required and can be removed, similarly the 'underscore' ('_') in Monument_Name can also be removed. Latitude and Longitude values were useful for plotting the data, but they do not serve any additional purpose in the pop up. Thus, they too can be removed.

In order to configure the pop up, go to the Content tab, click on the three dots next to the layer name and click Configure Pop-up (figure 17).

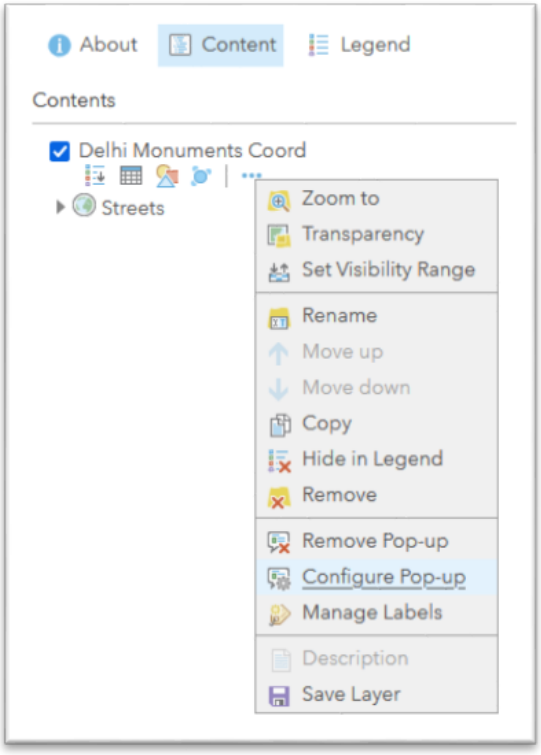


Figure 17: Configuring the pop-up

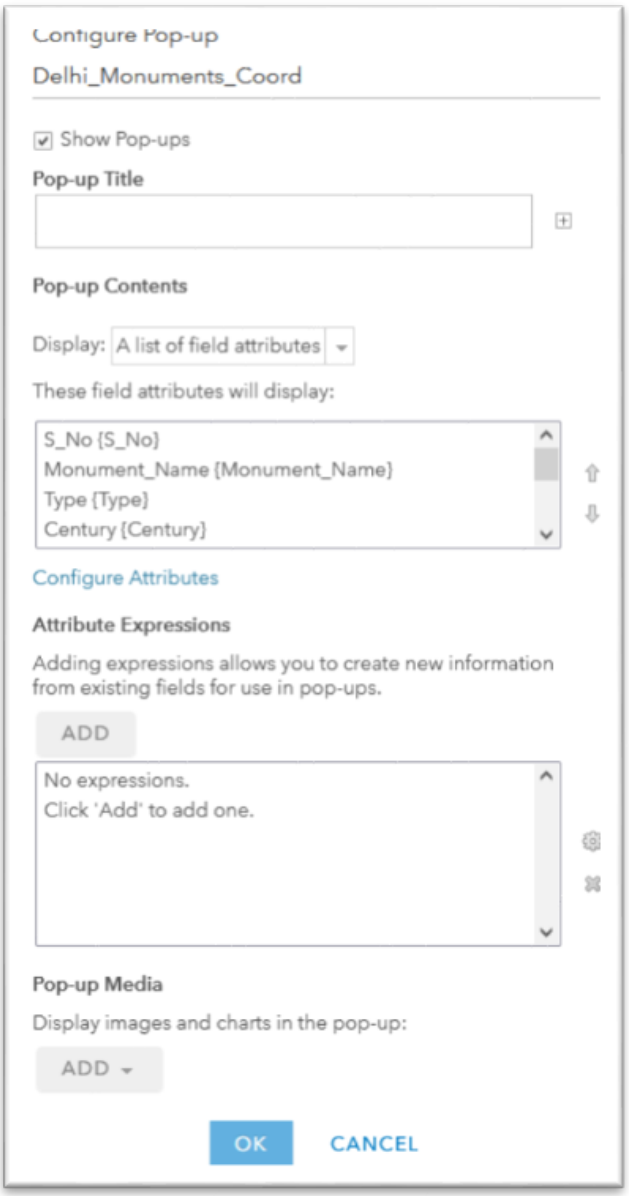


Figure 18: Options for configuring the pop-up

Click ‘Configure Attributes’. Using this table, you can select which attributes you want to ‘Display’ and/or which ones you want to ‘Edit’.

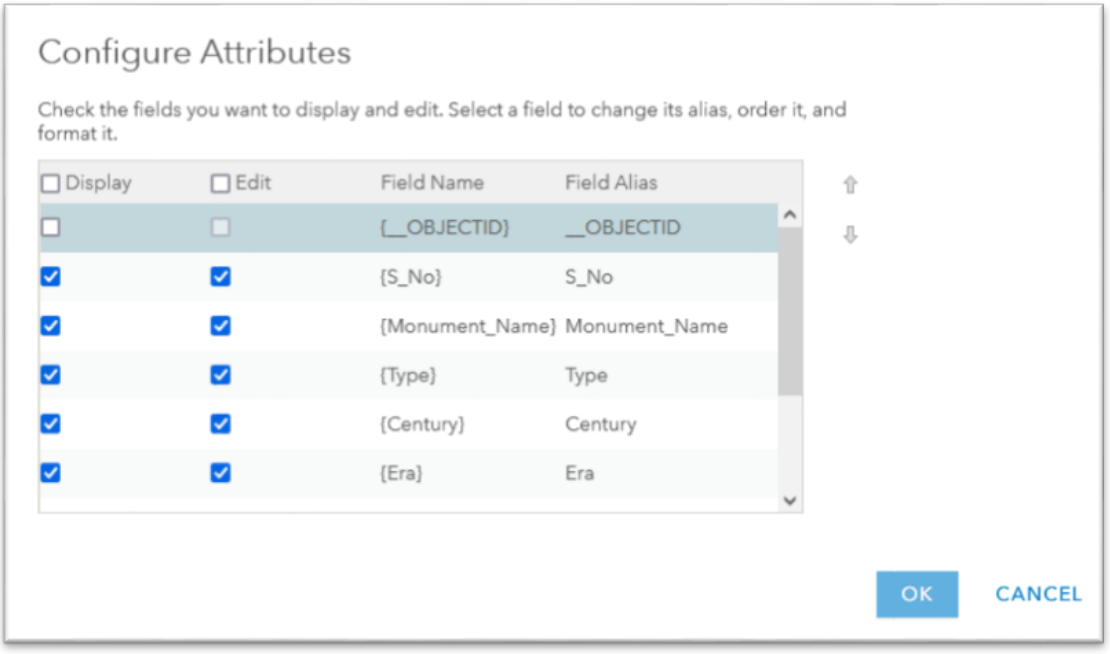


Figure 19: Selecting the attributed for display/edit

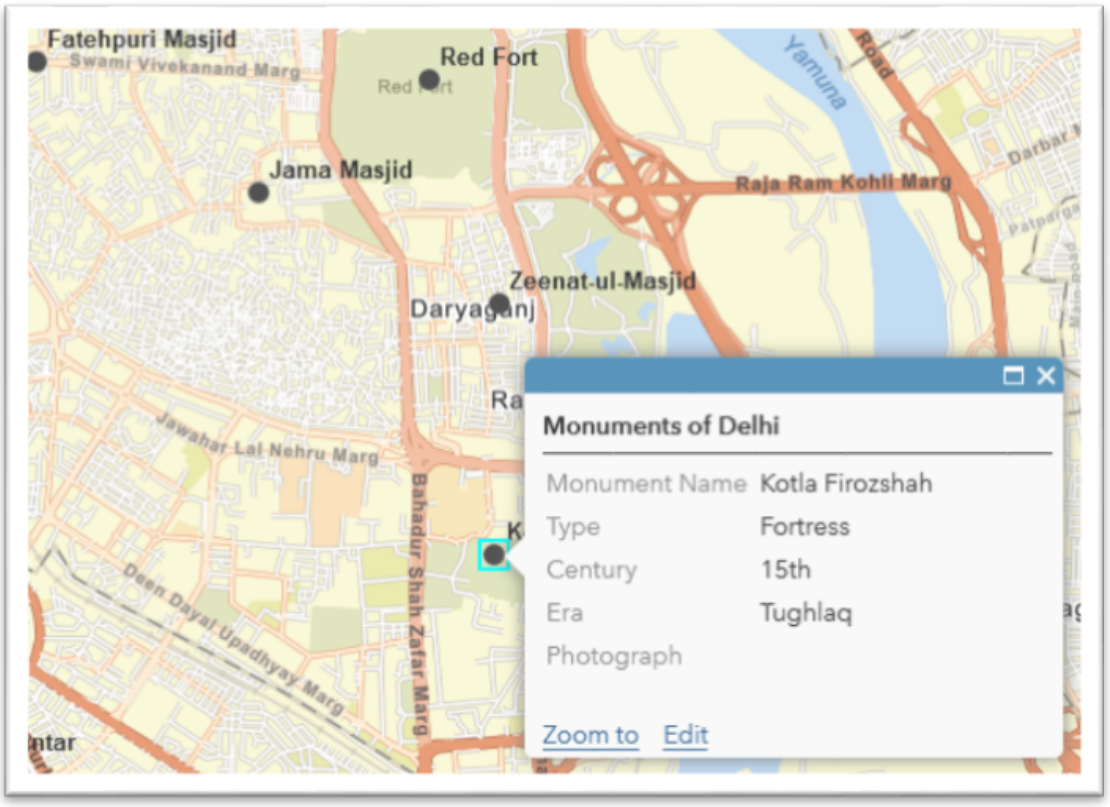


Figure 20: Edited and configured pop-up box

So, with this we have finished visualizing our point data using ‘single symbol’. Now let’s look at a couple of other ways of visualizing data.

In the Content tab, click on the symbol shown in figure 21 to change style. Instead of ‘Location (Single Symbol) which is already selected, in the ‘Heat Map’ rectangle, click Select.

Figure 21: Accessing a different style

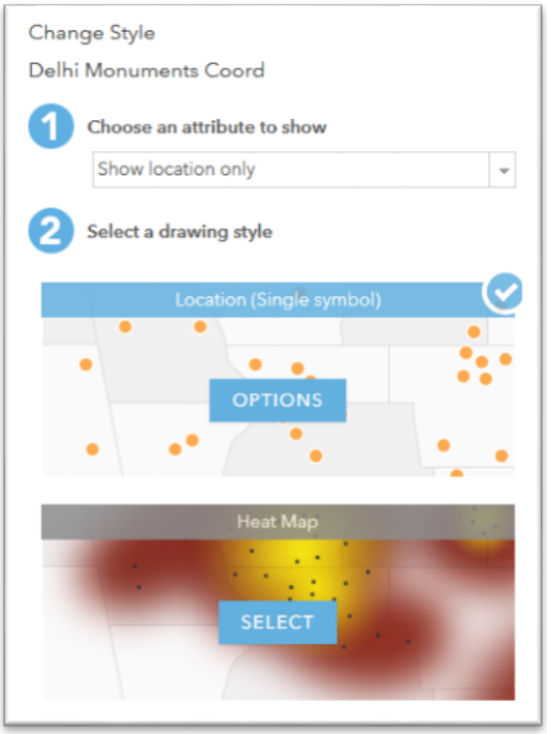


Figure 22: Style menu

'Heat Map' visualization shows the pattern of occurrence of spatial data. This map shows the density of monuments, and the legend of the map shows the highest concentration of monuments near Humayun's tomb.

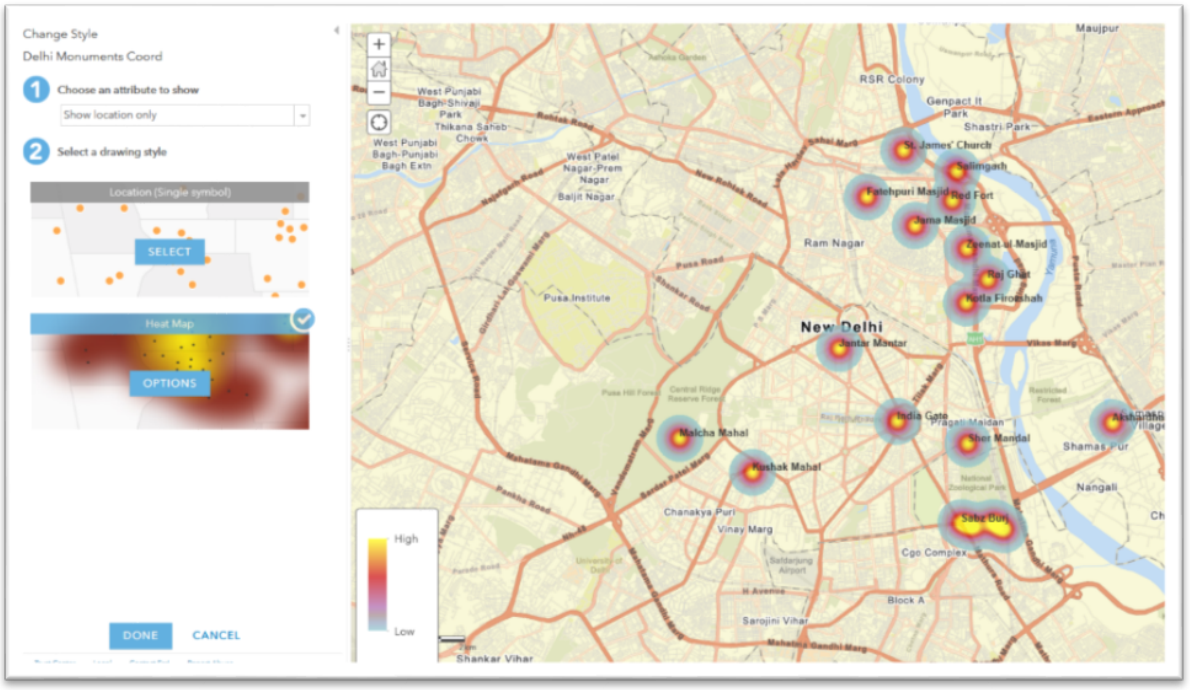


Figure 23: Heat Map visualization

Click on options to explore what more changes can be made to it.
The third visualization is with the help of attributes of the spatial data. In 'Choose an attribute to show' window, click the drop-down arrow and select any one of the attributes that you want to be displayed on the map. As an example, let us select 'Era'.

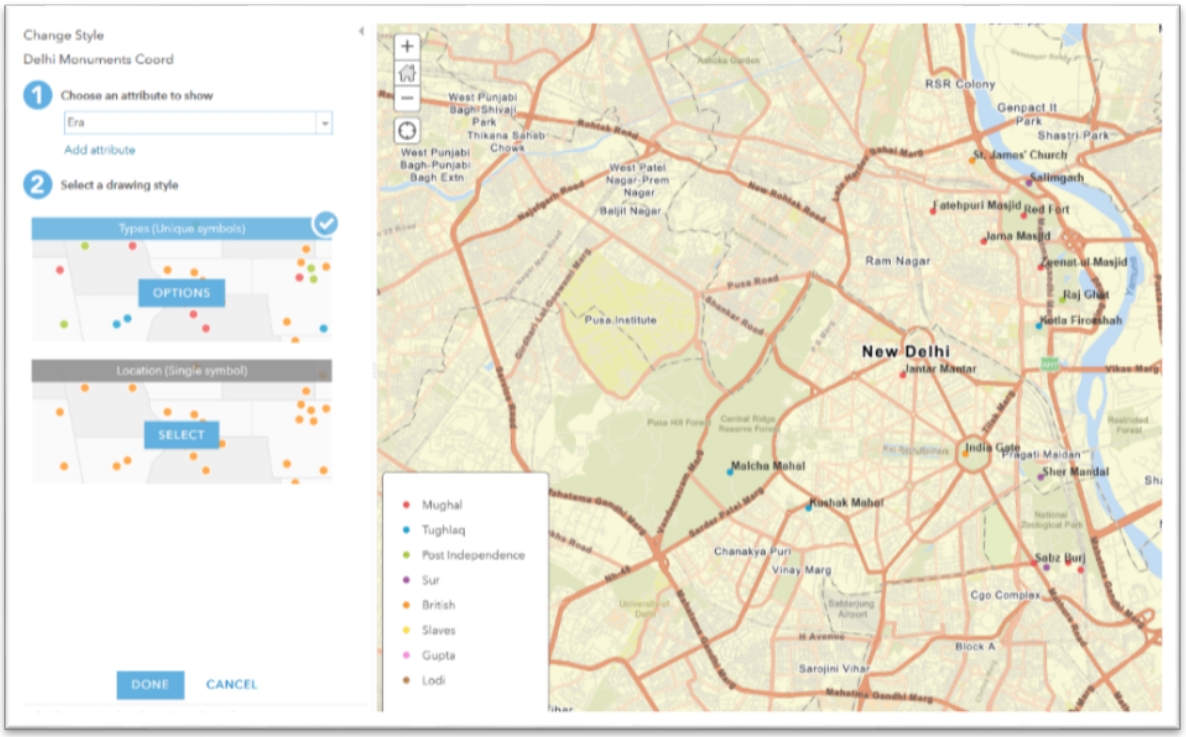


Figure 24: Classification of monuments according to their 'Era'

Delhi's monuments are now classified according to the Era of their construction!
You can explore symbology options to modify the look of the map.

Once you are satisfied with your symbology, save your web map by clicking the drop-down arrow next to Save button and then click on Save.

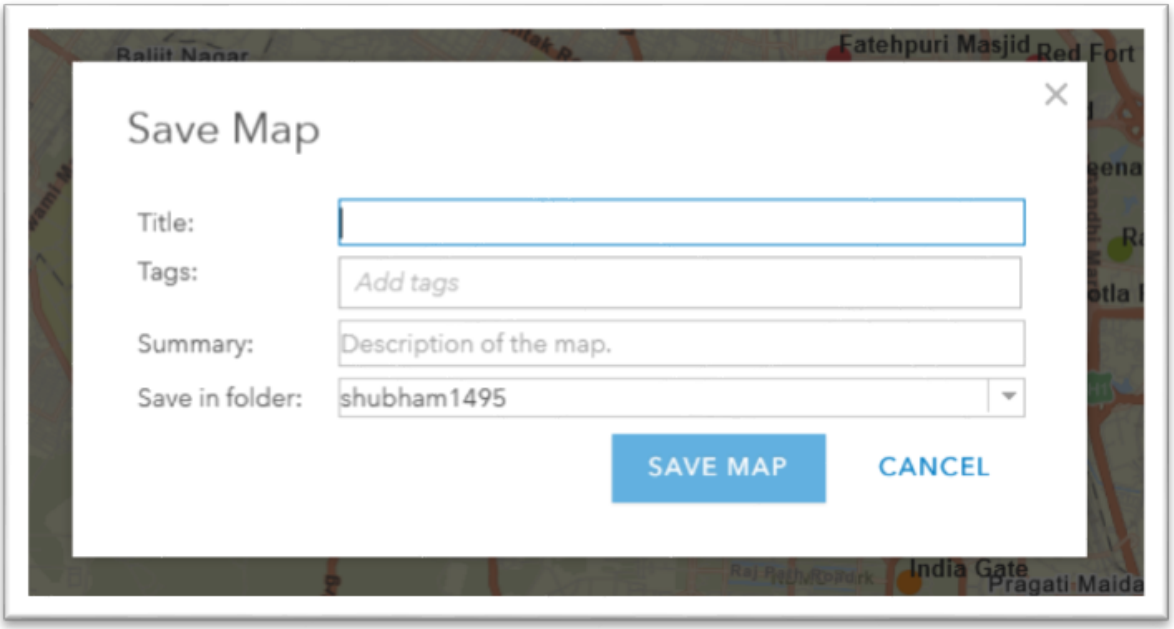


Figure 25: Saving the map

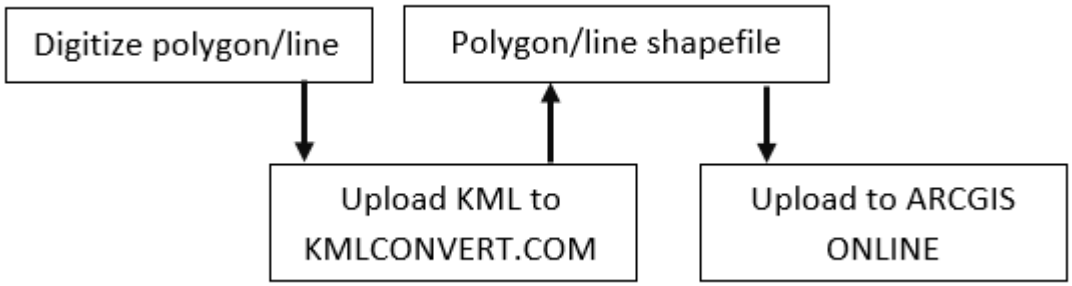
Fill the Save Map form by giving it a Title, Tags and writing a short Summary. Tags are essentially catchwords about your map which help other users of ArcGIS Online in discovering it on this platform. The Tags for this map could be ‘Delhi’, ‘Monuments’, ‘HistoricDelhi’ and so on.
With this we have learned to import a CSV file in ArcGIS Online and visualizing it in three different ways. The next activites will build upon this map by adding more features.

Hands-On with GIS Using ArcGIS Online-2

Now that you have visualized and symbolized point features on ArcGIS Online, we will do the same with line and polygon geometries. However, adding these geometries is not as straight forward as adding points since lines and polygons cannot be saved as CSV files. The usual method is to create shapefiles in a GIS package like QGIS and upload them directly. But since we are not using QGIS in this module, the only option in front of us is to digitize lines and polygons in Google Earth, save them as KML, convert them into shapefiles using a free online converter and upload the files. Since ArcGIS Online does not allow uploading KML files from the desktop, they need to be converted to shapefiles.

Activity 2: Visualizing and Symbolizing Vector Data (Lines & Polygons) in ArcGIS Online | Time Required: 20 Minutes

Figure 1: Process flow of the exercise



For this activity you will also need Google Earth Pro. If you do not have it installed on your Chromebook, you can download it from here.
Once you have installed Google Earth Pro, open it by clicking the Windows start button and searching for it.

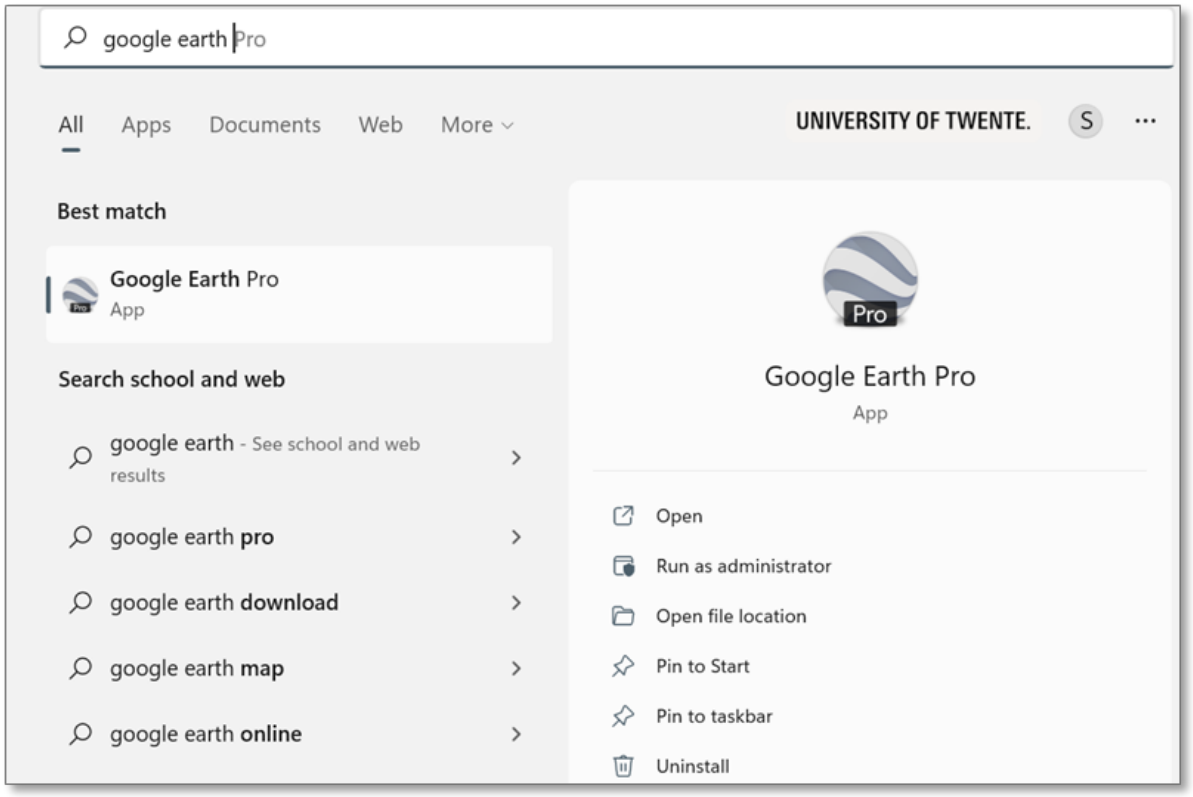


Figure 2: Starting Google Earth Pro

In the Google Earth Pro ‘search box’, type in ‘Red Fort’ and hit enter.

Figure 3: Place search in Google Earth Pro

Google Earth Pro will zoom into Red Fort. You can zoom out a bit manually in order to see the boundary walls of the fort as seen in figure 4.

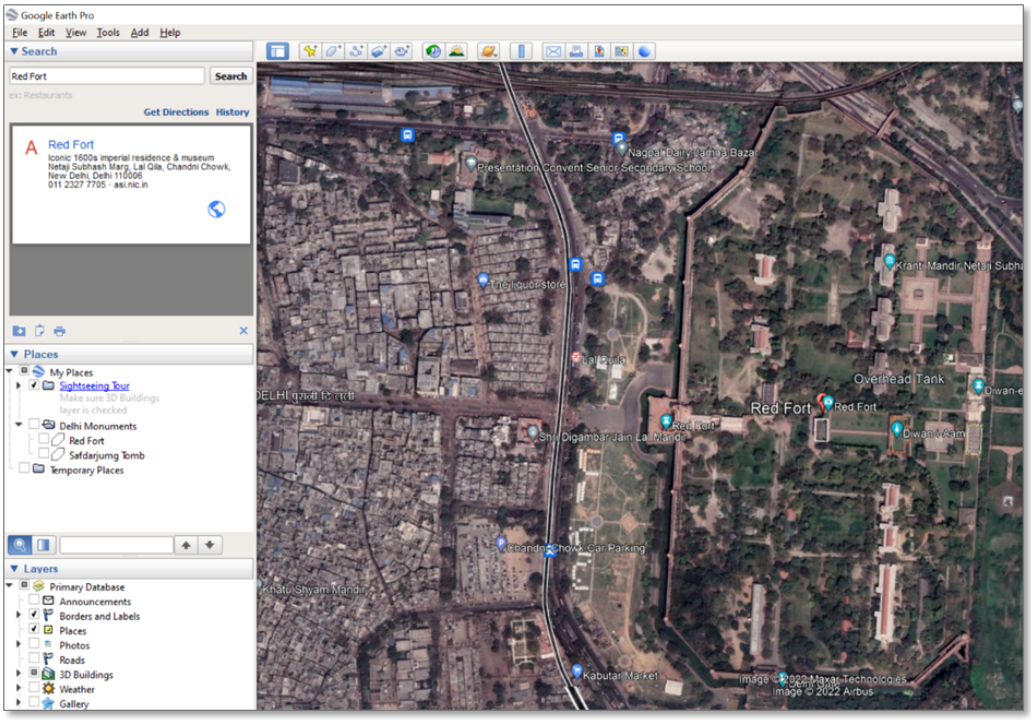


Figure 4: Red Fort in Google Earth Pro

Click Add Polygon tool to make a polygon on the image (figure 5).

Figure 5: Adding a polygon

A new dialogue box opens, you can change the name from ‘Untitled Polygon’ to ‘Red Fort’. Keep the dialogue box open, shift the cursor from the dialogue box to where you see the Red Fort. You will notice that the cursor has changed and now you can create a polygon on Google Earth.

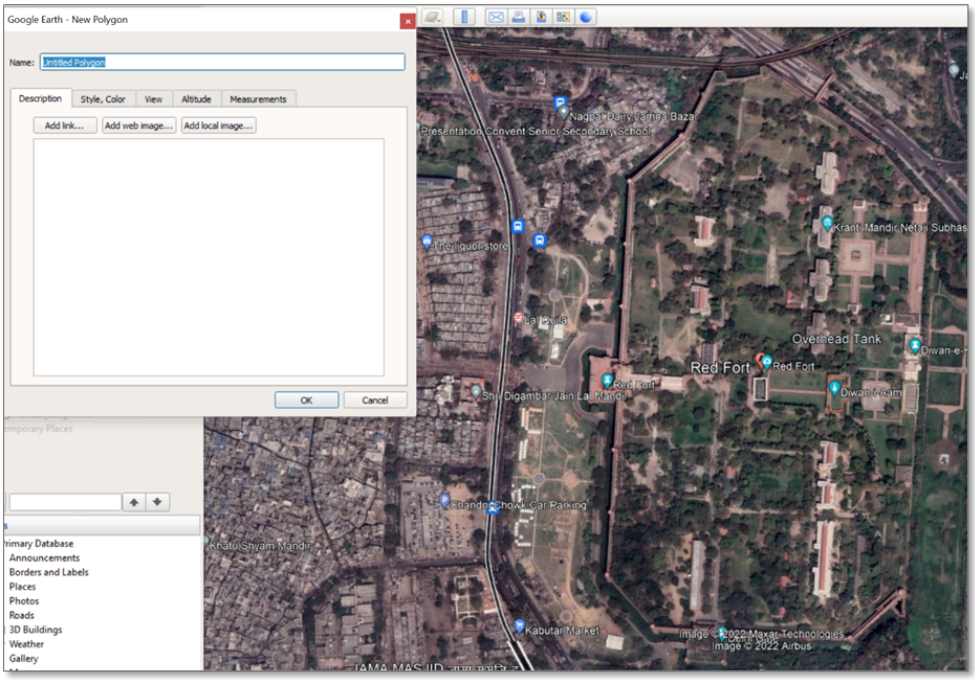


Figure 6: Polygon creation tool in Google Earth Pro

Figure 7: A digitized polygon in Google Earth Pro

Time for a task!

1. Add some more polygons from your list of monuments of Delhi.

Once you have added enough polygons to Google Earth Pro, right click on 'My Places' and Add a Folder.

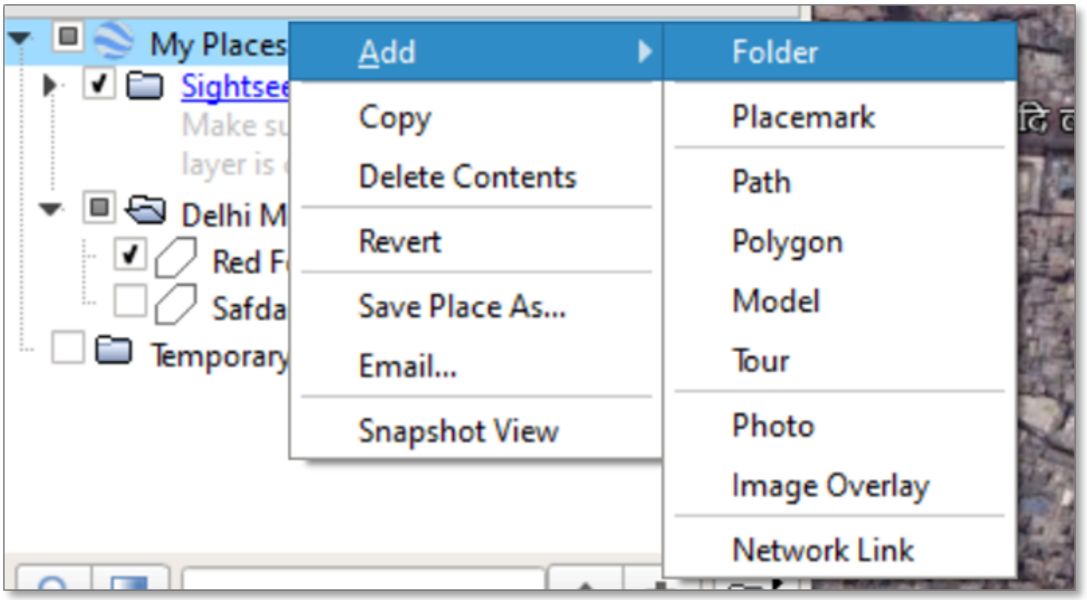


Figure 8: Adding a folder in My Places

Drag your polygons to this newly created folder. Right click on the folder and save it as a KML file.
The KML file you have just now created will contain all the polygons you digitized in Google Earth Pro.

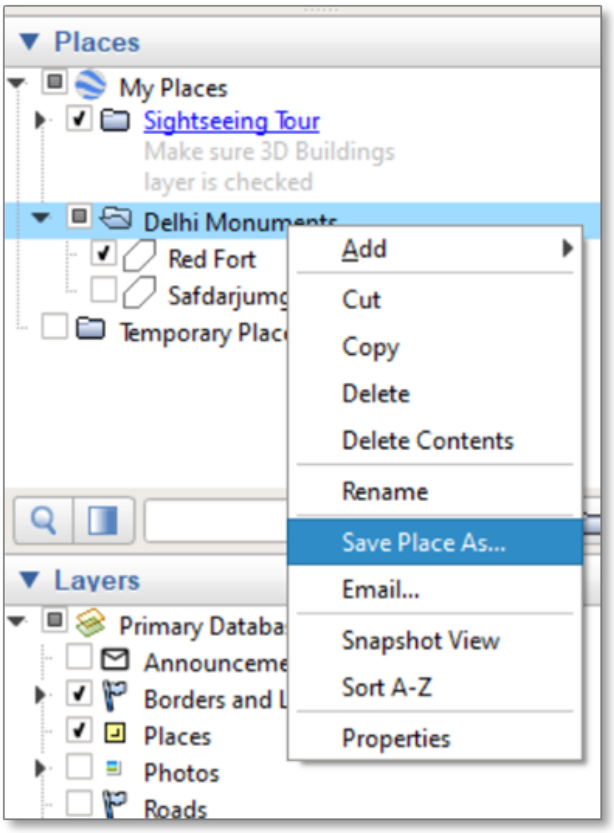


Figure 9: Saving the polygons as KML

Now open your web browser and go to convertkml.com.

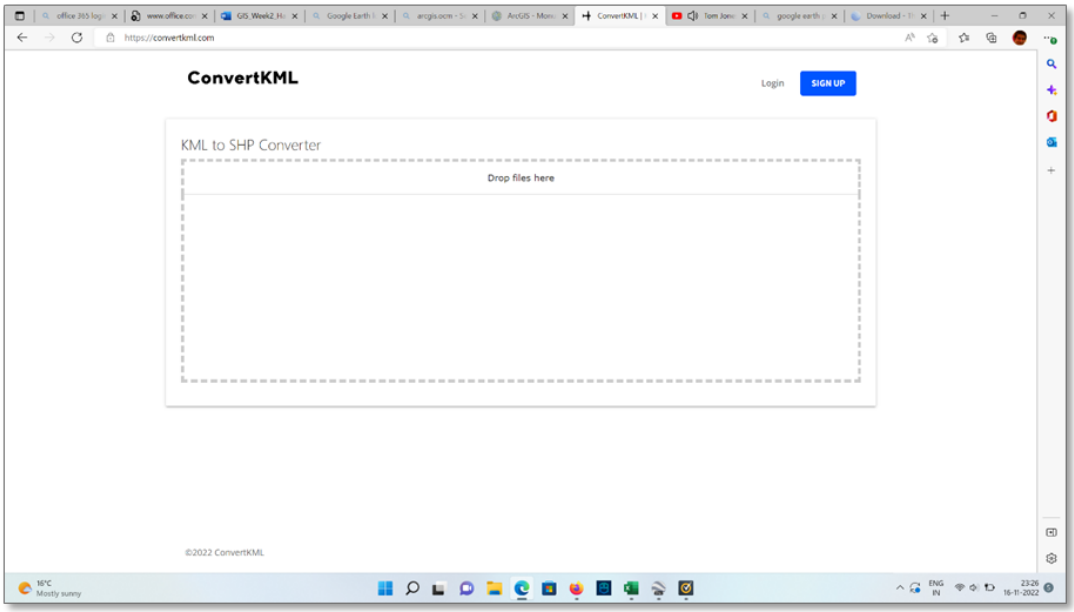


Figure 10: convertkml.com interface

Click anywhere in the dialogue box, navigate to the folder where you have saved the kml file, double-click on it to add it to the dialogue box.

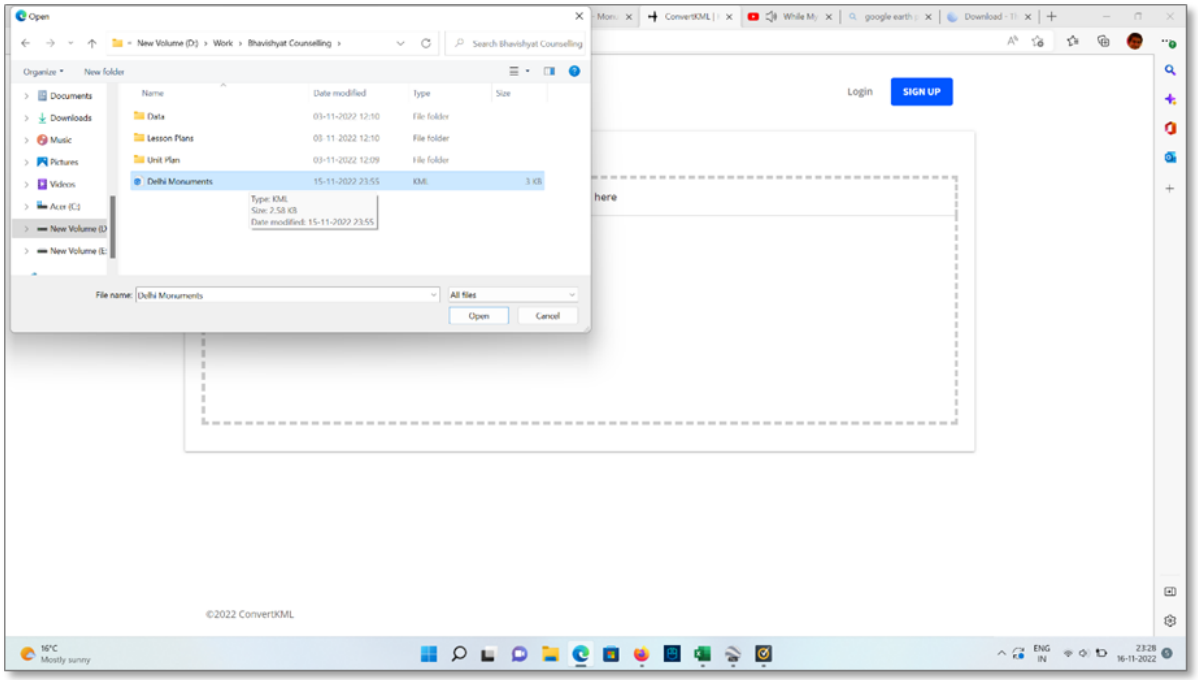


Figure 11: Adding kml files to convert them to shp

Once you have added the kml file, the shapefile will be ready almost instantly. You can download it to your Chromebook.

Figure 12: KML converted to SHP

Now that we have converted our polygon KML file to shapefile, it's time to go back to ArcGIS Online. If you are not logged in already, Sign into your account. After signing in, click 'Content'.

