World of Work

Teacher Handbook

Volume II:
Mapping and Visual Representation Cluster

Module 1: Mapping and Visual Representation
Module 2 : Geographic Information System (GIS) Analyst
Module 3: Urban Planning

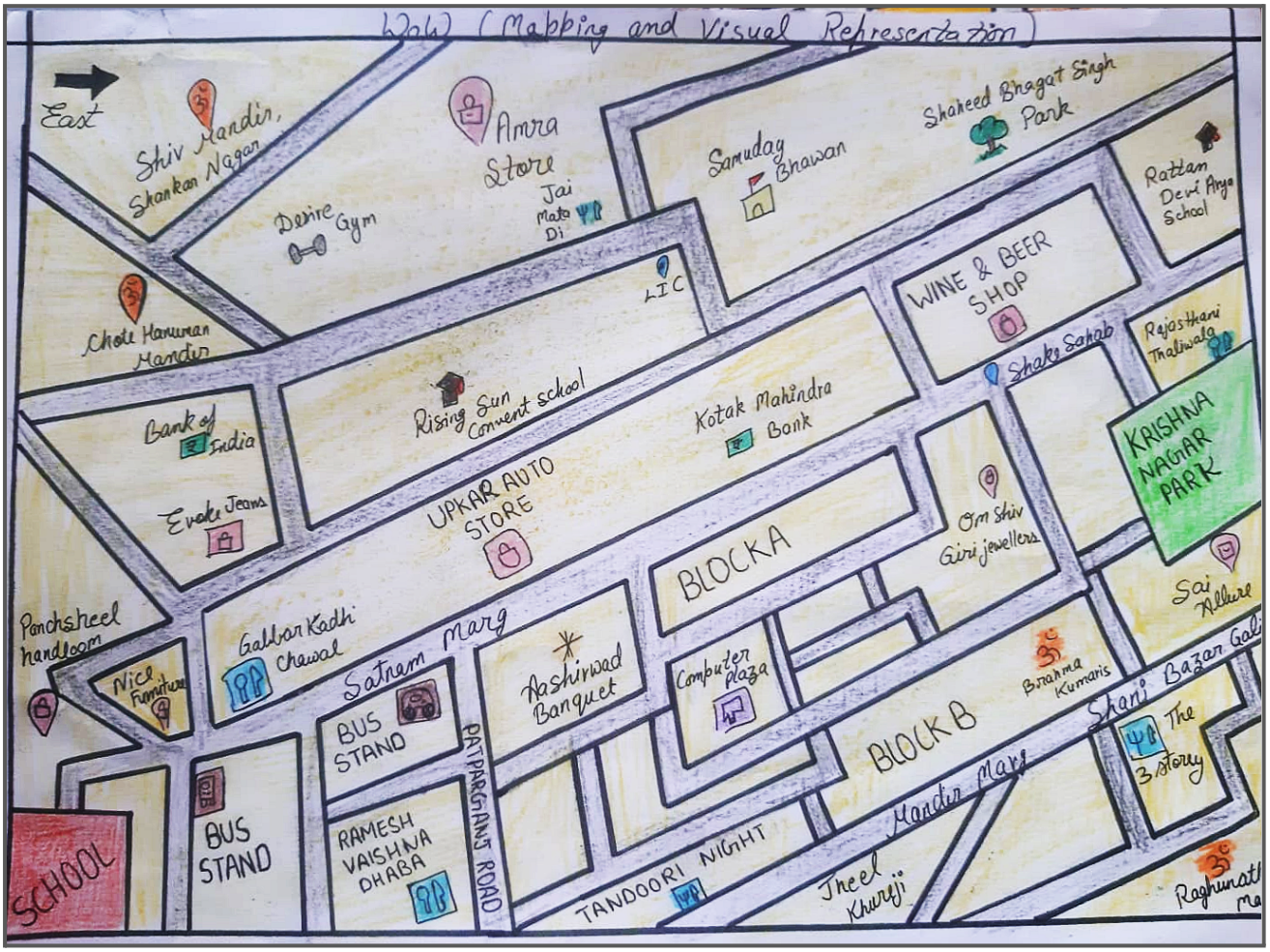


Image showing neighbourhood map submitted by one of the students' groups as part of the project

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
Research and Coordination: Ms. Tanya Mittal & Ms. Manvi Suyal
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

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 Writer
Mapping and Visualization	Geographic Information System (GIS) Analyst	Urban Planner
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		
	Unit 1: Transmedia Storytelling	16 hours/12 days
	Unit 2: Journalism	16 hours/12 days
	Unit 3: Content Creation	16 hours/12 days
	Unit 4: Mapping & Visual Representation	16 hours/12 days
	Unit 5: Geographic Information System (GIS) Analyst	16 hours/12 days
	Unit 6: Urban Planner	16 hours/12 days
	Unit 7: Working with People & Community	12 hours/ 9 days
	Unit 8: Social Work	12 hours/9 days
Grade 10		
	Unit 9: Enabling Learning	12 hours/ 9 days
	Unit 10: Teaching	12 hours/ 9 days
	Unit 11: Justice and Constitution	16 hours/12 days
	Unit 12: Lawyering	16 hours/12 days
	Unit 13: Public Policy	16 hours/12 days
	Unit 14: Research and Critical Thinking	16 hours /12 days
	Unit 15: Academic Research	16 hours/12 days
	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 you with all information, support and guidance you need as you work through Experiential World of Work modules. It guides you through the three modules under the Mapping and Visual Representation Cluster to be delivered over a period of three months. It contains the following:

- An introduction to the cluster which explains the role of the skill in the workplace and how it connects with the career modules
- An overview of each module in the cluster
- Detailed lesson plans for all the classroom sessions including teacher handouts and other materials to be used by the teacher in the classroom
- Description of the project and how they are to be transacted in the classroom by the teacher
- Assessment Rubrics for the project
- Design of the Teacher Professional Development sessions that were conducted by the TISS team the first time the module was transacted in the classroom
- The Student Handbook is also attached for your reference. This student handbook contains the handouts and worksheets that the students will use while going through the modules.

Cluster II: Mapping and Visual Representation

Module 1: Mapping and Visual Representation

Module 2 : GIS Analyst

Module 3: Urban Planner

Mapping and Visual Representation Cluster Overview

The Mapping and Visual Representation cluster is designed to introduce the students to the fascinating world of maps and their significance in our lives. Maps have a rich history that dates back centuries and have played a vital role in communication, navigation, and territorial definition. This cluster aims to develop students' understanding of mapping as a science and a tool through classroom discussions, fieldwork, and hands-on activities.

The cluster begins by exploring the historical context of maps, highlighting the need for mapping as a means to navigate and record movement from one place to another. Initially, maps were created for small areas, then expanded to encompass larger regions, countries, and eventually the entire world. As the need to comprehend vast areas beyond human scale arose, unique locational references such as latitudes and longitudes became crucial. Latitude was a relatively easy concept to develop, but longitude was interconnected with the measurement of time, making mapping time an essential aspect. Today, mapping plays a significant role in various location-based services like taxi and food delivery, connecting the demand and supply chains. Understanding concepts like latitude and longitude becomes vital in comprehending how maps are created and how people navigate. Students will also explore various socio-cultural and historical contexts of maps, gaining insights into the diverse perspectives and influences that shape the creation of maps.

The Mapping and Visual Representation module not only focuses on the technical aspects of mapping but also aims to develop students' visual-spatial thinking and reasoning skills. Representing spatial information on a map requires critical thinking and an understanding of how to effectively communicate information visually. By engaging in mapping exercises and activities, students will enhance their ability to think spatially and analyze geographical data.

In recent years, there has been a Geospatial Revolution, with advancements in technology making location information more accessible and widely used. Consumer GPS tools, interactive web maps, and location-aware mobile devices have transformed the way we interact with spatial information. This module will expose students to these technological advancements, enabling them to understand and utilize spatial data in their everyday lives.

By combining core concepts in cartography, geographic information systems (GIS), and spatial thinking in the GIS Analyst module, this course provides students with a solid foundation to engage with Geography beyond surface-level understanding. Students will explore the unique characteristics of spatial information, learn how spatial data is created, conduct spatial analysis, and design effective maps that convey compelling stories. Through the use of cutting-edge mapping and analysis software, students will gain practical experience in solving geographic problems and leveraging spatial information.

The Urban Planning module addresses the challenges of rapid urbanization in India, emphasizing the role of urban planners in ensuring healthy living conditions, provision of basic services, and sustainable development. By integrating this module, students will gain insights into urban dynamics and develop a deeper understanding of creating livable cities for the present and future.

Mapping and Visual Representation cluster offers students an exciting opportunity to delve into the world of maps, develop crucial spatial thinking skills, and engage with the power of geographic information. By exploring the historical, technical, and socio-cultural dimensions of mapping, students will not only acquire knowledge but also gain practical skills that can be applied in various disciplines and future careers.

Cluster II Module 1: Mapping and Visual Representation

Credits

Initial Module Conceptualization, Authoring and TPD sessions:	Dr. Anu Joy, Assistant Professor, TISS Hyderabad
	Dr. MB Rajani, Assistant Professor, National Institute of Advanced Studies
	Ms. Yemuna Sunny, Critical geographer and teacher
Research:	Ms. Karishma Modi, Teacher
Research and Coordination:	Ms. Tanya Mittal, Program Manager, CETE, TISS

1.1 Mapping and Visual Representation: An Introduction

Mapping is a human endeavour and therefore is also a product of the time and space of a map maker. This 4 weeks long module will familiarize the students with various socio-cultural, and historical contexts of various maps that have been made historically. The module will also emphasise the mapping and the relationship between physical geography and human activities.

In the past, mapping of large areas was done physically through surveys, and by taking detailed calculations. This process was very arduous, laborious, and time-consuming. For example, the first detailed survey (in the 19th century) of the whole of the Indian subcontinent took more than 75 years. Whereas today with digital tools, mapping has been made easy so that it can become an individual's endeavour for those who have access to tools (internet and computer). This module will introduce students to digital tools and satellite imagery for mapping. Also, through hands-on activities, students will be taught to make digital maps of their own neighbourhood, and will also be familiarised with accessing satellite images and maps of anywhere in the world.

This module brings together the concepts in cartography, and spatial thinking with real-world examples to provide the fundamentals necessary to engage with Geography beyond the surface level. Students will explore the history of maps, maps as a science and a tool, various contexts of mapping, and how to design maps so that they're effective at telling the stories we wish to share. This module will aim towards developing visual-spatial thinking and reasoning skills, as well as the skill of representing spatial information on a map in the students.

The focus areas of the module are:

- Techniques and concepts of map making. Mapping the familiar everyday world and locality to understand geographical and spatial characteristics
- Awareness about tools and resources available for making digital maps. Hands-on experience on accessing satellite imagery and making maps
- Varied contexts of mapping: colonialism, people's articulations and planning, Local to global linkages;
- Maps as fun, thought-provoking, perspective building

Prior Knowledge required for this module:

- Knowledge of the concepts : Location, Distance, Direction, Relationships, Symbols, Latitude, and Longitude
- Ability to use desktop/laptop computer interfaces, use google search
- Ability to use referencing,
- Ability to do basic sketching,
- Familiarity with the idea of colonialism
- Able to read instructions on hand-out and perform activities on computer
- Basic levels of map reading, map making and analysis

Student Learning Outcomes:

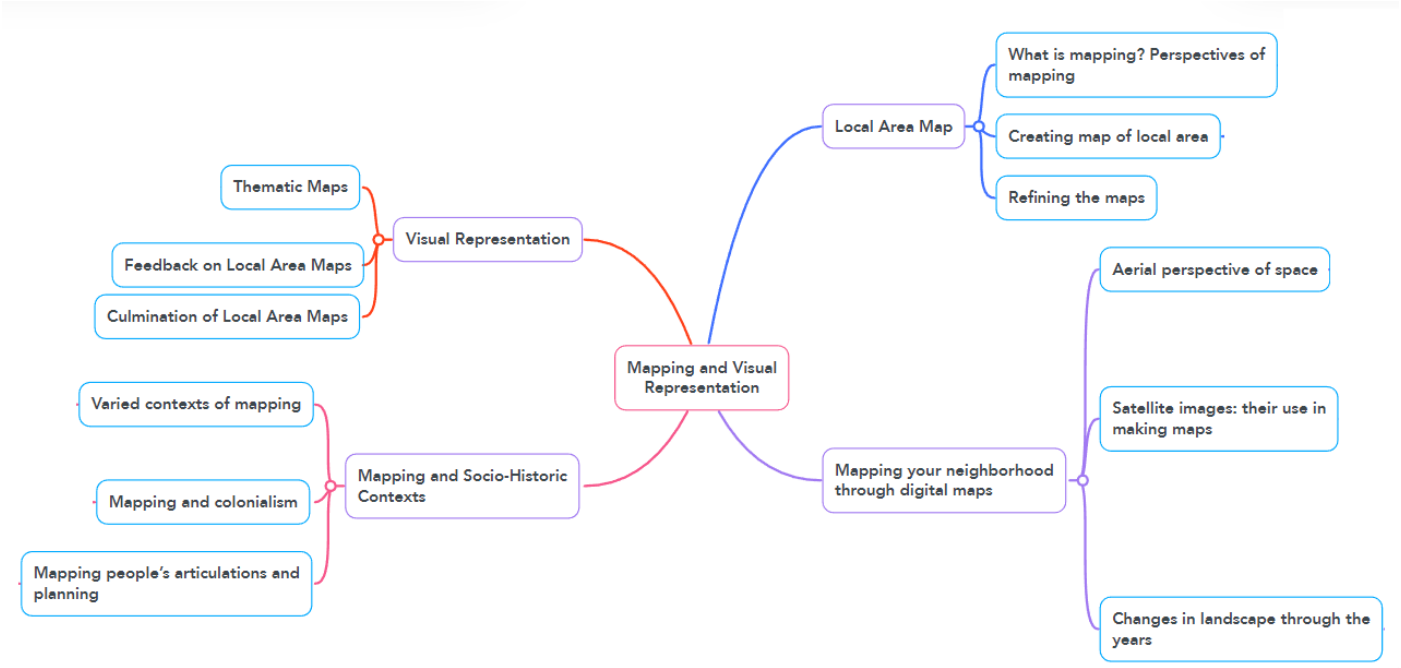
- Foster the development of visuospatial thinking skills and the ability to create maps proficiently.
- Acquire a comprehensive understanding of the fundamental techniques and concepts involved in map making.
- Recognize the relevance of the students' familiar everyday world in the context of map making.
- Gain insight into the nature of digital maps, including their creation process, the measurement of location, distance, and area, their diverse applications, and their distinctions from traditional survey maps in terms of time, effort, and precision.
- Analyze and interpret maps from various contexts, drawing comparisons and extracting valuable insights.
- Identify the social relations embedded within the act of mapping, recognizing its influence on societies and their interactions.
- Apply cartographic knowledge and social understanding to real-world situations, utilizing acquired skills in practical scenarios.
- Formulate layered inputs in cartography
- Create a map by consolidating information from various sources
- Develop a nuanced understanding of mapping functions, appreciating that they are much more than the locations of themes.

Concepts in the module:

- Techniques and concepts of map making
- Spatial concepts : direction, location, scale, symbols, legends, latitudes, and longitudes,
- The significance of students familiar everyday world and immediate surroundings for map making and understanding geographical and spatial characteristics
- Building connection with students neighbourhood/localities and the entities in it
- Reading maps and map features.
- Use a map to measure and find out the distances between places
- Cartography and planning
- Socio-historical context of cartography, nature of knowledge creation,
- Thematic mapping
- Food security, cultural transmissions across the globe

Module Overview:

Each week of the module will focus on a different theme. These themes are:



Module Assessment:

We will be assessing students on the following:

Formative (Unit) Assessment of the module will be through the module project. The module project will test the following from the broader set of Assessment Objectives for the World of Work course:

Summative Assessment of the module will be through a written exam.

Formative Assessment		**Summative Assessment**	
Assessment Objectives	**Competencies**	**Assessment Objective**	**Competencies**
1. Inquiry and Exploration	- Articulate and justify inquiry questions (What to Research) - Gather required information/data through multiple research methods (How to Research) - Use an appropriate choice of primary and/or secondary sources to seek evidence for their inquiry (Where to Research)	**1. Knowledge & Understanding**	- Recognize and use the specialized vocabulary of specific skills, careers and workplaces (Knowledge) - Summarise concepts about skills and careers using explanations, descriptions and examples (Understanding)

2. Critical Thinking & Decision Making	- Apply concepts learned in new and unfamiliar contexts (Adaptive) -Construct and evaluate arguments and solutions using logic and evidence (Reasoning) -Analyze data to generate evidence (Data-literate)	**2. Inquiry and Exploration**	- Articulate and justify inquiry questions (What to Research) - Gather required information/data through multiple research methods (How to Research) - Use an appropriate choice of primary and/or secondary sources to seek evidence for their inquiry (Where to Research)
3. Presentation & Communication	-Clearly and persuasively articulate their thoughts and ideas verbally and in writing (Coherence) -Create aesthetic, impeccable and convincing artefacts (written, visual, maps, data representations) (Versatility)	**3. Critical Thinking & Decision Making**	- Apply concepts learned in new and unfamiliar contexts (Adaptive) - Construct and evaluate arguments and solutions using logic and evidence (Reasoning) - Analyze data to generate evidence (Data-literate)
		4. Presentation & Communication	- Clearly and persuasively articulate their thoughts and ideas verbally and in writing (Coherence) - Create aesthetic, impeccable and convincing artefacts (written, visual, maps, data representations) (Versatility)

1.2 Lesson Plan

Week 1: My Local Area Map

Summary:

This segment of the module will introduce students to the world of mapping. The students will be engaged in a field visit and make and improve maps created by each group during the visits. They learn to examine map features, including titles, directions, symbols, and geographical components. Through group discussions and feedback, they compare and contrast different maps, identifying important geographical information represented on each map. The students also explore the use of maps as tools for visualizations, incorporating additional layers of information such as geographical features, local histories, cultural specificities, and socio-economic realities. The week's lessons conclude with a discussion, where students analyze the maps and identify various aspects of the landscape, including house sizes, changes in the environment, directions, and other geographical elements.

Important Concepts:

- A map is a representation of spatial information and from a point of view.
- A map contains information of an area — physical features, socio-cultural, and economic interest and presents information pertaining to geography, ecology and human activity. Map represents interrelationships between people, place, and environment, and how these vary spatially and temporally across and between locations.
- Information presented on a map uses 'scale' to represent physical distances and measure, direction (to orient) and symbols to represent data
- Map making requires field work and gathering data to be represented

Learning Standards:

During these sessions, students will have the opportunities to:

1. Learn to create maps and represent spatial and geographical information on a map
2. Develop Visuo-spatial thinking and cartographic skills
3. Learn how to use a compass

Lesson Plan: Week 1 Day 1
What is mapping? Perspectives of mapping

Classroom Inquiry Process	Resources
Lesson Aims ● Reading maps and map features ● Understanding the concepts and techniques of map making ● Creating a map of immediate surroundings and representing important geographical characteristics in it **Activity Description:** ● The lesson comprises outdoor activities and field work in the area where the school is located. ● Understand cardinal directions and coordinates ● Learn how to use a compass ● Mapping the familiar everyday world and locality to understand geographical and spatial characteristics ● Field walks, drawing maps of familiar locations and routes ● Individual tasks as well as group work. ● Discussions, presentations, and working in teams **Materials:** ● Compass ● Different types of maps ● Notes books ● Sheets for sketching map ● Local area maps (tourist map of qutub, redfort, metro of delhi, swiggy or uber booking map/traffic map) **Activity 1: Introduction to the module (20 mins)** Start the module by brainstorming and asking the students the following questions: What is a map? Have you ever seen a map? Why do you think a map is used? Take their responses and collate them on the board. Explain that a map is like a picture that shows where things/places are located. Usually a map shows a place from above, where everything is smaller. Then, begin the first activity by introducing the students to a locality map (any locality in Delhi). Highlight the map with a route from place A to place B drawn on it. The teacher will ask the students to figure out the directions from place A to B. To discuss the different directions, questions can be asked: where does the sun rise/sets? Compass can be introduced here. The teacher will explain what a compass is and how to use it. The students will use a compass to practice locating the cardinal direction. The teacher can ask questions like: a. Name a place : north of school, south of school, east of school and west of school b. Name of a state : north of delhi, south of Delhi, east of Delhi, west of Delhi c. Name of a country that is to the south of India? North? East? West?	

d. Andhra Pradesh is …….. of Delhi (Kashmir, Bihar, Uttarakhand etc.) e. Iran is ……..of Delhi (Japan, Sri Lanka, Pakistan, Bhutan, etc.) f. Name a continent that is north of India? South? **Activity 2: Examining different maps (20 mins)** The teacher will then show some local maps and ask the students: 1. What is the purpose of this map? 2. From whose point of view is this map made? 3. Who can use this map: can a bus driver use this map? Can a tourist use this map? 4. How are colors, symbols used in this map? It will be discussed that maps are designed from different points of view and for a particular audience. They can have different details, particular use of colors, symbols according to their designated purpose. Continuing the earlier discussion, the teacher will then give the students a tourist map of Tokyo or any other city in the world and ask some questions like: 1. Where will you find a place to eat? 2. How will you plan your day? 3. Where will you stay? 4. How will you travel? Will you take a car/bus/any other vehicle? This activity will help the students to navigate a completely unknown area because of the way these maps represent information, it will help in making the unfamiliar place familiar to the students. **Activity 3: Mapping the School (Practice session) (20 mins)** Then the teacher will inform the students that they have to create a map of their school campus. S/he will ask the students: What are the important things that should be included in the map of the school? How can a map of the playground or the school be useful to people? After taking their responses, take the students around the school campus and ask them to map the school area.	

Lesson Plan: Week 1 Day 2
Creating map of local area

Classroom Inquiry Process	Resources
Lesson Aims: ● Understanding usage of symbols, colors, legend, scale ● Creating maps of the local area and representing important spatial and geographical characteristics on it **Activity 1: Discussion on field visit (15 mins)** The class will begin with a recap of the previous session. Then, the teacher will orient the students about the field visit. S/he will inform that the students will be mapping an area of approx 800 square meters around the school. The students will be divided in groups (preferably 4 groups to make it easier to come back and combine the maps) and asked to think on: 1. What all will you map in the locality? (roads, buildings, places of worship, post offices, historical monuments, bus stops, shops, railway stations etc.) 2. How will you do it? (strategies, use of graph paper, ways to measure distances, use of compass) 3. How will you use different colors in your map? (Mark different areas (in different colors) such as parks, playgrounds, /residential colonies, market, commercial complexes etc. on the map) 4. How will you use legend, symbols, scale in your map? 5. Should all groups use the same legend, symbols, scale? Why? Teacher will share which group will map which area. **Activity 2: Field Work in Groups (45 mins)** Teacher will provide the students with the Handout designed to help the students during the field visit. The teacher will explain the handout, after which the students will go out to mapping the area in their groups.	**Handout:**

Lesson Plan: Week 1 Day 3
Refining the maps

Classroom Inquiry Process	Resources
Lesson Aims: ● Presenting maps created by each group to the whole class ● Examining features of the map made each group ● Comparing and contrasting the map made by each group ● Refining and improving maps ● Understanding map as a tool for visualizations **Activity: Refining the maps (40 mins)** Students will come back with their own maps and combine the maps on a big chart. The teacher will ask the students: ● What are the important features shown on the maps made by each group? ● What are the components of each map? (title, direction, symbols, areas, buildings, distance, labels, etc.) ● What are the types of information represented on each map? ● Discuss about the scale, point of view, and other details on each map. The teacher will ask the students to give feedback to each other. The students may ask each other to add some important geographical features, add colors, scale etc. The teacher can ask the students to include another layer of information (which are not represented on the maps made by them) For eg. ● Geographical features (boundaries, roads, highways, rivers, lakes, ponds, mountains/hills, valleys, trees, landscaping, etc.) ● Local histories (date the buildings, houses, schools, parks, religious places, post office, police station, heritage places/buildings etc.) ● Cultural specificities (Language, art, craft, food, festivals, fair etc.) ● Socio-economic realities (occupation of people, educational level, access to internet and electricity, etc) ● Land use (built up areas, agricultural, orchard, wasteland, industrial, etc.) ● Agricultural land, types of soil, major crops, irrigation system, etc. ● Settlement patterns (why people choose to live where they live, the kind of settlement patterns in the locality (is it nucleated, linear or dispersed) ? ● Energy use in the area, renewable and non-renewable energy sources, water sources, electricity distributions systems, etc. Or any other significant features of the locality can be represented on the map After feedback from peers and the teacher, the students can work on refining the map. **Activity 2: Discussion (20 mins)** After the students have worked on their maps, have a discussion and ask them:	

What things do you notice in this map? (Ask them to think about the socio-cultural, historical, or economic relationships/differences, spatial distributions, social characteristics, etc. in the map) Suggested questions: 1. Do you notice the difference in size of the different houses? What do these differences indicate? 2. Has the landscape changed? How was it in the past? 3. Where is the slope of the land, direction of the drain? 4. What are the flora/fauna etc. that you found? (Morphology of the landscape) Additionally, ask the children to identify: 1. Find their house on a map 2. Identify the house of all children in class on the map Home task: Ask the students to: 1. Estimate distance traveled by them to the school 2. Identify the directions from one location to another	

Week 2: Mapping your neighborhood through digital maps

Summary:

This week focuses on understanding and using digital maps and satellite imagery. Students will explore Google Earth Pro and Bhuvan, learning about satellite images, georeferencing, and digitizing features from images. They will also understand how to measure locations, distances, and areas using digital maps. The activities include examining maps of different dates/seasons/years to observe changes in landscapes, land use, and natural changes such as river movements and climate change effects. The lessons aim to develop spatial awareness and analytical skills using real-world examples.

Important Concepts:

- How digital maps are made.
- How location/distance/area can be measured using maps.
- Uses of digital maps.
- Other uses and applications

Learning Standards:

During these sessions, the students will have the opportunities to -

- Awareness about how pictures from air and space look, and how these can be used as maps
- Awareness and hands on experience about how modern maps are created using pictures taken from aircrafts and spacecrafts
- Measuring distance on ground versus measuring on satellite photos
- Ability to map features anywhere in the world from your desktop and see changes happening anywhere in the world by observing satellite photos of different dates of anywhere in the world

Lesson Plan: Week 2 Day 1
Aerial perspective of space

Classroom Inquiry Process	Resources
Lesson Aims: ● Identifying various features on satellite imagery ● Understanding an aerial perspective of space, neighbourhood ● Understanding spatial relationships **Tools:** Google Earth Pro, Bhuvan This session is to be conducted in a computer lab. Google Earth Pro has to be installed in desktop computers before the class begins. Instructions for installation are given on Page 2-3 of Handout 1. **Activity Title: How does your neighbourhood look when seen from above?** The class can start with students sitting at the computer (either one student at one computer or 2-3 at one, based on the number of computers available). Once the Google Earth is opened it will look like what is shown in Page 4 of Handout 1. The teacher can ask questions like, when you see a world map in your printed book or atlas, what do you see? Does the world look like a rectangle? This could lead to a discussion like: but in reality the world is an ellipsoid. Digital portals like Google Earth can represent the true shape of Earth. For instance when you are able to see India, USA is on the back (this can be illustrated by rotating the globe on the Google Earth window). After this the students can be made to get familiarise with Google Earth interface by asking them to perform instructions given in Page 4-8 (of Handout 1): for getting familiar with Google Earth interface (10 min) At this point teacher can give some explanation about what Google earth is: Google Earth is a geo-browser (a browser to visualise the whole earth) that accesses satellite and aerial imagery, topography, ocean bathymetry (bathymetry is the measurement of depth of water in oceans, seas, or lakes), and other geographic data over the internet to represent the Earth as a three-dimensional globe. Geo Browsers are alternatively known as virtual globes or Earth browsers. Using Google Earth and maps in classrooms can help visualize abstract concepts across a global canvas, allowing students to connect what they learn inside to what they experience in their daily lives, community, and to the larger world. Google Earth's creation tools allow you to create your own projects. Before which let us explore what Google Earth has. Apart from satellite images we can see many other kinds of maps. For instance the Borders and Labels layer displays the international boundaries, state borders, and names of places at certain zoom levels. The Layers panel on the left has features you can explore. Similarly the photos layer shows photos taken on ground of the features one sees on the satellite image (to see photos you must zoom in to be able to see buildings). Road layer shows the road. These layers (photos/road/borders can be ticked or unticked for visualising one or more layers at a time). Students can check all these by following instructions in page 9-10 in Handout 1 (10 min) Teachers can point out that so far the view has been only top-down, but digital images can also show 3D. For this the “Terrain” layer has to be enabled and a location	**Handout 1:**

can be zoomed in (to tilt the land one can press the scroll wheel of the mouse and move up or down). The hills and slopes become visible. Students can check this by following instructions on page 11 in Handout 1. (5 min) At this point teachers can ask if students know what latitude and longitude is? How can they find out the latitude and longitude of a location? After a brief discussion, the teacher can point out that students can find out the latitude, longitude of any location of earth using Google Earth. Students can zoom in to a location and move the mouse on the screen, at the bottom panel of Google Earth latitude longitude of a location will be displayed. Students can be asked to zoom out to see whole earth and also enable latitude longitude grids by following in page 12-14 in Handout 1 (5 min) Till now students would have explored the Google Earth interface and its functionalities. Now they can perform some activities that will help in: 1) identifying various features on satellite images, 2) the difference between how things look from above versus from the ground, 3) the spatial relationships between them: 1) Page 15-16: Lesson-1 Identifying various features on satellite imagery (10 min) 2) Page 17-18: Lesson-2 Understanding an aerial perspective of space and neighborhood (10 min) 3) Page 19: Understanding Spatial Relationships (10 min)	

Lesson Plan: Week 2 Day 2
Satellite images: their use in making maps

Classroom Inquiry Process	Resources
Lesson Aims: ● Understanding how digital maps are made: ○ satellite imaging ○ Georeferencing ○ digitizing features from images ● Making maps oneself ● Measuring location, distance and area using digital maps **Tools:** Google Earth Pro, Bhuvan **Activity 1: Satellite imagery (15 min)** This part of the session will begin by developing theoretical understanding. The teacher can start the class by displaying page 2 of Handout 2. This page has a few questions: • What are satellite images? How are they taken? How do users find them? • How are maps made using satellite images? • What is georeferencing? • What does georeferencing do to an image? (Pages 2-8 can be used as slides for teaching the theory.) First concept is- what are satellite images, how are they taken (picture and notes are given in page 3). Teacher can show this as a slide on the screen and read these notes out loud. Second, once these images are taken, how are they processed and given to people like us to use for making maps. The diagram and description in page 4 illustrates how images are taken, processed and made available to users. Teachers can display this on screen and read out the description and use the diagram to explain the concept Third, How are satellite images used to make maps? Display page 5 on the screen and point to the pictures one at a time and read out the explanation below each Fourth, how can we make measurements on satellite images? Teachers can ask students if they have taken photos using a camera (like in a mobile camera) and ask them if they can measure features on a photograph. The answer would be no. Then the teacher has to explain that satellite images have to go through a process called georeferencing which makes the image digital, after which measurements can be made on the image. Page 6-8 can be used to explain what georeferencing is and how it is done. These pages can be displayed on screen one after other in sequence and the pictures and descriptions can be used to explain. **Activity 2: Digitize the features in a map (45 min)** So far we have seen that satellite images are used for making road maps, railway maps,etc. Now we will learn how such maps are made. In this part the students will follow	**Handout 2:** 

instructions in handout and learn how to digitize features to make maps and how to measure. These will be done and hands on activity: Follow the instructions given in the Handout 2. 1. Page 10-24: Lesson-1 Digitising features from images: Red fort and school neighbourhood (30 min) 2. Page 25-30: Lesson-2 Measuring locations, distances, and area using digital maps (15 min)	

Lesson Plan: Week 2 Day 3
Changes in landscape through the years

Classroom Inquiry Process	Resources
Lesson Aims: ● Understanding changes by examining maps of different dates/seasons/years ● Major changes in the landscape (airport, dwarka area…etc) ● Observing land use changes in neighbourhood ● Observing changes in other places: ○ Natural changes: Movement of rivers, changes in shoreline ○ Growing cities ○ Climate change: Drying of lakes (Aral Sea kazakhstan), melting of glaciers (Gangotri glaciers) **Tools:** Google Earth Pro, Google Earth Engine **Activity: Exploring satellite imagery** Teachers can do a brief recap: Till now we have looked at satellite imagery, tried to understand how features look from above compared to from ground, we have tried to understand how these images are taken and how measurements are made using these images. Then teachers can ask the question, what can satellite images of 2 different dates of the same location show? The answer is "changes". A short discussion can happen about what kind of changes? Answers could be: 1) new buildings could have come up; 2) tree/vegetation could have grown; 3) near rivers flooding can be noticed, etc. At this point the class can undertake the first hands-on activity. In this a common area (like Red Fort) has been chosen, which should be familiar to all. Ask students to follow the instructions given in the attached Handout 3. ● Page 2-4: Lesson - 1: Understanding changes by examining maps of different dates/ seasons/ years, and observing the landuse/ landcover changes: around landmarks of Delhi(15 min) ● Page 4-5: Lesson - 1: Exercise 1 and 2 (10 min) After exploring the common area, the students zoom into their familiar territory. It could be their school (which will be common for all students of the class). This will familiarize students to find places of their choice and observe features and also changes. Ask students to follow the instructions given in the attached tutorials: ● Page 6: Lesson - 1: Changes in neighborhood: Exercise 3 (10 min) ● Page 7: Lesson - 1: Observe seasonal changes (5 min) ● Page 8: Lesson - 1: Exercise 4 (observe changes in last few years) (5 min) **Activity: Working on map** Students will be divided in their groups and given the time to work on their respective maps. They will incorporate feedback and apply the new concepts they have learnt this week to improve the maps. **Home task:** Now that students can find common places like Red fort, their school and possibly even their home, they should be encouraged to go and look at other places in	

the world where they can identify features and also notice changes. These changes can be natural or man made. In this case, students will look at places they may have not visited, or be familiar, however with the awareness of looking at satellite images and identifying features, they can now also look at places that are not familiar. Students should be asked to follow the instructions given in the attached handout: ● Page 9-14: Lesson 2: Observing other natural & man-made changes that have taken place in different parts of the globe (15 min)	

Week 3: Socio-historical contexts of mapping

Summary:

This week's sessions aim to deepen students' understanding of mapping by exploring diverse perspectives and contexts. They cover topics such as community maps, colonial impact on mapping, and mapping as a form of resistance. Students analyze maps from different cultures, learn about co-construction of knowledge, and study protest maps. They also engage in activities involving people's resource mapping and planning. Through these lessons, students gain critical insights into the complexities of mapping and its role in representing space, culture, and resistance.

Important Concepts:

- Diverse modes and intentions of mapping
- Specific communities and their modes and intentions of mapping and representation of place
- Maps are not always graphical and/or two-dimensional
- Diverse traditions of map-making can still inform the present-day mainstream practices of map-making (e.g. maps of our own neighborhoods)

Learning Standards:

During these sessions, the students will have the opportunities to -

- Raising awareness of the diversity in mapping traditions
- Raising awareness of the impact of colonialism on perspectives on representations and map-making
- Learning to think of place and map-making through a critical lens
- Reflecting on the impact of mainstream map-making practices on one's perspectives
- Thinking of the impact of unfamiliar map-making practices on one's perspectives

Lesson Plan: Week 3 Day 1
Varied contexts of mapping

Classroom Inquiry Process	Resources
Lesson Aims: **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 **Activity Title: Introduction (10 min)** The class will begin with the teacher asking the question: "Why do people make maps". S/he will take responses from students and write them on the board. After taking the responses, s/he will share: "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." Then, the teacher will refer to week 1 where students had made maps of their neighborhood. Based on that, s/he will ask 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? Teacher will take responses and move to the next activity. **Activity: Reading and group work— Maps in the Inuit community of Greenland (15 min)** The class is given 5 min to read the section on the Inuit community maps. For 5 min, students discuss, in groups, the question "What are your reflections on the fact that the Inuit people recalled every detail of their coastlines?" and complete the response in their workbooks. In the last 5 minutes allocated to this activity, a representative from each group can share the response noted in the workbook. The teacher checks to ensure that groups pay attention to the facts of: 1. The maps are not carried on voyages. 2. The maps are used to educate younger generations. 3. The maps are created to meet the needs of seafaring people. **Activity: Reading and group work— Maps from Marshall Islands (10 min)**	**Handouts:**

The class is given 5 min to locate the Marshall Islands on the map using the given link and QR code and 5 min to read about the Marshall Island community maps. In order to answer the question—Reflect on the creation of knowledge and their sharing through the example of the Marshallese "stick charts" —the teacher will highlight: The Marshall Islanders made their maps 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."** This means that they were intimately familiar with the ocean and its movements through their own seafaring experience. Thus, they based their knowledge on their experiences. They communicated this knowledge through mutually understood arrangements of fibres and shells. Students take 10 min to reflect on their own map and complete group work given in their workbook. **Activity: Home-work—Marshall Islands maps** **Activity Description:** Students find out about outriggers and their uses in different parts of the world. **Activity: Reading and group work— Clay Tablet of Nippur** **15 min** **Activity Description:** The teacher introduces the concepts: 1. Mesopotamia is a historically significant region. 2. The Map from Nippur is contextualized in the ancient past. Students will read the write-up and complete their group work in the workbook.	

Lesson Plan: Week 3 Day 2
Mapping and colonialism

Classroom Inquiry Process	**Resources**
Lesson Aims: 1. Encouraging students' recall of the term "colonialism" and its significance 2. Introducing students changes brought on by colonial intentions in the processes and outcomes of mapping **Activity Title: Introduction (15 mins)** Before the students are directed to read the introduction to colonialism, the teacher asks no more than two students to answer: ● What is colonialism? Students' responses will be logged on the black/whiteboard. Students will then be directed to read from **"Colonialism is the situation in which…"** to **"This huge inflow of wealth into 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 a large scale."** The teacher will confirm which of the responses was closest to the definition given in the text. Students complete the following questions using an atlas or Google Maps. ● Find out each of the places mentioned in the passages introducing colonialism. ● Figure out why coastal territories like Goa, Mahe and Puducherry became some of the first colonial areas in the subcontinent. **Activity Title: Mapping: Co-creation of knowledge (5 min)** The teacher asks students to read the section about **Co-creation of knowledge** and at the end, the students can be asked to create a mind-map of the idea of "co-construction" of mapping knowledge. ● From the passage, can you explain what is called 'co-construction' of mapping knowledge? **Activity Title: The surveying of the highlands of Tibet, Mongolia and Central Asia (10 min)** The teacher directs students to form groups of four. Each group reads the section **The surveying of the highlands of Tibet, Mongolia and Central Asia** and discusses their responses to: ● **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	**Handouts:**

Between 2000 and 5000 metres

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

Activity Title: Migration scrolls of the Aztec people (10 min)

Students should be directed to scan the QR code accompanying the text about the Aztec Migration Scrolls before they read the passage about it. In pairs, students should discuss what they see in the image given. Pairs then share their impressions with the whole class and the teacher should note these impressions on the white/blackboard. Key words such as:

island	rowing	canoe	lake (or water-body)
footprints	wavy outline (or wavy lines)	directions	migrate (any form of the word).

should be noted.

Students should read the section **Migration scrolls of the Aztec people** and answer the questions:

- 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?

Activity Title: Group discussion (10 min)

The teacher should give the students one minute to make quick notes of their learnings from the day's session. Next, the classroom can be divided into sections to discuss the following question:

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

Homework activities:

- Read the legend of the map of Tibet, Mongolia and Central Asia and figure out the land elevations.
    - Can you now figure out the direction in which the river is flowing? Indicate through arrows.
    - Label Bay of Bengal in the map.
- Complete the table to compare Aztec migration scrolls and the maps of the Tibetan highlands.

Lesson Plan: Week 3 Day 3
Mapping people's articulations and planning

Classroom Inquiry Process	**Resources**

Lesson Aims:

1. Understanding mapping as articulated by people for planning
2. Examining some of the ways in which mapping is used as a form of resistance

Activity Title: A Protest Map (10 min)

Before the students read the text, the teacher writes "North Dakota" on the white/blackboard and asks students if they already know anything about the place. Some answers that can be expected:

- a place/state in USA
- a place where there is an oil pipeline

As the class reaches a point where no one is adding any new information, the teacher divides the class into halves:

One half of the class should look up North Dakota on a map. The other half will look up a basic understanding of the people of North Dakota.

The teacher can appoint representatives of both halves to fill in their information in the following format.

Where - North Dakota	**Who - the Sioux**
● State in the present-day USA ● landscape was turned into large farms and ranches ● Known for lignite mining ● oil drilling	● The Sioux people ● Native American peoples or groups, who were hunters and farmers ● Gave the place the name Dakota ● became a minority once the Europeans colonised the land
When - Turning points for the Sioux people ● Original inhabitants of the lands that the Europeans occupied ● Named the region ● rise in fur-trading, large farms and ranches ● fur trade attracted French, Canadian, English, Scots and Americans to North Dakota	**What happened** ● land was made a fur-trading area and transformed the landscape in to large farms and ranches ● native population became a minority ● Mining of lignite ● oil drilling increased.

The students are then asked to read the section A Protest Map

Handouts:

Website link:

Classroom Inquiry Process	Resources
Activity Title: A Protest Map - II (15 min): The teacher accesses the website: https://decolonialatlas.wordpress.com/2016/09/07/dakota-access-pipeline-indigenous-protest-map/ and asks the students to read the contents. The teacher encourages students to answer the following: - 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? **Activity Title: People's Resource mapping and Planning (35 min)** The teacher asks students what they understand by the idea of people planning and mapping their resources.. Teacher notes all responses on the board. The students can be asked to read the section titled **People's Resource mapping and Planning.** Find out from other sources and discuss in class (can be done in groups or individually): ○ **Group 1:** What is a thematic map? ○ **Group 2:** What is a cadastral map? ○ **Group 3:** Was the map you made in Week 1 a thematic map or not? Why? The map made in Kerala for people's plan was in the scale 1: 12500.	

Classroom Inquiry Process	Resources
How can you compare the scale with that of the map that you made in Week 1? Which map can show more details? After reading the compiled documents, the same groups reflect on the maps created by individuals. ● 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). **Home work:** ● 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. ● Read the brief article by opening the link below and answer (in the workbook) the questions that follow: https://www.downtoearth.org.in/coverage/where-a-community-maps-its-resources-29784 ○ Why is a combination of people's knowledge and expert knowledge important? ○ How can such a combination help to create better development?	

Week 4: Mapping and Socio-Historic Contexts

Summary:

This week focuses on enhancing students' understanding of thematic maps with specific reference to food diversity, cereals, fisheries, as well as tracing global food journeys. They receive feedback on their Neighbourhood maps, leading to collaborative discussions and improvements. Students reflect on their learnings and incorporate feedback, deepening their understanding of mapping and representation. The final session involves presenting their maps and engaging in class discussions, promoting a comprehensive exploration of mapping concepts and enhancing collaborative skills.

Important Concepts:

- Diversity in food and culture, different cuisines and their origins across India and the world.
- Thematic map making: representing and visualizing data related to food diversity, staple cereals, and fisheries using symbols and legends.
- Layered mapping, combining information on staple cereals from different regions to create a comprehensive thematic map of India.
- Global flows of food: tracing the journey of a food item (e.g., mango) across various places and over centuries, highlighting cultural exchange and interconnectedness.

Learning Standards:
During these sessions, the students will have the opportunities to -

- Read, interpret and make thematic maps
- Explore the global dimensions of culture
- Engage in an interdisciplinary approach to food security and poverty
- Finalize their own Neighbourhood maps by incorporating feedback, making necessary updates, and effectively presenting their completed maps to the class

Lesson Plan: Week 4 Day 1
Thematic Maps

Classroom Inquiry Process	Resources
Lesson Aims: ● Defining and understanding thematic maps with specific reference to food diversity ● Mapping global flows and link them to food security ● Practicing representation in the context of food maps	**Thematic mapping:**
Activity 1: Understanding thematic maps - different cuisines (10 min) Students will be shown different thematic maps like street food map of India, Mithai map of India, Biryani Map of India and see that there are a variety and range of cuisines that can be seen across India. **Teachers can ask:** "Who cooks in your home?", and "Who cooks in the hotels and in the street shops?" and discuss the gender stereotypes around cooking. The teacher gives the students 30 seconds to think about their responses to the following question: **"What are two foods/cuisines you know how to cook?**" The students will be given a **map of the world** (In Groups). They will be asked to trace from other sources- from which part of the world or the country the cuisine originated, and represent their food/cuisine using a symbol and paste the note on the map. The teacher can ask students to mark the journey by using lines and arrows in the map. The teacher will ask the questions: 1. If we see food as an example of culture, does it stay in one place? 2. From where have the different cuisines traveled? It can be seen that culture (as demonstrated by food) is something that does not stay limited to specific places, but gets shared to people across different places.	Map of India and World
Activity 2 : Understanding thematic maps - cereals (10 min) Students are asked to define: "**staple cereals**". The teacher writes "What are staple cereals?" on the white/blackboard. Thematic maps of top rice producing states, millet producing states and wheat producing states of Indaia will be shown to students. Teacher will make a following table on the board and asks Students to collaboratively design three distinct and innovative symbols for the three cereals. ● The teacher asks students to make a legend so that anyone who reads the map will know what the symbols mean.	**Thematic mapping:**

Classroom Inquiry Process	Resources

rice	millets	wheat

Students will be provided political maps of India in the small groups and they will be asked to make a new thematic map- of staple cereals of India. This means that on a single map, the students will need to show all the three cereals.

- The teacher asks students to colour the map and then each group exhibits the maps in the class.

https://en.wikipedia.org/wiki/Fishing_in_India

https://tinyurl.com/y4uck9zy

Activity 3 : Understanding thematic maps - fisheries (10 min)

The teacher writes the following sentence on the board:

> "India has a large coastline of around –(7,516)---- km with -(3,827)----- fishing villages, and –(1,914)--- traditional fish landing centers. Apart from domestic consumption, India is a major global supplier of fish."

Students are then asked to find images of the fishing boats and gear and the landing sites in these places. They are also asked to search the internet to know the locations of the larger fish landing centres of the country.p
The class is divided into **eight or 4 groups**. A small-scale map of India is displayed by the teacher in the class. Each group is asked to pick a number from 1 to 8 and Mark the location of the place on the map

1. Veraval	2. Mumbai	3. Mangalore	4. Cochin
5. Tuticorin	6. Chennai	7. Visakhapatnam	8. Bhubaneshwar

Activity 4 : Global flows (20 min).

Group work: Divide the class into different groups. Each group should have a **map of the world** on which they can work. Students can use google and atlases for reference:
-On the world map mark all the places mentioned in the narration given above.

- Show by arrows the travel of the mango from one place to another.

- Also write along the arrow the time period of the mango's travel.

- Once you have done these, you have made a map of 10 to 11 centuries of the journey of the mango!

- Give the map an appropriate title.

- Make it colourful using some logic.

Classroom Inquiry Process	Resources
- All groups exhibit their maps in class. ● In order to present the map, students should be instructed that: Maps need to be understood by people without any person standing to interpret it. Give the map an appropriate title, and make it colorful; the students need to give the map a title. **Activity 5 - Food security (10 min)** The teacher asks students to examine the map of poverty/affluence given in the text. The teacher and the students discuss the key elements of what they have learnt in the 9th grade on food security. Students can recall on the following points: ● Nature and resources ● People and skills ● Land ownership ● Labour – wages and rights ● Production – How do the benefits get distributed in society? ● Basic needs like food, clothing, housing, education, health care…. **Homework:** Students will be given homework to think on the “No Poverty” goal under the ‘Sustainable development goals’.	**HW handout:**

Lesson Plan: Week 4 Day 2
Feedback on Local Area Maps

Classroom Inquiry Process	Resources
Lesson Aims: ● To reflect on the draft of the Neighbourhood maps which the students have made ● To collaborate using discussion and to use learnings from the four weeks in the completion of Neighbourhood maps ● To deepen the understanding of mapping and representation by providing opportunities to apply and engage with the content **Activity 1 : Individual Neighbourhood Map Feedback One-Two-Three (20 min)** **Activity Description:** In preparation for this class the teacher or a student representative should create a padlet (alternatively a Google Jamboard will also suffice) for documentation and sharing of student responses. **Steps for creating a padlet** Padlet is an online tool for collaboration. Users/participants on a padlet can post and comment on content in real time and save the discussion for later. It has a variety of templates to keep it structured and may even be used to create collaborative concept maps. 1. Visit padlet.com/ and sign up for a free account. 2. Select “Make a padlet”. 3. Select the template marked “Shelf” for the most efficient presentation. 4. Create one "shelf" per group.. 5. Set posting settings to: a. Attribution: ON b. Comments: ON (if you would like students to have documented conversations about the map feedback) c. Require approval: OFF (if this filter is on, the process will take longer to complete) d. Filter Profanity: ON (if the students need to be checked for abusive language online) 6. The padlet link will be ready to copy and share once all the settings have been decided. 7. Students will have to use the link to that specific padlet to see each other’s work. 8. Each member will post only on the shelf for their group. The class is divided into 4 groups. Each student will be required to make a presentation - Google Slides - following the structure of: 1. Presenting the first draft of the map 2. Highlighting **one** thing that they were interested in while mapping (this question was posed to the students at the start of Week 3). 3. Highlighting **two** things that the student is satisfied with about their map and would like to keep the same. They should justify why they would like to retain these features.	**Recapping the activities:** **Youtube video- Padlet tutorial**

Classroom Inquiry Process	Resources
4. Highlighting **three** things that—after three weeks of learning more about maps and representation—they would like to think about changing. They should justify these choices and connect it to the content learned in the preceding weeks. In response to every presentation, students will put up one comment or suggestion on a padlet board that is shared with the whole class. Students must use the following format to post their comments: The post title should read "Re: (name of the student for whom the feedback is)". The body of the post will contain the feedback. An example is given below. Re: Saniya's map ←post title You shared that you became interested in access to food when you were making your map. I think you could consider adding the locations of vegetable-vendors to your map. ↖ body of the post for the comment/feedback **Activity 2: Individual reflections (10 min)** **Activity Description:** Students take 5 minutes to read through the comments for their individual maps. The next 5 minutes are assigned for conversations with each other in case there are some clarifications , questions, discussions, etc. about the comments. **Homework:** Students complete the accepted feedback at home. ● Students must save the original version of their map. ● Students must create a copy to incorporate feedback. ● Edited maps should be named to reflect the updates. E.g. File names should reflect version numbers.	

Lesson Plan: Week 4 Day 3
Culmination of Local Area Maps

Classroom Inquiry Process	Resources

Lesson Aims:

- To complete the Neighbourhood maps
- To collaborate using discussion and positive feedback techniques to use learnings from the four weeks in the completion of Neighbourhood maps
- To deepen the understanding of mapping and representation by providing opportunities to apply and engage with the content

Activity Title: Individual Neighbourhood Map - Reinforced, Extended and Challenged (10 min)

Students are divided into the same groups as they were in for the previous session. They post the links to their updated maps on the same padlet as the previous session.

The post title should read: "(name)'s updated map - (date of completion)". In the body of the post, the students should list the feedback they incorporated.

Saniya's updated map - 14th June 2022	←post title
Link to original map: … Link to updated map: … ● Included vegetable vendors' locations. ● Added general stores that sell vegetables. ● Removed …. ● ….	↖ body of the post for a brief description of the changes

Each student looks at the original and updated maps of at least three of their group members and checks the comments left during the previous session as well as the changes made.

Based on their review activity, students make a table on a Google Document to capture the learnings from the activity of updating maps. Since this is a writing to learn (WTL) activity, it must be done in ways that the students can complete independently.

Writing to Learn (WTL)

Writing to learn is the process by which learners use writing as a means to reflect on learning. Such writing is not intended for presentation. It is a process of expressing internal thought processes in an organised fashion to help consolidate learning. Formats for WTL are available here: https://wac.colostate.edu/resources/wac/intro/wtl/

A suggested mode is to use an REC table to document what the preceding three weeks and the map editing activity has Reinforced—Extended—Challenged.

Classroom Inquiry Process	Resources
Students make a table with three columns: Reinforced, Extended, Challenged. Under each of the headers they note what the three weeks and the map updating have done to reinforce, extend and challenge their pre-existing ideas. For example, the mapping activity could **reinforce** that spaces can be represented using symbols and perspectives, the sessions about mapping tools could **extend** their knowledge of mapping processes and the content about contexts of mapping could **challenge** their understanding of why and how maps represent places. Once this reflection activity is completed, students have the option to discuss their tables in pairs. **Activity Title: Presenting final maps (60 mins)** Students are asked to present their maps to the entire class. Discussion can be permitted based on the availability of time.	

1.3 Module Project

For the Mapping and Visual Representation project, students will embark on a comprehensive exploration of mapping techniques and visual representation within the context of their own neighborhood. They will be tasked with creating a detailed map of an 800 sq.m area in the vicinity of the school. The project will be integrated into the entire module and introduced during session 2, allowing students to gradually develop their maps over the four-week period.

In the first week, the students will be divided in groups (preferably 4 groups to make it easier to come back and combine the maps) and asked to think on:

- What all will you map in the locality? (Roads, buildings, places of worship, post offices, historical monuments, bus stops, shops, railway stations etc.)
- How will you do it? (Strategies, use of graph paper, ways to measure distances, use of compass)
- How will you use different colours in your map? (Mark different areas (in different colours) such as parks, playgrounds, /residential colonies, market, commercial complexes etc. on the map)
- How will you use legend, symbols, scale in your map?
- Should all groups use the same legend, symbols, scale? Why?

Students will be asked to go out and map the area around the school. Then the students will come back with their own maps and combine the maps on a big chart. As the module progresses, the students will revisit the map they have created and improve it based on the new concepts they are studying. For eg.

- Geographical features (boundaries, roads, highways, river, lakes, ponds, mountains/hills, valleys, trees, landscaping, etc.)
- Local histories (date the buildings, houses, schools, parks, religious places, post office, police station, heritage places/buildings etc.)
- Cultural specificities (Language, art, craft, food, festivals, fair etc.)
- Socio-economic realities (occupation of people, educational level, access to internet and electricity, etc)
- Land use (built up areas, agricultural, orchard, wasteland, industrial, etc.)
- Agricultural land, types of soil, major crops, irrigation system, etc.
- Settlement patterns (why people choose to live where they live, the kind of settlement patterns in the locality (is it nucleated, linear or dispersed)?
- Energy use in the area, renewable and non-renewable energy sources, water sources, electricity distributions systems, etc.

Or any other significant features of the locality can be represented on the map. In the final week of the module, the students will finalise the maps and present it in the class. The project will be assessed by the teacher and will contribute to the students' grade for this course in the semester.

The project will assess the following Assessment Objectives:

1. Inquiry & Exploration
2. Critical Thinking & Decision Making
3. Presentation and Communication

1.4 Formative Assessment Rubric

Competency	Descriptor	Level		
		1-2	3-4	5-6
Criterion B: Inquiry and Exploration	Students should be able to create maps after using multiple ways of gathering information to highlight the socio cultural differences in the society	Students have not gathered information from any resources and have created a map that highlights the socio cultural differences with no to very less clarity.	Students have gathered information from some resources and created a detailed map that highlights the socio cultural differences with some clarity.	Students have gathered information from various resources and created a detailed map that highlights the socio-cultural differences with a good clarity.
Criterion C: Critical Thinking and Decision Making	We have discussed various contexts of mapping like relationship between maps and socio-cultural, historical aspects. The students should be able to apply the concepts that they have learnt in the classroom to form a relationship between their neighbourhood map and the different spatial and environmental context. Students should be able to analyse the maps they have created to identify the social issues in the neighbourhood.	Students are: - Able to apply the concepts that they have learnt to form some of the relationships between their neighbourhood map and the different spatial and environmental context. - Able to analyse the maps they have created to identify very few of the social issues in the neighbourhood .	Students are: - Able to apply the concepts that they have learnt to form most of the relationships between their neighbourhood map and the different spatial and environmental context. - Able to analyse the maps they have created to identify some of the social issues in the neighbourhood.	Students are: - Able to apply the concepts that they have learnt to form all of the relationships between their neighbourhood map and the different spatial and environmental context. - Able to analyse the maps they have created to identify all the social issues in the neighbourhood.

Criterion D: Presentation and Communication	Mapping is a visual form of communication that uses symbols, color, shapes, patterns etc. to convey a meaningful representation of a space. Students should be able to create maps that clearly represent the required information. Students should also be able to verbally explain their maps in the class with confidence and clarity. They should explain their journey of learning to make the maps, the mistakes made, feedback received and how the mistakes were rectified to make the final product better.	- Map is unclear and is poorly laid out. Very few lines are drawn by ruler (other lines by hand) - The legend/key, scale have not been created neatly. The labelling is not done neatly. - The student lacks confidence and clarity while verbally explaining the map. - The student did not incorporate the feedback to improve the map.	- Map is fairly well laid out. Some straight lines are drawn by the ruler. - The legend/key, scale have been created but requires to be neater. Some of the labellings is done neatly. - The student has some confidence and clarity while verbally explaining the map. - The student has incorporated some feedback to improve the map.	- Map is clear and is very well laid out. Most straight lines are drawn by ruler - The legend/key, scale is easy to find on the map and has been created neatly. Almost all the labellings are done neatly - The student has confidence and clarity while verbally explaining the map. - The student has incorporated all the feedback provided to improve the map.
Achievement*	*A student scores weighted average score of each of the above dimensions*	*A student scores weighted average score of each of the above dimensions*	*A student scores weighted average score of each of the above dimensions*	*A student scores weighted average score of each of the above dimensions*

1.5 Teacher Professional Development Guidelines

This Teacher Professional Development Guide is designed to assist with the delivery of professional development sessions about the Mapping and Visual Representation module.

Schedule of the training -

The training schedule is for two working days, each working day having 6 hours of active work.

Training on each day has been organised into three sessions of 90 to 120 minutes.

Each day would start with a warm-up and orientation session of 30 minutes.

Typical Training day schedule

08:00 am – 08:30 am	Warm-ups and Orientation
08:30 am – 10:00 am	First Session
10:00 am – 10:15 am	Tea Break
10:15 am – 12:15 pm	Second Session
12:45 pm – 01:00 pm	Lunch Break
01:00 pm – 03:00 pm	Third Session

Overview of the training

Day 1

Session 1 Recognising stories around us and connecting with our story

Focus - Teachers recognising the role and power of stories, recognising that stories are all around us and we are using stories in our personal and professional lives consciously and unconsciously.

Session 2 Listening, Observing and Telling stories

Focus – Getting a first-hand experience of listening to a storytelling live; Recognising how listening and observing contributes to creation and telling of stories.

Session 3 Recognising stories across media forms

Focus - Discussing storytelling applications in career ; Defining Transmedia Storytelling and how we will use it ; Demonstrating Exemplary resources

Day 2

Session 4 Understanding narrative form (Beginning, Middle and End)

Focus – To understand the flow and structure of narratives.

Session 5 Understanding World-making through stories

Focus - Understanding narrative elements (Characters, Conflicts, Perspectives, Imagery) and how it helps us create story-worlds and immersion.

Session 6 Overview of facilitation skills and Closure – Team

Focus – Discussing some practical tips and concerns of facilitating sessions with students, scaffolding facilitating participatory activities and developing a shared commitment for implementing the module with students in the classroom

Details of the Sessions

Session 1 -

The session is to begin with some warm-ups and grounding exercises involving stretching of the body (hands, legs, neck) and use of breath (Breathing slowly, and rapidly, and deeply together) and voice (humming and saying out vowels loud).

Then participants are to work in randomly allotted pairs. In each pair, one by one, each person is to share a personal story from their own memory (but it has to be told spontaneously and with dramatic exaggeration). Exaggeration helps the imagination muscle to open up.

This should be followed up with a quick discussion. This activity brings a sense that we already know stories and how to tell them. And that, stories are all around us and we use them frequently, consciously and unconsciously.

The second part of the activity involved retelling the story each person heard from their partner in pairs. Encourage people to retell based on what they heard and not change the story too much. The discussions following the retellings focus on listening, and recalling and how does it feel to be the character when someone else is narrating the story.

The activity might also bring nostalgic memories and space has to be created for some people to share how they feel after they spontaneously shared a story.

Session 2 -

This session focuses on how listening and observing are storytellers' regular tools. Only when we listen and observe people, places and situations, we have a frame of reference that comes handy when we are telling stories.

For helping the group to recognise the value of listening, enable an environment where the group goes from chaos (everyone speaking over one another) to mindful listening (when we listen to hear and not to respond).

For observations, give individual participants a chance to walk around the room and observe everything as if they are observing it for the first time. Then encourage them to pick an object that is calling to them. They are to stay with an object and have a conversation with it (that is, to make up as much detail as one

can about the object - what exactly is the object, how long has it been there, how is it used, what all does it get to see etc).

A demonstration of storytelling is to be done by the facilitator using any archetypal story. It enables the participants to experience stories as listeners and the discussion could focus on how they experienced the story and what techniques they believe the storyteller used.

Session 3 -

This session landscapes the range of storytelling used in professional lives - from marketing to teaching, from performance art to having therapeutic conversations.

The session would also highlight the 'transmedia' aspect - how stories are and could be told using diverse media tools available - like a podcast or an animated story, a picture book or a video game scenario, infographic or a short film. Some exemplary resources are to be shared.

Session 4 -

Using archetypical traditional stories, the flow and structure of stories is presented. The concept of stories having a sense of 'beginning', 'middle' and 'end' is introduced. Some examples of stories could be taken from the participants to see through their flow and structure.

Participants should get first-hand experience of experimenting to see how the same story told with multiple beginnings could influence the way it is received. The criticality of getting the beginning and end prepared, if nothing else, is to be established with examples.

Session 5 -

A story remains a loose sequence of events unless it creates 'immersion'. In this session, the facilitator should enable participants to experience immersion by creating a fictional environment through voice (example - going to a nostalgic place). The facilitator should then create a space in the session to listen to how each participant could or couldn't experience immersion. The facilitator has to build upon the inputs of participants to explain how some rich narrative details enable listeners to feel 'as if they are inside the story' and 'as if they are the characters in the story'.

Different elements of the story - like characters, conflict, perspectives and imagery are to be introduced. Some examples of each element are to be shared through demonstration. For example, cite a movie participants have seen and ask who were the characters and what made them memorable. Also ask, what characteristics of the characters were established (were they honest? were they brave?) and how were these characteristics established (was it directly told or was it left for the audience to discover as the story unfolded).

Session 6 -

This session revisits the key learnings and shares some practical tips on facilitating storytelling sessions among the students.

The session should highlight -

a. The need to develop a practice routine to strengthen the storytelling muscle - stretching the body and trying different body postures and gestures, using expressions to enact situations and practicing character voices and sounds.
b. The need to develop a repertoire of stories that one could tell spontaneously or with preparation.
c. The need to create safe space in the classrooms for students to share their narrative expressions.
d. The need to take students on a gradual journey of comfort - from working in groups/pairs to performing as groups and then, performing individually.

The sessions would conclude with participants working in groups. They are to prepare for half an hour and tell the story of how they experienced the workshop with any medium of their choice.