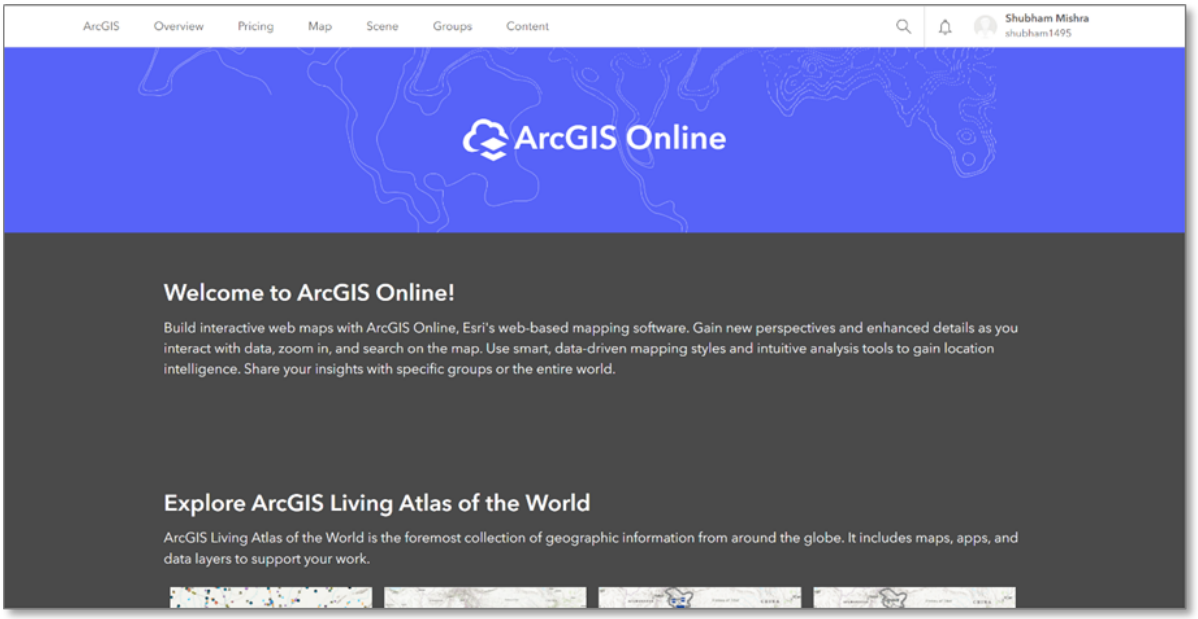


Figure 13: ArcGIS Online homepage

The Content page shows all the Web Maps that you have made. The Delhi Monument, being the latest (or the only one so far) will be at the top of this list. Click on it.

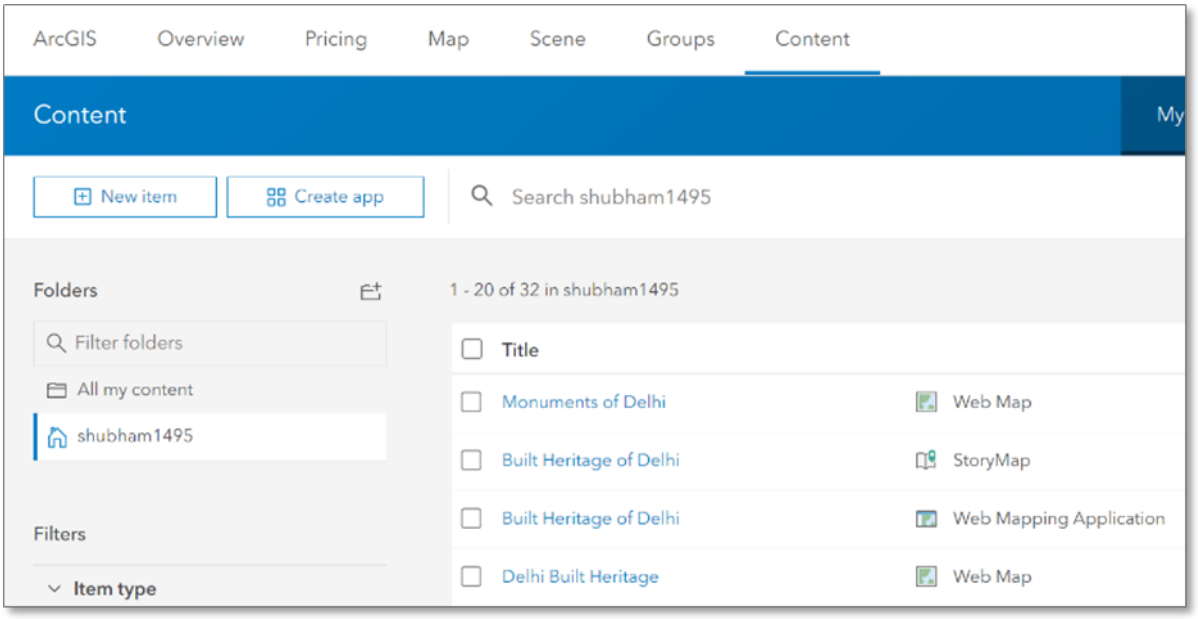


Figure 14: ArcGIS Online content page

The resultant page (figure 15) shows a short summary of this web map. You can update the summary, should you want to. Click 'Open in Viewer Classic' to open this web map on a web page.

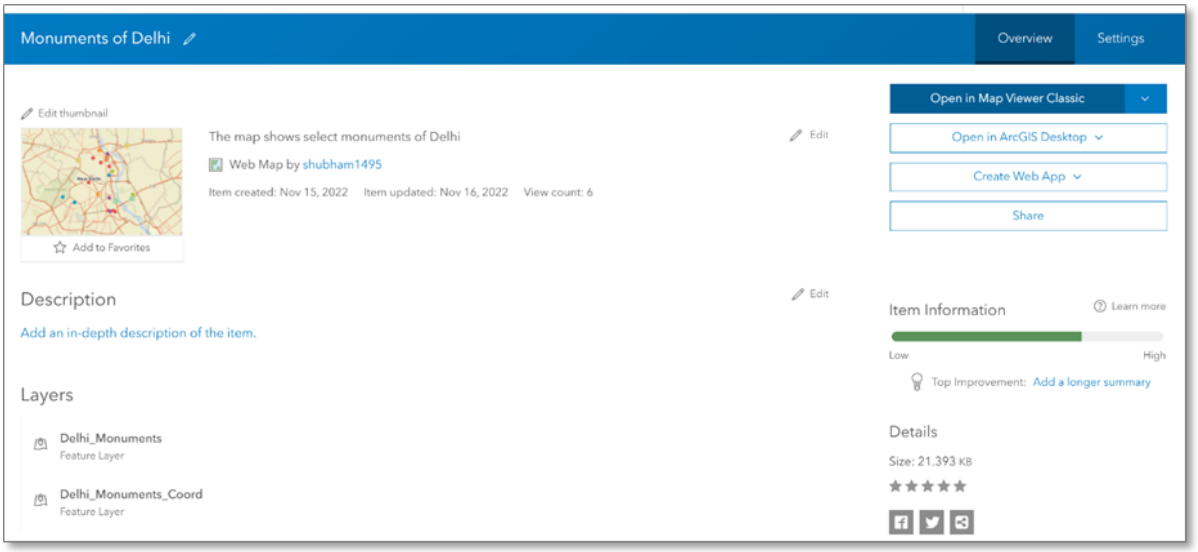


Figure 15: Monuments of Delhi page

We are back to our Delhi monument map. We are now going to add our recently created shapefile to it. Click the drop-down arrow next to Add and select 'Add layer' from file.
Browse to your folder that has the shapefile, select it and upload it. As soon as the file is added, you are prompted to select the style for displaying this layer. Since there are no attributes in this dataset we will select Location (Single Symbol) only.

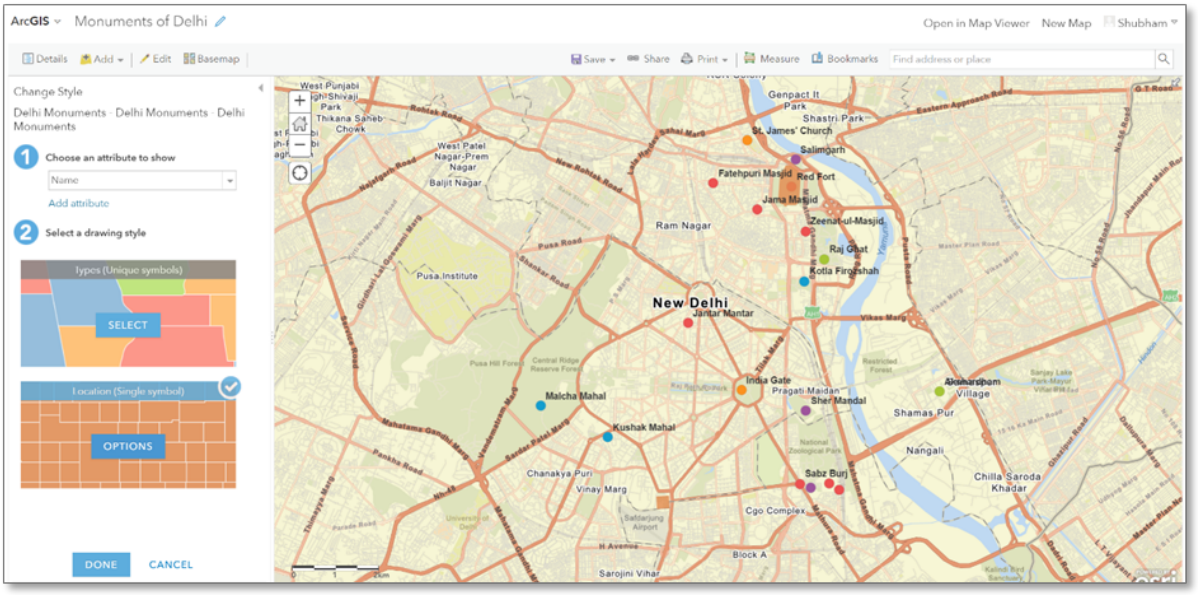


Figure 16: Stylizing a polygon shapefile in ArcGIS Online

Time for another task!

1. Like you drew polygons, create line segment/s in Google Earth Pro.
2. Put them in a folder and save it as KML.
3. Convert the KML to SHP.
4. Upload the SHP to ArcGIS Online as another layer on the Delhi monuments map.
5. Visualize the line segment/s using appropriate symbol.

Adding Qualitative Data In ArcGIS Online-1

In addition to attributes, sometimes we need to provide additional information about a feature in a layer in our web map. This can be achieved by adding Map Notes to our map.
Activity 1: Adding Map Notes to Features | Time Required: 20 Minutes
Sign In into your ArcGIS Online account, if you are not signed-in already. After signing in, click 'Content'.

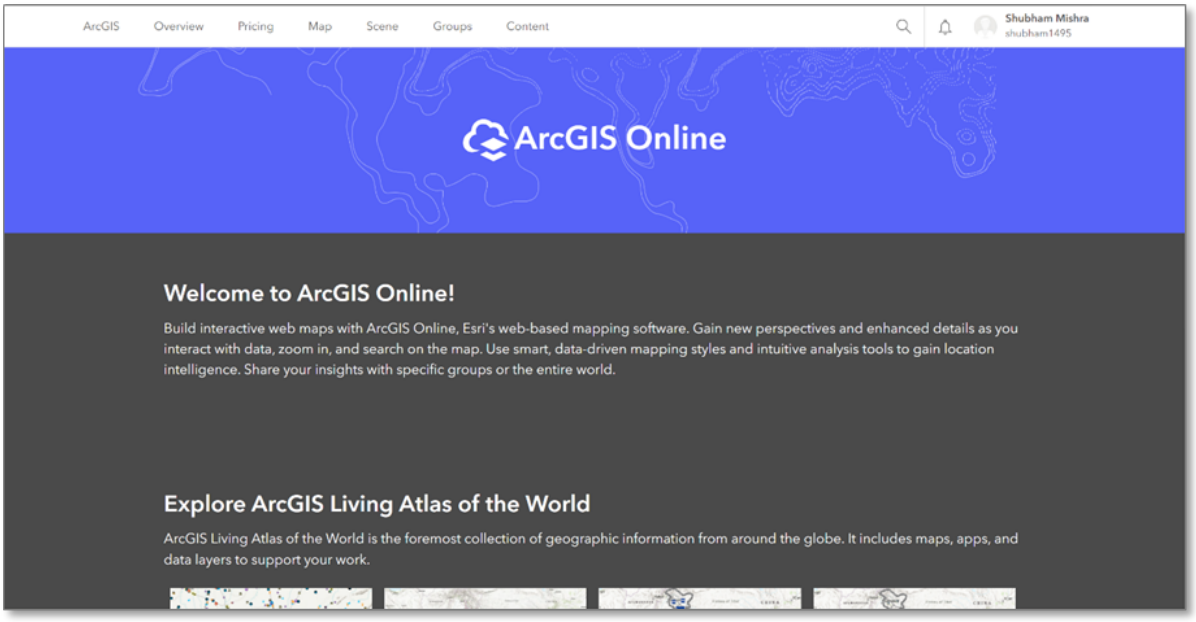


Figure 1: ArcGIS Online homepage

As we have seen earlier, the Content page (figure 2) shows all the Web Maps that you have made so far. The Delhi Monument, being the latest (or the only one so far) will be at the top of the list. Click on it to open the web map.

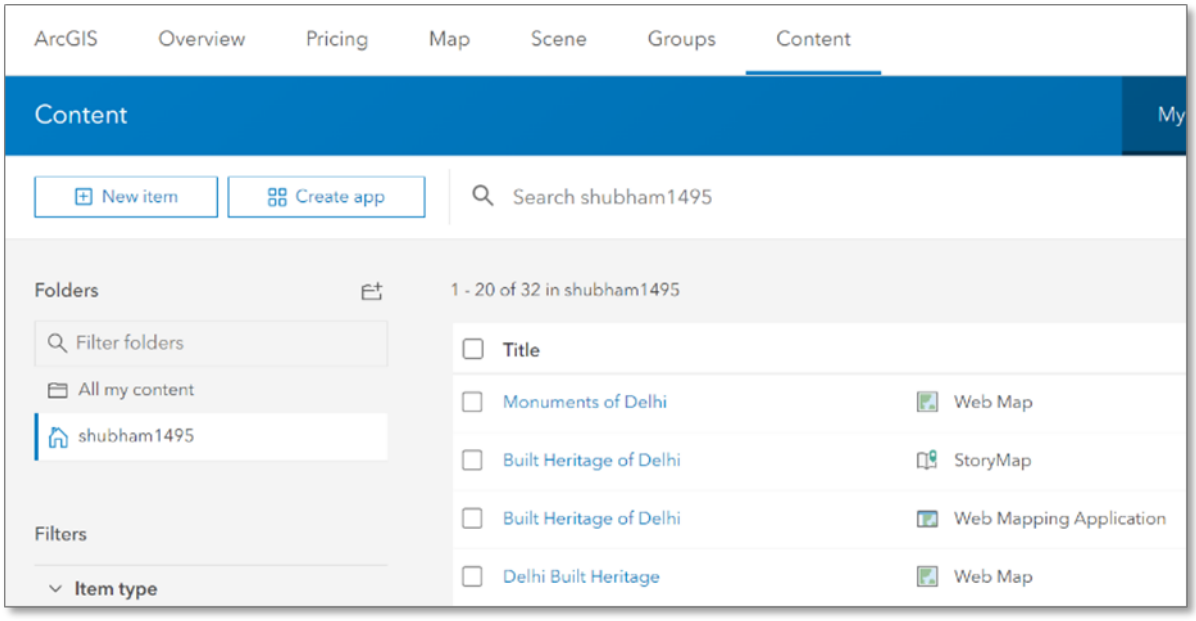


Figure 2: ArcGIS Online Content page

The resultant page (figure 3) shows a short summary of this web map. You can update the summary, should you want to. Click 'Open in Viewer Classic' to open this web map on a web page.

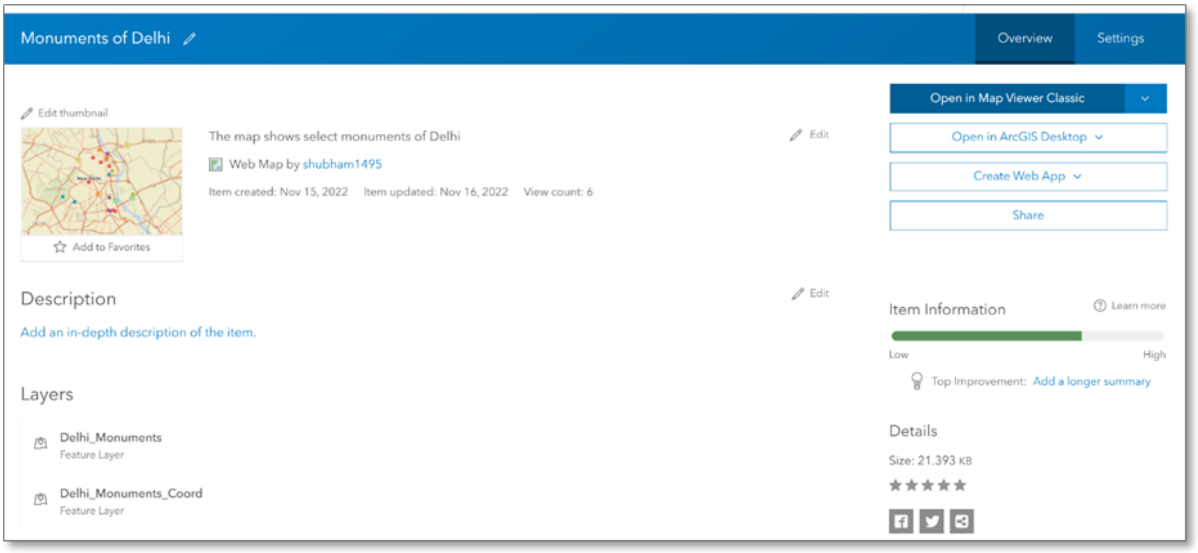


Figure 3: Monuments of Delhi page

We are back to the Delhi monument map (figure 4). We will now add Map Notes to the point layer showing the monuments. In this exercise, we will do this for only one monument. You can later do it for all of them.

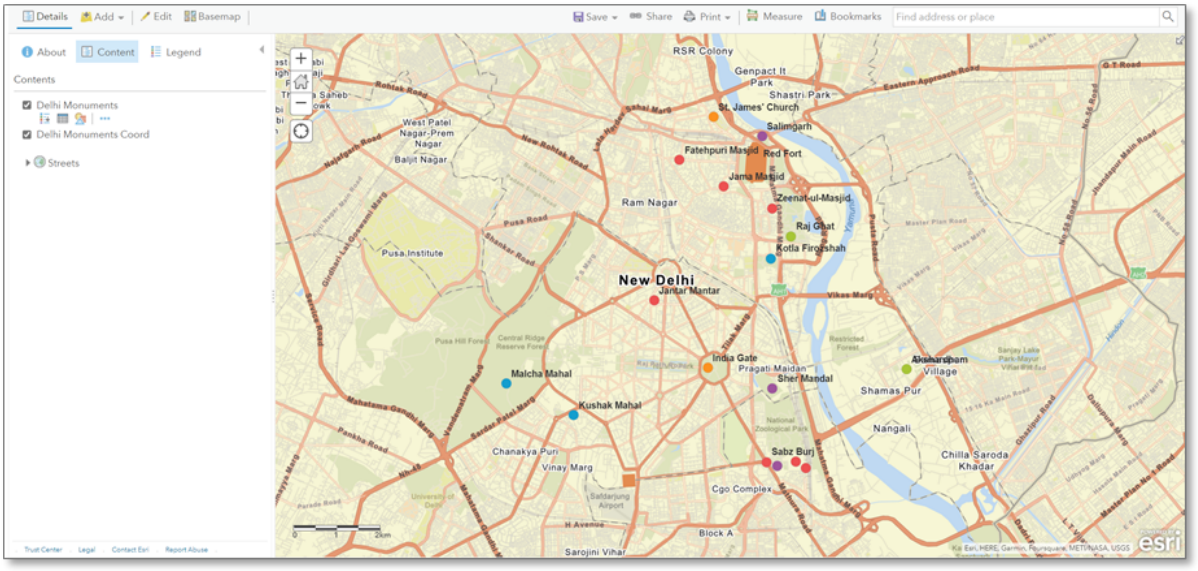


Figure 4: Monuments of Delhi web map

Click on the drop-down arrow next to Add and then click on Add Map Notes.

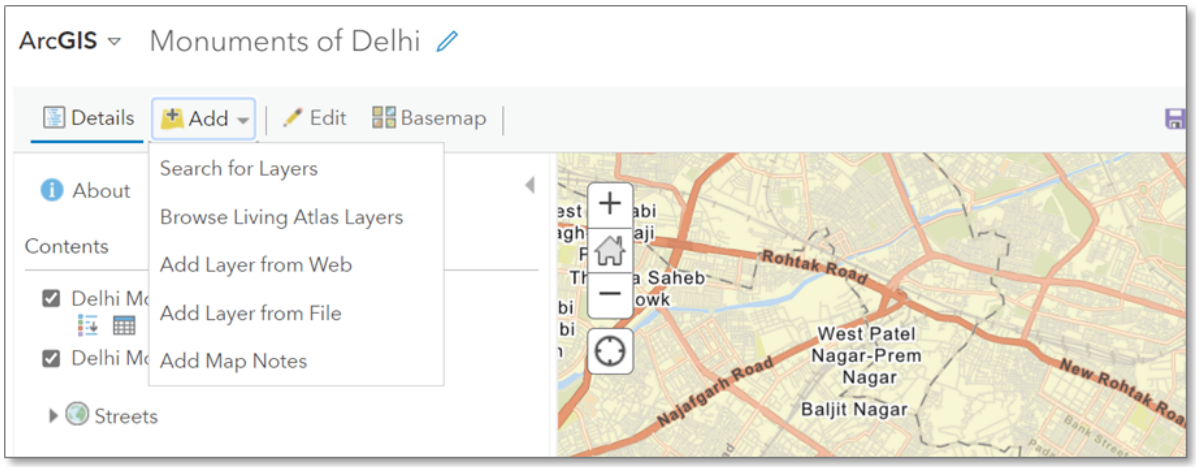


Figure 5: Adding Map Notes

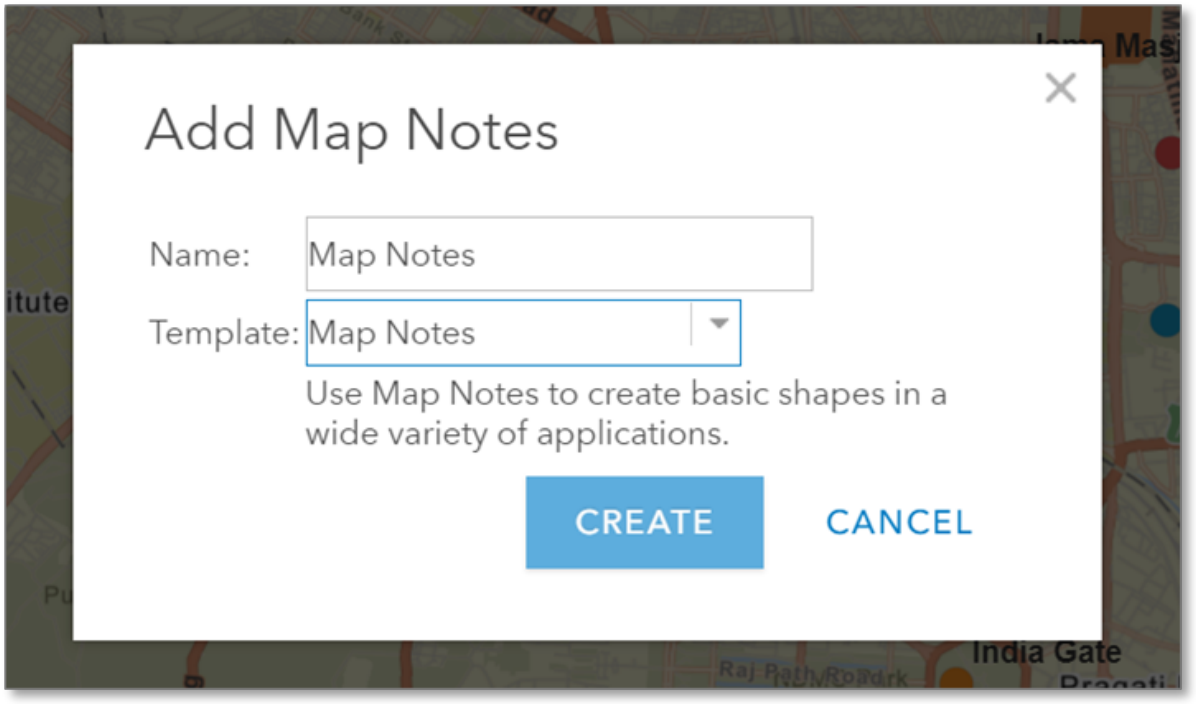


Figure 6: Map Notes dialogue box

You can either stick to Map Notes as the Name or give your notes any name you want. There are also options for using different templates for Map Notes which can be accessed by clicking on the drop-down arrow next to Map Notes. For now, we will stick to the default option.

Click CREATE.
A new panel opens on the left side of the screen. It lets you add Map Notes as points, lines, polygons or text.

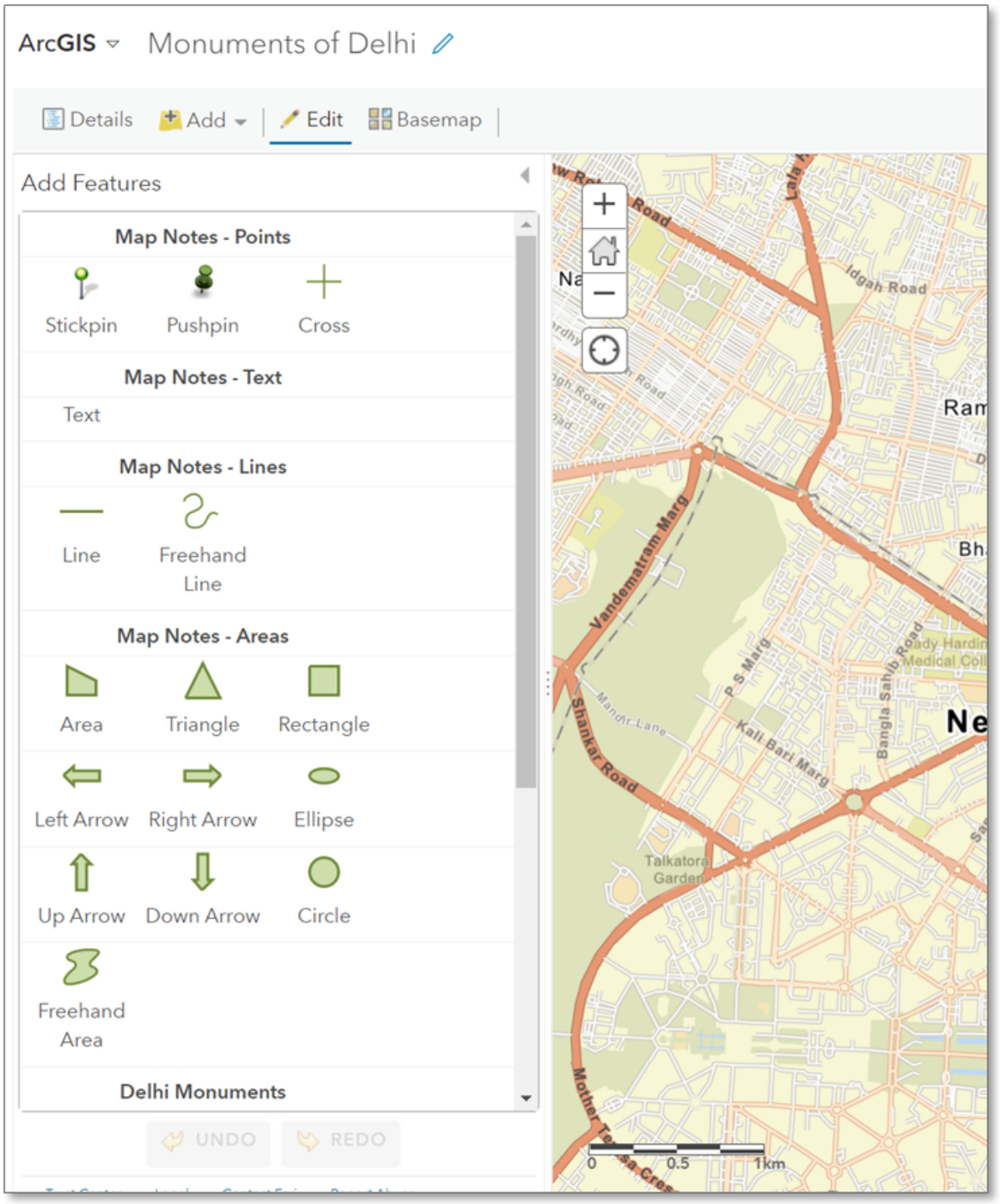


Figure 7: Map Notes panel

For now, we are going to use a Point for the Map Note that we are going to add to the Web Map. Click on any of the point options Stickpin / Pushpin / Cross and place the point near Kotla Firozshah.

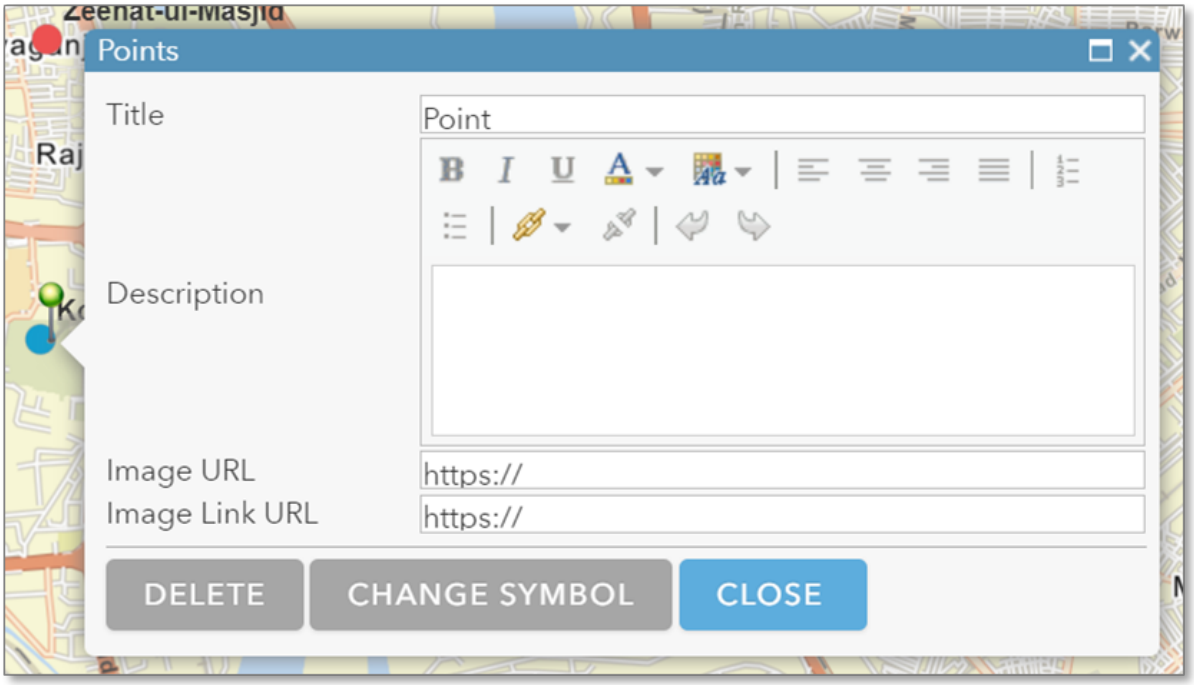


Figure 8: Adding text to the Map Note

In this Dialoge Box, we can give a title, write a detailed description, add links to an image. There are also various options for formatting the descriptve text. Once you have added the description of the place, you can click CLOSE. Click on DETAILS next to go back to previous screen.
Now you can see Map Note as a separate layer on the web map.
Click on the Pushpin icon next to the point for Kotla Firozshah to see the description.

Figure 9: Feature description using Map Notes

Adding Qualitative Data In ArcGIS Online-2

In addition to qualitative information, photographs can add another dimension to the feature layer. We can do this by searching for a photograph on the web and inserting its link in the attribute table.

Activity 2: Adding Photographs to Features | Time Required: 20 Minutes
Sign In into your ArcGIS Online account, if you are not signed-in already. After signing in, click 'Content'.

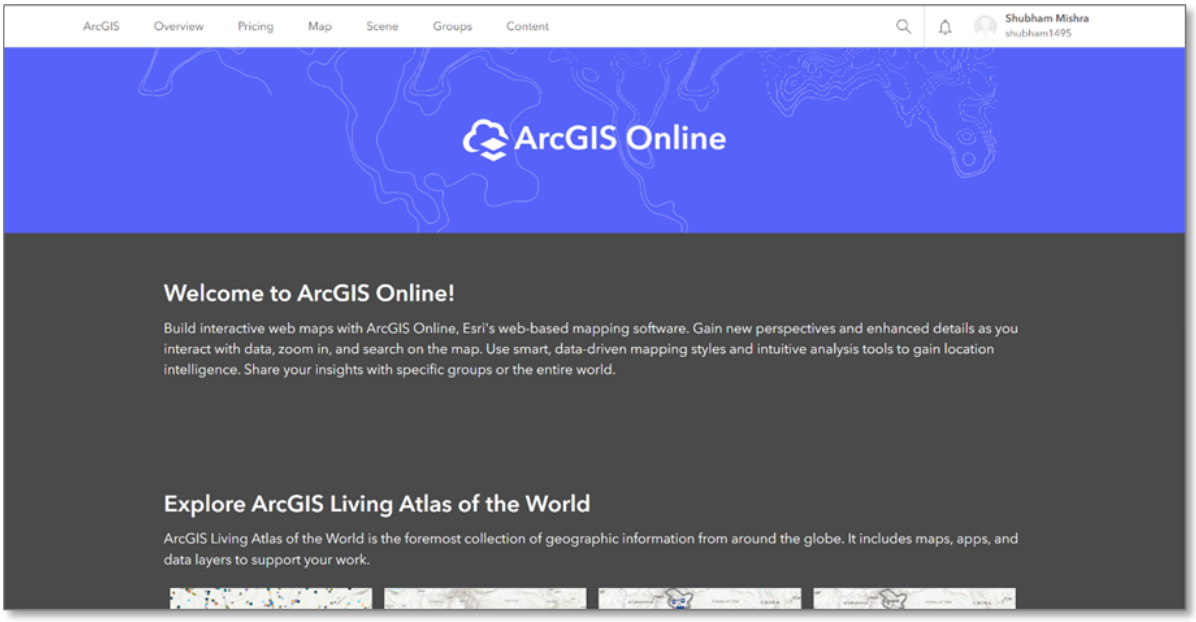


Figure 1: ArcGIS Online homepage

As we have seen earlier, the Content page (figure 2) shows all the Web Maps that you have made so far. The Delhi Monument, being the latest (or the only one so far) will be at the top of the list. Click on it to open the web map.

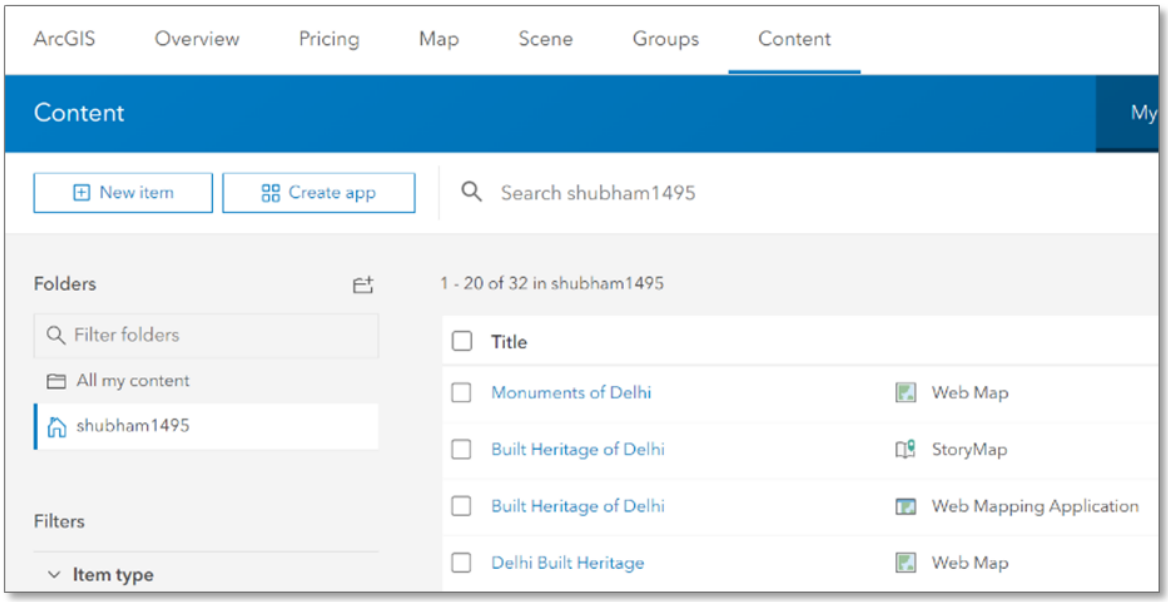


Figure 2: ArcGIS Online Content page

The resultant page (figure 3) shows a short summary of this web map. You can update the summary, should you want to. Click 'Open in Viewer Classic' to open this web map on a web page.

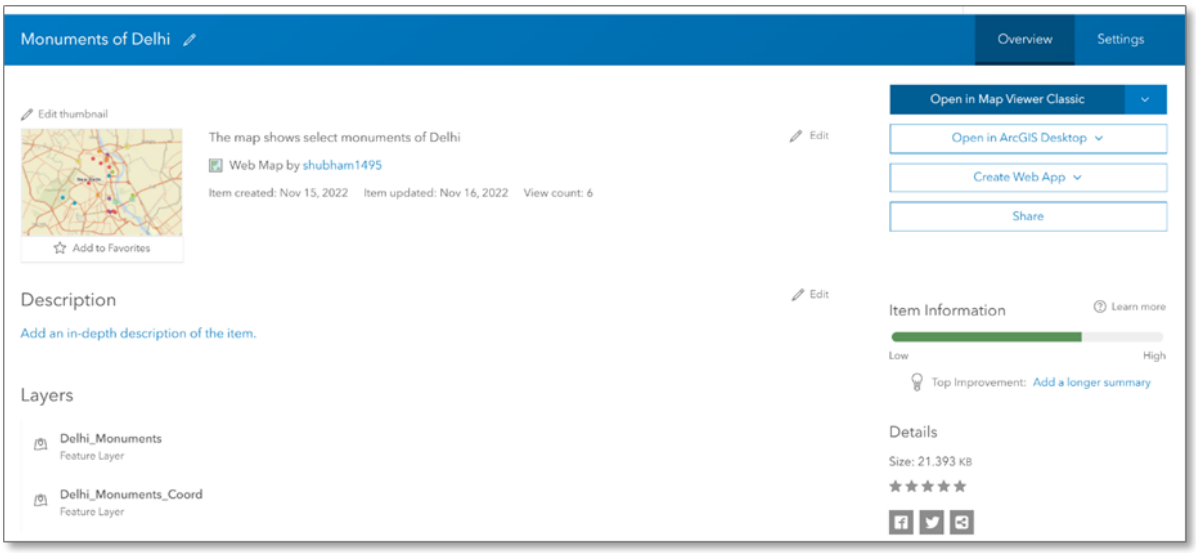


Figure 3: Monuments of Delhi page

We are back to the Delhi monument map (figure 4). We will now add photographs to the point layer showing the monuments.