1.6 Student Workbook

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

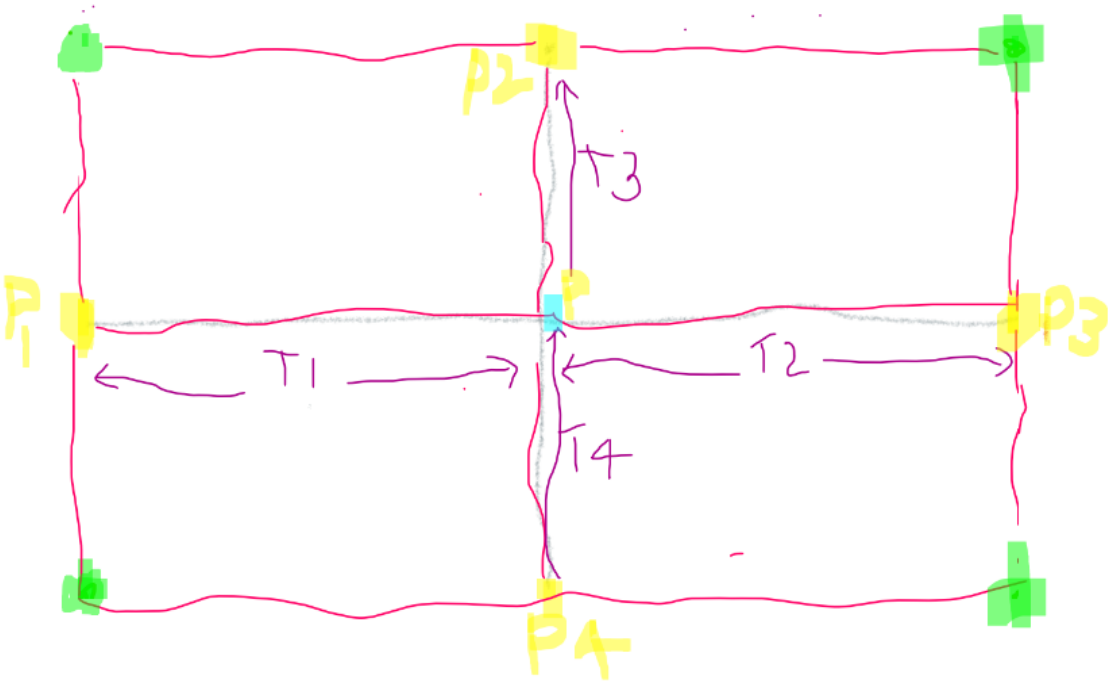
Session	Topic	Objectives and Description
Week 1		
Session 1	What is Mapping? Perspectives of mapping	1. Reading maps and map features 2. Understanding the concepts and techniques of map making 3. Creating a map of immediate surroundings and representing important geographical characteristics in it *In 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.

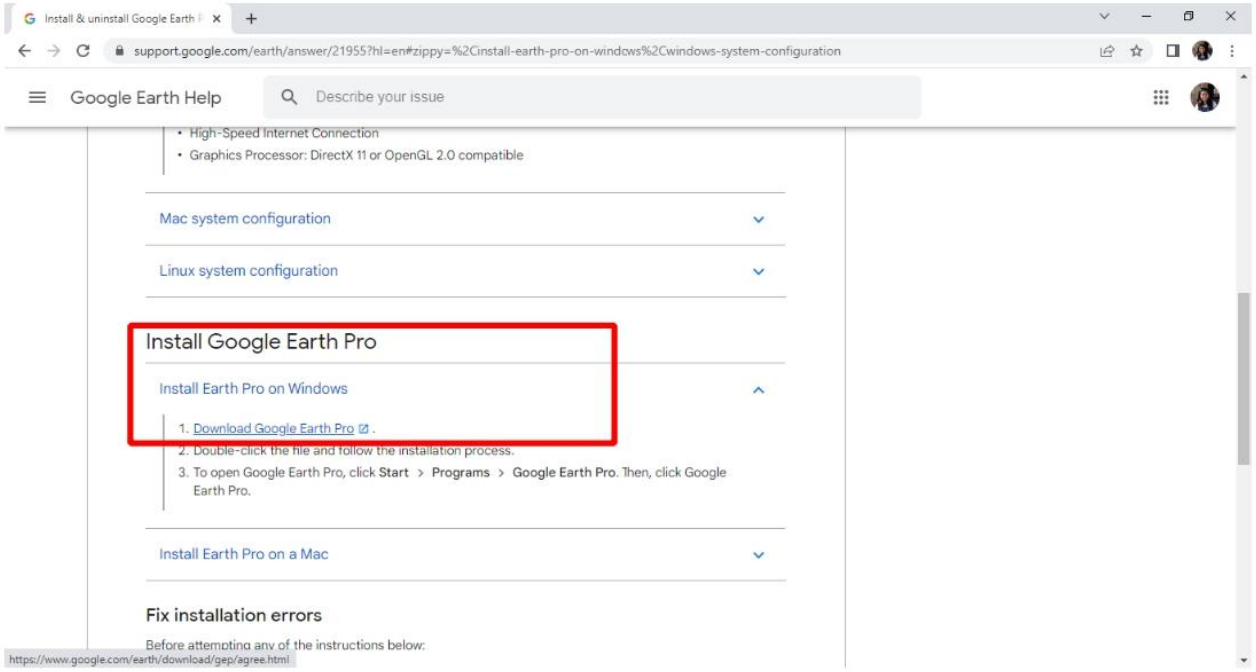
You have sketched along 5 points along the transect T1. You have successfully finished your sketching of the neighborhood along a transect. Keep all your papers, notebooks and so on carefully in the school. These will be required to do further activities in the proceeding weeks.

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

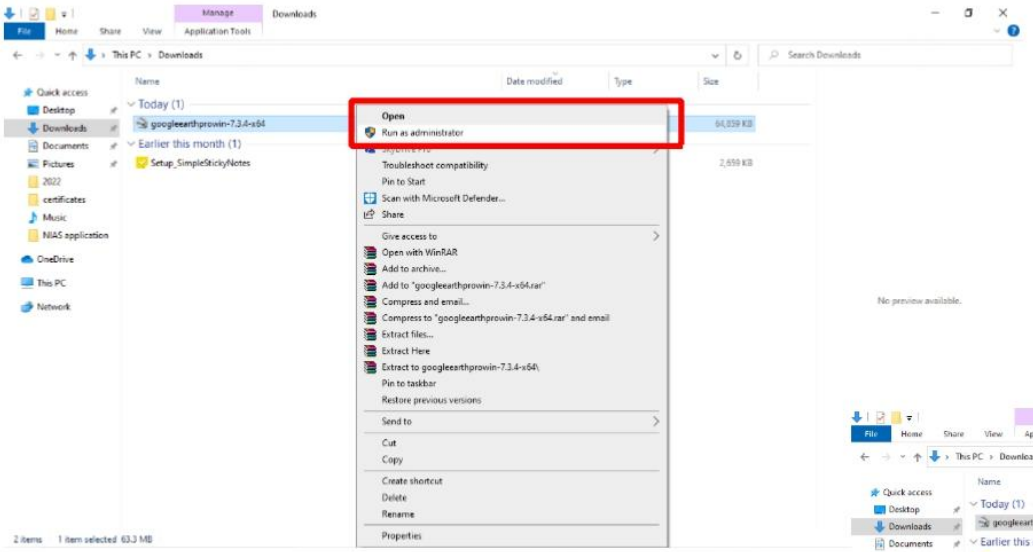
Step 01 Click on the following link-

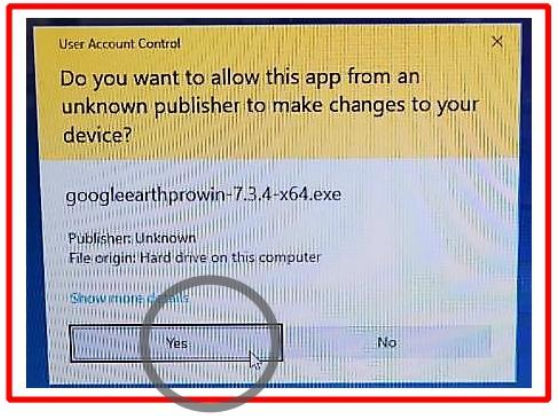
https://www.google.com/earth/versions/#download-pro

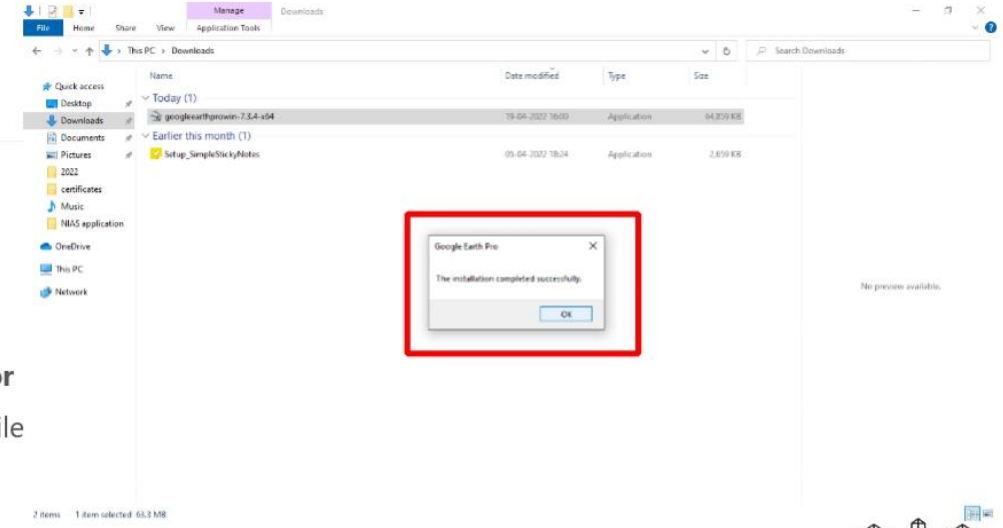
OR you can go to the **Google Earth Website**, to **download** the app

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

Google Earth & its Interface





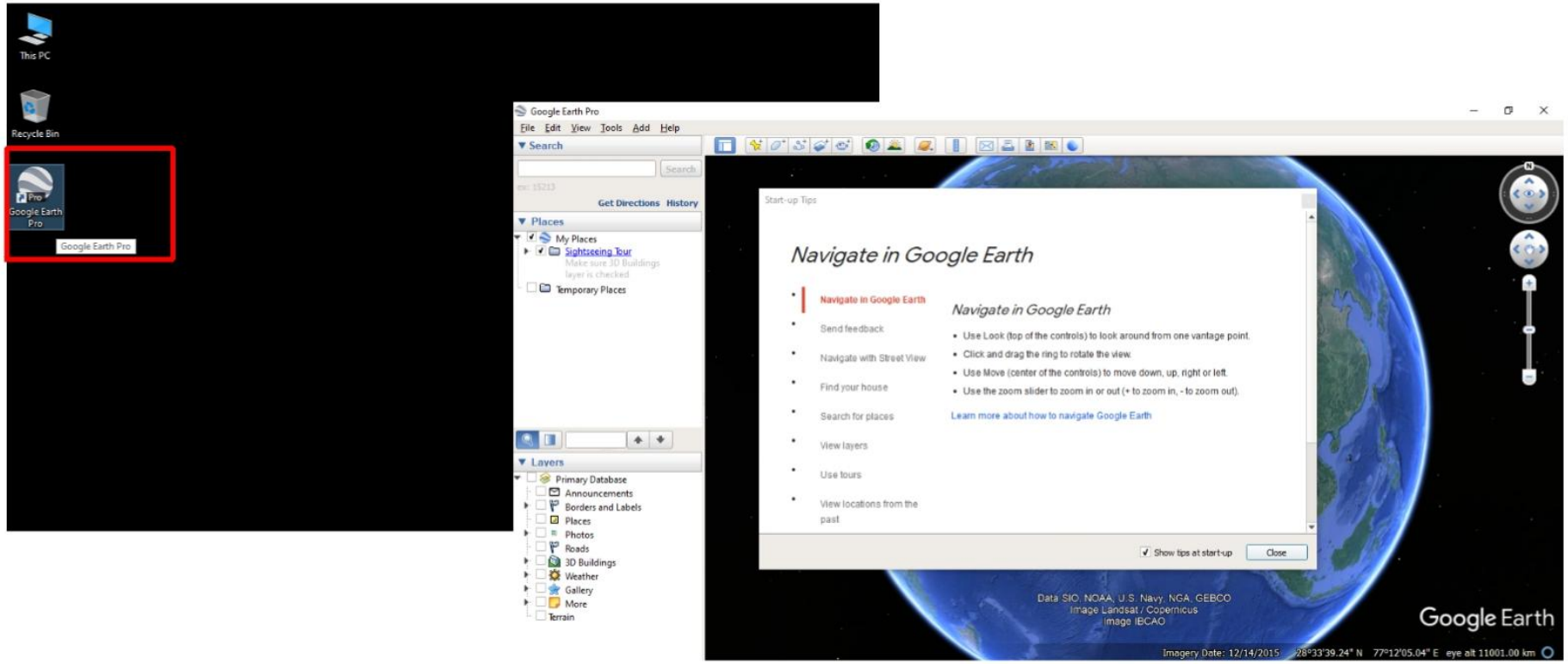


Step 03 **To install Google Earth**< **Go to** the folder where the installer is downloaded. In this case, it is the downloads folder.

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**

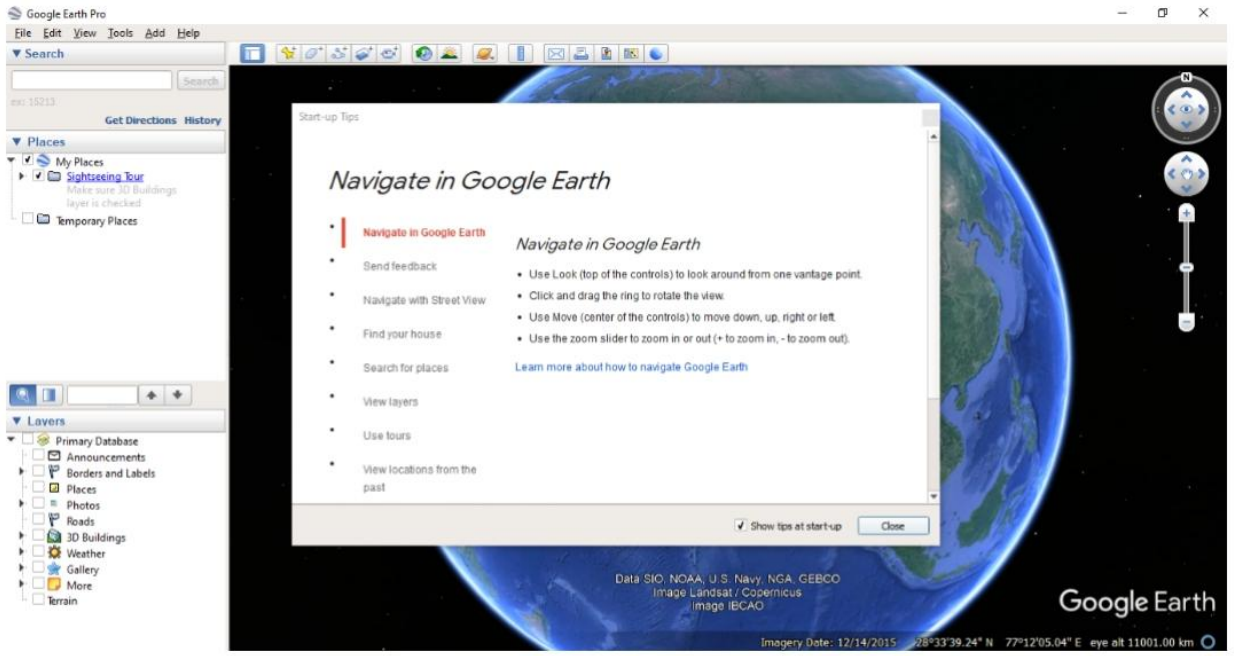
Google Earth & its Interface



Step 06 Open **Google Earth**

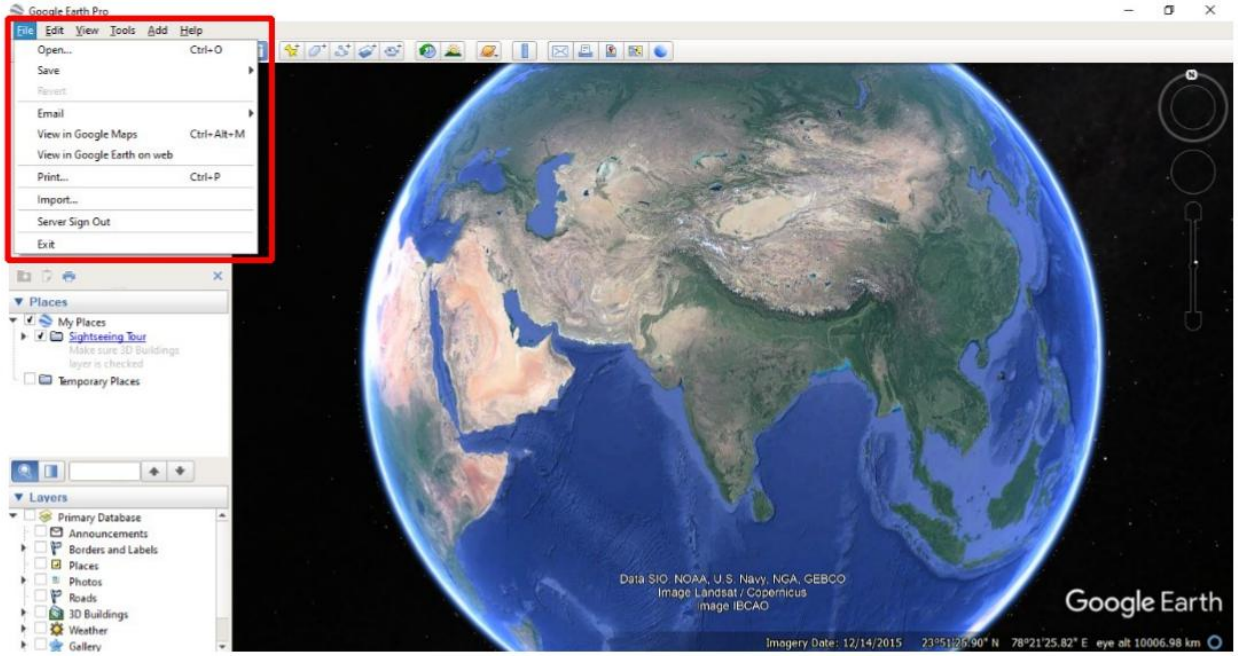
Step 07 You will now be able to see the Google Earth interface.

Google Earth & its Interface



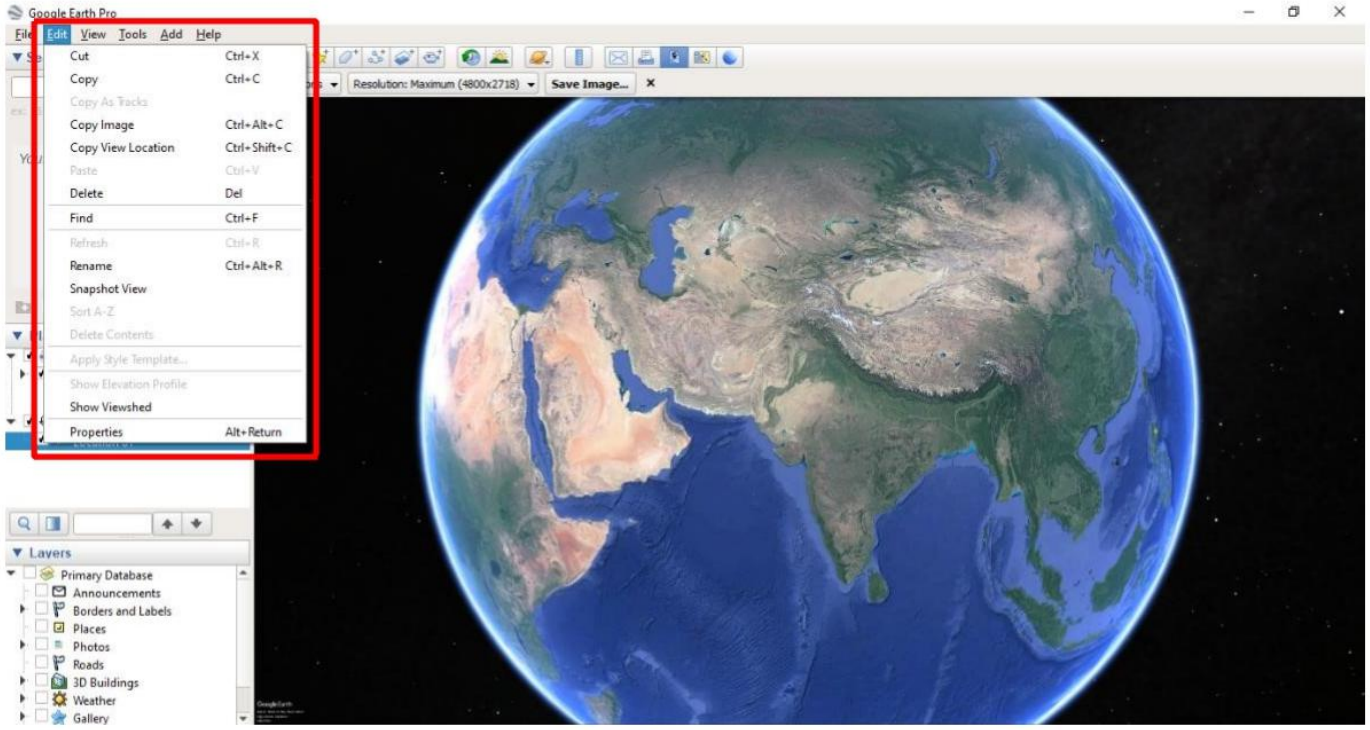
The central part of the workspace allows you to view the satellite imagery of the globe in detail; **the left panel** has the Search tab, **Places panel** and **Layers panel** that allows you to search and visualize locations that have been previously saved and related geographic information, respectively

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**

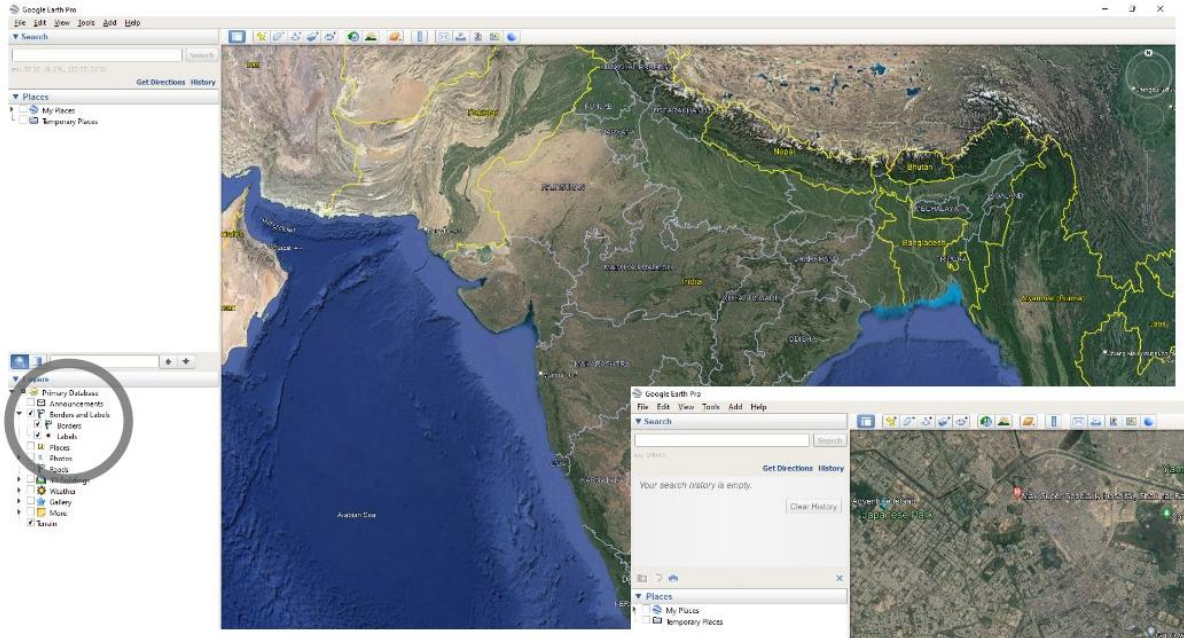
Google Earth & its Interface



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.**

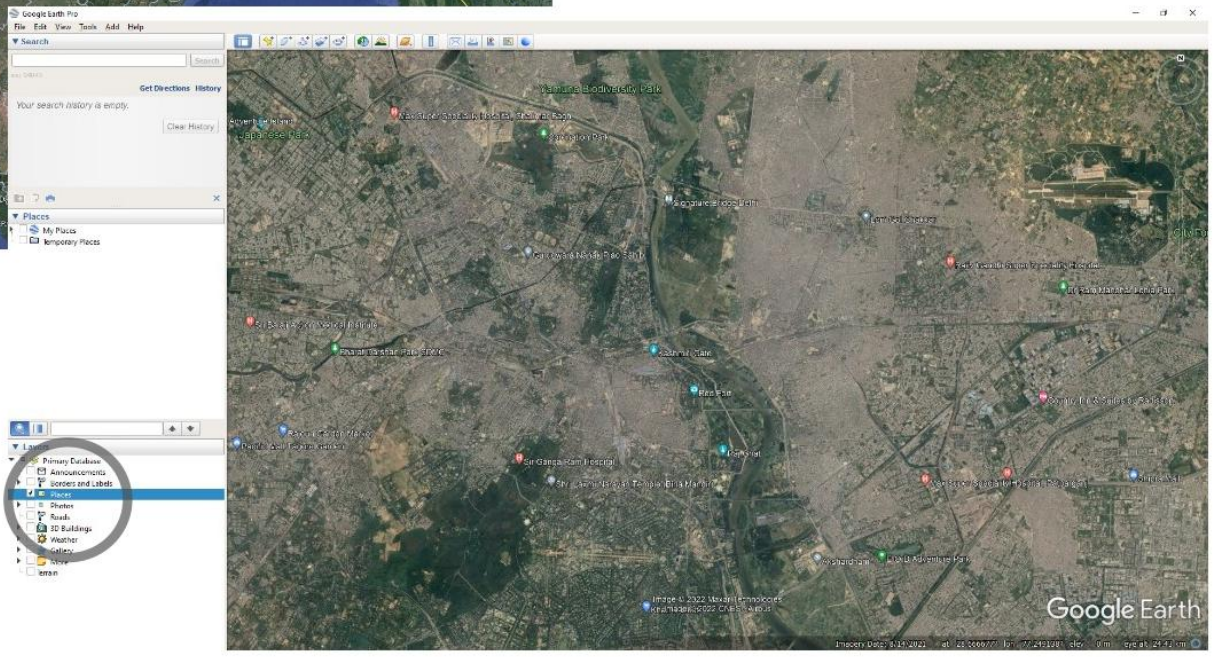
TIP: You can learn and use the shortcut keys for the commands, like **Crtl+C, Crtl+V**, etc.

Google Earth & its Interface

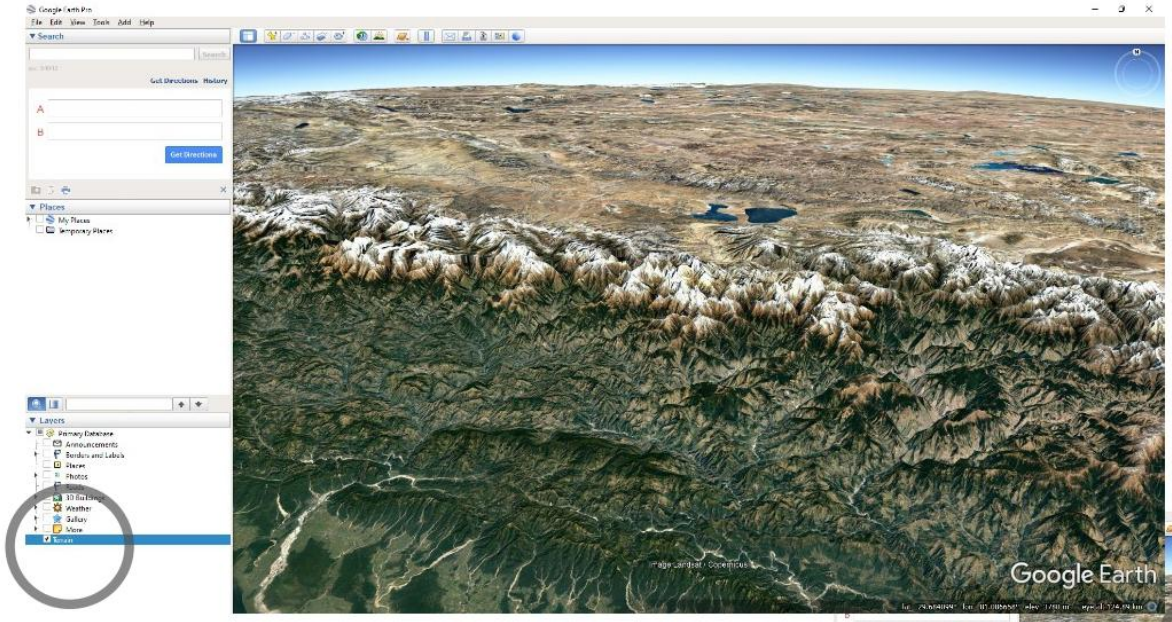


The **Layers** panel on the left has features you can explore. The **Borders and Labels** layer displays the international boundaries, state borders, and names of places at certain zoom levels.

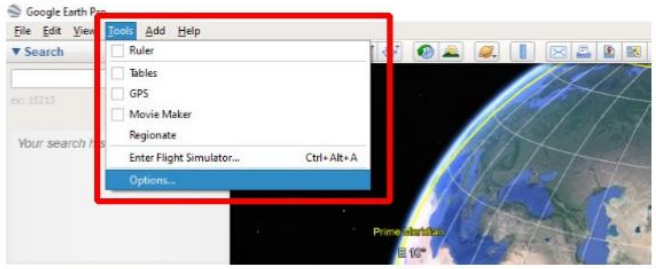
The **Places** layer shows locations of different buildings, and landmark that help you navigate easily .

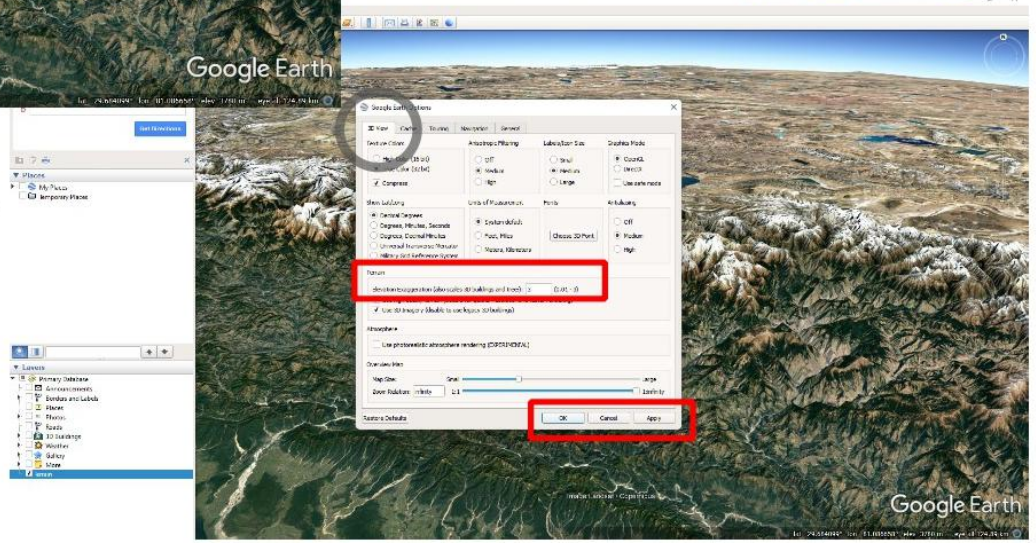


Google Earth & its Interface



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

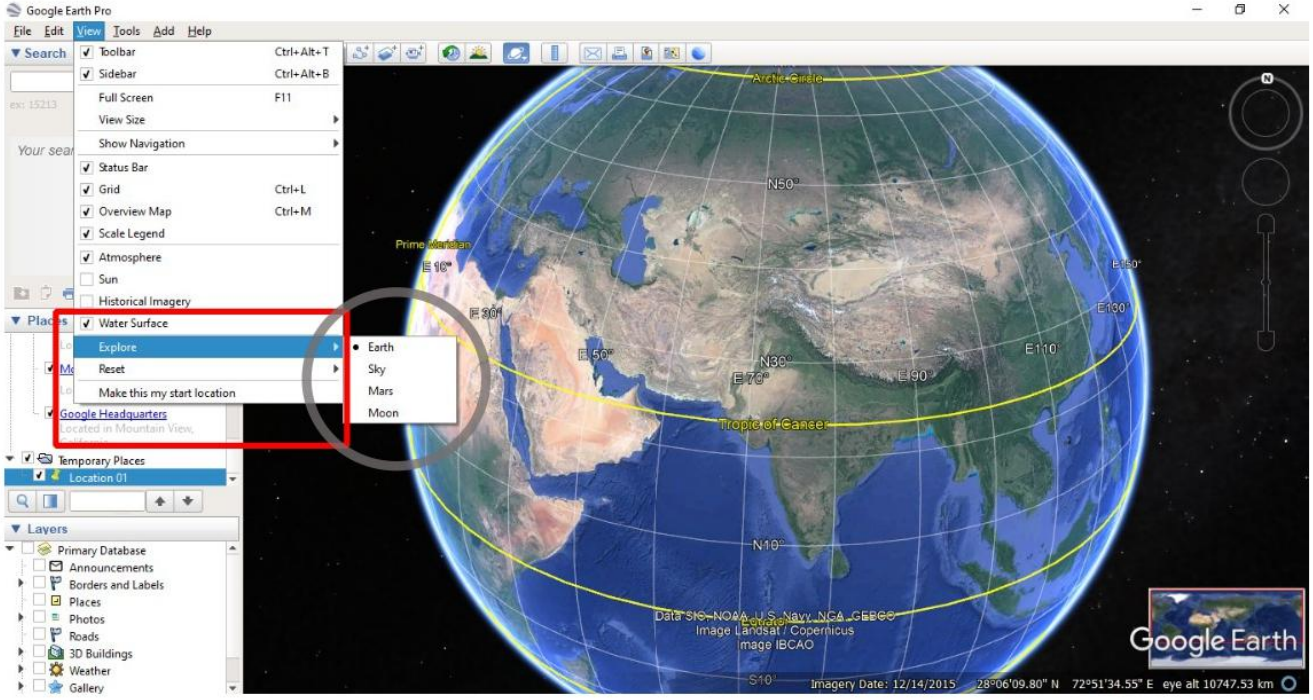


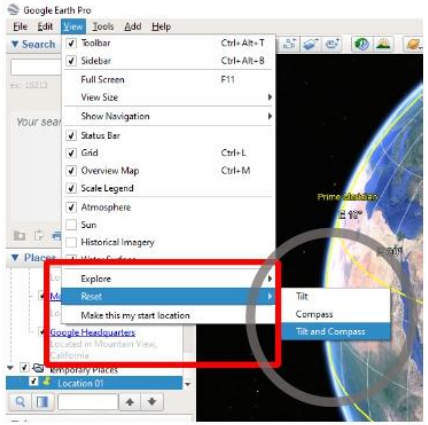


TIP: To view the terrain better, you Click-on **Tools**< **Options**< **3d View**. The **3D View** tab allows you to edit the **Elevation exaggeration of the terrain and other features** on ground (Keep the value at 3 for optimal results).

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

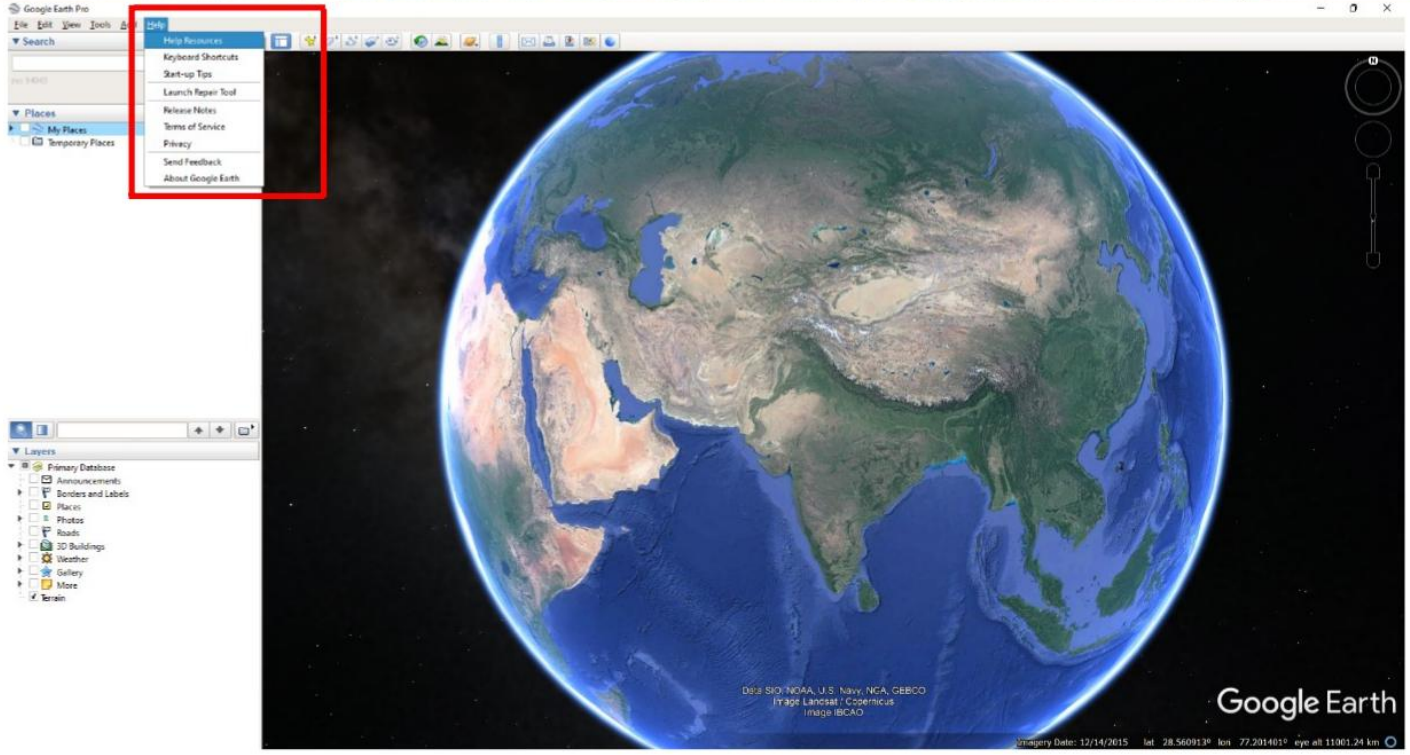
Google Earth & its Interface





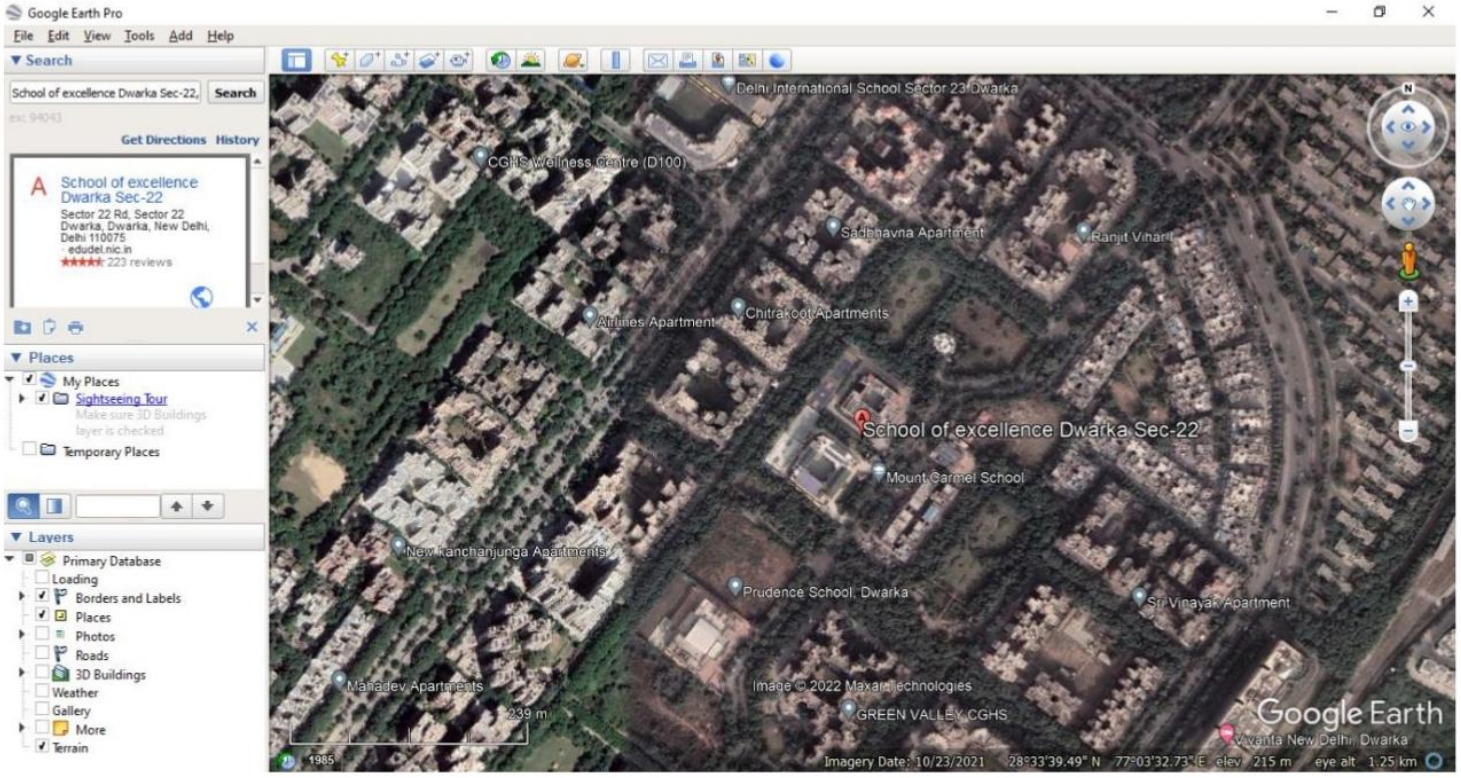
The **Explore** option allows you to not only view Earth from space but you can also explore Moon, and Mars! You can reset your view by using the Tilt and Compass options in **Reset** command. You can also choose a location to make it your start point.

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



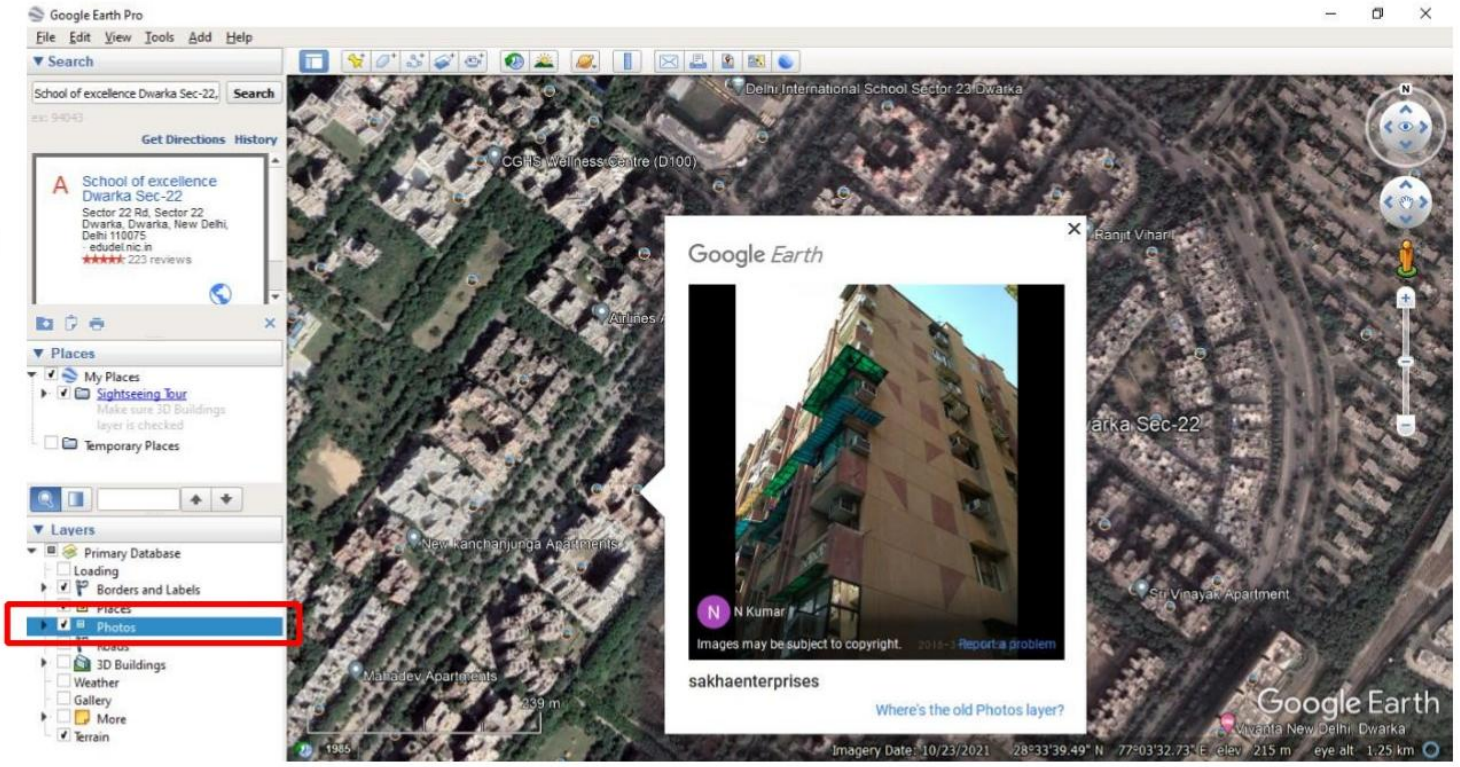
Observe the satellite imagery of your school neighbourhood, you can notice several features, such as, buildings, green patches, open spaces, roads, railway lines, airport, etc. Pan to the right and left of the image to observe more features around your school neighbourhood.

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.

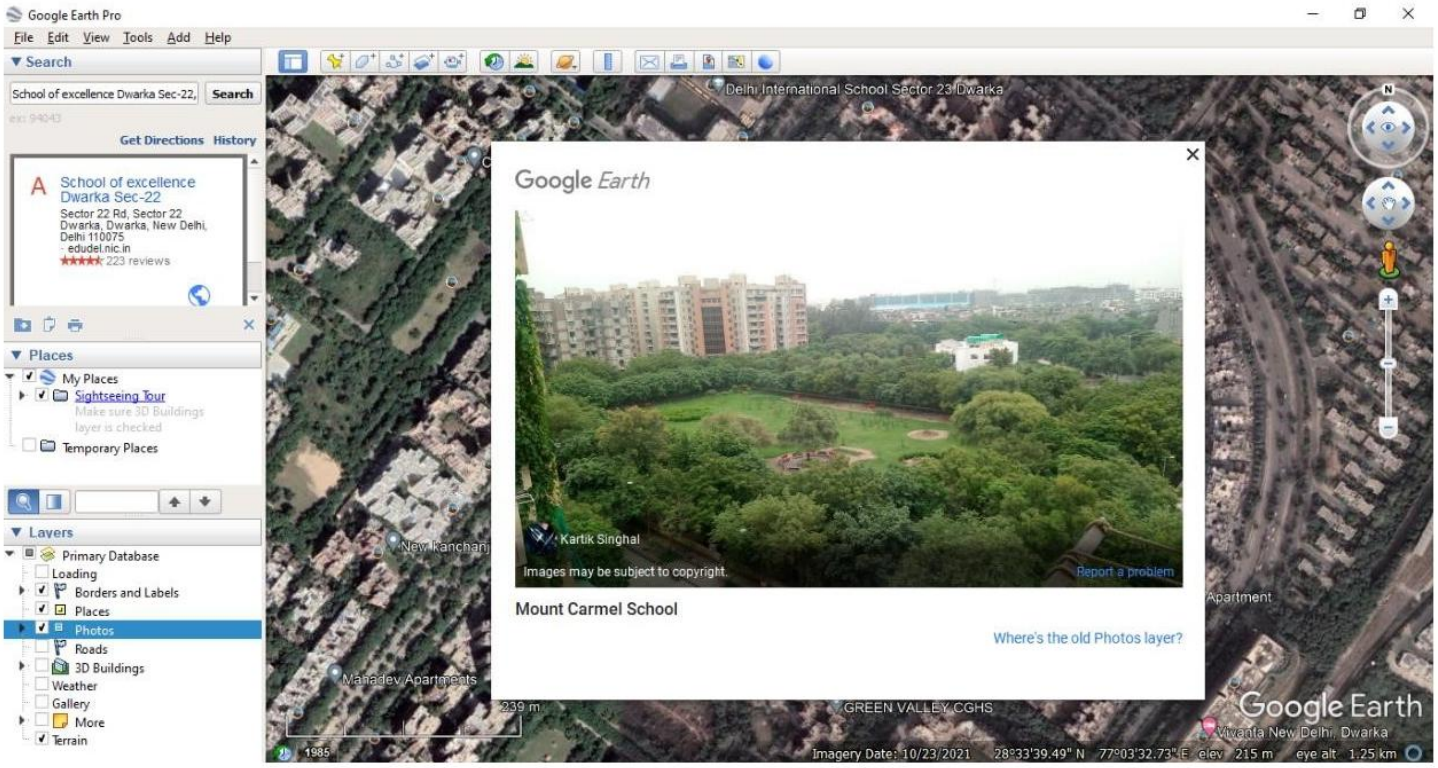
Google Earth allows you to see photographs of places, and see the aerial perspective of the same.



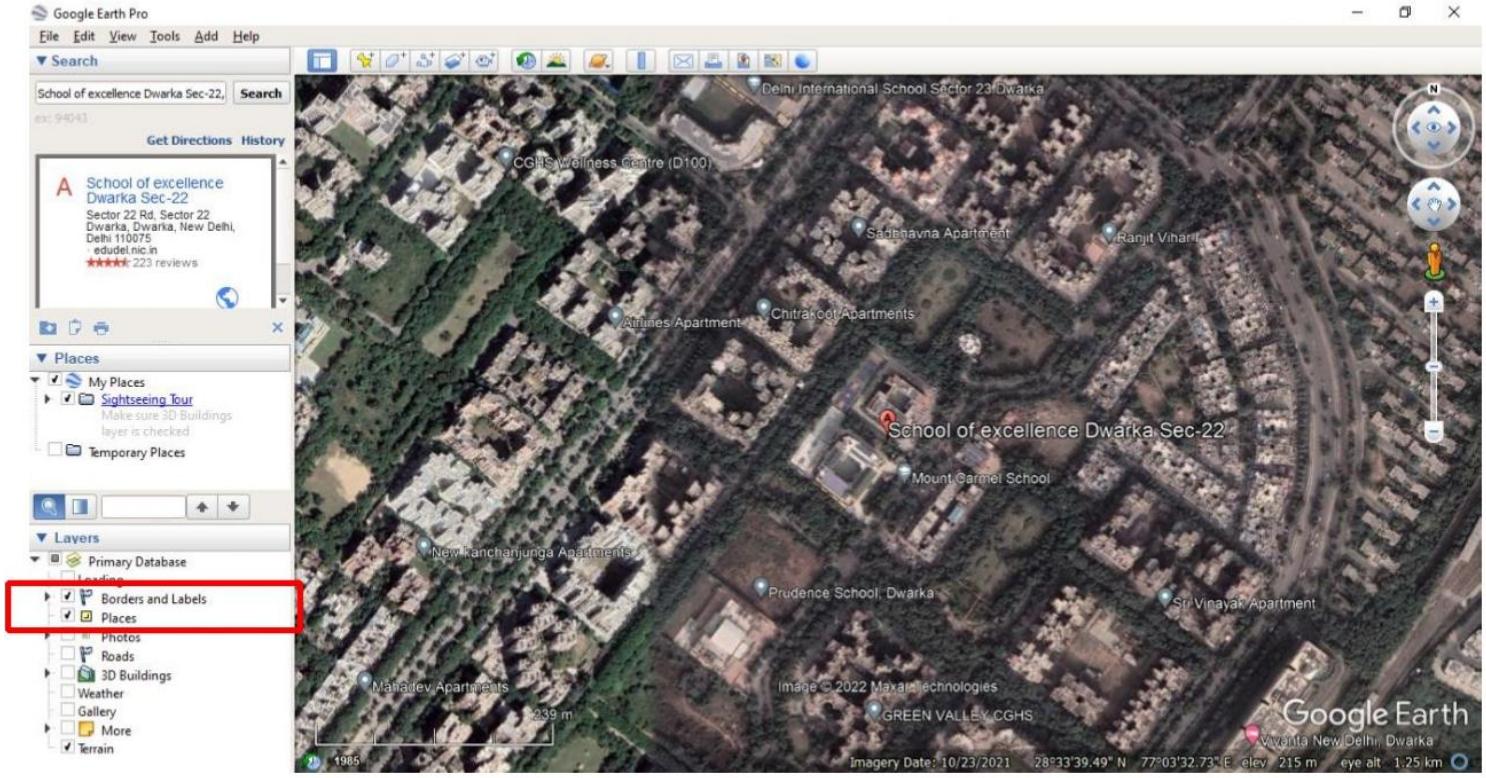
- **Check** the box against **Photos** in the **Layer** panel on the left.
- You can see photographs of certain locations in your school neighbourhood, for example, the image in the satellite imagery shows the photograph of an apartment building, while allowing you to see the building from above.

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

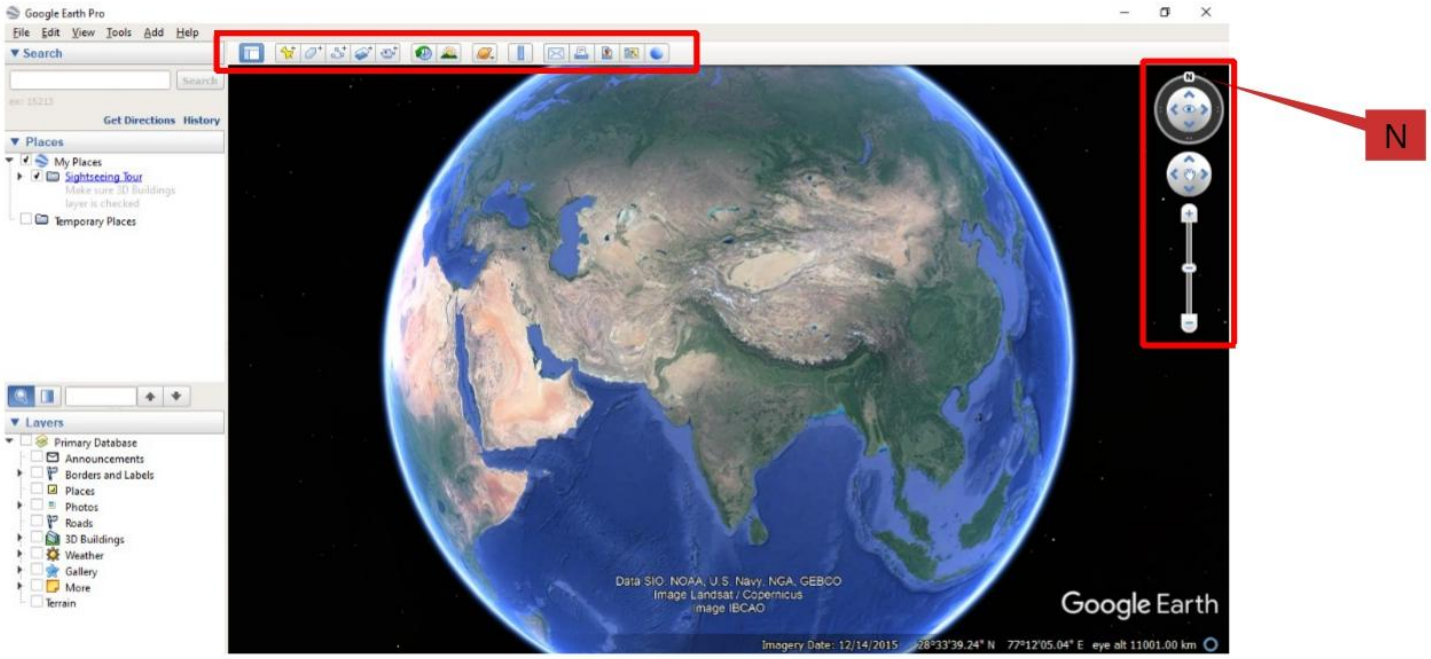


Now that you are familiar with identifying features on the satellite image of your school neighbourhood, let us understand spatial relationships of these spaces. You can observe in the North, West, and South direction of your school, there are apartment buildings, while in the East there is a park.

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.

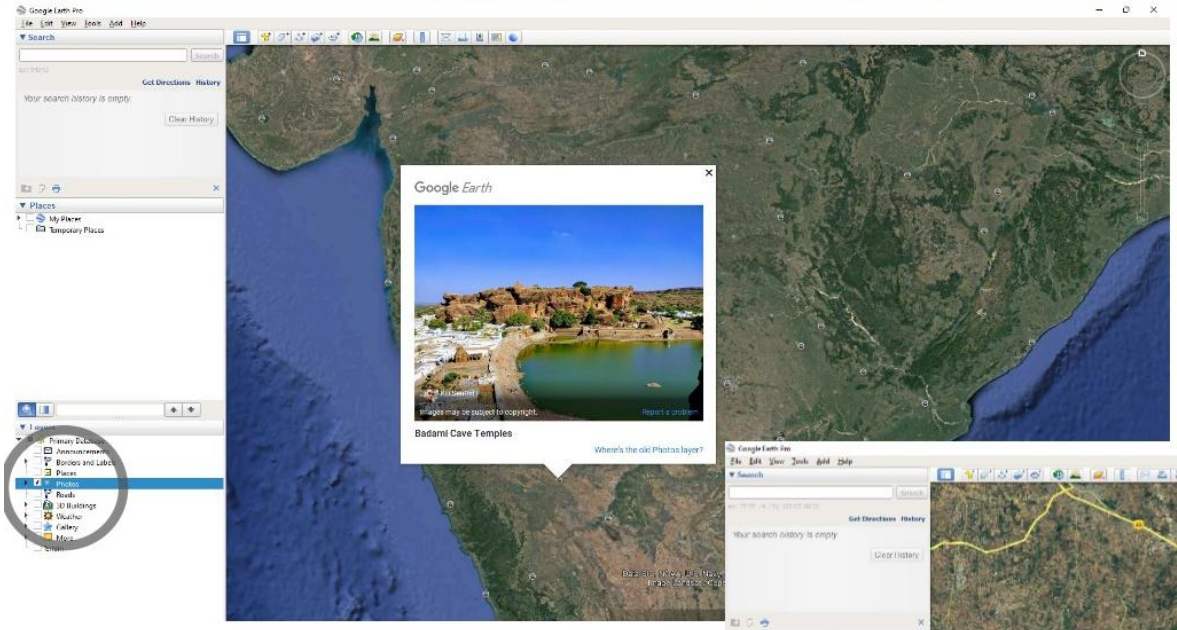
Google Earth & its Interface



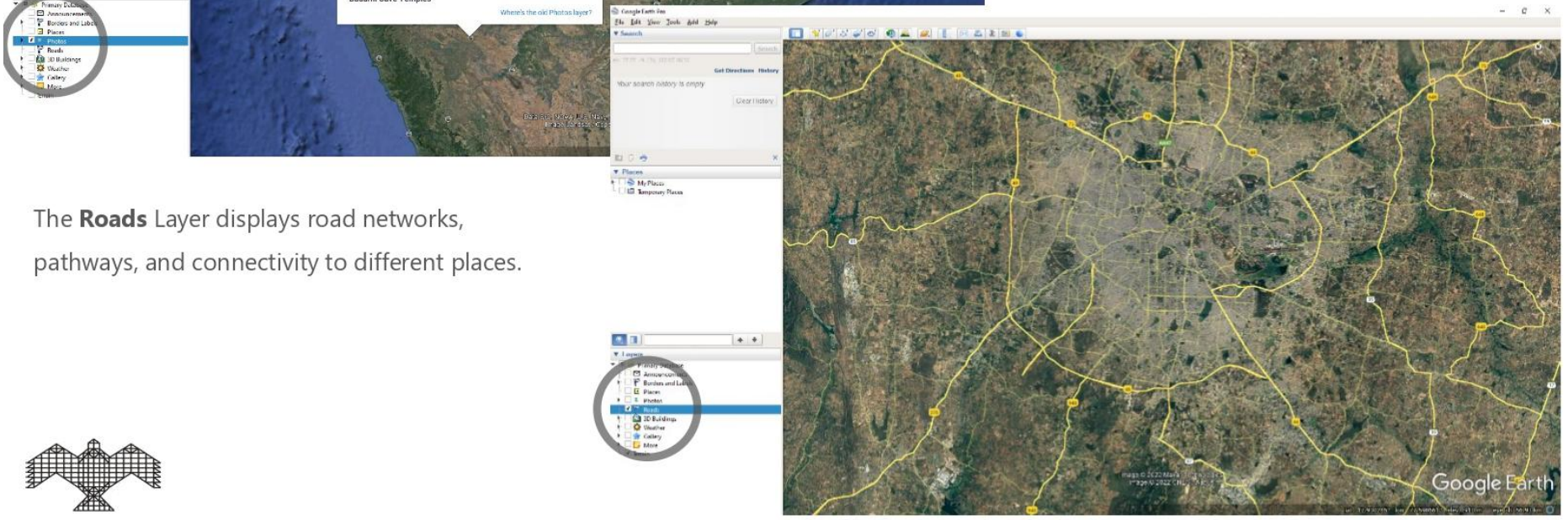
The **Top panel** has tools that allows you create maps, measure distances, view places from the past, sunlight across landscapes, view location on Google maps, among other options; the controls on the **right allow you to navigate, zoom-in and out of location**

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

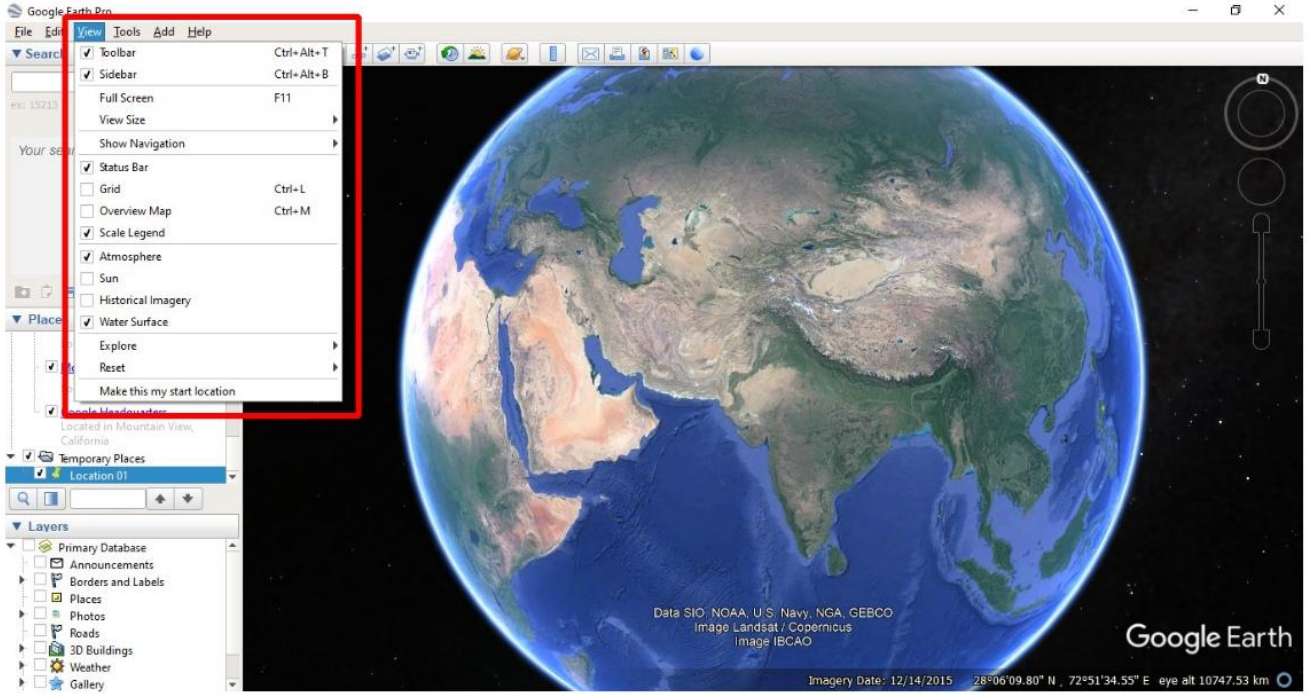


The **Photos** Layer allows you to view photographs of certain locations



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

Google Earth & its Interface

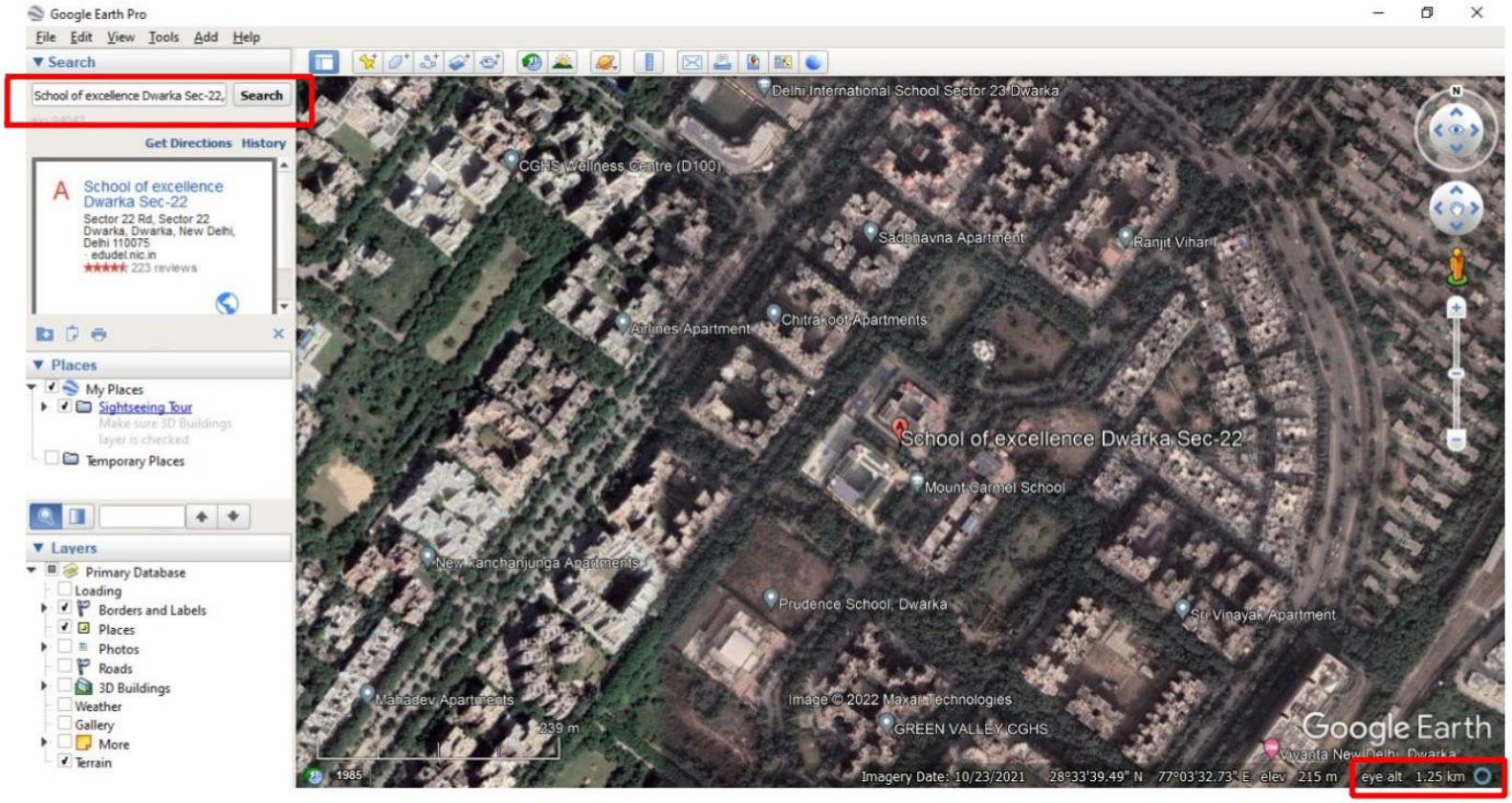


The **View** tab in the top panel allows you to check boxes for the tools you want to appear on the workspace. Some of these are already checked by default. However, you can select some other tools. Options like **Full Screen, Grid, Scale,** and **Overview Map,** are some changes you can make to your 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)

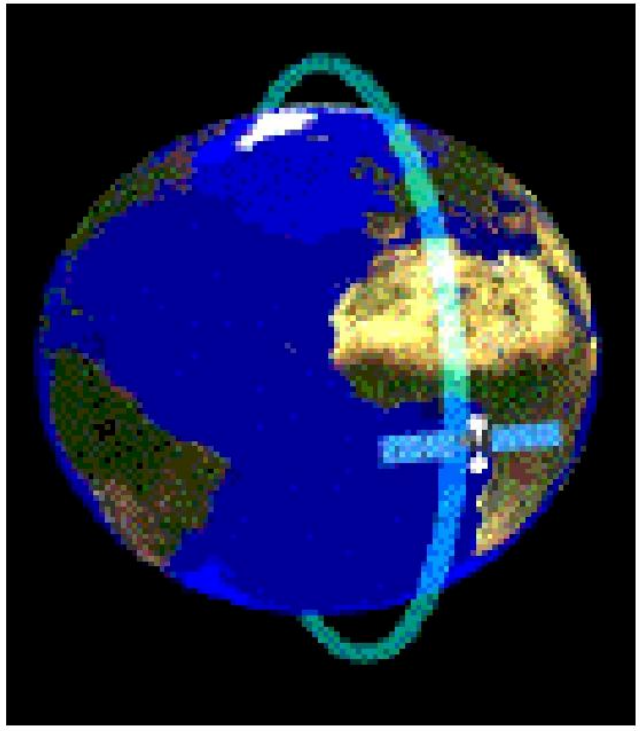
Mapping your neighborhood through digital maps

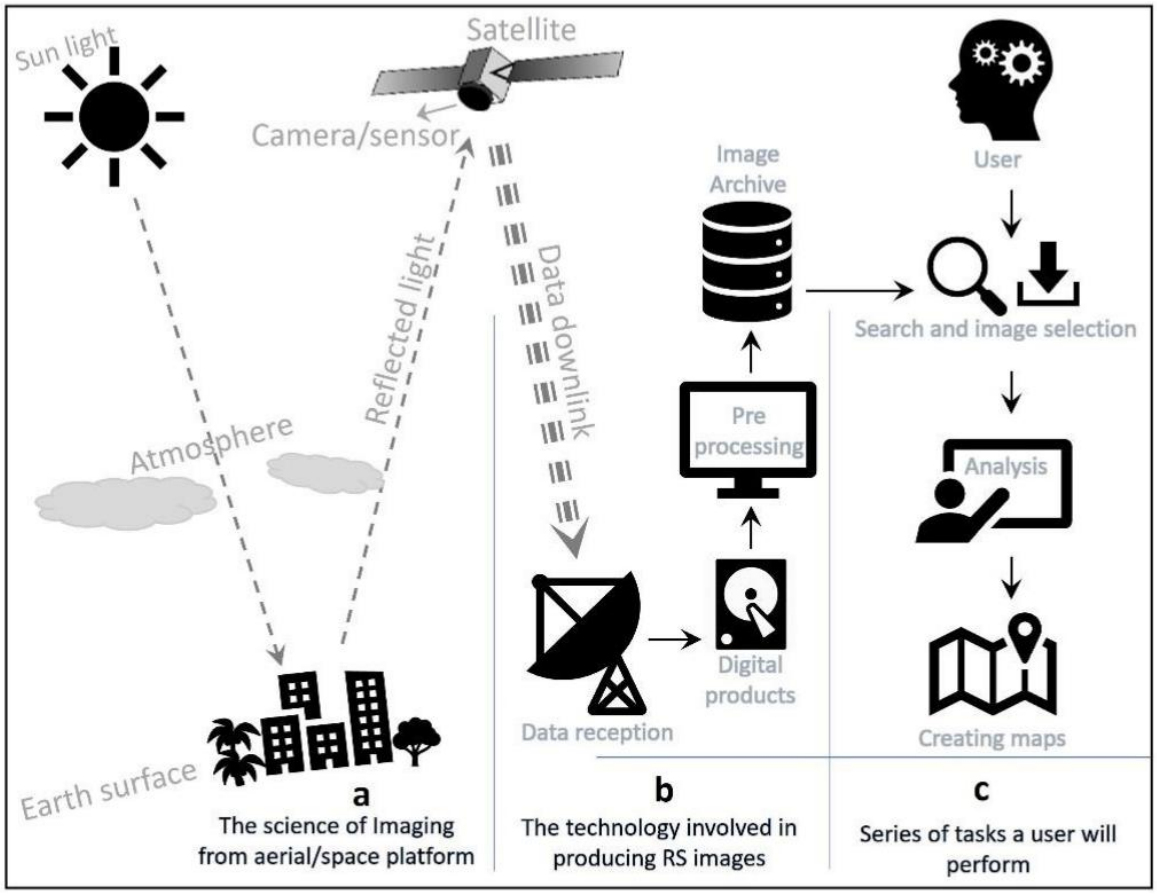
Objective: Learning how to digitize features, and making maps. You also learn how to measuring locations, distances, and area using digital maps.

Theory

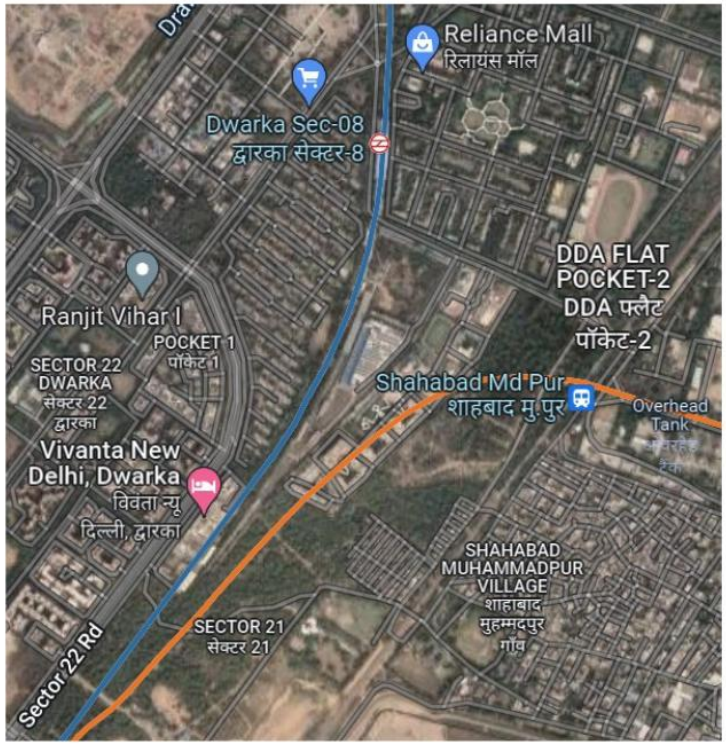
- Concepts one should know:
  - Remote sensing satellites and their orbit
  - What is a satellite images? how are they taken? How do users find them?
  - How are maps made using satellite image?
  - What is georeferenceing?
  - What does georeferencing do to an image?

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.

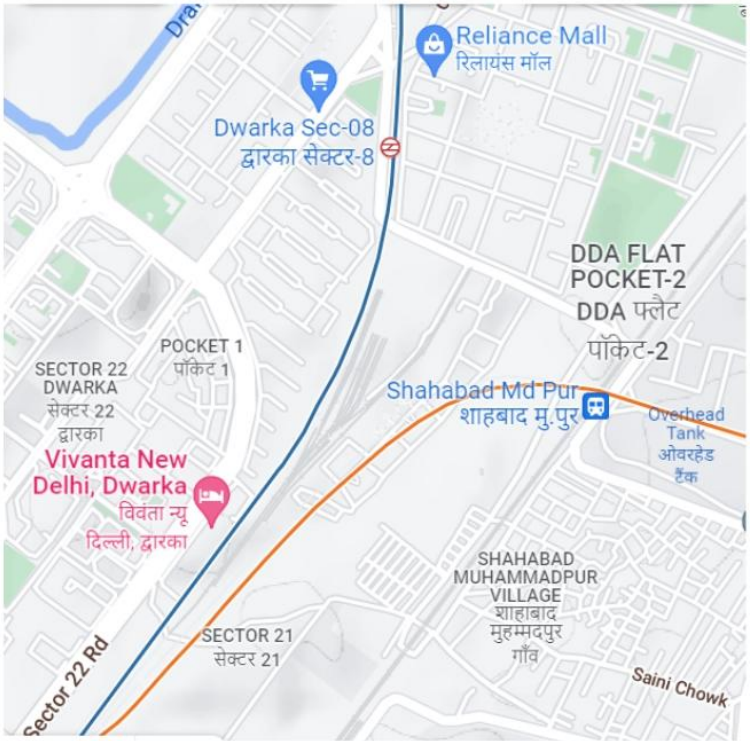




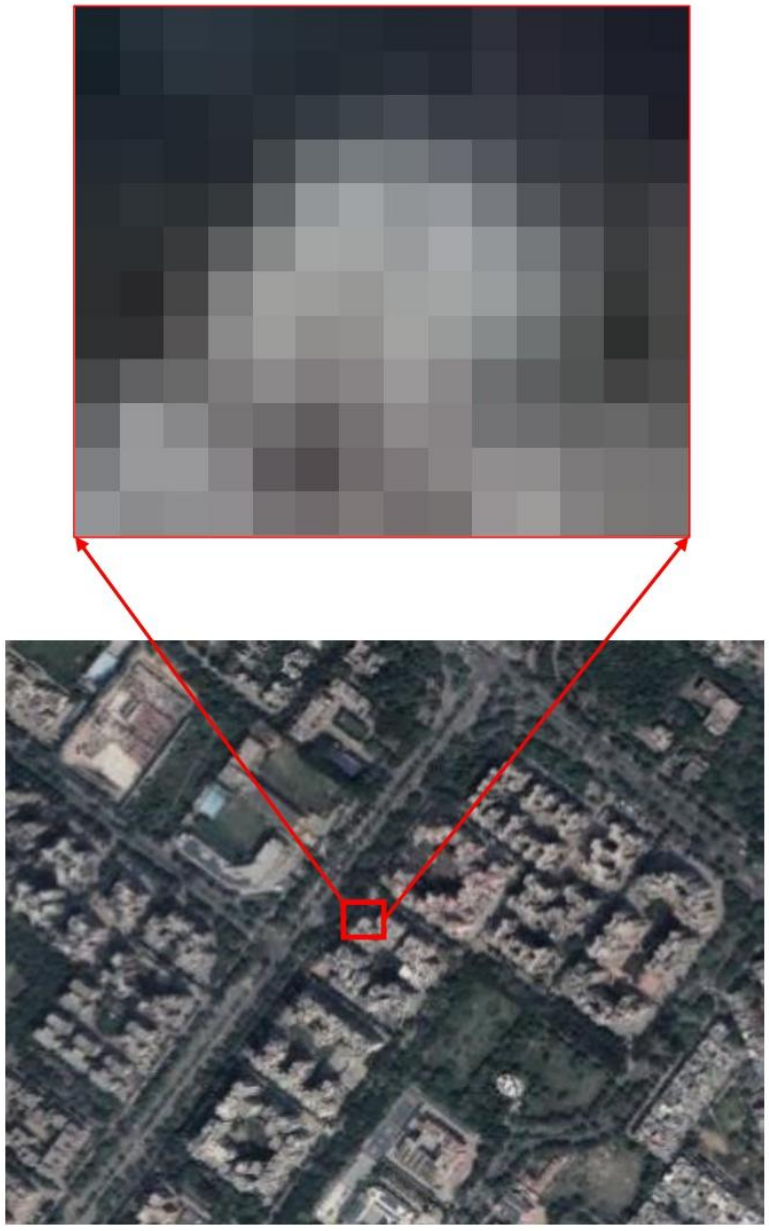
a. Sun's light falls on the earth surface and the reflected light is captured by the camera/sensors aboard satellites (if the atmosphere has obstructions, like for instance clouds/haze, then those will affect quality of image)
b. The data captured by the sensors are in binary format. This data is downlinked 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



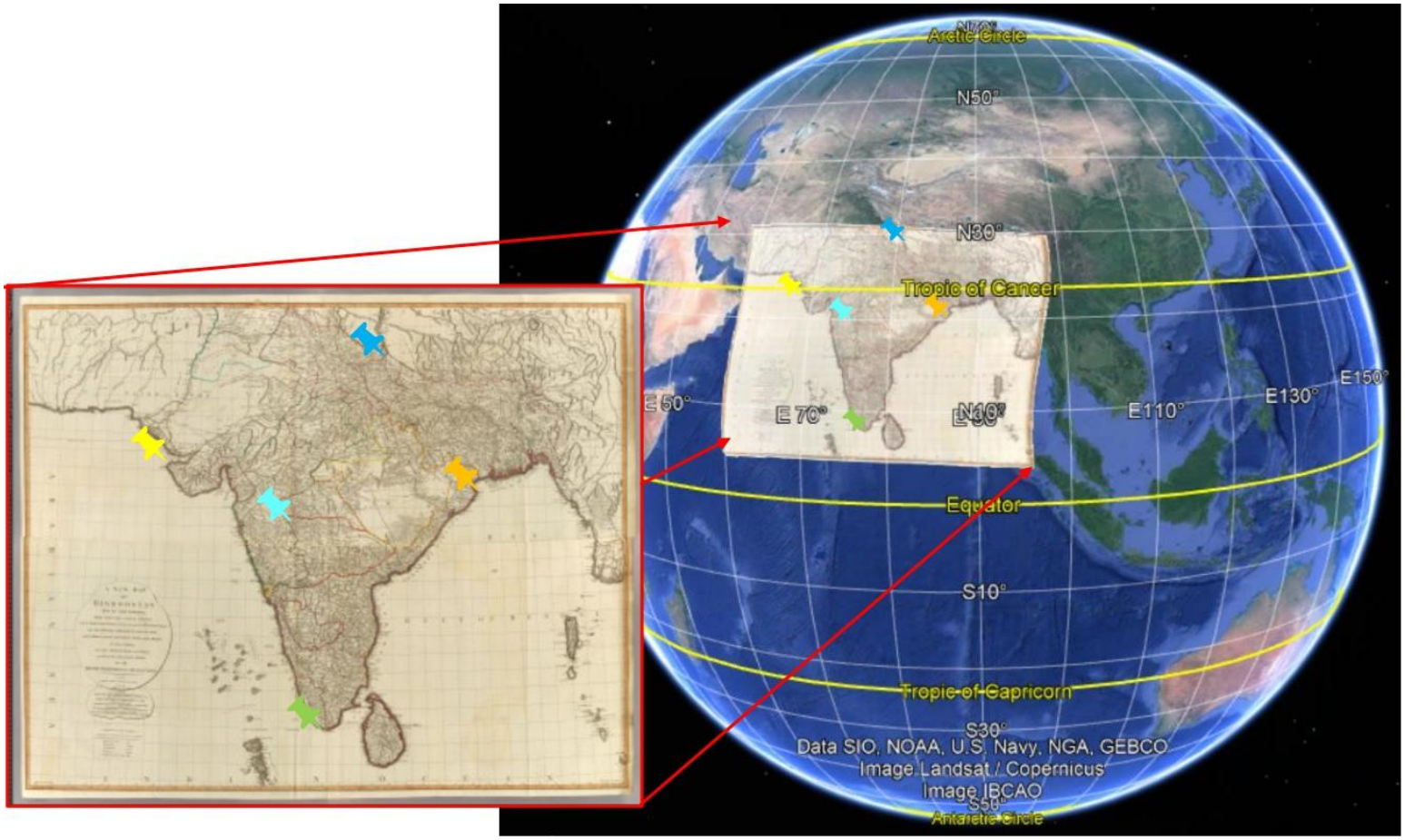
These traced features are used to make maps. Such as the road map above which shows roads, railway lines , railway station etc. Similarly, satellite imagery can be used to make maps of various earth surface feature like, rivers, forests, etc



- 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

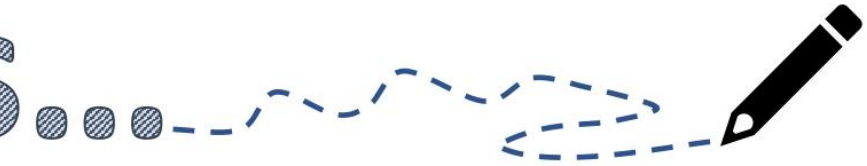
Lat: 22°11'3.18"N Long: 68°49'54.28"E
Lat: 7°56'39.88"N Long: 77°30'59.75"E
Lat: 20°43'36.38"N Long: 86°57'56.95"E
Lat: 28°32'14.61"N Long: 81° 0'19.33"E
Lat: 19°40'56.41"N Long: 75°29'49.18"E

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

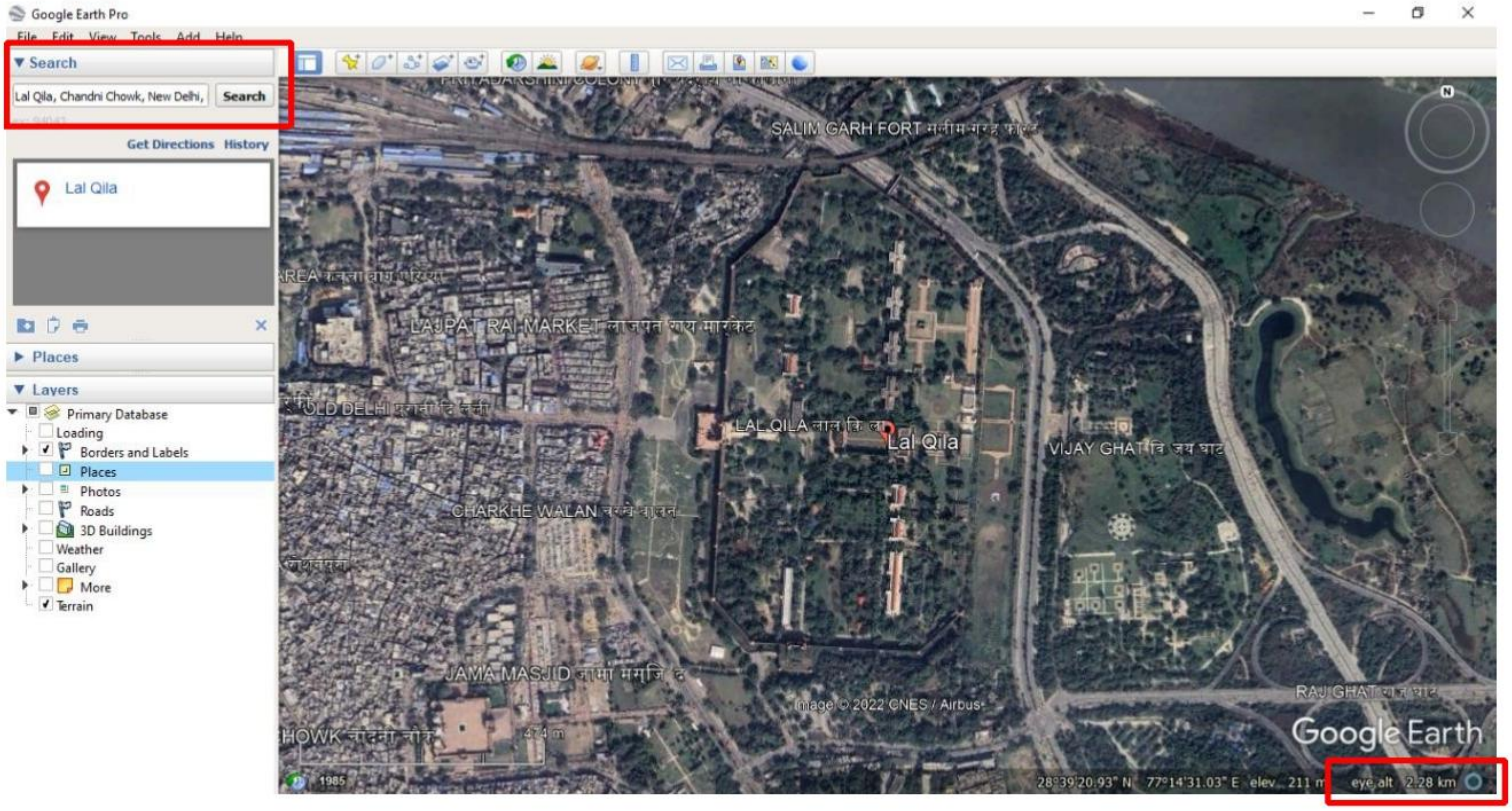


- Once these (min 4) coordinates is attributed to raw images the software can then calculate lat & long for whole image
- After image is georeferenced, measurements (location of features, distance, area) can be made on images
- Google Earth is a geo-portal where all the images have been georeferenced 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



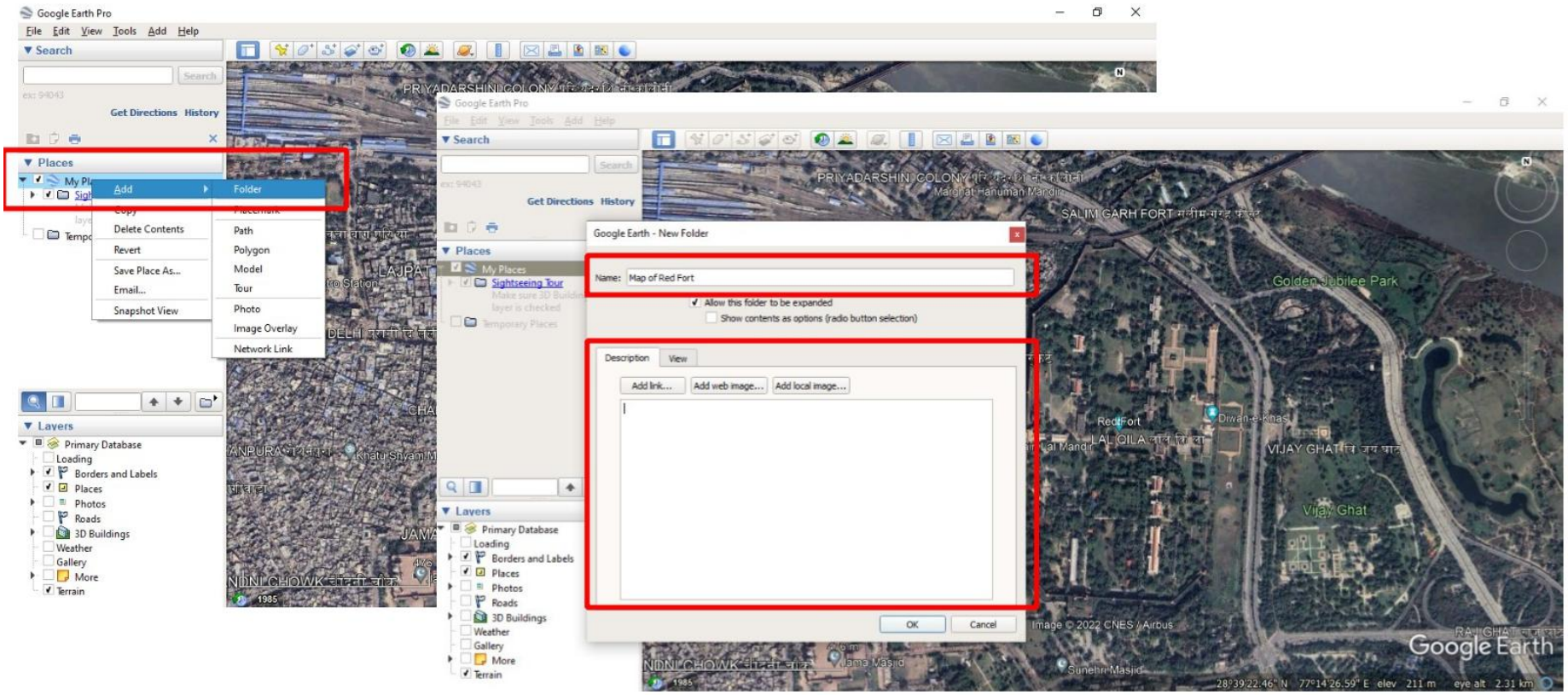
Lets consider the Red Fort and the area immediately surrounding it. Observe the different features on this satellite image by applying what you learnt in your previous lesson.

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

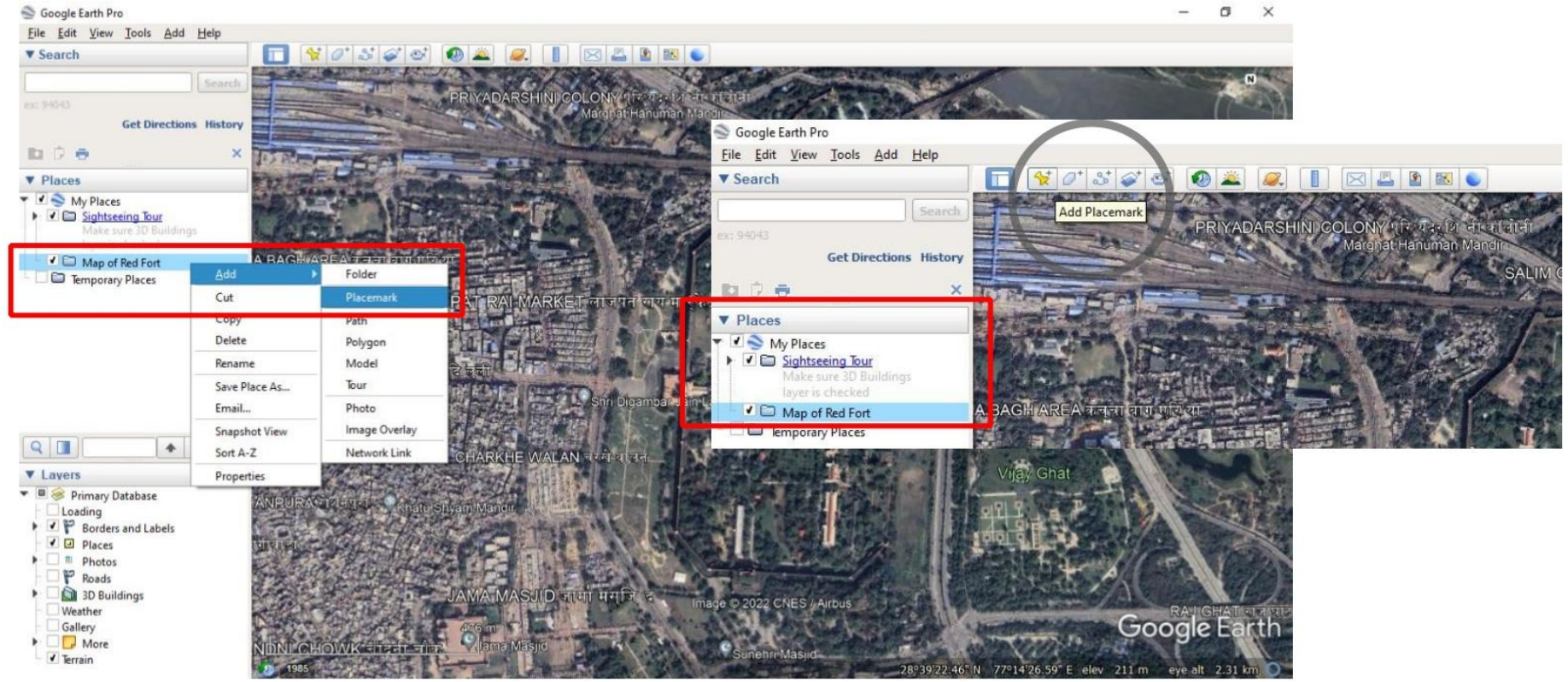


Step 02 Right-click on **My Places**< in the drop- down menu Click **Add**< Click-on **Folder**

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

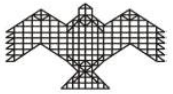
Lesson 1: Digitizing features from images



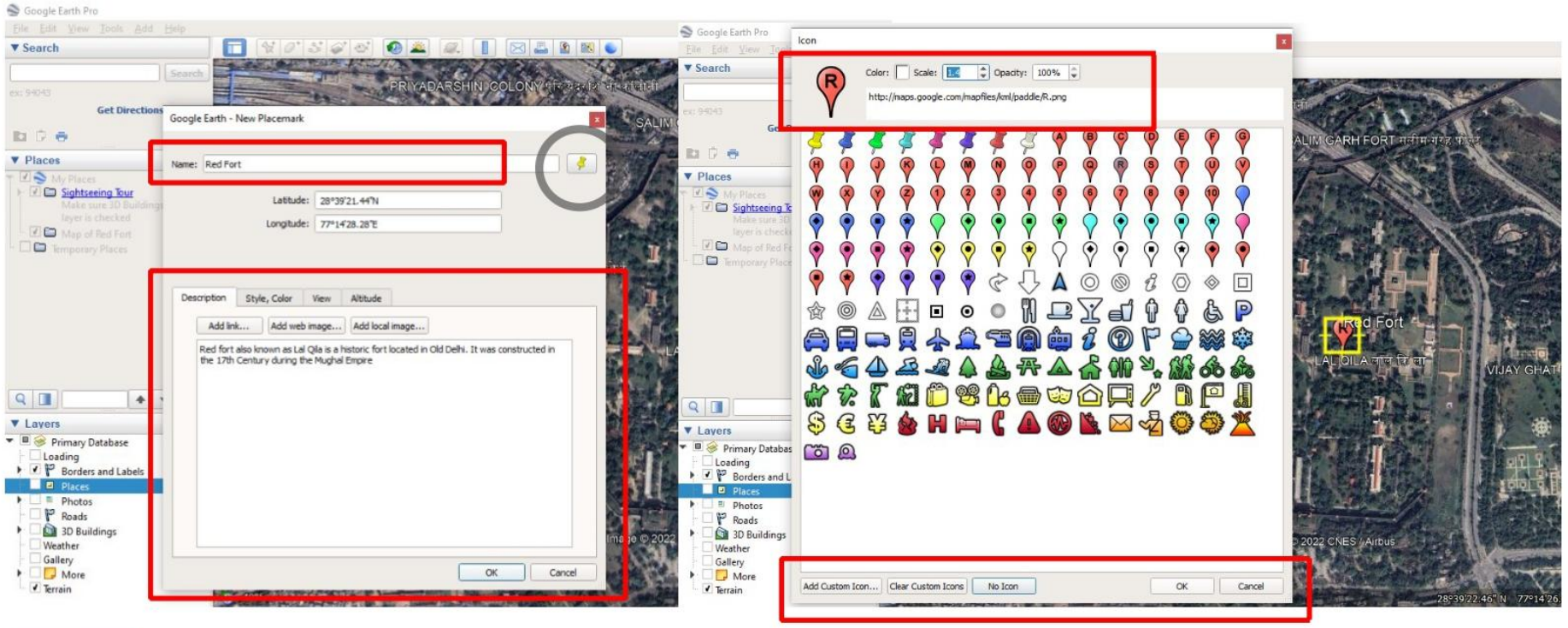
Step 05 Right-click on new **Folder** you have created (in this case its called **Map of Red Fort**)< in the drop- down menu Click **Add**< Click-on **Placemark**

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

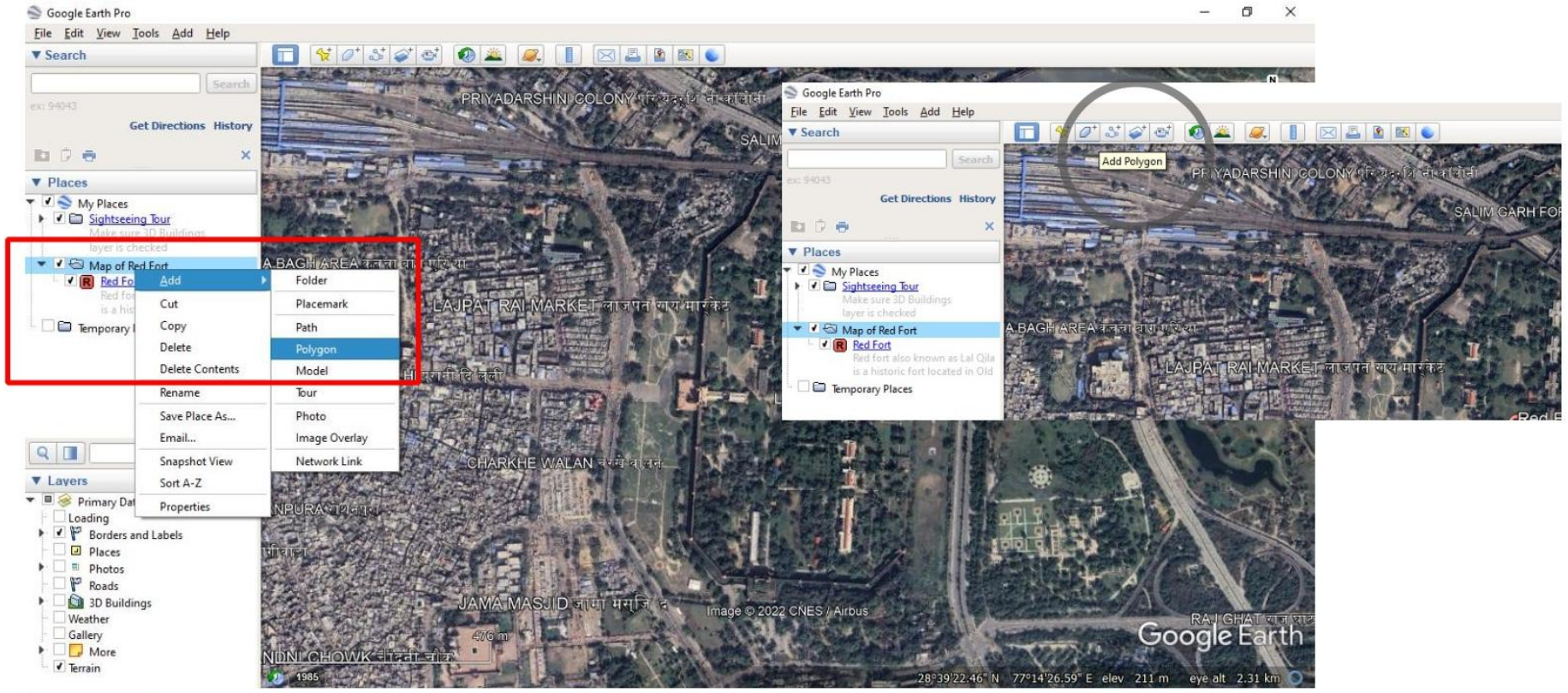


Step 06 A **New Placemark** window will pop-up, where you can enter the **Name** of the placemark (in this case its called **Red Fort**), and you can add a **Description**.

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

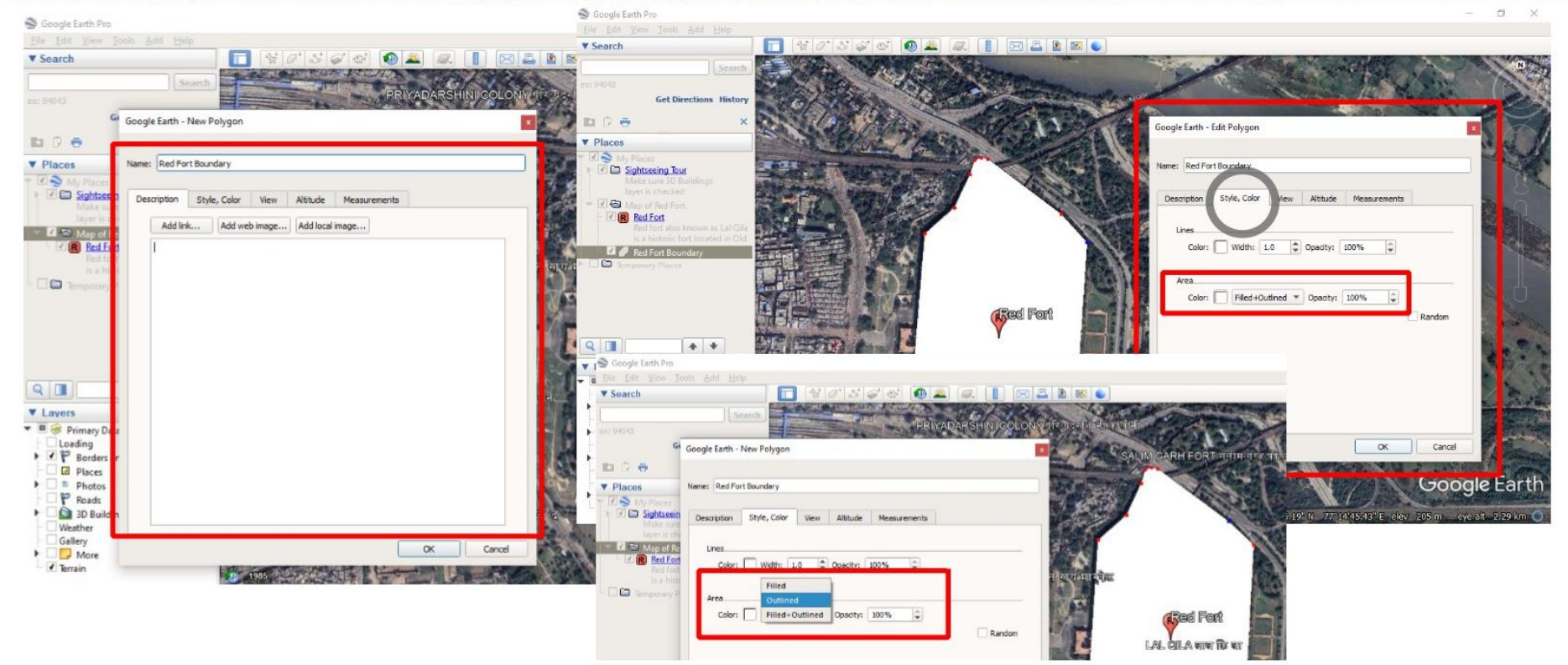


Step 09 Right-click on new **Folder** you have created (in this case its called **Map of Red Fort**)< in the drop- down menu Click **Add**< Click-on **Polygon**

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



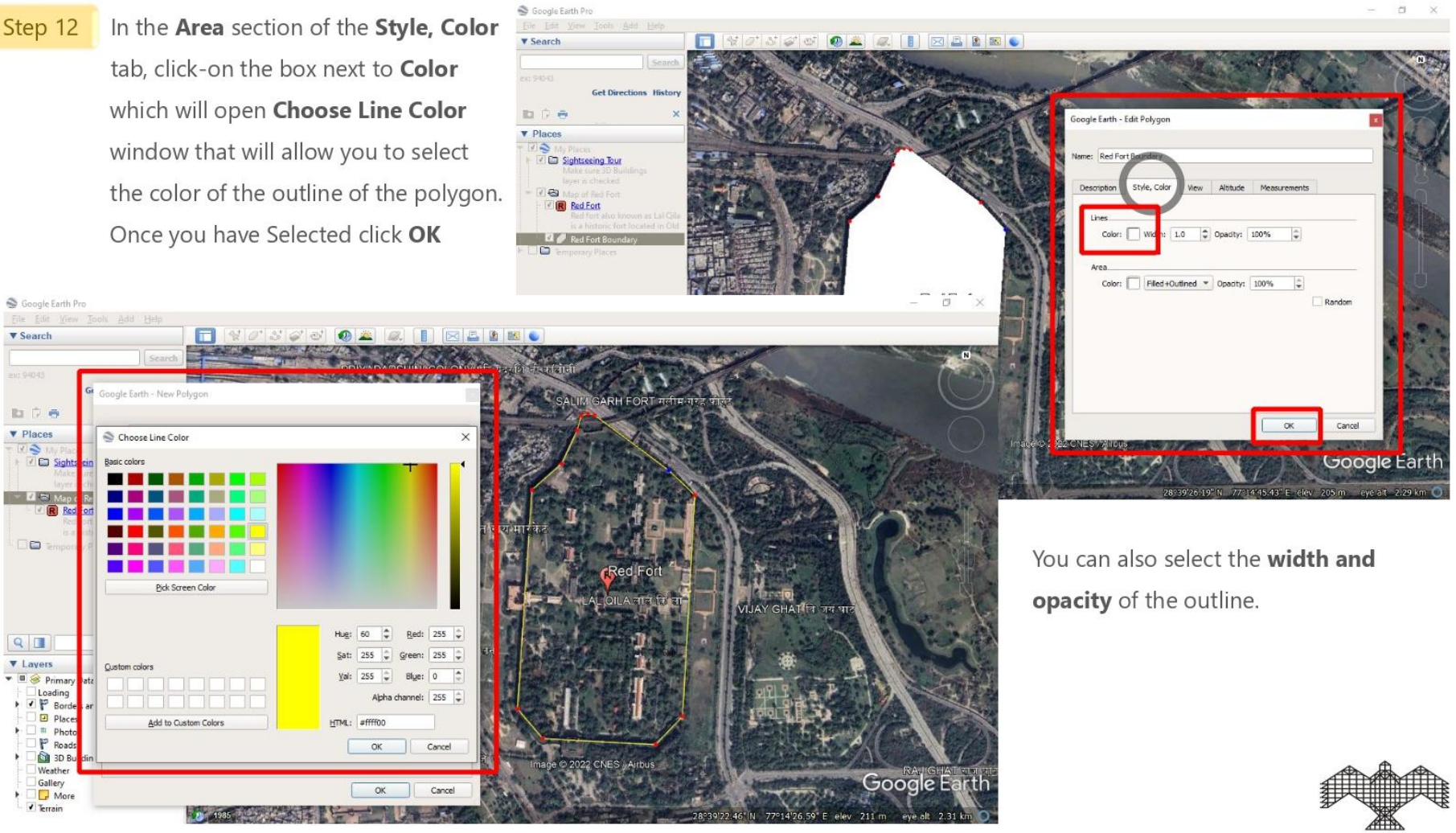
Step 10 A **New Polygon** window will pop-up, where you can enter the **Name** of the polygon (in this case its called **Red Fort Boundary**), and you can add a **Description**.

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

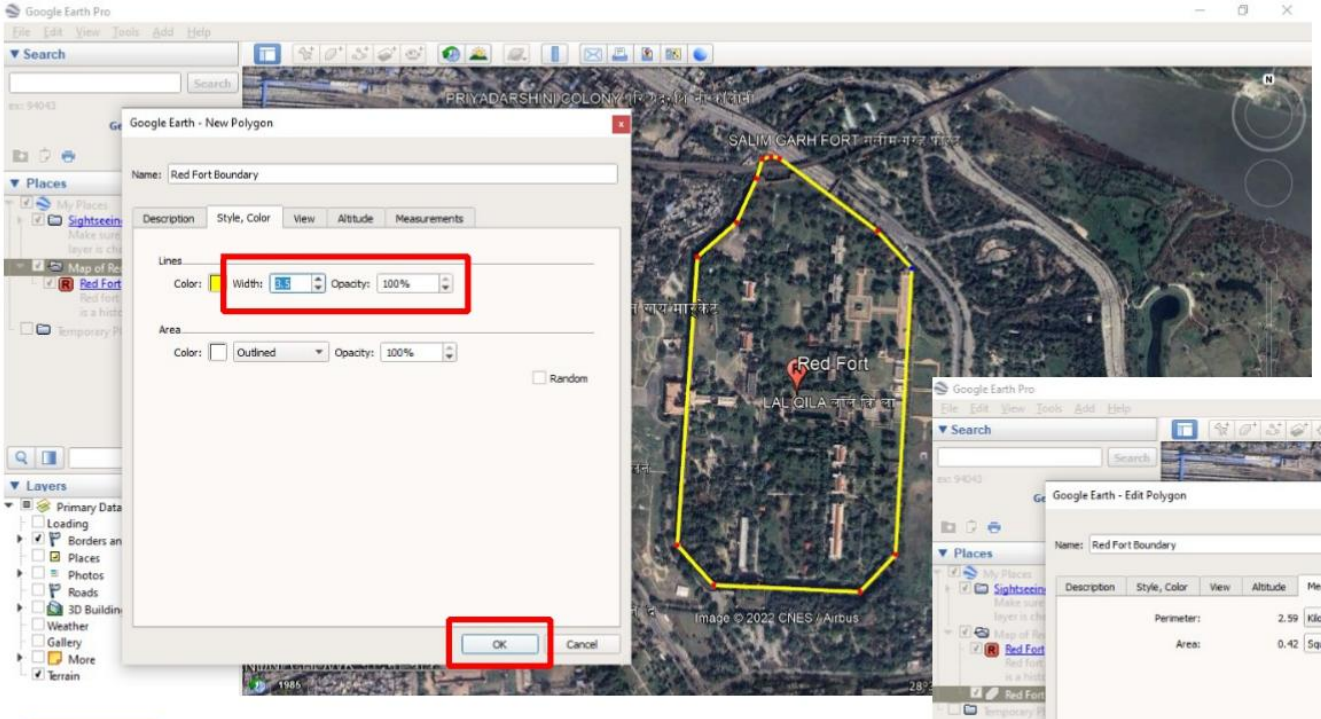
Step 12

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**

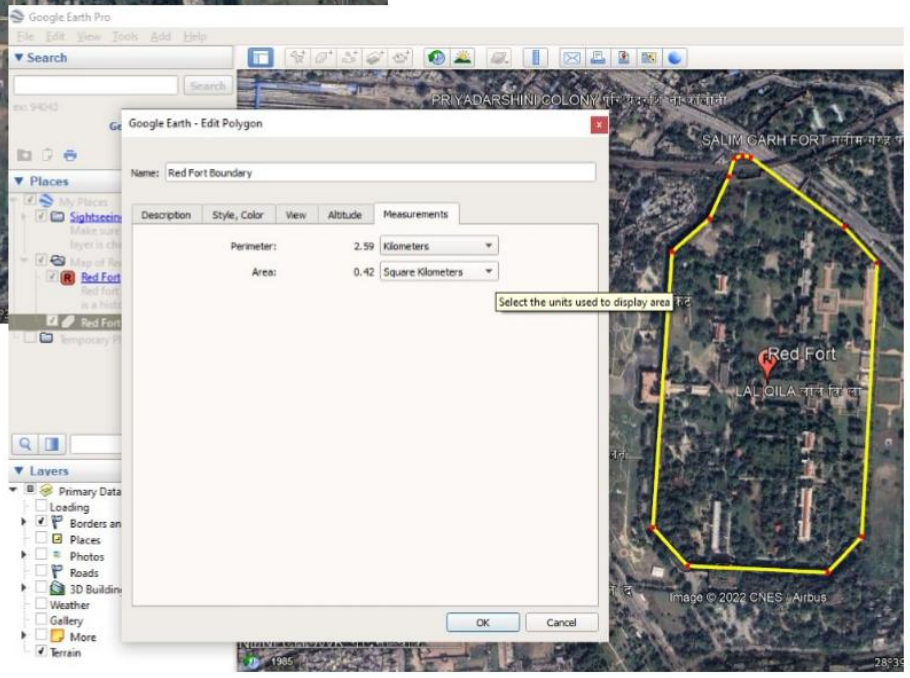


You can also select the **width and opacity** of the outline.

Lesson 1: Digitizing features from images

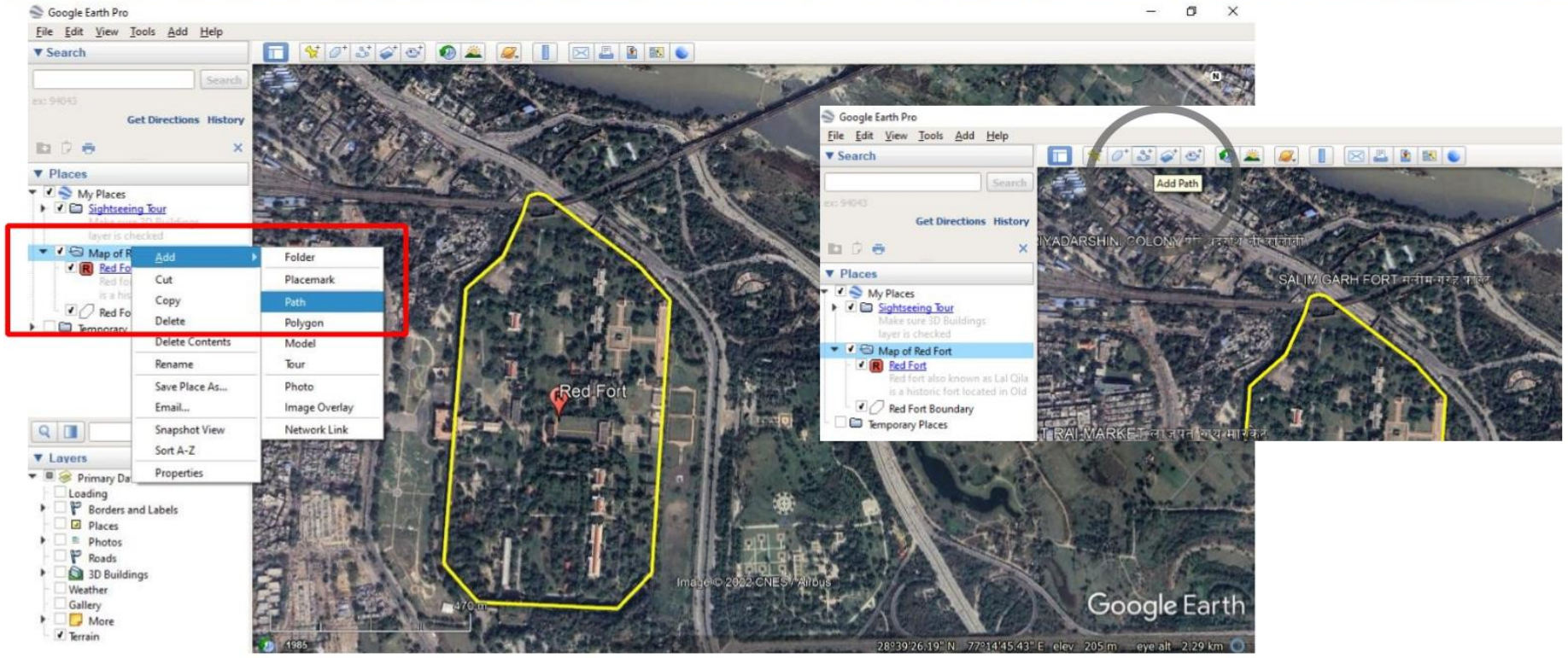


You can also select the **width and opacity** of the outline.



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

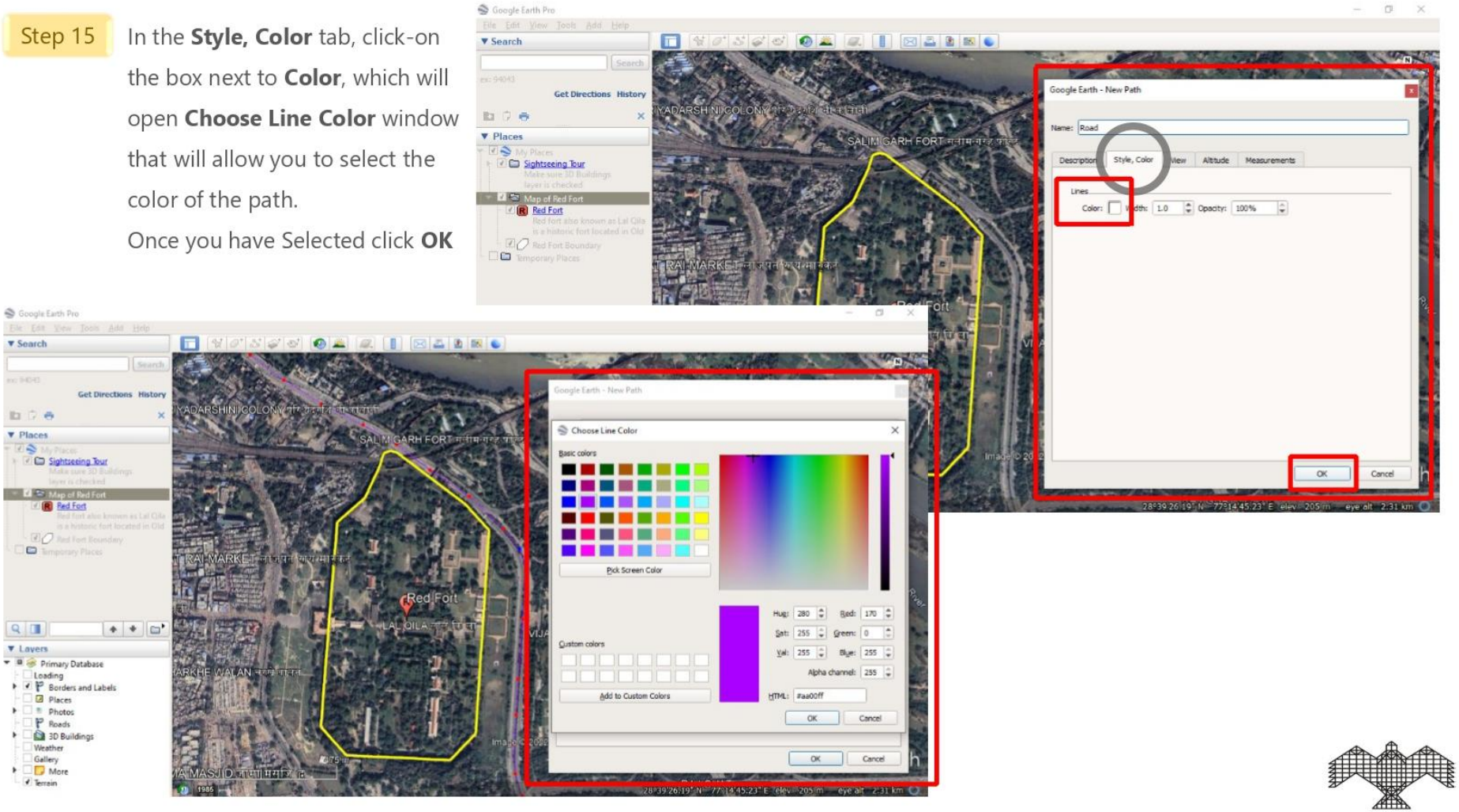
You can Select the **Map of Red Fort layer** in the **Places** panel on the left< Click-on the **Add Path** icon on the top toolbar panel

Lesson 1: Digitizing features from images

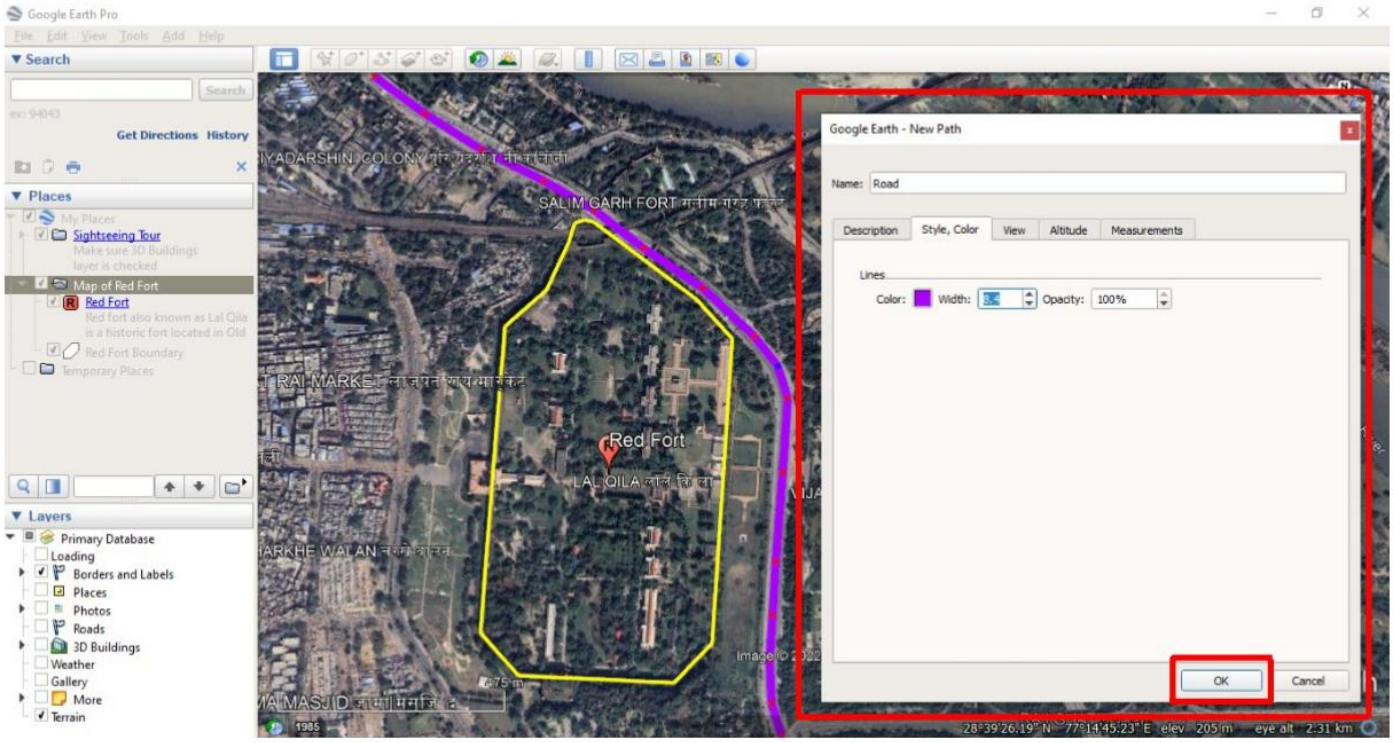
Step 15

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**

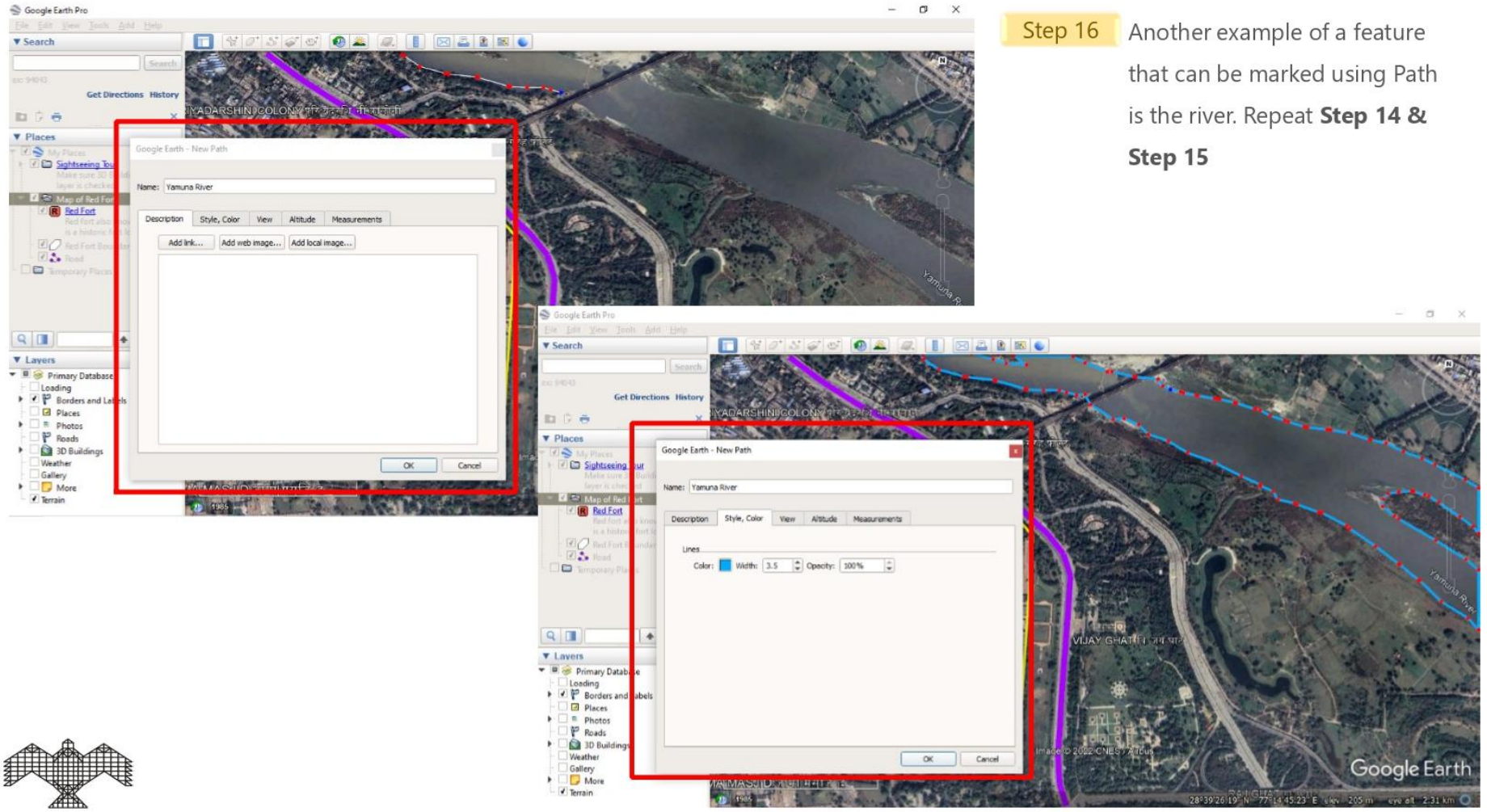


Lesson 1: Digitizing features from images



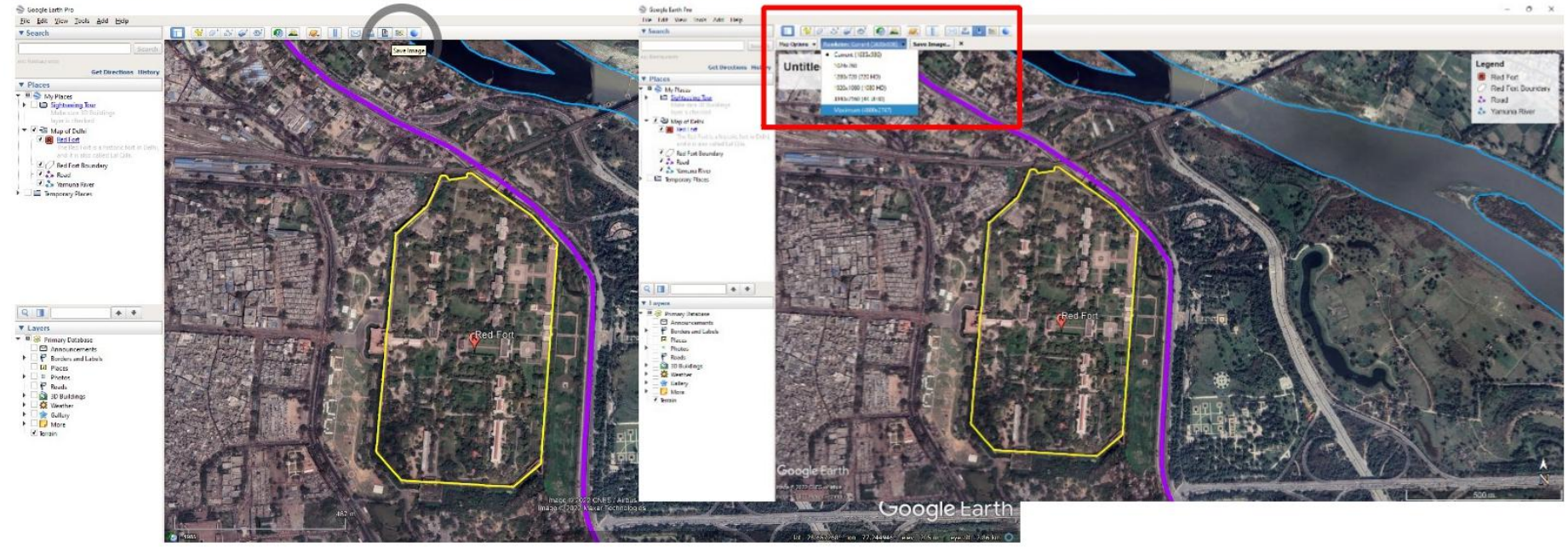
You can also select the **Color**, **width**, and **opacity** of the line. Click **OK** once you have made the changes

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**

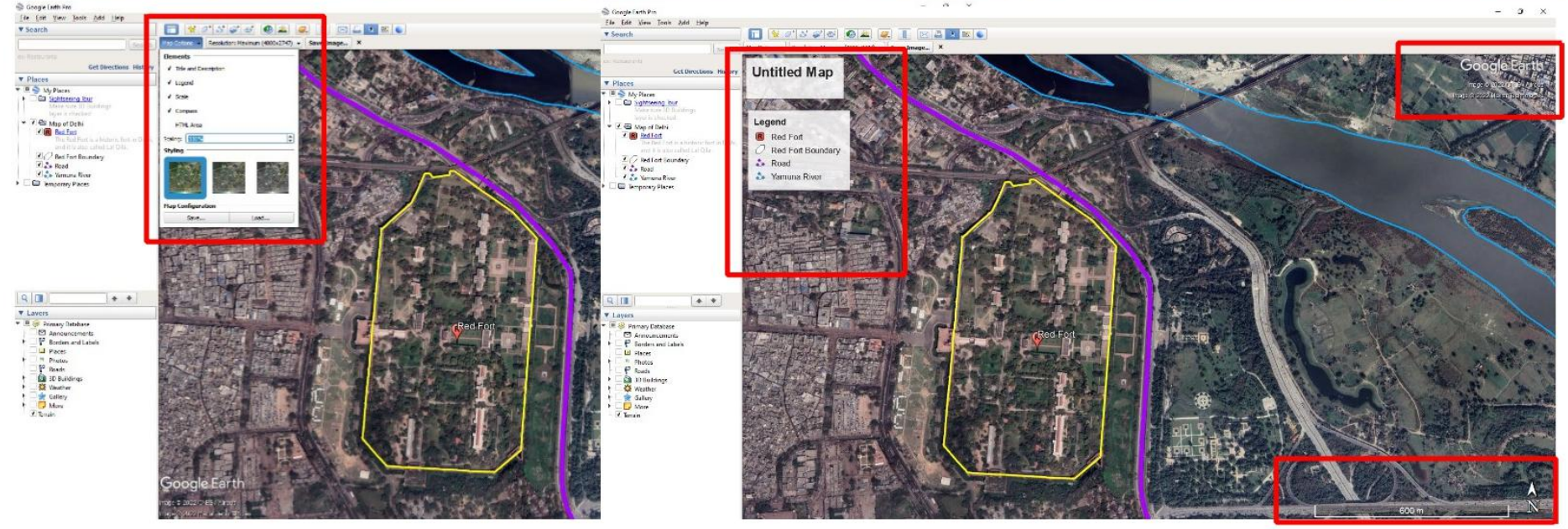
Lesson 1: Digitizing features from images



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.