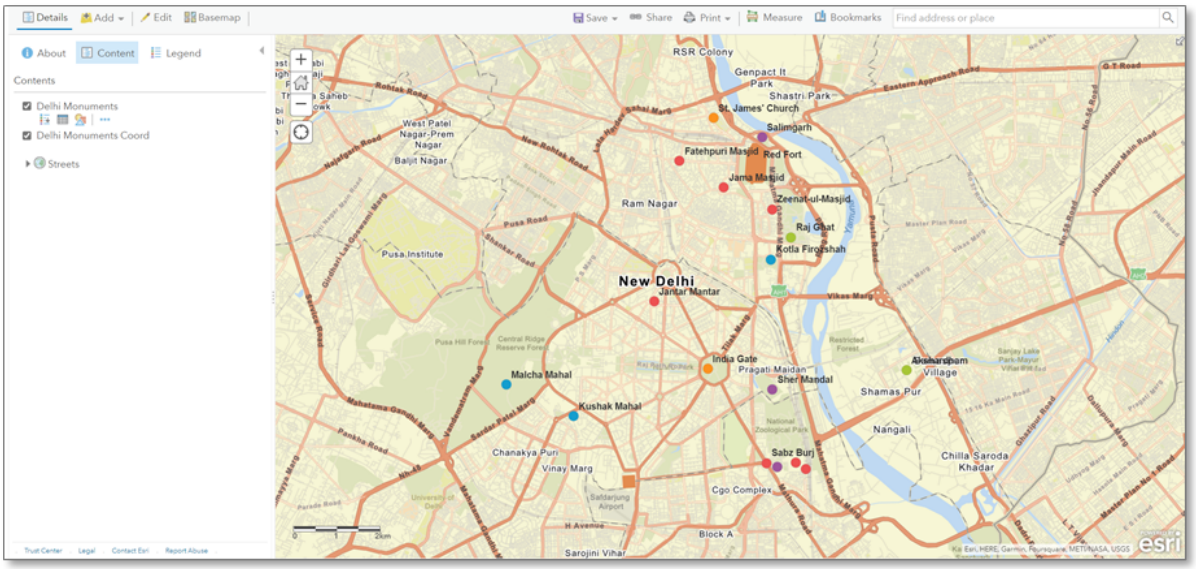


Figure 4: Monuments of Delhi web map

Our task is to add a photograph to each of the 25 monuments. Click on any one of them (Kotla Firozshah, for example) and then click Edit in the pop-up box.

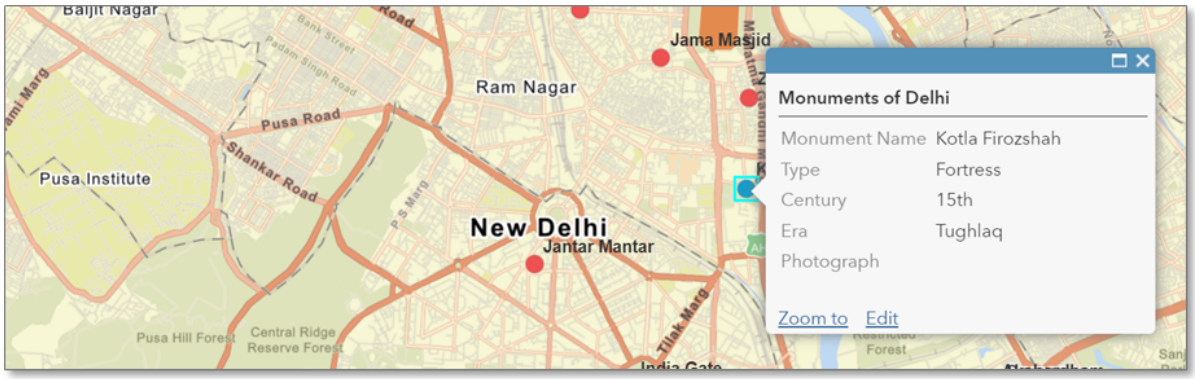


Figure 5: Editing the pop-up box

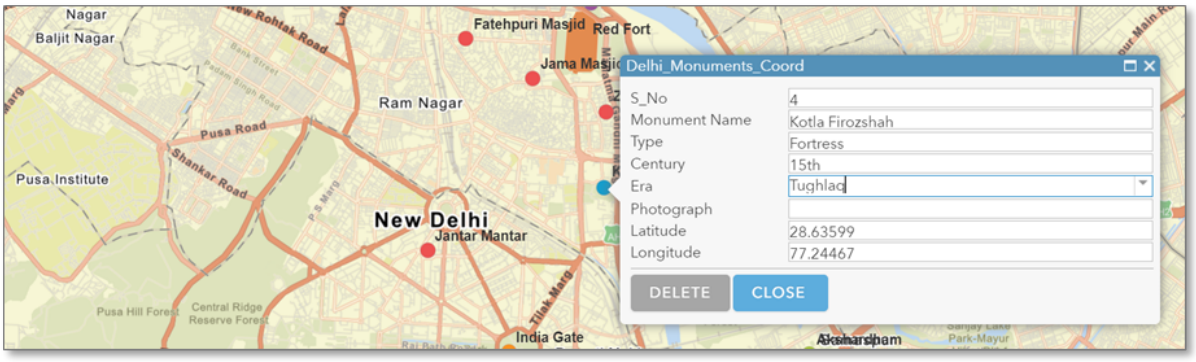


Figure 6: Pop up box in edit mode

In figure 6, we can see that the row in front of the 'Photograph' is blank. We need to fill in the photograph related information in this row.

Open your web browser, and do a Google Image search for Kotla Firozshah. The resultant web page will give us plenty of images of this monument. We, however need an image with a 'Creative Commons' license.

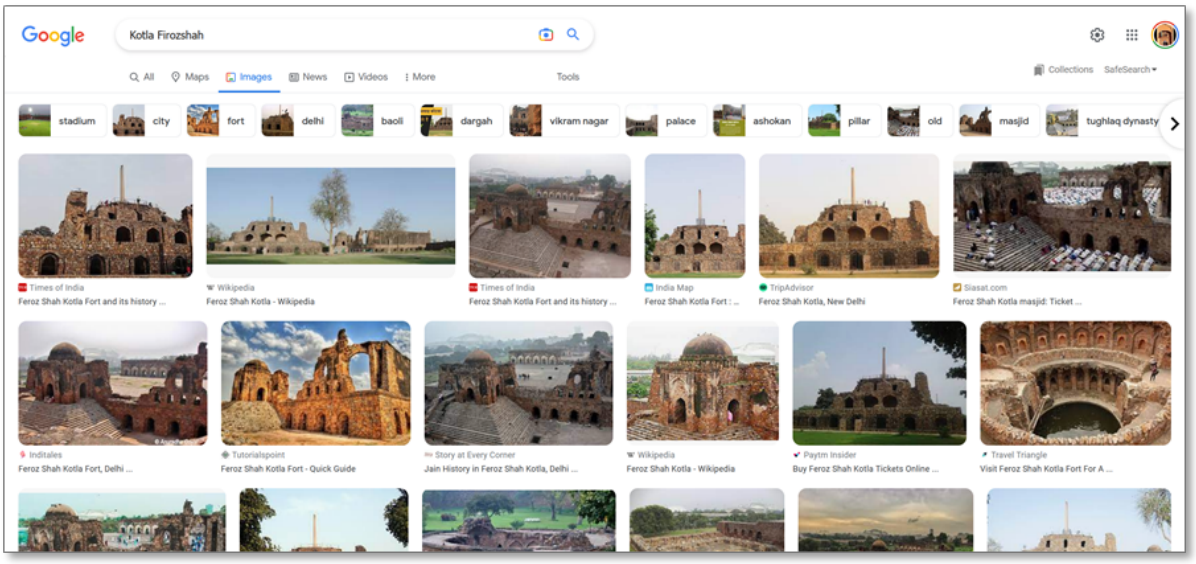


Figure 7: Result of image search for Kotla Firozshah

On the search results page, click 'Tools', then the drop-down arrow next to 'Usage Rights' and select 'Creative Commons licenses'.
The search results are now modified, and we get images with Creative Commons license.

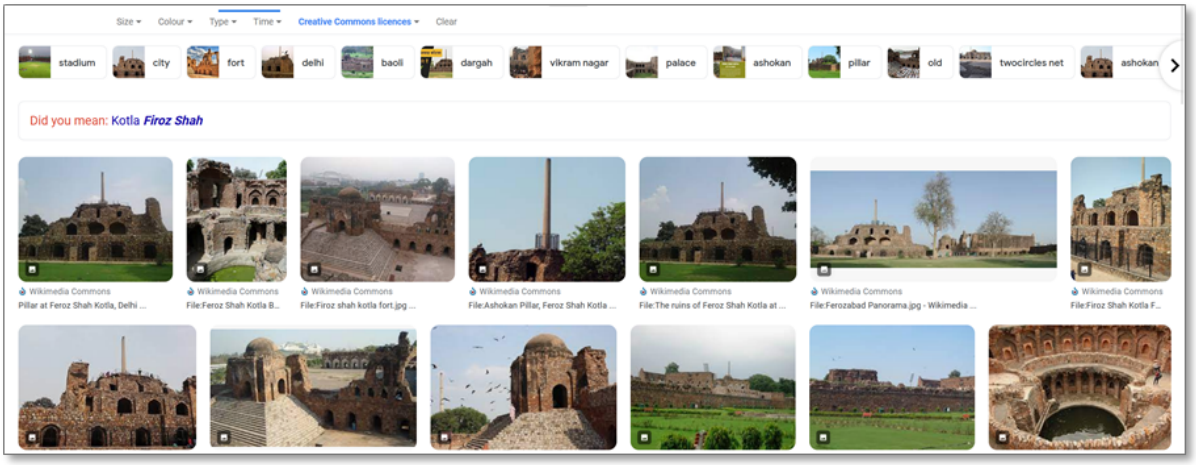


Figure 8: Kotla Firozshah images licensed under Creative Commons

Click on any image. An enlarged version of the image will open on the right side of your browser. Click visit. You will be taken to the Wikimedia page of the image (figure 9).

Click on 'Use this File (on the web)' and a table will open up with a link to use the file.

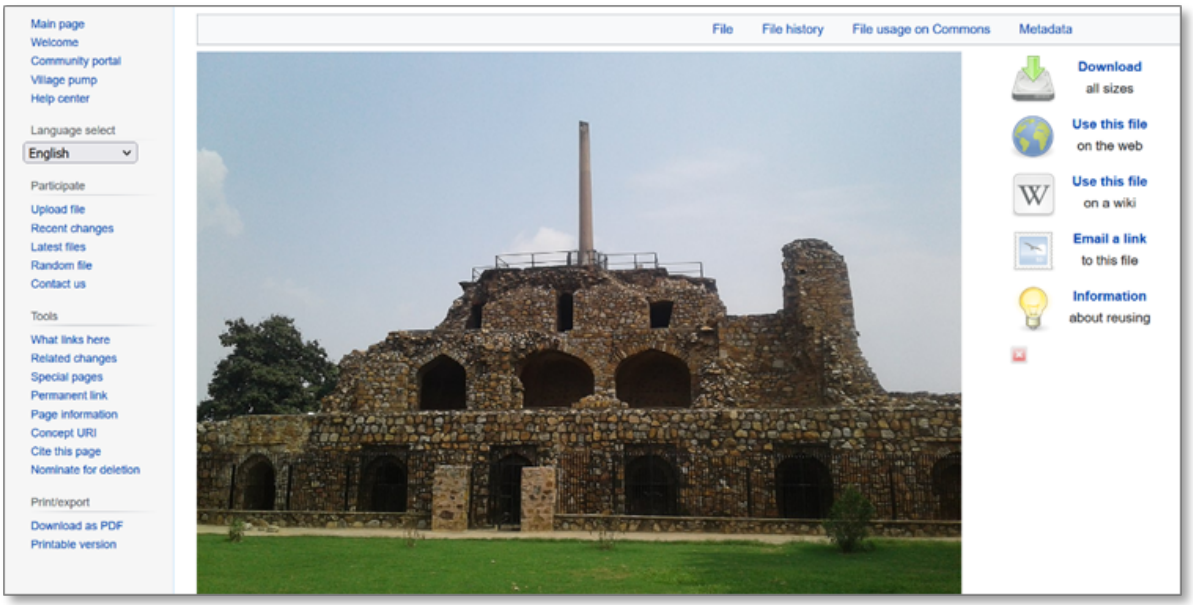


Figure 9: Wikimedia Commons page for Kotla Firozshah

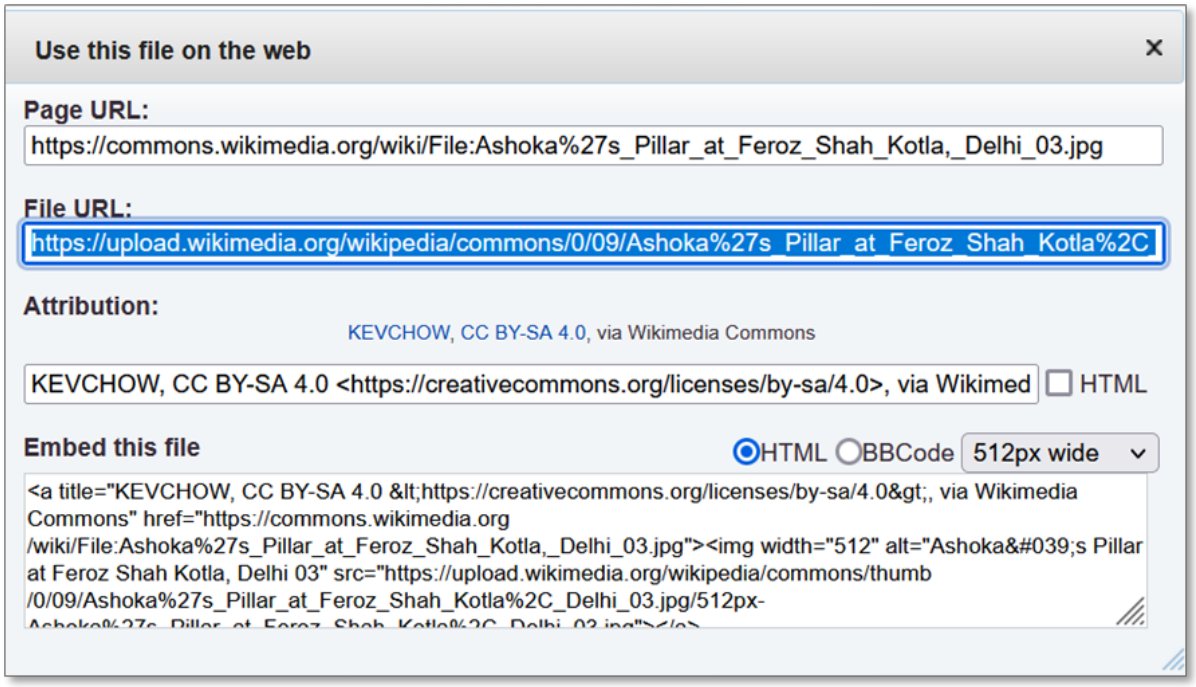


Figure 10: File usage options

Copy the File URL and paste it in the empty row in front of Photograph in ArcGIS Online (figure 11). Click Close. Close the edit session by clicking the triangle in front of Add Features. With this we have added a link for an image to one of the monuments.

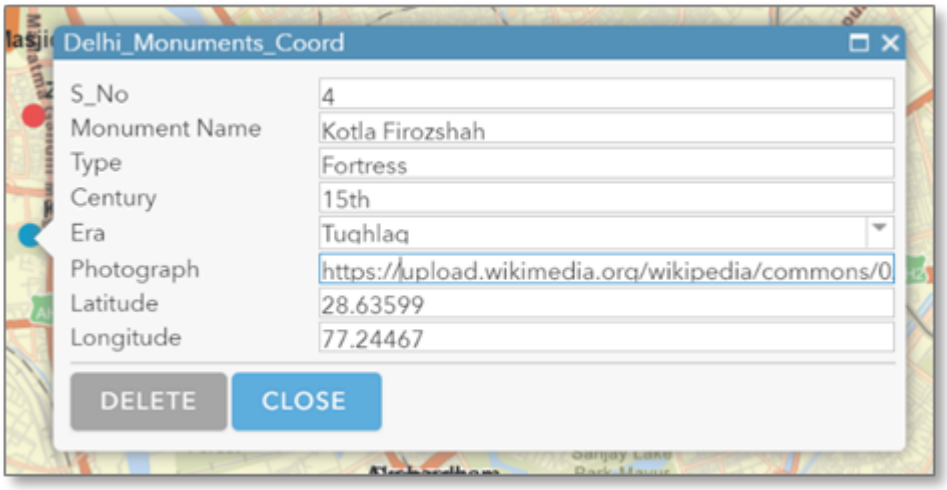


Figure 11: Adding image URL to the feature layer

Now click on the point representing Kotla Firozshah again. You can see we have a hyperlink called More Info in front of Photograph (image 12). Click the hyperlink and you will be taken to the image URL (figure 12).

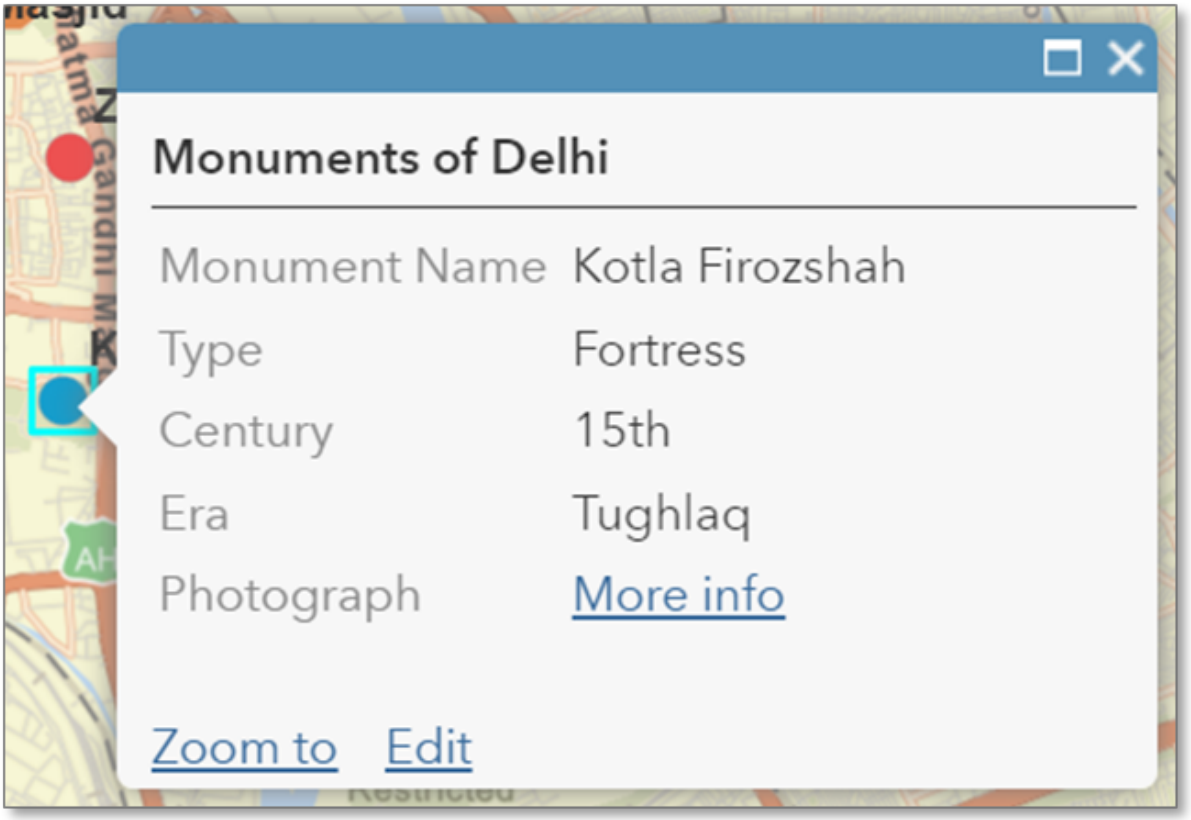


Figure 12: Layer pop-up with hyperlink to the image

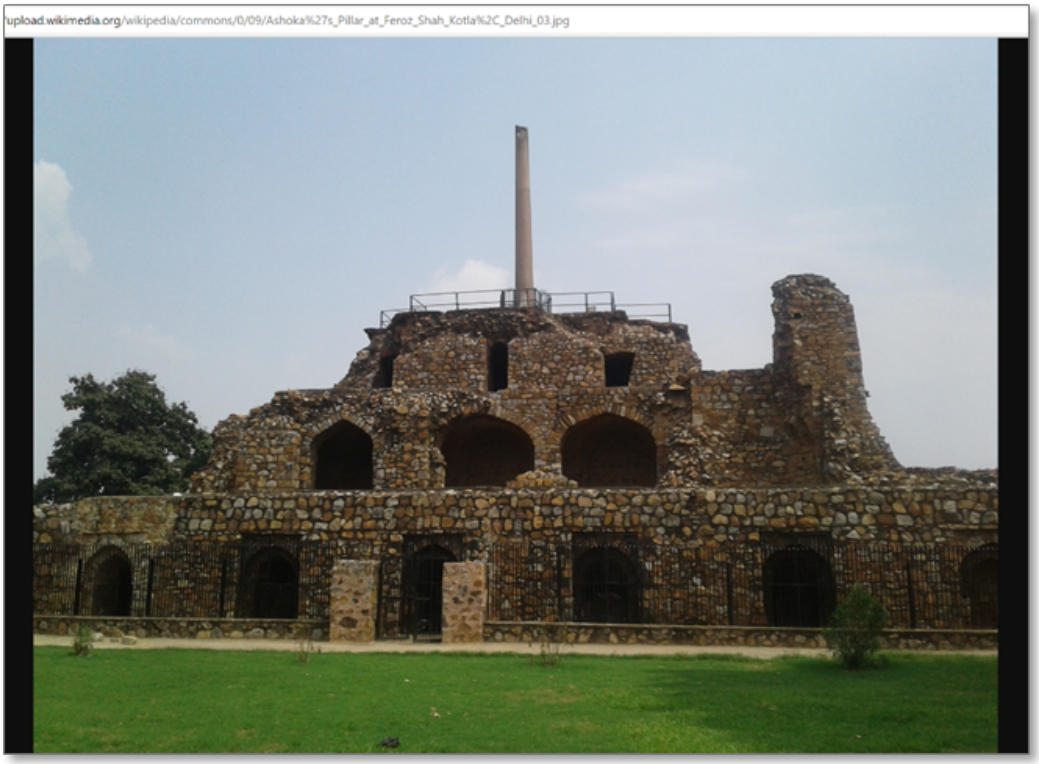


Figure 13: Feature image opens in a new tab

Time for a task!

1. Add images for the remaining monuments.

How to be a Storyteller (Project)

INTRODUCTION TO STORY MAPS

What is a StoryMap?
A StoryMap is a web map that has been thoughtfully created, given context and provided with supporting information so that it becomes a stand-alone resource. It brings together maps, narratives, and multimedia like audio, video and images. It also has interactivity like swipe, pop-ups and time sliders that help users explore the content.

Is it a Web map?
Yes, since it is web based and is a map, we can call it a web map too. But then it is more than a web map…

More than a Web map? How so?
Web map is a digital map on the web. It has some interactivity in the sense that you can switch on and off layers, zoom in and out and pan. Perhaps measure distances and areas as well. And add some images and descriptions. However, maps are specialized visual tools which all of us do not know how to read and interpret.

StoryMap combines these and much more in a form that is attractive even to laymen. All of us have stories to tell. These could be personal stories, stories about events or stories about places that we may have visited. And all of us like listening to different stories. StoryMaps bring to us these stories enriched with multimedia.

What are the stories that I can tell through StoryMaps?
You can tell practically any story!

a. Can I use it to showcase the tangible and intangible heritage of my city?
- Yes, StoryMap will let you weave a narrative around old and new images, maps and videos of such heritage aspects of your city.

b. How about quantitative aspects like bar graphs, pie charts?
- Of course, you can add these too in your map. All you need is the data to make them.

c. But I am not interested in GIS or maps or geography at all. All I am interested in is cricket and Virat Kohli is my favourite cricketer. What kind of StoryMap can I make?
- Now don't we all love King Kohli? How about making a StoryMap showing all the cities of the world in which he has scored centuries? Perhaps you can also add some clippings of Kohli celebrating his tons!

d. Wow, that sounds pretty amazing! Is there anything which cannot be turned into a StoryMap?
- Hmm, that's a tough one to answer!

e. Can I share my stories?
- That's what StoryMaps are for! They are not like GIS data which just sleeps in your laptop. You can embed your StoryMap in your blog or website, share its link with your friends or put the link on your social media handles.

f. Amazing! So, what are we waiting for? Let's start making some StoryMaps.
- Not so fast! Let's first see some examples of StoryMaps and learn about their content, components, structure, and style.

Hands-On with Story Maps

1. Sounds of the Wild West: An audio tour of Montana's four major ecosystems

S. No.	Contents	Description
1.	Theme	Nature
2.	Components	Narrative, Images, Maps – Location, and Audio
3.	Styling	Full page immersive viewing Attractive photographs Short, succinct text Simple navigation, link to different sections provided in the StoryMap
4.	Salient Feature	Audio clippings of the ecosystem as well as those of specific fauna found in them

2. Mapping the spread of COVID-19

S. No.	Contents	Description
1.	Theme	Epidemic
2.	Components	Narrative, Maps – Interactive thematic maps, Location
3.	Styling	Full page immersive viewing Narrative style text, highlighting important information Links to other webpages with information on related topics

		Top to bottom navigation
4.	Salient Feature	None

3. Mapping Mount Everest

S. No.	**Contents**	**Description**
1.	Theme	Nature
2.	Components	Narrative, Maps – Thematic and Location, Video, 3D models of the landscape, Photographs and sketches
3.	Styling	Full page immersive viewing Short, succinct text Top to bottom navigation
4.	Salient Feature	3D Models

Planning your next story map

Thinking through the foundational elements of your story is essential for success. Use this worksheet as a tool to identify some key story components before you dive into the ArcGIS StoryMaps builder.

1. *Elevator pitch: What and Why?*

What is the purpose of your story, or why are you making it?

2. *Who is your intended audience?*

Think about who you want to read your story to: funders, policy makers, local stakeholders, friends, family, general public, scientists…

3. *What are the key takeaways for your readers?*

What do you need your readers to know after finishing the story?

1.

2.

3.

4. *What content do you have already, and what content do you still need?*

Think about media that might be useful for telling this story (photos, videos, audio, maps, infographics, etc.). List any media content that you have or need to get that will help support your story.

Have:

Need:

5. *Do you have any data that supports your story? If you don't have what you need, do you know of other sources that might?*

List any data—spatial or otherwise—that could help explain your key takeaways outlined above.

Have:

Need:

6. *When, where, and how do you want to promote your story?*

Will you distribute your story through social media? Email? Something else? Are there individuals or organizations you can partner with to share it more widely? Do you need shared language or other materials for any coordinated promotion?

SOME IDEAS FOR THE PROJECT

As we have learned earlier today, a StoryMap is a web map that has been thoughtfully created, given context and provided with supporting information so that it becomes a stand-alone resource. The examples from the StoryMaps Gallery show us that we can make a story map on virtually any topic – qualitative or quantitative in nature – provided we think through the storyline, its sequencing and arrangement and the support material that will be needed for it.

Create your own StoryMap
For the project work in this Module, you can create a StoryMap on any topic of your choice. Now that you have been introduced to the StoryMap Gallery, you may want to explore more maps for inspiration. To get you started, we are listing here some topics that you may want to explore for creating your StoryMap.

Some Ideas for your StoryMap

a. Some famous Eateries of your neighbourhood

Location of each eatery on the map, short description, images of items it is famous for, a short video interview with the owner and much more…

b. All venues where matches of the Fifa World Cup 2022 are taking place

A bit of the Fifa World Cup, its history and past countries where it has been hosted, location of current host nation, venues, stadiums in each city with basic information about the capacity and some images.

c. Famous landmarks of Delhi or any other city

This one is easy, just like the Monuments of Delhi web-map!

d. Tree species in your neighborhood

Neighbourhood's location, images of some prominent trees (like that old Banyan tree under which you used to play as a kid with your friends), short description about their leaves, flowers and fruits along with images and much more…

e. Delhi Metro

A short history of Metro in Delhi, overview in terms of total length, Map of Delhi Metro Lines, famous places / landmarks on each line with their description and images, short video of you travelling in the Metro and interviews with other users

f. Religious landmarks of the city

Another variant of the Monuments of Delhi web-map!

g. Venues where your favourite cricketer has scored centuries

Who is your favourite cricketer, which place is he/she from, location of each venue where he/she has scored tons, a bit about the venue, name, capacity, records etc.

h. Flora and fauna of Delhi Ridge

What is Delhi Ridge, where is it located, some basic facts like area covered, prominent plant and tree species along with photographs and descriptions, main animal and bird species along with pictures and if possible, sounds and videos!

i. Famous cuisine from each Indian state

Map of India, zooming in on to each state and images and perhaps videos of the signature food item.

j. Places (cities/villages etc.) explored in your favourite novel

A bit about your favourite author and his/her work that you like the most, places in that work, their location and descriptions and so much more…

Create your own Story Map

Now that you have learned the basics of StoryMaps and have also planned your own StoryMap, it is time to get down to making it.

Activity 1: Create your own StoryMap
Go to ArcGIS StoryMaps website and click ‘Sign In’ into your ArcGIS Online account.

Figure 1: ArcGIS Online homepage

The resultant webpage (figure 2) is the homepage of your StoryMap account. If you have made some maps earlier, you will have their thumbnails. If not, this page will be blank, and you can start making a StoryMap by clicking on ‘New Story’.

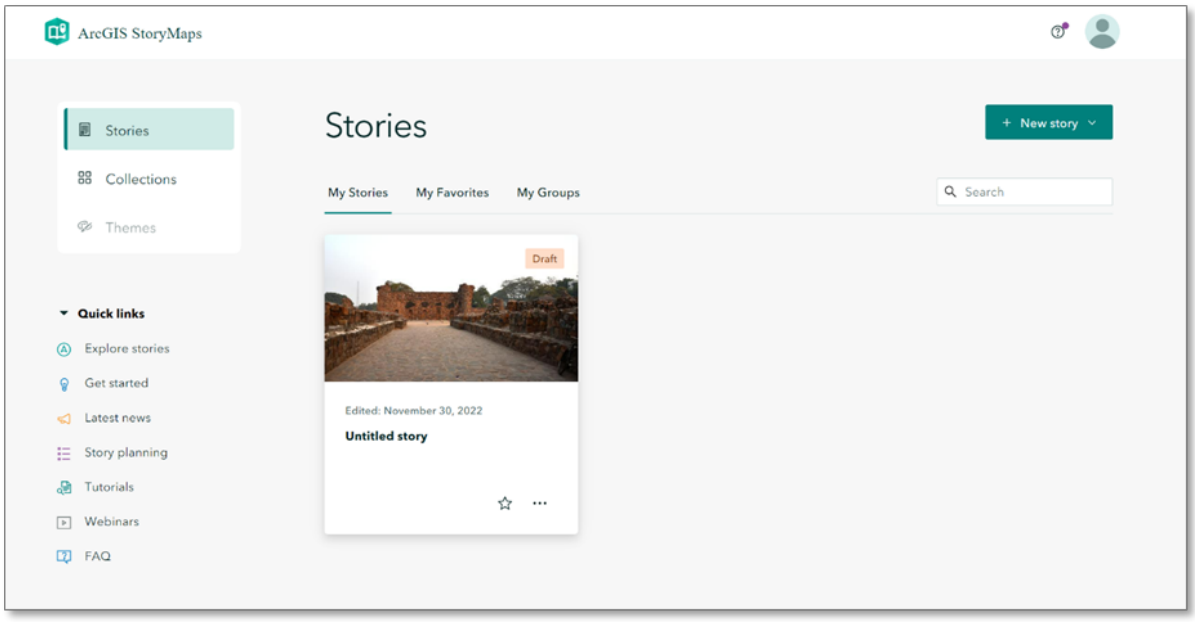


Figure 2: ArcGIS StoryMaps homepage

When you click on ‘New story’, you get an option to either ‘Start from scratch’ or a ‘Quick Start’. The latter has three further options of ‘Sidecar’, ‘Guided map tour’, ‘Explorer map tour’. We will use ‘Start from scratch’ as the other three options can be accessed later also.

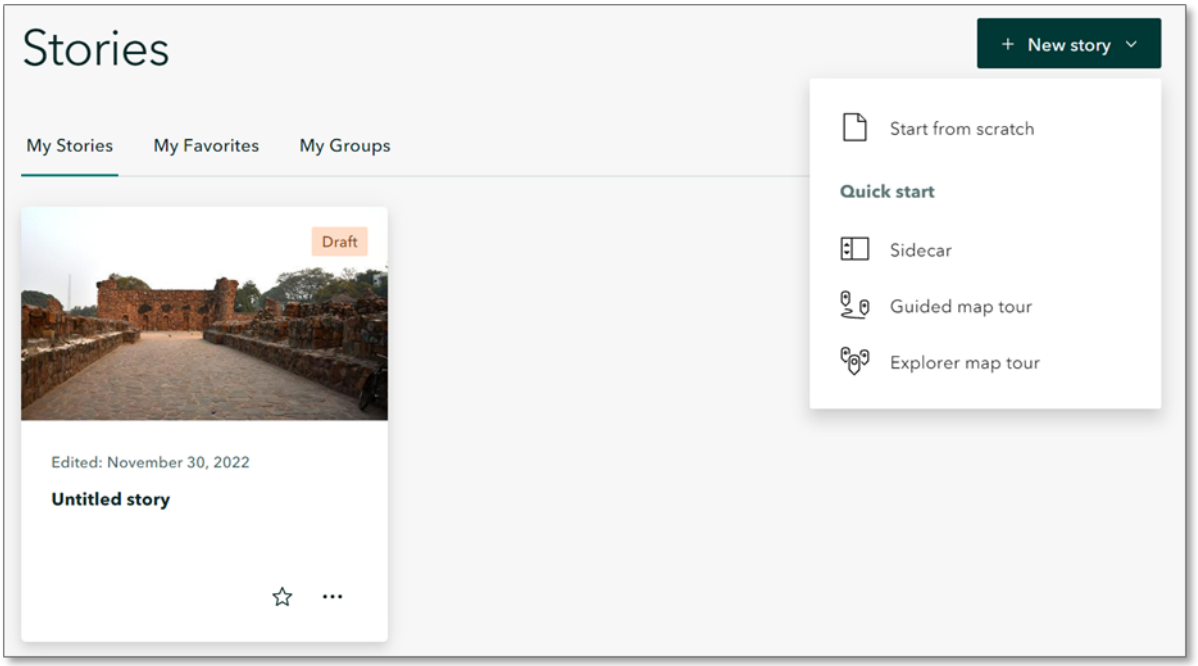


Figure 3: Options for starting a StoryMap

The Story Builder will open in a new tab and at the first instance looks somewhat like figure 4.

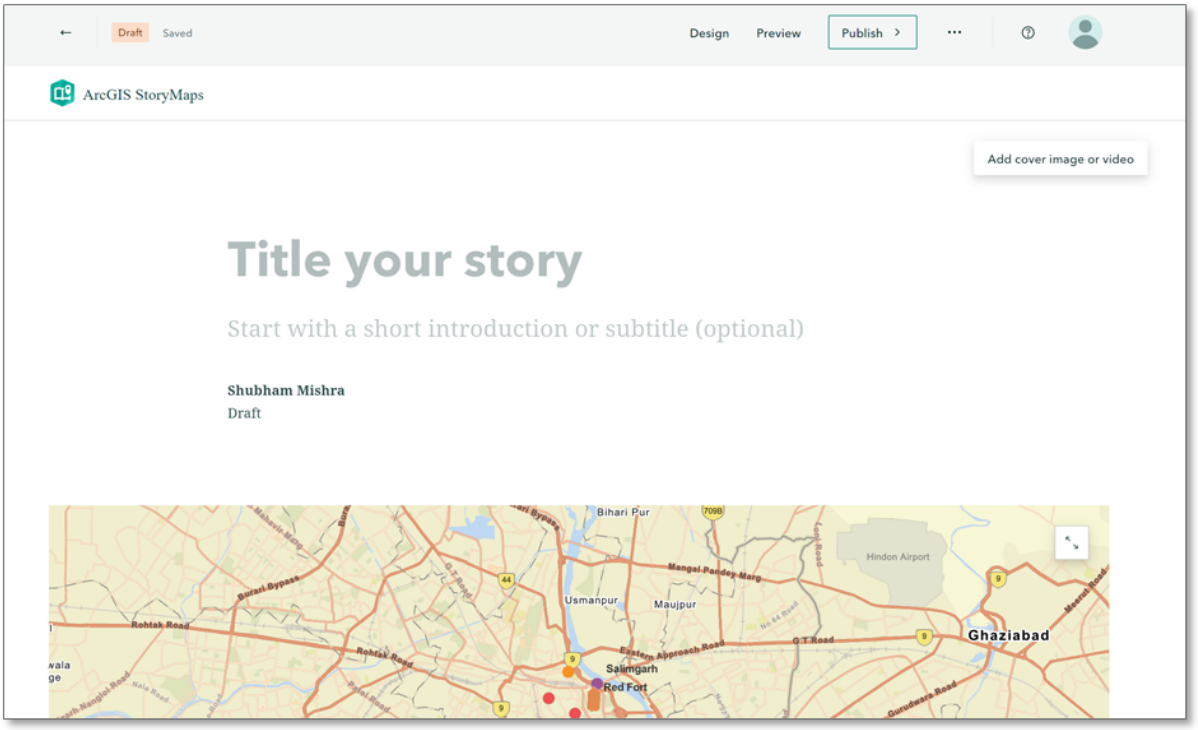


Figure 4: The Story Builder page

On this page you can do the following:
Click Add cover image or video to put a video as a cover to your StoryMap.
Decide the overall design of the StoryMap.
Add a Title and a short introduction or subtitle to the StoryMap.
Click Design to access the various options to decide the look and the feel of your StoryMap.