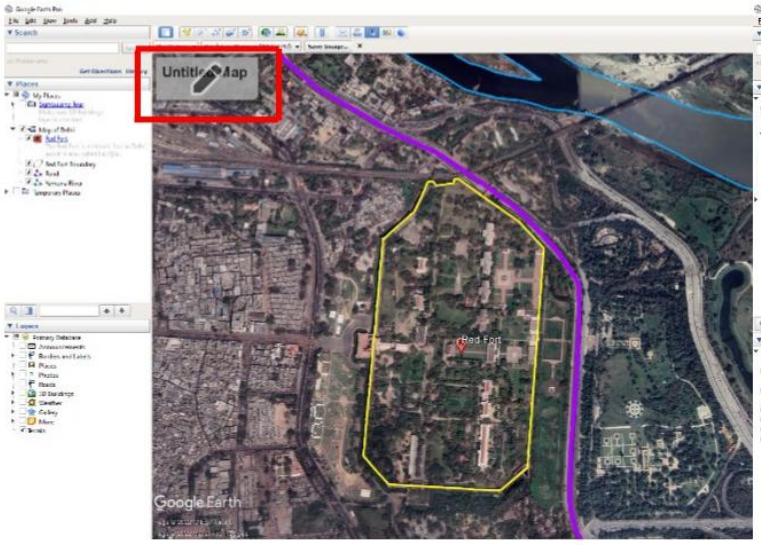
Lesson 1: Digitizing features from images

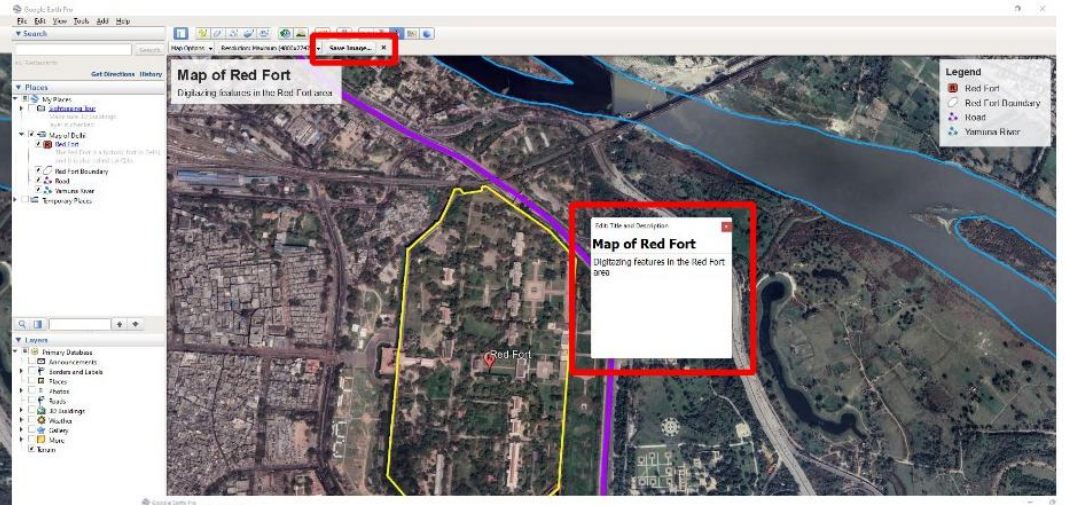


Step 19 In the **Map Options** tab, the drop-down menu will allow you to choose the options you want displayed on your map. For instance you can add/ remove the **Title** if you don't want it. You can also change the scale of the options displayed using the **Scaling** tab. The scale is based on the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

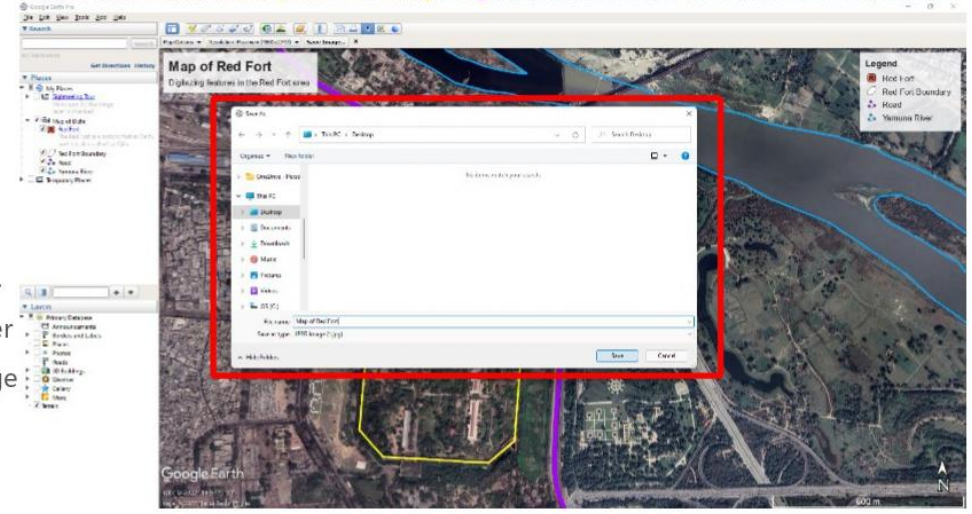




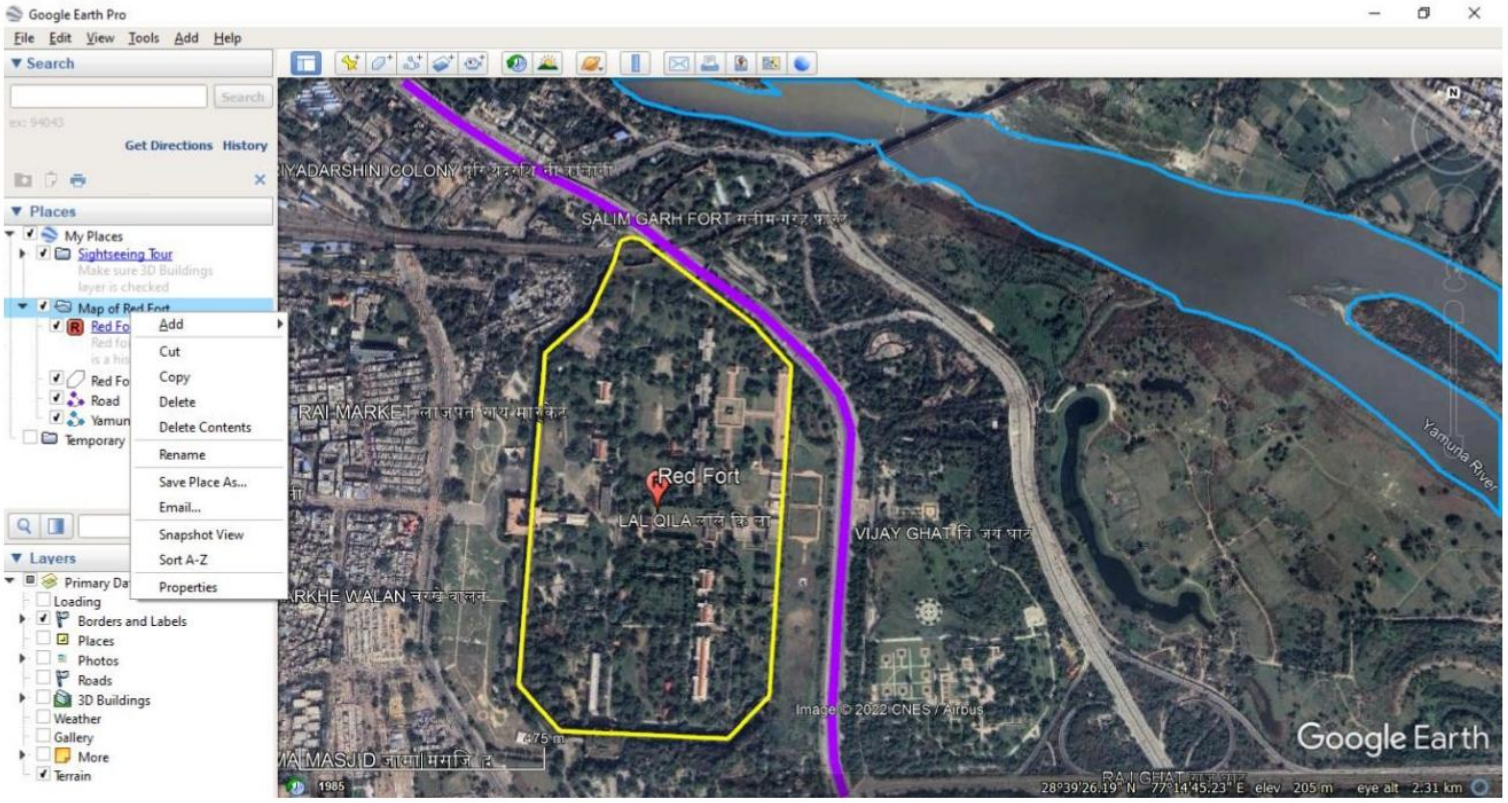
Step 21 Click-on the **Title** block on the top of the map layout. A window will pop-up that will allow you to **Edit the Title and Description** of the map. Once you have made the changes click anywhere outside the **Edit** window.

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.



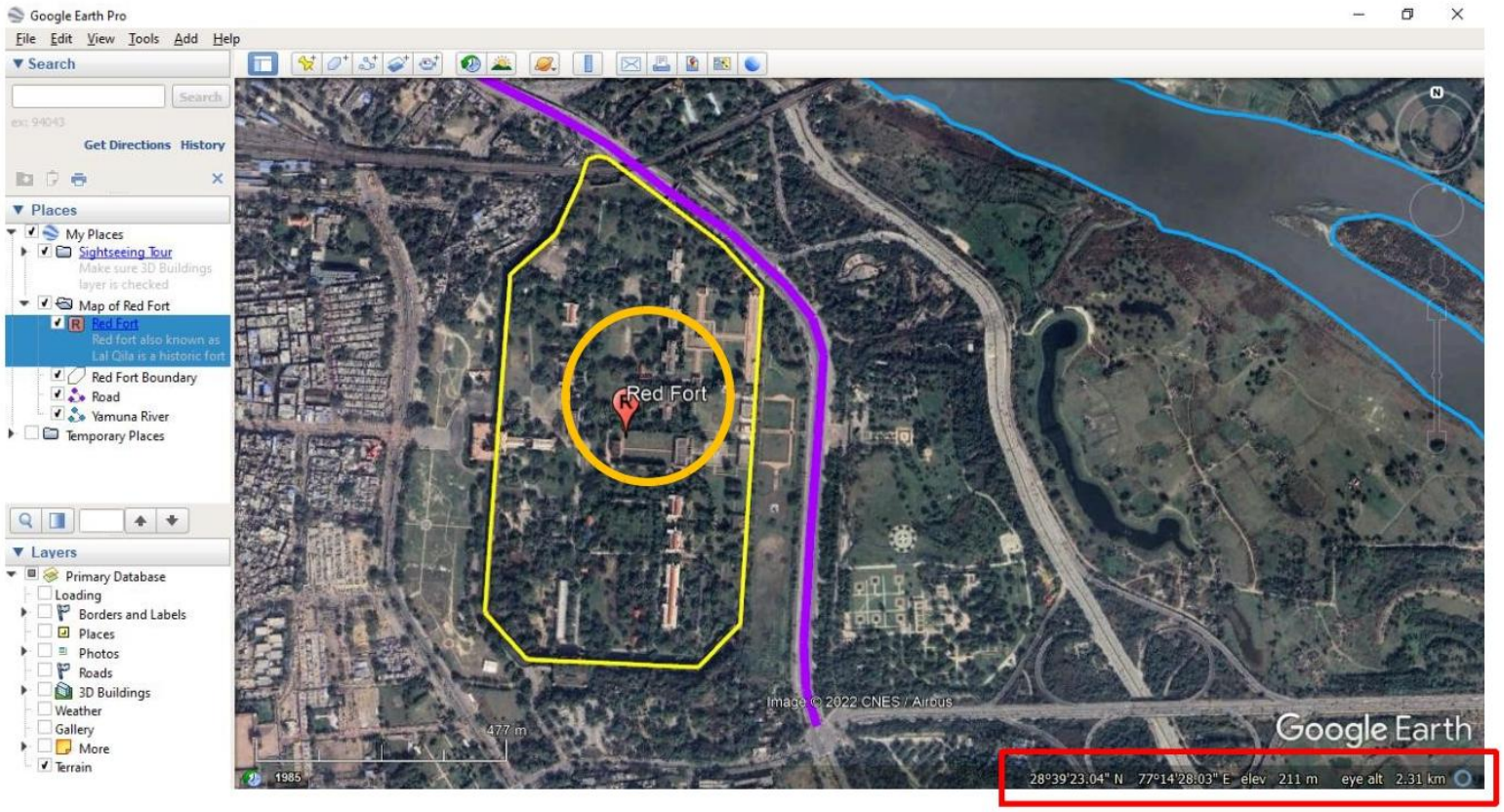
Lesson 1: Digitizing features from images



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.

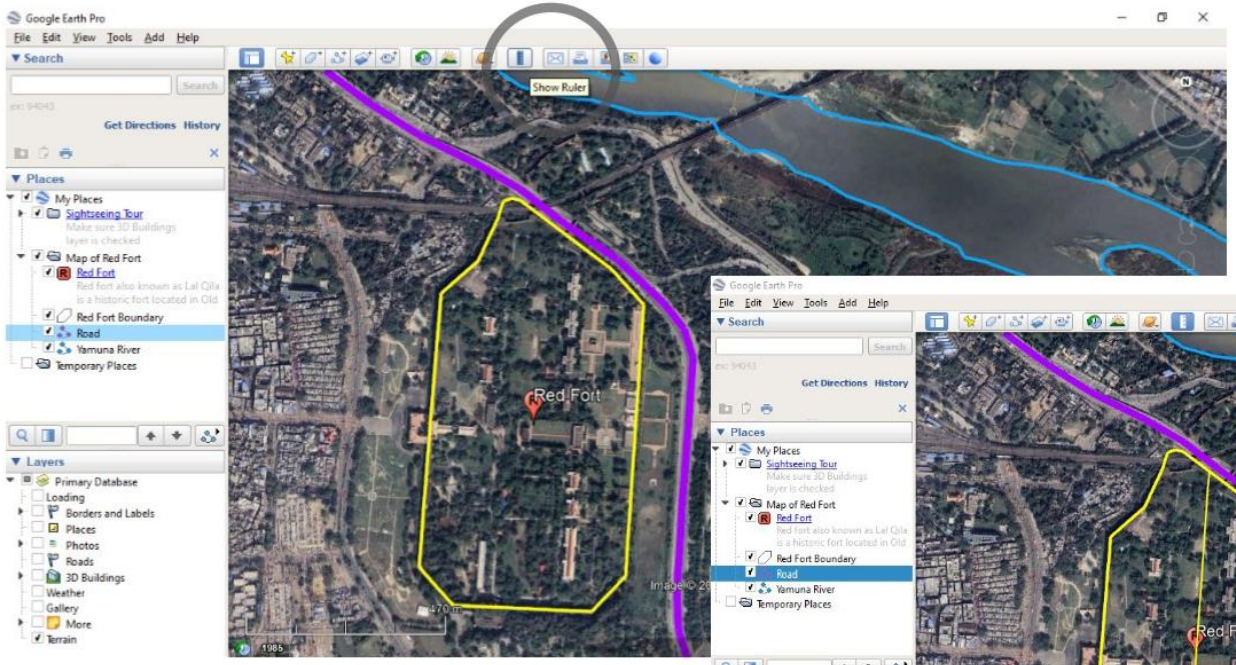
Lesson 2: Measuring locations, distances, and area using digital maps



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

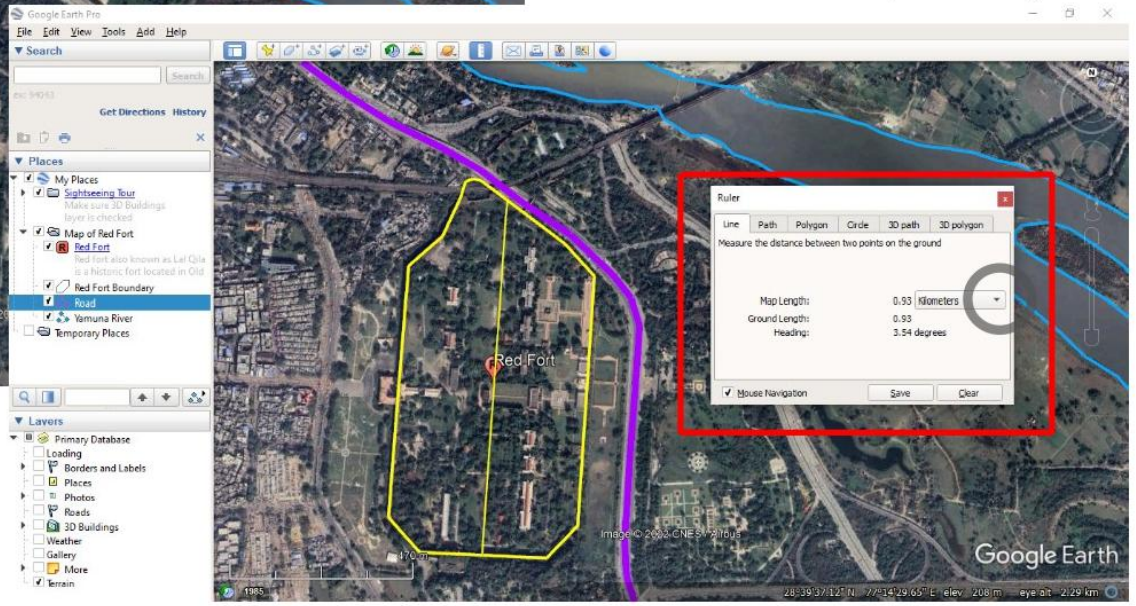
Select **Ruler** icon on the top toolbar of the workspace.

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.

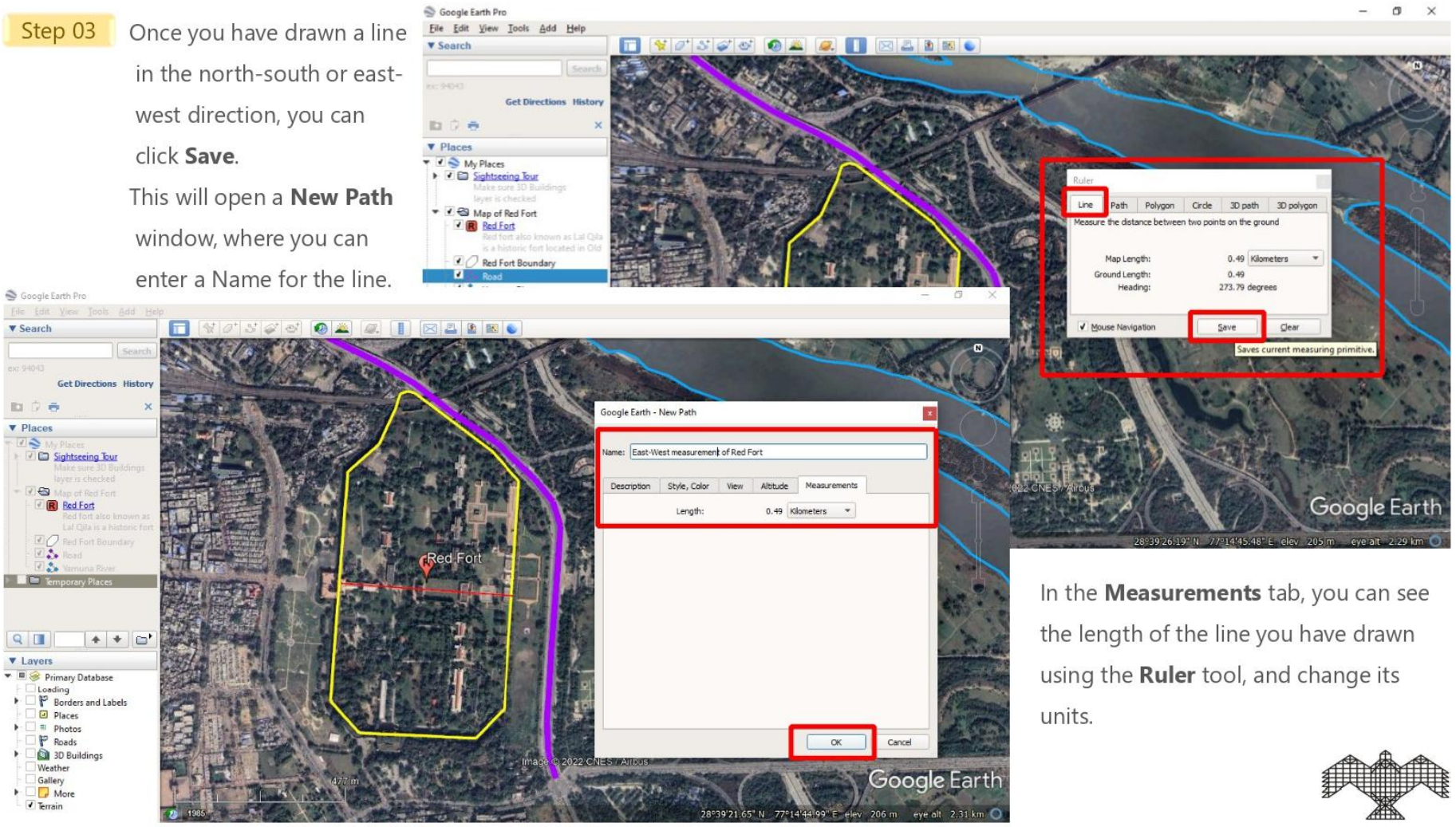
In the **Map Length** tab, the drop-down menu in units, you can select the units of measurement (like metres, kilometres, etc)



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.

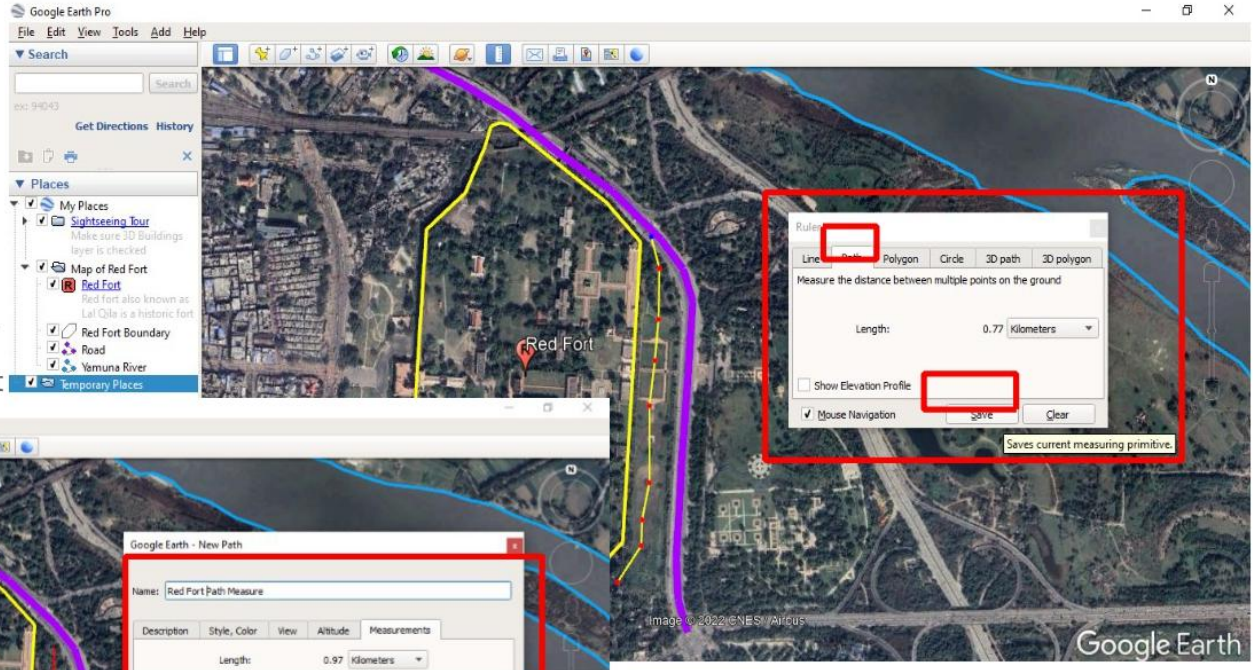


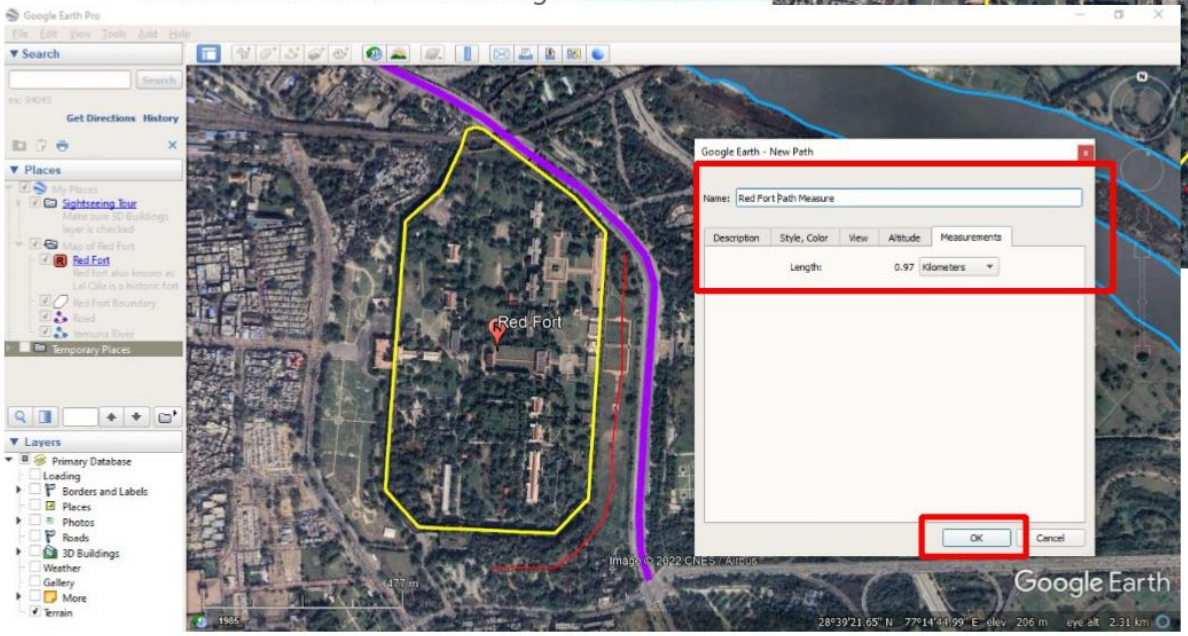
In the **Measurements** tab, you can see the length of the line you have drawn using the **Ruler** tool, and change its units.

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

Step 04

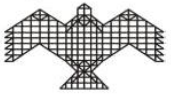
In the **Ruler** window, select the **Path** tab and on the screen mark points of a path you would like to measure (for example, along the Red Fort boundary). The **Path** option allows you to draw a line in haphazard pattern or along any direction that need not be straight





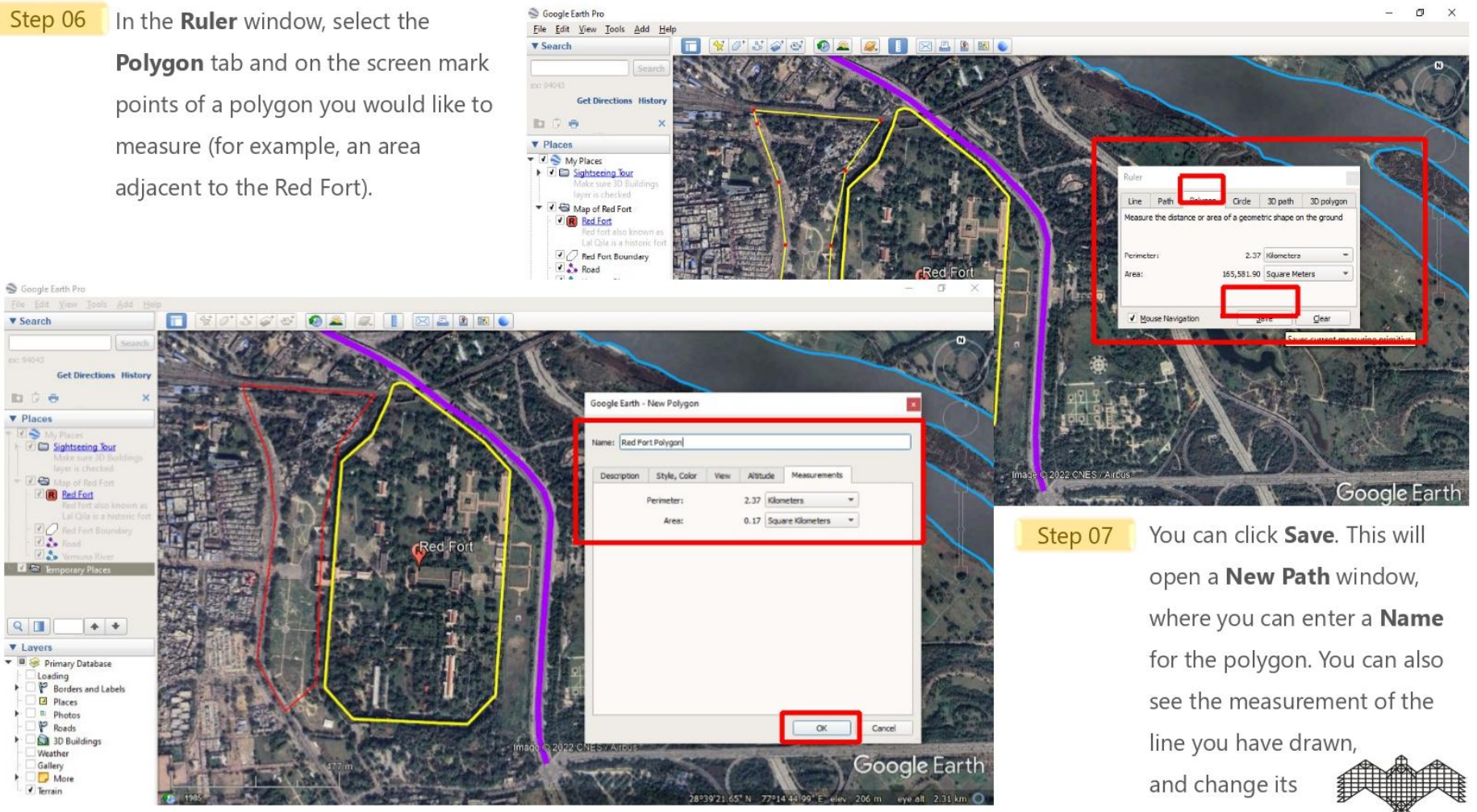
Step 05

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.



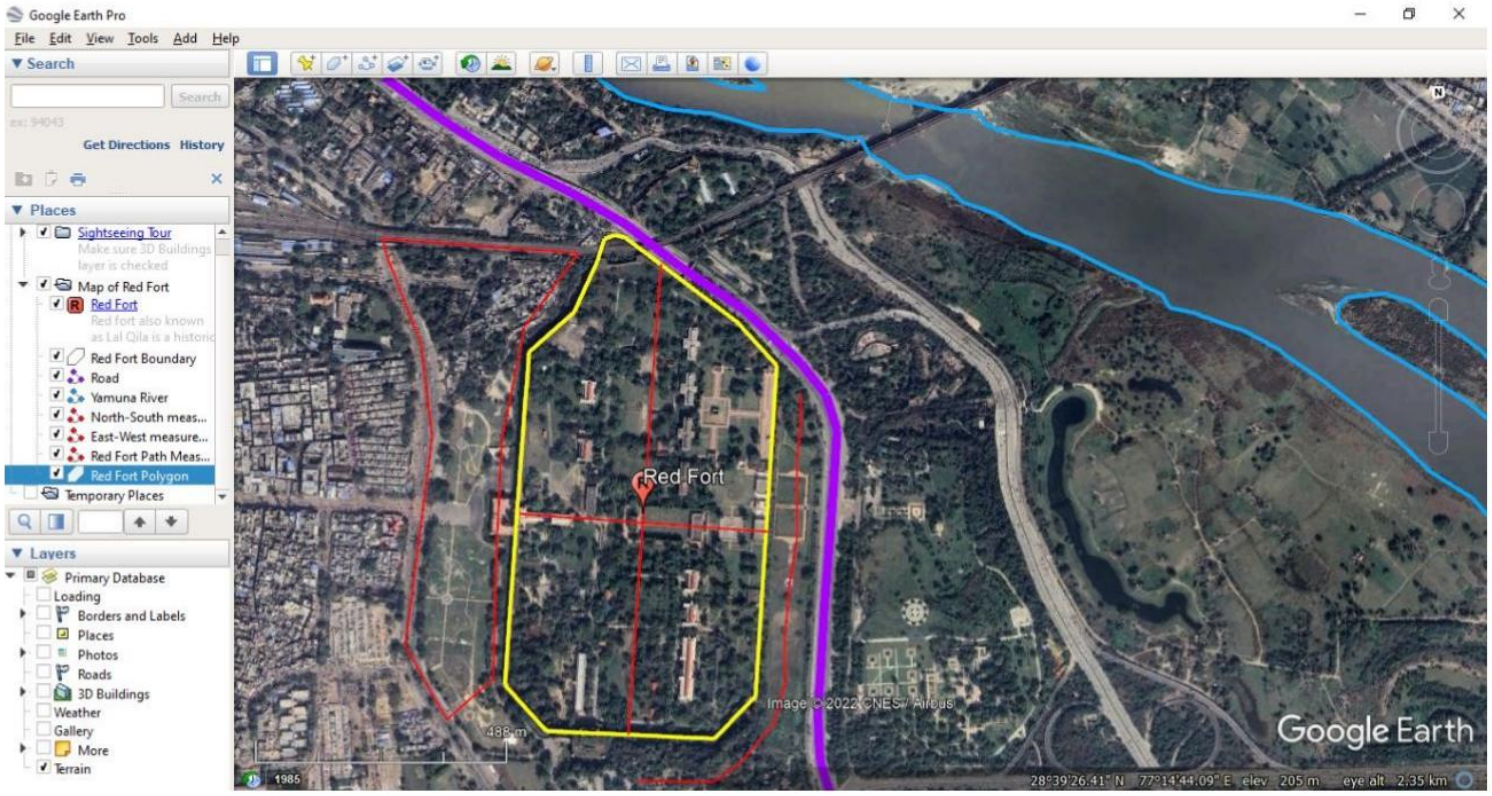
Lesson 2: Measuring locations, distances, and area using digital maps

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.

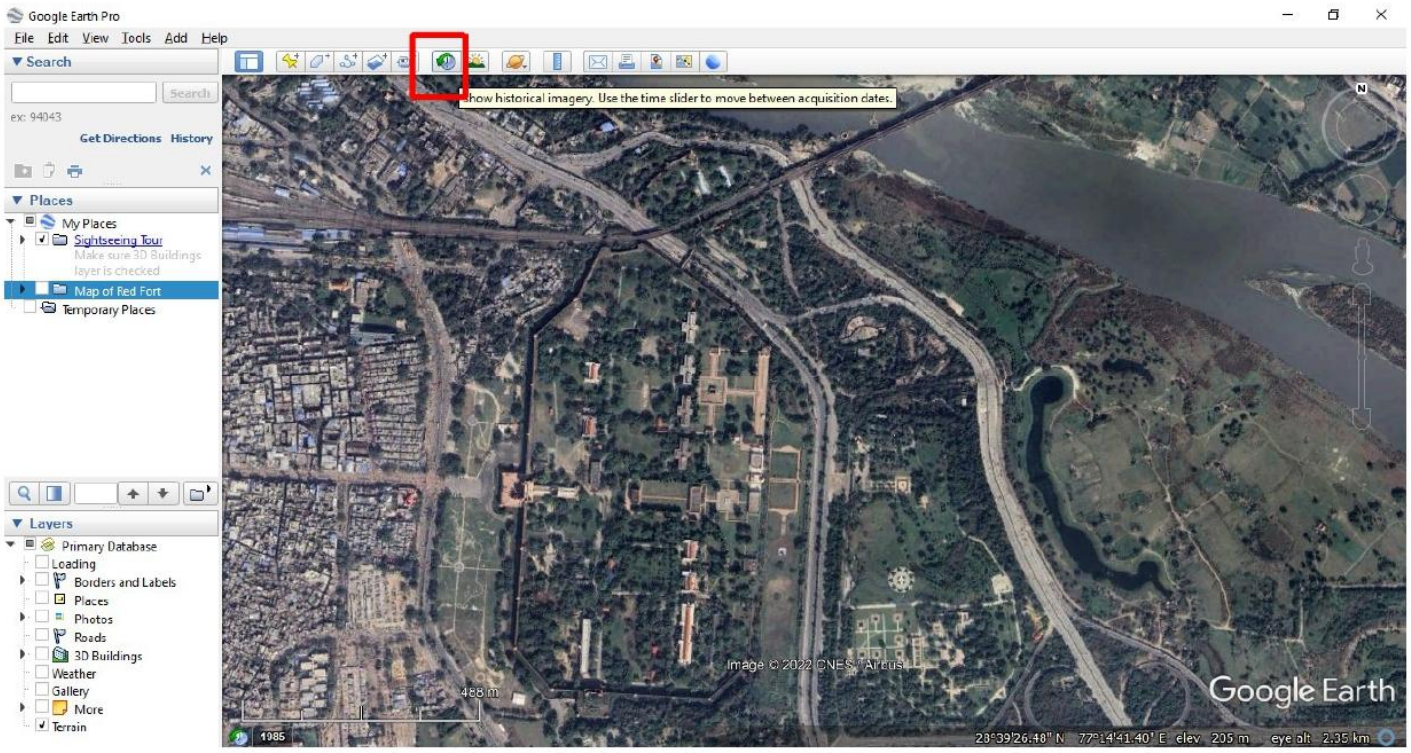
- You can then measure the path you take to school either by walk, drive, or the bus.
- Measure the distance between your school and the nearest bus stop.

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.

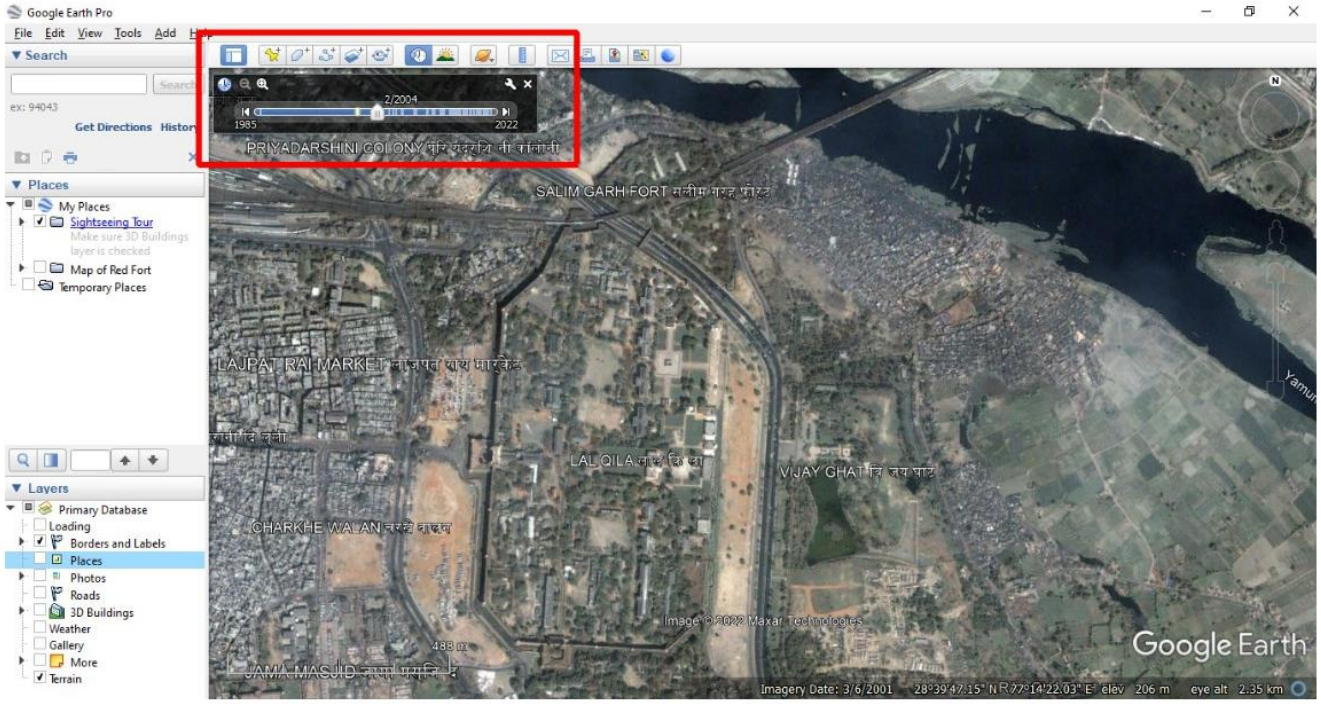
Lesson 1: Understanding changes by examining maps of different dates/ seasons/ years, and observing the landuse/ landcover changes



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.

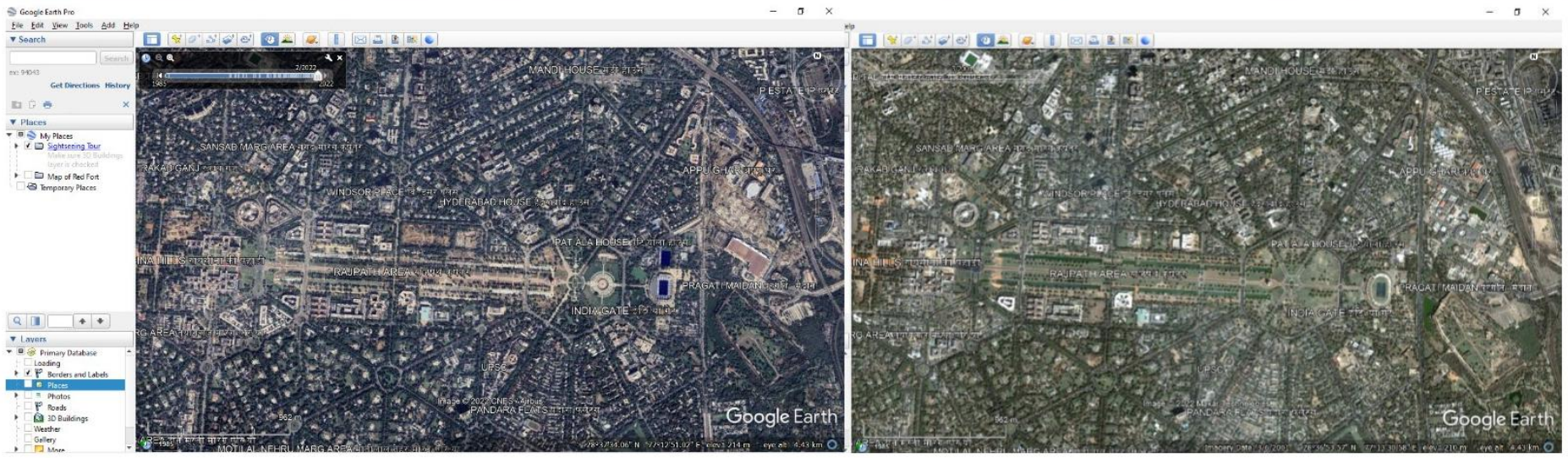
Lesson 1: Understanding changes by examining maps of different dates/ seasons/ years, and observing the landuse/ landcover changes

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

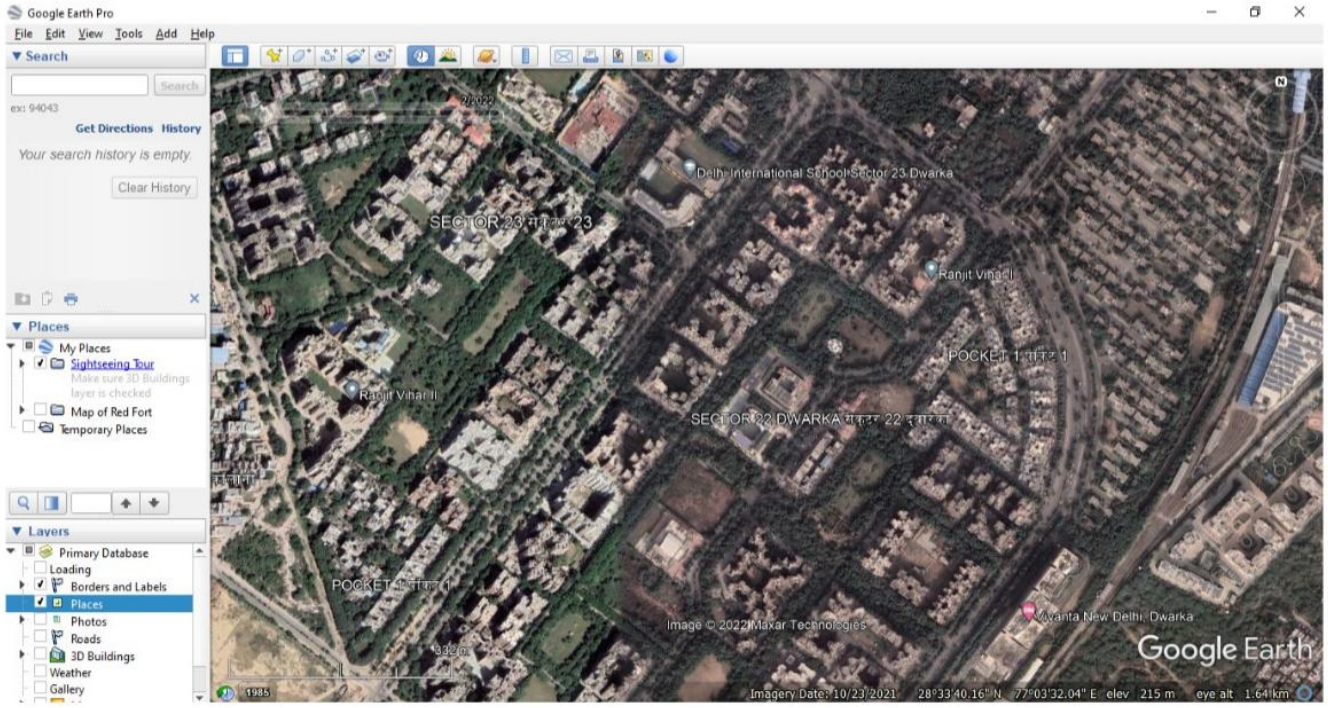


An example of historical imagery of the **Rajpath** in Delhi show the changes that have occurred in landcover in the recent times. Observe the changes in open spaces that has taken place recently.

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

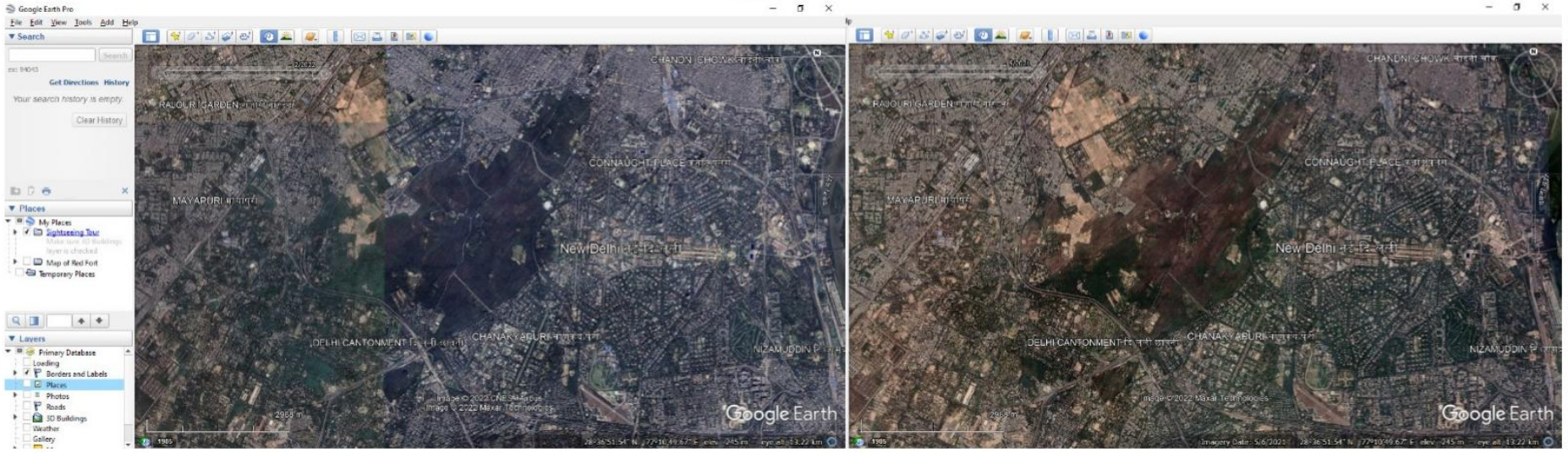


Consider the example of your school neighbourhood (for instance, School of Excellence, Dwaraka Sec-22, New Delhi). With the help of **historical imagery** option see the changes that have taken place in the past few years.

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

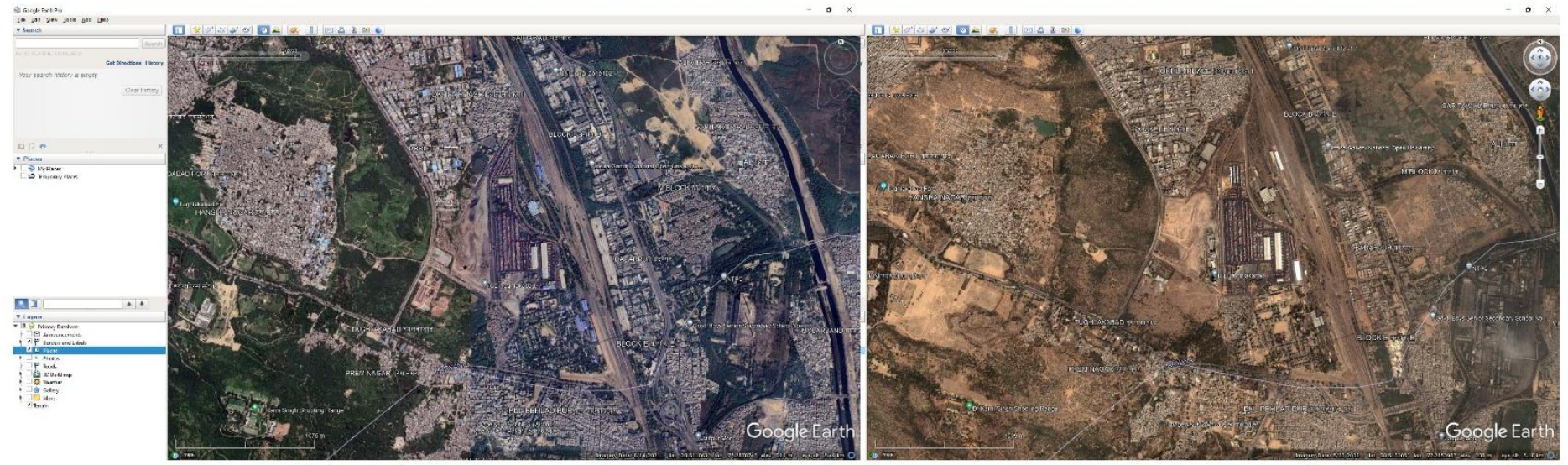
- What changes do you observe in the landuse/ landcover of the area since 2001.
- When (what date) can you start to see major changes taking place in this area?
- What do you think are the reasons for the changes that have occurred in this area?

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

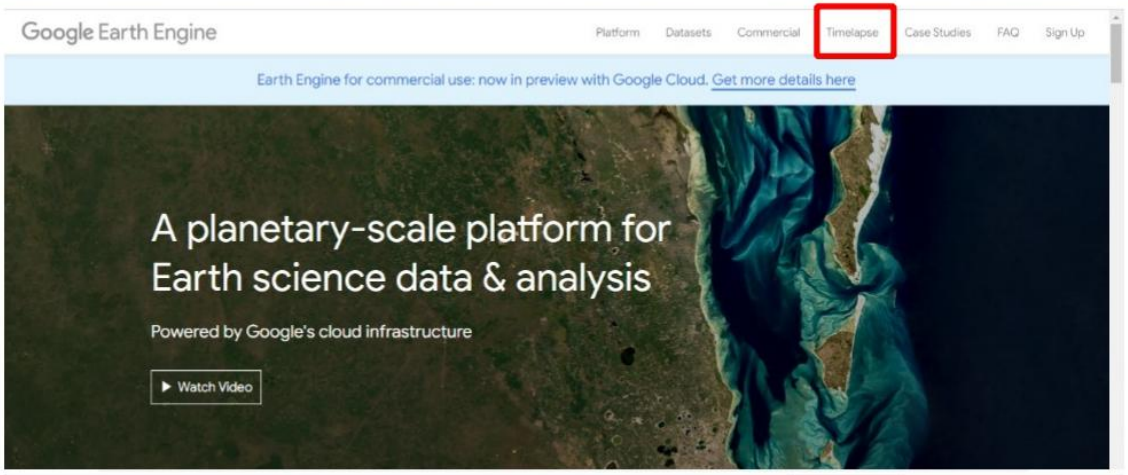


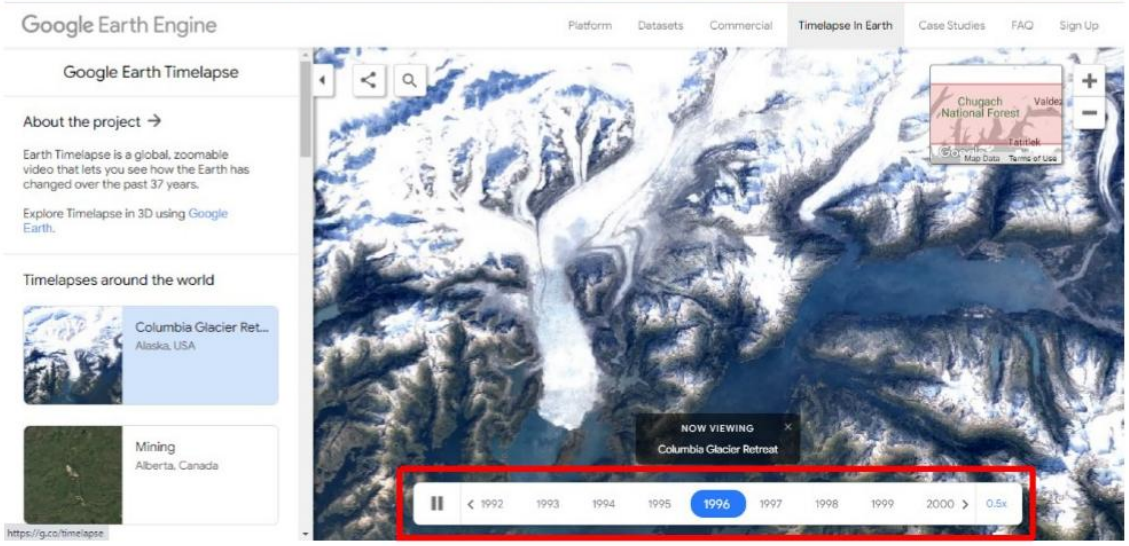
This is another example of a Garbage dump in Tughlakabad. Use **historical imagery** option to see the changes that have taken place in the past few years. Observe the change in open/green spaces over time and see the seasonal changes that have taken place

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.