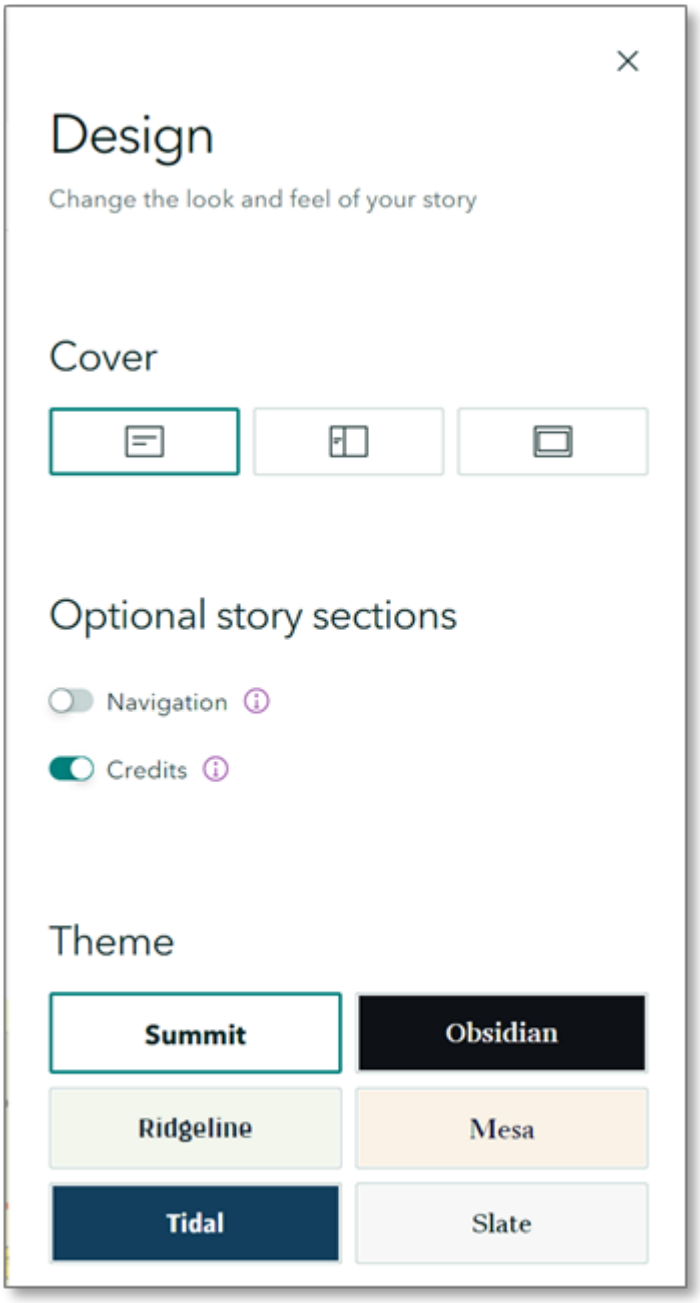


Figure 5: Design options for the StoryMap

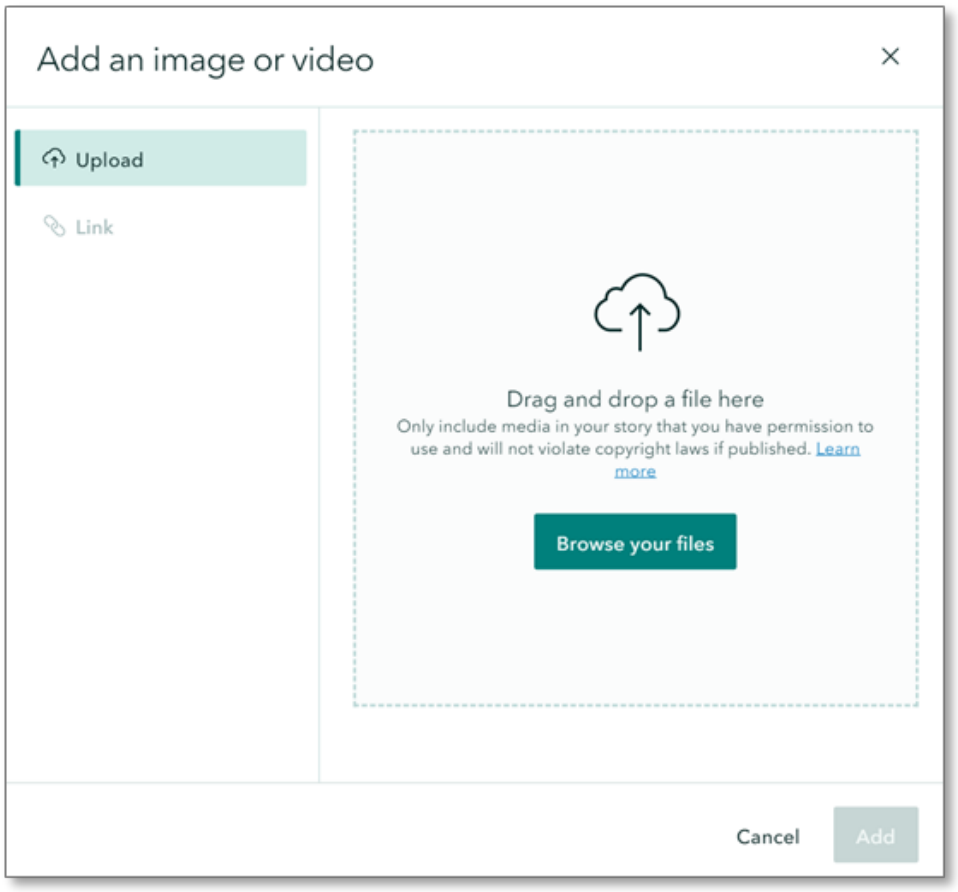


Figure 6: Adding an image or a video as cover

You can add the Title simply by typing in where it says, 'Title your story'. You can similarly add a short introduction or subtitle.

Click the little  icon to add different types of content to the StoryMap.

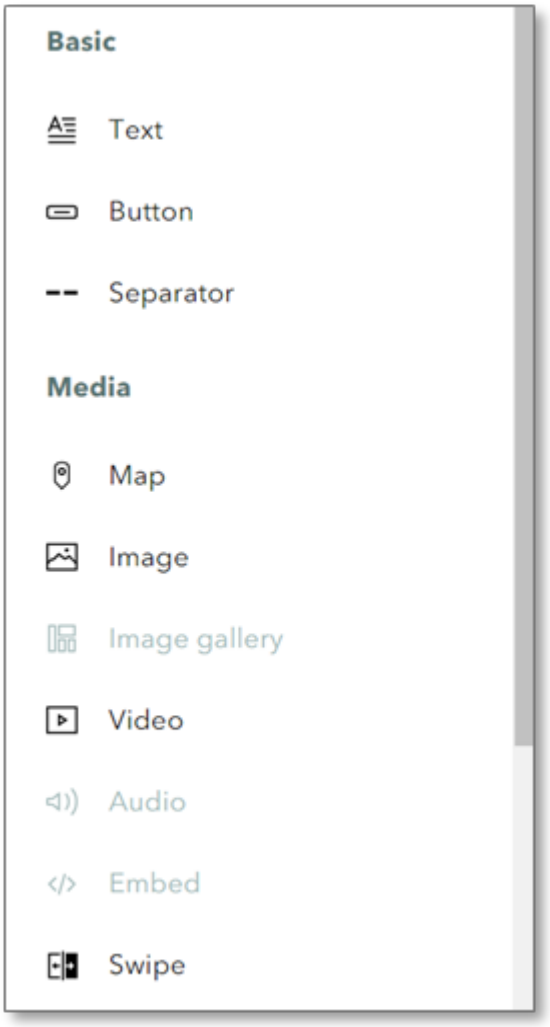


Figure 7: Adding content to the StoryMap

If you want to add some more text, click Text. You can also add a Map by clicking on Map.
Since you are already signed-in, it takes you to your Content page of web-maps and you will be able to see all the maps that you have created so far.

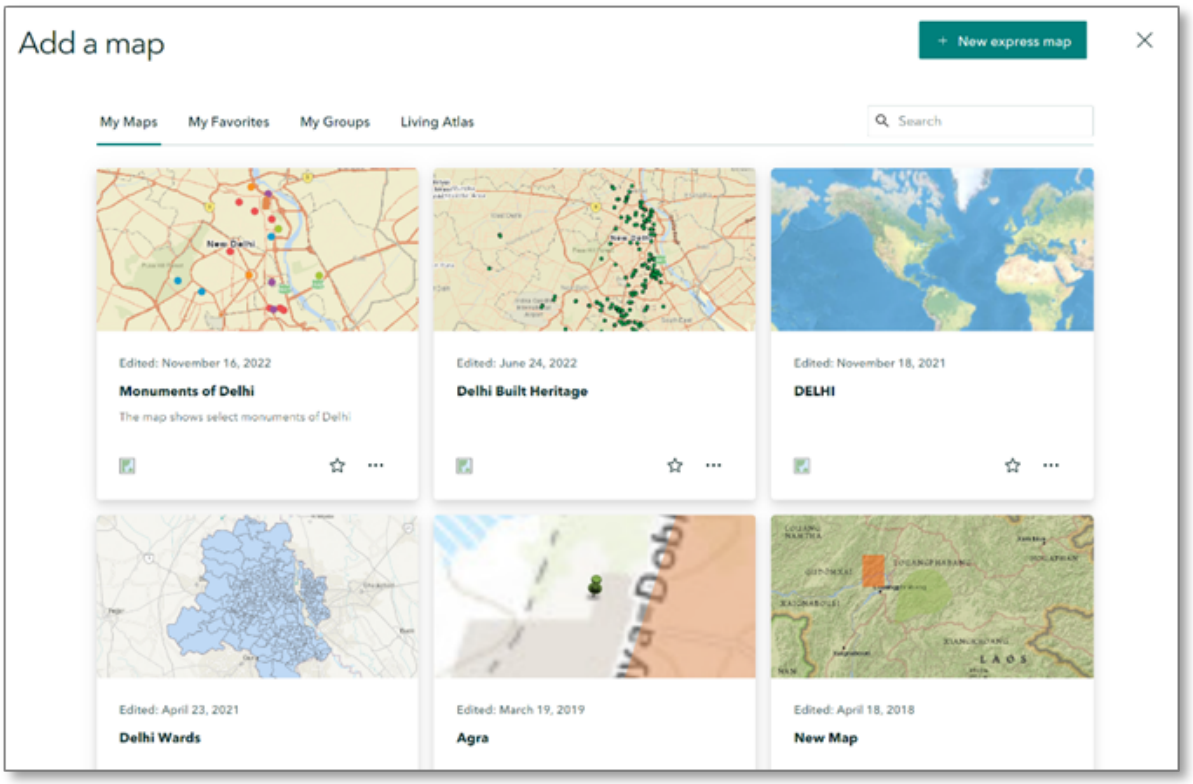


Figure 8: Add a map

Click Monuments of Delhi.

Figure 9: Adjusting map appearance

The Monuments of Delhi web-map that we can see in figure 10 appears how we had last saved it in ArcGIS Online.

On the left-hand side panel, the first tab lists the layers in this map. You can take your cursor over the layer and a tool will appear in the panel itself to switch-off the layer if you do not want it in the map.

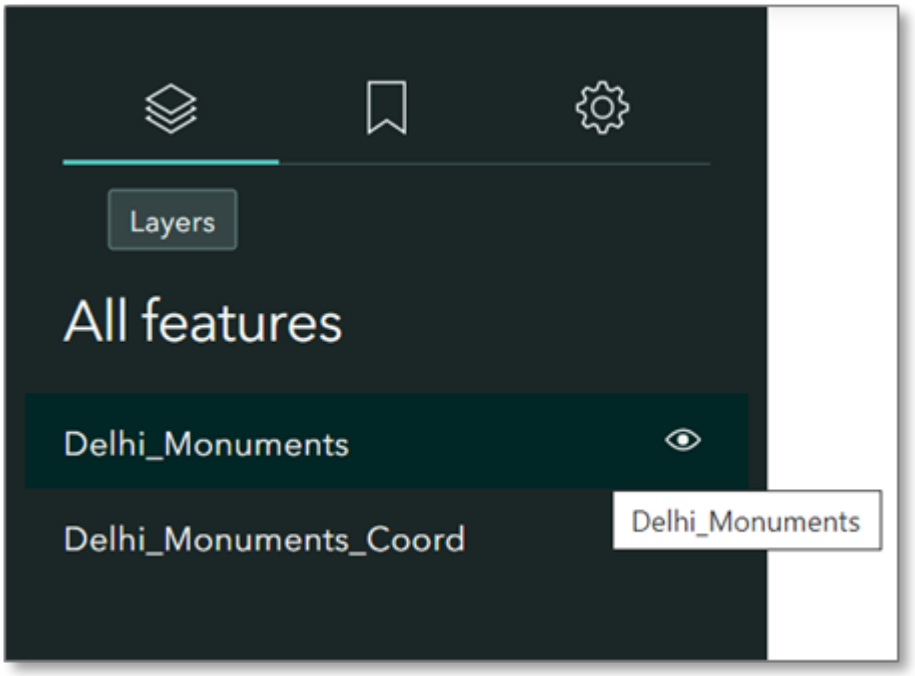


Figure 10: Switching on / off a layer

Time for a task!

1. Explore the function of the two tabs located next to **Layers** in the left-hand side panel.

In case you want to change the map style, say Single Symbol, click Edit in ArcGIS. This will open the map in ArcGIS Online and you will be able to change the style of the map. If you are happy with how the map looks now, click Place Map in the bottom right corner.

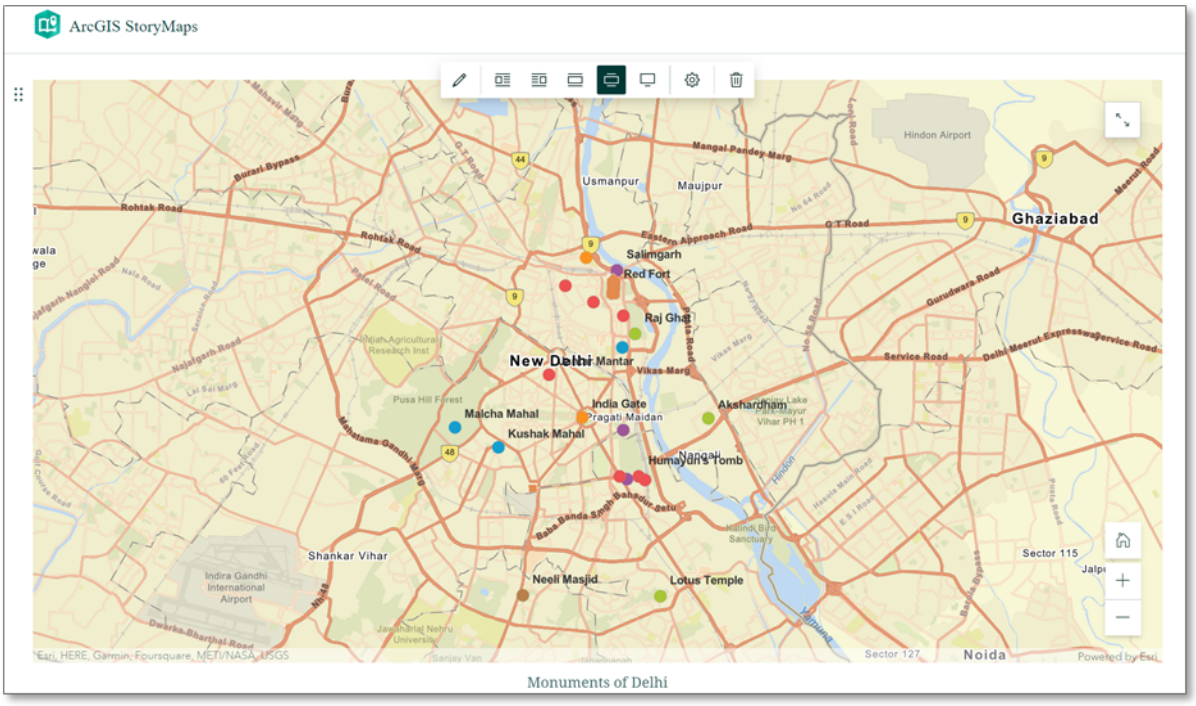


Figure 11: Map placed in the StoryMap

The ribbon on top of the map (figure 13) gives us some more options of placing it in the StoryMap.

Figure 12: Adjusting the map in the StoryMap

When you go down in the page, after the recently added map, you will see the icon again to add more content to your map.

Time for some tasks!

1. Explore different type of content/media that can be added in the StoryMap.
2. Scroll down to **Immersive**. Take your cursor to **'Slideshow'**, **'Sidecar'**, and **'Map tour'**, one at a time to understand the kind of StoryMap you can create.

If you click on Map Tour you will be taken to the following screen.

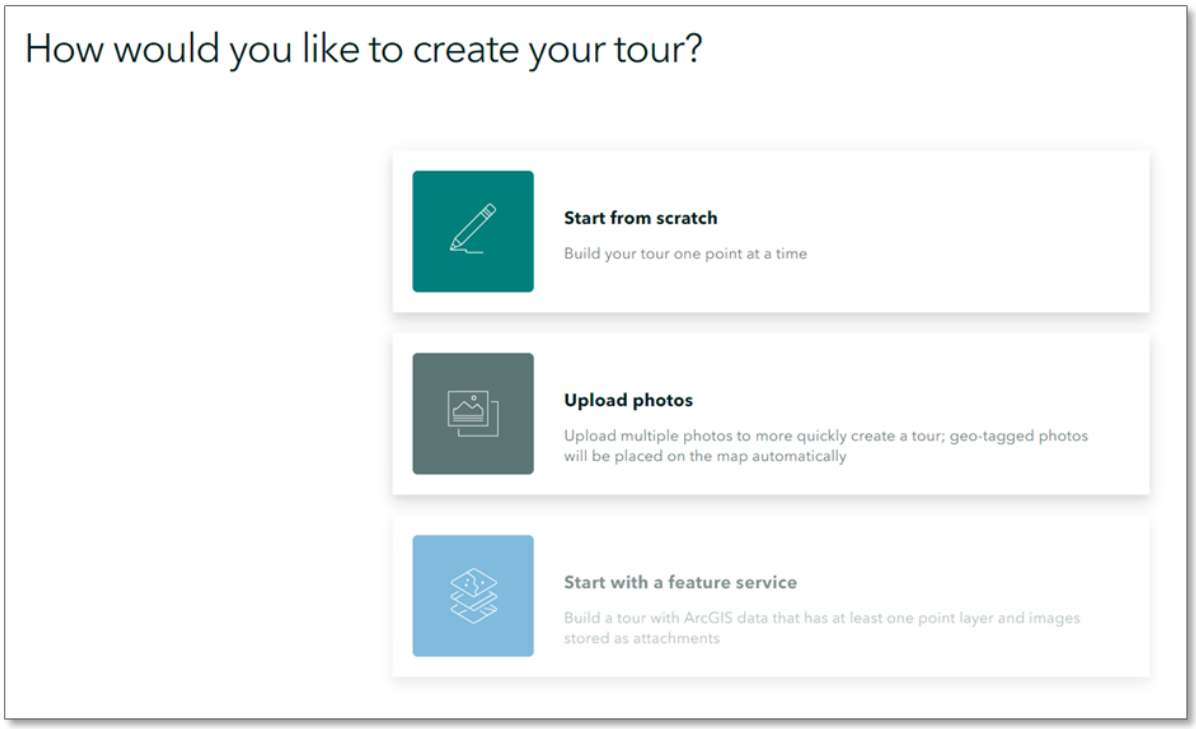


Figure 13: Creating a Map Tour in the StoryMap

Since you may already have photographs of the Monuments of Delhi, you may want to go for the second option of Upload photos.
In this example, we are going to go for Start from scratch.

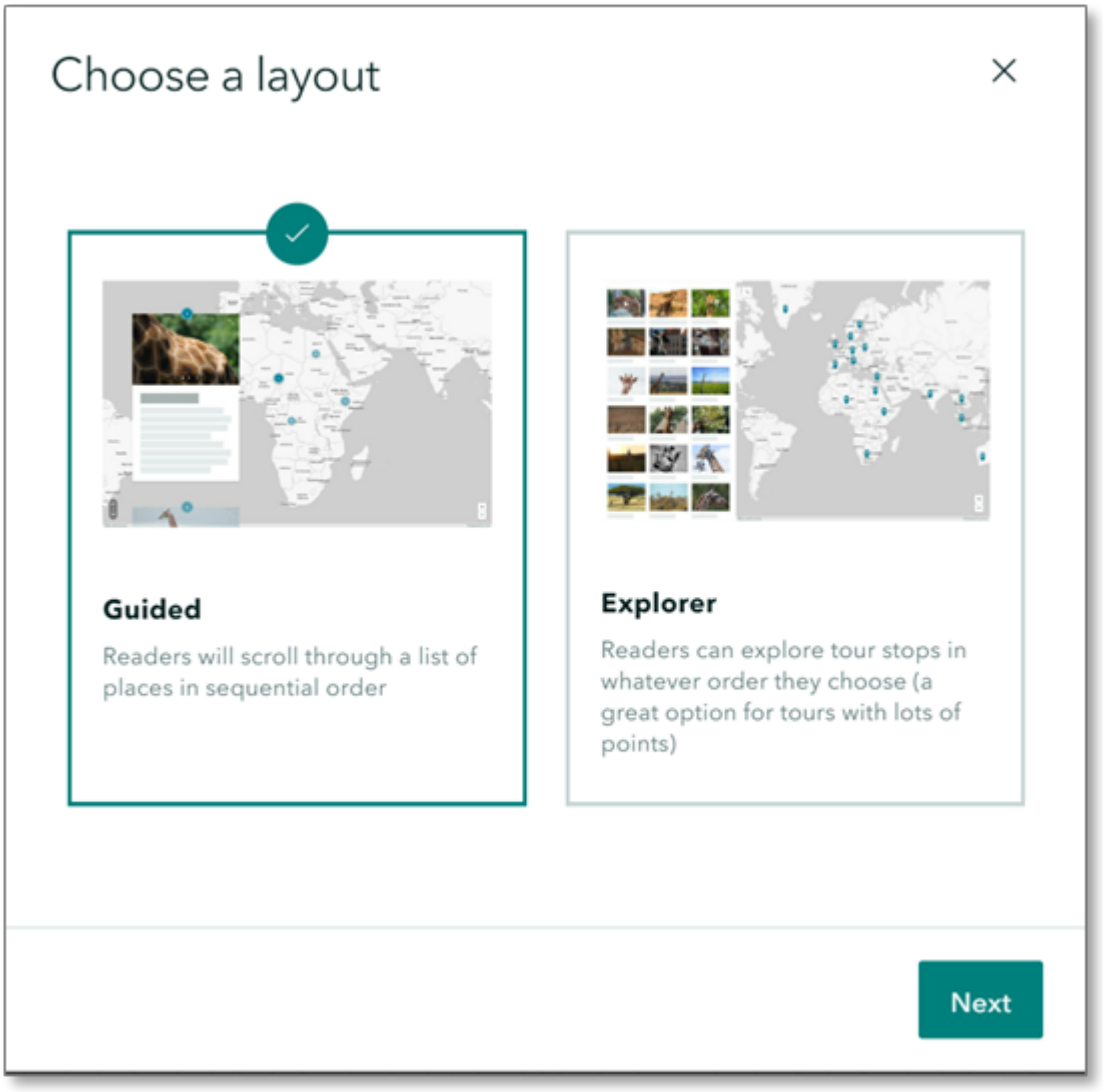


Figure 14: Choosing a layout for Map Tour

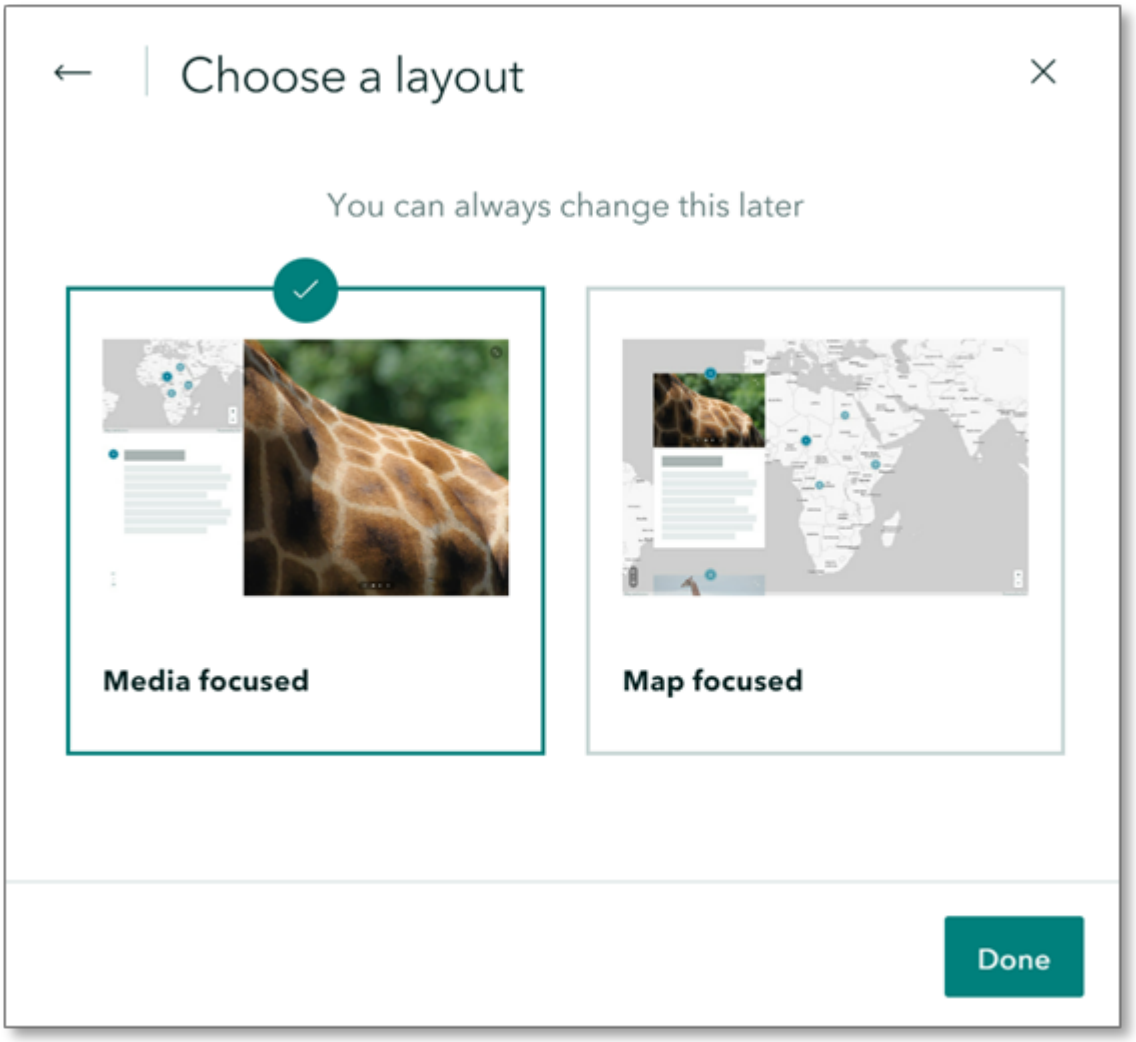


Figure 15: Choosing a layout 2

When you click Done, you will be taken to the next screen where you can start building the Map Tour.

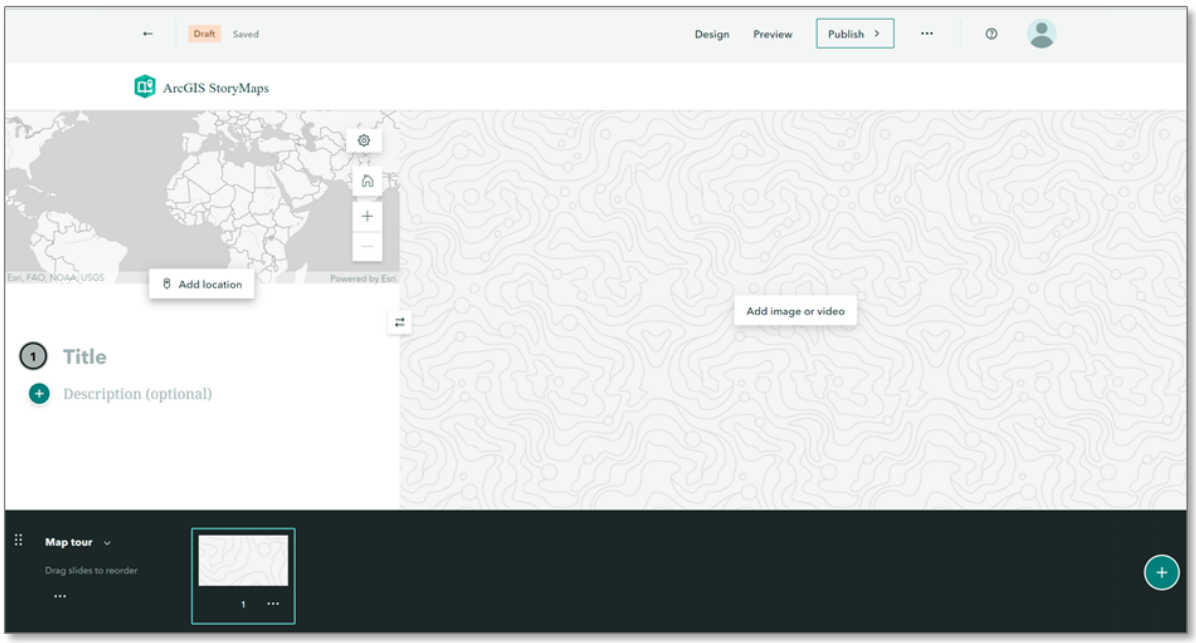


Figure 16: Making the Map Tour

On this page you can Add the following content to the Map Tour:

- An image or a video of the place
- Title and description
- Location of each feature

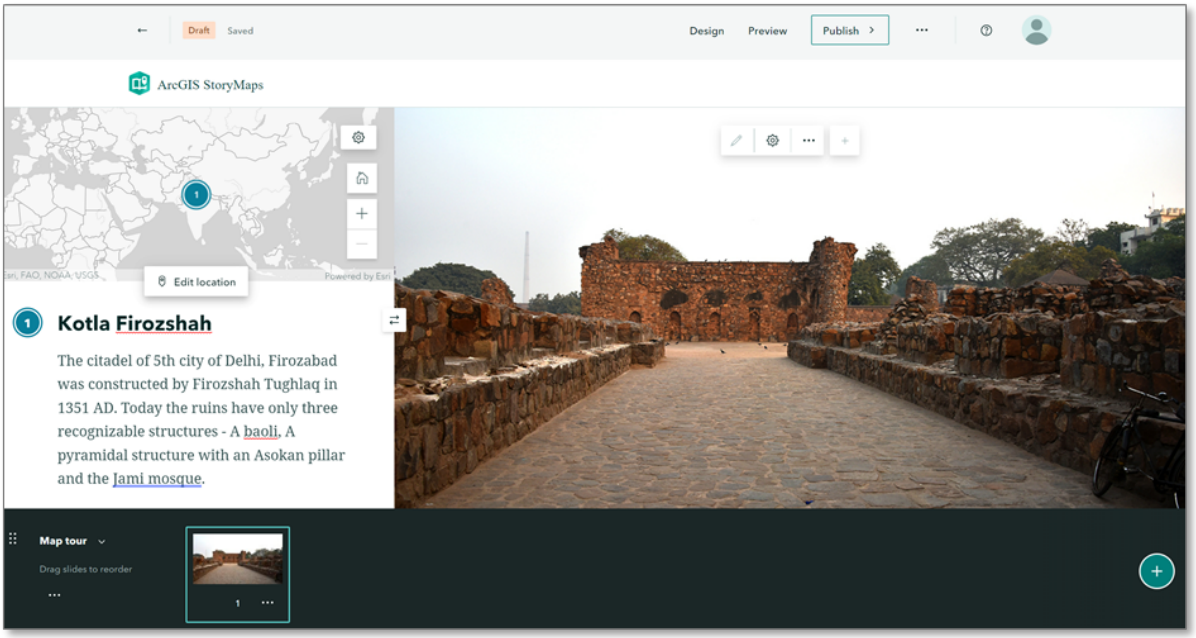


Figure 17: Map Tour with the first stop

Time for some tasks!

1. Add other monuments to the Map Tour.

2. Instead of rushing through this exercise, take your time to explore different options for creating the Map Tour. This will include, images, videos of the monument if you have them, text and links to provide further information to the users and experimenting with location maps.

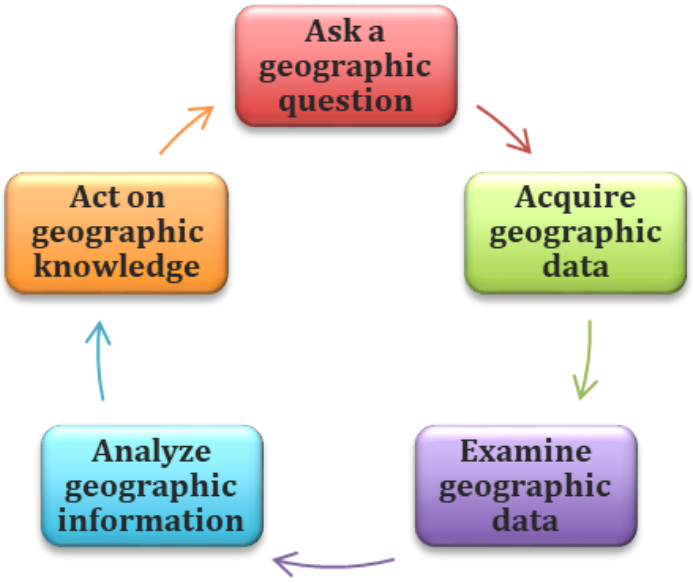
Understanding the Application of GIS in different fields

Introduction to GIS Applications

Let us ask again: What is GIS?

- A Geographic Information System (GIS) is a computer system of software, hardware, people, and geographic information
- A GIS can: create, edit, query, analyze, display and edit map information on the computer

The Geographic Approach



1. Ask geographic questions

Think about a topic or a place, and identify something interesting or significant about it. Spin that observation into the form of a question, such as "Where are things?" to "How do things change between here and there?" to deeper questions, such as "Why does this thing change between here and there?" or “What is the result of this thing changing between here and there?" Thus, you might be tempted to ask "Where do songbirds nest?” A good question sets up the exploration.

2. Acquire geographic resources

Once you have a question, you can think about the information needed to answer it. Here, it's helpful to consider at least three aspects of the issue: geography, time, and subject. Defining the geographic focus helps you define the scale (global, regional, local) of your inquiry, and helps you define the extent (a city, a country, a continent, the globe) of your inquiry. In studying a country in relation to others, your inquiry might require country-level data, and you would need data for the country of interest as well as for neighboring countries.

Often, you can find the necessary geographic data quite easily, in readily available packages or downloadable from the Internet. These days, the explosion of technology and rise of the Internet has made it much easier to acquire information. Even if you are missing some desired data, you may still be able to answer your initial question, or a variation of it, by exploring your resources carefully.

3. Explore geographic data

Turn the data into maps, tables, and charts. Maps are especially valuable, because they give you a powerful view of patterns, or how things change over space. Maps also allow you to integrate different kinds of data from different sources – pictures (aerial photos, satellite images) and features (roads, rivers, borders) - layer after layer. Explore these data in a variety of combinations. Look at individual items and what is around them. Explore how spatial phenomena relate to things around them.

For any one set of data, there are many ways to twist and turn it. By integrating maps with tables, charts, and other representations, some patterns may begin to appear. Using a GIS, this kind of visual exploration is simple to do. One layer of information stacks on top of another. By changing the map symbols, altering the sequence of layers, or zooming in to specific parts of the map, patterns and relationships become easy to see.

4. Analyze geographic information

After creatively exploring the relationships between this and that, or here and there, focus on the information and maps that most seem to answer your questions. Using carefully constructed queries, you can highlight key comparisons, or expose patterns that had lain hidden during initial explorations. For instance, if you discover that most traffic accidents in your community occur at intersections along major streets running due east-west, what might you expect to find in other communities, and why?

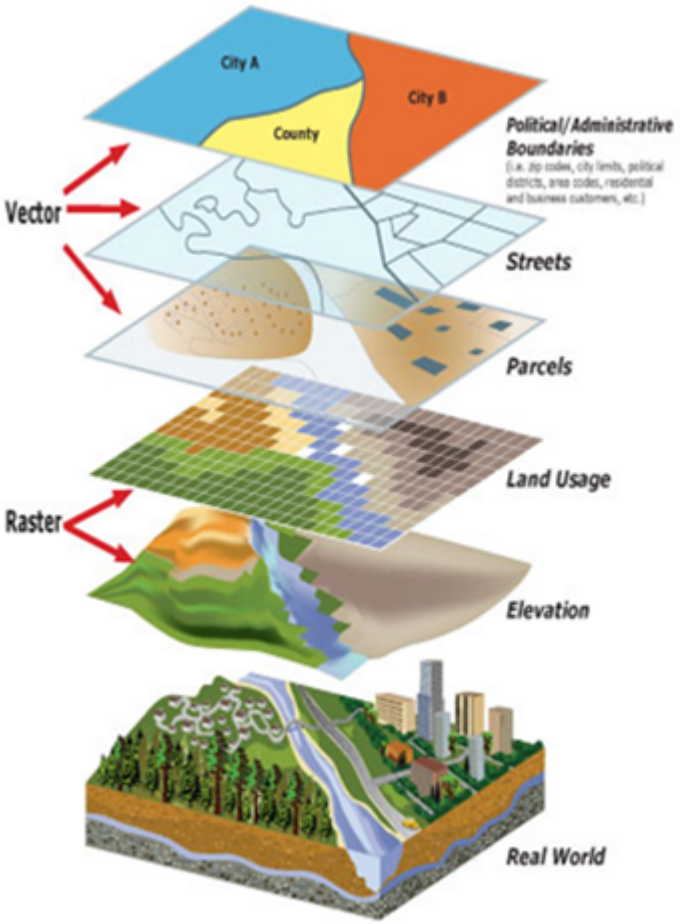
Since GIS data is made up of map representations and tables of characteristics, a GIS can handily solve queries and identify things. "Please computer find for me all cities of one million or more people where rainfall is less than 10 inches per year." The important thing is that you now understand the issue better than before, and you have drawn some conclusions from your research, turning pieces of data into geographic knowledge.

5. Act upon geographic knowledge

You have used GIS or paper-pencil techniques to integrate data from multiple sources and to weave them into knowledge that enables you to act. Being geographically wise means acting on the geographic knowledge that you have gained. Good citizens will share their geographic knowledge with a broader community, and help others act according to it. Understanding the widespread linkages and helping others see how their lives are affected means "thinking globally, acting locally." Acting on geographic knowledge means being willing to answer the question, "Now what?"

What can a GIS do?

- It enables you to visualize information in new ways that reveal new and important relationships, patterns, and trends.
- It integrates various types of spatial data (databases, imagery, GPS coordinates, etc.).
- Perform Geographic Queries and Analysis
- Map, Model, and Analysis Data
- Make Better Decisions and Create Better Solutions

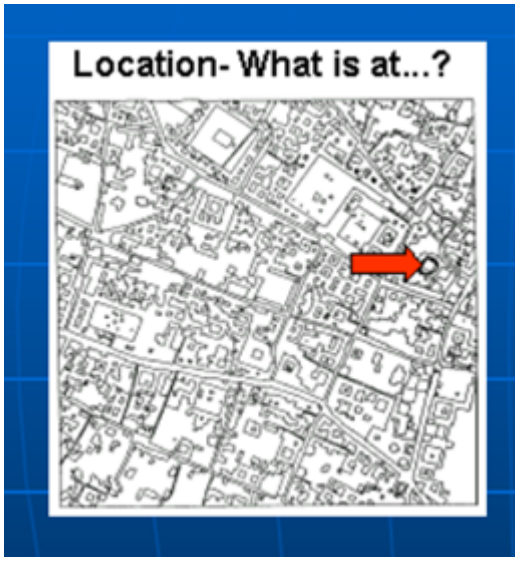


Questions GIS can Answer

- So far, GIS has been described through formal definitions and through its ability to carry out different functions on spatial data.
- One can also, however, distinguish GIS by listing the types of questions the technology can (or should be able to) answer. If one considers a particular application carefully, there are five types of question that sophisticated GIS can answer.

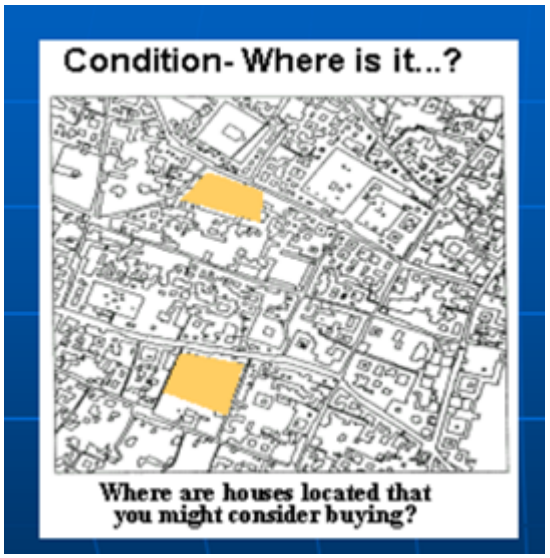
What exists at a particular location?