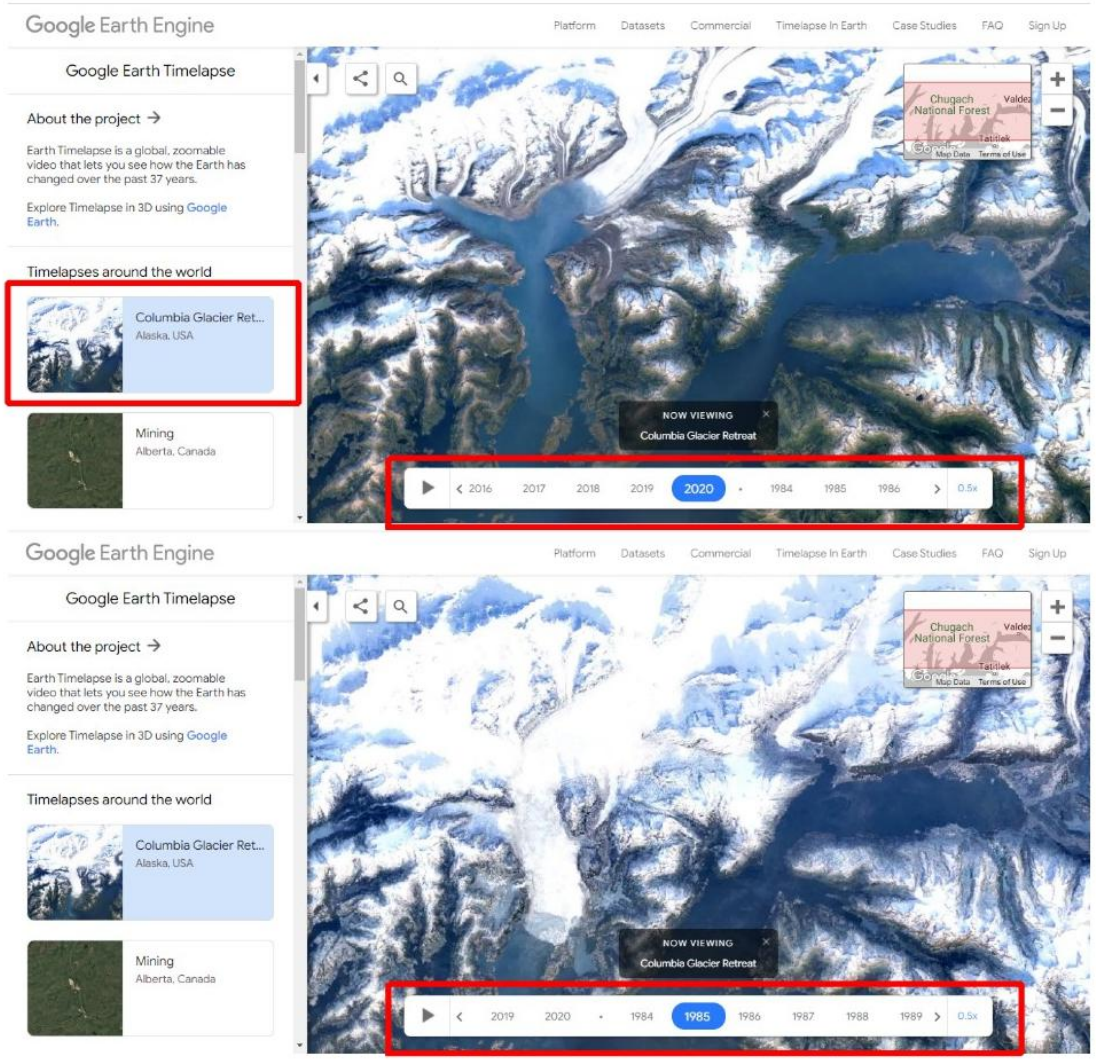


You can observe some the natural and man-made changes that have taken place over time, on satellite imagery with the help of an online platform called **Google Earth Engine**. Explore the site but for our lesson, here's a link to access the website- https://earthengine.google.com/

Step 01

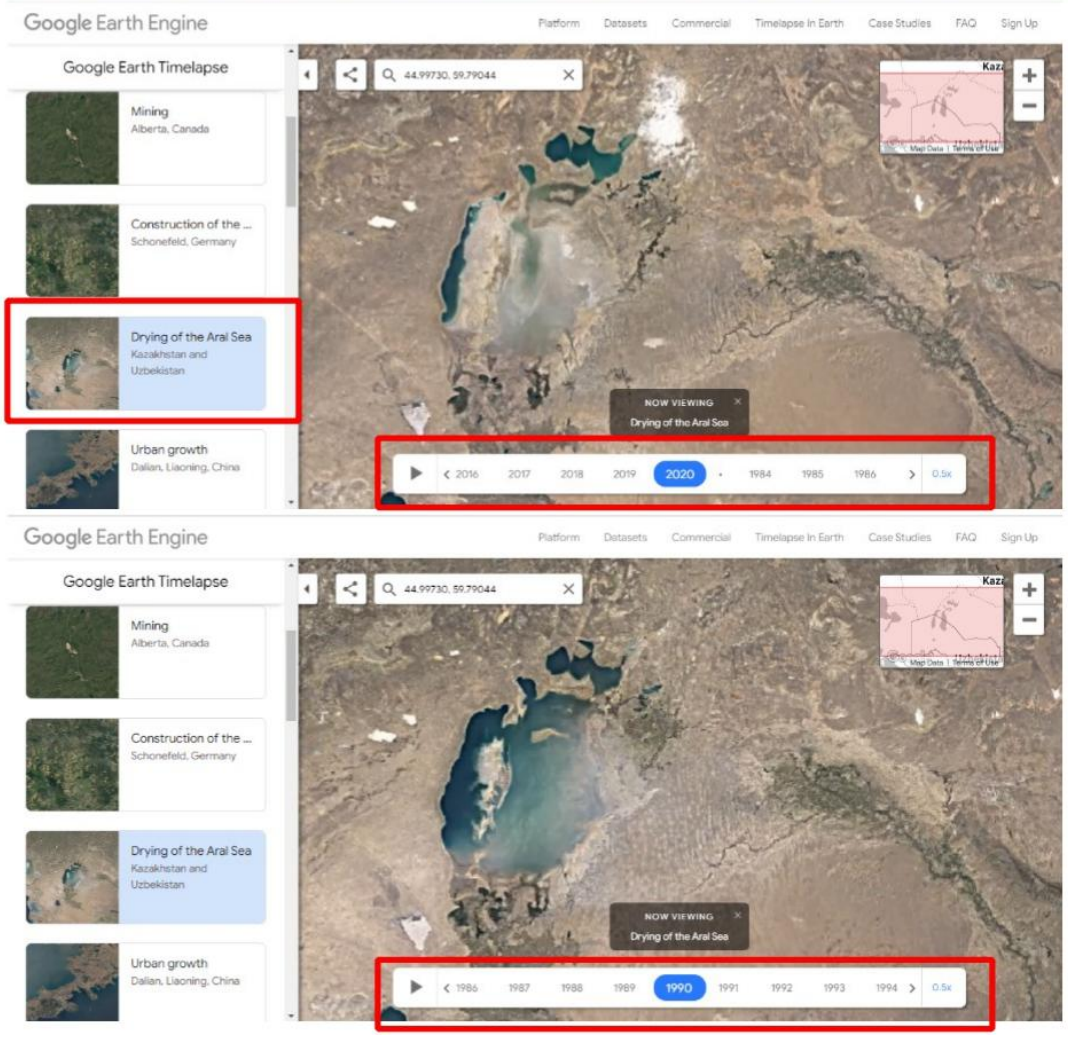
The link above takes you to the **Google Earth Engine** homepage. Click-on the **Timelapse** tab on the top right corner of the page. This takes you to the **Google Earth Timelapse** page that displays timelapse animation of different geographic regions from the year 1985 through 2020. The timelapse 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.



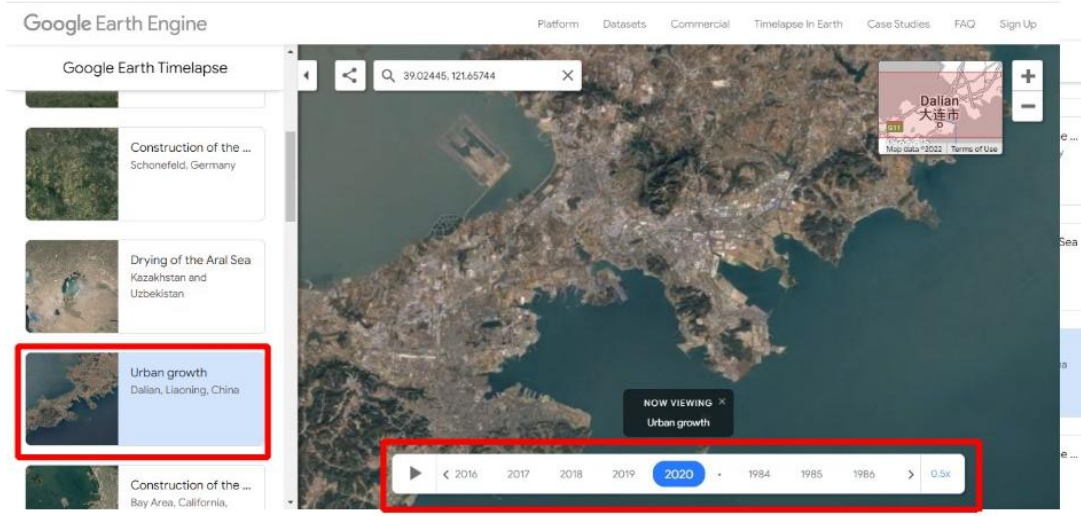
This page allows you to view a few examples of **Timelapses around the world**. The images shown here is an example of the Columbia Glacier Retreat. The first image is of the Glacier in the year **2020** and the image below is of the Glacier in the year **1985.** Observe the melting of glaciers that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

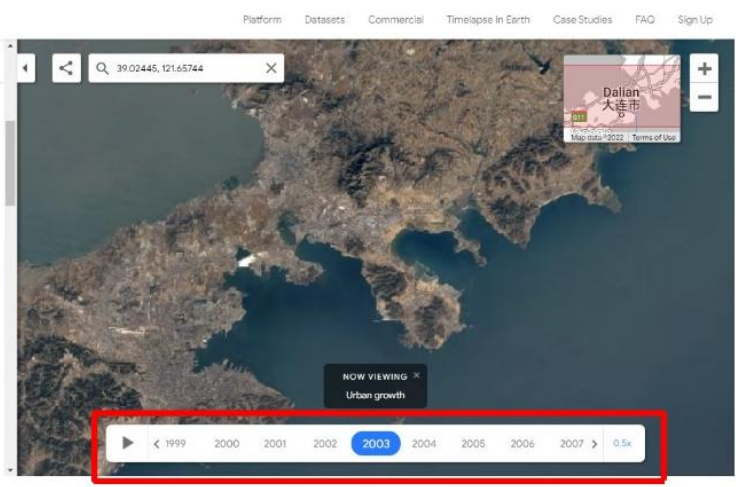
Lesson 2: Observing other natural & man-made changes that have taken place in different parts of the globe.

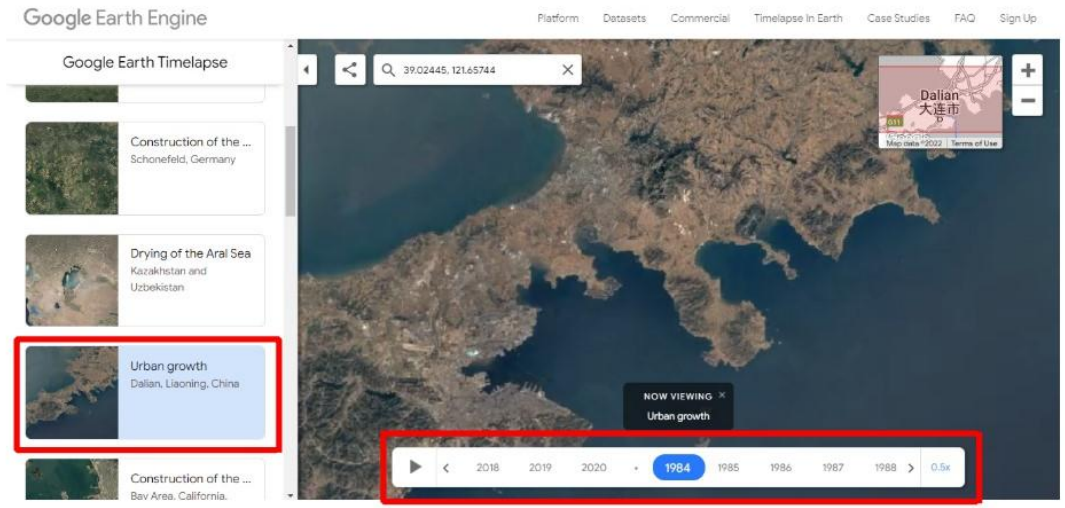


Another interesting example is the Drying of Aral Sea. Observe the change in the extent of the sea that has occurred over the past few years.

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

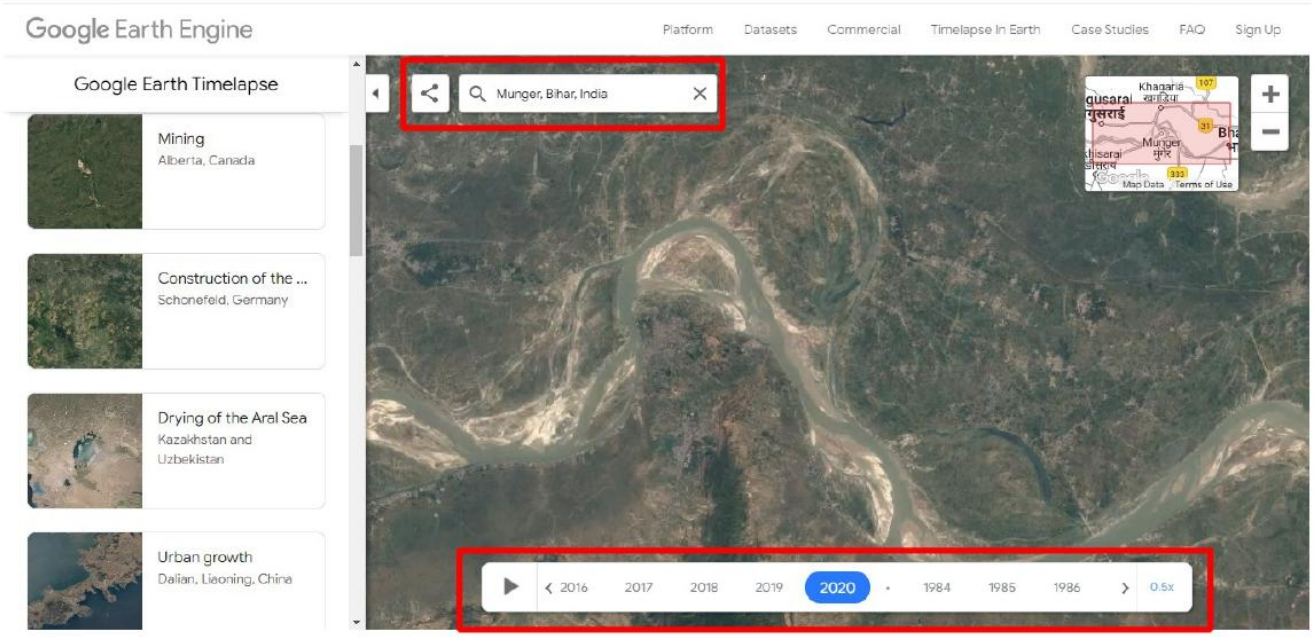






An example of Urban Growth of Dalian, Liaoning, China. The images here show urban growth at various stages from **2020** to **1984**. You can observe that from **2003** the region started experiencing massive urban growth including land reclamation.

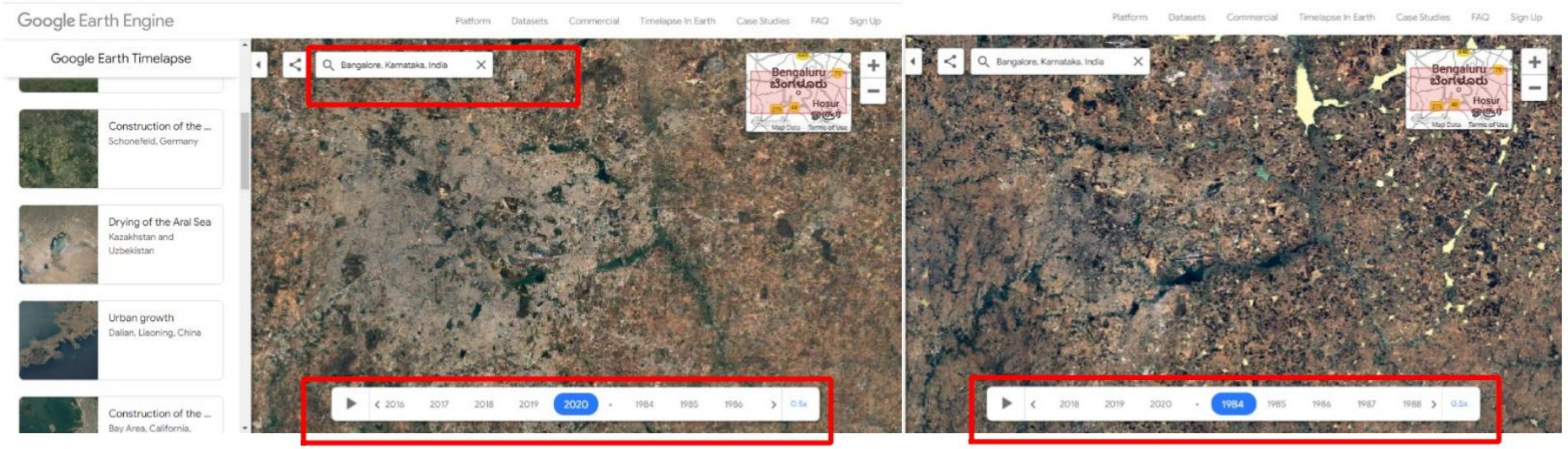
Lesson 2: Observing other natural & man-made changes that have taken place in different parts of the globe.



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

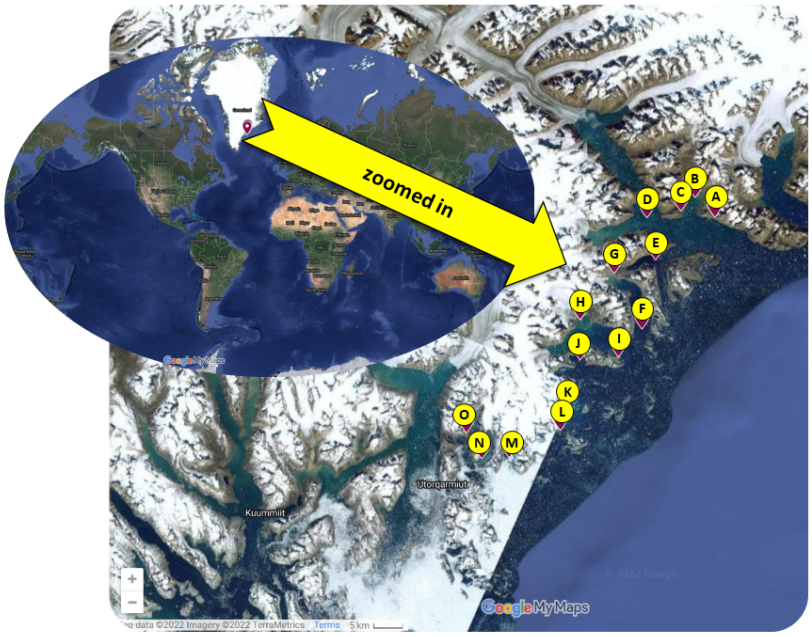
The Tunumiit people live in Greenland. Mapping is part of their way of life reflecting their intimate familiarity with the land and it's nature.

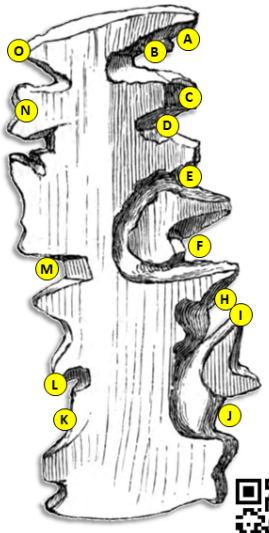
The Tunumiit people are seafarers. A Tunumiit person called Kunit gave a small wooden artefact to a Danish explorer called Holm. This was a Tunumiit map with rich information about the coastlines that they frequently sailed around. It was a map carved on driftwood showing their imagery of the land. This 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

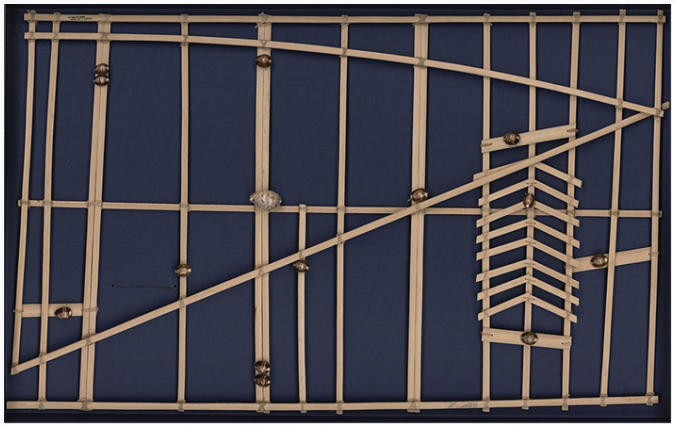
The Pacific Ocean is dotted with many island groups that cannot be seen on a small-scale map such as a globe or a world map. The Marshall Islands is one such group of islands.

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

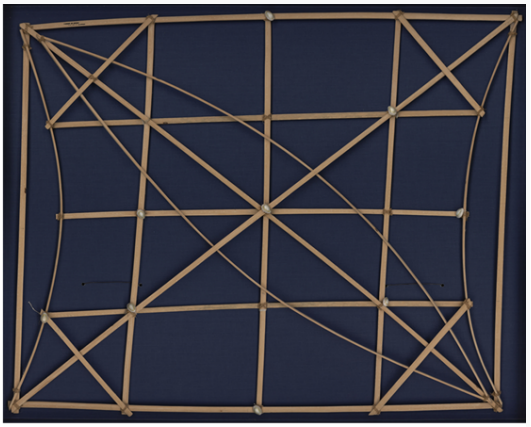
  https://tinyurl.com/y2uyku56, or use the QR code.

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?

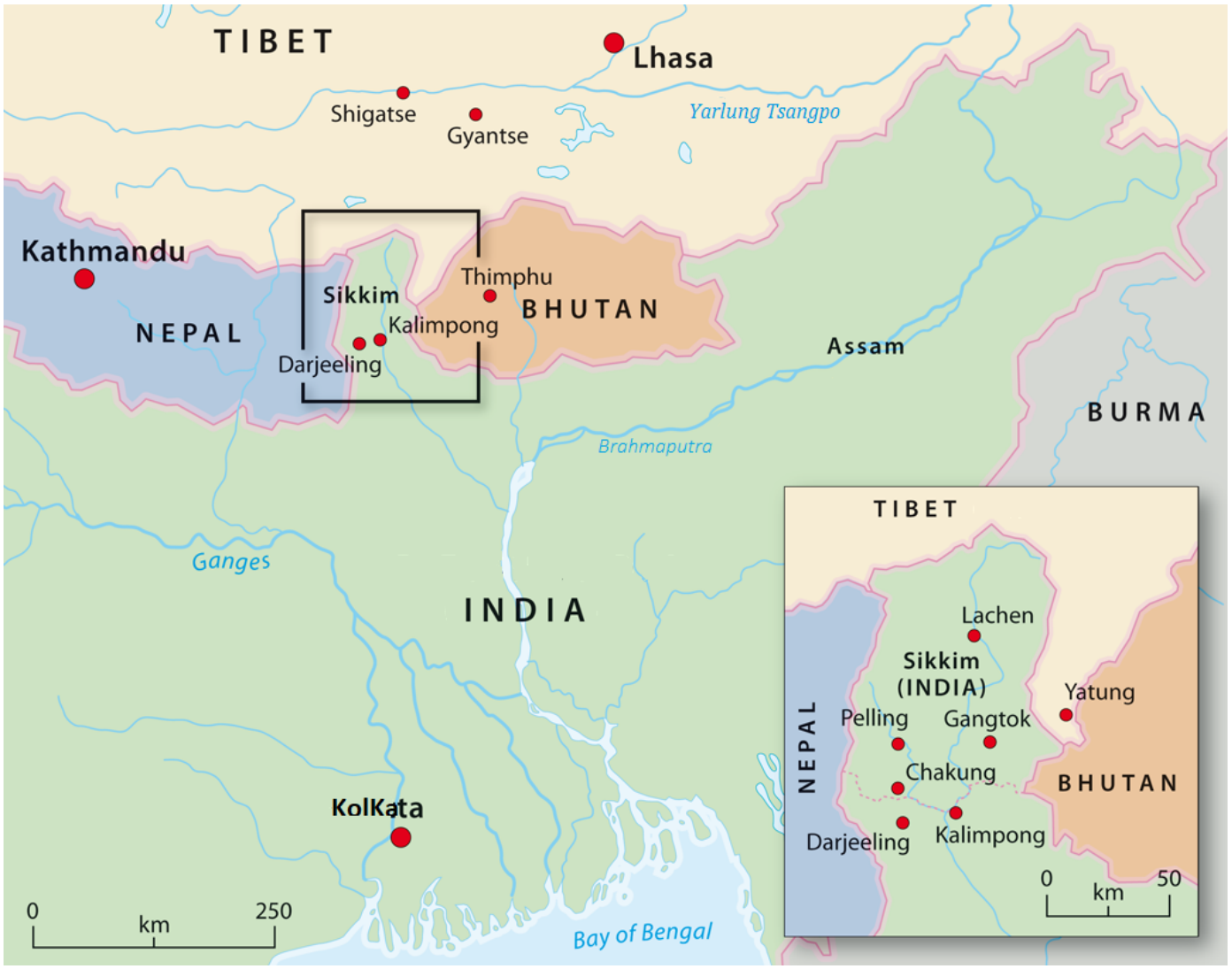
- Why was mapping the colony important for the coloniser? Tick the ones you think are correct:

- 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

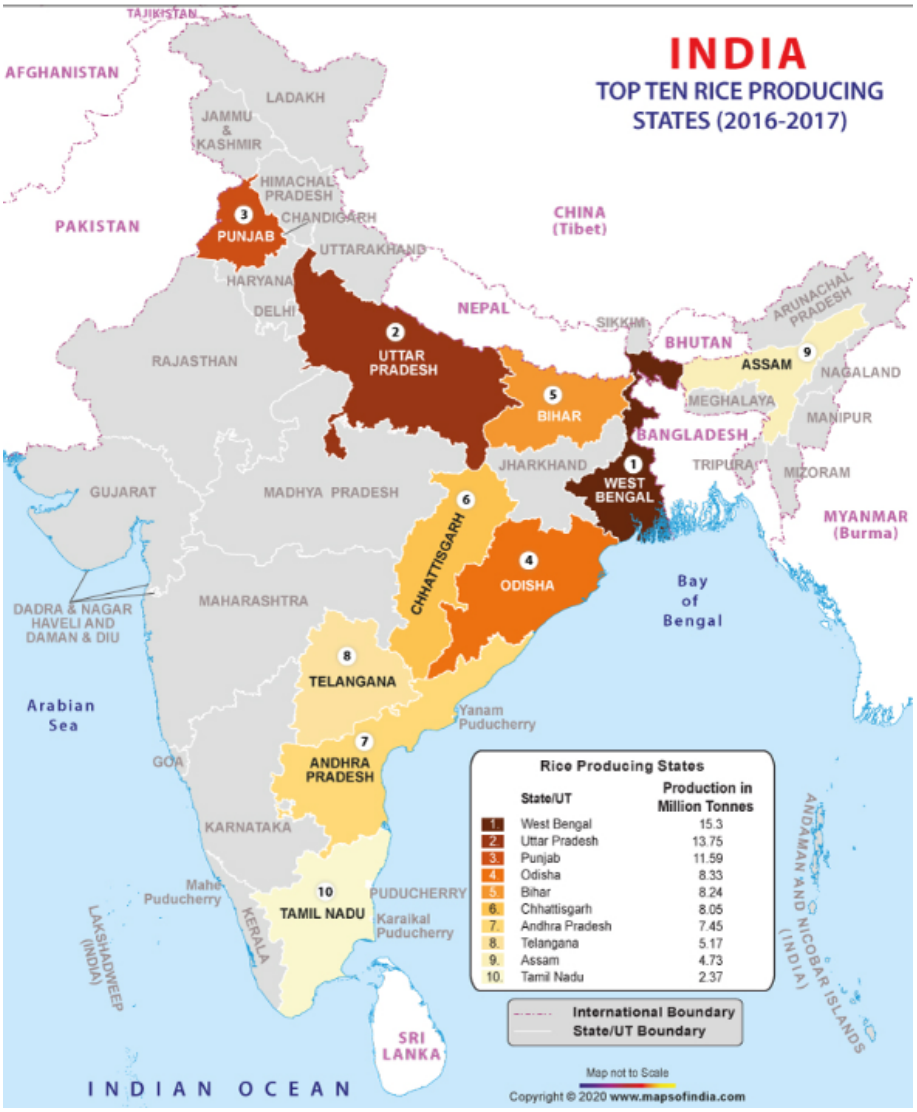
Here are three interesting maps of food- one of sweets, another of biryani, and the third one of street foods in India. Of course, these show only some varieties where the map makers have made interesting representations. Look carefully at the details provided by the maps.


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

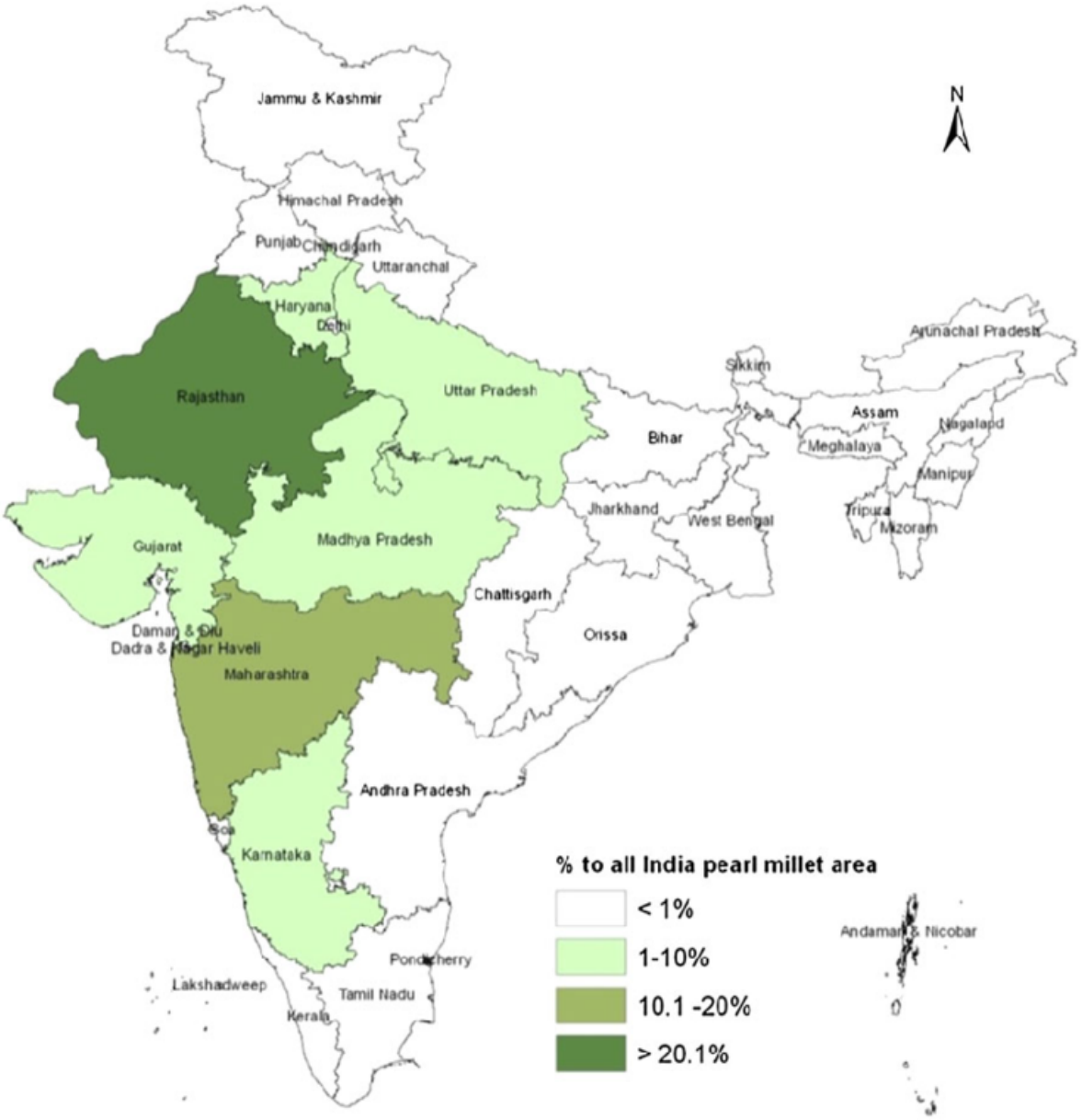

the better india
Kalari Kulcha
Chole Bhature
Sidu
Bun Tikki
Dung Po
Phagshapa
Dahi Samosa
Bedhai
Khar
Galho
Mawa Kachori
Litti Chokha
Kelli chana
Jadoh
Poha Jalebi
Dhuska
Barra
Jalebi Fafda
Bai
Kathi Rolls
Muya Awandru
Cheela
Dahibara Aloo Dum
Vada Pav
Ros Omelette
Mirapakaya Bajji
'Variety' Dosa
Paddu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

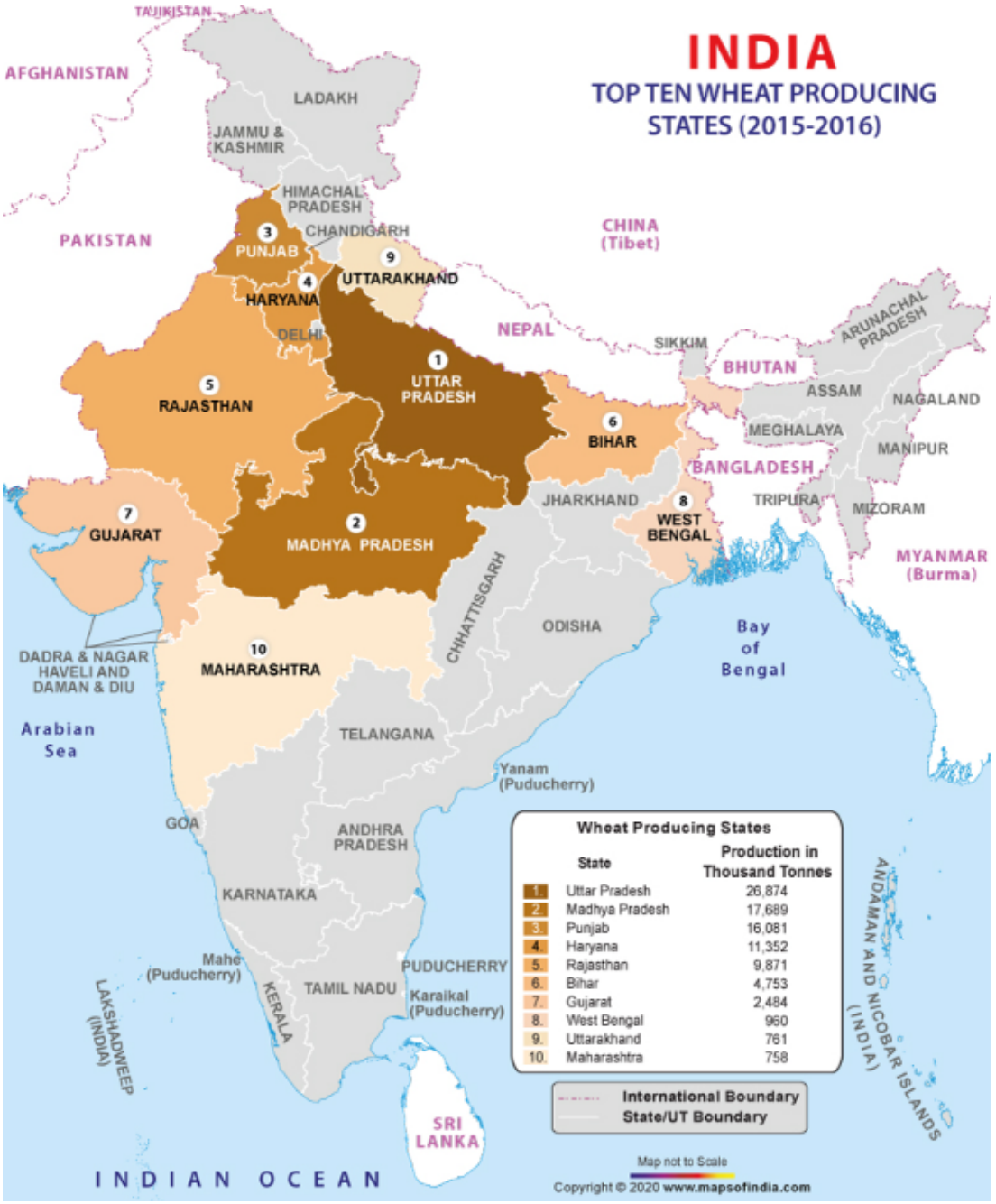
Maps of staple cereals

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.

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.

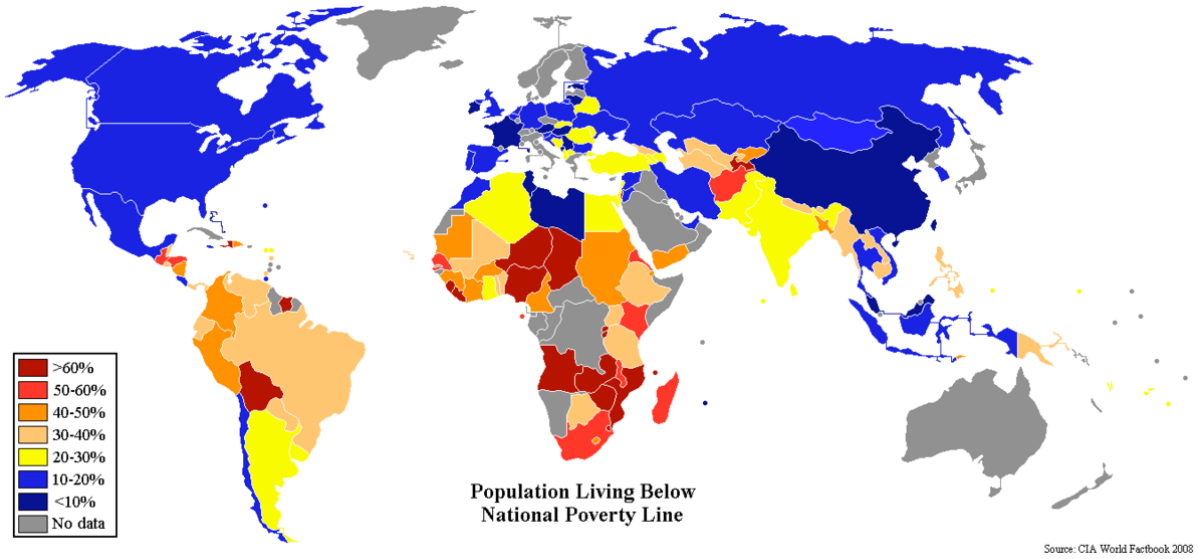
Food security

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:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

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)

2.1 Geographic Information System (GIS): An Introduction

We explore our world, every day, through newspapers, the Internet, books, magazines and on TV. We also explore our surroundings by various means of transportation or merely on foot. What is the shortest path to my school? Where is the closest neighborhood store? Where does our water come from? In what ways are the actions of people around us connected to the lives of others around the planet? All these questions have a common answer – geographical knowledge. Geography is much more than just a map. It is the study of our world and all that exists in it - people, land, air, water, plants and animals - and our relationship with them over space and time.

Maps are effective tools for learning geography and when they are combined with technology, they can become even more powerful as a 'Geographic Information System' or GIS. The combination of maps and data can produce digital maps that engage us with 'science of where'. The interactive features in digital maps can help us understand how different phenomena have changed over time or to find solutions to real-world problems.

GIS by its very nature is a multidisciplinary tool. Therefore, students and teachers can apply it from different perspectives to understand the world around us. History teachers, for instance, may be interested in observing a region change over time. Geography teachers may be interested in simulating the landscape of a region in 3D and creating interactive maps. Science teachers can enhance local projects with IoT (Internet of Things). Language teachers can explore the richness of communication with multimedia GIS. All classes become vocational in nature when students develop skills sought by the adult world. Students can engage with this important career and technical field irrespective of their background in humanities, science, or commerce.

This World of Work module on GIS envisages to impart theoretical as well as practical knowledge on GIS to the students.

Sessions in this module consist of:

- Concepts
- Exemplar resources + examples with discussion
- Exercises & Assignments

Learning Outcomes of the module are:

- Students will learn what digital maps are and how they are made.
- Students will understand the basic concepts of GIS.
- Students will learn GIS techniques and create maps.
- Students will understand the relevance of everyday data that can be used as input in GIS.
- Students will learn to visualize quantitative and qualitative data using freely available GIS software.
- Students will understand the GIS concepts that are applied to facilities, management, vehicle routing, safety and preparedness, and much more.
- Students will learn to use ArcGIS Online, a free to use web-based GIS program.
- Students will learn to create a basic web-map by importing data from MS Excel and Google Earth Pro as well as digitizing real world features with the help of tools in ArcGIS Online.
- Students will learn to make a Story Map on ArcGIS Online platform.
- Students will get an overview of application of geo-spatial technology in different fields and shall be made aware of various career options in this domain.

Software Requirement

This module partly is hands-on in nature. Table 1 lists the software packages that will be used during the module.
Table 1: Software requirements of the module

Software Package	Description	Role in the Module
MS Excel/Any other spreadsheet software	Spreadsheet software	Creation of CSV file for ArcGIS Online
Google Earth Pro	Desktop tool for 3D representation of the Earth	Creation of polygon and line KML features
ArcGIS Online	Web based tool for creating web-maps and Story Maps	Creation of web map and story map
Convertkml.com	Online tool to convert KML files into Shapefiles	Conversion of polygon and line KML files into shapefiles

Learning Plan

Week 1: Introduction to GIS
Week 2: Practical GIS with ArcGIS Online
Week 3: How to be a Storyteller (Project Week)
Week 4: Understanding the application of GIS in different fields

Module Assessment:

We will be assessing students on the following:
- Knowledge, understanding and application of the concepts
- Creativity in telling and retelling stories
- Presentation of their stories in multimedia forms

Formative (Unit) Assessment of the module will be through the module project. The module project will test the following from the broader set of Assessment Objectives for the World of Work course:
Summative Assessment of the module will be through a written exam.

Formative Assessment		Summative Assessment	
Assessment Objectives	**Competencies**	**Assessment Objective**	**Competencies**
1. Critical Thinking & Creativity	1.1 Use creativity and original thinking in writing stories (Creativity) 1.2 Adapt the concepts learnt in new and diverse contexts (Adaptive)	**1. Critical Thinking & Creativity**	1.1 Identify and use perspectives in understanding situations and issues (Critical Thinking) 1.2 Use creativity and original thinking in generating solutions (Creativity) 1.3 Adapt the concepts learnt in new and diverse contexts (Adaptive) 1.4 Interpret and comprehend self in relation to skills and careers (Awareness and Reflection)
2. Presentation & Communication	2.1 Demonstrate clear and confident presentation of thoughts and ideas (Coherence) 2.2 Ability to use multimedia and multimodal forms of communication effectively (Versatility) 2.3 Ability to iterate and incorporate feedback to improve/refine the work (Iteration)	**2. Knowledge & Understanding**	2.1 Demonstrate command of the specialized vocabulary of specific skills and workplaces (Knowledge) 2.2 Summarise concepts about careers using examples (Understanding)

2.2 Lesson Plan

Week 1: Introduction to GIS

Important Concepts

- Exploring Maps
- Understanding different types of Maps
- Basic Concepts of GIS

Learning Standards

- Students will understand basic concepts of GIS
- Students will learn what are digital maps and how are they made
- Students will be enabled to understand the elements of a map.

Inquiry Questions

1. What is the importance of GIS in making informed decisions
2. How to create GIS Web Maps
3. What are the elements of Maps
4. What are the components of GIS
5. What are the basic Concepts of GIS

Lesson Plan: Week 1 Day 1

Classroom Inquiry Process	Resources
Lesson Aims: 1. Describe the importance of GIS in making maps. 2. Enabling students to practically understand map elements such as scale of map **Activity 1 : Introduction to the module** (20 minutes) Start the module by recapping from the previous Mapping module and start interaction by asking the students the following questions: · What are some things we know about mapping from the mapping module? · Have you heard about GIS. · What does GIS stand for? · What are the main components of GIS? · How do I get from one place to another? · Who owns this land? · Where else do they own this land? · What is the value of GIS? · Is GIS a map? · What is a GIS Map? · What are digital maps? · Do you know Google Map uses GIS. Take their responses and collate them on the board. The teacher will build on the GIS module and move towards understanding GIS Map. Here Use PPT to explain. **Activity 2**: (20 Minutes) After an intellect brainstorm show students couple of YouTube videos and understand about GIS and then discuss · 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	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

You can use these questions during the videos to enhance their learning while watching the videos:

1. In your opinion what is the most important aspect of data that GIS is able to address as compared to any other data analysis tool/system?

Answer: Visual/Spatial aspect of data, i.e. how is data/information/phenomena spread across an area/region.

2. Which one of the three words in GIS i.e. Geographic, Information or System is the most important component of this science?

Answer: Geographic, it represents geography or space and if we exclude it we cannot have a GIS. Thus Geography is that component that gives GIS a unique space amongst all information systems.

3. What do you think are the main components of a GIS?

Answer: Spatial/geographic data i.e. data about a location, Attribute data: Non-spatial data which gives us further insights into a location, Hardware, Software and People who use GIS for decision making.

4. Can you think of some 'Geographic Layers' from your surroundings?

Answer: Some examples, School building where this class is taking place, trees and vegetation around the building, other built up areas, natural areas like parks etc.

5. Can you name some 'Attributes' for each of these 'Geographic Layers'?

Answer: Some examples, Name of the school, No. of Floors, Year of Establishment, Color of the building, Construction material etc., Name of the tree, height etc.

WK1-Day 1 - Exploring GIS Maps presentation

Handout Day 1

Activity 3: Understanding the Elements of Maps (20 minutes) Use PPT to explain.

a) Identify the Elements of a Map

b) Maps are 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.

Activity 4 - Let us look at different scaled maps from Largest Scale to Smallest Scale (20 Minutes)

- 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
	1:50000	500 m
	1:100000	1 km
	1:250000	2.5 km

Smallest	1:1 million	10 km
	1:2.5 million	25 km
	1.5 million	50 km
	1.10 million	100 km

Use PPT to show the different scale Maps for references.

Lesson Plan: Week 1 Day 2
Understanding Types of GIS Maps

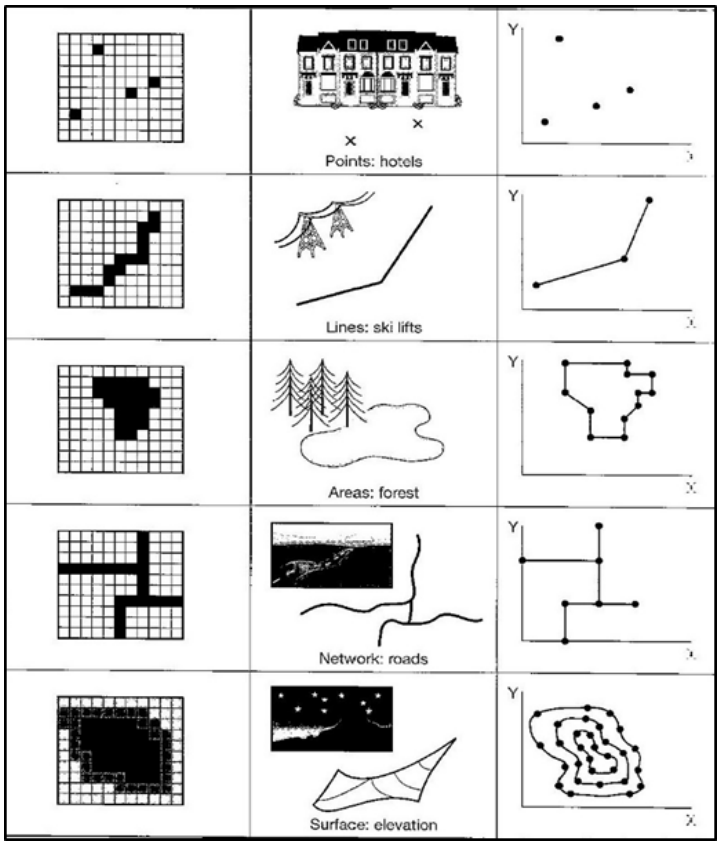
Classroom Inquiry Process	Resources
Lesson Aims: 1. Explore different Types of GIS maps. 2. Understanding the patterns & Relationships of GIS Maps **Activity 1: Understanding Type of Map** (30 minutes) Session will be approached by exploring and understanding different types of GIS based Maps available, understanding its use and then Students will focus on the thematic Maps understanding the relationships of geographic data on the map through different types of representation. · What is a Web Map? · What is a Digital Map? Refer PPT for explaining different types of Web Map and Digital Maps - Topographic Map, Thematic Map, Cadastral Map, Base Maps **Activity 2: Understanding patterns and relationships through GIS Maps** (25 minutes) GIS allows us to see patterns and relationships in geographic data. Different thematic maps can be used to understand what each map depicts what GIS can do. Such as Location Map, Category Maps, Map by quantities (Chloropeth Maps) and Cluster Maps. Refer PPT for the explanation of the thematic maps. **Activity 3: Introduction to Bharat Maps and GIS** (25 Minutes) **(Time management - this activity can be done briefly in case of paucity of time)** This will be a live demo by the teacher to the students of the 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	**WK1-Day 2 - Understanding Types of Maps presentation** **Handout Day 2** · Website: **https://bharatmaps.gov.in**

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. This demonstration of **BharatMaps website** will be a good learning for students of how digital maps work.	

Lesson Plan: Week 1 Day 3

Basic Concepts of GIS

Classroom Inquiry Process	Resources
Lesson Aims: 1. Familiarization with basic GIS concepts 2. Components of GIS Systems 3. What is Latitude and Longitude **Activity 1- Introduction to Basic Concepts of GIS** (25Minutes) The Session begins with understanding some Basic Concepts and components of GIS and also learning the latitude and Longitude of any location and followed by the activities related to that Refer PPT for the introduction of the GIS concepts. **Activity 2. Understanding the real-world features with respect to GIS entities.** When we say GIS Entities it means every feature on the ground is represented by a Ø Point Ø Line Ø Polygon For example Ø Electric Pole or a location of a school can be a point on the map Ø School Building area boundary can be represented as a Polygon on the map Ø Roads and Railways can be represented as line on the map **Exercise A** : In the following table let us see how a point, line and polygon are represented in the vector and raster form.	· Refer Presentation **WK1-Day 3 – Basic Concepts of GIS**

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

Exercise B - Students will be given two Maps to identify the features with respect to the GIS Entities**.**

Refer PPT to show these two Maps or you may give a print out to students for the exercise.

This Activity can be done individually or in group of 2 students each or teacher can decide depending on the class size.

Activity 3: Identifying Coordinates of 25 Monuments of Delhi.

(Time management: This activity can be completed at home by the students if they do not finish in class)

The students will be expected to use MS Excel or any spreadsheet software to create a sheet displaying the name of the Monument, its Longitude and its Latitude. They can use Google Maps/Google Earth to get the coordinates. They will save the file in CSV format.

Instruction to Identify LAT /LONG from GOOGLE MAPS

Delhi_Monuments_Coord

Delhi_Monuments_WithoutCoord

Website: https://maps.google.com

Get the coordinates of a place

- On your computer, open Google Maps.
- Right-click the place or area on the map.
- This will open a pop-up window. You can find your latitude and longitude in decimal format at the top.
- To copy the coordinates automatically, left click on the latitude and longitude.

Format your coordinates

- To format your coordinates so they work in Google Maps, use decimal degrees in the following format:

Correct: 41.40338, 2.17403

Incorrect: 41,40338, 2,17403

For Detailed Please refer the PPT and **GIS_Week1_Handbook_D3A1** document for this session.

Handout Day 3

Week 2 : Practical GIS With ARCGIS Online

Important Concepts

- Getting an overview of ArcGIS Online
- Visualizing and symbolizing spatial data using ArcGIS Online
- Adding qualitative information and photographs to a web map in ArcGIS Online

Learning Standards

- Students learn different ways to plot spatial data on a web-based GIS package called ArcGIS Online
- Students learn different ways to symbolize spatial data based on its attributes
- Students learn to add qualitative information to maps

Inquiry Questions

- What is ArcGIS Online and how can it be used to visualize geo-spatial data?
- What different methods can be used to visualize geo-spatial data?
- What kind of inter-operability is achieved between different geo-spatial software?

Lesson Plan Week 2 Day 1
Introduction to ARCGIS Online

Time Management: You can look at individual activities and exercises over all of Week 2 and see which of these can be done after class by the students in case there is a shortage of time. If you are running behind time, make up time in later sessions by assigning completion of work for after class.

Classroom Inquiry Process	**Resources**
Lesson Aims · Created a public account on ArcGIS.com · Familiarization with the interface of ArcGIS Online **Activity 1 Title: Creating a public account on ArcGIS.com** (20 minutes) This module is entirely hand-on in nature, in which the students will learn to plot and visualize geo-spatial data using **ArcGIS Online** – a web-based GIS program. This requires a free public account to be created on **ArcGIS.com**. The teacher will give a quick overview of what will be achieved in this module and then run the students through the registration process, following which they can create their logins to use the software. The teacher will refer to **'GIS_Week2_Handbook_D1A1'** document to complete this activity. The teacher will distribute this document to the students before the start of the activity so that they can follow the step-by-step instructions and complete the activity. ***Note:*** *The teachers will be required to create their respective accounts on ArcGIS.com before the start of Week 2 so that they are able to run the students through the registration process.* **Activity 2 Title: Explore ArcGIS Online Interface and Understand its Basic Tools** (60 minutes) At the start of this activity, the teacher will sign into his/her ArcGIS Online account and give a quick overview of ArcGIS Online's interface and its tools to the students. The teacher will explain to the students the importance of becoming familiar with the software's interface so that they can use it effortlessly later in the module. The teacher will cover all basic tools **(Zoom In, Zoom Out, Basemap Gallery, Measure, Save and Bookmark)**. After the teacher's instructions, the students can do this activity on their own.	GIS_Week2_Handbook _D1A1 

The teacher will refer to **'GIS_Week2_Handbook_D1A2'** document to complete this activity. The teacher will distribute this document to the students before the start of the activity so that they can follow the step-by-step instructions and complete the activity. The teacher will also ensure that the students attempt all **'tasks'** given in the handbook. He/she will also encourage them to not rush through the activity and pause and think about the tools of the software they are learning. Students can also spend time outside the classroom to get practice with the software	GIS_Week2_Handbook _D1A2

Lesson Plan Week 2 Day 2
Hands-on with GIS using ArcGIS Online

Time Management: You can look at individual activities and exercises over all of Week 2 and see which of these can be done after class by the students in case there is a shortage of time. If you are running behind time, make up time in later sessions by assigning completion of work for after class.

Classroom Inquiry Process	**Resources**
Lesson Aims · Learned to visualize and symbolize points, lines and polygons in ArcGIS Online · Learned to import data of two different formats (CSV and shapefiles) into ArcGIS Online · Learned to convert KML files from Google Earth Pro to shapefiles · Explored different techniques of visualizing spatial data · Learned to create a basic web-map · Learned to customize the web-map and make it more appealing for the viewer **Activity 1 Title: Visualizing and Symbolizing Vector Data (Points) in ArcGIS Online** (50 minutes) This is the most important activity of this module since it explores the maximum number of features of ArcGIS Online, as compared to any other activity of this module. The second activity of this day, as well as those of Day 3 merely build upon this. Therefore, it is important for the teacher to not only give an overview of the activity to the students but also run through it before they attempt it themselves. Since this activity has different components – **importing CSV data**, **symbolizing it** and **visualizing it in different ways** students are likely to get overwhelmed a bit. They may also get a little lost in using the software. As an instructor, the teacher may need to give individual attention to students at different stages of the activity. Therefore, it is crucial that the teachers themselves are thorough with the hands-on workbook for this activity. The teacher will refer to **'GIS_Week2_Handbook_D2A1'** document to complete this activity. Hands-on workbooks, however detailed they may be, can explain software only to a certain extent. Ultimately, it is down to a user to use the handbook, understand the given instructions and apply them to features/scenarios which may not be explicitly explained in them. The handbook for this activity is no different. For instance, there are numerous shapes and colors that can be used to symbolize the data. The handbook does not give details of all of these.	GIS_Week2_Handbook_D2A1

Therefore, the teacher will need to encourage students to not only follow the instructions in this case but also explore other shapes and colors once they have understood how symbology works. In this manner, they will get a sound grip on the working of the software.

Activity 2 Title: Visualizing and Symbolizing Vector Data (Lines and Polygons) in ArcGIS Online (30 minutes)

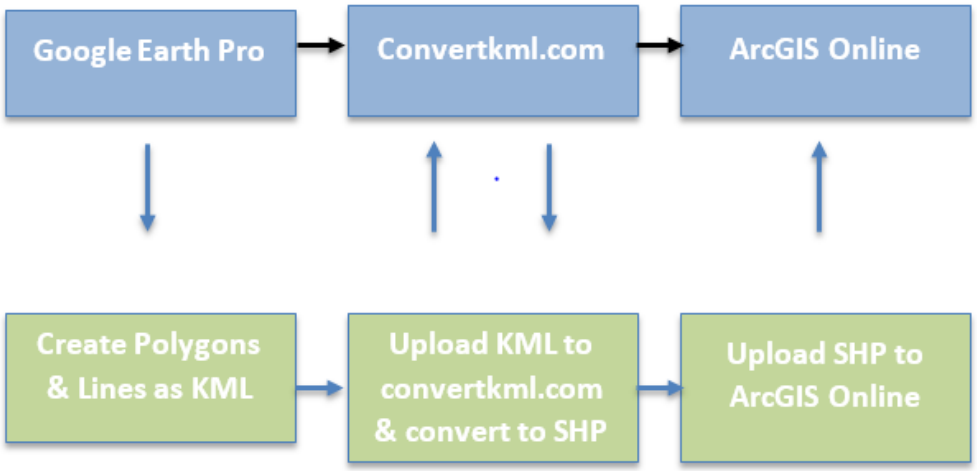
This activity is quite similar to **Activity 1**. Instead of points, it has instructions for adding **lines** and **polygons** to ArcGIS Online. However, since we are not using any desktop GIS package for digitization, we will use **Google Earth Pro** for creating lines and polygons.

The students would have already learned to create these geometries in Google Earth Pro during the Mapping Module. Nevertheless, the handbook for this activity provides instructions to digitize polygons in Google Earth Pro and save them in a KML file.

The students will then need to use an online converter to create shapefiles from the KML files. The converter that will be used for this is convertkml.com.

The converted shape files will then be uploaded on ArcGIS Online.

The workflow for this activity is shown in the figure below.



Refer to **'GIS_Week2_Handbook_D2A2'** document to complete this activity.

GIS_Week2_Handbook_D2A2

Lesson Plan Week 2 Day 3
Adding Qualitative Data in ArcGIS Online

Time Management: You can look at individual activities and exercises over all of Week 2 and see which of these can be done after class by the students in case there is a shortage of time. If you are running behind time, make up time in later sessions by assigning completion of work for after class.

Classroom Inquiry Process	**Resources**
Lesson Aims ● Learned to add qualitative information to the web-map apart from the attributes. ● Learning to add images to features in the web-map **Activity 1 Title: Adding Map Notes to Features** (40 minutes) At times, in addition to the information contained in the attribute table, additional information for a feature needs to be provided. For example, it may be necessary to provide detailed information about a feature. Adding such information may not be possible in the attribute table since it can accommodate only a limited number of characters or even if the details are within limits, the appearance of the attribute table and that of the overall web-map gets compromised. This activity, therefore, explores the use of adding a layer of **Map Notes** in which details of a feature or a link to such details can be added. **Map Notes** in ArcGIS Online come in different templates. The hands-on activity book provides instructions for creating a generic layer of **Map Notes**. You can encourage the students to explore different templates of **Map Notes** once they have finished the guided activity. The teacher will refer to **'GIS_Week2_Handbook_D3A1'** document to complete this activity. **Activity 2 Title: Adding Photographs to Features** (40 minutes) In addition to qualitative information, photographs can further enhance a map. In this activity, the students will explore how links to photographs of features can be added to a feature layer. The teacher will refer to **'GIS_Week2_Handbook_D3A2'** document to complete this activity.	GIS_Week2_Handbook_D3A1  GIS_Week2_Handbook_D3A2 

Week 3: How to be a Storyteller (Project Work)

Important Concepts

- What is a StoryMap?
- Understanding elements of StoryMaps
- How to create a StoryMap?

Learning Standards

- Students will understand the basic concept of StoryMap
- Students will learn about different elements of StoryMap
- Students will learn to plan and create a StoryMap

Inquiry Questions

- What is a StoryMap?
- What are the components of a StoryMap?
- What are the different steps in creating a StoryMap?

Lesson Plan: Week 3 Day 1
Introduction to Story Maps
Time Management: This is a light session and you can cut down and first and last activity to save time or catch up on time

Classroom Inquiry Process	Resources
Lesson Aims · Understand what a StoryMap is · Learn about the different components of a StoryMap **Activity Title: Introduction to the Week** (20 mins) The teacher will start this module by summarizing the previous week on ArcGIS Online and start the interaction with students revolving around the following questions: · What are some of the salient features of mapping that we learned from creating maps on ArcGIS Online? · What different element did the Map Notes bring to the web map that we created? · Have you heard about StoryMaps? · How do you think we can combine Stories and Maps? · What do you think will be the components of StoryMaps? The teacher can write the key words that emerge from this brainstorming session on a flipchart or on the blackboard. **Activity 2 Title: What are StoryMaps?** (40 minutes) The teacher will start the second activity by showing the following webpage to the students: What is a Story Map? (https://storymaps.arcgis.com/stories/b8c4708a8f20471fb77de1733941e3d3) This webpage is an introduction to StoryMaps by **ESRI** (Environmental Systems Research Institute), the GIS company whose StoryMaps templates will be used by us in the Module. The webpage has several links and interactive icons embedded within it. The teacher will click these to show the students various possibilities that exist in StoryMaps.	· What is a Story Map? (https://storymaps.arcgis.com/stories/b8c4708a8f20471fb77de1733941e3d3) Lecture_Handout_Day1

The teacher can get back to the brainstorming session after showing the webpage and ask the students to add more key words about the StoryMaps. Towards the end of this session, the teacher will introduce the project – **'Create your own StoryMap'** – to the class. The teacher will also need to distribute **'Lecture_Handout_Day1'** document to the students. **Activity 3 Title: Making of Groups** (20 minutes) The teacher will divide the class into Groups of 5 students for the project work.	

Lesson Plan: Week 3 Day 2
Hands-on with StoryMaps

Time Management: This is a light session and you can cut down and first and last activity to save time or catch up on time

Classroom Inquiry Process	Resources
Lesson Aims · Become thorough about the components of StoryMaps · Planning a StoryMaps **Activity 1 Title: Understanding StoryMaps by some examples** (40 minutes) Having explained the basics of StoryMaps the previous day, the teacher will show some examples of StoryMaps to the students from the **ArcGIS StoryMaps Gallery**. (https://doc.arcgis.com/en/arcgis-storymaps/gallery/) The following StoryMaps are recommended to be shown by the teacher to the students: a. Sounds of the Wild West: An audio tour of Montana's four major ecosystems (https://storymaps.arcgis.com/stories/42b1a6fe6a524b578becd12c0bee4b4c) b. Mapping the spread of Covid-19 (https://storymaps.arcgis.com/stories/4fdc0d03d3a34aa485de1fb0d2650ee0) c. Mapping Mount Everest (https://storymaps.arcgis.com/stories/c87bc0a59c0144008e25d50a5dd1b192) The teacher will ask the students to study these StoryMaps carefully and read the lecture handout that summarizes their content, components, styling and salient feature, if any. This activity will help the students understand the varied topics that can be made into StoryMaps, and the different components (maps, images, video, audio etc.) that can be used therein. The teachers should encourage students to see more StoryMaps from the Gallery if there is time left in the session. T	https://doc.arcgis.com/en/arcgis-storymaps/gallery/ https://storymaps.arcgis.com/stories/42b1a6fe6a524b578becd12c0bee4b4c https://storymaps.arcgis.com/stories/c87bc0a59c0144008e25d50a5dd1b192

he teacher may refer to **'Lecture_Handout_Day2.docx'** as a reference document to understand the components of the StoryMaps. He/she may share it with the students once they have identified the components of the StoryMaps on their own. **Activity 2 Title: Planning your StoryMap** (40 minutes) The teacher will distribute **'Plan_your_StoryMap.docx'** document to students at the beginning of this session. The document consists of certain questions that will help the students in planning their StoryMap. The teachers need not evaluate the filled-up document; it is only intended to help students assess the requirements for creating this StoryMap. The teacher will also distribute **'Some_Ideas_for_the_Project.docx'** document to the students. The document lists some ideas for the StoryMap project along with an overview of how each idea can be converted into a StoryMap.	Lecture_Handout_Day2.docx  Plan_your_StoryMap.docx  Some_Ideas_for_the_Project.docx 

Lesson Plan: Week 3 Day 3
Create your own StoryMap

Time Management: This is mostly a hands-on session and students will be working on the computer. They can continue the work after the classroom

Classroom Inquiry Process	Resources
Lesson Aims · Started making a StoryMap of your choice. **Activity 1 Title: Create your own StoryMap** (80 minutes) By now, the students would have gained enough knowledge about StoryMaps and having done the preparation for the StoryMap earlier, the students will now put their knowledge to use and make a StoryMap of their choice. They will use the handbook prepared for this purpose which covers the basic tools for creating StoryMaps on the ArcGIS platform. The teacher will distribute the document **'GIS_Week3_Handbook_D3A1'** to the students. It contains detailed and step-by-step instructions to create a StoryMap on the ArcGIS platform. The students will save their respective maps at the end of the session and present them on the last day of the GIS module.	**GIS_Week3_Handbook_D3A1**

Week 4: Understanding The Application Of Gis In Different Fields

Important Concepts

- Understanding GIS Applications
- Exploring GIS as Career Option
- Latest Trends in GIS Technology

Learning Standards

- Familiarity with GIS helps students in their understanding of how GIS applications operate in their world.
- GIS encourages Spatial thinking, critical thinking, promote global awareness, strengthen and extend technology skills among students
- GIS does provide students with career skills that will never go out of style.

Inquiry Questions

1. What are the various applications of GIS
2. In what segments GIS can be used in daily life
3. What are the different career options in GIS
4. Which are the upcoming trends in GIS Technology

Lesson Plan: Week 4 Day 1
GIS Application

Time Management: This is a relatively light session

Classroom Inquiry Process	Resources
Lesson Aims: ● To provide a holistic GIS approach to the understanding of the interactions and inter-linkages between the earth's elements ● To provide insights into the use of GIS in our daily lives. **Activity 1_: Introduction to GIS Applications will be approached by asking some questions like** *(25 Minutes)* · What can a GIS do? · What can you do with a GIS? · What can a GIS do for you? And then understanding how GIS Answers these questions. Teachers will use the PPT to explain the same. The PPT has speaker notes to help the teacher deliver the material (Slides 2 to 11) **Activity 2 : Open Discussion** *(25 minutes)* Teachers along with students may have an open interaction about how GIS can be used in daily life such as location technology working at the backend of apps such as Swiggy / Zomato / Amazon / Google maps for finding routes. And what are the different segments /sectors where GIS technology can be implemented. (Use PPT shared to explain different GIS Applications (Slides 12-23). **Watch YouTube Videos** https://www.youtube.com/watch?v=BMCyfKzZC5c https://www.youtube.com/watch?v=J-31pLWwNMQ **Activity 3** *(30 Minutes)* After having a fruitful discussion, the students will use their Intellect skills to prepare the possible List of GIS Applications that can use GIS in their Surrounding with respect to	**Wk4-Day_1_GIS Applications** **Handout_Week 4_Day1** **https://www.youtube.com/watch?v=BMCyfKzZC5c** **https://www.youtube.com/watch?v=J-31pLWwNMQ**

· What exists at a particular location · Where is something located · What change has taken place · What is the pattern · What if scenario	

Lesson Plan: Week 4 Day 2
Exploring GIS as a Career Option

Time Management: You can move quickly through the Activity 2 presentation . Activity 3 has many sub tasks, you can cut it short or assign some of it for home work

Classroom Inquiry Process	Resources
Lesson Aims: ● The students will be exposed to various dimensions of GIS and the existing and emerging career options in this field. ● To develop creative thinking among students and make them technology-savvy so that they could be ready to join the Geospatial industry **Activity 1: Open Discussion (*20 minutes)*** Teacher will start the session by recapping the previous session on GIS Applications, discussing the wide variety of disciplines available where GIS can be used. And then ask the students about their list of GIS applications they had prepared. Then show some youtube videos of some professionals in different disciplines using GIS. 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 **Activity 2 *(30 minutes)*** This recap will open to the discussion about Exploring GIS as Career by asking questions like · Do you think you can have a career in GIS? · Do you want a career or just a job? · Do you want to do something cool? · Do you want to do something important? · Do you love maps? Use the PPT to discuss and explore these questions and reasons why GIS is a good Career option?	**Wk4-Day 2_GIS Career.pptx** https://www.youtube.com/watch?v=snJkwwtYbFg https://www.youtube.com/watch?v=Sa9rXunC6gs https://youtu.be/msJOEbuLQMk https://youtu.be/kxtg9jtefXM

Refer to the Speaker Notes in the presentation.

Activity 3 – Creating a GIS Career Concept Map (*30 Minutes)*

After exploring and understanding the GIS Career path, Students will Brainstorm in groups of 3 or 4 together to create a Concept Map to list Career Option they would like to pursue in future.

They will also do a Google web search to answer the question of the STEM of the Concept Map

Materials Required

- chart paper
- computer/internet/printer
- glue/markers /scissors

Instructions for Creating a GIS Career Concept Map

- Students will choose one GIS career path of interest to put in the center of the chart paper to create a concept map.
- Students will add the following stems to their Career map:
  - *What stream will they choose in their 11th/12th grade?*
  - *What higher education will they pursue after 12th grade?*
  - *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 them?*
- Students will create lists under each stem that answer the above questions.
- Students will cut and paste or sketch pictures related to the chosen career around the concept map.
- Students will present their work.

Handout_Week4_Day2

Lesson Plan: Week 4 Day 3
Latest Trend in GIS Technology

Time Management: You can cut down on time for the first activities, in order to create more time for project presentations

Classroom Inquiry Process	Resources
Lesson Aims: ● To create awareness among students on the upcoming trends in GIS technology ● To get knowledge related GIS Technologies such as Remote Sensing, Drones and LiDAR **Activity 1** ***(10 Minutes)*** Please note that Core GIS syllabus is over. Now we will cover related topics such as Remote Sensing, Drone and LiDAR technologies. Start the session with a Recap from the previous session on Career in GIS. Then open the discussion by asking questions · Do you know how information technology is moving? *(You may get many answers as todays children are very smart as they are aware of many tech tricks of the mobile technology, gaming, some are computer geek)* Ask Students what did they learn from the entire GIS module? **Activity 2** ***(25 Minutes)*** Build the session and by orienting the students towards discussing the developments and advancements taking place in the field of GIS Technology. Use the PPT (Slides 1 to 6) to discuss and explain the trends in GIS Technology in upcoming years. Watch a YouTube Video https://www.youtube.com/watch?v=J-31pLWwNMQ&t=4s **Activity 3** ***(25 minutes)*** After the discussion on the latest trends in GIS Technology, the teacher will introduce upcoming technologies such as Remote Sensing, Drones (UAV) and LiDAR to students about how they are bringing advancement in the GIS Technology sector.	**Wk4-Day 3_Latest Trends in GIS Technology.pptx** Handout_Week4_Day3 https://www.youtube.com/watch?v=J-31pLWwNMQ&t=4s **Remote Sensing** **Drones**

Teachers may use PPT to introduce the Remote Sensing (Slides 4 to 10), Drones (UAV) (Slides 11 to 15) and LiDAR technology (Slides 16 to 20).

Activity 4 *(20 Minutes)*

Students will 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

LiDAR

Activity 5: Presentation of the project (30-45 Minutes)

Students will present their StoryMaps that they had created on Day 3 of Week 3 as their Project Presentation.

2.3 Module Project

The GIS project will be undertaken in Week 3 and Week 4. While the students will largely work on it during Week 3, they will get an opportunity to present it during Week 4.

The project will be on creating a StoryMap on ArcGIS Online. At the beginning of Week 3, the teacher will expose the students to StoryMaps with the help of examples which are available on the ArcGIS StoryMaps Gallery. These examples will give a good idea to the students both about the variety of stories that can be narrated using this format, as well as the tools – text, maps, images, audio-video – which are available on the platform to make StoryMaps. The preparatory phase of the project, which will consist of looking at some examples as well taking stock of the information that the students will require for their respective StoryMaps will take place during the first two days of Week 3. The teacher will also divide the students into groups of 5 (or any appropriate number) in this phase. On the last day, the students will start working on their respective StoryMaps. If a group selects a topic, which is on Delhi and its surroundings, it can visit the area to collect photographs, short videos or any other information it may find useful to create a good StoryMap.

Some documents related to StoryMaps, including a list of topics will be given to students during this Week. The students will choose a topic either from the given list or any other of their choice for the project work.

2.4 Formative Assessment Rubric

Assessment (Formative and Summative)

For the Formative Assessment, students will be assessed through the Module Project. The project will assess the following Assessment Objectives:

1. Inquiry & Exploration
2. Critical Thinking & Decision Making
3. Presentation and Communication

For the Summative Assessment, students will be assessed through a written exam that will assess all the competencies.

Formative Assessment Overview	
Type of Task	Project Work: - Create Your Own StoryMap
Resources Required	By Students: ● Access to internet – Video links, resource sheets to be used during the project ● Internet for gathering information (text, audio, video, images etc.) on the StoryMap subject ● Chromebook ● Student Handouts By Teachers: ● Instruction based lesson plan (Week 3) pertaining to 'StoryMaps' ● Projector
Formative Assessment Criteria:	(C) Critical Thinking & Decision-making (D) Presentation & Communication

Overview (For CRT)		
Sub Task	**Criteria Assessed**	**Max Score Points**
1 (Individual)	C	8
2 (Group)	D	8

Sub Task 1 Rubric:

Formative Assessment Components	**1-2**	**3-4**	**5-6**	**7-8**	**Evidence**
Classroom Participation	Learners are minimally engaged – they are seen exhibiting the behaviors mentioned in the "Evidence" to a rudimentary level	Learners are participating to some extent – they may speak occasionally or speak when called upon. Other behaviors mentioned are seen to a limited extent	Learners are seen to speak at least once per session. They are alert and taking notes, they are contributing to the discussion in their groups	Learners are very active and contribute to others' learning too. They are the ones' driving the activity in their group	Through the various activities of the project in Week 3, the students are actively involved in classroom discussion as evidenced by the following: § They are speaking up in class and responding to teacher's questions, § They are thinking about the topic of the StoryMap and its different nuances by filling up the activity sheet, § They can be seen participating actively within their groups discussing the different elements of the StoryMap.

Sub Task 2 Rubric:

Formative Assessment Components	1-2	3-4	5-6	7-8	Evidence
Video Presentation ***(Critical Thinking & Decision-making)***	Students' StoryMaps depict the points mentioned under **'Evidence'** to a rudimentary level. The StoryMap is unedited with typos in text and poorly selected multi-media content and hastily prepared maps.	The students present a StoryMap with a captivating narrative but is one-dimensional i.e., it lacks multi-media content to make it engaging and palatable for the audience.	The StoryMap displays a good choice in terms of its topic, and the use of text and multi-media. It however, is unedited and meanders along without coming to any conclusion.	The StoryMap is thoroughly engaging. All the points mentioned in the "Evidence" column are present with high quality	Students (in Groups of 5) make a StoryMap of their choice: § The StoryMap is well thought through from the beginning to the end, § Has a short introduction which gives an overview to the audience, § A conclusion/summary in the end, § The different sections of the StoryMap are well organized in terms of the sub-themes, § Easy to navigate layout, § Ample use of Maps, Images, Audio and Video in the StoryMap, § Optimum resolution of images, clear audio and stable video, § Hyperlinks provided wherever additional

					information is required to be given, § Appropriate zoom level / pan of the maps used, § Well designed labels and pop-ups in the maps used
Video Presentation (Presentation & Communication)	The student is neither interested nor has sufficient understanding of the subject chosen for the StoryMap. He/she shows a low level of fluency in speaking, there may be many pauses and mis-speaking.	The student shows some fluency and comfort in speaking and is somewhat interested in the StoryMap topics.	The student has a good grasp on the topics of the StoryMap and the tools used in creating it. He/she narrates the StoryMap in a way that is engaging and keeps the audience captivated and encourages them to learn more about the topic.		The StoryMap is presented in a lucid manner and the presenter is thorough with both the subject as well as the tools used in creating the StoryMap. The student speaks fluently and is comfortable in presenting the StoryMap.

2.5 Teacher Professional Development Guidelines

The Teacher Professional Development Guide is designed to assist with the delivery of professional development sessions on the module: 'Geographic Information System (GIS)'.

Objectives of the TPD Training of the module -

a. Develop a contextualized understanding with teachers about GIS as a decision support tool.

b. Enable the teachers to not only understand the theoretical concepts of GIS but also make them GIS practitioners using freely available online software.

c. Enable the teachers to explore StoryMaps for qualitative mapping.

d. Equip the teachers with knowledge about GIS so that they can guide the interested students towards a career in GIS.

SCHEDULE OF THE TRAINING

The training comprises a day-long offline session which will focus on hands-on GIS exercises. Subsequently, there will be four online sessions, one each for every week of the GIS module.

DETAILS OF THE TRAINING

WEEK 1

Day 1

Session 1 – This session will be an introduction to Geographic Information Systems (GIS). The teachers will explore its role in informed decision making and its uses.

Focus – Teachers to identify the importance of GIS and how it goes beyond mapping.

● Teachers will identify and explore maps of different scales.

● Teachers will identify and explore elements used in a map.

The session will start by summarizing the previous module on 'Mapping' and brainstorm certain key questions on GIS mapping with the students. This initial conversation will be followed by viewing select videos on GIS from YouTube. Building on this, the teacher will then explain to the students, elements that make up a map and the concept of scales in maps.

Day 2

Session 2 – This session will explore different types of GIS maps and understand their use and purpose.

Focus – Teachers to emphasize:

● The use of Thematic Maps to explain the relationship of geographic data through different visual representations.

In this session, different types of maps and their uses will be explored with the help of examples. In doing so the various patterns and relationships that can be unearthed using GIS maps will be explored too. In the

final part of this session, ‘Bharat Maps’ which is a multi-layer GIS platform created by the Government of India will be explored.

Day 3

Session 3 – This session will familiarize the teachers with some basic GIS concepts like the coordinate system and latitudes and longitudes. The teachers will also learn about the different geometries that are used for building GIS datasets. In the final part of the session, they will find the latitudes and longitudes of a given set of locations.

Focus – Teachers to link theoretical GIS with practical examples.

● Teachers will link the theoretical understanding of mapping using a system of coordinates with the practical exercise of finding latitudes and longitudes of select locations.

This session will focus on relating the theoretical aspects of GIS with the real-world features that we see around us every day. It will begin with an explanation of different real-world features and the types of geometries that can be used to represent them in a GIS environment. In this session, some of the basic components of a GIS like the coordinate systems and latitudes and longitudes will also be explained. This session will end with the first hands-on activity of the module that will require the participants to find out the latitudes and longitudes of select locations of Delhi.

WEEK 2

Day 1

Session 4 – This week is entirely hands-on in nature. The teachers will learn using GIS on an online software called ArcGIS Online.

Focus – Teachers will familiarize themselves with ArcGIS Online

● They will first create a public account on ArcGIS Online.

● Familiarize themselves with the interface of the software.

This week, the module is entirely hands-on in nature, in which the participants will learn practical GIS with the help of an online software called ArcGIS Online. In this session, they will make a public account on ArcGIS.com and subsequently familiarize themselves with the interface of the software.

All the sessions of this Week in the module will be conducted using an exercise handbook which has step-by-step instructions to complete each and every exercise.

Day 2

Session 5 – This session will explore importing data of three different geometries (point, line and polygon) into ArcGIS Online and visualizing it in the software. It will end with fine tuning the visualization and creating a web-map.

Focus - Teachers to learn practical aspects of GIS on ArcGIS Online

● Different visualization techniques for different data types.

● Inter-operating between different geo-spatial software.

This session is the most important session of this week. Having explored the interface of the software, the participants will now learn to import data of different geometries into it and visualize it by different methods. While visualizing they will also learn about the attributes of data and how they play a role in determining the kind of visualization that can be used.

The participants will also create other visual elements like a 'pop-up' box and streamline it for an improved visual experience. They will also learn how spatial data from Google Earth can be used as input for ArcGIS Online using a bridge mechanism. The outcome of this session will be an interactive web-map.

Day 3

Session 6 – This session will explore adding qualitative data to the previously created web maps.

Focus – Teachers to learn practical aspects of GIS on ArcGIS Online

● How to add additional information in the form of feature descriptions and photographs to web maps.

The participants will continue to explore ArcGIS Online further in this session. At times, we also need to incorporate additional features like photographs and detailed narratives to a web-map. In this session, the participants will add detailed descriptions and photographs to the locations in the web-map that they had plotted during the previous session.

WEEK 3

Day 1

Session 7 – This week will be the 'Project Week' of the GIS module in which the participants will learn to create a 'StoryMap'. In order to do this, the teachers will first explore what a StoryMap is and learn about its different components.

Focus – Teachers to explore the concept of StoryMaps

● How StoryMaps are in a way web-maps and at the same time much more than them because of additional features and elements.

The focus of this entire week is on creating a StoryMap. In this session, the participants will start exploring what StoryMaps are first by brainstorming and later by looking at certain examples. Towards the end of the session the teacher will be required to divide the students into groups of 5 for the project work.

Day 2

Session 8 – This session will explore the StoryMaps further by exploring their components and understanding the approach to create one.

Focus – Teachers to explore StoryMaps further by

● Breaking down a StoryMap into its different components.

● Planning a StoryMap.

In this session, the participants will explore the StoryMaps further by looking at different types of StoryMaps available from the ArcGIS StoryMaps Gallery. They will examine these in terms of their theme, styling and components. They will start exploring ideas for their own StoryMap as well as start preparing for it by appraising the material that they may already have or may need to collect.

Day 3

Session 9 – In this session, the participants will put the recently acquired knowledge of StoryMaps to use by creating one on any topic of their choice.

Focus – Teachers to create a StoryMap

● Think about the audience that the StoryMap is for.

● What are the components that can make it interesting and interactive for the user.

During this session, the participants will get down to making a StoryMap of their choice. For this, they will be given a step-by-step handbook that will guide them through the process of creating a StoryMap using the ArcGIS template.

WEEK 4

Day 1

Session 10 – This session will explore the various applications of GIS.

Focus – In exploring the various applications of GIS, the teacher will understand

● The different types of questions that a GIS can answer.

● Role of GIS in our daily lives.

In this session, the participants will be exposed to different applications of GIS. The session will start with an open discussion on how GIS is used in our daily lives. The teacher will show videos from YouTube to explain this further. In the last part of the session, the basic questions that can be answered by a GIS will be explored.

Day 2

Session 11 – This session will present GIS as a career option and the different kinds of opportunities that exist within this domain.

Focus – In exploring GIS as a career option, the participants will look to understand

● What kind of training/skills are required in this industry?

This session will explain the different career opportunities that exist in the geo-spatial domain. The teacher will explore these with the help of certain select YouTube videos as well as getting the participants to make a ‘GIS Career Concept Map’.

Day 3

Session 12 - This session will explore the latest trends that are soon to dominate the geo-spatial world.

Focus – In exploring the latest trends in the geo-spatial industry, the participant will

● Understand how GIS is an integrating technology that brings several other allied technologies on to a common platform.

The last session of this module will explore the state-of-the-art technologies like remote sensing, drones and LiDAR (Light Detection and Ranging) which exist and are being widely used in the larger geo-spatial domain. The module will explore the concepts behind them and their usages with the help of certain select YouTube videos.

2.6 Student Handbook

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.

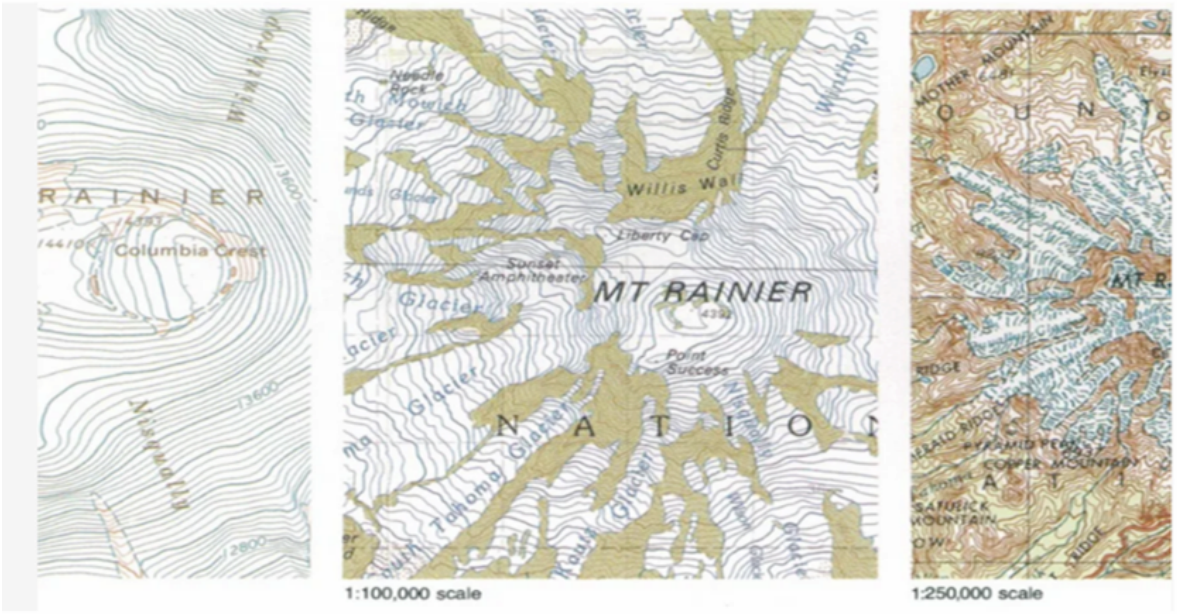
Elements on a Map

- 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.

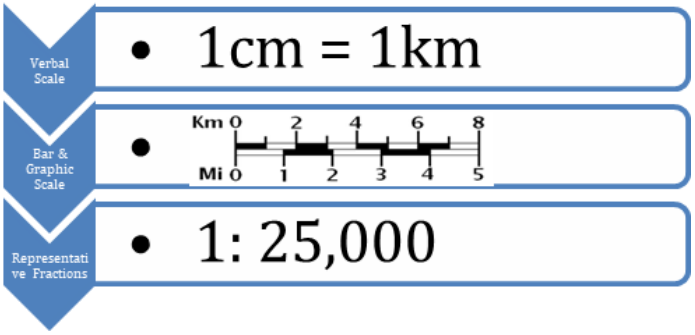
Scale of Map

- 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.

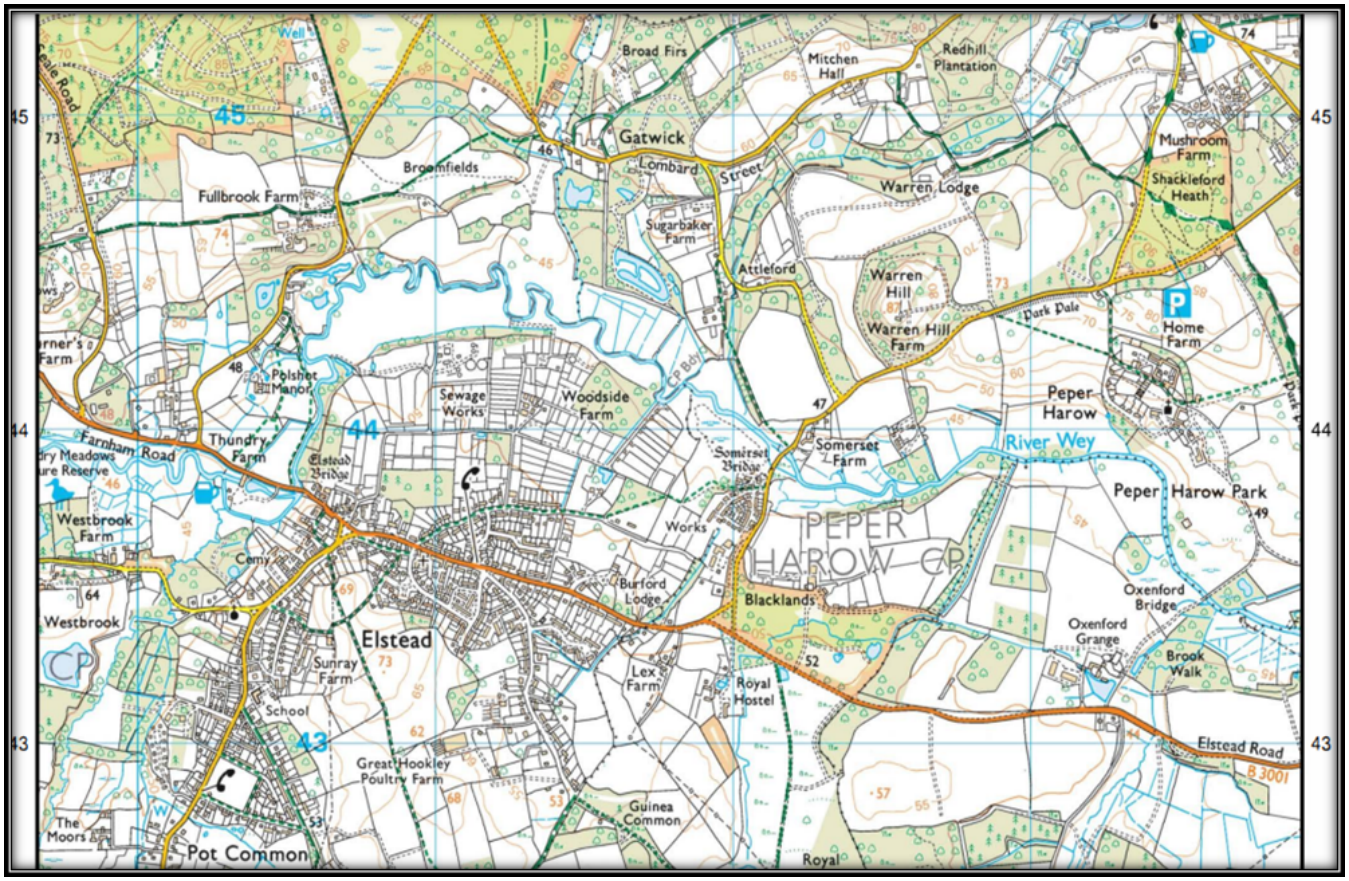
Let us look at different scaled maps from Largest Scale to Smallest Scale to understand the variation of size of the earth feature or landscape from the real world.

	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

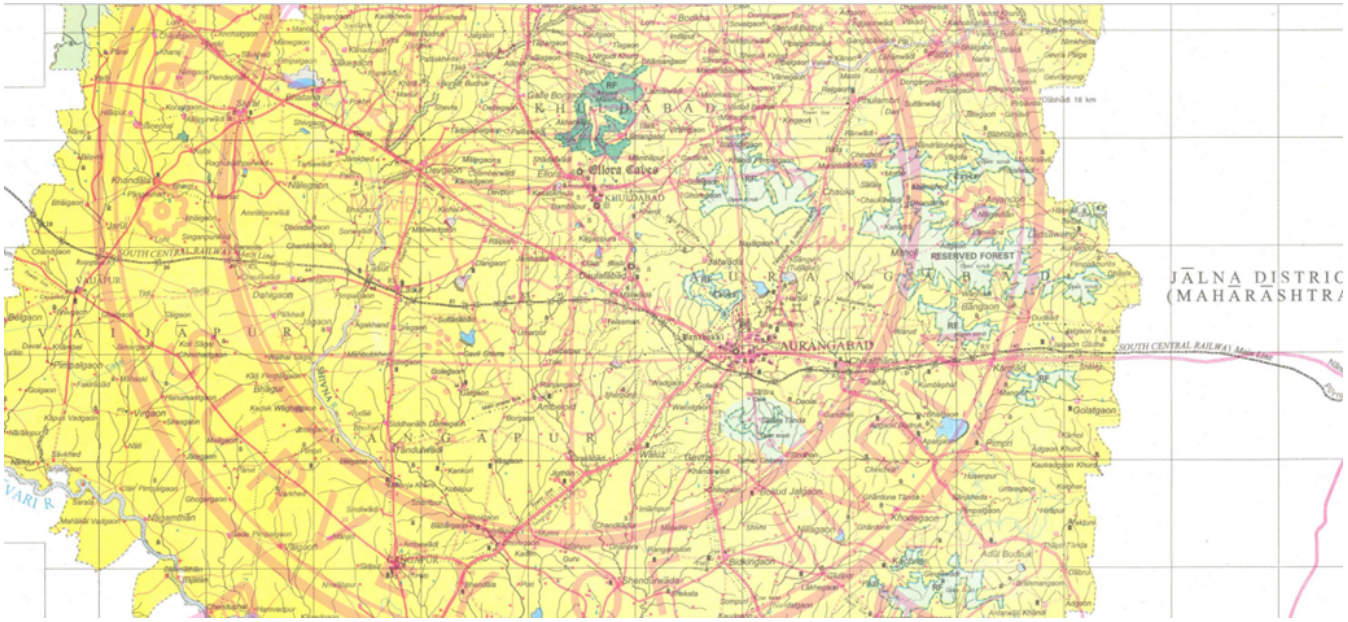
1:25000 Scale Map



1:50000 Scale Map (Toposheet)

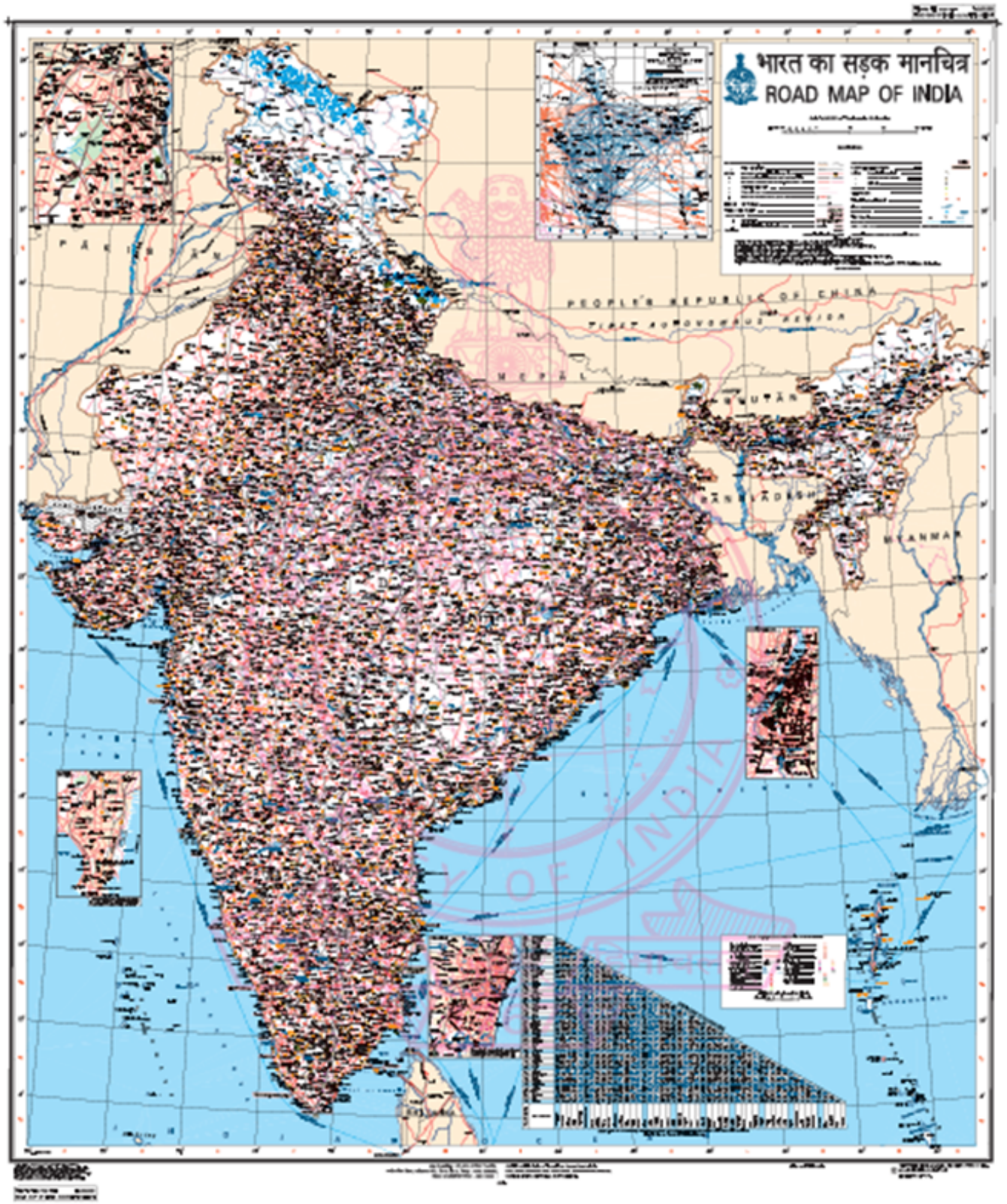
1: 100000 Scale Map Toposheet

1:250000 Scale Map

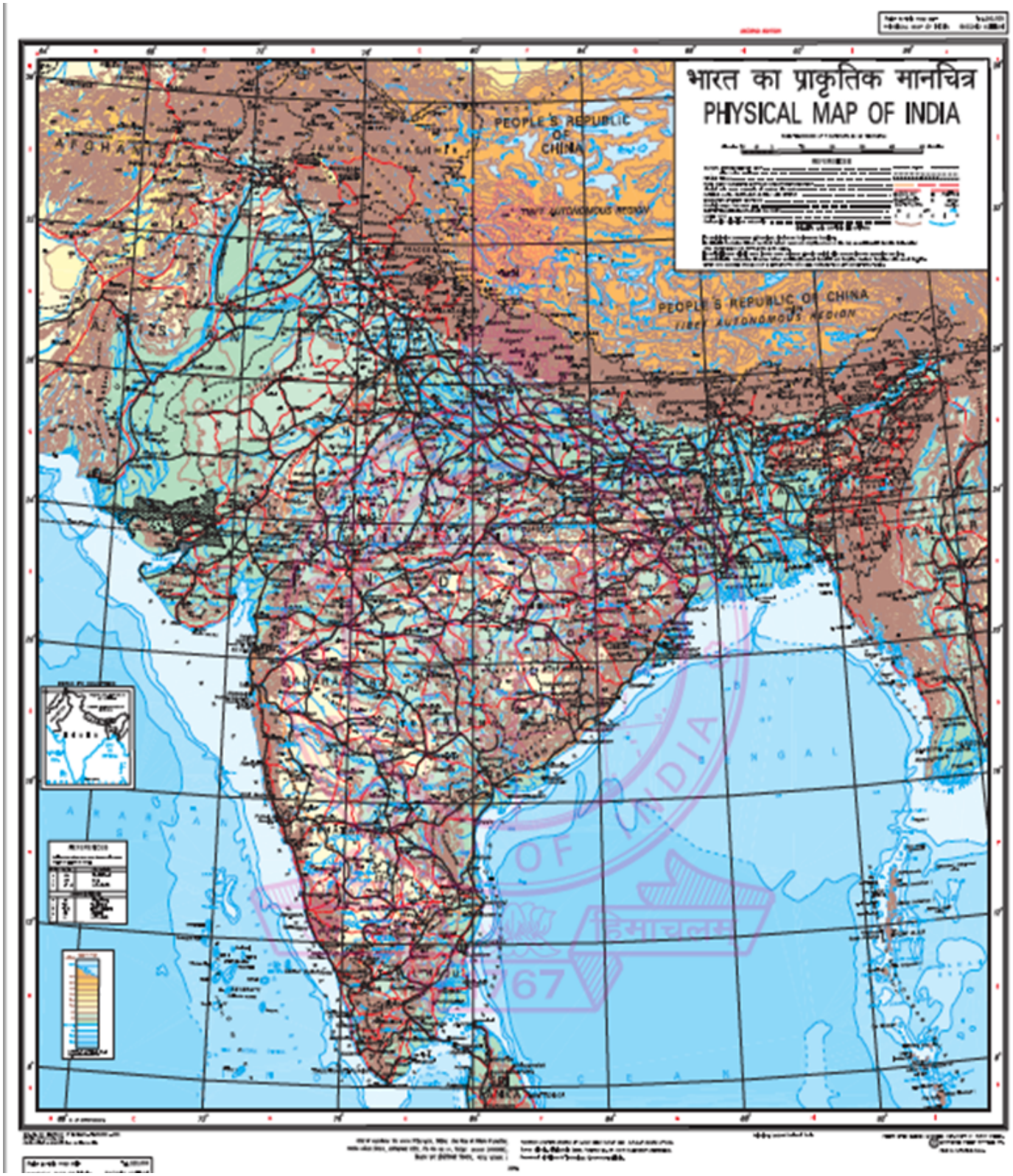


1: 2,5,00,000 Scale Map: Road Map of Delhi, and parts of Haryana, Rajasthan and Uttar Pradesh

1:4000000 Scale Road Map of India



1:4000000 Scale Physical Map of India


भारत का प्राकृतिक मानचित्र
PHYSICAL MAP OF INDIA
PEOPLE'S REPUBLIC OF CHINA
AFGHANISTAN
PAKISTAN
MYANMAR
BANGLADESH
SRI LANKA

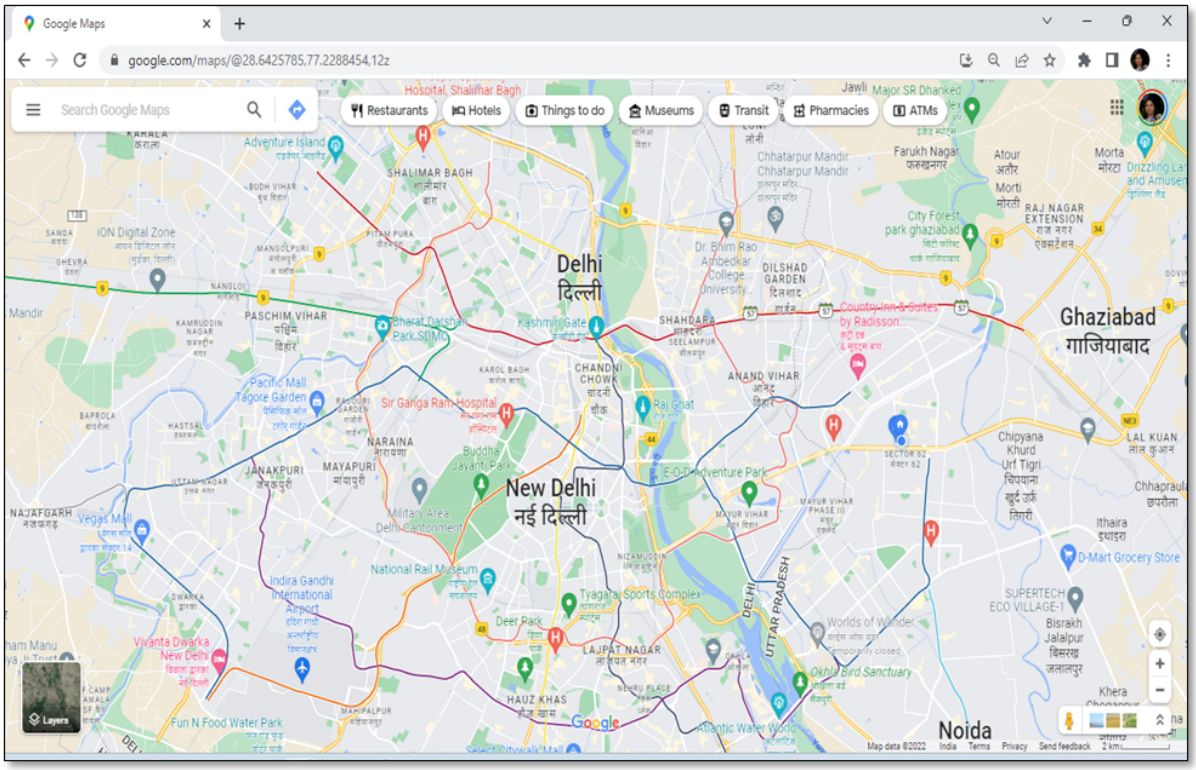
Understanding Types of GIS Maps

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.

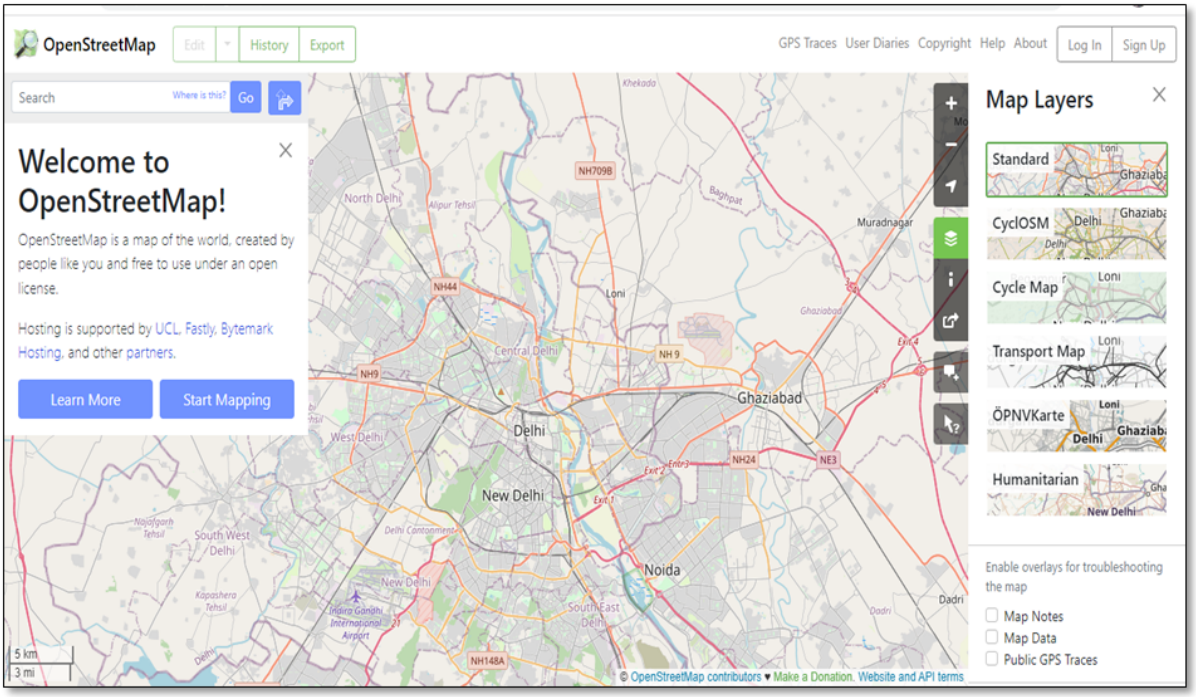


What is a Digital Map?

- 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.

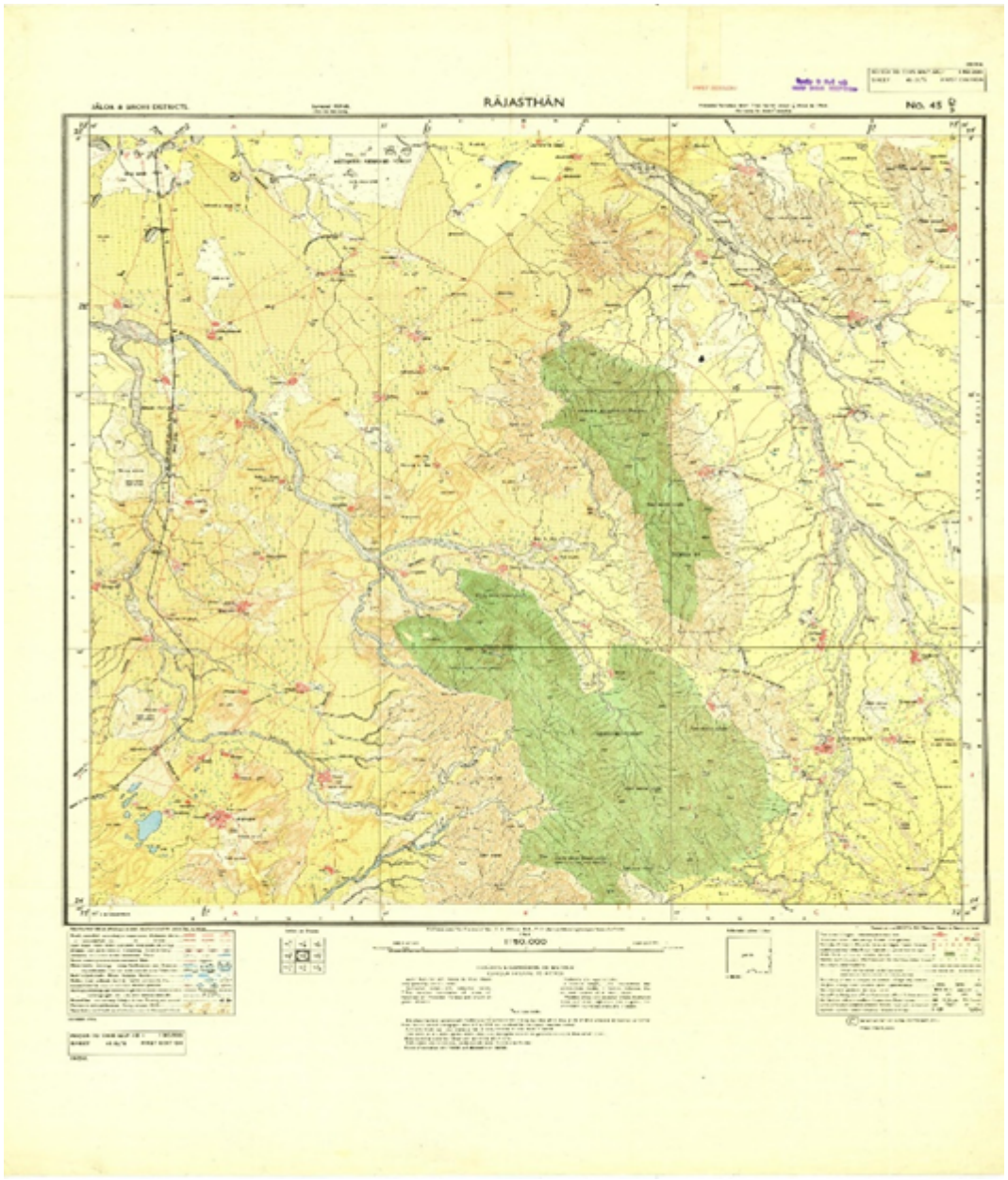


Types of GIS Maps

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

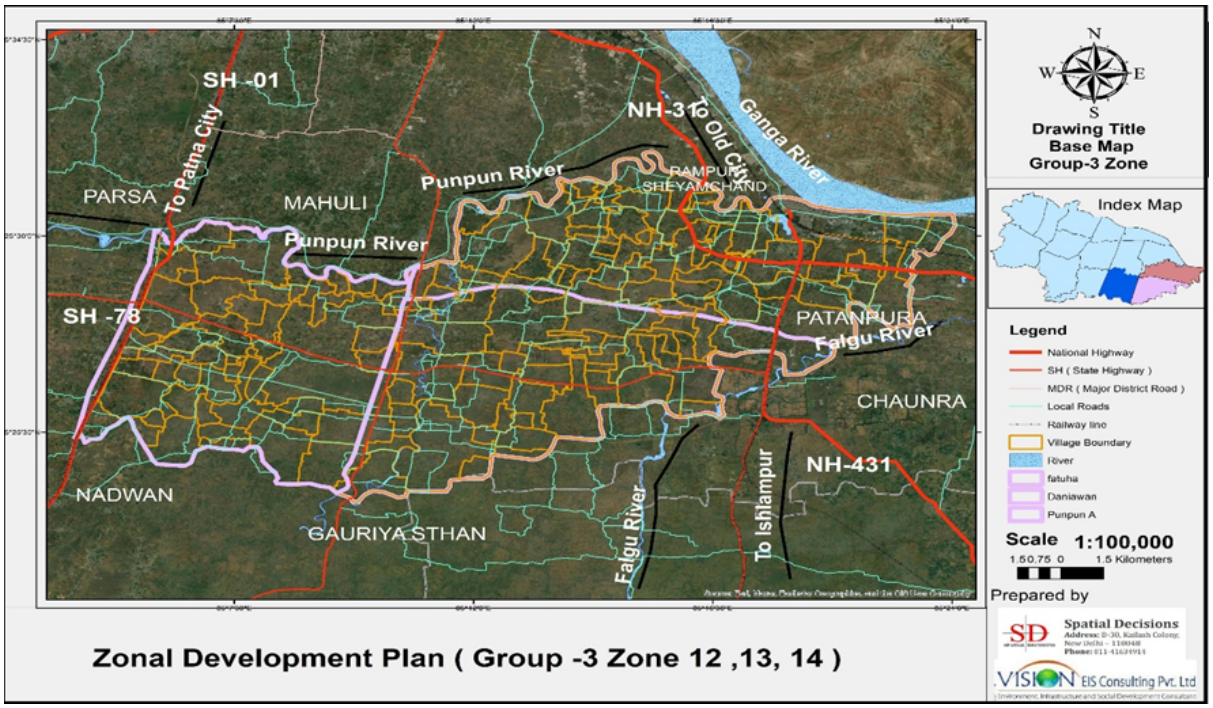
Topographic Map

- 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.



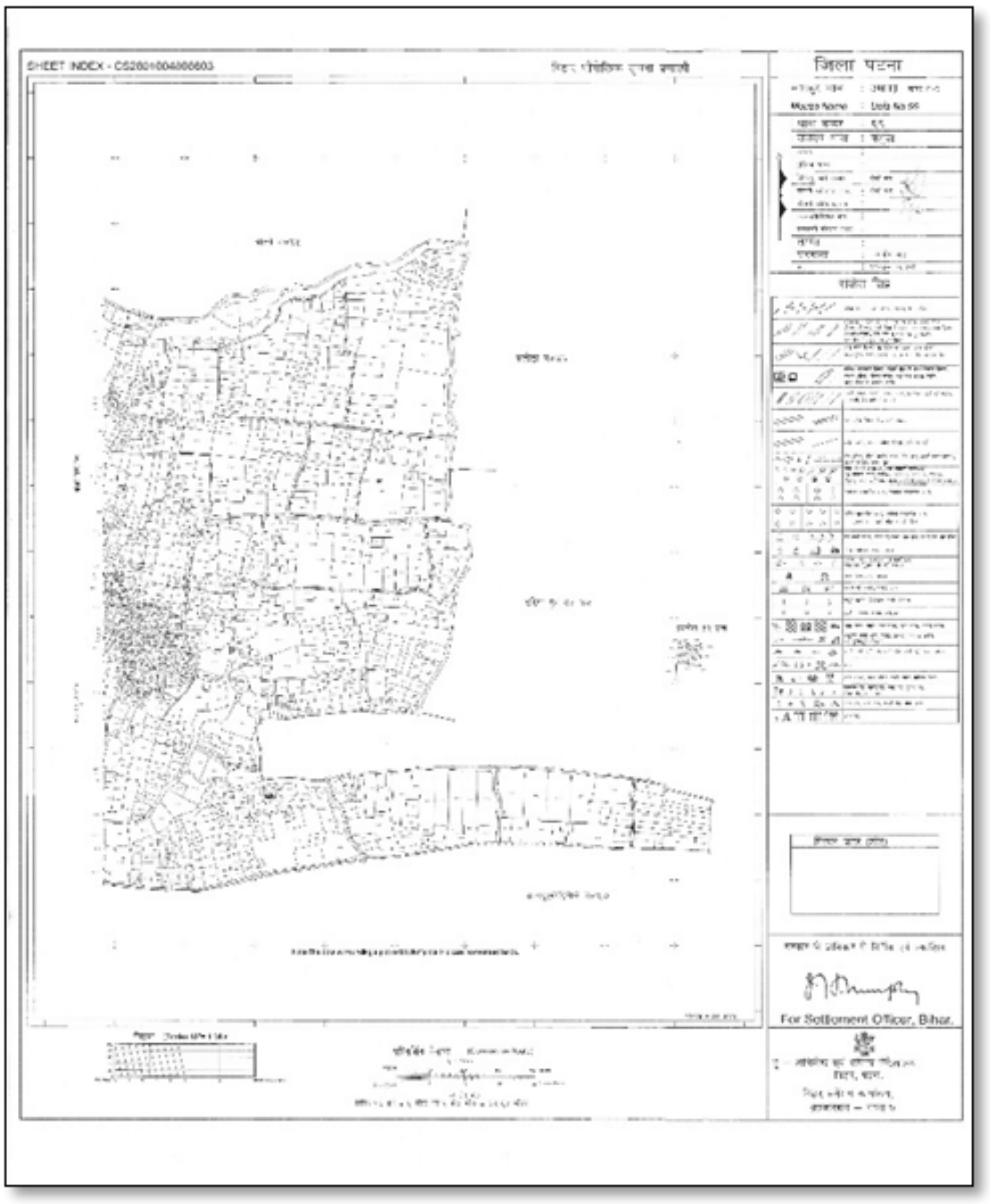
Base Maps

- 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.

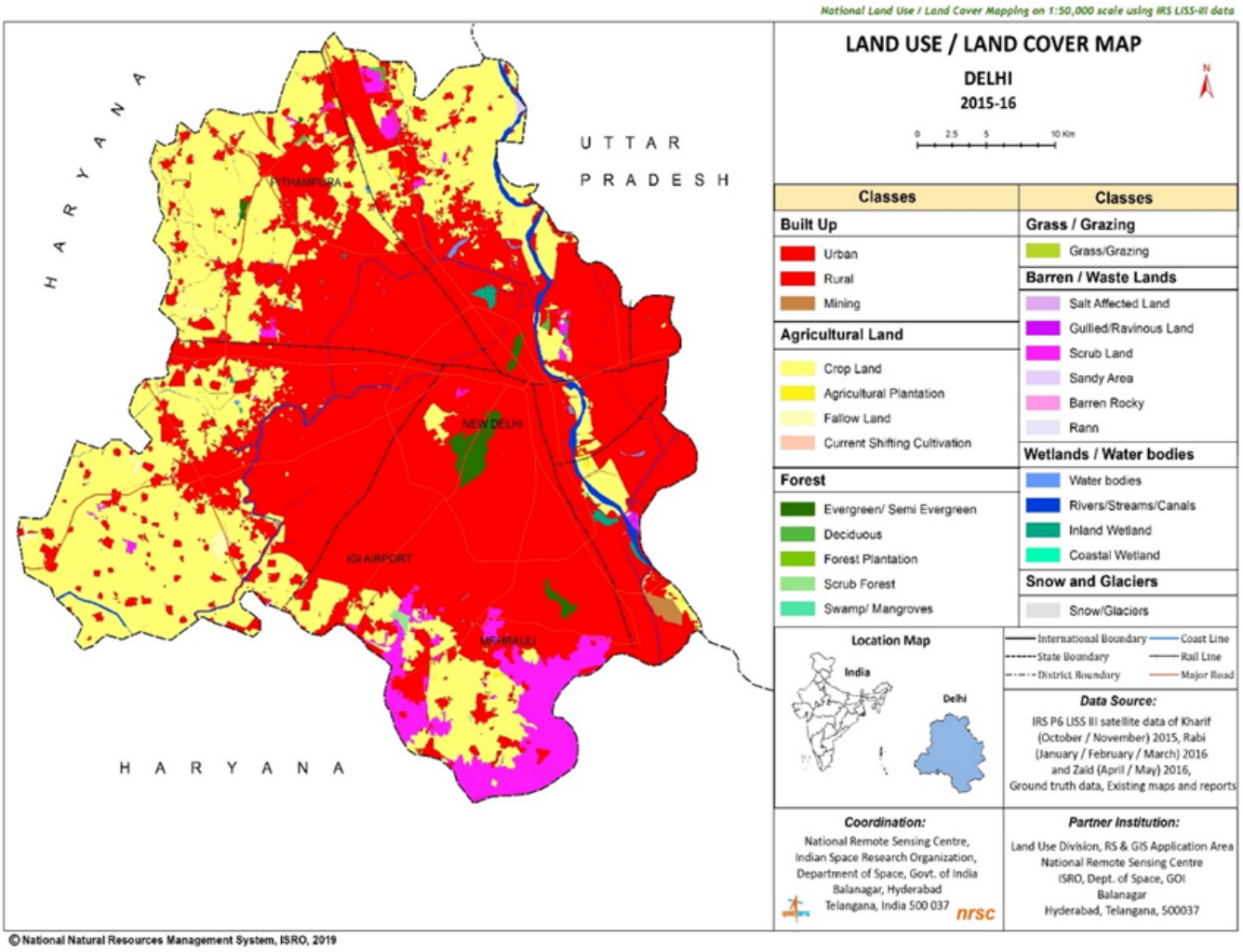
Let's do an activity understanding these patterns and relationship through Thematic Maps

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

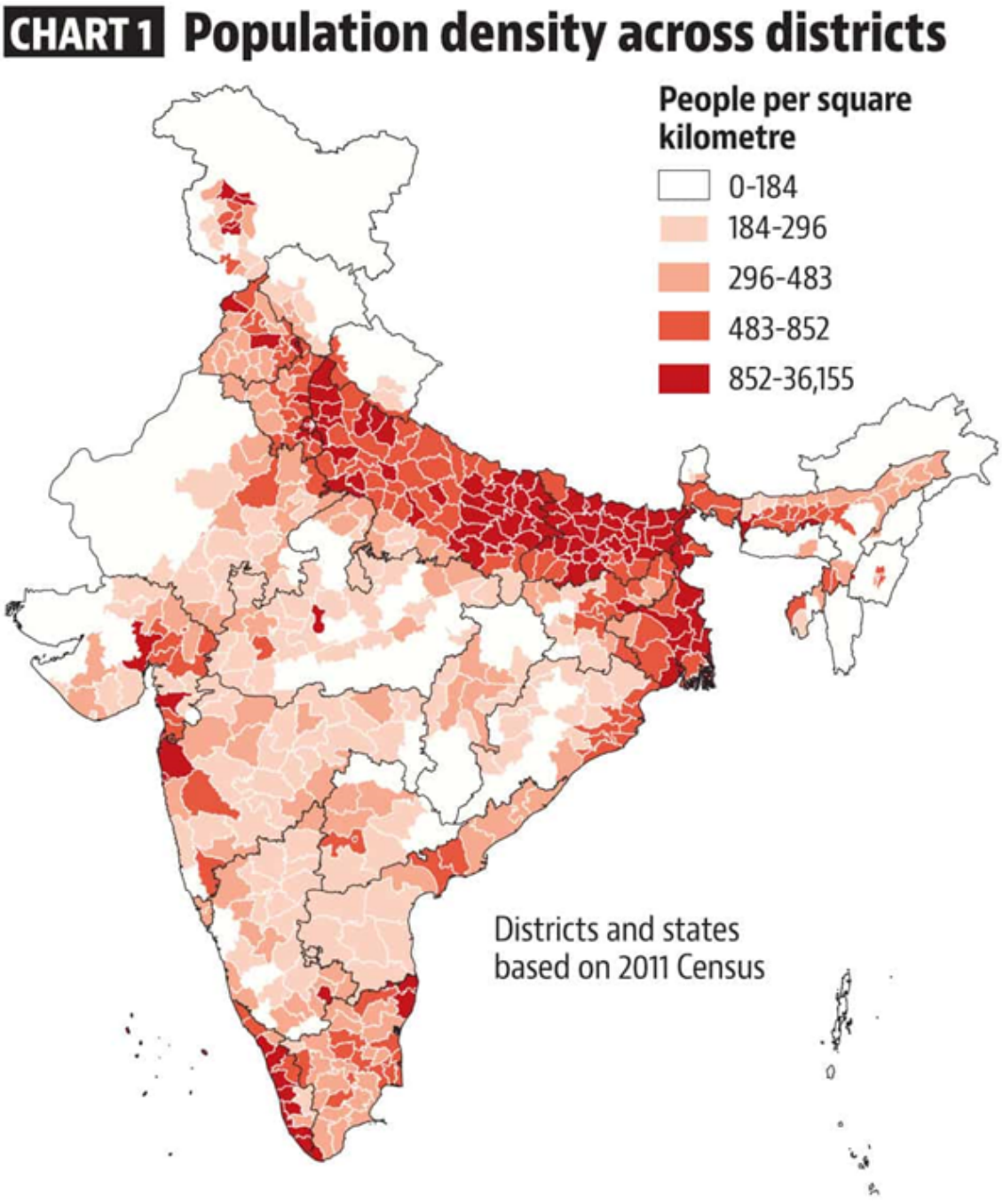
When you need to understand exactly which portions on the map correspond to which data segment, there is nothing else like a category GIS map. A specific attribute is assigned its own distinct color. The result is a convenient map of differently colored patches, each representing a particular category.

Example – Land Use Land Cover Map



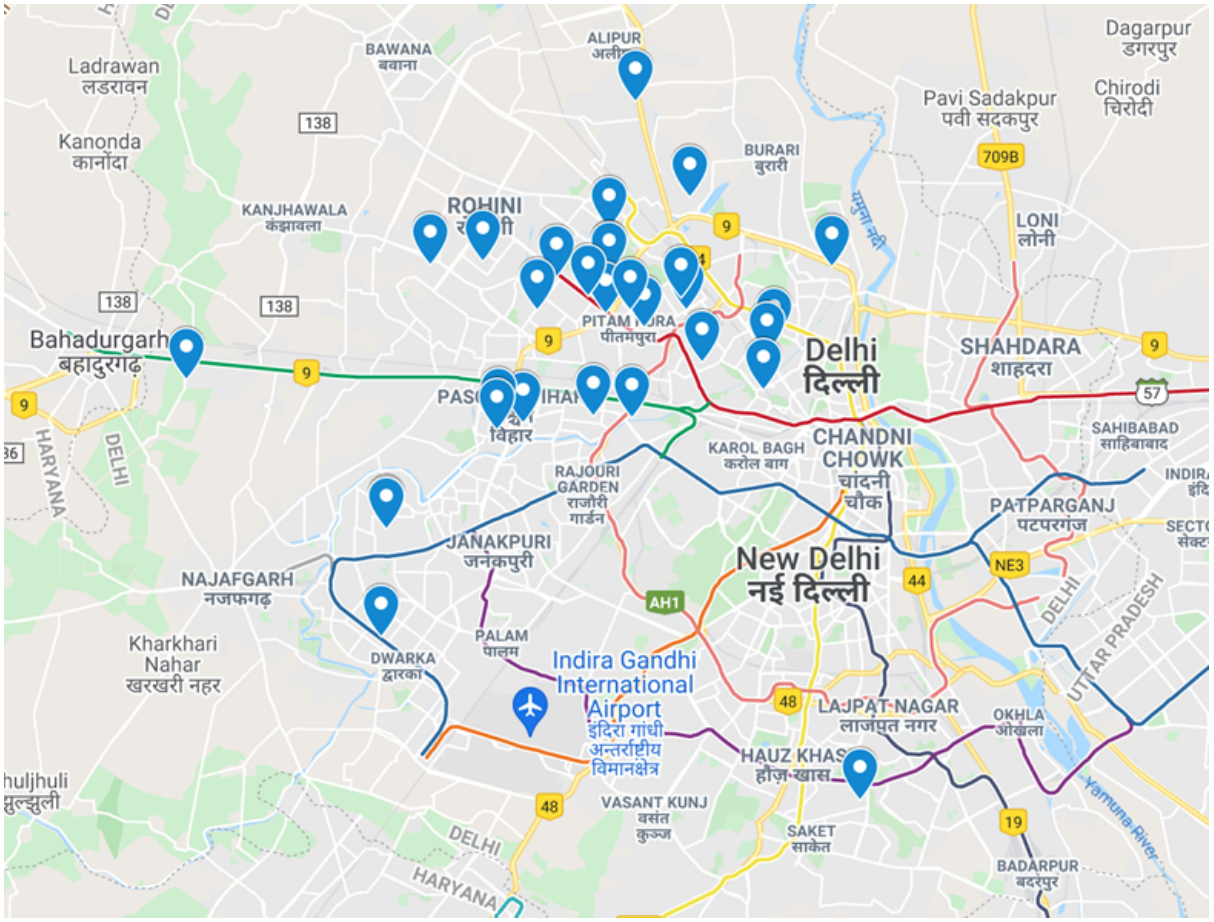
Choropleth Map (Map by Quantities)

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

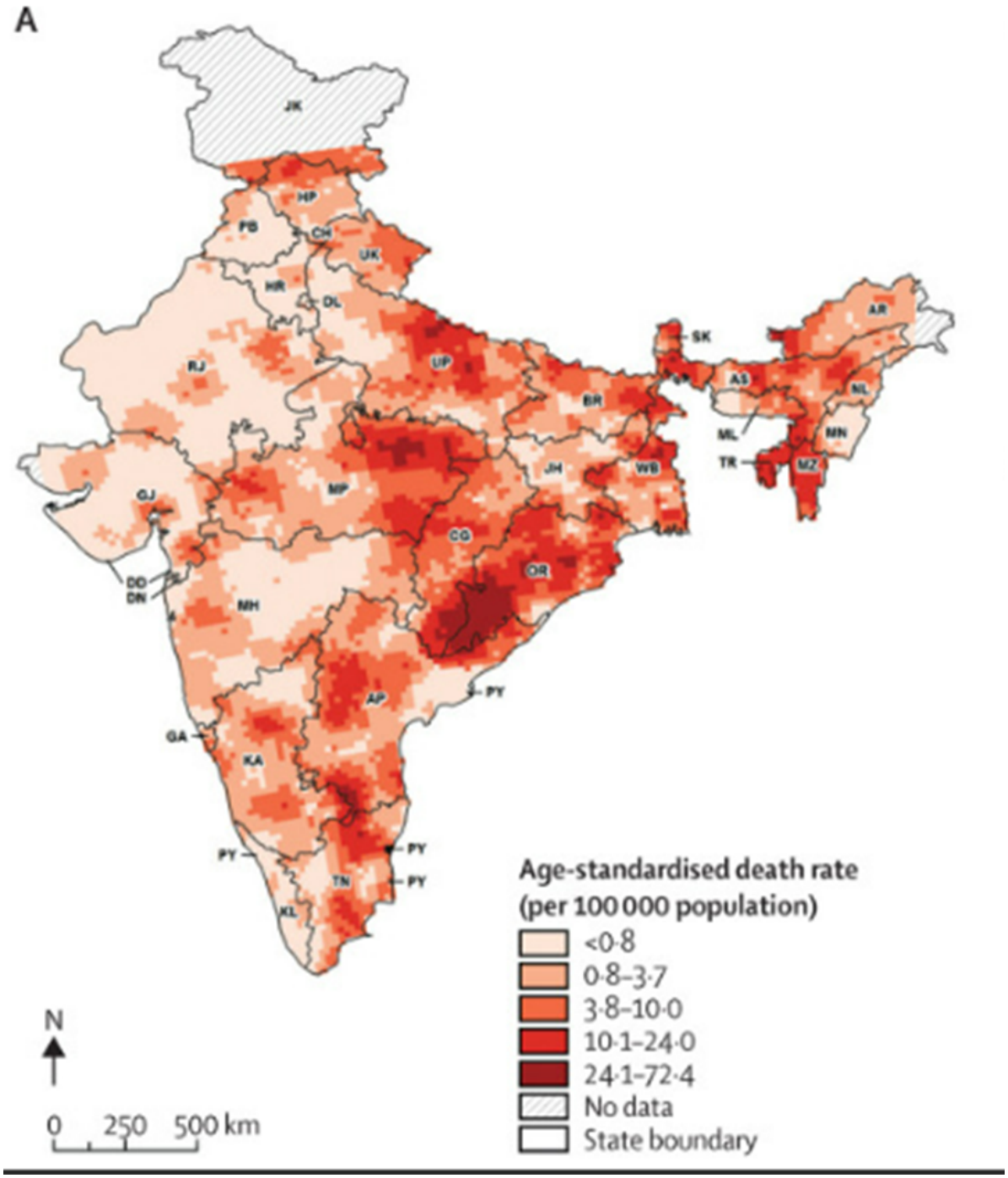
Location Map means a map depicting the location of the resource referenced in the application delineated in relation to named local streets, at a scale that depicts the resource in its entirety and enough surrounding area to locate the resource on other map sources.
Example – Location Map of Schools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

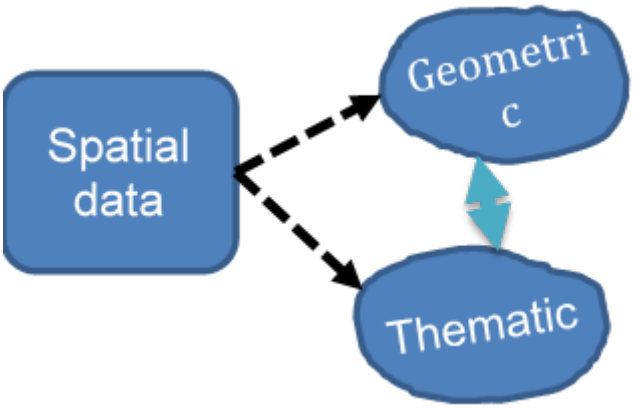
- geometric data,
- thematic data, and

- 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.