- To find what exists at a particular location.
- A location can be described in many ways, using, for example, place name, postcode, or geographic reference such as longitude/latitude or x and y.



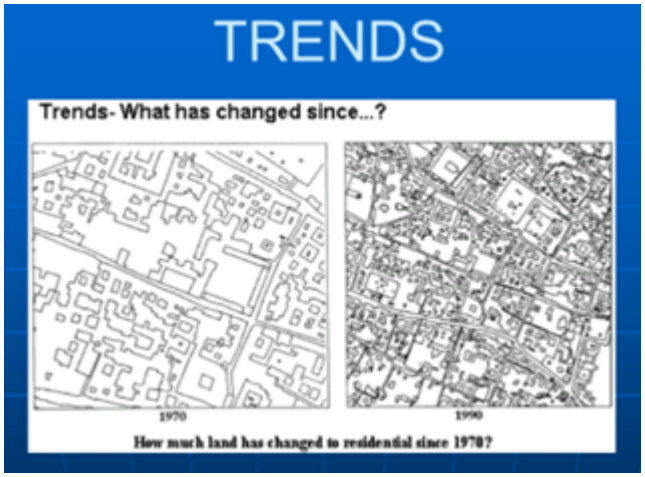
Where is a particular object located?

- The second question is the converse of the first and requires spatial data to answer. Instead of identifying what exists at a given location, one may wish to find location where certain conditions are satisfied e.g.
- Schools having 15 classrooms & made up of local bricks.
- A park area within 100 meters of a road, and with soils suitable for supporting buildings.



What change has taken place?

- Trends- What has changed since...?
- The third question might involve both of the first two and seek to find the differences.
- e.g., in land use or elevation within an area over time.

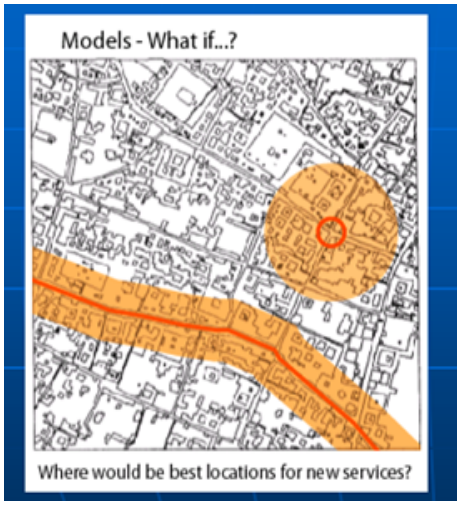


What is the spatial pattern?
What pattern exists...?

- This question is more sophisticated.
- Eg: One might ask this question to find out at which traffic points accidents are occuring most frequently

What if?

- Modelling- What if...?
- "What if…" questions are posed to determine what happens, for example, what are the effects on urban areas, if the road is expanded by one hundred meters, or delineate 5m buffer zone around the national park to prevent from grazing. Answering this type of question requires both geographic and other information.



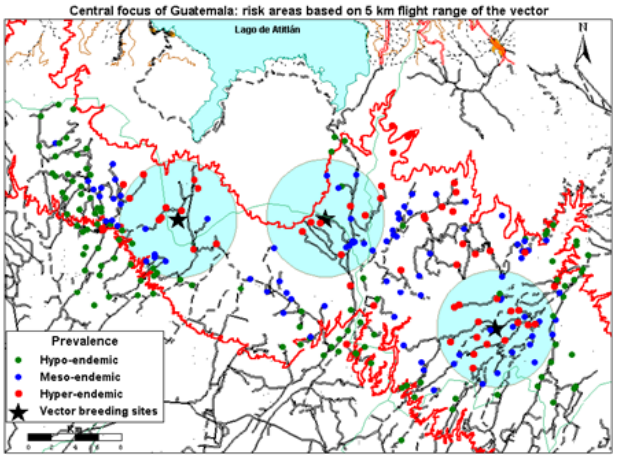
What can you do with a GIS?
Geographic Information Systems (GIS) have various applications, and technological advancements have significantly enhanced GIS data, specifically how it can be used and what can be achieved as a result. Geographic Information Systems are powerful decision-making tools for any discipline since it allows the analyzation of environmental, demographic, and topographic data. Data intelligence compiled from GIS applications help companies and various industries, and consumers, make informed decisions.

Activity 2 – Open Discussion How GIS can be used in various Disciplines

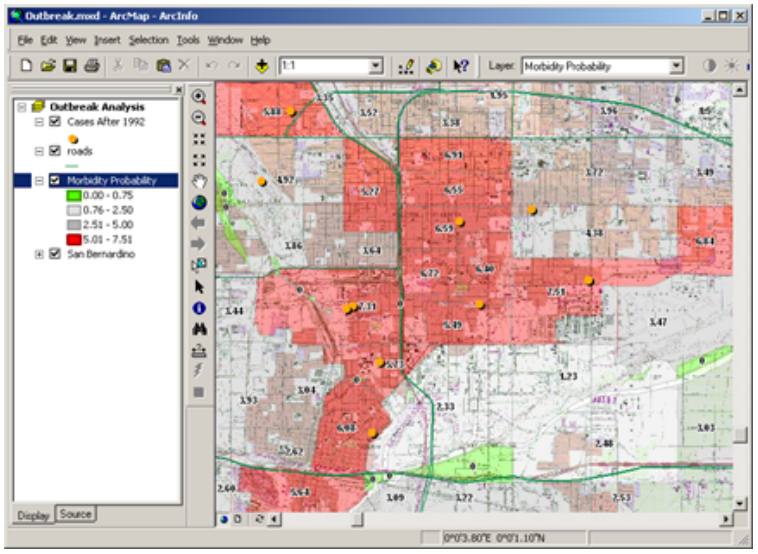
GIS Applications

GIS in Health Services
- Planning Health Facilities
- GIS helps in locating the nearest Hospitals and Health Centers at the time of Emergency
- Disease Outbreak Analysis
- GIS helps in quickly analyzing the location of any disease outbreak in an area

Health Facilities

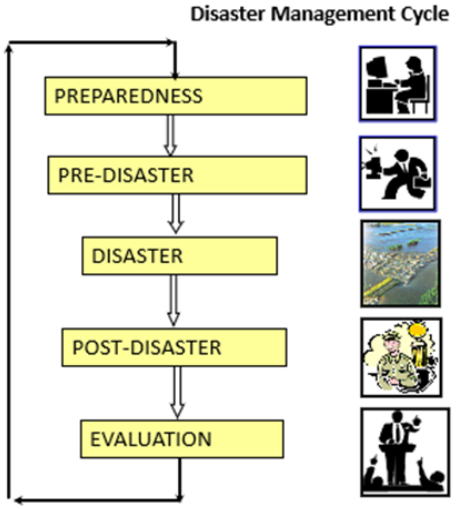


Outbreak Analysis

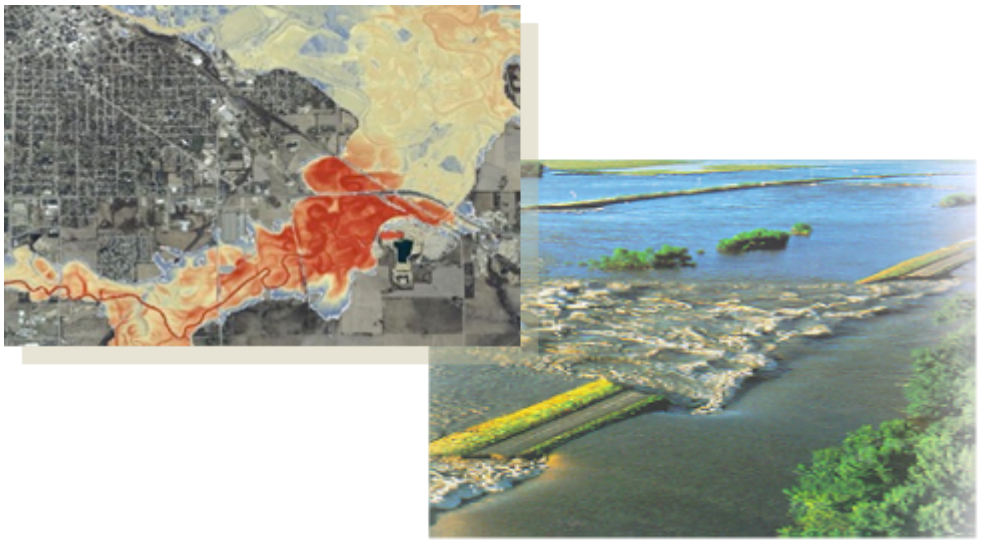


GIS for Disaster Management

- Disaster Planning
- Predicting
- Response requirement study / Disaster Preparedness
- Protection needs
- Modeling & simulation (using GIS)
- Modeling Disaster assistance centre
- Post Disaster Records management
- Post Disaster Situation Visualization



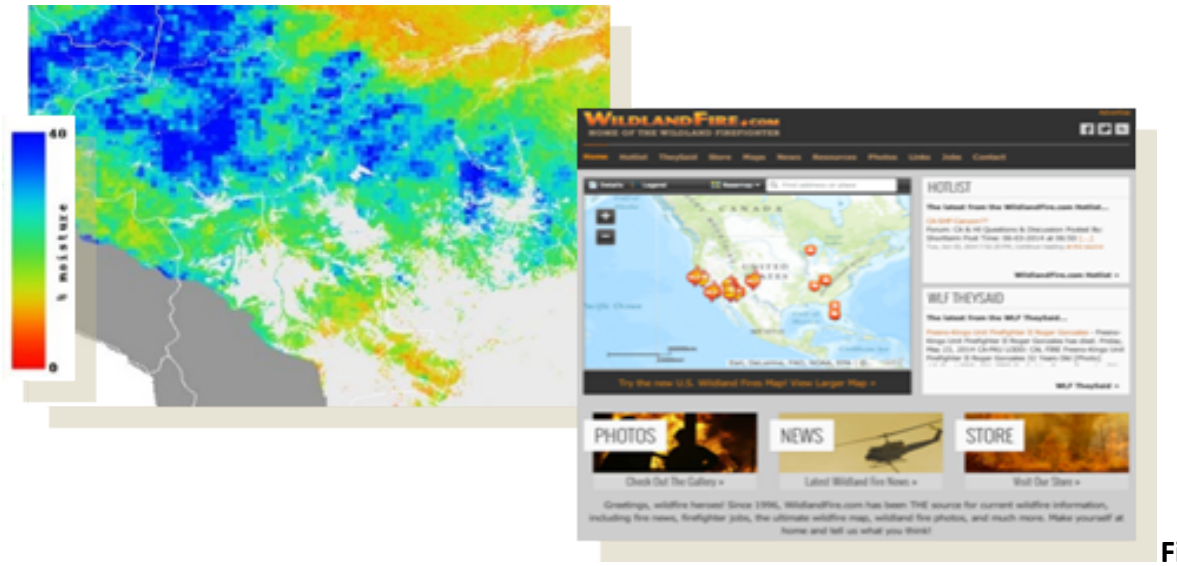
- Flood hazard Monitoring
- GIS helps in mapping for land use
- planning in flood-prone areas and creating flood risk zone maps for future prevention from the disaster



Flood Assessment

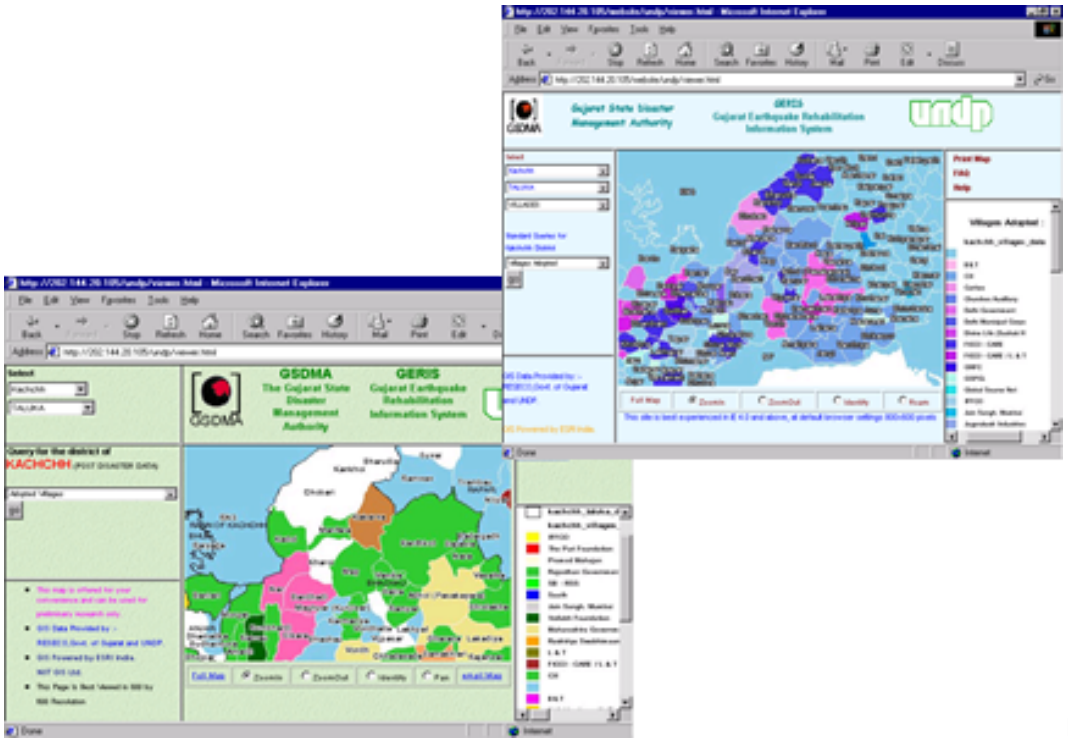
- Forest Fire
- GIS enables Forest fire risk zone analysis and mapping is necessary to prevent the spread of fire by detecting the areas where fire can start and easily spread.

Fire Prediction



Fire Incident

- Earthquake Monitoring
- GIS helps in analyzing the relevant data for monitoring earthquake prone zones for planning proper rescue mission at the time of disaster



Earthquake Monitoring

GIS for Defence

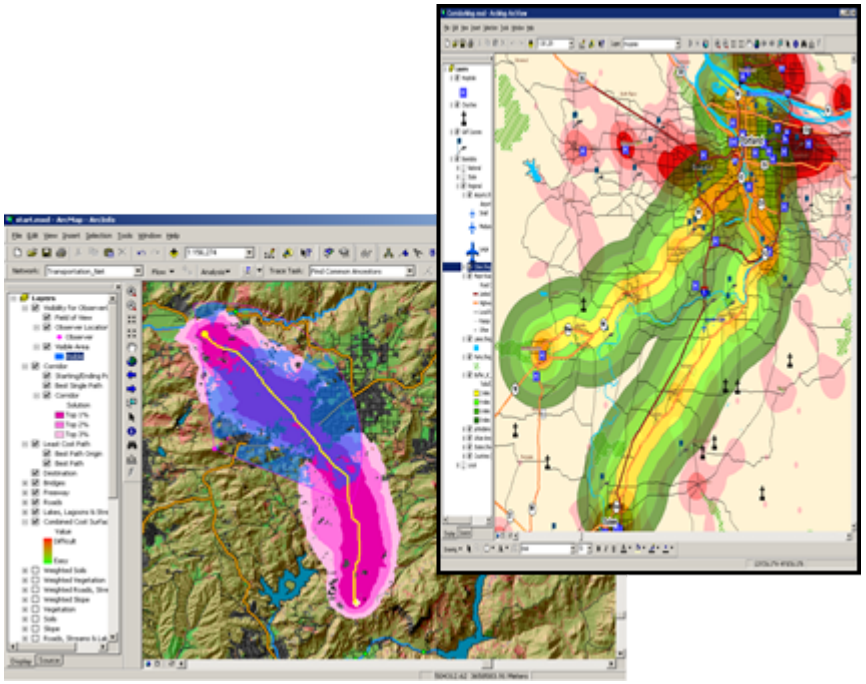
- Military Operations

GIS plays a pivotal role in military operations. The concept of Command, Control, Communication and Coordination in military operations is largely dependent on the availability of accurate, spatial information to arrive at quick decisions for operational orders. In the present digital era, GIS is an excellent tool for military commanders in operations. The use of GIS applications in military forces has revolutionized the way in which these forces operate and function. Military forces use GIS in a variety of applications including cartography, intelligence, battlefield management, terrain analysis, remote sensing, military installation management and monitoring of possible terrorist activity.

Command Control

- Defence Estate Management

GIS helps in mapping and managing the defence lands from civil encroachments and land use planning for Military activities.



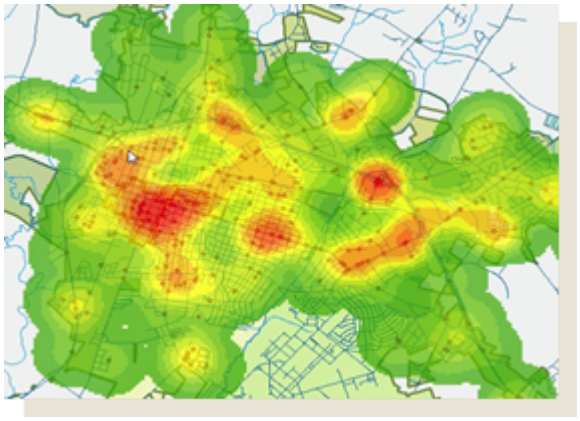
GIS for Public Safety

GIS can also be used to get critical information to emergency responders upon dispatch or while en route to an incident to assist in tactical planning and response. GIS helps identify potential suspects to increase

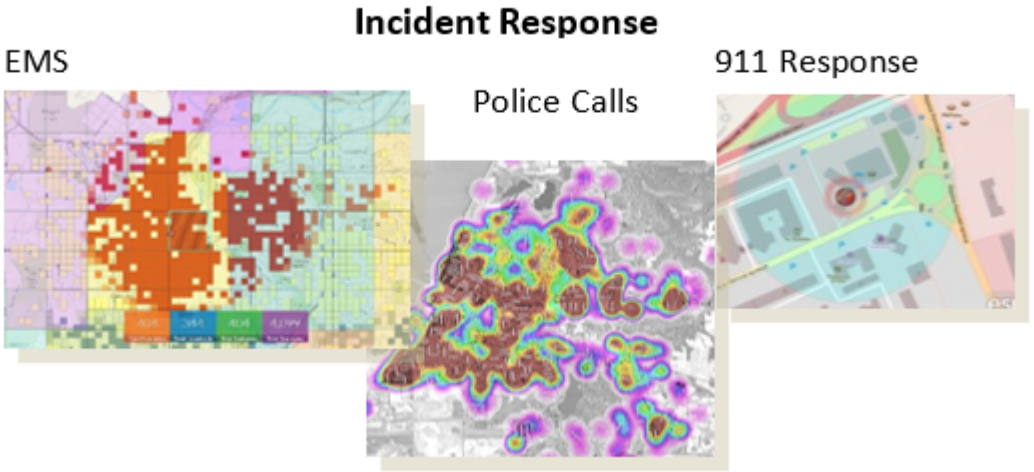
investigators' suspect base when no leads are evident. GIS plays an important role in crime mapping and analysis. Response capabilities often rely on a variety of data from multiple agencies and sources.

- Crime mapping and Analysis and Incident Reporting

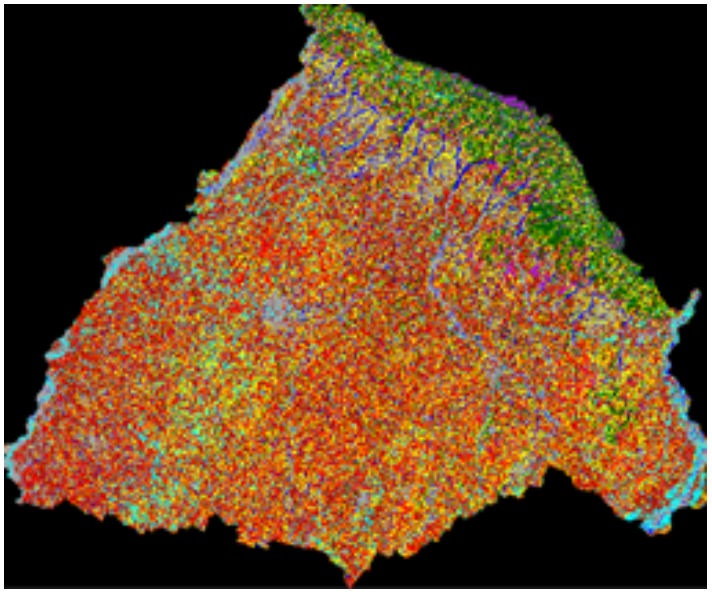
GIS is helping save lives in the public safety and security area by
- improving incident response,
- finding patterns of crime,
- helping us understand the implications of social and ethnic violence
-provide mapping solutions for crime analysis, criminal tracking, traffic safety, community policing, Intranet/Internet mapping, and numerous other tasks.



Crime Analysis

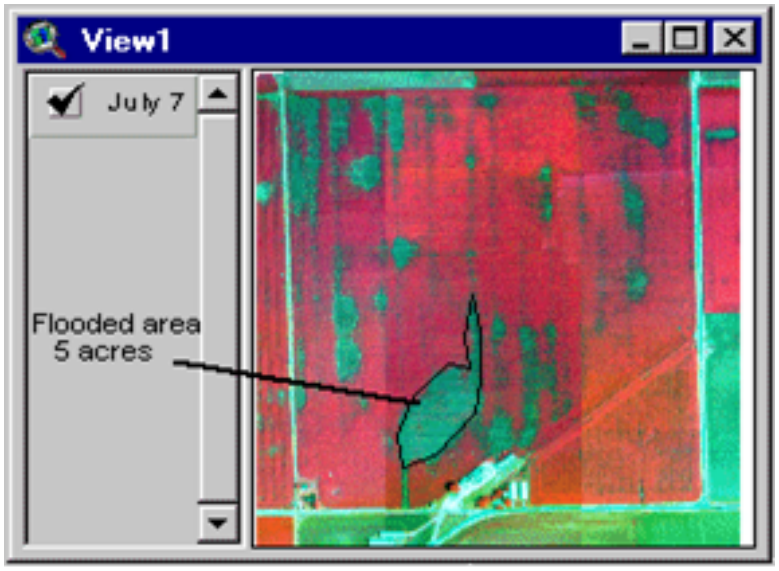


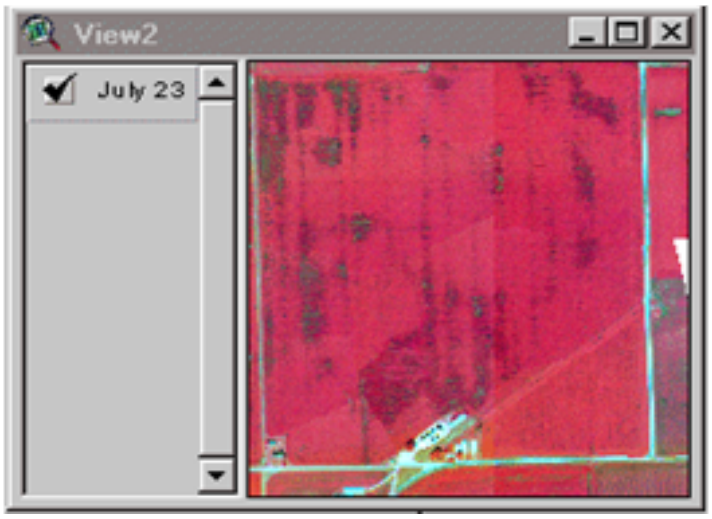
GIS in Agriculture
- Precision Farming
- GIS greatly contributes to managing timely, accurate, cost-efficient and repetitive information about agriculture.
- Monitoring Crop Yield and Health
- GIS enables monitoring of crop growth, health, and accurate or near accurate prediction of yield



Analyzing Agriculture Yields

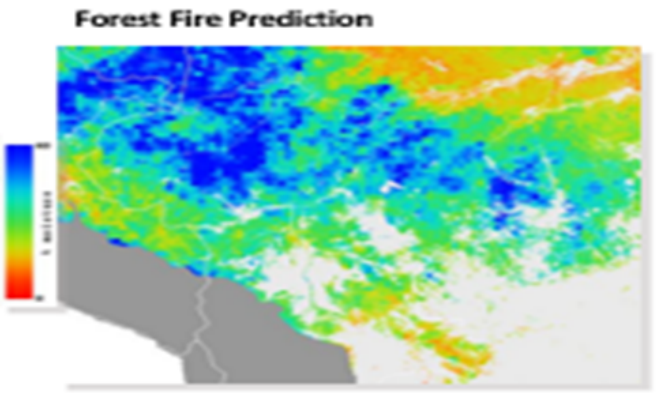
• For instance, by applying GIS technologies can be of great use for monitoring the development process of crop, identifying affected areas, determining soil quality condition, yield forecasting, visualizing real topography of crop fields and other spatial analyses in modern agriculture or elevation to assist with crop management, site suitability, and drainage planning, as well as risk prevention from flood, drought, erosion, and disease.





GIS in Forestry

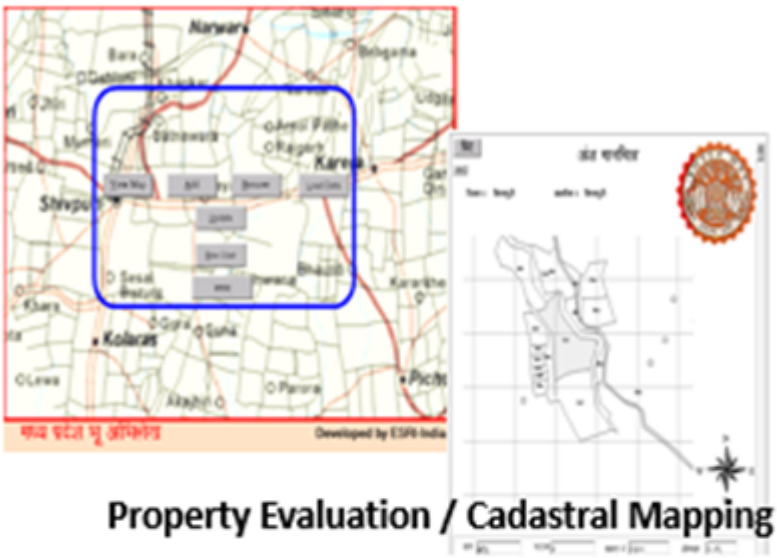
- Forest Fire Monitoring
- GIS has been quite effective in Management activities which include fire prevention, wildlife control, prescribed burning, and post fire recovery actions
- Forest Resource Management
- GIS helps in Restoration of the forest, Inventory of all types of vegetation species, maintaining the habitat culture, forest map production



GIS for Urban Planning

- Property Taxation /Revenue Mapping
- GIS can help in monitoring property tax revenue by creating a common platform that visually links all property-related data.

- Solid Waste Management
- GIS helps in waste collection optimization and waste disposal planning, can locate storage containers, prioritize inspections, and monitor the transportation of hazardous materials.



Property Evaluation / Cadastral Mapping

Waste Management

GIS for Citizen Engagement through Apps

Citizens also use GIS in daily life by using Apps such as given below. These apps are all based on GIS especially the location information i.e Latitude and longitude which is being used at the backend for tracking and finding destinations etc.

GIS Applications in Different Disciplines

1. Urban Planning
2. Rural Planning
3. Disaster Management and Mitigation
4. Flood Damage Estimation & Management
5. Land Management
6. Agriculture and Forestry Management
7. Location & Navigation Tracking (Zomato / Uber /Ola/Amazon etc.)
8. Irrigation Water Management
9. Transportation Planning
10. Environmental Impact Analysis
11. Climate Change Mapping
12. Architectural, Engineering & Construction Planning
13. Infrastructure and Utilities
14. Wildlife Conservation
15. Surveying and Mapping
16. Vehicle Tracking & Route Planning
17. Banking & Insurance
18. Public Security & Crime Mapping
19. Health Services & Epidemiology
20. Defence & Military Applications
21. Ecology and Biodiversity
22. Mining & Geology
23. Education
24. Natural Resource Management
25. Water Resource

Activity:

After a fruitful discussion please Make a list of 15-20 GIS Applications that can use GIS from your Surrounding with respect to

- What Exists – at a particular location
- Where is that Location
- What if scenario - Spatial Pattern
- What change has taken place

You can visit a google website for research.

You May Read More GIS Applications - https://gisgeography.com/gis-applications-uses/

Exploring GIS as a Career Option

GIS technology is ubiquitous and the expanse of its reach in multiple fields is growing rapidly. Most technologies require a spatial component, and it is one of the pillars of emerging technologies. Be it our day-to-day activities or cutting-edge futuristic research, none can be visualized without geospatial information. A vast range of career opportunities are available in this field.
https://www.esri.com/en-us/what-is-gis/careers

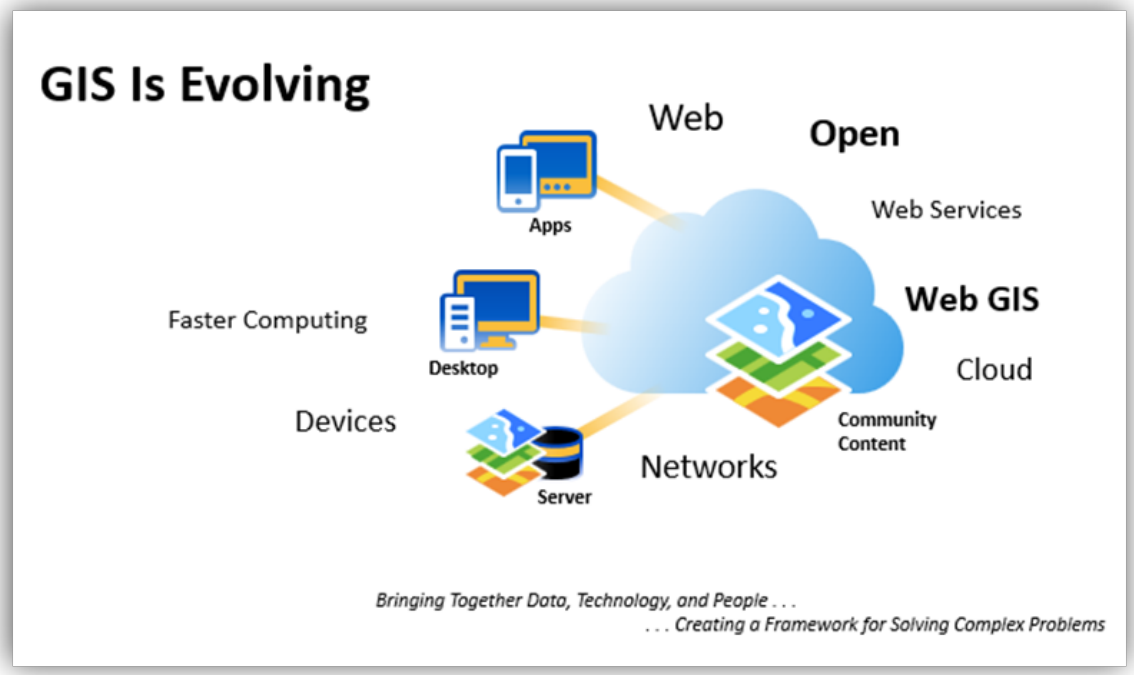
Understanding GIS Career
GIS is Changing How We Think and Act

GIS changes, obviously, how we think and how we act. In that sense, it's transformational. It also integrates geographic science into everything we do

- what we measure, how we analyze things, what predictions we make, how we plan, how we design, how we evaluate, and ultimately how we manage it - a whole workflow of activities.
- What GPS did as a technology is that totally transformed us as human beings so that we're never lost. Same way GIS is exactly that pervasive - that our organizations would not be lost, that our communities would not be lost, that our society would not be lost, that those trends would be reversed, that we could actually dream of and create a more sustainable future.

GIS Is Evolving
GIS is becoming a part of an interconnected platform.
Not that you want to share everything, but certainly this trend is emerging.
So, these are interesting times when Web GIS is bringing together all of our data and connecting it along with our technologies and our people.
It's creating a framework where we can work on challenging problems.
It's a pattern of apps that make cool maps, that do analytics, that provide pervasive access to your work, that support content management better and go online with content, and more collaboration, and why?

What does this mean?
GIS is getting easier, it's getting more accessible, dramatically, and it's becoming social.



Many Reasons to Choose GIS as a Career
Do you want a career or just a job?
Do you want to be paid for doing something you love to do or just collect a paycheck? A career where GIS is a fundamental part of your day allows you to be immersed in a field where you can continually grow and move forward in an environment of lifelong learning.

Do you want to do something cool?
GIS is an exciting, rapidly changing, and cool technology that merges nicely with many other technologies you may be interested in, such as video, web development, and phone apps.

Do you want to do something important?
GIS is a green technology that is making a difference on our planet and to its people every day for key decisions about wildlife habitat, human health, renewable energy, climate change, water quality and availability, wilderness areas, and much more.

Do you love maps?
For thousands of years, maps have been fascinating and powerful sources of information. GIS combines the best of visualization and technology. Today's maps are not just reference sources, they are dynamic, and you can change them to suit whatever need you have or problem you are trying to solve.

Are you curious about your world?
GIS allows you to investigate what-if scenarios, model, ask questions, and investigate possible outcomes.

Do you care about the well-being of your local community?
A career in GIS enables you to do something about issues in your own community: health, zoning, services, greenways, crime, trash, traffic, and more.

Building a GIS Career
Plan Your Career in GIS When You're in School

It's never too early to plan for your future GIS career. If you think, live, and breathe GIS, integrate GIS into class projects. This is how to build experience for your future in GIS. Nothing makes a candidate stand out more than having a portfolio of work.

How to get started in GIS

The starting point in building a successful career in GIS is a solid education. This involves taking classes in cartography, GIS, spatial analysis, database management, web technologies, and programming.

Minimum level of education for a career in GIS

Most employers strongly prefer at least a bachelor's degree. Depending on the industry of the job listing, that degree would preferably be in Geography, Computer Science, Engineering, or Urban Planning.

Job seekers that already have a bachelor's degree in another major should supplement their college education with a certificate program. Those striving for managerial positions in GIS will be more successful if they also have a master's degree.

Learning GIS Software Applications

The next step is to take coursework that applies the concepts of GIS and cartography. These courses are always software specific so it's important to choose a class that teaches the software you will be using once employed.

Taking your GIS skills to the next level

The current trend in GIS is customization and application. More and more GIS packages are being altered to serve a specific GIS purpose.

Many of the software packages contain some ability for customization using programming languages.

Getting GIS experience

As with all fields, nothing beats real-world experience. Internships are extremely popular in GIS as they allow the employer a cheap source of labor for lower-level GIS tasks and, in turn, provide valuable training experience for the intern.

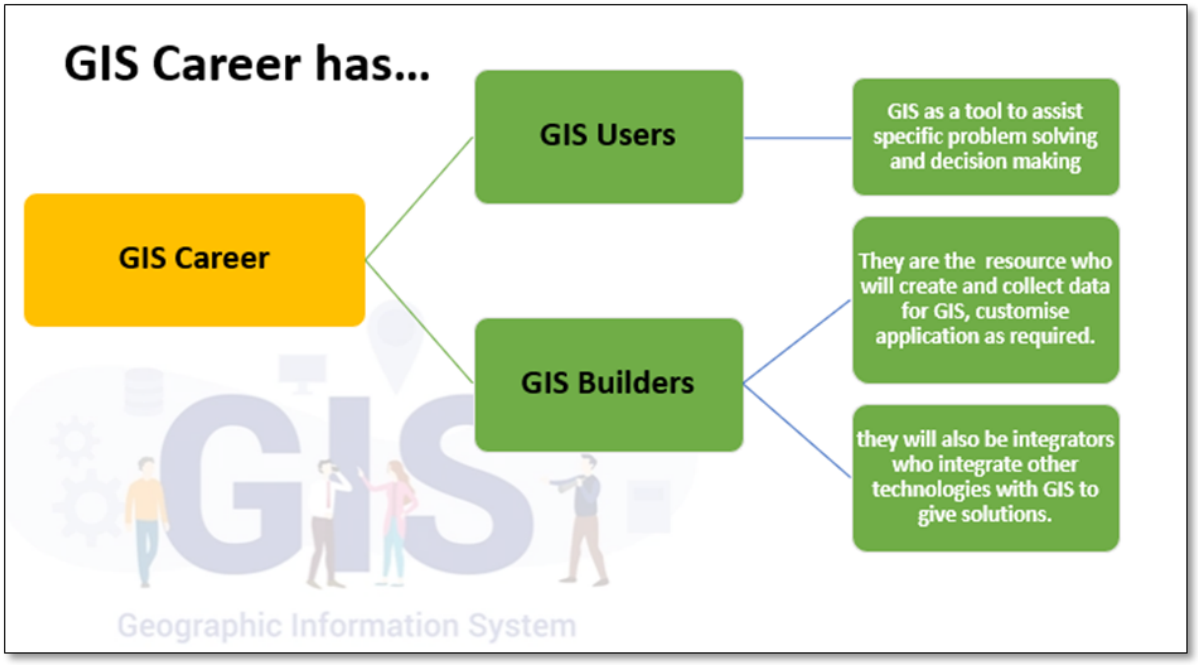
The only way to truly become proficient in GIS is to simply use it. The coursework will only serve to provide a base knowledge of the field and without some form of practical experience, most companies will not be interested in hiring.

Finding a GIS Job

Once you've completed your coursework and gotten hands on work experience, where do you look for a job? There are quite a few job sites on the internet specializing exclusively in GIS employment opportunities.

GIS Career can be divided into two

- GIS Users are the users who use GIS as a tool to assist specific problem solving and decision making
- GIS Builders are the resource persons who will create and collect survey data, customise application based on requirements using various coding and programming languages and they will also be integrators who integrate other technologies with GIS to give solutions.