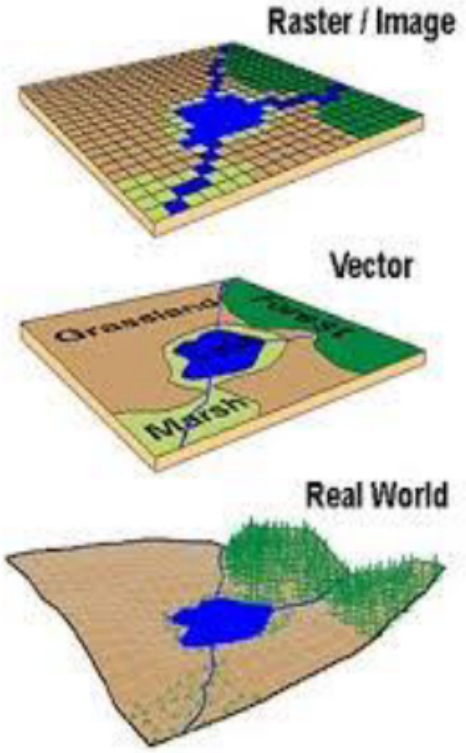
Non-spatial data (also called attribute or tabular data) describe the characteristics of features associated with vector data. It is stored in a database file (.dbf) and usually managed by Database Management Systems (DBMS) in the GIS environment. A unique identification number is used by the database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

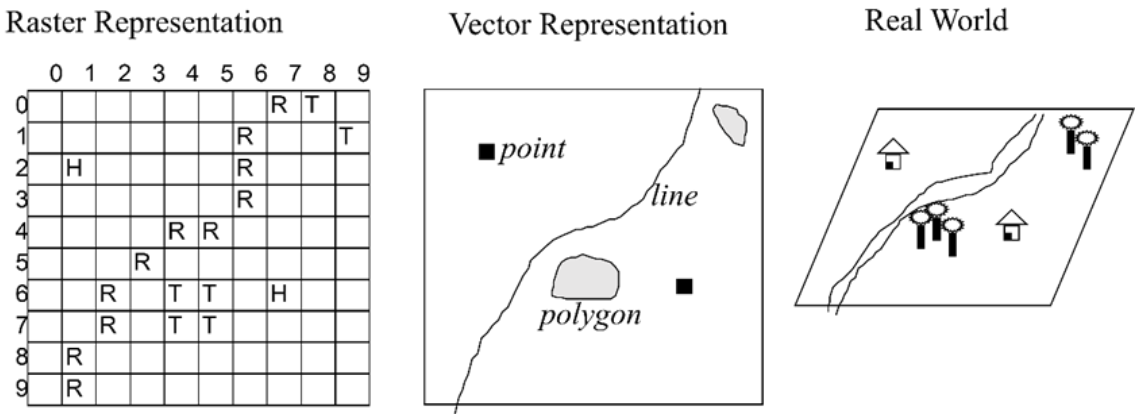
- Raster data
- Vector data



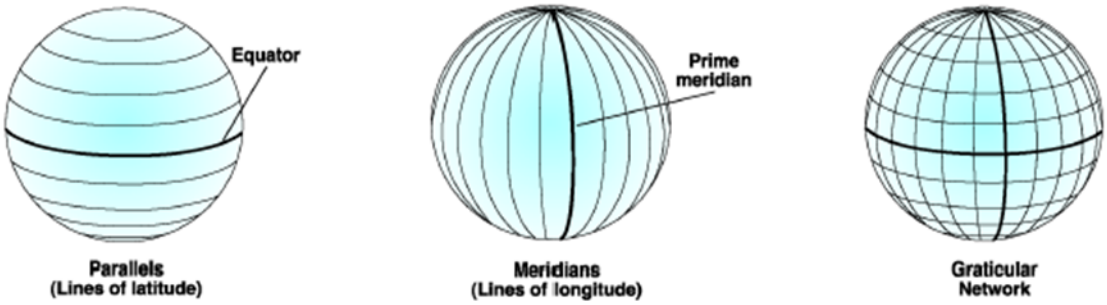
Raster: Raster data is in pixel form where the entire study area is divided into regular grids of cells in a particular format and sequence, i.e., row by row from the top-left corner. Each cell has a certain value. Every location in the study area corresponds to a cell in raster format, and a layer is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

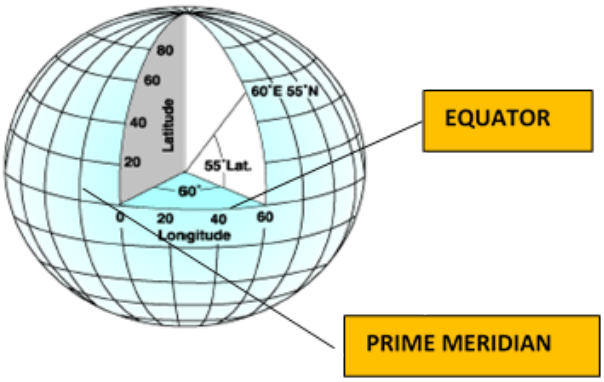
Vector: In the vector data model, every feature is represented in the form of a point, line, and polygon (Fig. 2). For instance, wells are represented by a point, rivers by a line, and lakes represented by a polygon with x and y locations. There is only one x and y location for a point; a line feature 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)

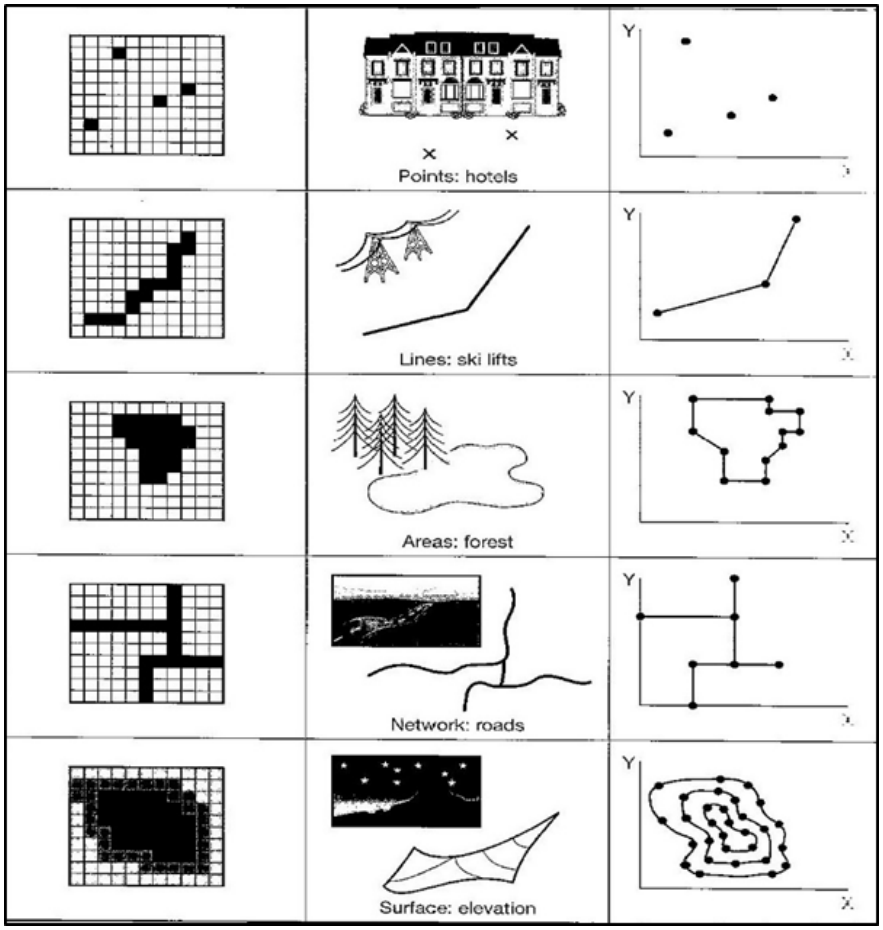
Understanding the real-world features with respect to GIS entities.

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

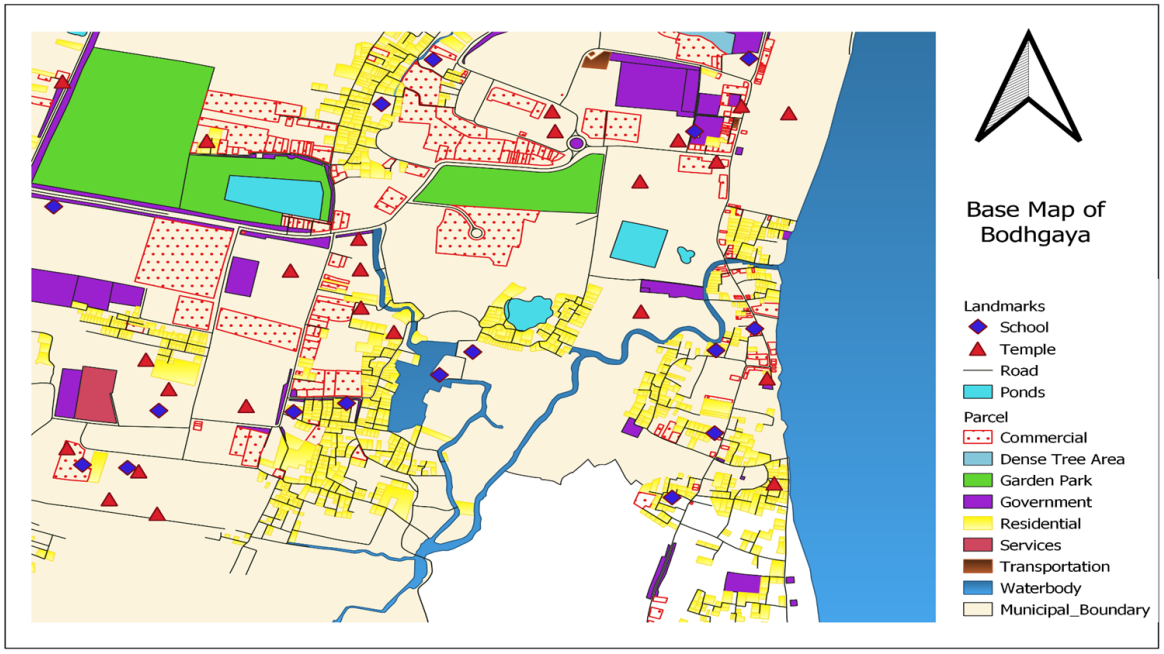
For example

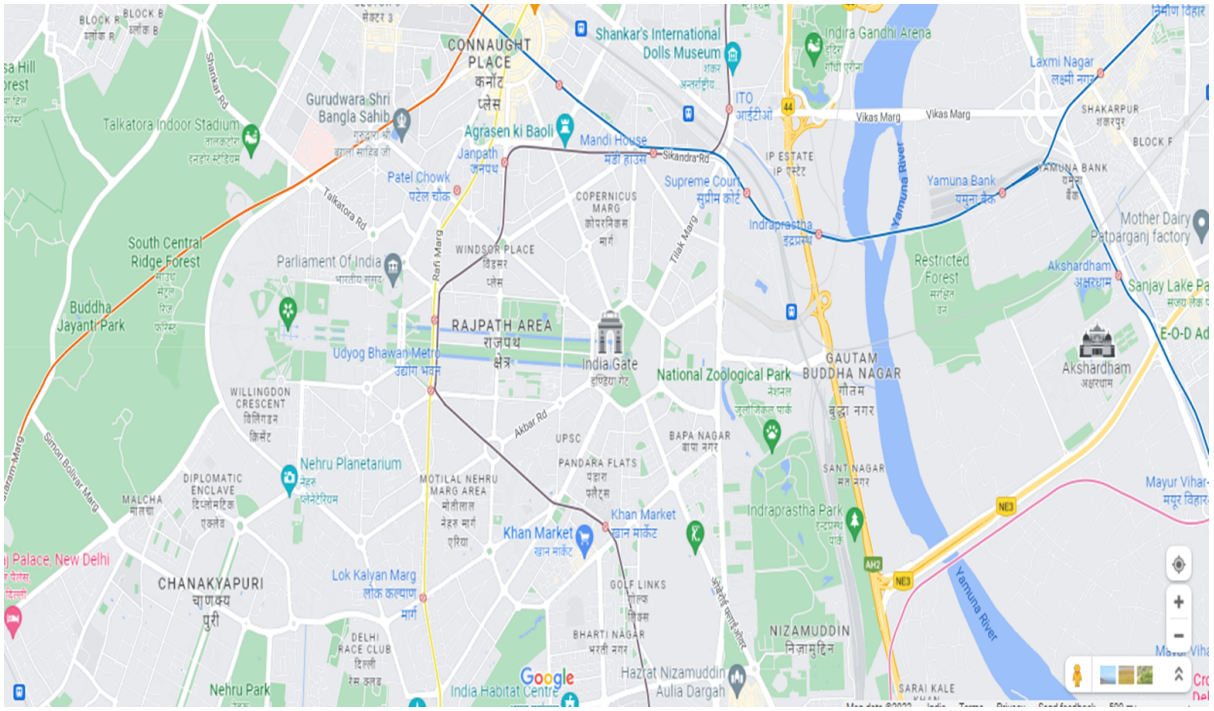
Electric Pole or a location of a school can be a point on the map
School Building area boundary can be represented as a Polygon on the map
Roads and Railways can be represented as line on the map

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).

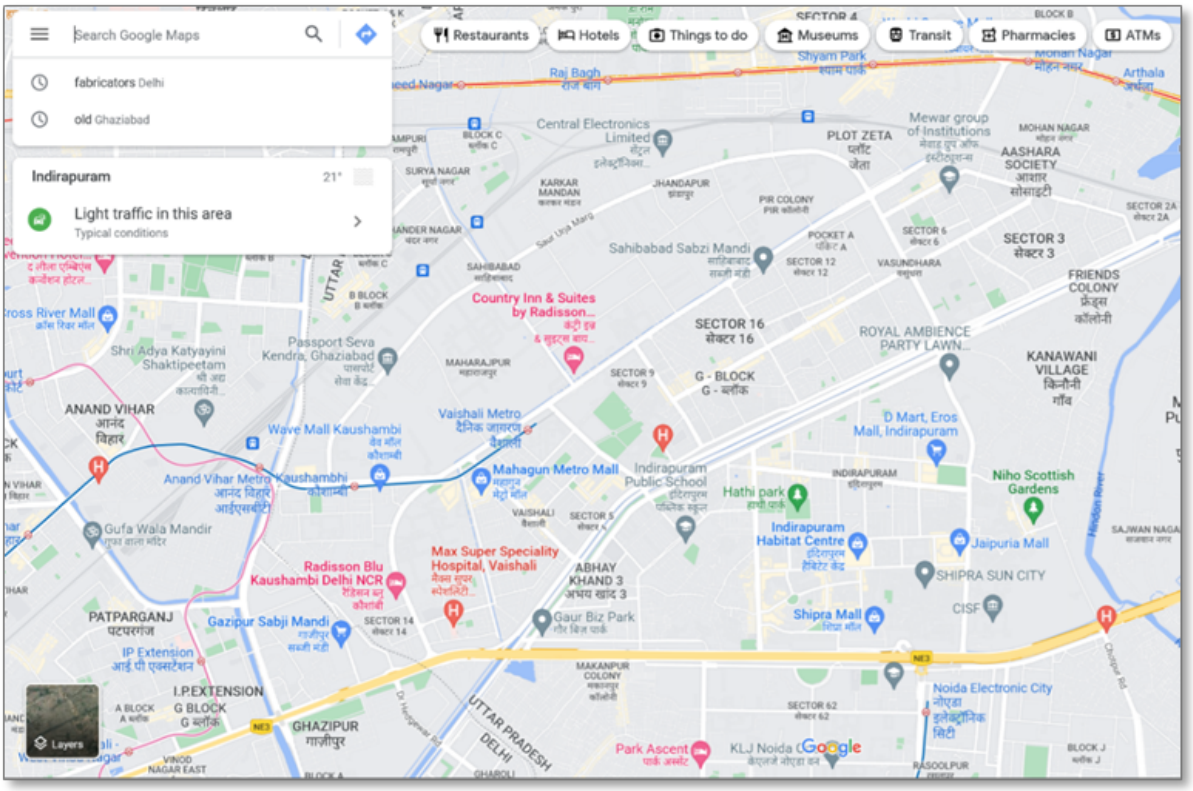


Figure 2: Google Maps interface

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).

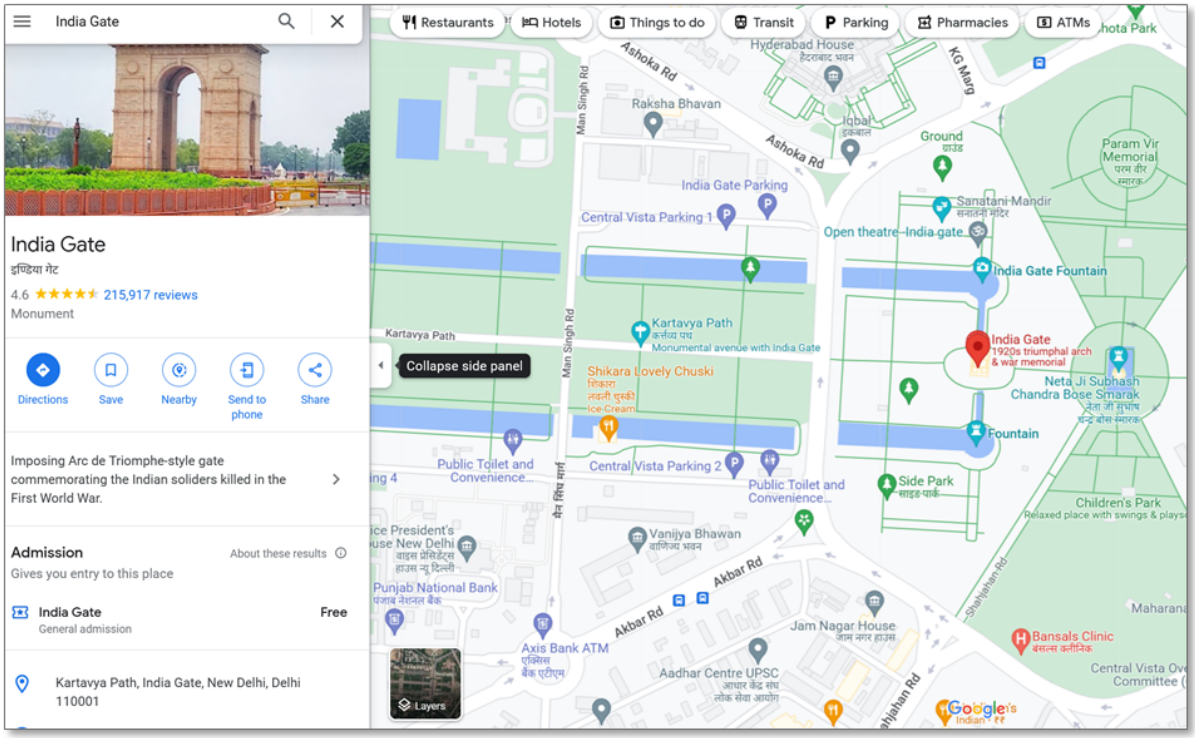


Figure 3: India Gate on Google Maps

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).

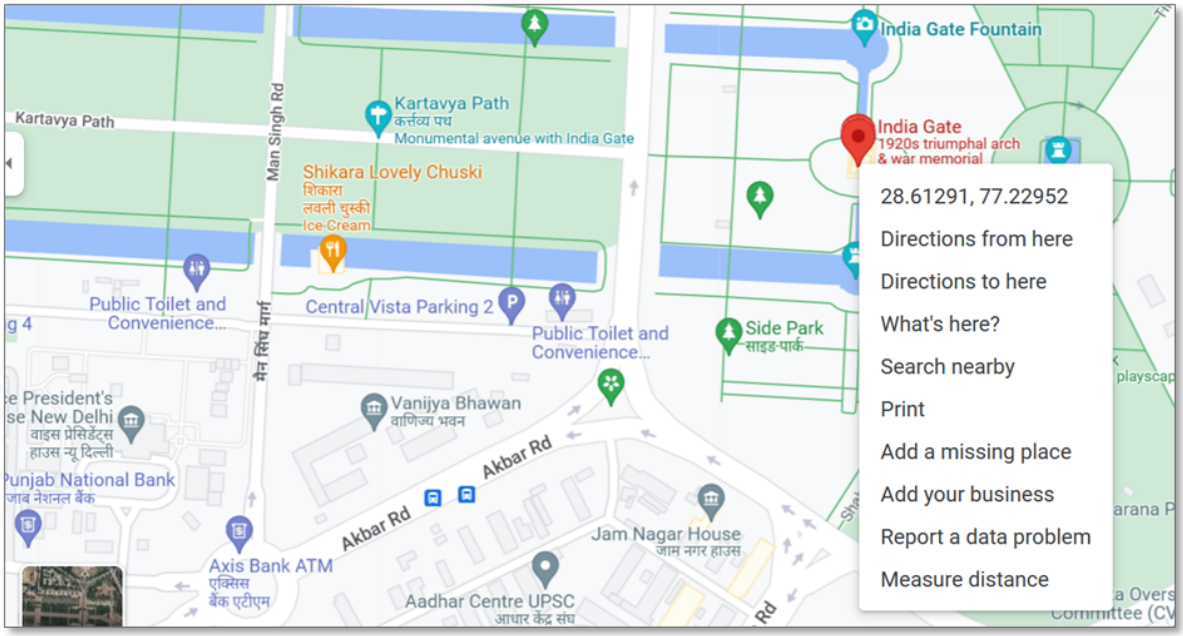


Figure 4: Latitude and Longitude of India Gate

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).

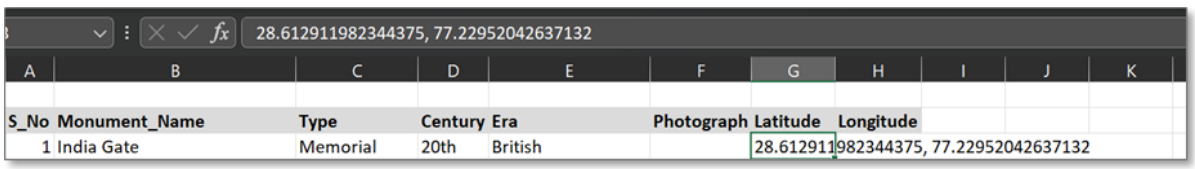


Figure 6: Editing the latitude value

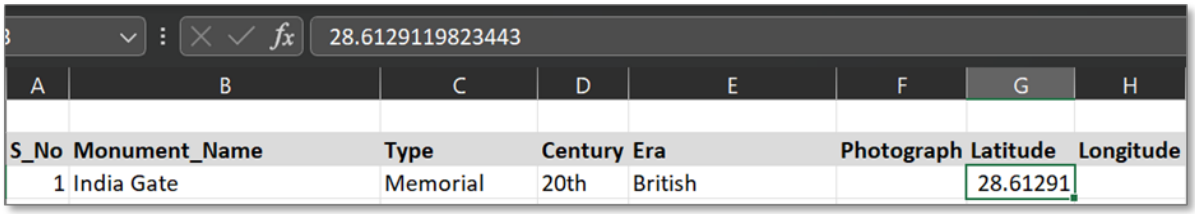


Figure 7: Latitude value after editing

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.

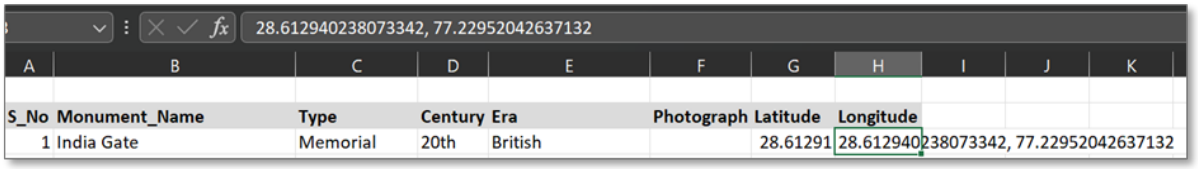


Figure 8: Editing the longitude value

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

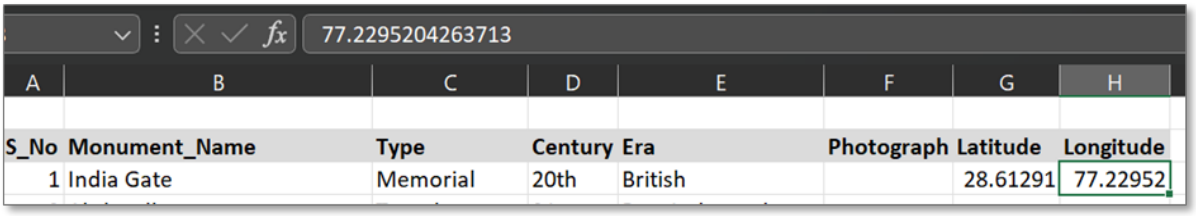


Figure 9: Latitude and longitude values for India Gate

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.

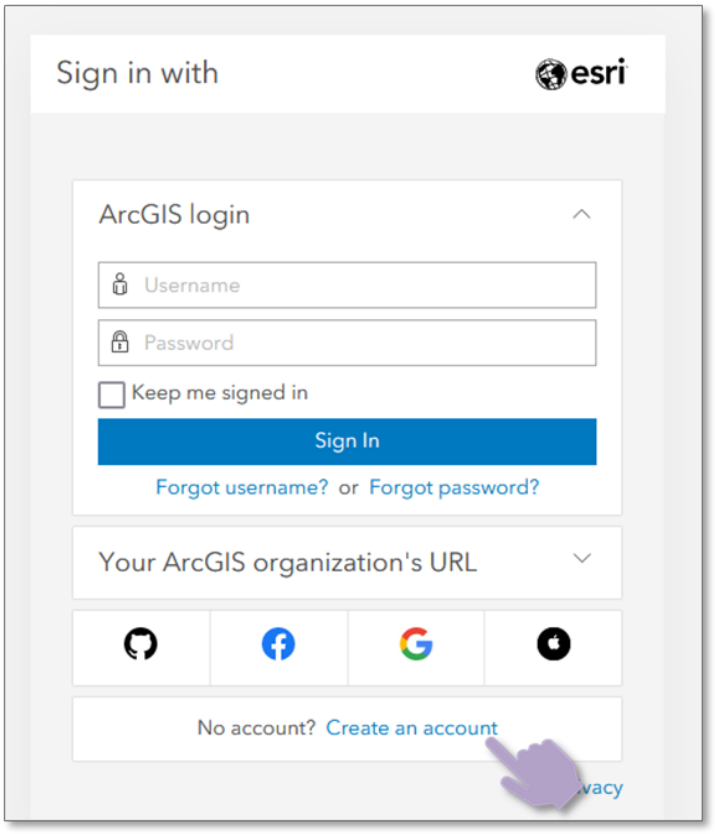


Figure 3

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.

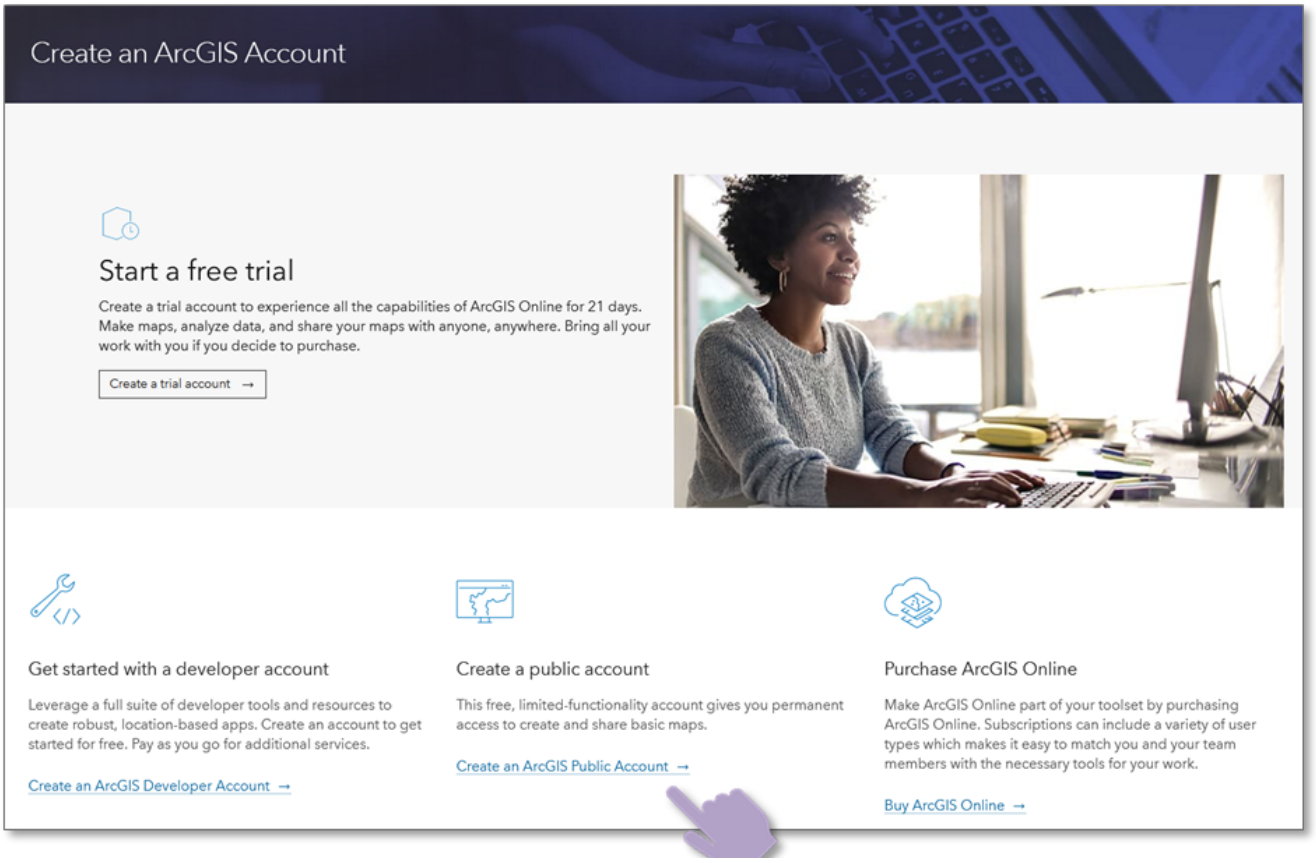


Figure 4: Creating an ArcGIS public account

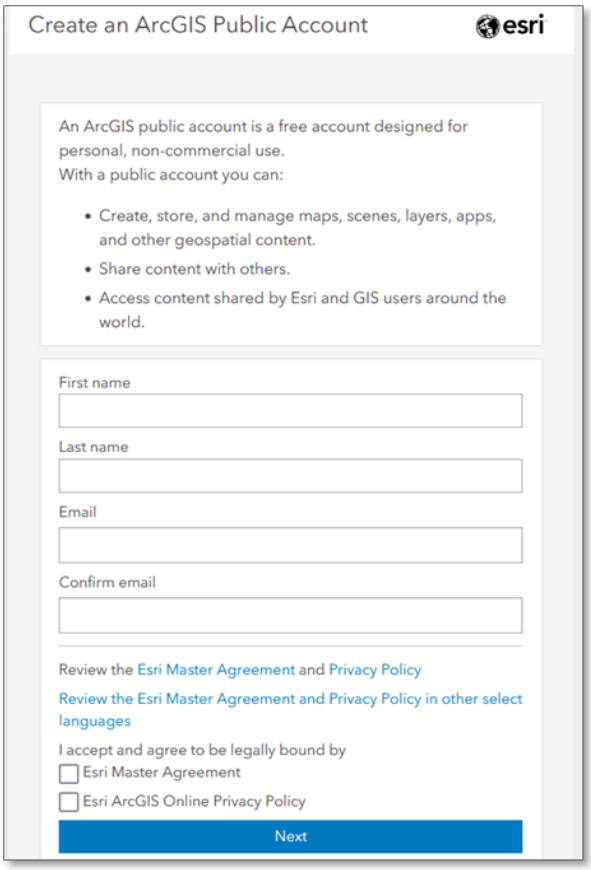


Figure 5: Personal details for creating the public account

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

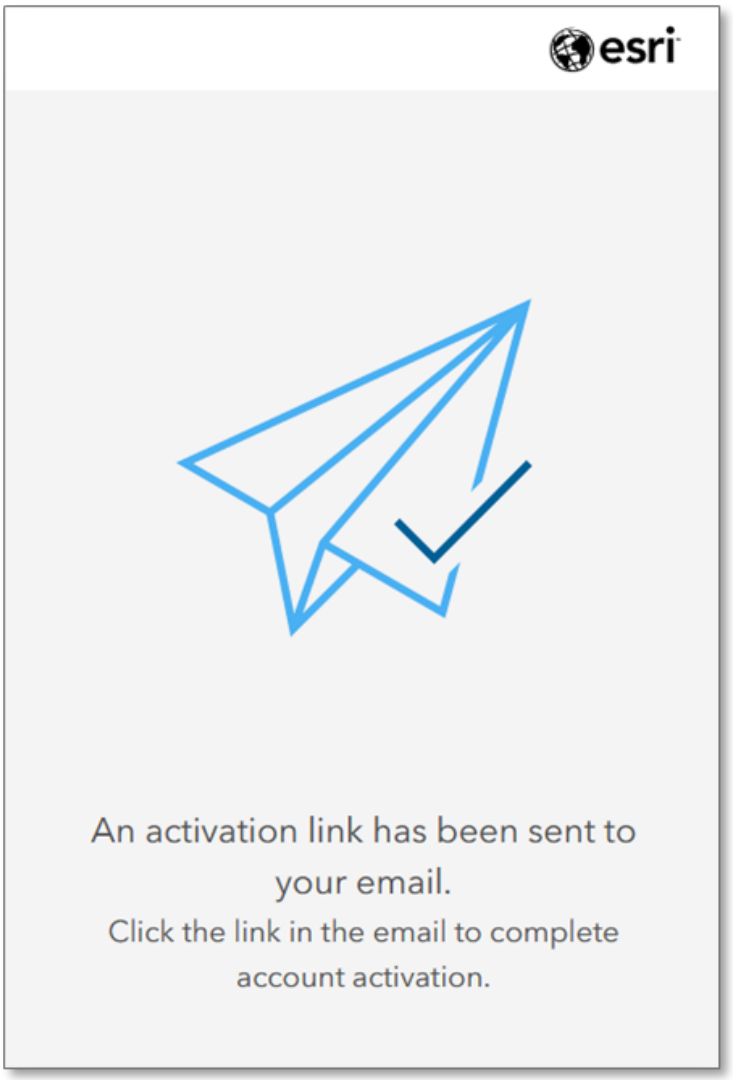
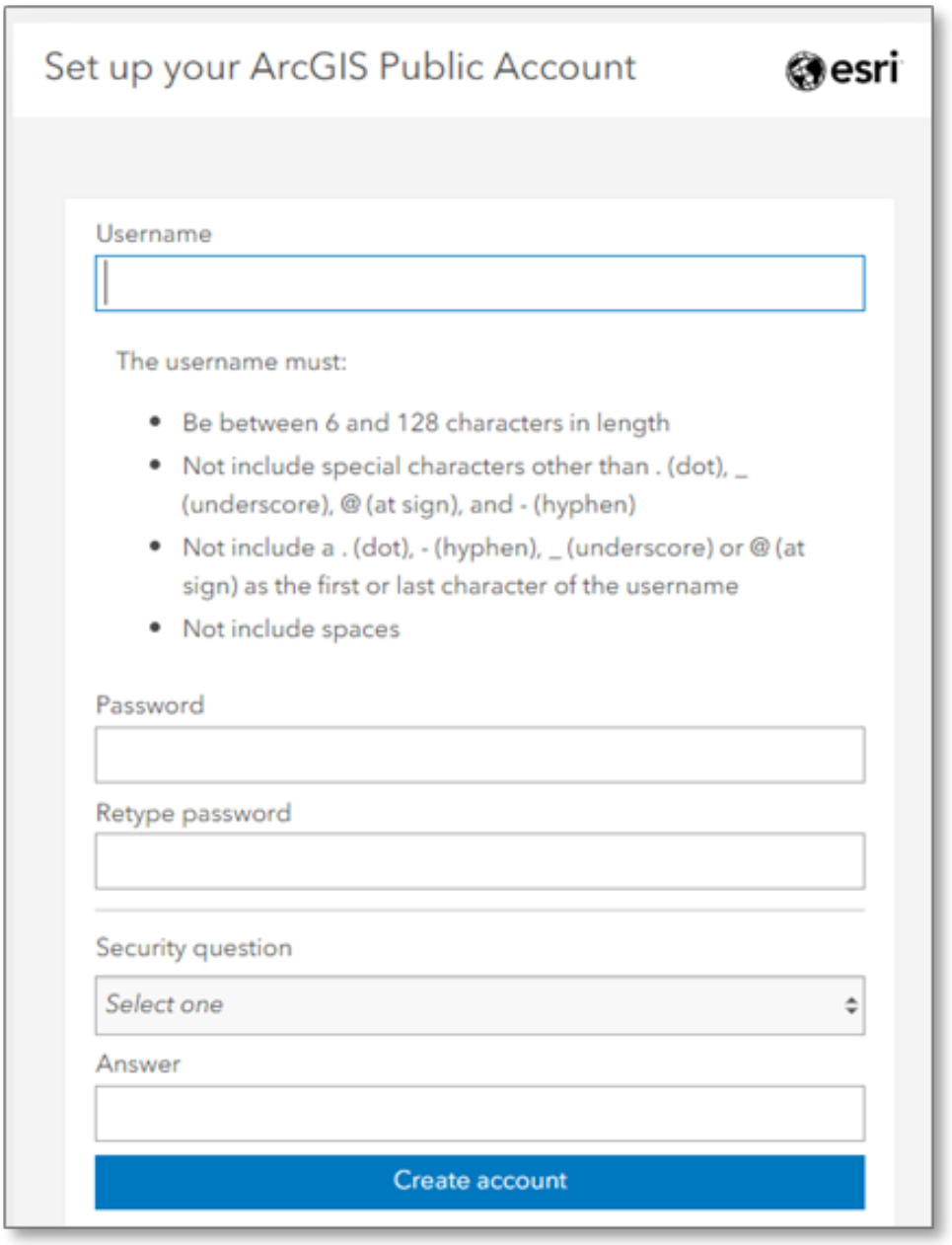


Figure 6: Receipt of public account activation link

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.

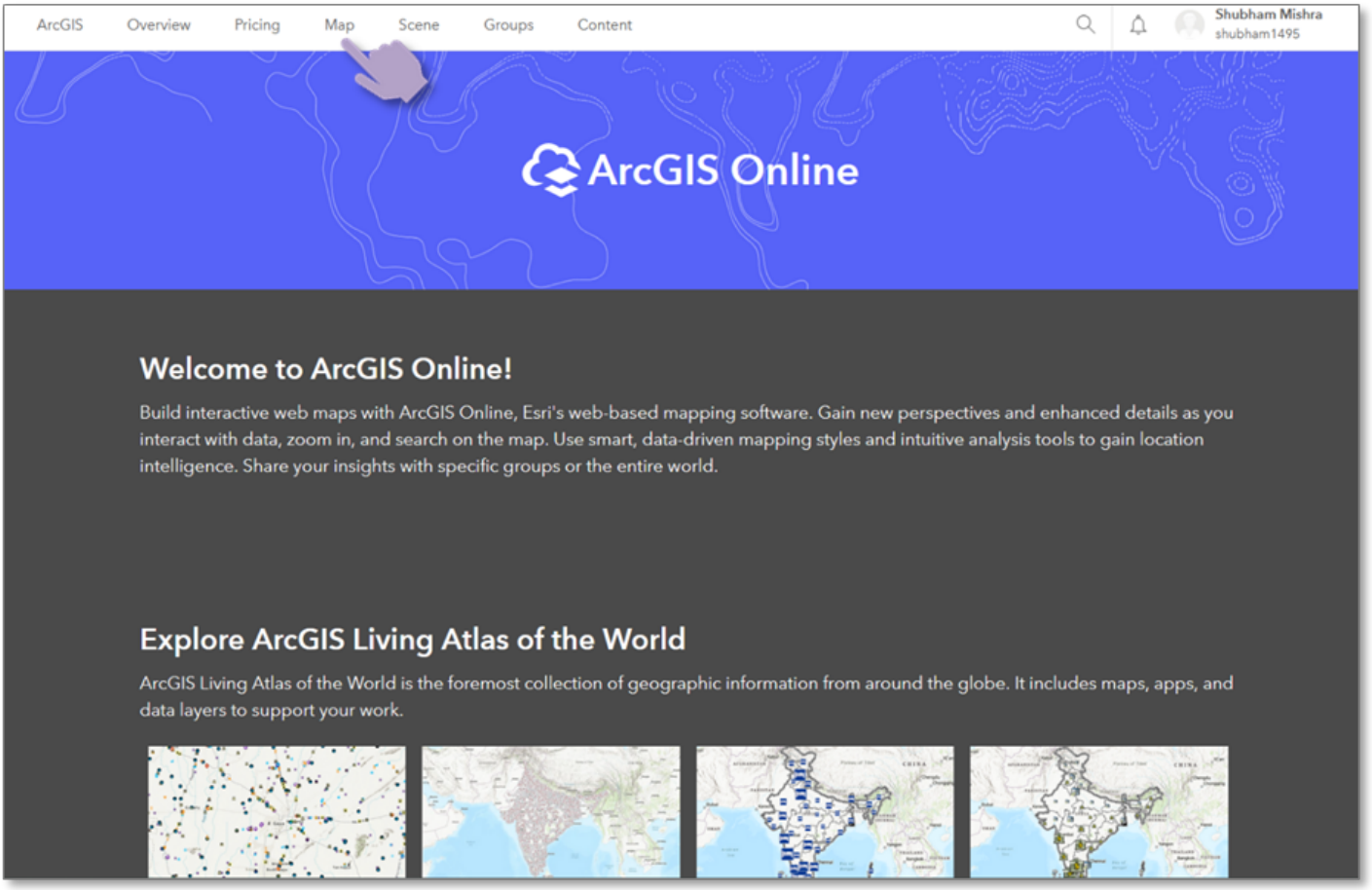


Figure 1: Tabs on the homepage

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.

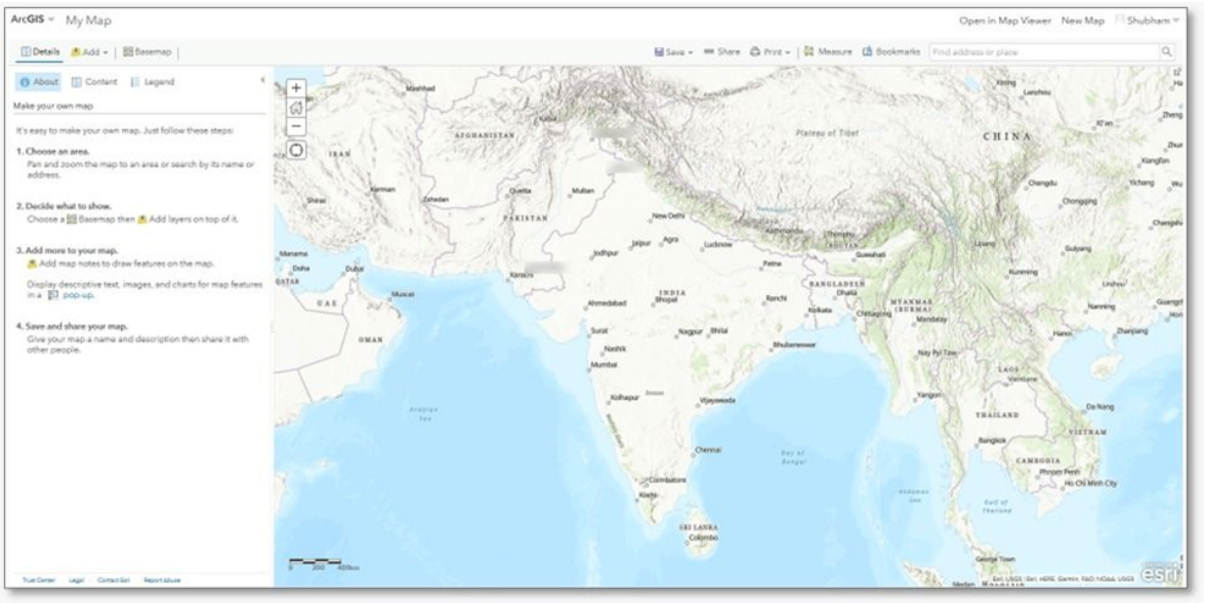


Figure 2: The My Map page

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.

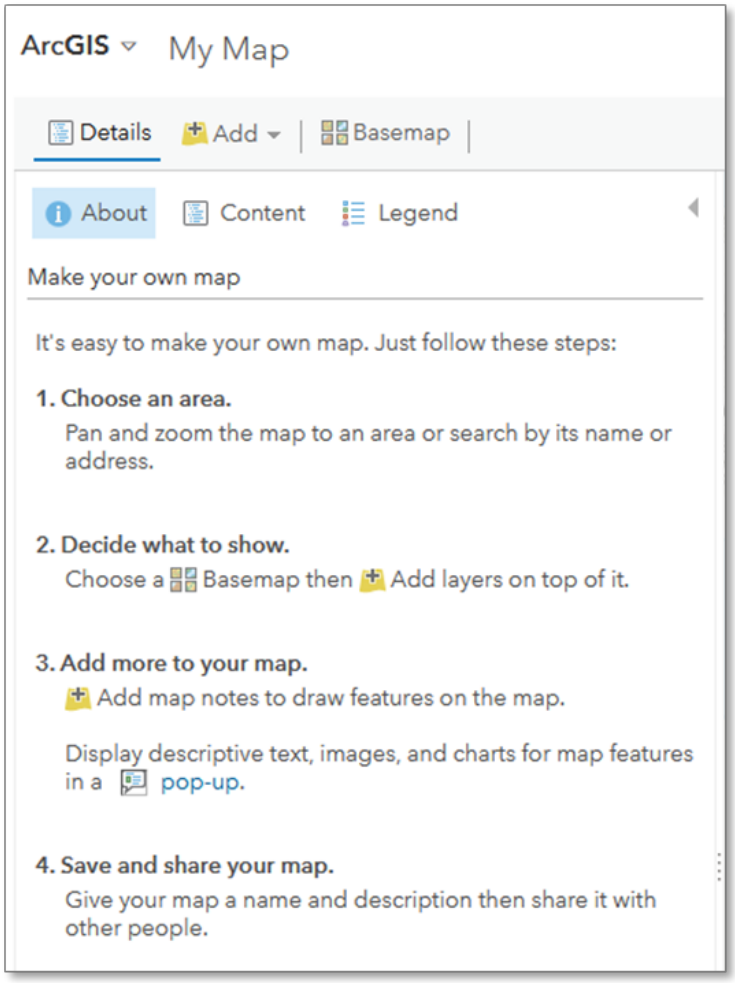


Figure 3: The 'About' tab in My Map

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.

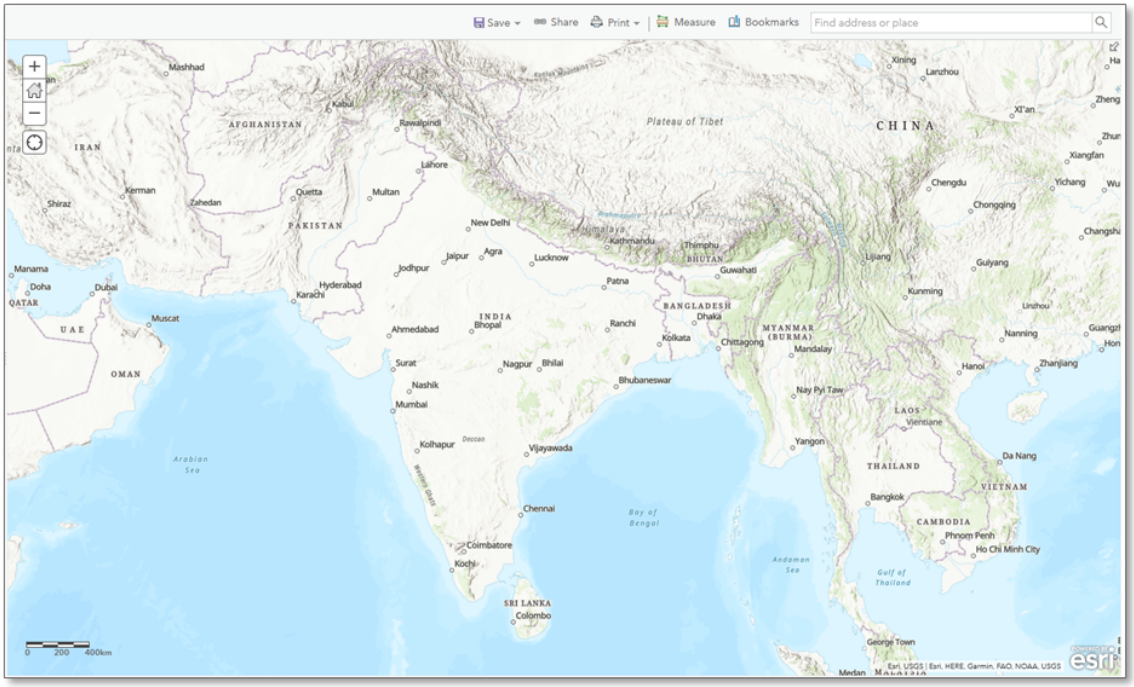


Figure 4: The default map in the Map Window

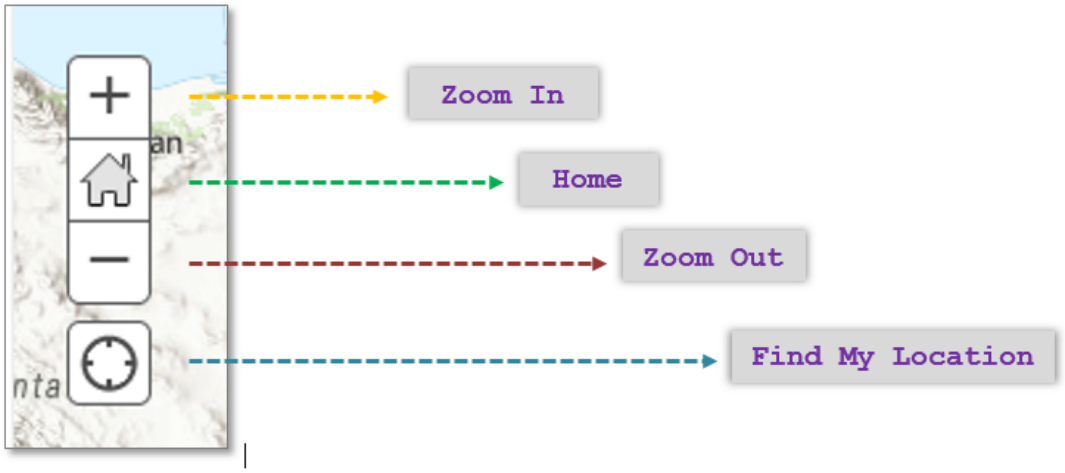


Figure 5: Navigation tools

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.

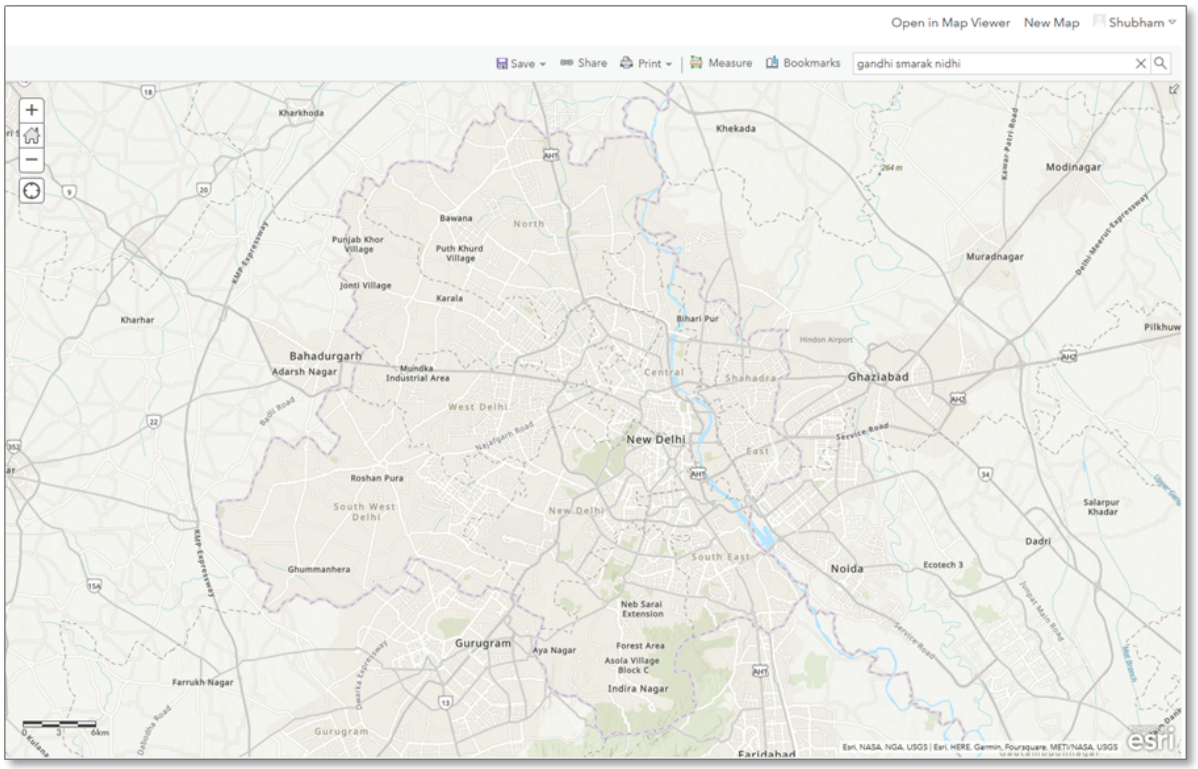


Figure 6: A zoomed in view of Delhi

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

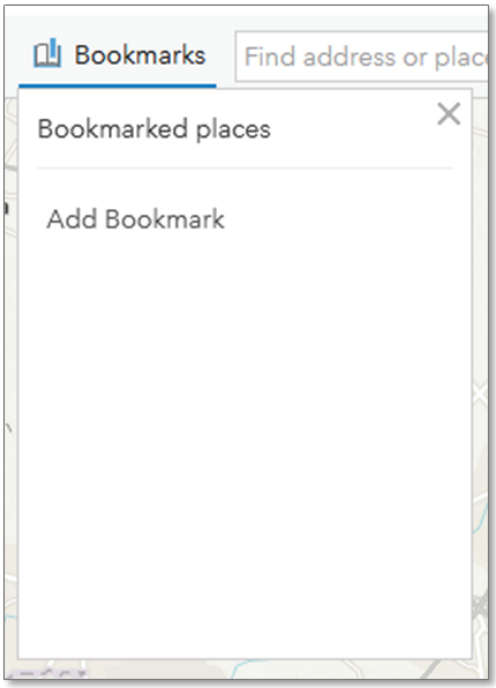


Figure 7: Add a Bookmark

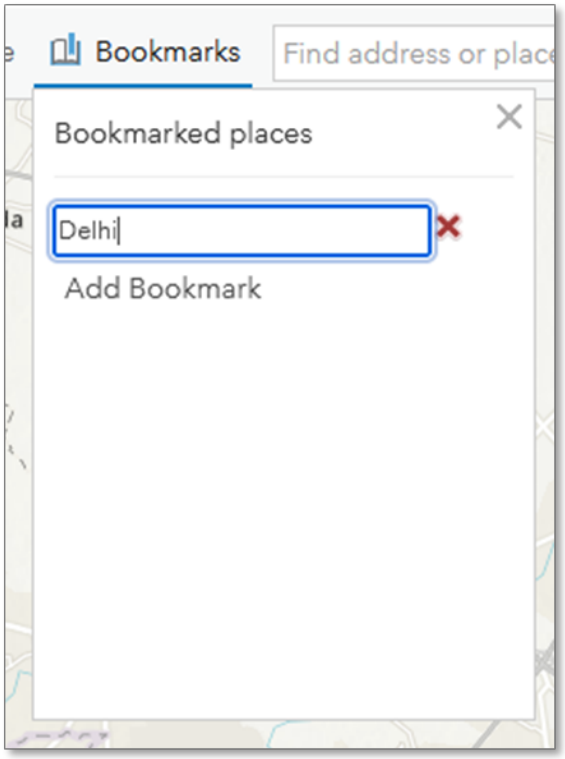


Figure 8: Bookmark added

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.

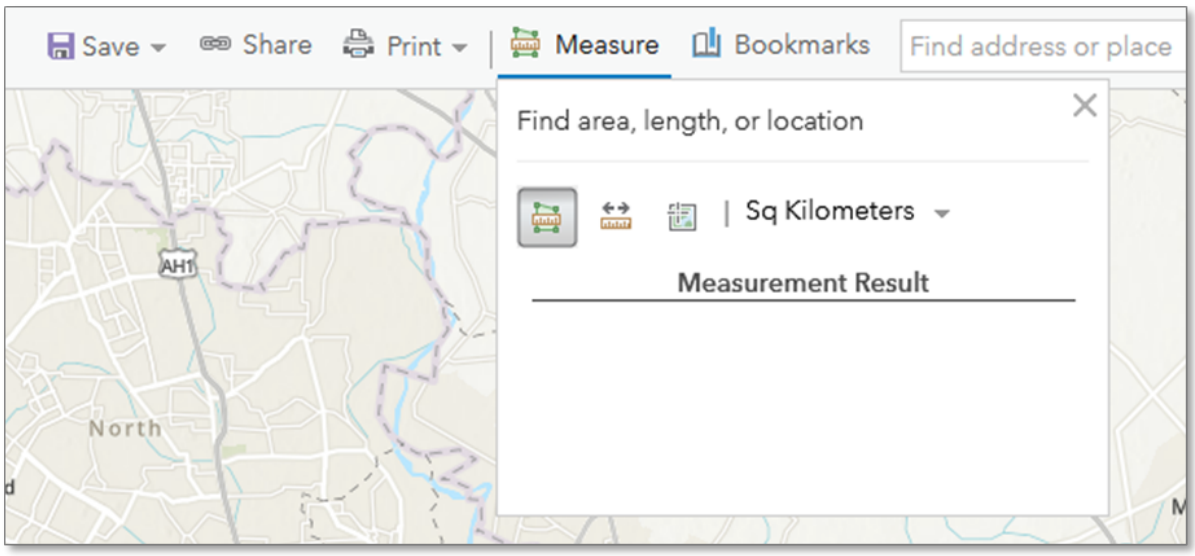


Figure 9: Measurement tools

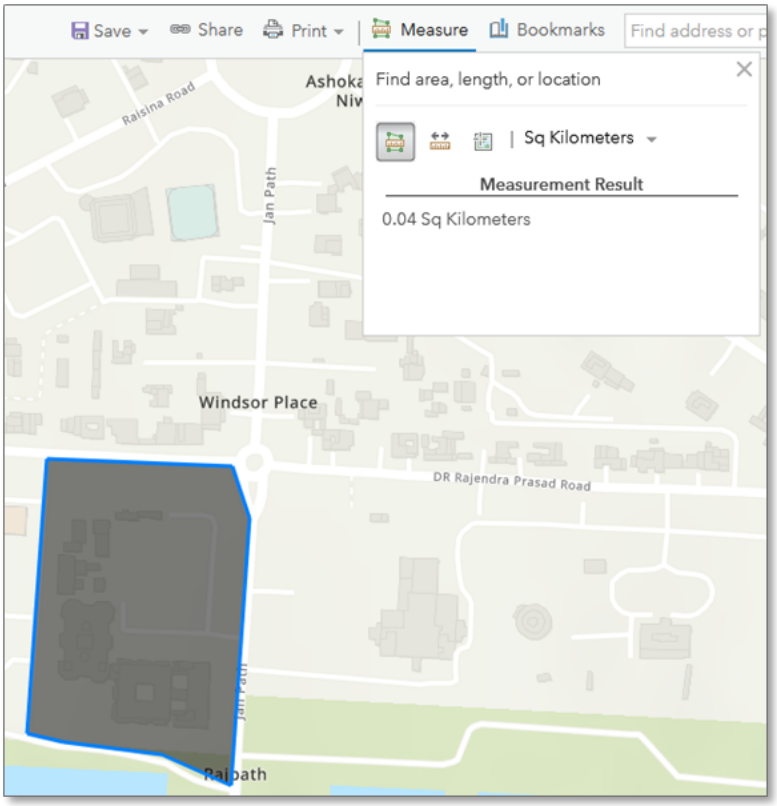


Figure 10: Measuring areas

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

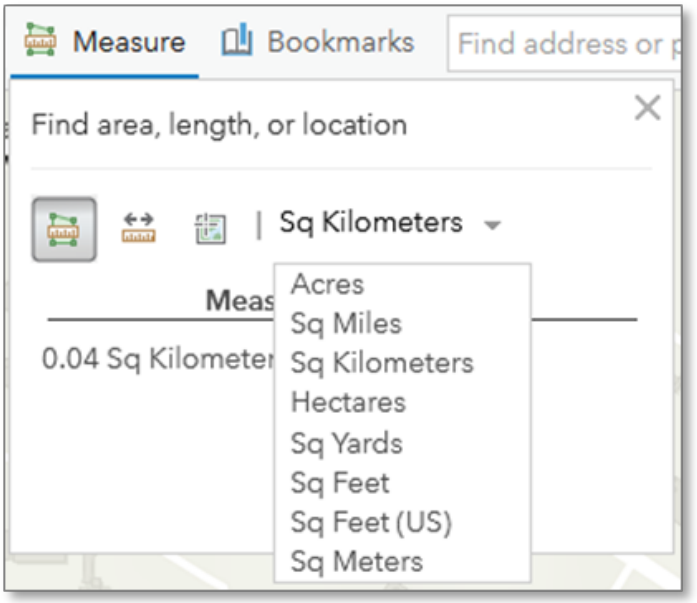


Figure 11: Unit selector

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'.