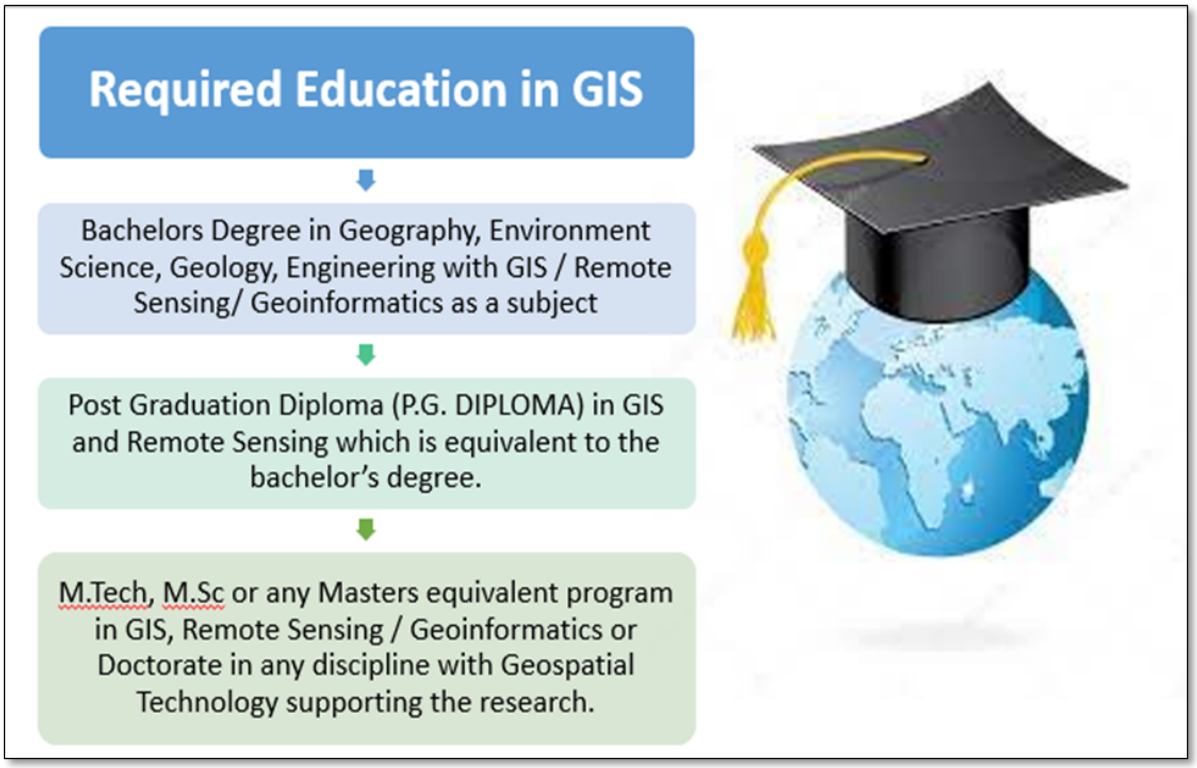


Major Responsibilities in a GIS Career

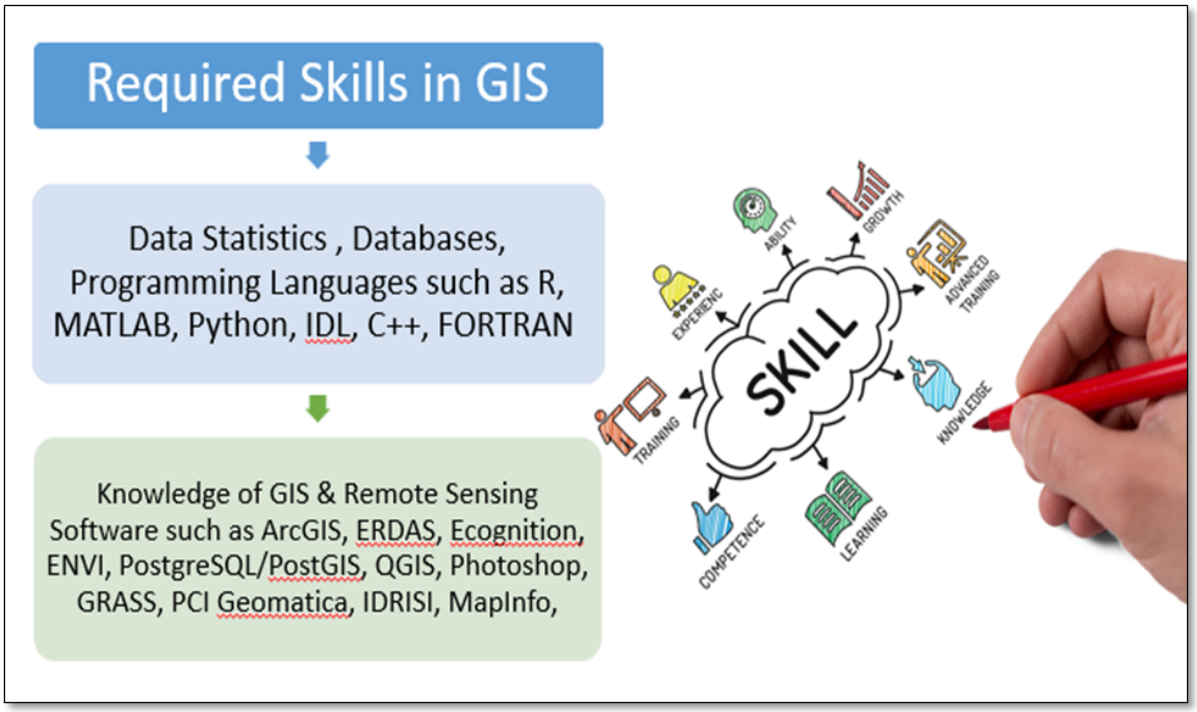
These are some of the Job responsibilities you will come across in a GIS Career

- Cartographic design
- Data analysis
- Computer programming
- Database administration
- Project management
- System administration
- Careers in GIS can also encompass business development, managerial, and administrative roles.

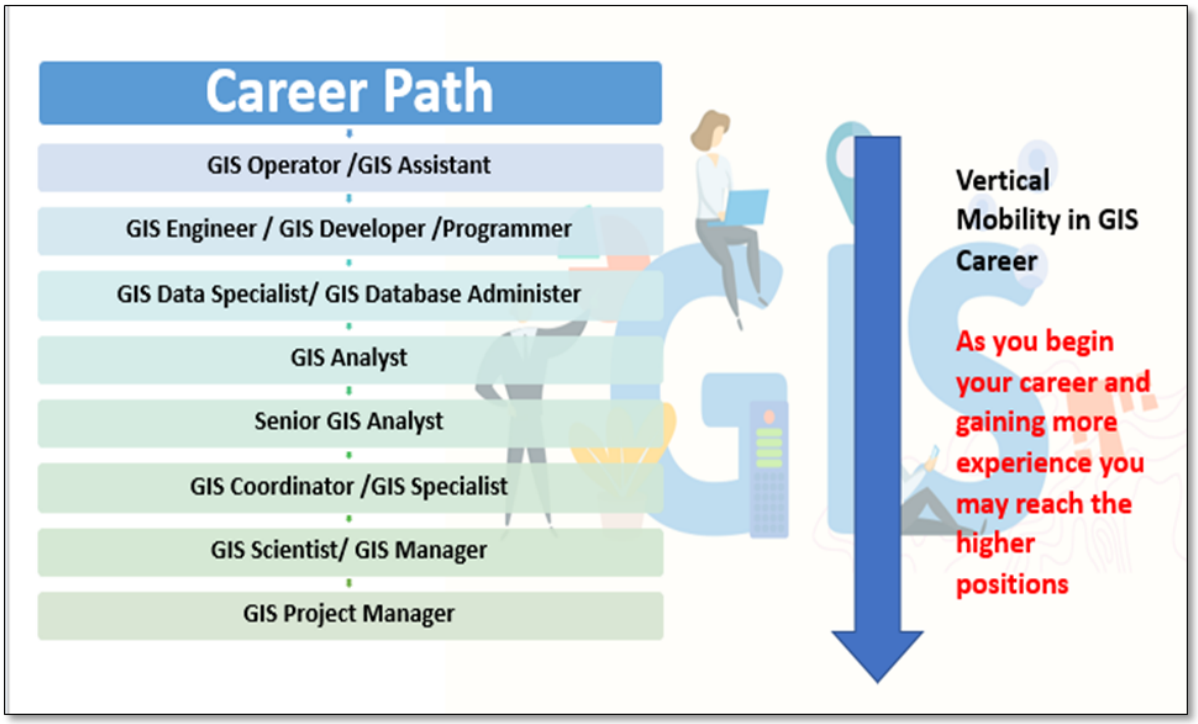
Required Education in GIS



Required Skills in GIS



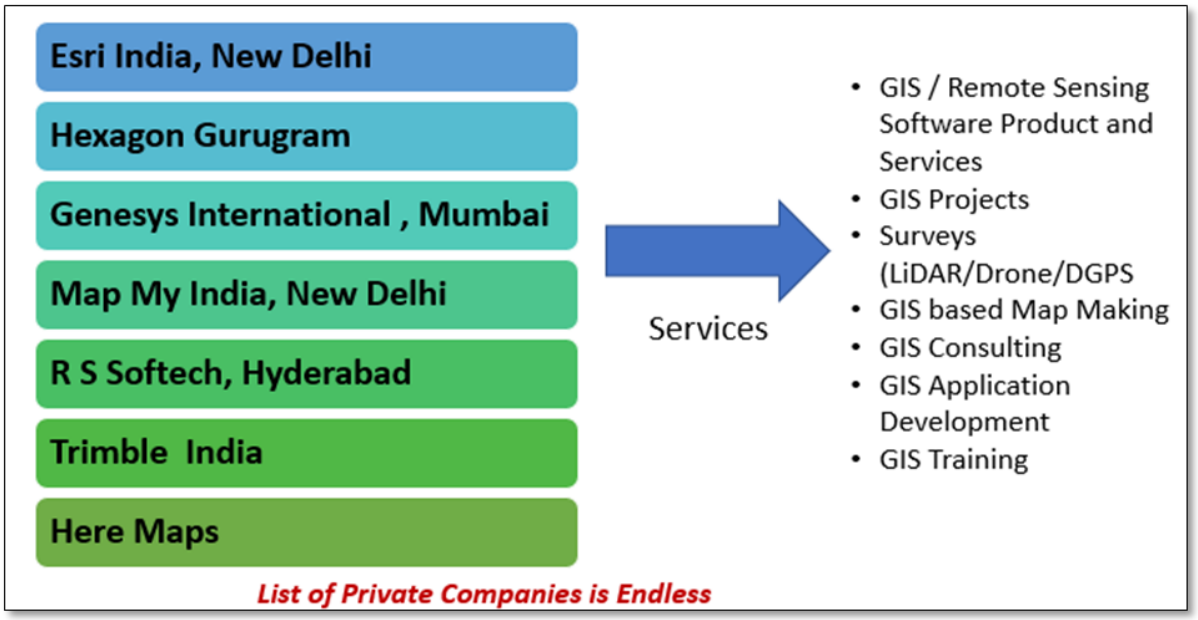
Career Path



Government /Public Sector Organisations where you can pursue your GIS Careers

- Survey of India
  -More than 100 years old National Mapping organisation is working towards development of Base Maps with latest Technologies.
  -Headquartered in Dehradun with 22 Directorates across India
  -Train Professionals in various specific technology such GIS, GPS, Photogrammetry, Survey, Cartography, etc.
- National Remote Sensing Centre
- One of the primary centers of Indian Space Research Organisation (ISRO), Department of Space (DOS).
- NRSC has ground stations for receiving satellite data, generation of data products, dissemination to the users, and development of techniques for remote sensing applications.
- 5 Regional Remote Sensing centers across the country for promoting remote sensing applications for various states.
- Defence Geoinformatics Research Establishment (DGRE)
- The only establishment of its kind in DRDO to provide cutting edge terrain intelligent solutions to the Armed Forces.
- DGRE has 05 Research & Development Centres (RDCs) in the Himalayan Region
- DGRE is a leader in the development of critical technologies for enhancing combat effectiveness for mapping, forecasting, monitoring, control and mitigation of landslides and avalanches in Indian Himalayas.
- National Informatics Organisation
- NIC under the Ministry of Electronics and Information Technology (MeitY) is the technology partner of the Government of India.
- Dedicated GIS/RS Department at the centre connected with State NIC divisions to impart GIS Based solutions to providing e-governance.
- NIC offers a wide range of services which includes multi-layered GIS based platform

Private Companies giving Opportunities in GIS Career



Fields that use Geospatial Technology

- Agriculture
- Archaeology
- Banking and Financial Services / Insurance
- Census
- Conservation / Forestry
- Defense and Military Intelligence
- Disaster Management / Hazard and Risk Analysis
- Education & Research
- Economic Development
- Education Administration
- Education and Research
- Elections
- Emergency Response
- Energy / Oil and Gas Pipelines
- Engineering
- Environmental Health
- Environmental Law
- Environmental Planning
- Epidemiology
- Geography
- Government
- Geology & Mining
- Health Care Delivery and Policy
- History / Social Services
- Public Safety /Homeland Security / Law Enforcement
- Hydrology
- Land Records and Cadastral
- Location Based Services
- Surveying, Mapping and Cartography
- Marine and Coastal Ecology
- Media and Press
- Oceanography

- Real Estate
- Sustainable Development
- Transportation and Logistics
- Travel and Tourism
- Urban & Rural Planning
- Utilities (gas, electric, water, sewer

Activity: Creating a GIS Career Concept Map
Create a Concept Map to list Career Option you would like to pursue in future.

Materials Required
- chart paper
- computer/internet/printer
- glue/markers /scissors
- Make a group of 2 students

Instructions for Creating a GIS Career Concept Map
- You will choose one GIS career path of interest to put in the center of the chart paper to create a concept map.
- You will add the following stems to their Career map:
  - What stream will you choose in their 11th/12th grade?
  - What higher education will you pursue after 12th grade?
    - What organisations or types of organisations in India will need people from this career path?
    - (If time permits) use Google to find examples of people who have pursued this career path
  - What skills or training does a person in this job need?
  - Where does a person with this job work?
  - What does a person with this job do?
  - Why is this career important for you?

Create lists under each stem that answer the above questions.
You can cut and paste or sketch pictures related to the chosen career around the concept map.
You will present your work at the end.

Here are two videos about GIS as a career in India which you can watch:
https://www.youtube.com/watch?v=c5wPlubRdQM
https://www.youtube.com/watch?v=BPnDDlSzQos

Latest Trends in GIS Technology

GIS has evolved largely because of advancements in technology. The evolution of GIS is far from over, with exciting new software and methods continuing to change the way people utilize this GIS technology. If every new tech trend gives you more questions than opportunities, we have a solution.

- GIS technology is establishing itself as an essential tool for organizations to collate different maps and remote sensing data and generate location-specific business models.
- GIS technology is developing at an accelerating rate, and it may be hard to keep pace with the latest trends and implement them successfully in your business.
- GIS market value will increase to $24,607.7 million in 2030. In 2020 the GIS market revenue reached $8,185.9 million, and this number is to grow at a CAGR of 11.6% in a decade.

For Example –
"In 2005, Google released two products that completely changed the face of geo-spatial development: Google Maps and Google Earth made it possible for anyone with a web browser or a desktop computer to view and work with geo-spatial data. Instead of requiring expert knowledge and years of practice, even a four-year-old could instantly view and manipulate interactive maps of the world.

Top Upcoming GIS Trends

#1 Real-Time Data

This GIS technology trend allows people to interact with data in real time. Mobile GIS apps generate and analyze data from thousands of sources. Many GIS fields need this innovation for instant accessing spatiotemporal data. Besides, spatiotemporal applications are useful for marketers, transportation dispatchers, and decision-makers.

#2 Miniaturization of Sensors

The miniaturization of sensors is the driving force of market growth. The small size of sensors makes them more efficient, cost-effective, easily accessible, and popular. Now they can help customers in many ways by collecting more real-time data.

#3 Disaster Mitigation and Response

Incorporating advanced GIS technologies can help predict and prepare for natural disasters. With the Geographic Information System, people can quickly process large amounts of data to develop action plans and save lives. Today, geospatial data has been used in interactive visual analytics to track the spread of the Covid-19 virus.

#4 Self-Driving Vehicles

The driverless vehicle industry is growing at an accelerating rate. GIS technologies play a crucial role in this process. They enable cars to operate safely using radar and lidar. Access to high-definition geospatial details ensures successful navigation.

#5 Smart Cities

Thanks to GIS technology and especially sensors, people can benefit from a better living experience. Collecting data with geospatial is a core for building an efficient Smart Cities framework. In India almost all states have many Smart Cities which are using GIS technology.

#6 Sustainability

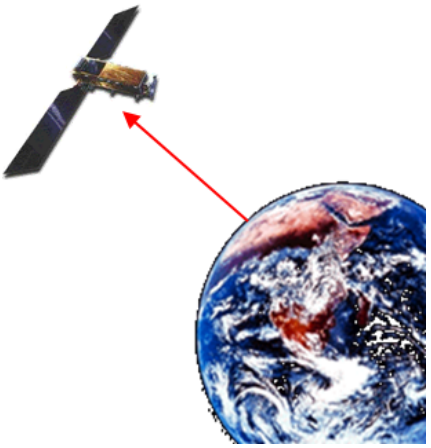
Sustainability initiatives are crucial today when climate changes affect people around the globe so dramatically. Smart technologies can help governments and businesses reduce their carbon footprint. GIS

technology enables us to map out sustainability plans by visualizing and analyzing important data. The 2030 Agenda recognizes the value of geospatial information in making informed, data-driven decisions.

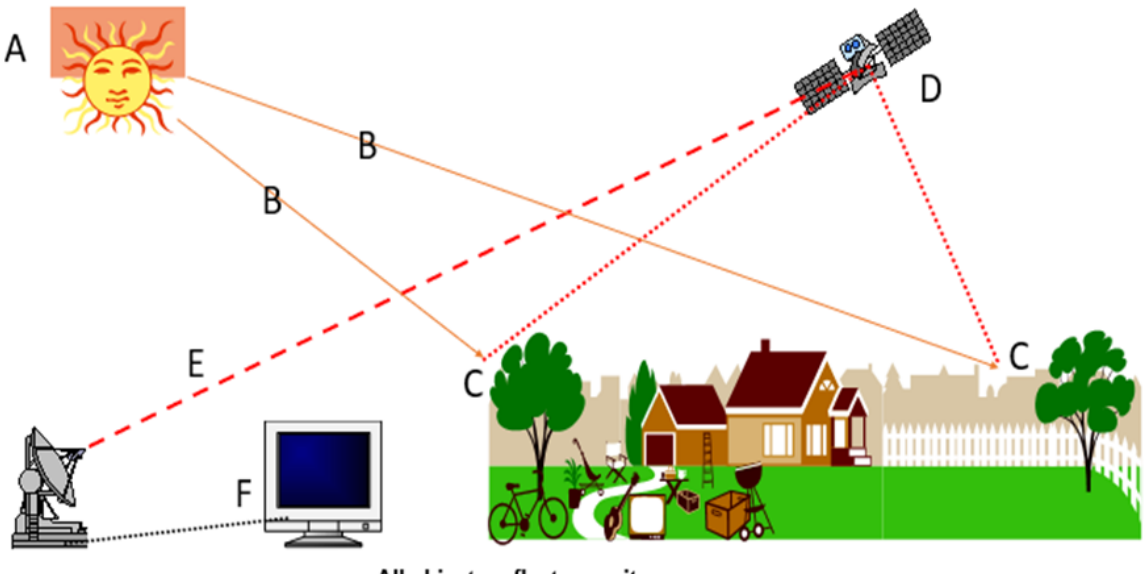
#7 LIDAR
This is the new trend in GIS technologies. Light Detection and Ranging (LiDAR) is one of the new trends in GIS we cannot miss. LiDAR is a major support to geospatial technology as well as an industrial revolution. It's used in various mapping applications, including forestry, urban planning, wreck detection, etc. Businesses adopt LiDAR for accuracy, support of autonomous vehicles, and mapping backpacks.

#8 Drones /UAVs
Drones /UAVs are robots or unmanned aerial vehicles flown over a certain amount of land for gathering data with high accuracy sensors gathering data from farms for pest management and crop management, roads for traffic congestion and rerouting for congestions, mapping the high-density forests and rivers, and many more. Robots and drones do the survey which makes it more time and resource efficient.
Watch a YouTube Video
https://www.youtube.com/watch?v=J-31pLWwNMQ&t=4s

Remote Sensing
What is Remote Sensing ?
"Remote sensing is the science (and to some extent, art) of acquiring information about the Earth's surface without actually being in contact with it. This is done by sensing and recording reflected or emitted energy (EMR) and processing, analyzing, and applying that information."



Remote Sensing Process



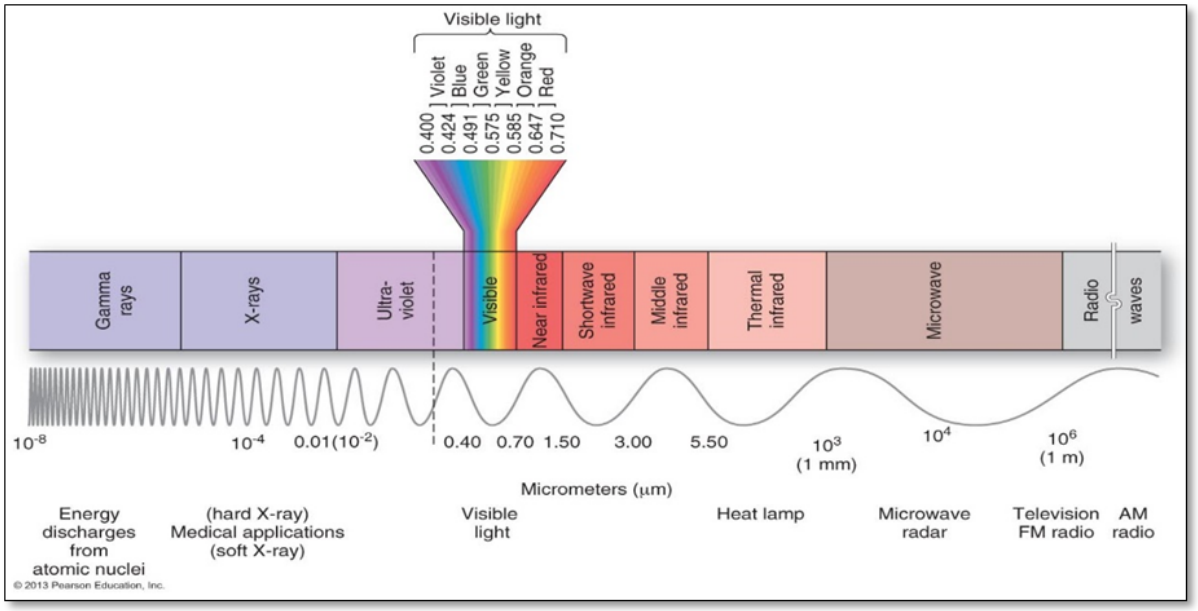
1. Energy Source or Illumination (A) - the first requirement for remote sensing is to have an energy source which illuminates or provides electromagnetic energy to the target of interest.
2. Radiation and the Atmosphere (B) - as the energy travels from its source to the target, it will come in contact with and interact with the atmosphere it passes through. This interaction may take place a second time as the energy travels from the target to the sensor.
3. Interaction with the Target (C) - once the energy makes its way to the target through the atmosphere, it interacts with the target depending on the properties of both the target and the radiation.
4. Recording of Energy by the Sensor (D) - after the energy has been scattered by, or emitted from the target, we require a sensor (remote - not in contact with the target) to collect and record the electromagnetic radiation.
5. Transmission, Reception, and Processing (E) - the energy recorded by the sensor has to be transmitted, often in electronic form, to a receiving and processing station where the data is processed into an image (hardcopy and/or digital).
6. Interpretation and Analysis (F) - the processed image is interpreted, visually and/or digitally or electronically, to extract information about the target which was illuminated and ready for various applications

Electromagnetic Radiation/Spectrum (EMR)

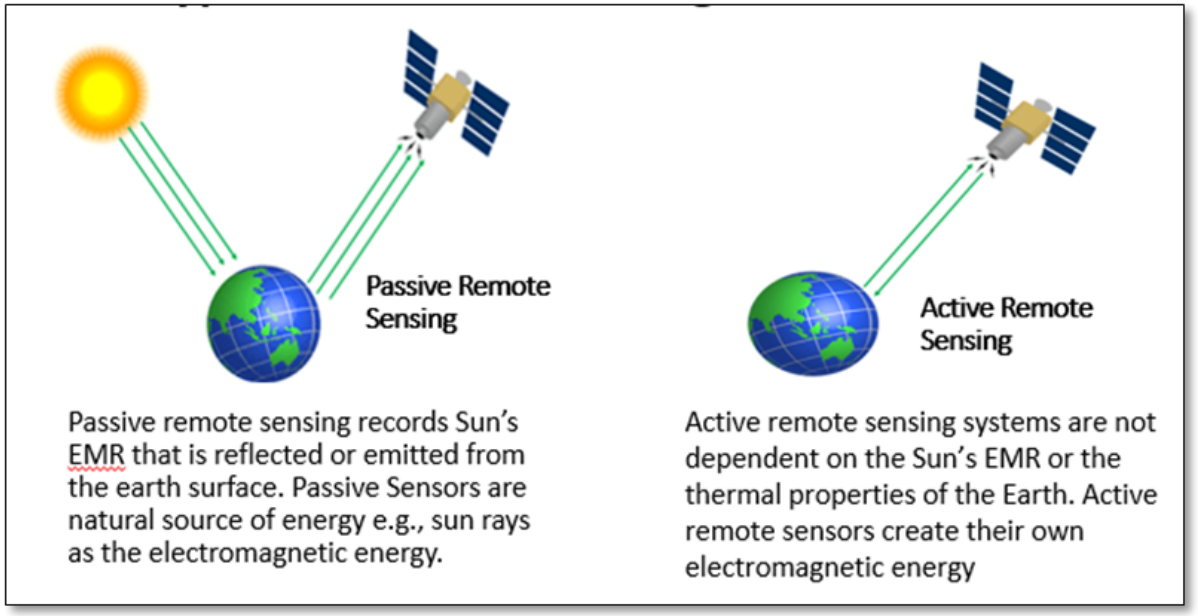
In the field of remote sensing, we are mainly concerned with the interaction of light with the earth surface features. White light is a bundle of electro-magnetic energy also known as Electo magnetic radiation or spectrum

What are the sources of E.M. energy?

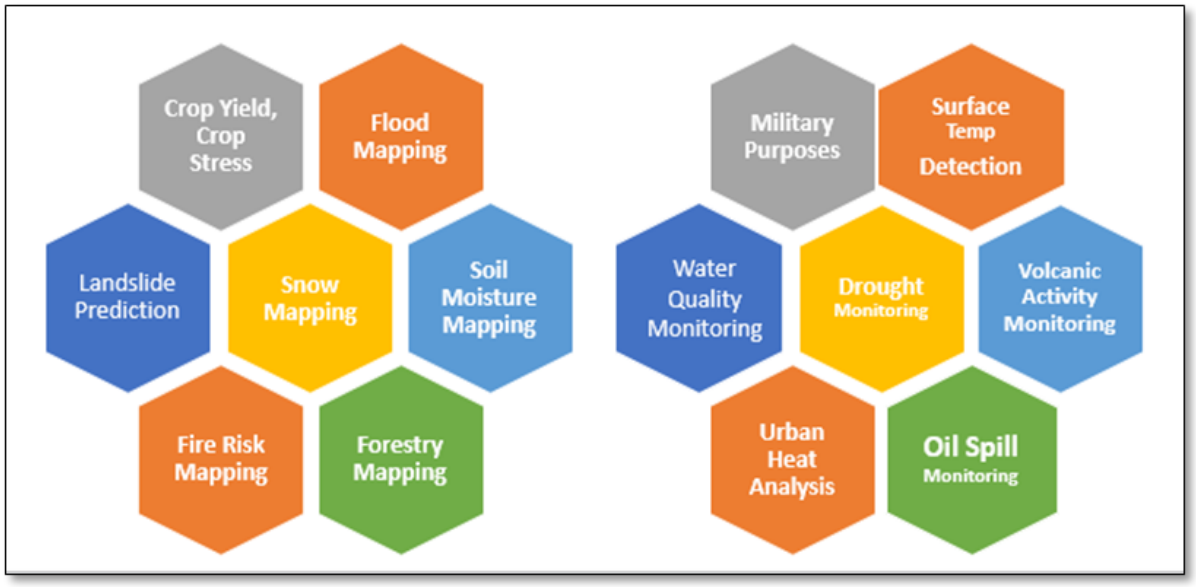
a) Natural Light – Sunlight or Earth's emission
b) Artificial light – Flashlight, Radar or Laser



Types of Remote Sensing



Applications of Remote Sensing



Drones / UAVs (Unmanned Aerial Vehicles)

What is a Drone?

Unmanned Aerial Systems (UAS), also known as drones, are aircraft that fly without a human pilot on board. Drone flights are controlled either via radio by a pilot on the ground or by a preset flight path set by a computer program.

Drones are unmanned aerial vehicles (UAVs) that make our lives easier than before. They are used in situations where human flights are difficult and risky. Drones are used to inspect suspected locations from a safe distance controlled by an individual.

The applications of drones are not limited to the military world; the usage has grown tremendously in the civilian and commercial industries over the past decade. UAVs are used in surveillance and delivery applications as well as in asset protection, disaster response, search and rescue operations, and healthcare and agriculture.

Drone Applications

Drone technology continues to advance, making drones ideal tools for gathering certain ground data that can pair well with more traditional techniques. Initially Drones were known for their military use, drones are now being used by individual entrepreneurs, SMEs, and large companies to accomplish various other tasks.

Think about making a delivery, for example. The destination has a specific address, which on a traditional map will be plotted on the corresponding street. But maybe the door at the plotted location isn't where that building accepts deliveries. Maybe deliveries need to go to the door around the back. A drone can help with this level of detail to better streamline last-mile delivery and give drivers accurate information about their location.

Some of the major Applications of Drone Technology are as follows:

- Military Applications
- Survey & Mapping
- Precision Agriculture
- Urban Development
- Forest and Wildlife
- Health care
- Entertainment
- Tourism
- Traffic Management
- Disaster Management
- Public Utility
- Aerial Photography

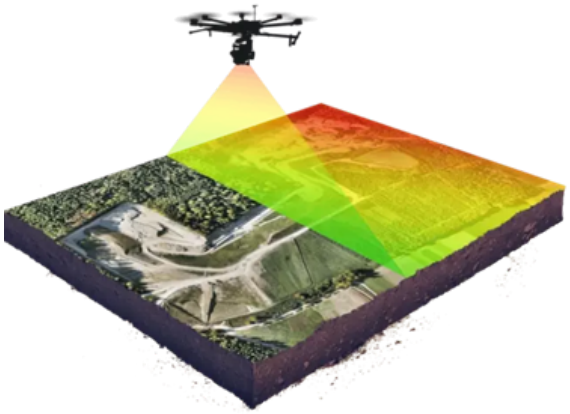
Benefits of Drones Technology

- Maintaining Safe Environments
- Cost Saving Technology
- Quality of Aerial Imaging
- Precision
- Easy Controllable or Deployable
- Security
- Minimises Obvious Danger and Health Risks
- In-depth and Detail Data In place
- Flexibility for Quick Inspections
- Reach Hazardous Area

LiDAR (Light Detection and Ranging)

What is a LiDAR ?

LiDAR is an acronym for light detection and ranging. It is an optical remote sensing technology that can measure the distance to, other properties of a target by illuminating the target with light, often using pulses from a laser. These light pulses—combined with other data recorded by the airborne system—generate precise, three-dimensional information about the shape of the Earth and its surface characteristics.



LiDAR Platforms

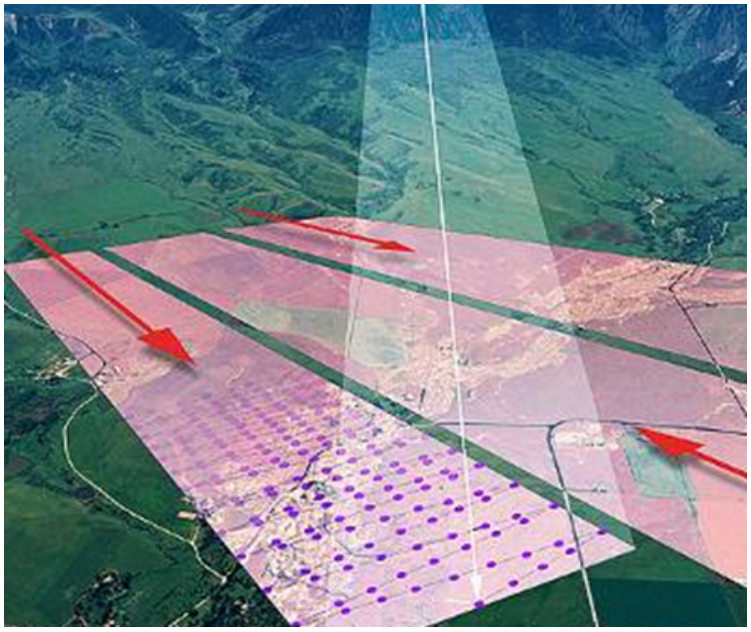
There are two types of LiDAR Platform

- Airborne LiDAR
- Ground Based LiDAR

Airborne LiDAR

- Mounting of Laser Scanning Lidar Sensor and positioning instruments inside an aircraft / helicopter / UAV /drone and flying over targeted areas is an effective and efficient technique for collection LiDAR data across tens to thousands of square miles.

- Airborne LIDAR, the system is installed in either a fixed-wing aircraft or helicopter. The infrared laser light is emitted toward the ground and returned to the moving airborne LIDAR sensor (based on active remote sensing).
- There are two types of airborne sensors:
- Topographic LiDAR - used to derive surface models for use in many applications
- Bathymetric LiDAR - type of airborne acquisition that is water penetrating.



Ground Based LiDAR

- LiDAR was first developed as a fixed position ground-based instrument for studies of atmospheric composition, structure, clouds and aerosols.
- Modern navigation and positioning system has enabled use of a new generation of lidar technology bringing the laser-based survey method down to Earth by mounting the instruments atop SUVs vehicles, boats and even backpacks
- Ground based LiDAR collects very dense and highly accurate points, which allows precise identification of objects. These dense point clouds can be used to manage facilities, conduct highway and rail surveys, and even create 3D city models for exterior and interior spaces, to name a few examples.
- There are two main types of terrestrial LIDAR:
- Mobile LiDAR
- Terrestrial LiDAR

LiDAR Applications

LiDAR technology has many applications and uses across various industries and fields. Below are some of the applications of LiDAR.

- Defence & Security
- Roads & Highways
- Telecom & Power
- Gas & Oil Sector
- 3D Mapping
- DEM
- As Built
- Railways
- Mining
- Infrastructure
- Urbanization & Development
- Forestry & Agriculture
- Topographic Surveying & Mapping
- Smart cities
- Disaster Management

LiDAR a Driver to the Future

- LiDAR is simple –Direct measurement
- LiDAR is the best technology for topographic data capture
- LiDAR data Captured once can be Used in Several Applications
- LiDAR can provide high degree of accuracy and more detailed information.
- LiDAR is being adopted by every mapping industry in the country.

Activity:

Let's watch some interesting Youtube Videos for better understanding of Remote Sensing, Drones and LiDAR in mapping and related fields.
Youtube Links as follow:
Remote Sensing:
https://www.youtube.com/watch?v=sBI3MIbzIBA

Drones:
https://www.youtube.com/watch?v=rsP86OkhnPI
https://www.youtube.com/watch?v=tsjVQprGZEk
https://www.youtube.com/watch?v=vuh9OX2E6ek

LiDAR:
https://youtu.be/H2-Yp30TGk4
https://youtu.be/zREAEdXzOcw

Cluster II Module 3: Urban Planning

Credits

Module Conceptualization, Authoring and TPD sessions:	Dr Champaka Rajagopal, Faculty, Azim Premji University, Bengaluru and Professor Affiliate, Urban School, Sciences Po, Paris
Research and Development of Lesson Plans, assessments:	Aditi Jain, Scholar, MA in Public Policy and Governance, Azim Premji University, Bengaluru
	Sneha Chandna, Content Consultant
	Shubham Mishra, GIS Consultant
Research and Coordination:	Himanshu Pippal, Project Manager, Bhavishyath Counselling
	Niharika Dadoo, Independent Consultant
Overall Supervision:	Vijay Krishna, Founder, Bhavishyath Counselling

Student Planner

Session	Topic	Objectives and Description	Readings
Week 1- Reading Urban Places through a Planner's Lens			
Session 1	Urban Experience and Planning	- Students reflect on their personal urban experience - Students analyse the strengths, weaknesses, adequacies, and inadequacies of their locality - To understand the role of urban planners -to address weaknesses and enhance the strengths of their locality *In this session, we will have an exhaustive discussion on all aspects of cities: what is the kind of infrastructure they should have, what makes a city high quality, who is responsible for the proper management of a city, what do you as a student want from a city and so on.*	- Allan B. Jacobs. 1984. Places Journal 1(4). (attached) https://placesjournal.org/assets/legacy/pdfs/looking-at-cities.pdf?55a5bc - Donald Appleyard, Kevin Lynch, John Myer. A View from the Road (attached)
Session 2	Reading and walking urban places	- Understanding the types of activities taking place in a locality - Understanding relationships between people involved in activities - Assessing the level of access to public and private amenities - Experiencing the quality of a place *In this session, you will walk in an area of the city and see it from the point of view of an urban planner. What kind of activities go on in the area, how good is the transport connectivity, how good are other facilities like parks, what are the problems we can observe, what is the behaviour of the people etc.*	

Session 3	Preparing a Diagnostic Map	- Through a hands-on activity, students map the urban places they walked in during the previous session - To make mental connections about how people relate to one another and how they relate to the place - Observe the issues and discuss possible ways to address them *In this session, we will prepare a map of the city based on the field trip done in the previous session. We will use this to understand problems in the area related to urban planning and think about how to address these*	
Week 2- Components of planning, processes, and participation			
Session 1	Types of Planning	- To introduce 3 types of planning processes to the students i.e., 1) Statutory land use planning 2) Urban design schemes 3) Infrastructure projects *Here we will get introduced to the idea of land use and land use planning. We will see how localities can be classified into different types based on land use with examples from Delhi. We will also get introduced to two other components of urban planning ie. urban design and infrastructure projects*	Urban Planning (Grades 6-12+). National Geographic. Learn with us: https://education.nationalgeographic.org/resource/urban-planning
Session 2	Statutory Master Plans: Contentions in the Planning Process	- To expose students to key issues facing statutory urban planning - To introduce students to different planning mandates at the national level and their weak implementation - To let students know the planning laws and processes mandated at the State government level	Draft Master Plan for Delhi 2041 Master Plan for Delhi 2021

		- To provoke students to ask the question of who should prepare plans and the absence of participatory planning In this session we will explore some of the laws related to Urban Planning and who is responsible for urban planning. We will also study the idea of 'Master Plan'	Main Bhi Dilli Campaign: https://www.mainbhidilli.com/
Session 3	Participatory planning	- To expose students to forms of public participation processes underway: 1) Delhi: Main Bhi Dilli Campaign 2) A wide range of creative public process interfaces, including informal discussions, workshops, challenges, hackathons, etc Public Participation is important for good Urban Planning. In this session we look at the Main Bhi Dilli campaign which effectively involved people in planning for Delhi. We will also think about what we ourselves want from Delhi, the city we live in.	
Week 3- Planning Instruments: Zoning, Floor Space Index, Reservation of Land for Public Purpose			
Session 1	Zoning Regulations	- To provoke students to imagine a Zoning Regulation they feel is most suited for a liveable neighbourhood - To make students understand components of land use and zoning regulations in Town & Country Planning Laws and Master Plans - To make students assess the current pattern of Zoning Regulations and how they could be better crafted *In this session, we list down all the things that we think makes a city liveable and high quality. We then look at how Zoning Regulations is a way to achieve those parameters we listed down.*	Draft Development Plan for Greater Mumbai 2034 Revised Master Plan for Bengaluru 2015

Session 2	Floor Space Index	-To expose students to the concept of the Floor Space Index as a key instrument used by planning authorities *In this session, we understand and apply the idea of Floor Space Index (FSI) which is an important regulation for the construction of buildings. We do calculations of FSI*	
Session 3	Reservations of Land for Public Purpose	- To make students understand that Constitutional provisions of obligatory functions of Municipal Corporations are implemented through Master Plans. - To help students understand the system of planning standards through which master plans decide on how much land should be reserved for public purposes. - To help students see that the top-down approach to defining planning standards does not often meet real needs on the ground. *All cities need land that is open space (Like parks and gardens) and land that is used for public purposes like roads, health centres, schools and markets). In this session, we learn how to calculate how much land is available for these purposes in a given area or city. We also discuss that the local residents and businesses know best what is the requirement for their area and they should be consulted.*	
Week 4- Urban Design, Infrastructure Schemes, and Financing Master Plans, Urban Design Schemes and Infrastructure Projects			
Session 1	Urban Design Schemes	- To expose students to understand how physical aspects of places in cities have an impact on the quality of life - To get students to understand urban design as the relationship between the built and the unbuilt. *Are all cities similar? If not, how do we understand the difference? In this session, we look at aerial views and maps of many different cities to understand how the cities are laid out, the kind of*	

		pattern the roads in the city form and the overall design of the city.	Camilla Ghisleni. 2022. What is urban planning? Arch Daily. https://www.archdaily.com/984049/what-is-urban-planning Smart Cities Mission Project for Bhubaneswar, Odisha, 2015 to date.
Session 2	Infrastructure schemes: Smart Cities Mission	- To expose students to infrastructure development as a core component of urban planning - To help them understand how integrated, city-wide urban design and infrastructure projects are undertaken for cities (The Smart Cities Mission) *In this session, we get introduced to the idea of urban infrastructure and the different types and examples. We also look at an example where the whole city is studied and a design is created and then infrastructure projects are planned based on the design*	
Session 3	Role Play and Wrapup	- Bring together all the ideas and concepts introduced in this module - Give students an experience of stakeholders and negotiations in the planning process *In this session, we will play a game where a group of students representing different people like citizens, businessmen etc sit together and discuss how to solve a particular problem in their area*	

Reading Urban Places Through an Urban Planner's Lens

WHAT IS URBAN PLANNING?

Urban planning involves dealing with current and future demands of inhabitants of cities.

WHY URBAN PLANNING?

Cities in India are inhabited by diverse types of urban places and people coming from many social backgrounds. Large metropolises as well as small and medium sized cities experience a fairly high rate of population growth (2-3.5% Annual growth rates). Cities are also hubs of diverse types of economic activities and employment. These pressures if not addressed can result in a wide range of risks for people living and working in cities. For instance, traffic congestion, air pollution can increase respiratory disorders. Lack of basic education can decrease employment opportunity. Lack of good streets can cause inefficient travel by road, and so on. In India, the state government, supported by the national and local governments are entrusted with the responsibility to address issues faced by cities and channelise good quality of life. This implies regulating private development and making land available for public purpose, including providing access to civic amenities and infrastructure for all, for the present and the future.

The function of urban planning is two-fold: one, to make sure that people building on private lands and properties allow a healthy level of natural light and ventilation within their buildings; and two, to make provisions for basic services (health centres, schools, water, sewerage, solid-waste, roads, transport, etc) for the inhabitants of the city. To do so, urban planners are trained to understand how cities work. They are equipped with skillsets to read cities and understand relationships between the diverse range of places and people inhabiting and shaping the present and future of cities.

HOW TO READ A PLACE THROUGH AN URBAN PLANNER'S LENS?

The first unit focuses on reading an urban place through 3 sessions which include:

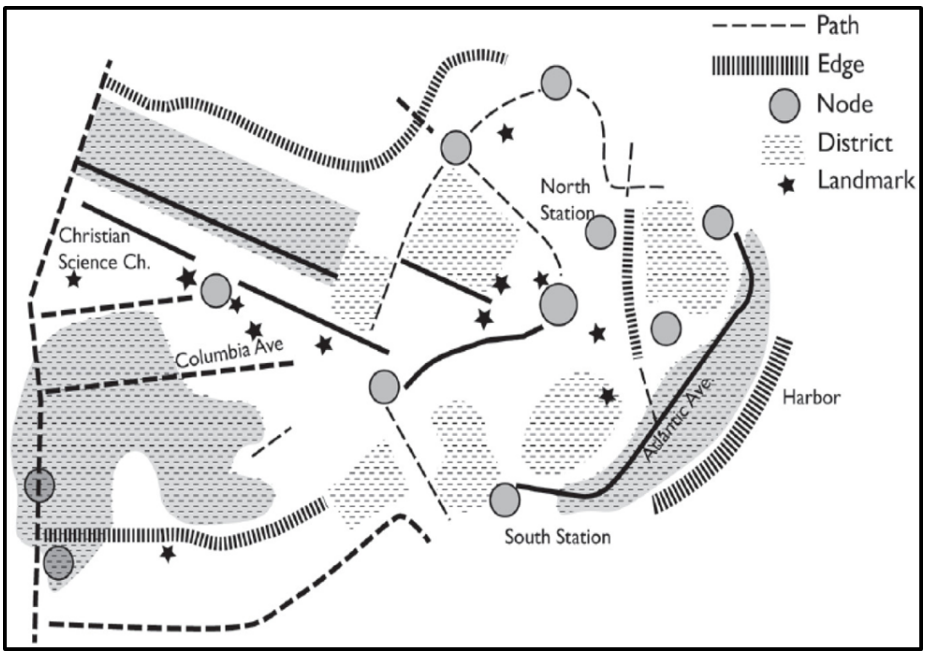
1. Urban experience and planning
2. Reading urban places
3. Mapping urban places

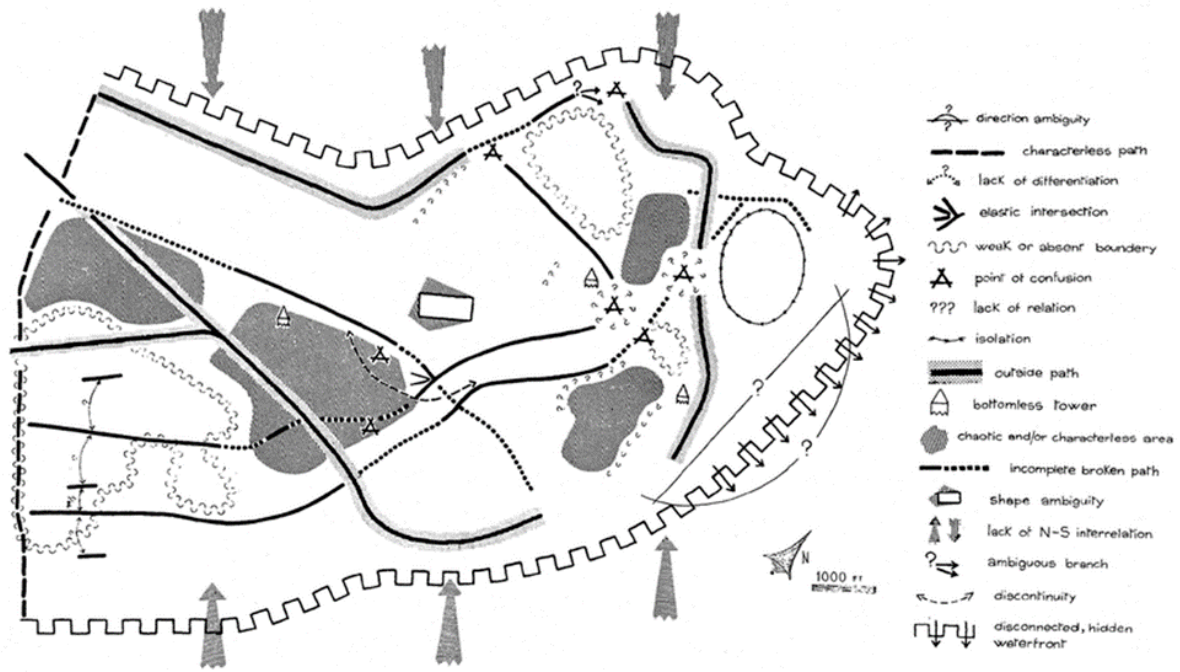
KEY CONCEPTS

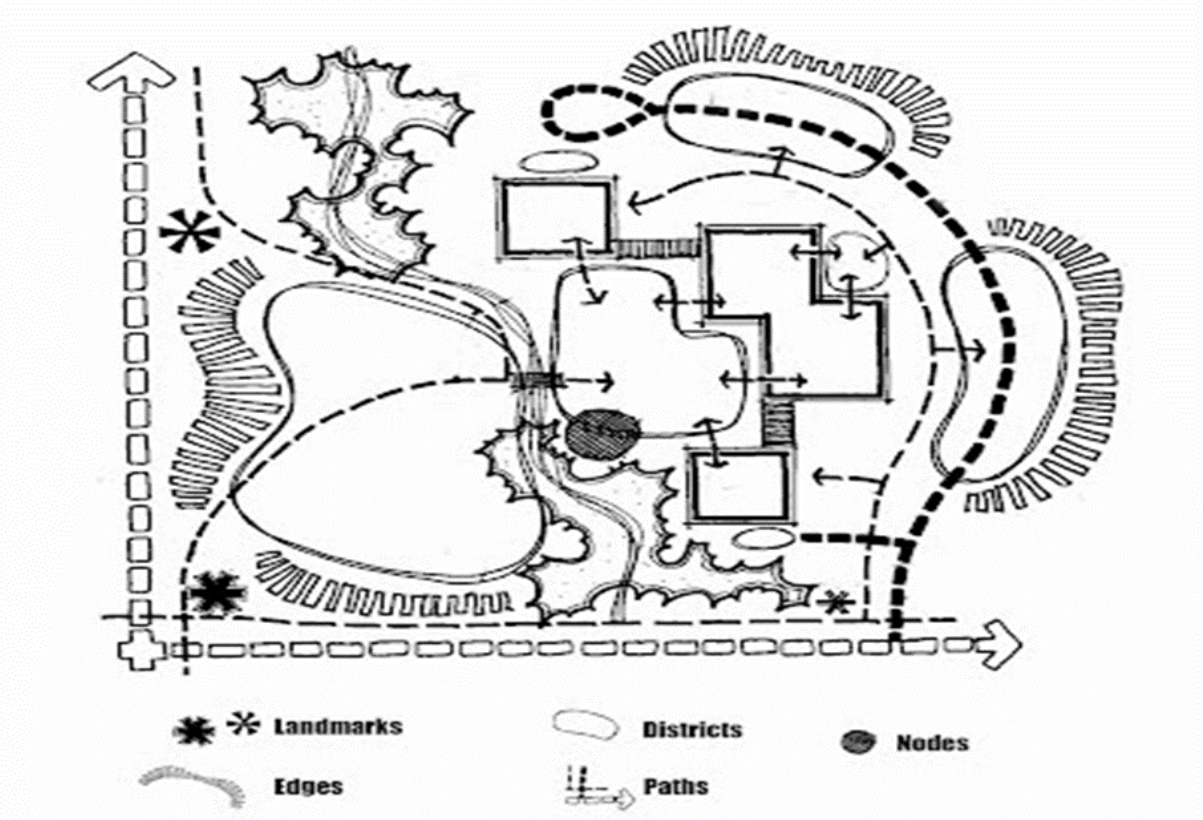
1. Strengths of urban places- access to good common infrastructure playgrounds, clean water, electric supply leading to faster commute, no traffic jams, better health for all, etc.
2. Weaknesses of urban places- Pollution, poor garbage collection, local flooding, not enough space for children to play, etc.
3. Common resources: Civic amenities, infrastructure, health, education, open spaces, water supply, public transport, solid waste management, etc.
4. Privately owned resources: Land, property, automobiles, water…
5. Land use: Housing (residential), shops, factories (commercial), hospitals (health amenities), etc.

REFERENCES

1. Allan B. Jacobs. 1984. Places Journal 1(4). (attached)
   https://placesjournal.org/assets/legacy/pdfs/looking-at-cities.pdf?55a5bc
2. Donald Appleyard, Kevin Lynch, John Myer. A View from the Road (attached)
3. Samples of mapping urban places (in the following page).






Landmarks
Districts
Nodes
Edges
Paths

Urban Experience and Urban Planning

ACTIVITY 1- THE URBAN EXPERIENCE

What is your experience of the urban?

ACTIVITY 2

Strengths and weaknesses of cities

STRENGTHS	WEAKNESSES
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.

PURPOSE AND COMPONENTS OF URBAN PLANNING

- Plan for alleviation of problems and achieve a decent quality of life
- Plan for better amenities and quality of the built environment in residential and workspaces
- Reserve land for civic amenities such as public health care centers, municipal schools, parks, gardens, maidans
- Plan for future infrastructure projects metro rail, water, sewerage networks
- Allocate investments for priority development and monitor plan and project implementation

HOMEWORK

1. Who plans for provisioning civic amenities in the city?

1. _____

2. Are the authorities involved in providing basic infrastructure in cities a part of the Delhi Municipal government, state government, or central government?

2. _____

3. Is there a master plan for Delhi? Who prepares the plan? What information do you think the plan must provide?

3. _____

4. Who designs, finances, and implements infrastructure projects for common use?

4. _____

Reading and Walking Urban Places

Activity- Looking at Cities

Figure 1: Google image/ map showing path of the walk for reading urban places/ looking at cities

Note for Teachers: You can show the google image of the area in which the school is located on smartboard.

COMMENT ON THE FOLLOWING ASPECTS OF PLANNING

In the comments section, please write your experience and your observations from the visit.

ASPECT	COMMENT
Spatial experience	
The class of people occupying locality	
Land use	
Building uses	
Demand for certain kinds of residential, and commercial, types of services sector activities	
Ward office	
Parking on-street	

Building violations	
Building extensions	
Nature and size of amenities available at a Ward level in a city	
Tree-scape, streetscape	
Private plants and gardens and the level of upkeep	
Physical infrastructure	
Transport and mobility	
Whether public places have been maintained well?	
Signage, Noise levels, city lights	

HOMEWORK

1. What are maps/plans?

1. _____

2. How do maps help in navigating through any space?

2. _____

3. What types of information should maps prepared for master plans include?

3. _____

4. Based on your reading of urban places who should prepare these maps, to inform planning?

4. _____

5. Based on your walk and reading a locality, what should be the components of planning?

5. _____

Preparing a Diagnostic Map

Activity 1- Mapping Urban Places and Their Problems

Key Concepts:

What is mapping?

A map is a symbolic representation of selected characteristics of a place, usually drawn on a flat surface. Mapping a place/area means presenting that information in a simple, visual way. Mapping helps in visualizing a place by showing sizes and shapes of locations of features, and distances between places.

What are the essential components of a map?

Distance, direction, and symbols are the major components of a map.

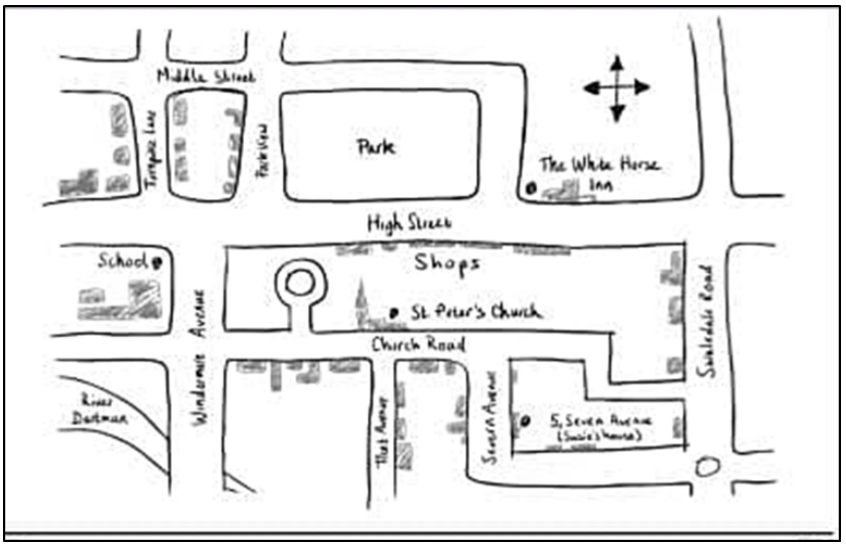
What should diagnostic maps for a city's master plan include?

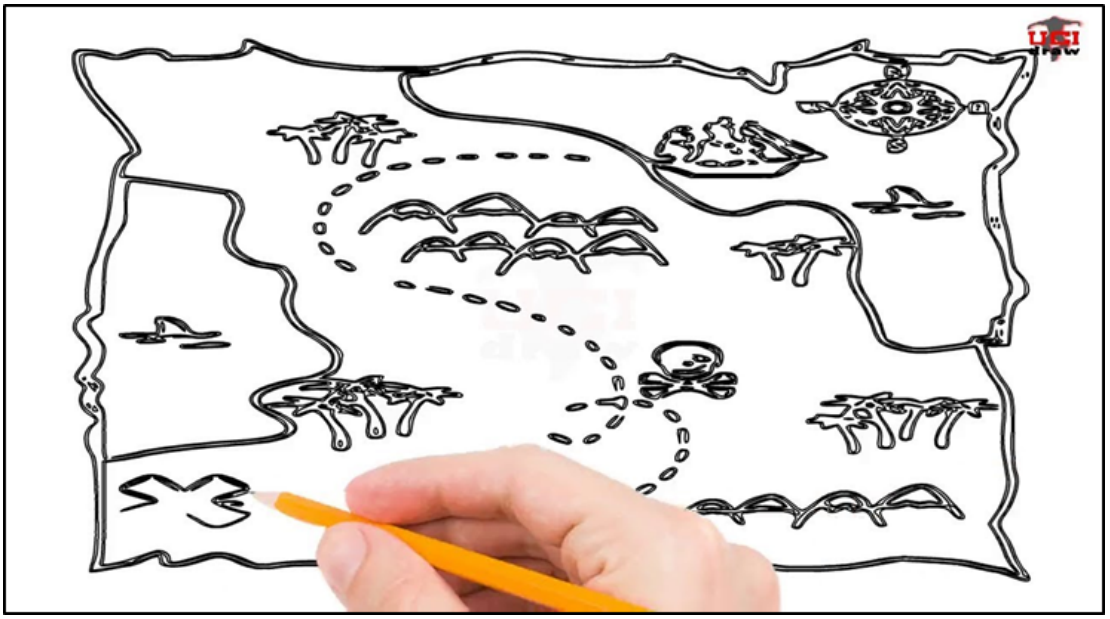
Maps prepared for city master plans may include analysis, recommendations, and proposals for a city's population, economy, housing, transportation, community facilities, and land use. It is based on public input, surveys, planning initiatives, existing development, physical characteristics, and social and economic conditions

Who prepares the master plan for Delhi? Have you seen these maps? What did you observe?

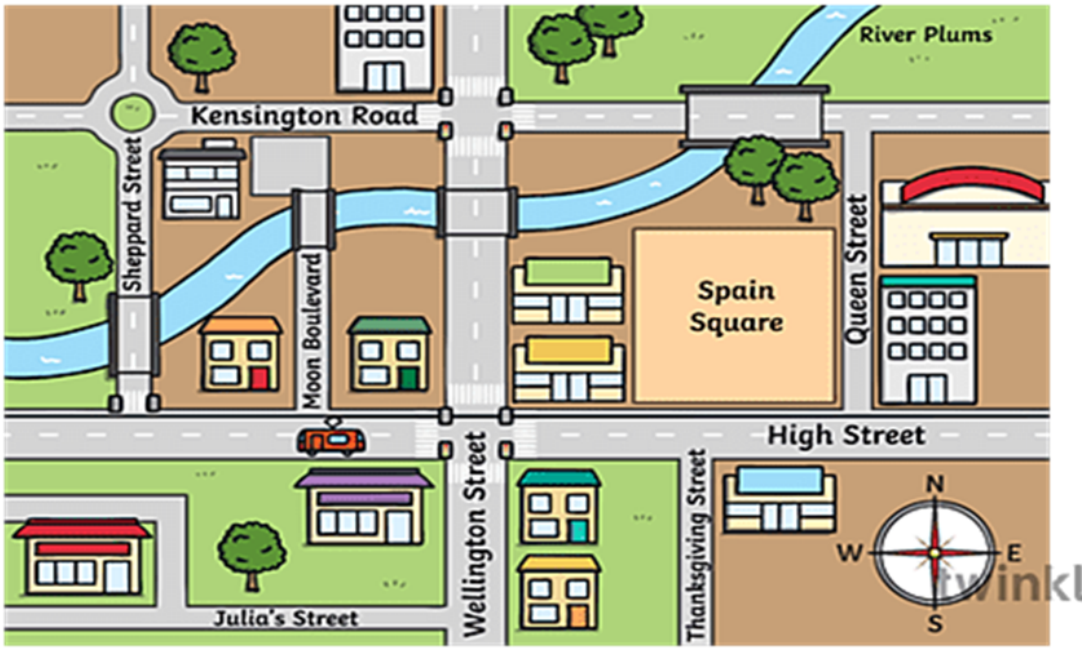
The Delhi Development Authority (DDA) is responsible for preparing the master plan for Delhi? Have you seen the various diagnostic maps prepared for the Master Plan for Delhi? Please collate some examples.

Here are sample drawings/sketches to illustrate how you can prepare your own diagnostic map showing challenges and strengths of localities.





You can use colors and make a more refined map like the ones shown here.

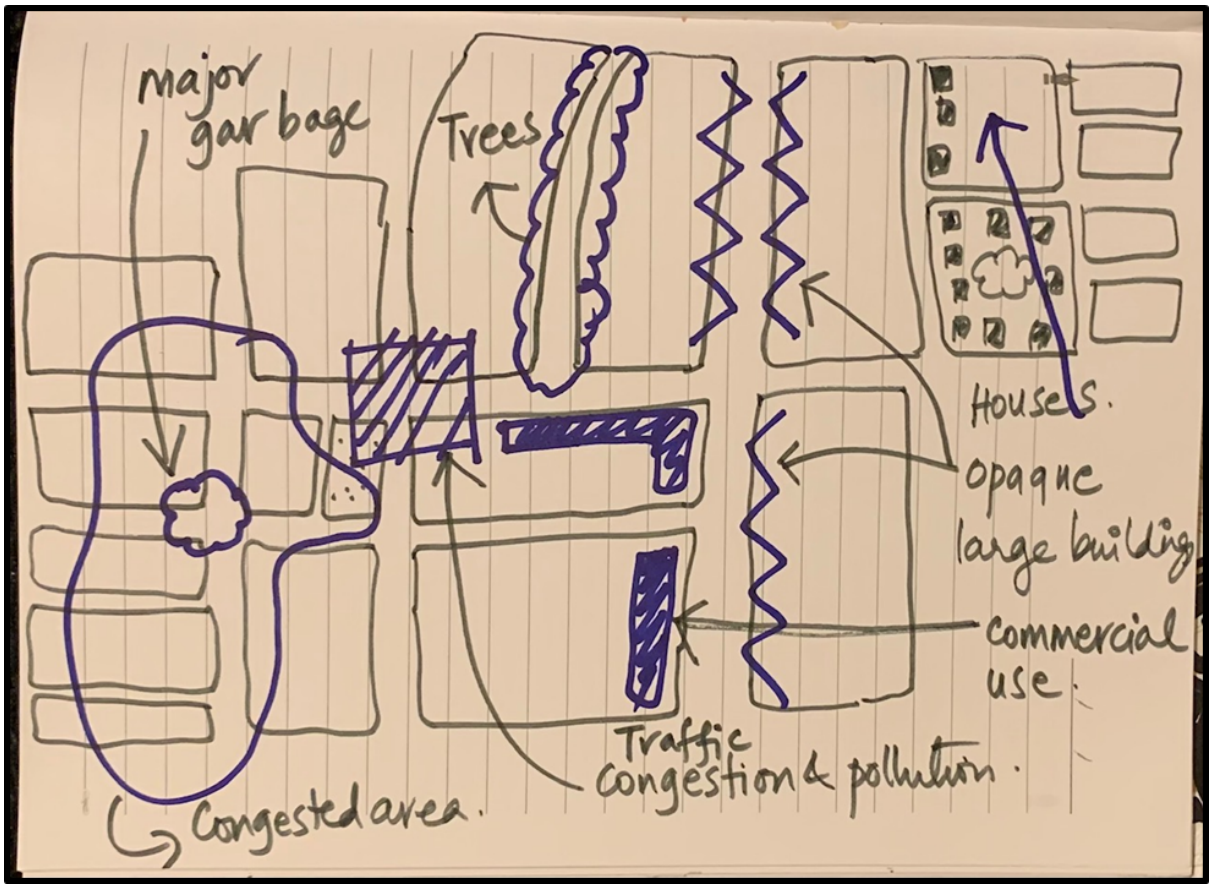


Please draw your map in the space provided below.

Activity 2 - Suggesting Solutions to the Problems, While Building on Strengths

In the map you have created, draw circles around places that need attention as shown in the example below, and draw arrows to show how some linkages may be improved in the area/ streets/ parks. What new amenities can be added to vacant sites?

Example:



Types and Components of Planning

IMPORTANT TERMS

1. Statutory land use planning

A statute is a written law or regulation passed by a government organisation. Land use planning pertain to designation of use of land for particular purposes for a stipulated period of time. For example, including residential, commercial, open spaces, environmentally vulnerable areas, which has to be mandatorily implemented by public and private owner of land. Example: Designating a parcel of land with shops on them as commercial or a parcel of land with houses on them as residential for a ten-year period, as part of a master plan.

Land use planning involves:

a) **Understanding the nature of land use:** whether the buildings/places are residential, commercial, open spaces (like parks), etc.

b) **Proposing the future development potential of urban places:** how much to build on a parcel of land in order to make sure buildings have adequate natural light and ventilation.

c) **Making land available for civic amenities and infrastructure** to ensure that everyone has access to basic needs such as food, water, shelter, livelihoods and places are livable

2. Urban design projects/ schemes

It involves:

a) Designing the layout of street networks, open spaces, and civic amenities.

b) Designing configuration of buildings including massing, volume, shape, appearance, and silhouettes

3. Large infrastructure projects

It includes designing, planning, constructing, and managing projects such as airports, railway stations, rail lines, highways and roads, bridges, water supply, sewerage, etc.

4. Land use

The type of activity on a parcel of land (residential, commercial, office, open spaces, etc)

5. Existing land use map (ELU)

Legal documentation of the type of use a land has been put to, whether houses (residential), shops (commercial), work (offices), or factories (industrial), mapped at a particular point in time. The preparation of the ELU is mandatory in land use planning.

6. Proposed land use map (PLU)

Vision and proposals for future development on a parcel of land. The PLU is a key output of a Statutory Master Plan. It is assigned after conducting an existing situation analysis of issues faced by the city and the locality.

Activity 1 - Identifying Types of Urban Planning

Looking at the images shown by the teacher, of different types of places, please classify your responses in the table given below. A few answers are already written to guide you well.

	Land use planning	Urban design scheme	Infrastructure development
An informal area, such as Shahjahanabad, Delhi			
Planned residential neighborhoods such as Vasant Kunj, Vasant Vihar, etc			
Slums	Juggi-jhopdi		
Apartment complexes			
Areas such as Karol Bagh	Shopping/ commercial		
Office and business districts such as Connaught Place			
Industrial sites such as in Faridabad/ Meerut			
IT Parks	Office/ mixed use		
Large open spaces such as the Central Vista	Open space		
Jawaharlal University			
Offices such as Nirman Bhavan	Public office		
Heritage precincts such as Chandani Chowk, and heritage buildings such as Humayun's Tomb	Old city area		
The Yamuna River pollution			

The metro rail			
The Delhi International Airport			
Dilli Haat	Recreational and cultural		
Large hospitals			
Delhi University campus			

Activity 2- Land Use Planning

After looking at the pictures, please compare the type of land use planning you thought (in the previous activity) with the Land use planning categorization according to the DDA Act.

	Student's guess of land use from the previous Activity	Land use as per DDA's MPD 2041
An informal area, such as Shahjahanabad, Delhi		
Planned residential neighborhoods such as Vasant Kunj, Vasant Vihar, etc		
Slums	Mixed land use	Residential/ juggi
Apartment complexes		
Commercial areas such as Karol Bagh	Mixed use	Commercial
Office and business districts such as Connaught Place		
Industrial sites such as in Faridabad/ Meerut		
IT Parks	Office/mixed use	Mixed use
Large open spaces such as the Central Vista	Open space	
Jawaharlal University		

Offices such as Nirman Bhavan	Government office	
Humayun's Tomb, Jama Masjid	Heritage zone	Public and Semi-Public, heritage
The Yamuna River pollution		
The metro rail		
The Delhi International Airport		
Dilli Haat	Cultural	Public and Semi-Public
Large hospitals		
Delhi University campus		

Statutory Master Plans: Contentions in the Planning Process

IMPORTANT TERMS

1. 74th Constitutional Amendment Act

The Constitution of India prepared in 1950, has undergone several amendments to respond to changing growth needs. The 74th CAA is one such amendment introduced in 1992, after India liberalized its economy in 1991. India was faced with a dual challenge: to promote economic growth and repay balance of payments to the International Monetary Fund. To this end, liberalisation of the Indian economy allowed foreign investors/ companies to contribute to India's economic growth. Therefore, cities became important engines of growth. The 74th CAA was passed to acknowledge the importance of cities as politically empowered local self-governments. Until 1992, cities were to be governed by State governments. The 74th CAA required State legislatures to devolve power to District, Metropolitan and Local governments. The power and responsibility to plan for cities also vests with District, Metropolitan and Local governments. Notwithstanding this mandate, most State governments have not devolved power to District, Metropolitan or Municipal governments. Therefore, city governments have remained politically and financially weak, in most States in India. Cities do not have Mayors with 5-year-long tenures, as prescribed in the 74th CAA. Municipal Corporators also remain weak and powerless.

2. Planning Authority

As per the 74th CAA, the Municipal Corporation is required to prepare master plans for their jurisdictions, under the aegis of District Planning Committees and Metropolitan Planning Committees. Decisions in the DPC, MPC and Municipal Corporations about urban planning is meant to be taken through negotiation and consensus between elected representatives and administrators. However, since the 74th CAA is not implemented in most States. So, neither the DPCs/ MPCs nor Municipal Corporations are entrusted with the powers to prepare statutory master plans. Historically, most State governments have been appointing Development Authorities (DA) as the Planning Authority. For example, in Delhi, it is the Delhi Development Authority, in Bangalore, it is the Bangalore Development Authority, in Lucknow, the Lucknow Development Authority and so on. However, DAs preparing master plans means that master plans are prepared purely as technical and administratively driven processes. The process does not legally require participation of the public or involvement/ consensus with Municipal Corporators. Urban planning professionals and civil society organisations have been working with State governments for over two to three decades to enable the devolution of power to local government levels.

3. Public participation

Post liberalization of the Indian economy, the number, and types of actors involved in decision-making spaces were amplified. Several not-for-profit organizations were established in the country. Considering the absence of a public participatory process in` master planning, these organizations have advanced the significance of democratic decision-making processes. In master planning, these not-for-profit organizations have worked with planning authorities over the last three decades to introduce public participation at various stages of the planning process. The Main Bhi Dilli Campaign is one such process innovation led by the people

4. State-level Town and Country Planning Acts

Post-independence, to ensure the planned development of cities in India, the Union government established the Town & Country Planning Organisation (TCPO), in Delhi. The TCPO prepared model Town & Country Planning Laws for State governments to emulate and enact their own. State governments prepared their own TCPAs in the period the 1960s. Karnataka for instance, prepared the Karnataka Town & Country Planning Act, 1961. The Delhi Development Authority incorporated its planning functions in the DDA Act

1957 when the DDA was established. All TCPAs and the DDA Act prescribe land use categories, components of the master plan, contents of the master plan, and planning process.

Session 2 includes 2 activities involving the above concepts

Activity 1 - National Level Mandates for Master Planning

Shown below is the image of the Statement of Objects of the 74th Constitutional Amendment Act (CAA) and Chapter III, Section 10 of the Delhi Development Act

(b) composition of Municipalities, which will be decided by the Legislature of a State, having the following features:

(i) persons to be chosen by direct election;

(ii) representation of Chairpersons of Committees, if any, at ward or other levels in the Municipalities;

(iii) representation of persons having special knowledge or experience of Municipal Administration in Municipalities (without voting rights);

(c) election of Chairpersons of a Municipality in the manner specified in the State law;

(d) constitution of Committees at ward level or other level or levels within the territorial area of a Municipality as may be provided in the State law;

(e) reservation of seats in every Municipality-

(i) for Scheduled Castes and Scheduled Tribes in proportion to their population of which not less than one-third shall be for women;

(ii) for women which shall not less than one-third of the total number of seats;

(iii) in favour of backward class of citizens if so provided by the Legislature of the State;

(iv) for Scheduled Castes, Scheduled Tribes and women in the office of Chairpersons as may be specified in the State law;

(f) fixed tenure of 5 years for the Municipality and re-election within six months of end of tenure. If a Municipality is dissolved before expiration of its duration, elections to be held within a period of six months of its dissolution;

(g) devolution by the State Legislature of powers and responsibilities upon the Municipalities with respect to preparation of plans for economic development and social justice, and for the implementation of development schemes as may be required to enable them to function as institutions of self-government;

10. Procedure to be followed in the preparation and approval of plans.—(*1*) Before preparing any plan finally and submitting it to the Central Government for approval, the Authority shall prepare a plan in draft and publish it by making a copy thereof available for inspection and publishing a notice in such form and manner as may be prescribed by rules made in this behalf inviting objections and suggestions from any person with respect to the draft plan before such date as may be specified in the notice.

(*2*) The Authority shall also give reasonable opportunities to every local authority within whose local limits any land touched by the plan is situated, to make any representation with respect to the plan.

(*3*) After considering all objections, suggestions and representations that may have been received by the Authority, the Authority shall finally prepare the plan and submit it to the Central Government for its approval.

(*4*) Provisions may be made by rules made in this behalf with respect to the form and content of a plan and with respect to the procedure to be followed and any other matter, in connection with the preparation, submission and approval of such plan.

(*5*) Subject to the foregoing provisions of this section the Central Government may direct the Authority to furnish such information as that Government may require for the purpose of approving any plan submitted to it under this section.

11. Date of operation of plan.—Immediately after a plan has been approved by the Central Government, the Authority shall publish in such manner as may be prescribed by regulations a notice stating that a plan has been approved and naming a place where a copy of the plan may be inspected at all reasonable hours and upon the date of the first publication of the aforesaid notice the plan shall come into operation.

Please go through the Statement of Objects of the 74th CAA, and the procedure to be followed for the preparation of Master Plans, shown above, and then answer the following:

1. What does Section (g) in the statement of objects mean?

_____
_____
_____

2. Who prepares Master Plans?

_____

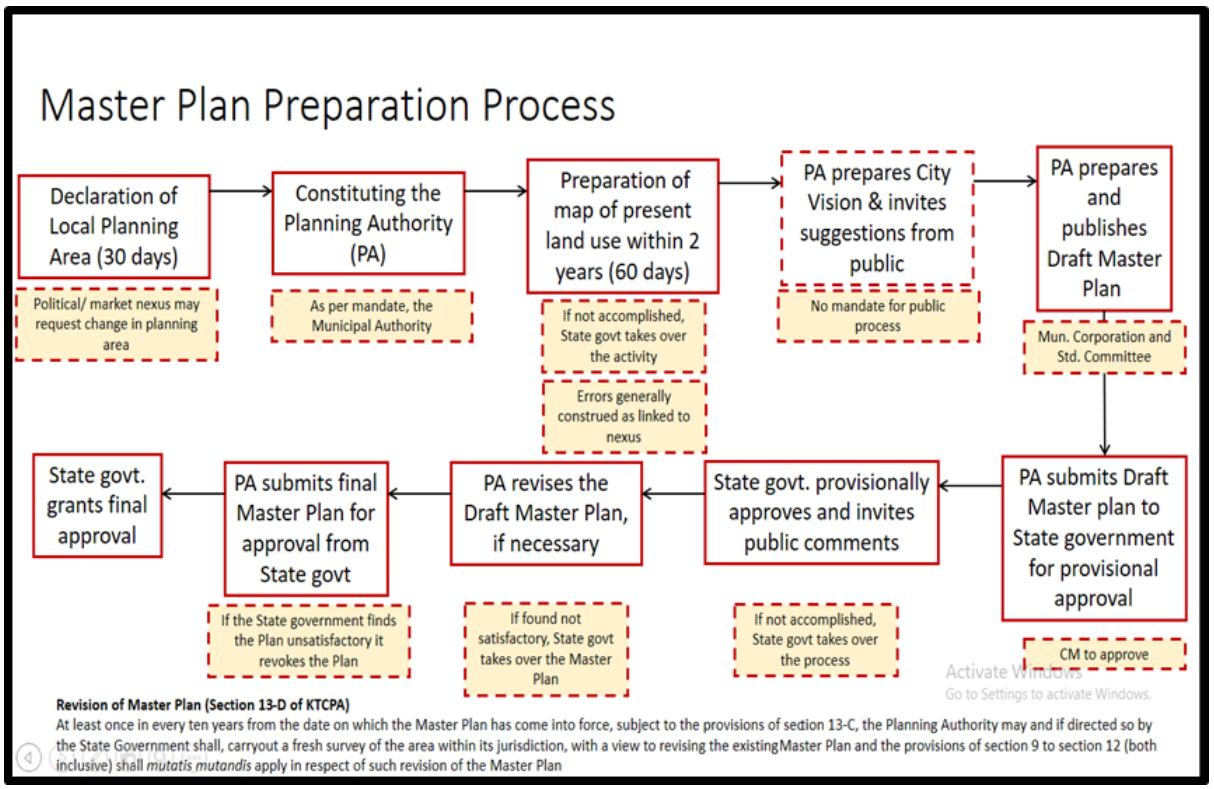
3. Who is the 'authority' in the Delhi Development Act?

_____

4. Who approves the Master Plan? Is it the same authority that prepares the plan or some other authority?

_____
_____

Activity 2 - Planning Process



The flow chart above includes the following stages, stipulated in the Town and Country Planning Acts of State governments:

- State government notifies the intent to prepare the Master Plan
- State government appoints the planning authority
- Planning authority prepares the Existing Land Use Map (ELU)
- Public suggestions and objections are called on the ELU
- Planning authority finalizes the ELU
- Planning Authority uses the ELU and other datasets for analysis of the existing situation and identification of issues
- Population and employment projections and demand for future residential, amenities and workspace are estimated
- City Vision is formulated
- Proposed Land Use Map is drawn
- Development Control Regulations or Zoning Regulations are written
- Draft Master Plan is submitted to the State government (UDD)
- Chief Minister accords provisional approval to the Draft Master Plan
- The DMP is put up for public suggestions, objections, and comments
- The state government constitutes a three-member committee to review the suggestion and comments received
- Suggestions and comments are reviewed and incorporated in the DMP
- The Final Master Plan is published for implementation and enforcement

Mentioned above is the Master Planning process.

Point out at what points in time you think participatory processes must be initiated by the Planning Authority:

1. _____

2. _____

3. _____

4. _____

5. _____

Participatory Planning

Town and Country Planning laws at the State government level for most states in India do not incorporate participatory or consultative processes as integral to the planning and decision-making processes. To address this gap, civil society organizations and Ward-level Resident Welfare Associations in several cities have proactively taken the initiative to organize social groups which advocate participation of local communities in master planning, urban design and infrastructure projects.

This session focuses on the Main Bhi Dilli Campaign, driven by multiple civil society organizations and academics. The Delhi Development Authority prepared the Draft Master Plan for Delhi 2041 and published it to receive suggestions, objections, and comments from the general public in 2021. To expand inputs received from various segments of society, especially the underprivileged, the Main Bhi Dilli campaign developed several innovative tools to simplify and deepen communication. This session exposes students to some of the tools the Main Bhi Dilli Campaign employed.

Activity 1 - Main Bhi Dilli Campaign

After watching the video on Main Bhi Dilli Campaign, answer the following:

1. **Based on your exposure to statutory master planning, how would you imagine a public process?**

   _____
   _____
   _____
   _____
   _____

2. **What are the components of the Main Bhi Dilli campaign which aims to communicate the Master Plan for Delhi?**

   _____
   _____
   _____
   _____
   _____

3. **What types of tools does the campaign employ in order to expand simple communication of the Plan?**

   _____
   _____
   _____
   _____
   _____

Activity 2 - Visioning Your Own Delhi

What do you think Delhi needs and that the master planning process must address for better quality of life for all the diverse communities of the city?

1. _____
2. _____
3. _____
4. _____
5. _____

Zoning Regulations (ZRs) or Development Control Regulations (DCRs)

IMPORTANT TERMS

1. Land use
The type of activity on a parcel of land (residential, commercial, office, open spaces, etc., or a mix of some activities).

2. Existing Land Use Map (ELU)
Legal documentation of land use existing at a particular point in time, prepared as part of a Master Plan. The preparation of the ELU is mandatory in land use planning.

3. Proposed land use map
PLU indicates future development vision and potential on a parcel of land. The PLU is assigned after conducting an existing situation analysis of issues faced by the city, using the ELU.

4. Mixed land use
Places and buildings which have not just one land use, such as residential or commercial, or civic amenities. They have multiple land uses. For instance, in traditional, old city areas, each building may have commercial, residential, and industrial warehouses.

5. ZR/ DCR
A set of parameters that qualify the quality of life in urban places. This includes permissible and prohibited land uses, Floor Space Index or buildability on a parcel of land, relationship of buildability on a parcel of land with street width, and rules for car parking on a parcel of land.

Activity 1 - Parameters of a Residential Locality with a Good Quality of Life

Please respond to the following questions given below.

1. Could you list down what places in Delhi or other cities you have been to, that have a good quality of life?

   _____

   _____

   _____

   _____

   _____

2. What in these places do you think makes them attractive to you? Why do you think these places have a certain good quality of life?

   _____

   _____

   _____

_____

_____

3. What are the parameters you think the Master Plan must include as rules and regulations for a place to have a good quality of life? What are the parameters that the Master Plan must include as regulations that make the city a good place for you to live?

_____

_____

_____

_____

_____

_____

_____

_____

Activity 2 - Content of ZRs or DCRs

The teacher will show you the Zoning Regulations of Bangalore or Delhi. From your observation of the documents, answer the following questions.

1. What are the parameters that qualify good quality of urban places and which of these should be part of Zoning Regulations?

_____

_____

_____

_____

_____

2. Should road width be a critical factor in defining how much can be built on a parcel of land? Why? Give reasons for your answer.

_____

_____

_____

_____

_____

4. What do you think should be the key considerations for determining how many floors should be permitted in a building on a parcel of land? Give reasons for your answer.

_____

_____

_____

_____

_____

5. What is different in the list you have suggested, versus what the ZR prescribed in our cities?

_____

_____

_____

_____

_____

Planning Instruments: Floor Space Index

IMPORTANT TERMS

1. Floor Space Index: Bulk FSI and Net FSI

Town and Country Planning Acts legislated by State governments in India define Floor Space Index as:

Bulk FSI = Total Built-Up Area of a Building / Total Parcel Area

Generally, Development Plans for cities do not adhere to this definition. Zoning Regulations make a series of exceptions to the computation of FSI consumed in a building. The total FSI in a building after exemptions is known as **Net FSI.** For example, architectural elements such as a porch, balcony, mezzanine floor, stairwell, lift shaft, etc. are not counted as FSI consumed in a building. Builders or developers therefore submit plans to the Building Permits department of Municipal Corporations for approval of building design, showing Net FSI after subtracting the exempted elements. However, the builder/ developer later tends to convert these deducted areas into useable spaces such as bedrooms, utility rooms, study rooms etc. This implies that the owner of the building or the developer pays less fees to the municipal corporation for development charges, than the area sold by them. In the process, the State and the Municipal governments lose revenue in the form of development fees, on the exempted architectural elements.

2. Violation

FSI consumption in most Indian cities is generally violated. In other words, each building in a city has invariably constructed more floors than is permitted as FSI by the Zoning Regulations.

3. Condonation of violation

Once the Planning Authority and Municipal Corporation recognize this violation of FSI, they levy a penalty on building owners to regularise violations. Many of these violations and their regularisation over time have accrued to give rise to more construction than places can handle. These lead to higher generation of solidwaste, traffic congestion, lesser natural ground area, frequent flooding and less livable areas.

4. Development charges

For every sq. ft. of building constructed by a private land owner, the municipal corporation and other agencies in charge of infrastructure delivery levy a development charge on the private parcel owner/ developer. These charges are levied at a highly subsidized rate for the services provided by these government organizations.

Activity- Computing FSI

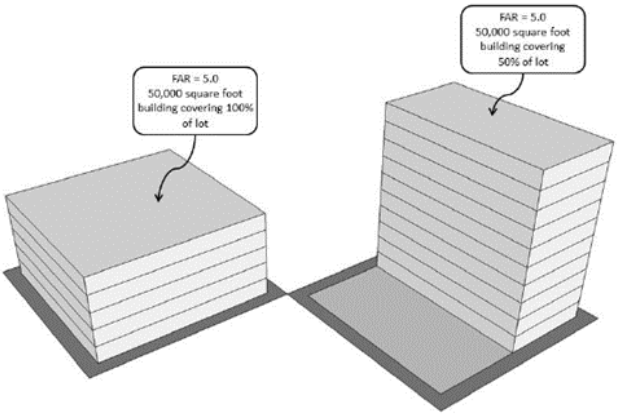


Fig 1.0: Diagrammatic representation of Bulk FSI

Source: PlaNYC: Strategic/ Development Plan for New York City

Important formulae:

- Bulk FSI = (No. of floors X Total floor area) / Total parcel area
- Net FSI = (No. of floors X (Total floor area-Total area occupied by architectural elements exempted from FSI computation)) / Total parcel area
- Development Charges on Bulk FSI= Bulk FSI X 10,000
- Development Charges on Net FSI= Net FSI X 10,000

Information about the building:

- Number of floors: 8
- Total floor area: 1000 sq ft
- Total parcel area: 2000 sqft
- The total area occupied by architectural elements exempted from FSI computation: 250 sq. ft. per floor
- Development charges per FSI consumed: Rs. 10,000/- (assumption)

1. Calculate Bulk FSI

_____

_____

_____

_____

_____

2. Calculate Net FSI

_____

_____

_____

_____

_____

3. Calculate Development Charges on Bulk FSI

_____

_____

_____

_____

_____

4. Calculate Development Charges on Net FSI and Bulk FSI and estimate the losses to the government

_____

_____

_____

_____

_____

5. What is your inference of this activity?

_____

_____

_____

_____

_____

Reservation of Land for Public Purpose

IMPORTANT TERMS

1. Basic services

Basic services includes social infrastructure (health, education amenities, open spaces, municipal markets, slaughterhouses, cemeteries, homes for the elderly, homes for children without homes, homes for the homeless, and so on); physical infrastructure (water, road, drainage, sewerage, solid waste management); utility infrastructure (power, telecommunications, transport, freight).

2. Planning standards

The Urban Development Plan Formulation and Implementation Guidelines provide planning standards for all types of amenities/ infrastructures. Master Plans/ development plans for cities have normalized these standards on a per capita basis. For instance, every inhabitant of a city must have access to 6 sq. ft. of open space, 0.03 sq. ft. of the primary health center, and 0.013 sq. ft. of primary school. Similarly, standards are established for all types of basic amenities and infrastructures. The issue in implementing the planning standards is that the planning standards require very high levels of access to premium land. It becomes unaffordable for city governments to acquire and make this land available for basic services.

3. Reservation of land for a public purpose

It is made using a planning instrument known as Accommodation Reservation. The Planning Authority identifies vacant land parcels through the Existing Land Use Map. Using the planning standards, the Planning Authority estimates the existing backlog on the need for social amenities based on population at the Ward and City levels.

Activity 1 - Compute the Total Per Capita Space Available in Each of These Localities for Open Spaces. These are three wards of Bengaluru city

Methodology:

Step – 1: Note down the total population of the Ward

Step – 2: From the table on Proposed Land Use Plan, note down the total land reserved for open spaces

Step – 3: Divide the total area of open space available in the Area by the total population of the Area. This gives the per capita open space available in the Area.

Step – 4: Repeat the exercise for a total of three Wards; compare the per capita availability of open space across the three localities.

Benson Town

Area: 1.34 sqkm
Population: 22601
Number of people per sqkm: 16876

Proposed Land Use Analysis		
Description	**Area in Ha.**	**%**
Residential (Main)	105.00	28.31
Residential (Mixed)	91.40	24.64
Commercial (Central)	-	-
Commercial (Business)	0.20	0.05
Mutation Corridor	-	-
Commercial Axes	5.94	1.60
Industrial	-	-
High Tech	-	-
Public and Semi-public	34.88	9.41
Green (Parks & Open Spaces)	30.39	8.19
Traffic and Transportation	75.17	20.27
Public Utilities	-	-
Unclassified	27.89	7.52
Total	**370.87**	**100.00**

Total per capita open space = _____

KR Puram

Area: 24.57 sqkm
Population: 199487
Number of people per sqkm: 8119

Proposed Land Use Analysis		
Description	**Area in Ha.**	**%**
Residential (Main)	513.64	29.75
Residential (Mixed)	463.95	26.88
Commercial (Central)	-	-
Commercial (Business)	45.47	2.63
Mutation Corridor	39.46	2.29
Commercial Axes	7.35	0.43
Industrial	173.03	10.02
High Tech	-	-
Public and Semi-public	14.82	0.86
Green (Parks & Open Spaces)	87.12	5.05
Traffic and Transportation	263.55	15.27
Public Utilities	41.72	2.42
Unclassified	76.18	4.41
Total	**1726.31**	**100.00**

Total per capita open space = _____

Electronic City

Area: 34.65 sqkm
Population: 342299
People per sqkm: 11169

Proposed Land Use Analysis		
Description	**Area in Ha.**	**%**
Residential (Main)	408.47	16.52
Residential (Mixed)	21.60	0.87
Commercial (Central)	-	-
Commercial (Business)	-	-
Mutation Corridor	17.09	0.69
Commercial Axes	-	-
Industrial	132.14	5.34
High Tech	1461.28	59.08
Public and Semi-public	24.52	0.99
Green (Parks & Open Spaces)	160.12	6.47
Traffic and Transportation	242.30	9.80
Public Utilities	5.75	0.23
Unclassified	-	-
Total	**2473.27**	**100.00**

Total per capita open space = _____

Think and Answer

Question: What do you infer about the extent of land available for open spaces per person?

Ans:

_____

_____

_____

_____

Urban Design Concepts

IMPORTANT TERMS

1. Urban design

It is the design of urban places. It involves laying out plans for cities, including, street hierarchies (major, minor, local streets), street networks, and gridded city blocks for ease of movement of people and goods, and designing streets and public spaces.

2. Urban Fabric

Places in cities are diverse. They are occupied by people from varied cultural backgrounds. The design of places in cities must take into account historically relevant social, and cultural practices and livelihood patterns of people. At the same time, places in cities are subject to pressures of modernity, technological change, speed, and transformation. The urban fabric connotes an inter-weaving of all these forces, which the urban designer must take into account while preparing a layout plan.

3. Gridded streets and city blocks

Laying out the design of a city, a neighborhood, a business district or an industrial area involves multiple steps. One of the key steps is to lay out a framework of streets, involving:

- Arterial roads: which connect one city to another
- Sub-arterial roads: which connect important parts of a city
- Major streets: which connect adjoining localities
- Minor streets: these connect places within an urban place such as homes across streets or homes to markets, etc.

These streets are generally laid out in a grid-like chequered pattern for efficiency and to prevent bottlenecks in the movement of people and goods.

4. Human-centric streets

Industrialization the world over, brought with it a demand for speed and efficiency. Robert Moses in the United States, for instance, advanced high-speed expressways, and flyovers in New York, to support a car-oriented society. Architects such as Le Corbusier promoted car-oriented cities with tall towers and wide roads and carriageways for cars. This paradigm however has been critiqued heavily for being non-human-centric. In an independent India, national government institutions such as the Indian Roads Congress (IRC) defined road standards with speed and efficiency as goals. After liberalization in 1991, this changed. With more and more non-government agencies and community engagement in decision making the national, state, and local governments have demanded road safety for all humans. Gender sensitivity has become an important criterion in the design of streets and street networks. This meant optimizing street right of way for cars and automobiles and allocating much wider spaces for people to walk or bicycle. The National Urban Transport Policy in India, state policies, and plans/ projects at the city levels are required to now follow norms and measurements for carriageways, footpaths, and greenways along the footpaths that ensure ease of movement for the elderly, women, children, and persons physically challenged or needing assisted mobility.

5. Figure Ground Maps

In urban design, the figure-ground map is a drawing technique used to understand the relationship between built and unbuilt areas in cities. The figure-ground map reveals how much land in a given square of the area is built up. It shows the level of built-up density or sprawl. It is a strong tool for comparative assessment across cities.

Activity 1 - Understanding the City as a Fabric

Looking at the images shown by the teacher, answer the following questions.

1. What sense of place do you have from looking at the satellite images?

- ●Shahjanabad-_____
- ●Las Vegas-_____
- ●Barcelona-_____
- ●Mexico-_____
- ●Paris-_____
- ●Lutyens Delhi-_____
- ●Washington DC-_____
- ●Bangalore's BDA Layouts-_____

Fig. 1.0: Shahjahanabad

Fig 2.0: Lutyens Delhi

Fig 3.0: Las Vegas

Source: Google Earth

Having read these images of urban fabrics, now, answer the following questions.

1. What are the characteristics of Shanjanahabad and Lutyens Delhi? How are they different?

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2. What differences do you see between Shahjahanabad's streets and the layout of the enclave in Las Vegas?

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3. Which of these places is human centric and which ones are car centric?

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Activity 2- Linking Place to Fabric

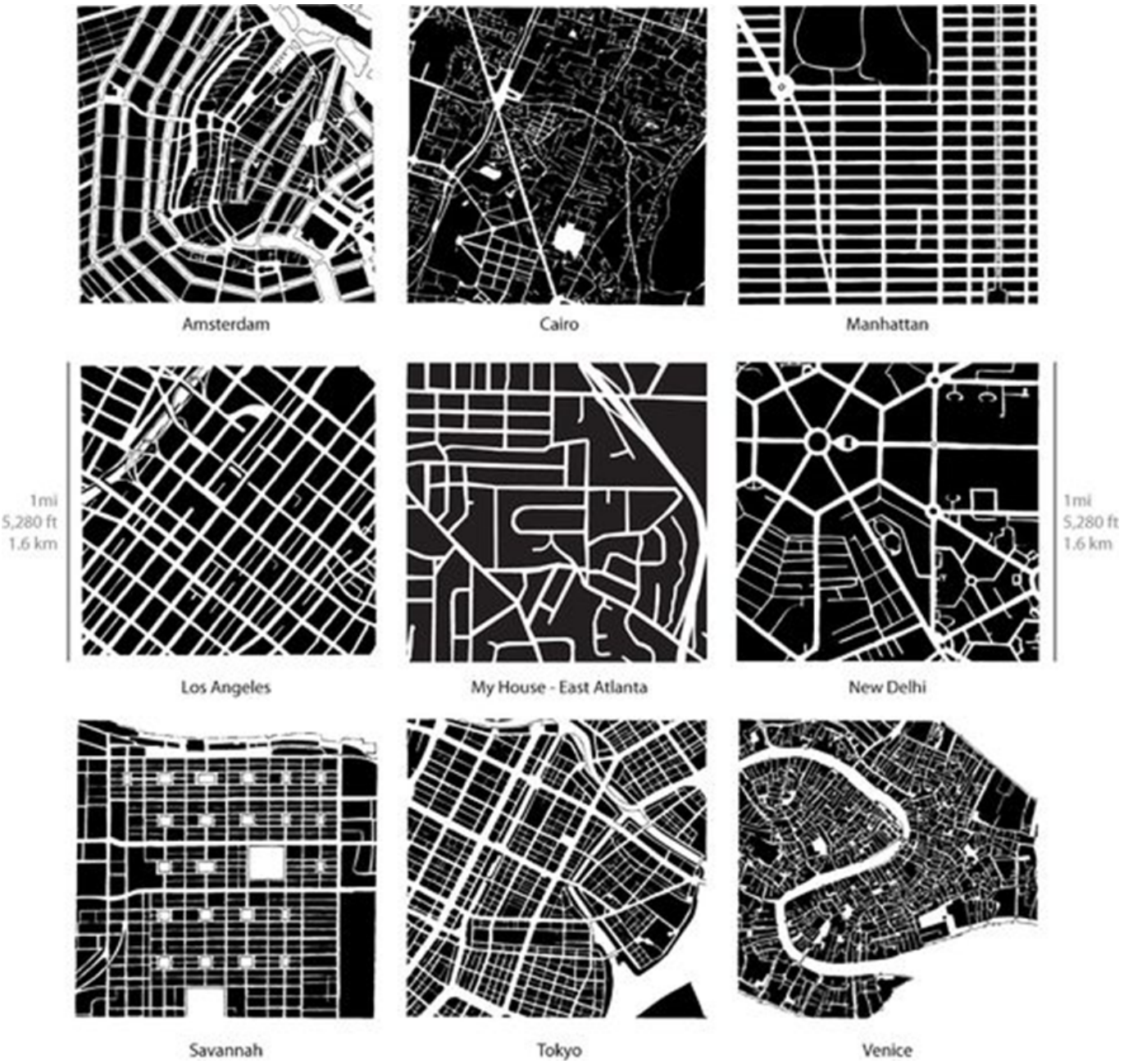

Fig 4.0: Figure Ground Diagrams of parts of multiple cities, drawn at the same distance of the eye from the ground (i.e., at the same scale).

Source: Allan Jacobs. 1995. Great Streets. MIT Press.

Please take a keen look at the figure ground diagrams in Fig. 4.0 and answer the following questions

1. What do the photos and figure-ground maps together tell us about the nature of the place?

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2. What characteristics do you draw from the maps for each city? Are the places drawn well planned/ not planned/ congested/ spacious? Which city from the above maps is well planned? Which city is not very much planned? As an urban designer, what would you do to improve the experience of the place?

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Urban and Infrastructure Design

IMPORTANT TERMS

National Government Schemes for urban infrastructure development:

Since the establishment of the Planning Commission in 1957, the Government of India (GoI) prepared Five Year Plans to chart the development planning initiatives for rural areas and cities. Containing the growth of cities by curtailing rural migration into cities and in-migration from small and medium towns into large metropolises was a major preoccupation of the GoI. The national and state governments were concerned about proliferation of slums in the big cities. The GoI launched several schemes, for upgrading urban infrastructure in small and medium towns in order to provide a good quality of life, while discouraging mobility into larger cities. The Urban Infrastructure Development Scheme for Small and Medium Towns was one such scheme undertaken prior to liberalization. After liberalization of the Indian economy in 1991, the focus on urban development was concerted. The GoI launched several schemes to improve infrastructure in large and medium sized cities. The Jawaharlal Nehru National Urban Renewal Mission, the Atal Mission for Rejuvenation and Urban Transformation, the Smart Cities Mission are all examples. This session deals with examples from the Smart Cities Mission, with examples from the city of Bhubaneshwar, Odisha as a case in point.

Smart Cities Mission

"The main objective of the Smart Cities Mission is to promote cities that provide core infrastructure, clean and sustainable environment and give a decent quality of life to their citizens through the application of 'smart solutions…. 100 cities have been selected to be developed as Smart Cities through a two-stage competition."

The Smart Cities Mission has two types of projects:

- Pan city projects
- Area Based Development
  - § Redevelopment
  - § Greenfield development
  - § City Improvement (Retrofitting)

Special Purpose Vehicles

Projects under the Smart Cities Mission (SCM) are governed under a Special Purpose Vehicle or a Special Company. Departments from the National and State government levels are part of this Company. The Municipal Commissioner of a city is generally the CEO of this Company. This Company is incharge of design, construction of projects conceived within the ambit of the Scheme.

ACTIVITY 1- URBAN DESIGN OF AN AREA BASED ZONE

The site of the activity is Bhubaneswar. Some facts:

Bhubaneswar:
- Capital of Odisha State.
- Population: 8.40 lakh people
- Municipal corporation limits:186 sqkm.

- The Smart Cities Scheme: 186 sqkm
- Area Based Development Project: 985 acres
- Location of the ABD project: Bhubaneswar Town Centre District (BTCD)
- Context:
- The Area Based Development precinct area includes the following types of places:
    - The Lake Neutral
    - Janpath
    - Railway station
    - Housing development project
    - Satyanagar institutional core
- The Area Based Development precinct includes the following urban systems:
    - Road, transport and mobility
    - Drainage, sanitation
    - Housing for the Economically Weaker Section
    - Educational institutions
- It constitutes the following types of population and stakeholders:
    - Formal businesses in the CBD
    - Informal financiers and informal economic activities such as vendors of fruits, vegetables, essential commodities
    - Residents, slum dwellers
    - Business entities related to private education
    - Public institutions
    - Government offices
- The following are the key issues faced in this area:
    - Un-walkable streets
    - Polluted lake and drainage channels
    - Traffic congestion at intersections
    - Air pollution
    - Poor quality infrastructure and housing for slum dwellers
- The place requires the following improvements and interventions:
    - Walkable streets
    - Congestion free traffic intersections
    - Cleaner air
    - Clean lake, segregation of drainage and sewerage
    - Improved infrastructure and better quality housing for slum dwellers

Below are maps showing the overall context and specific site

Fig 1.0: Site location of the Smart Cities Mission, Area Based Development Project

Fig 2.0: Image of the site

Fig. 3.0: Homeless people living on the streets of Bhubaneswar.

Source: WIRE: https://thewire.in/urban/bhubaneswar-smart-cities-mission

Fig 4.0: Slums Bhubaneswar

Source: Times of India: https://timesofindia.indiatimes.com/city/bhubaneswar/model-slum-likely-in-each-ward/articleshow/95110445.cms

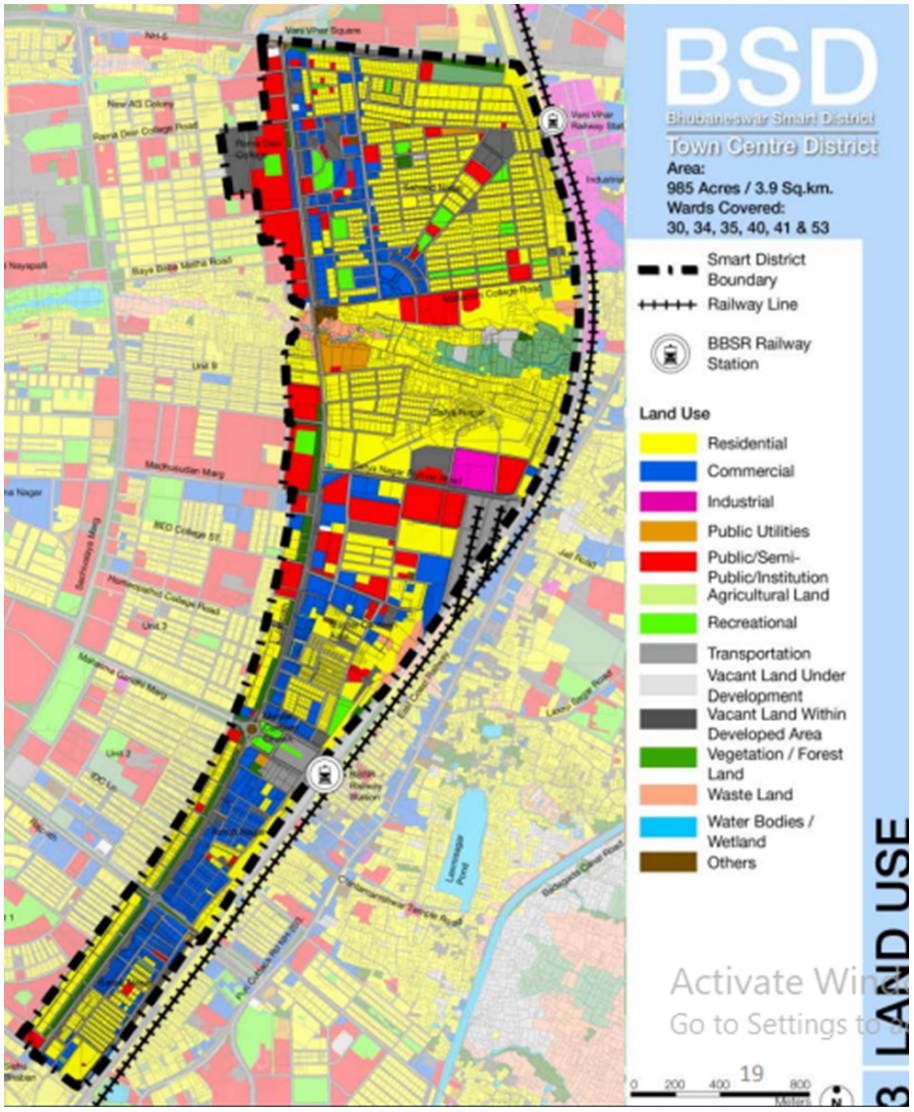


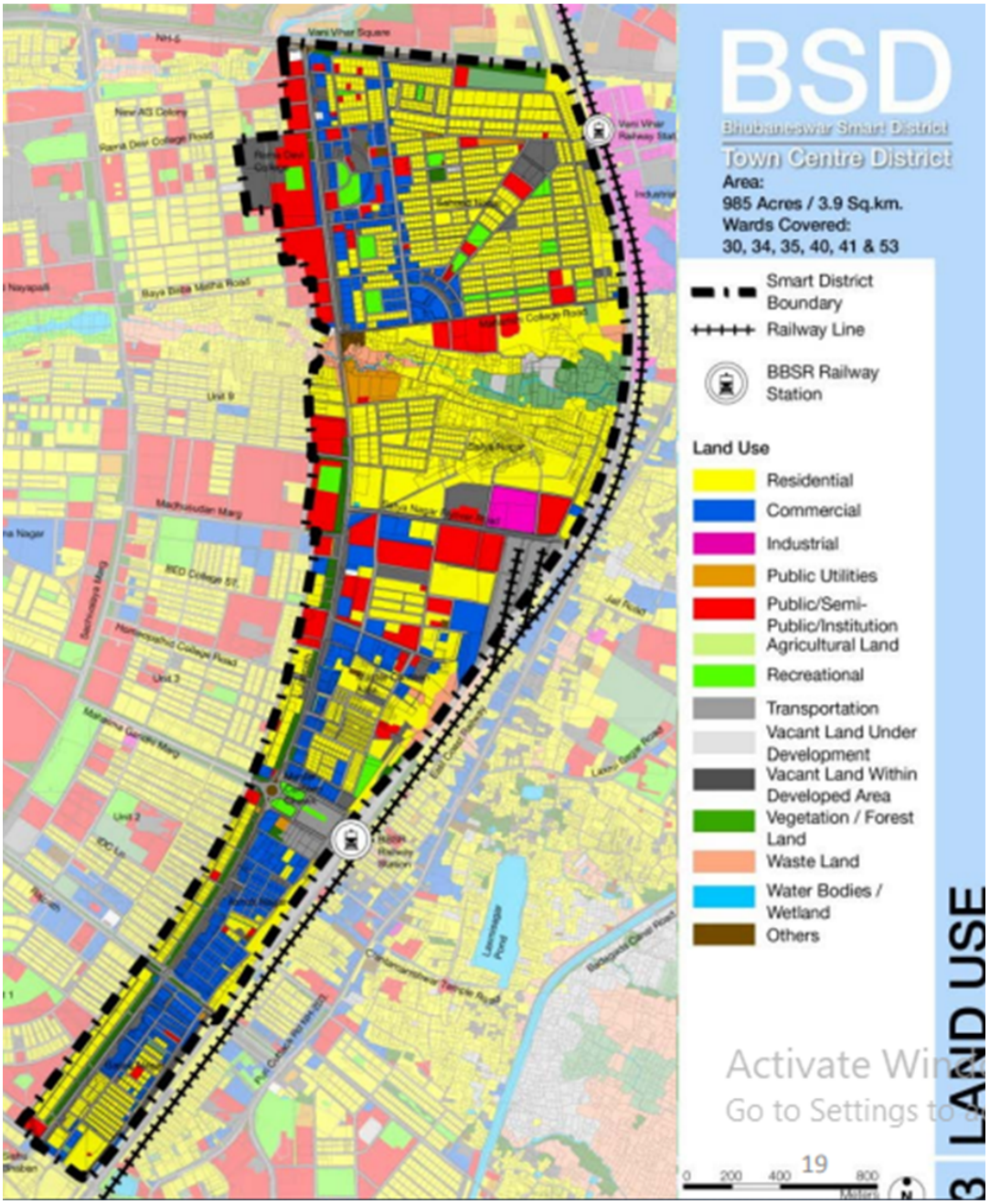
Fig 5.0: Specific Site, Land use map;

Source: Smart Cities Mission, Bhubaneswar, Odisha

Note: Issues highlighted on the map are fictitious and for academic purposes only.

Activity:

Form groups of 4-5 members each. Using the information given, and the map below, please make a sketch and a brief set of points on design solutions to the problems for the ABD Project area.



Continued…

Please list down the proposals you wish to make below:

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Project Work

Dear students,

You have now been exposed to the role of an urban planner in India. Their task is a tough one and a powerful one, because they are involved with multiple government authorities, private companies and communities to shape the future visions and development in our cities.

With this exposure, there are two types of activities envisaged for you all. One, a group activity involving role play and another, an individual assignment involving a reflective essay. The two activities are connected. The group activity is sequenced first.

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Exercise 01: Role Play (Groups)

You will be working in groups to create and perform a role play for decisions to be made for an urban design project. Your group engages in role play in the following manner.

You have to imagine yourselves as actors involved in making a decision for granting permits for the construction of a large apartment and mixed use development, which is located in a complex site. Making this new intervention may mean a lot of traffic congestion, potentially more crowding, threats to an ecologically sensitive area and air pollution.

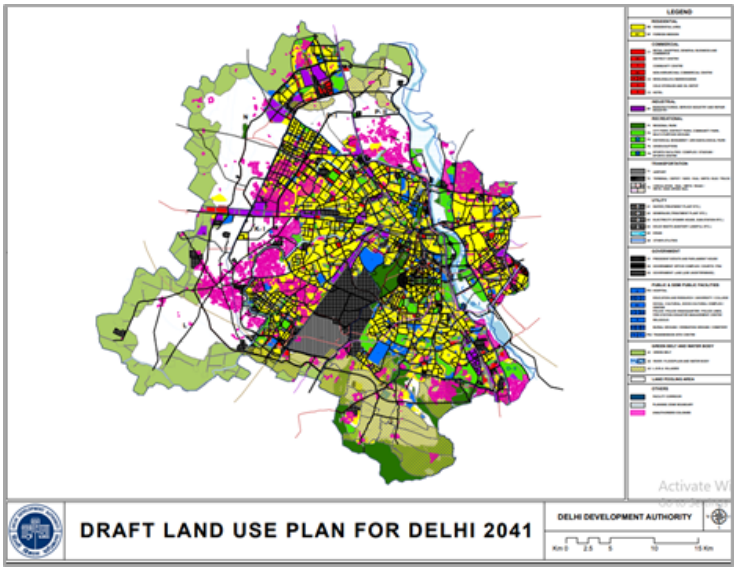
The context

You have the following information:

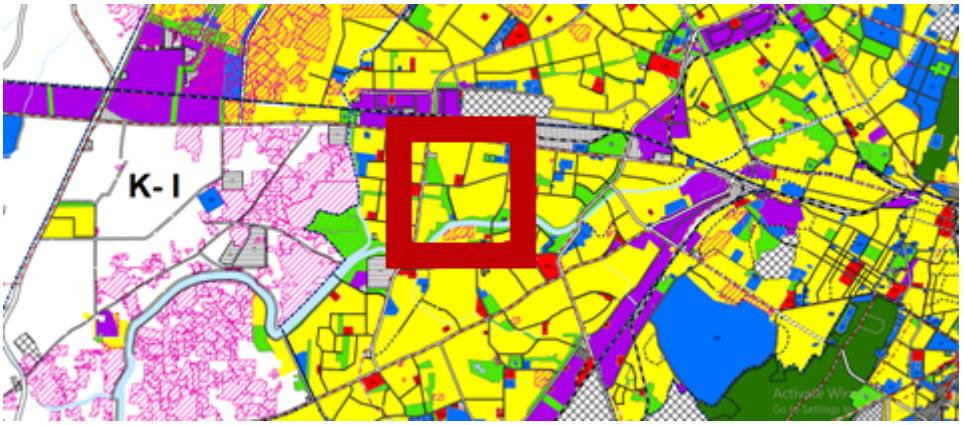
1. The site is a hypothetical setting, which has the following character:
    i. A bustling commercial street
    ii. A well planned residential area
    iii. An adjoining informal slum settlement
    iv. A nullah passes through the development which often floods
    v. A traffic congested junction
2. The new development being proposed on this commercial street has a mixed use building accommodating 50 apartments, 15 offices and a shopping mall. This development will accommodate 50 families/ approximately 200 people, 100 cars and 50 two wheelers, visitor's vehicles.

3. This mixed use development is located on the commercial street and right next to the drain that floods during monsoon.

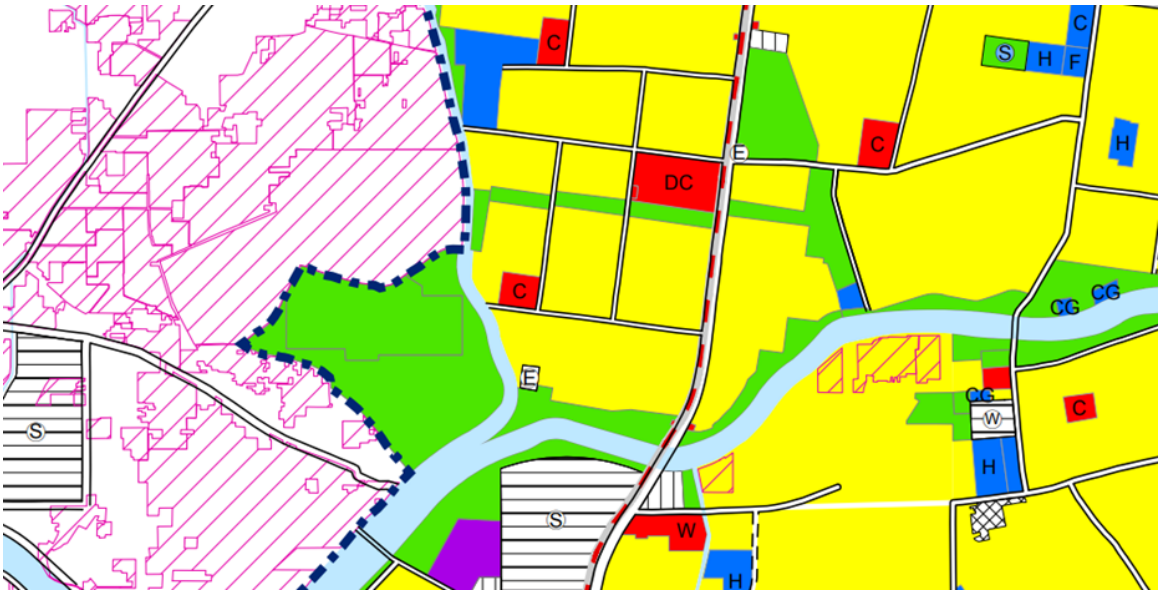
4. The builder submits the sanction plan to the Development Authority and Municipal Corporation. The Development Authority and the Municipal Corporation start to scrutinise the sanction plan for compliance with the regulations. The builder seems to have complied with all aspects of the Zoning Regulation, including Floor Space Index, setbacks, land use, building height with respect to street networks and open spaces on site.
5. However, at the same time the residents from the planned locality learn about the proposed development and raise an objection with the development authority and the municipal corporation that this new development will disrupt the tranquillity of their neighbourhood.
6. Some activists learn about the development and object to it from a different point of view. They say that the development will hamper the site from two other angles – one, that it will erode the naturally sensitive area and a nullah adjoining the site where the development is proposed. Two, that the slum living along the nullah will partially get displaced due to the proposed development.
7. The slum dwellers and residents of the planned area are not amenable to the project because it will worsen the traffic congestion and channel the flooding to the slum and the neighbourhood.
8. The planning authority and municipal corporation want the development because it will generate them revenue. Urban planners, traffic experts and environmental planners are to address the solution.
9. Your group must represent the many actors in this location: government organisations, the real estate developer, the local communities (slum dwellers and residents of the planned area).
10. By assuming roles, you will all play out a scenario of how a decision can be negotiated.
11. Finally, the urban planner in each group will negotiate a decision making sure all members are satisfied with the nature of development approved.



Map 1.0: Draft Master Plan for Delhi 2041, showing site for apartment building intervention. Note that the project/ site of intervention and all actors involved in role play is entirely hypothetical.



Map 02: Wider context of the site of intervention and the site of intervention



Map 03: Site of intervention for the mixed use apartment complex indicating area of influence where flooding, traffic congestion and other negative implications are likely to occur

Your task

- You will form groups of 8-9 members
- As homework, each group will prepare a power point presentation with a few slides on the nature of the project. The sequence of slides may be as follows:
  - An existing land use map in a city, showing a commercial street with commercial land use, a drain/ nullah, green buffer abutting the street (see Handout).
  - A map showing site of intervention of the apartment complex and area of influence, negative repercussions that the existing residents are anticipating
  - An image of a mixed use development, with offices, apartments, a mall and club house/ amenities etc.
  - An advertisement bill board of this development put up by the builder, showing something like the following information:
    - § 50 apartment units
    - § 150 million sq ft of office use
    - § 150 million sq ft of commercial mall
    - § 2 car parking units per apartment

§ 20 car parking unit per office establishment
§ Pay and park for the mall
§ Lavish club house
§ World class gym

(Note: Students are welcome to add more information to increase the commercial value of the intervention, also questioning its location in this residential neighbourhood).

- You will acquaint your selves with the Zoning Regulations for the intervention:
    - o Floor Area Ratio of 3.5
    - o Proposed permissible land use: Mixed: Residential and commercial
    - o Buffer from drain: 10 meters
    - o Access street width: 40 feet
- Your group will also list out the procedures required by the building bye laws for the Municipal corporation to decide on whether to grant the building permit for the builder
    - o No objection certificate from the Planning Authority- the Development Authority
    - o No objection certificate from the Municipal Corporation
    - o No objection certificates from officials from water supply and sewerage department
    - o No objection certificate from the electricity department
    - o No objection certificate from officials from environment department
    - o No objection certificate from officials from pollution control board
    - o No objection from Traffic Police
    - o No objection certificates from Ward Committee Members including Ward Level officer from the Municipal Corporation, elected Ward Councillor, representatives of the neighbourhood, informal settlements
    - o Representation of environmental and social activists
- Using this background work each member of the group will play the role of one of the characters in the plot stated above, to scrutinise whether the new development is compatible on the street.
- Each student will prepare one slide to put forth their argument on why they think the development is permissible or not in the location (see teacher prompts on how to guide students on what each of these slides from each student can contain).
- **Arguments may be noted by the group through collective reflection as home work**

Development Authority

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Municipal Corporation, Urban Planner Member

Official from the Ward Councillor

Official from the Water Supply Department

Official from the Electric Supply Department

Official from the Environment Department

Official from the pollution control board

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Ward Committee Members, Residents of the planned layout adjoining the site

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Ward Committee Members, Residents of the slum settlement along the nullah

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Official from environmental and social activists

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These points will be made by individuals and discussed by team members beforehand, as group work.

Synthesis of decision by the Urban Planner Member, Municipal Corporation

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Modality of presentation

- Two persons from the team will first present the case
- Then, the Urban Planner Member, from the Municipal Corporation will convene a meeting among all stakeholders in order to take the decision to accord the development permit the or not
- Each stakeholder will explain their argument: for or against and why, by referring to the Zoning Regulations and daily lived experience of quality of life
- The Municipal Official, the Urban Planner Member will synthesise all points from all stakeholders and announce the decision.

All the very best and enjoy the exercise of becoming urban planners!

Exercise 02: Individual Reflective Essay

Please reflect on the group exercise done and write a reflective response essay on any one of the following themes:

a. The dilemmas of the Municipal Officer involved in granting permits
b. The merits of a consultative/ participatory process as the one in the role play exercise

Word count: Max. 700 words.

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