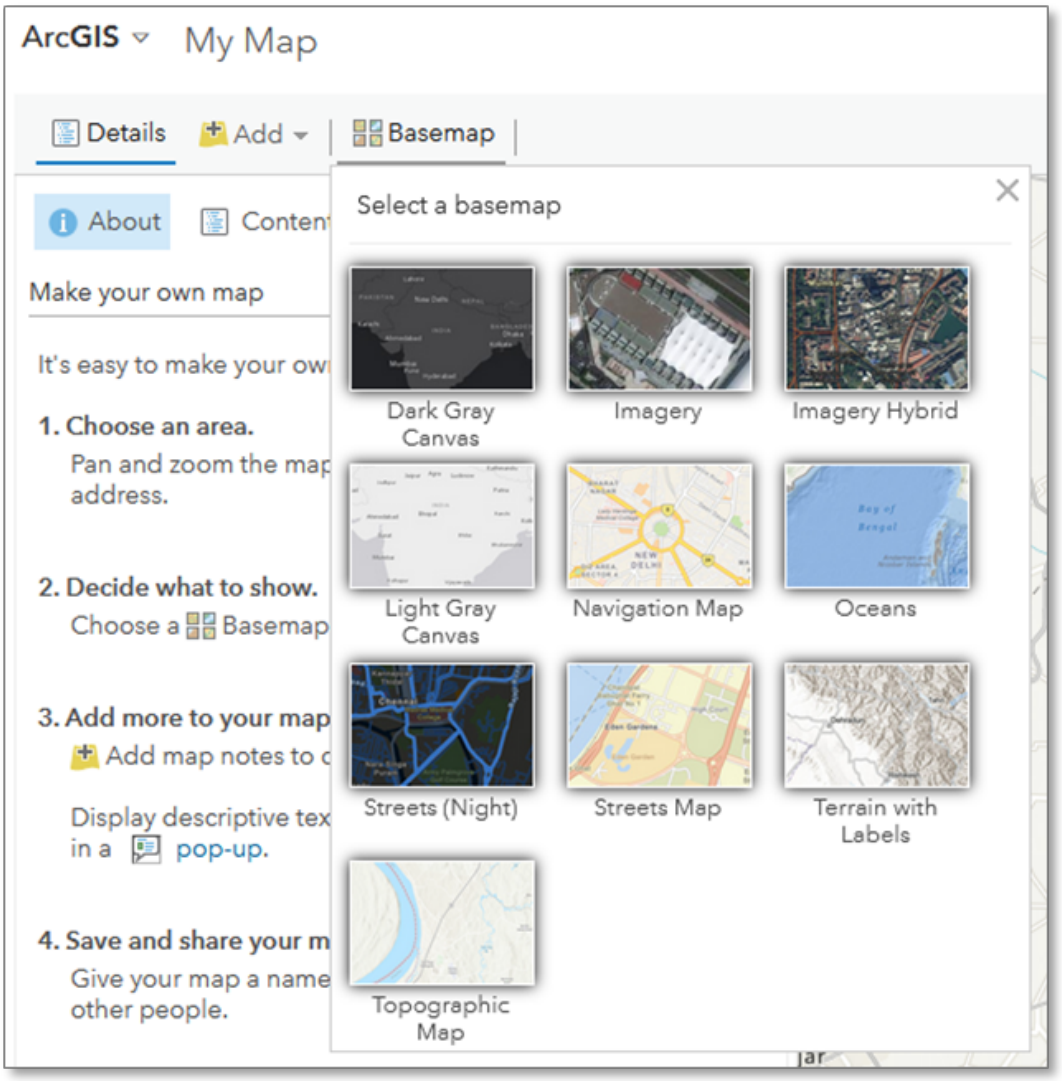


Figure 12: The Basemap Gallery

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

Figure 13: 'Streetmap' basemap for Delhi

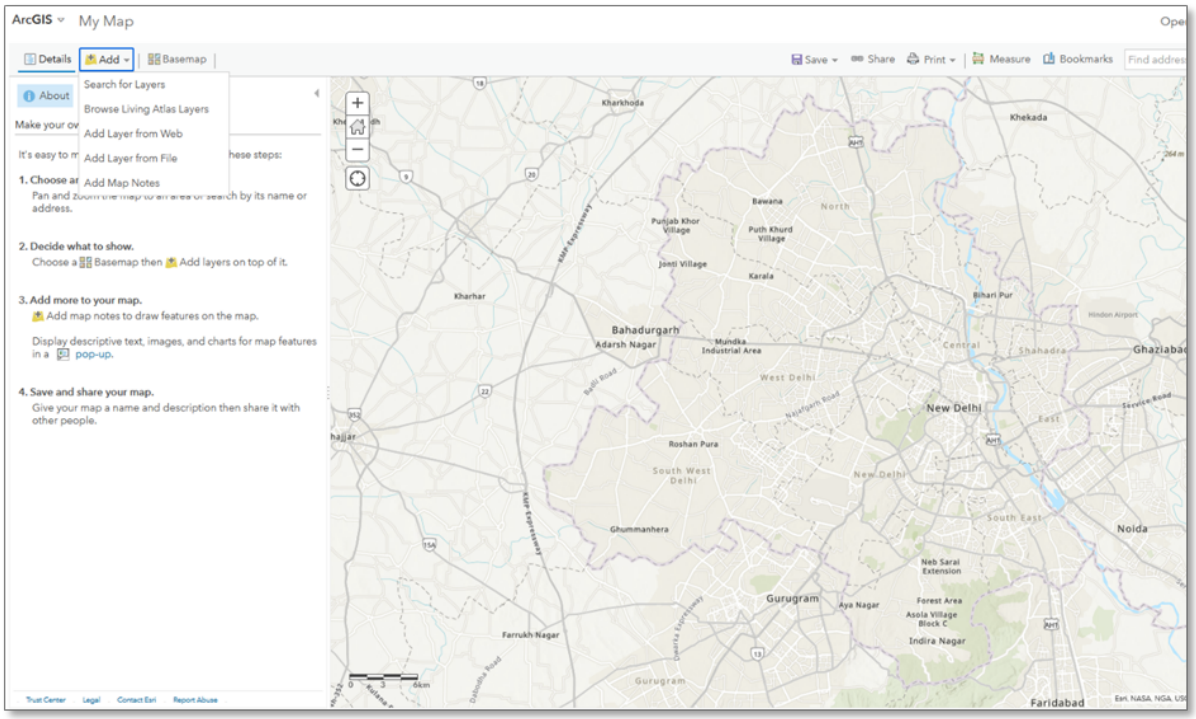
Select other basemaps too from the gallery and examine their pros and cons for your map.
Now that we are somewhat familiar with the interface of ArcGIS Online, we can start plotting and visualizing some geo-spatial data.

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.

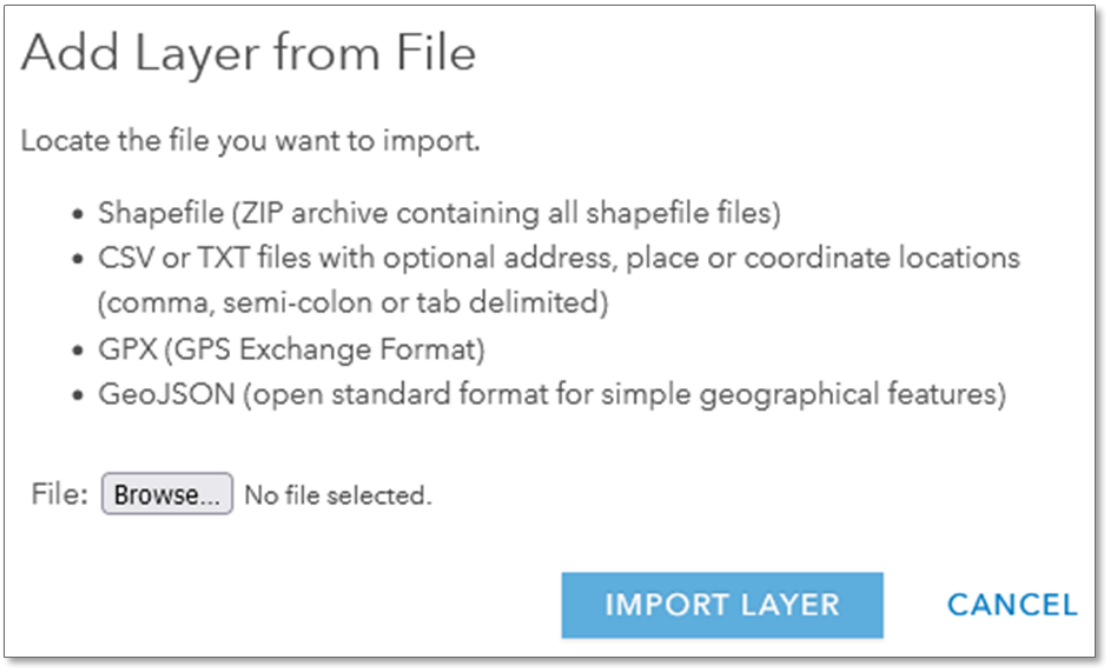


Figure 2: Import Layer dialogue box

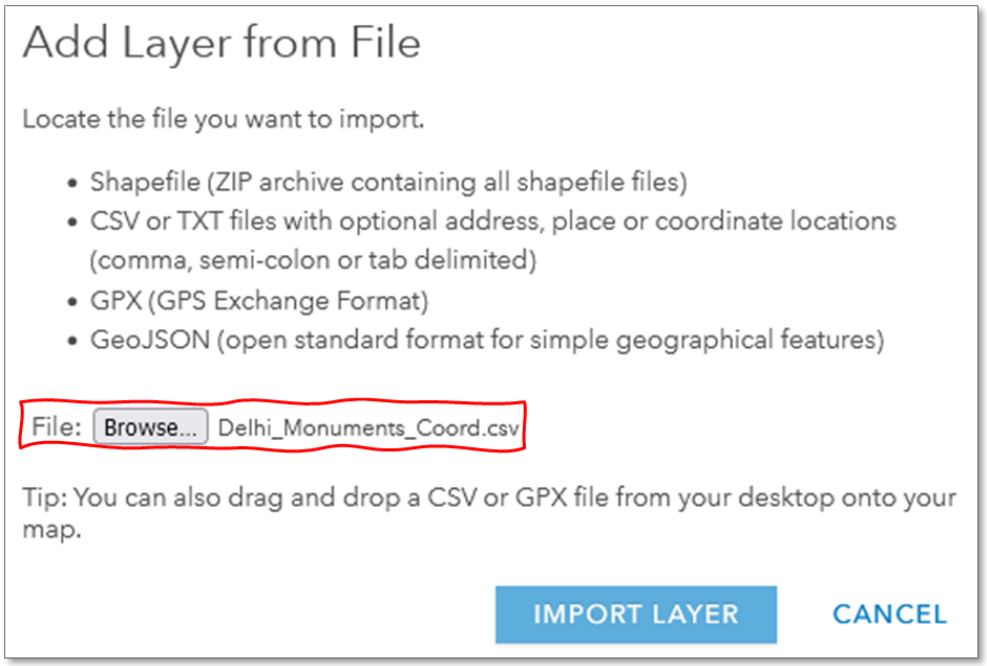


Figure 3: CSV file ready to import

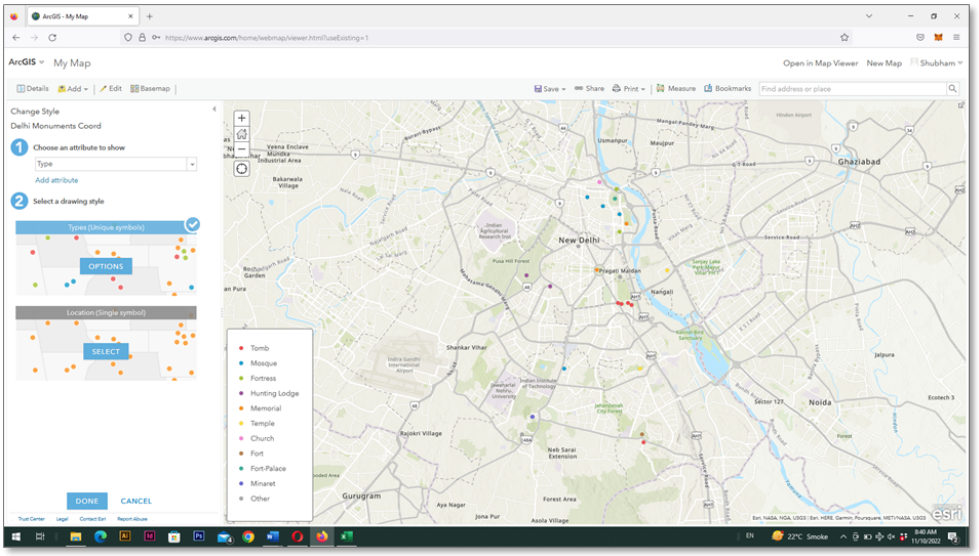


Figure 4: Monuments of Delhi plotted in ArcGIS Online

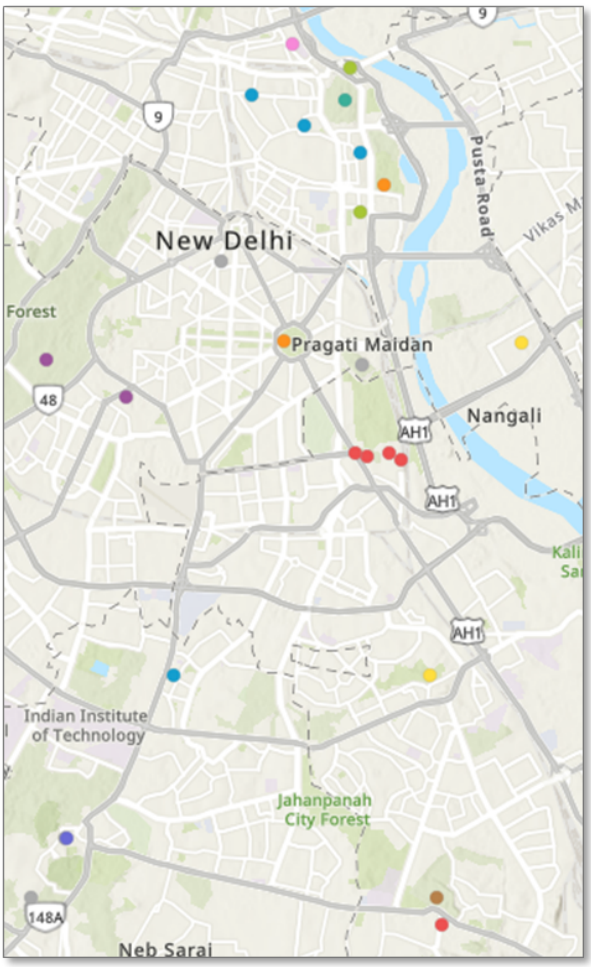


Figure 5: Zoomed in view of Delhi monuments

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.

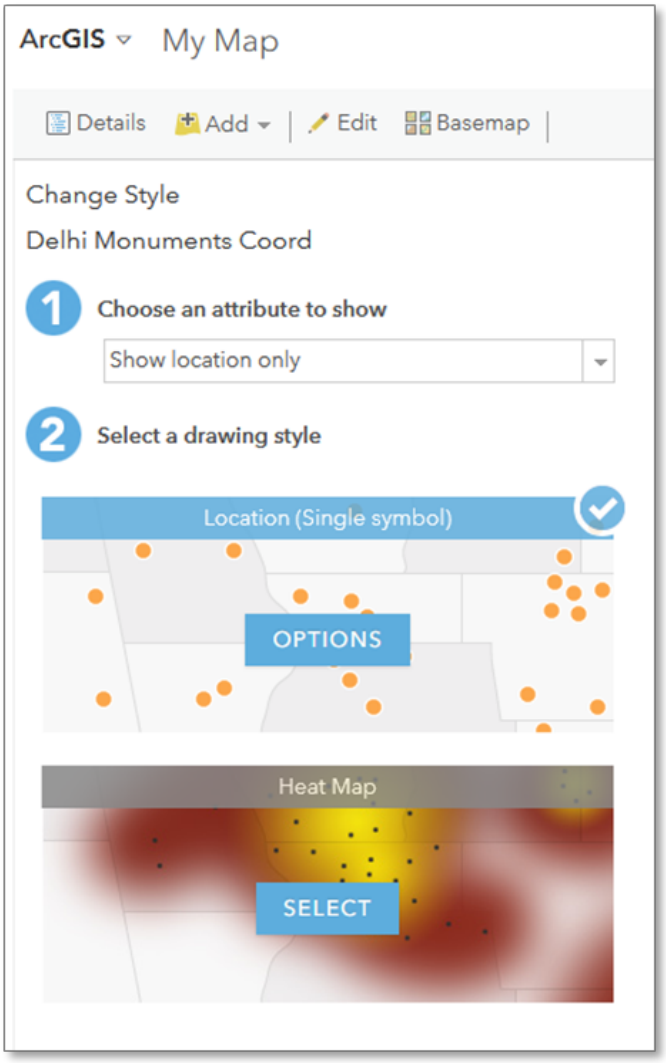


Figure 7: Showing the monuments by 'Show Location Only'

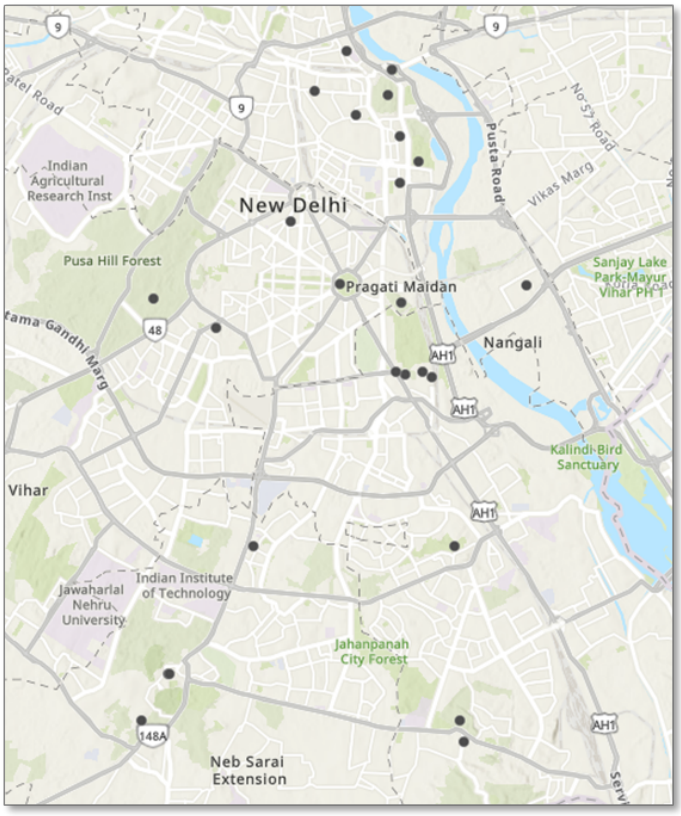


Figure 8: All monuments displayed in a single color and shape

Click Options to experiment with shape and symbol size.

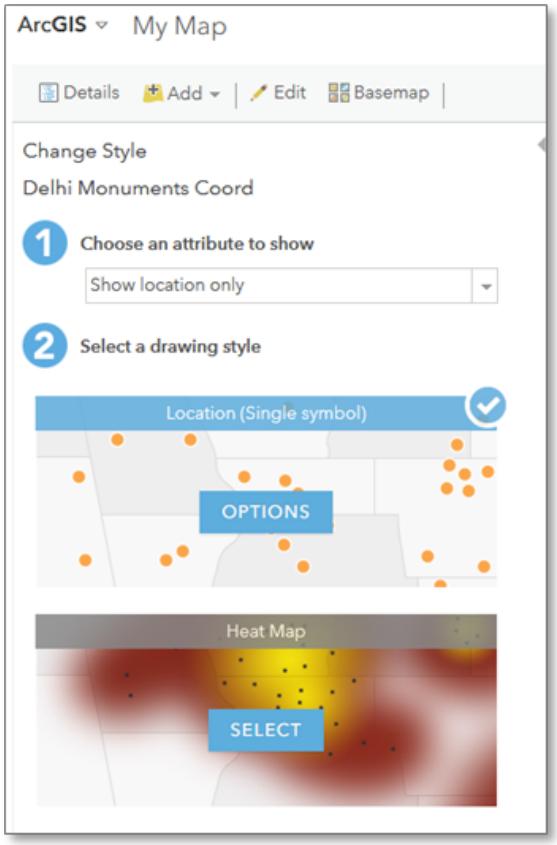


Figure 9: Accessing the options

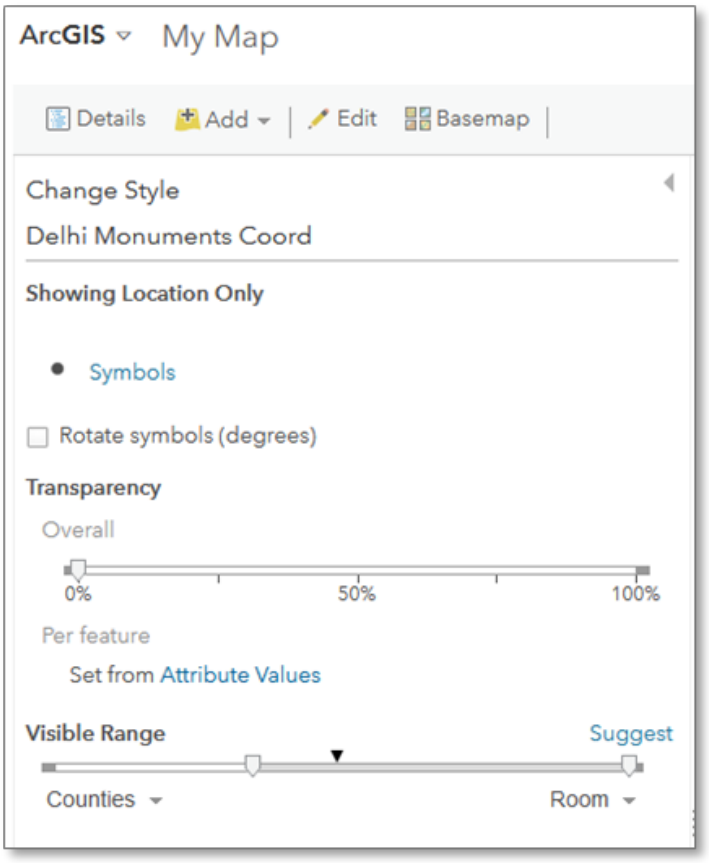


Figure 10: Options for displaying data

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).

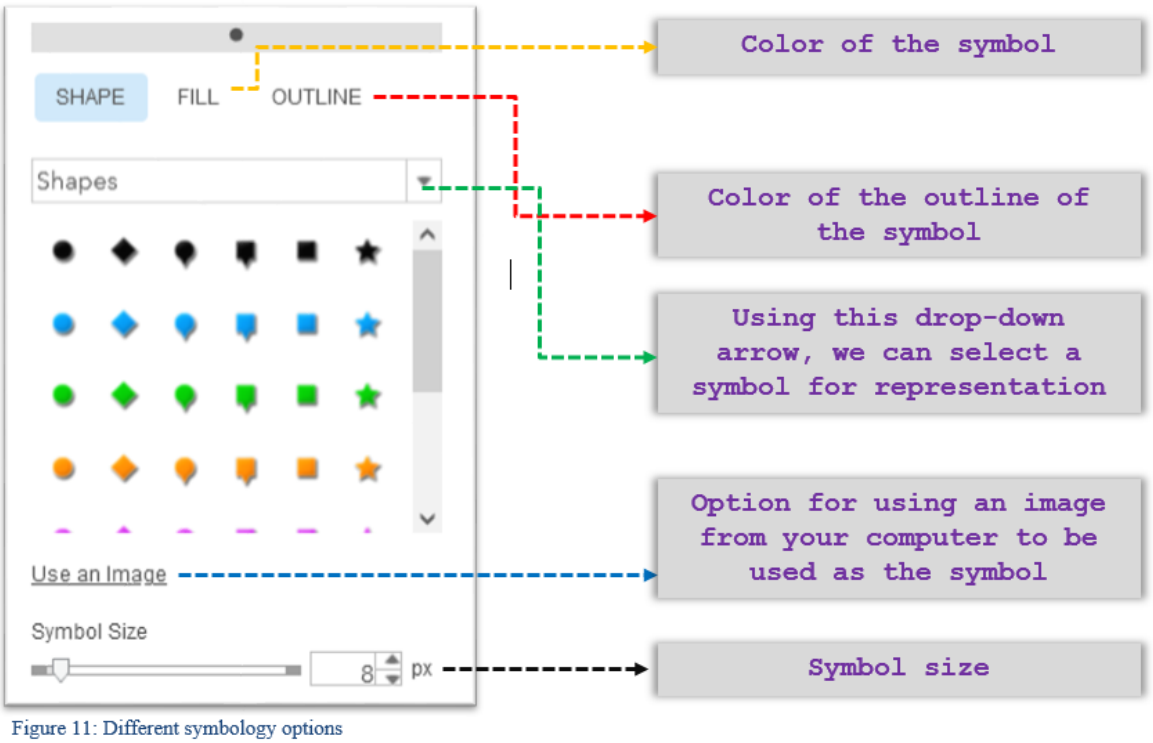


Figure 11: Different symbology options

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).

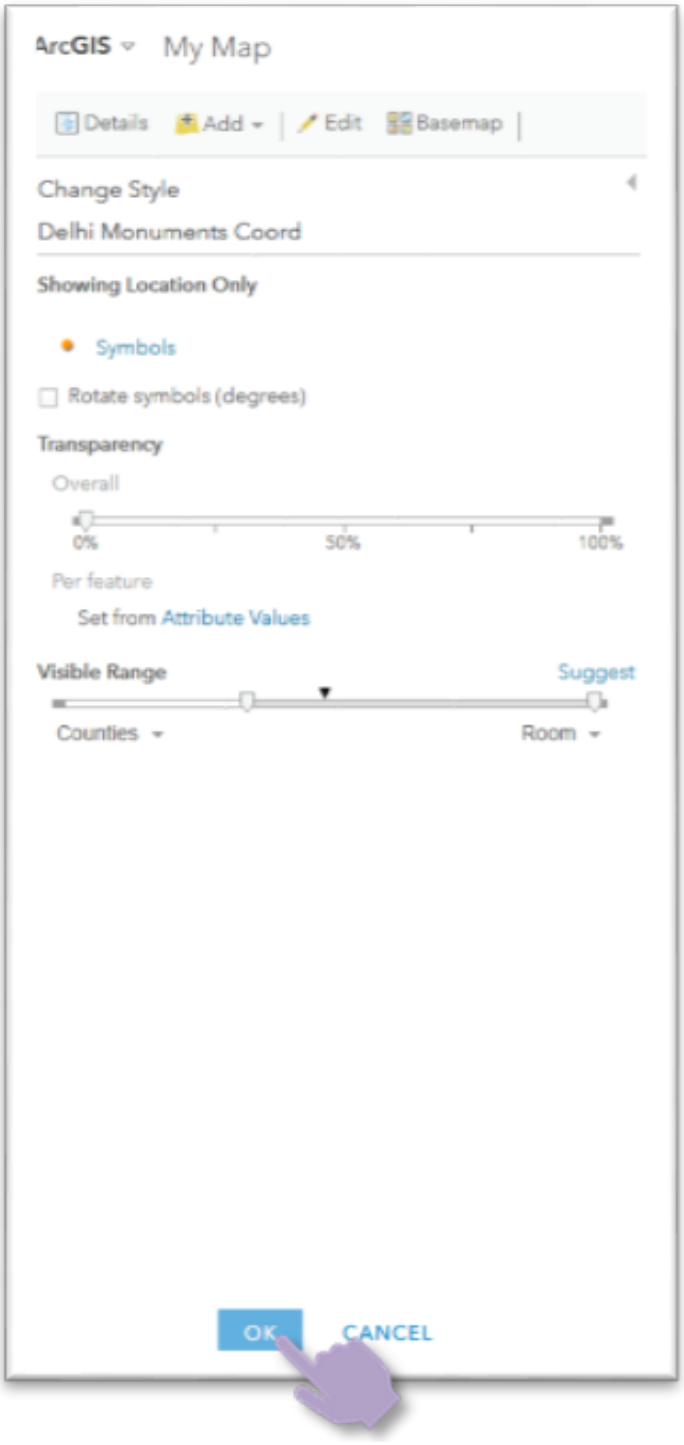


Figure 13: Configuring symbology options

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.

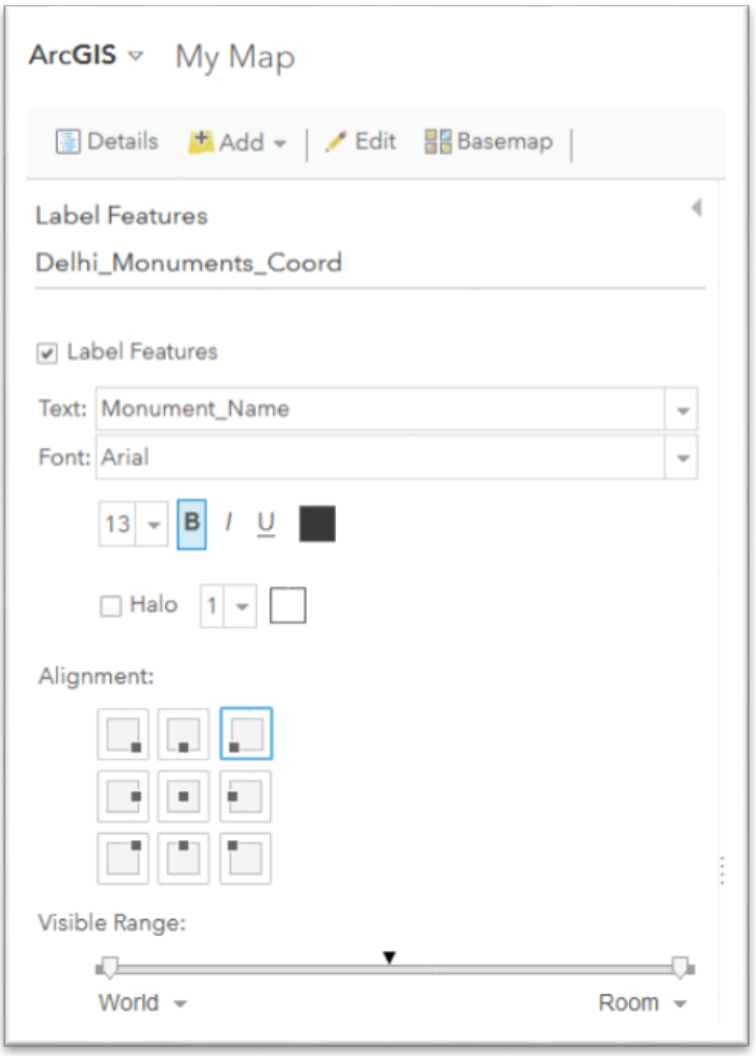


Figure 14: Options for styling labels

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.

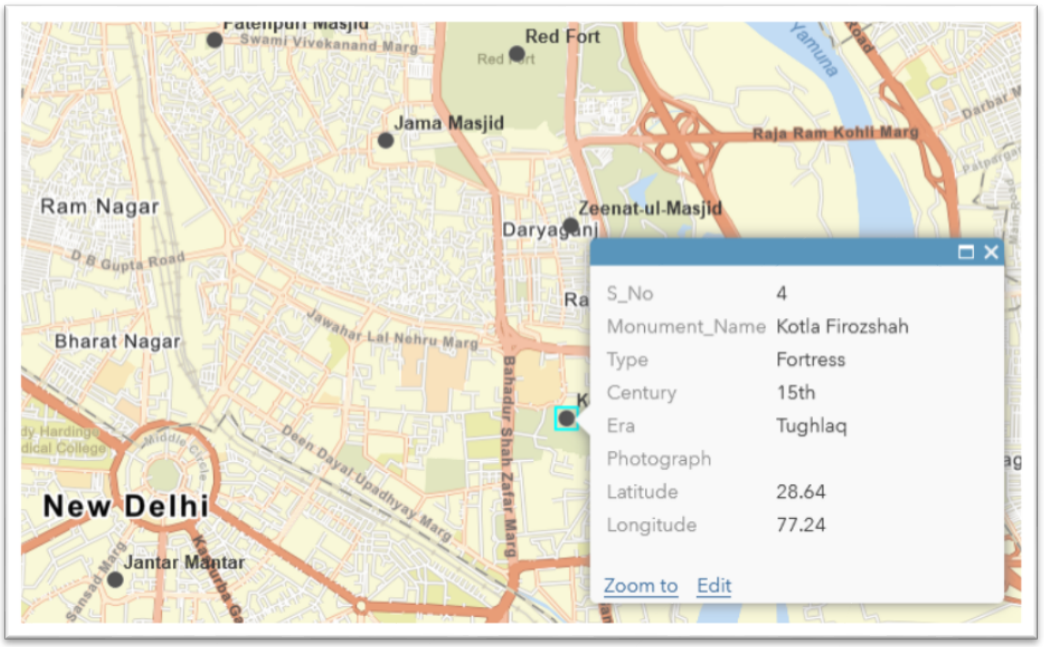


Figure 16: Pop up showing attributes of a monument

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).

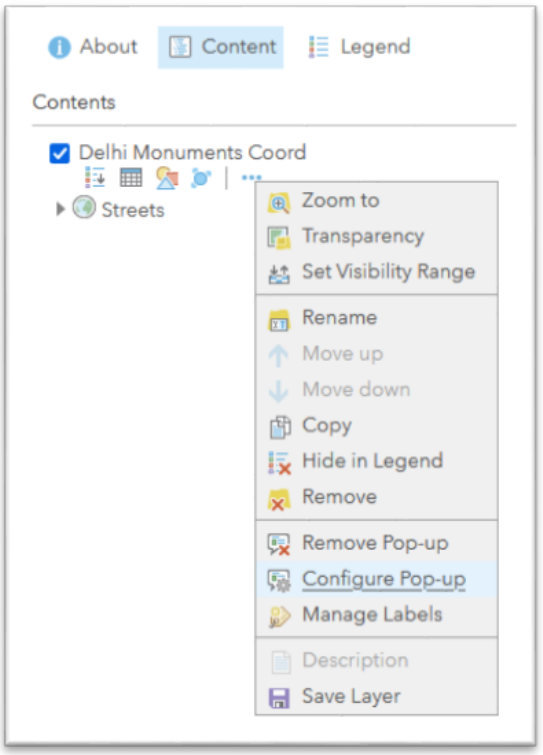


Figure 17: Configuring the pop-up

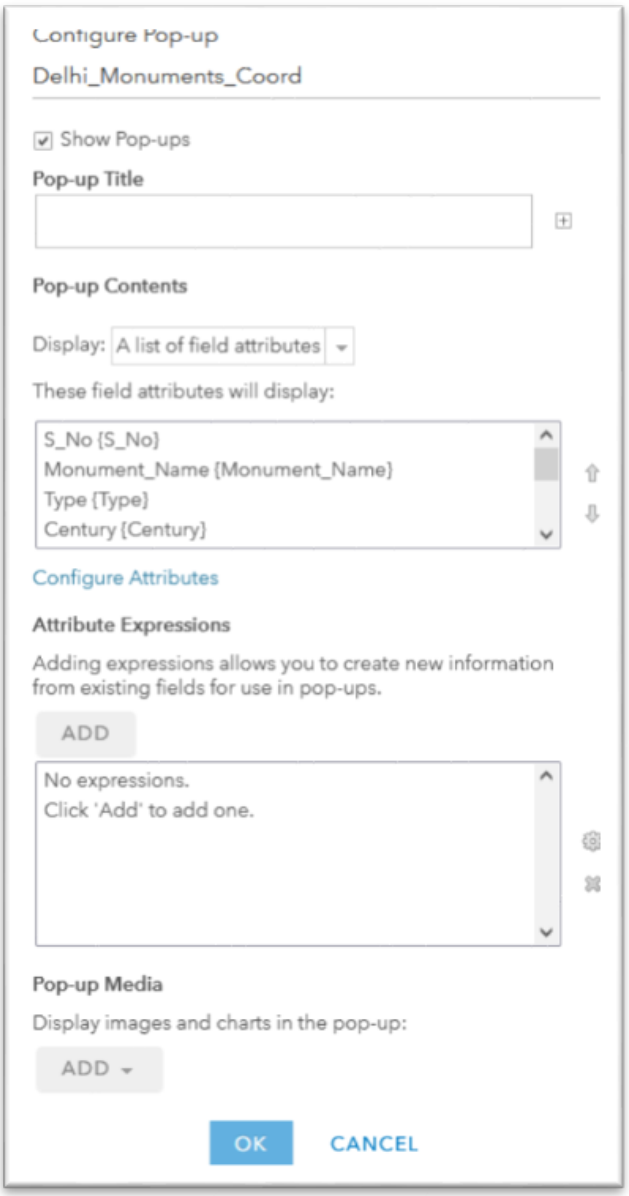


Figure 18: Options for configuring the pop-up

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

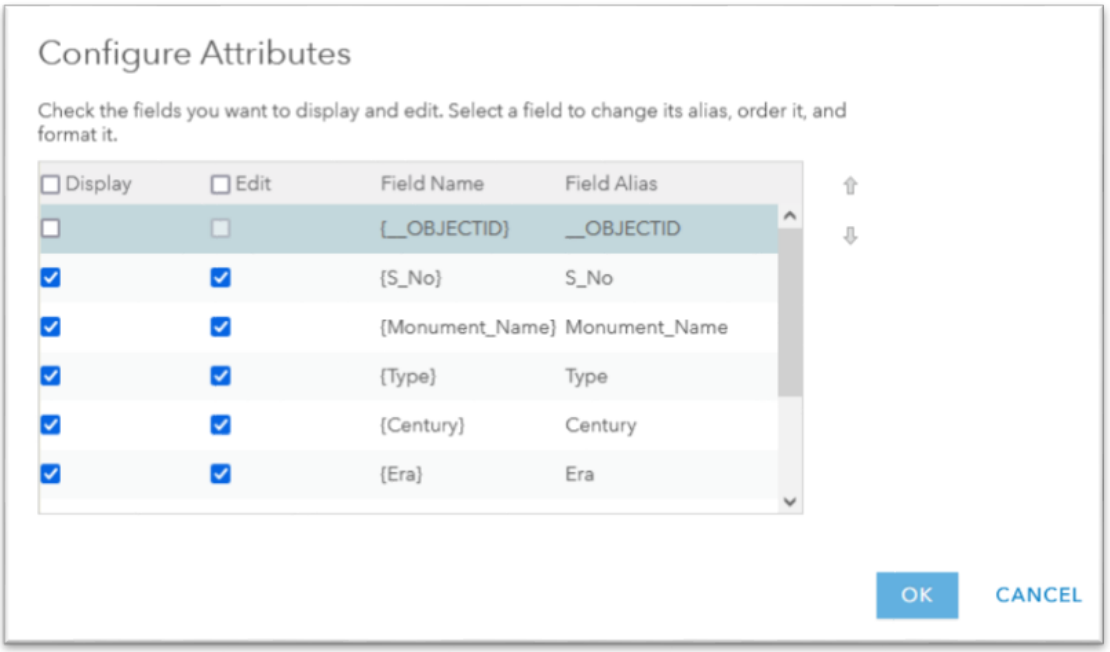


Figure 19: Selecting the attributed for display/edit

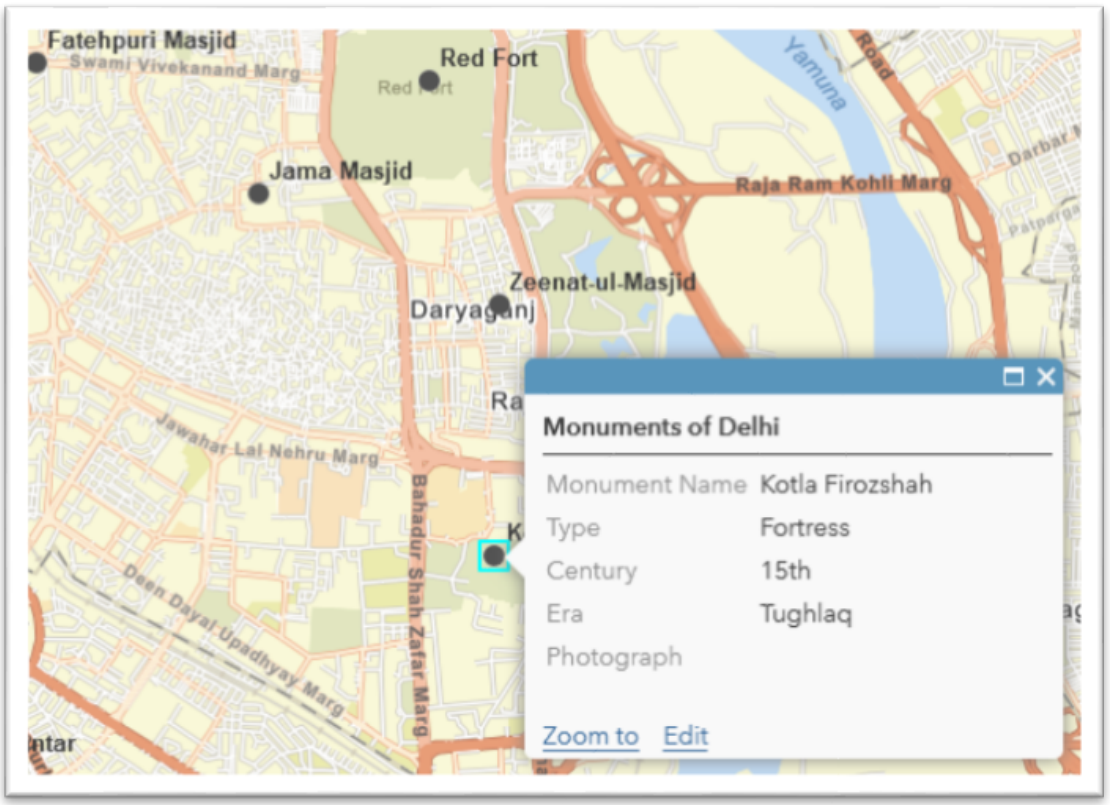


Figure 20: Edited and configured pop-up box

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

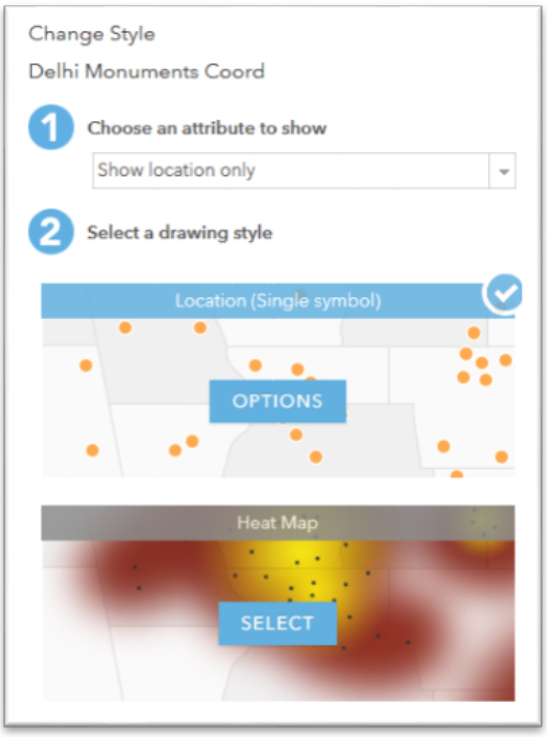


Figure 22: Style menu

'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.

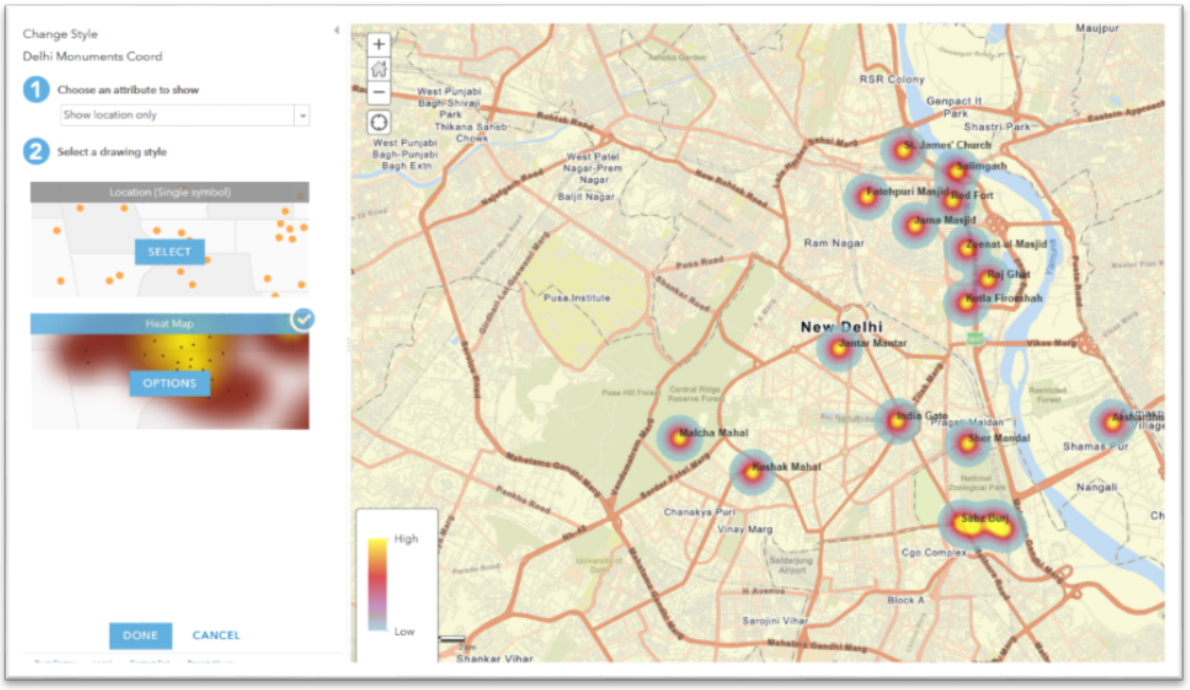


Figure 23: Heat Map visualization

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'.

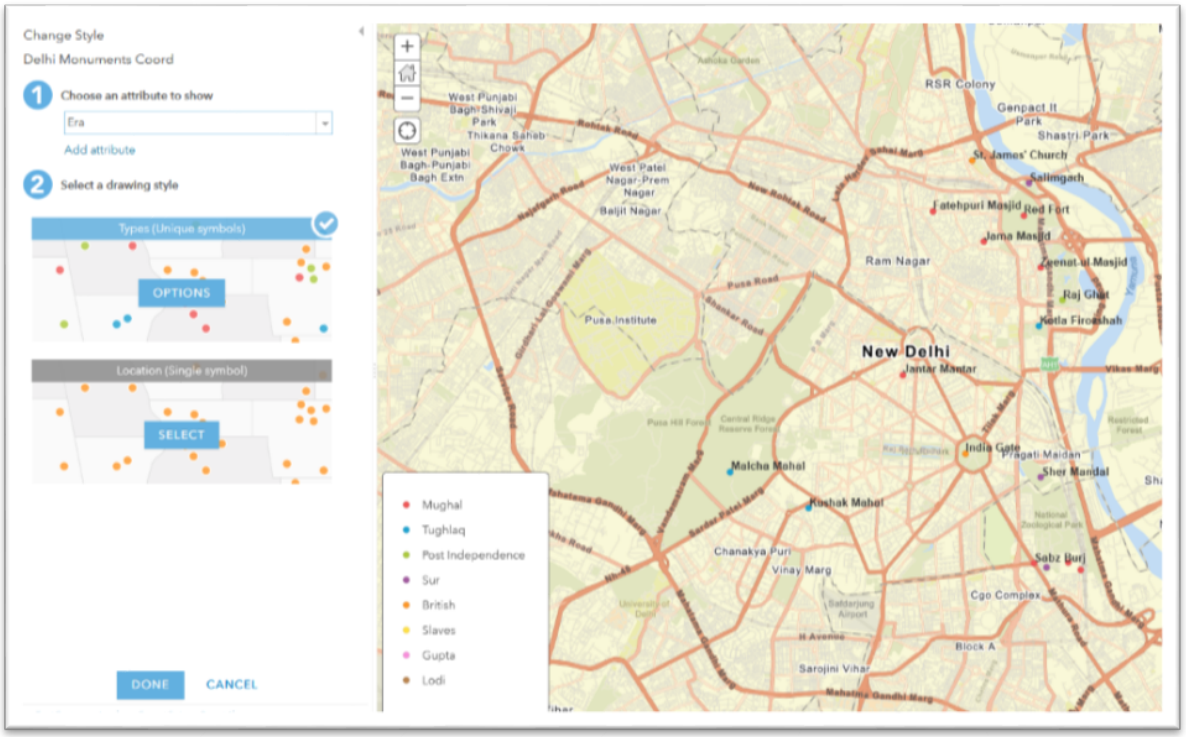


Figure 24: Classification of monuments according to their 'Era'

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.

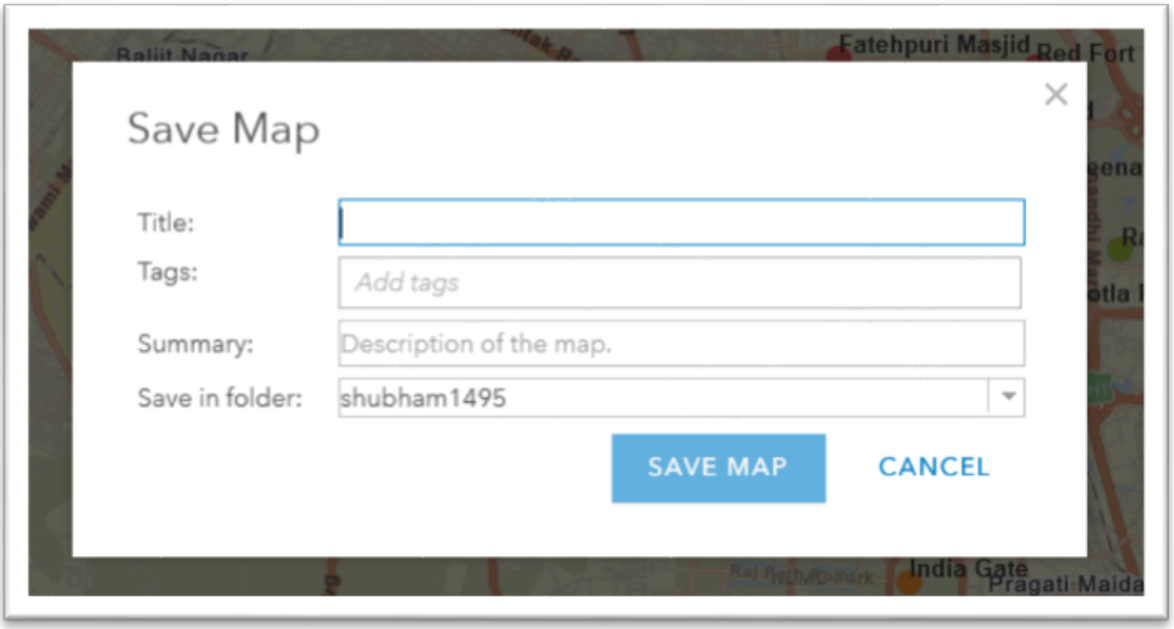


Figure 25: Saving the map

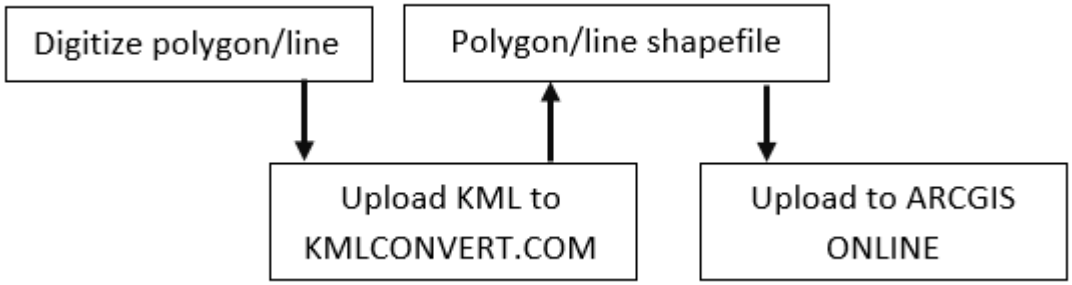
Fill the Save Map form by giving it a Title, Tags and writing a short Summary. Tags are essentially catchwords about your map which help other users of ArcGIS Online in discovering it on this platform. The Tags for this map could be ‘Delhi’, ‘Monuments’, ‘HistoricDelhi’ and so on.
With this we have learned 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.

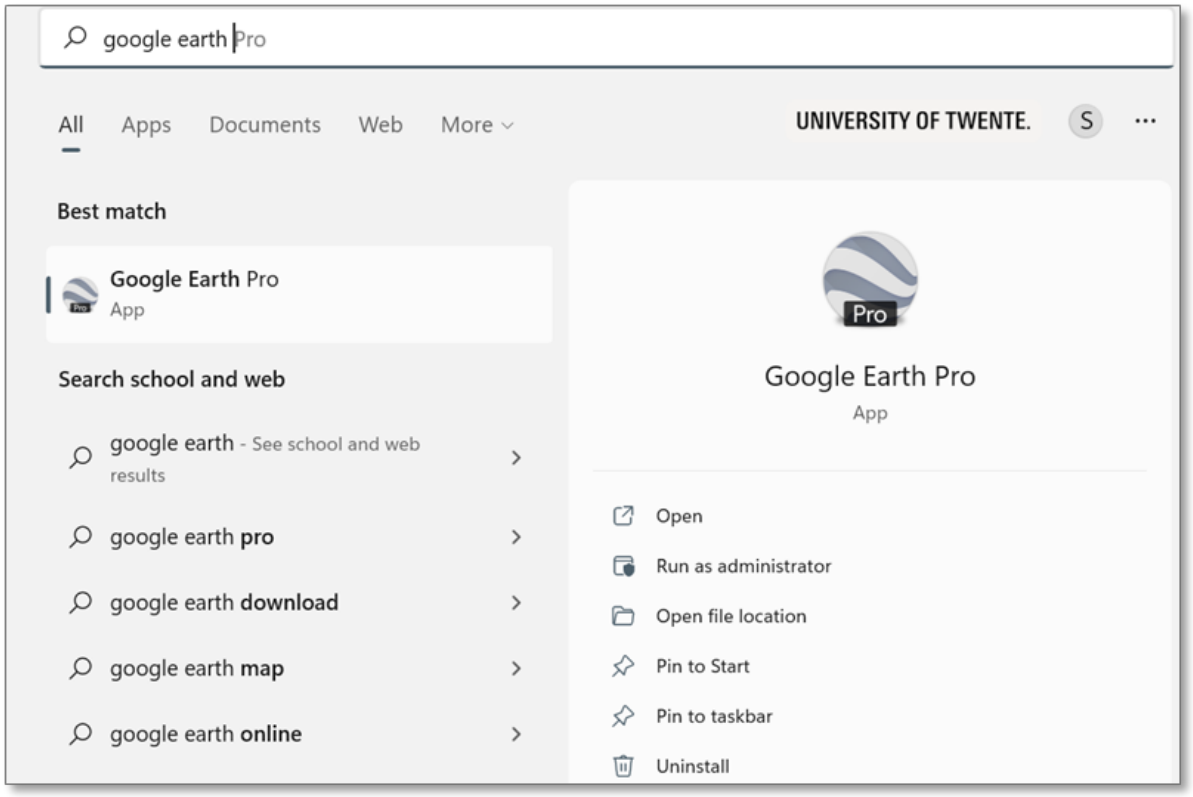


Figure 2: Starting Google Earth Pro

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.

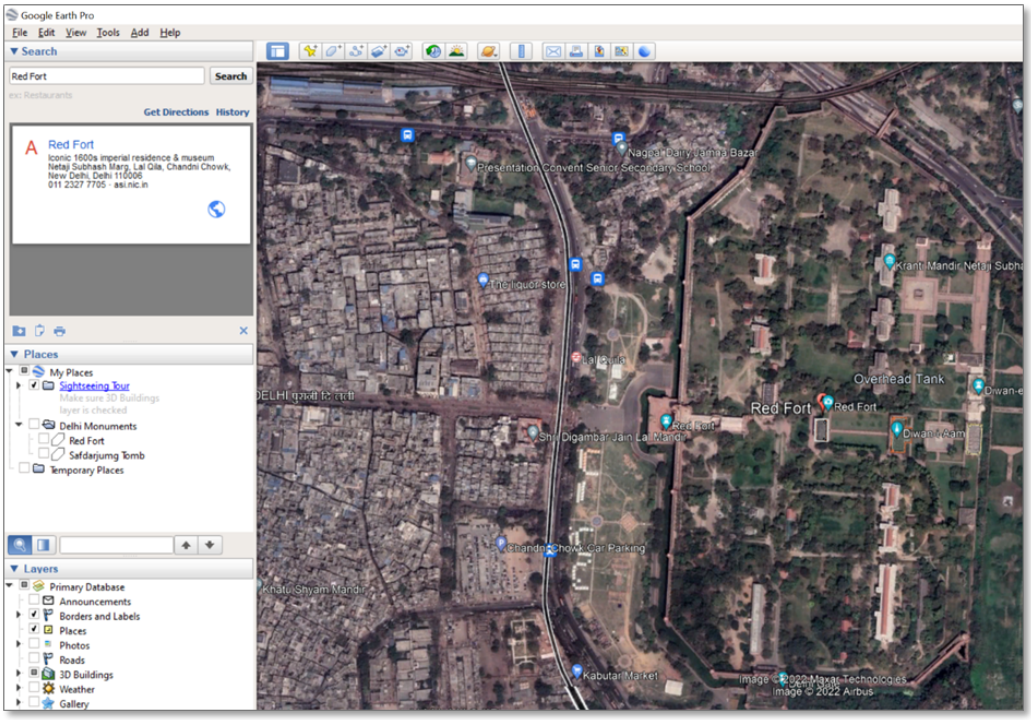


Figure 4: Red Fort in Google Earth Pro

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.

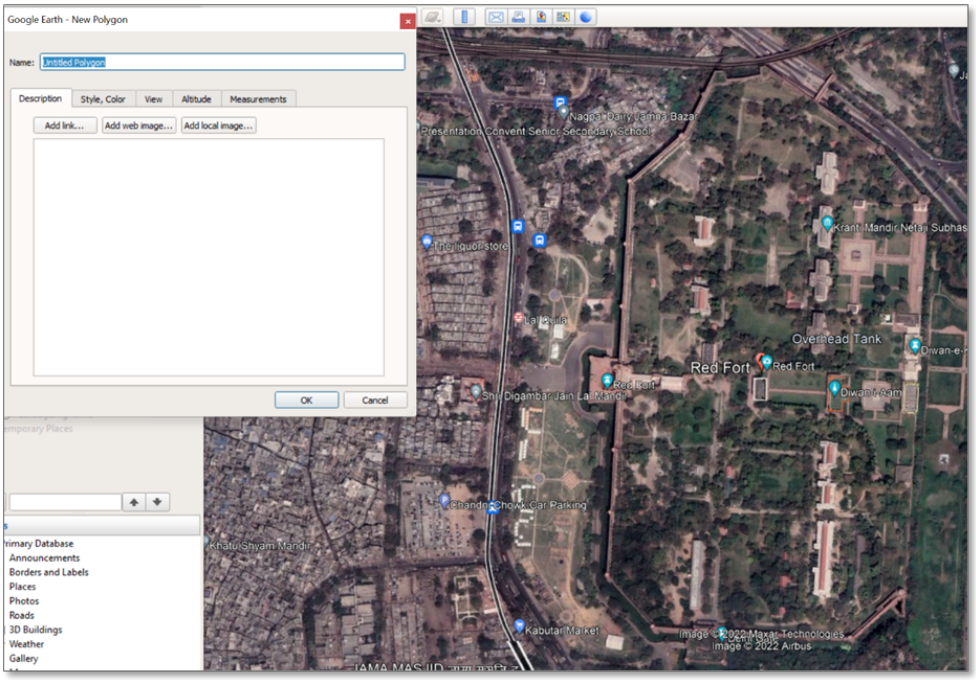


Figure 6: Polygon creation tool in Google Earth Pro

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.

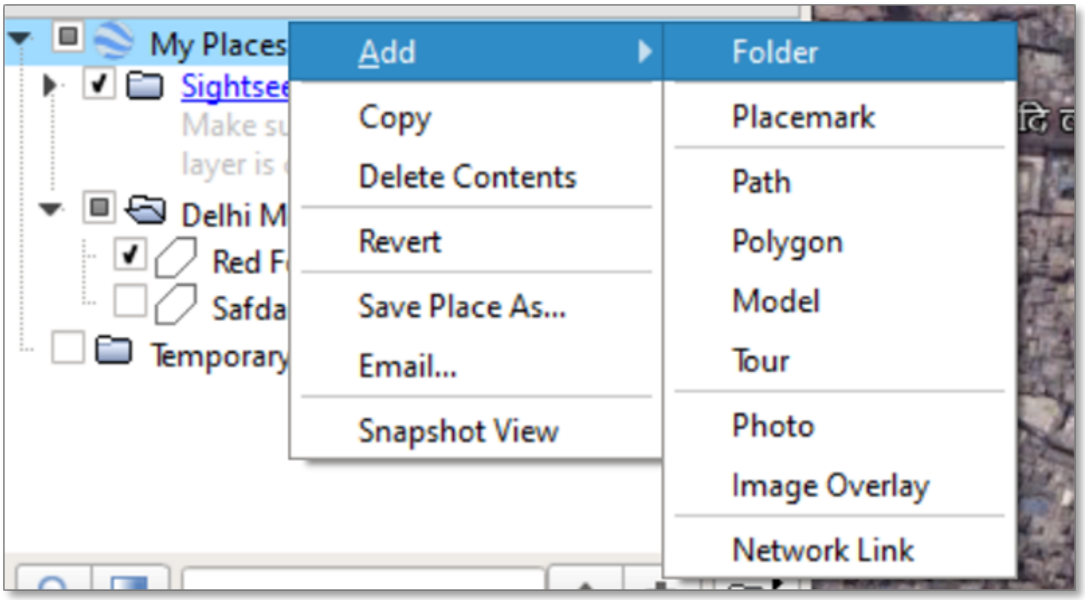


Figure 8: Adding a folder in My Places

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.

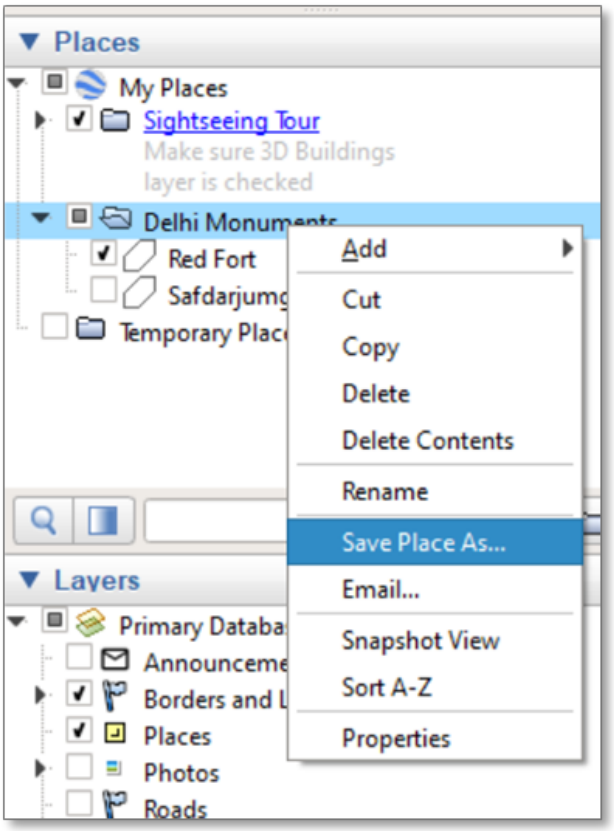


Figure 9: Saving the polygons as KML

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

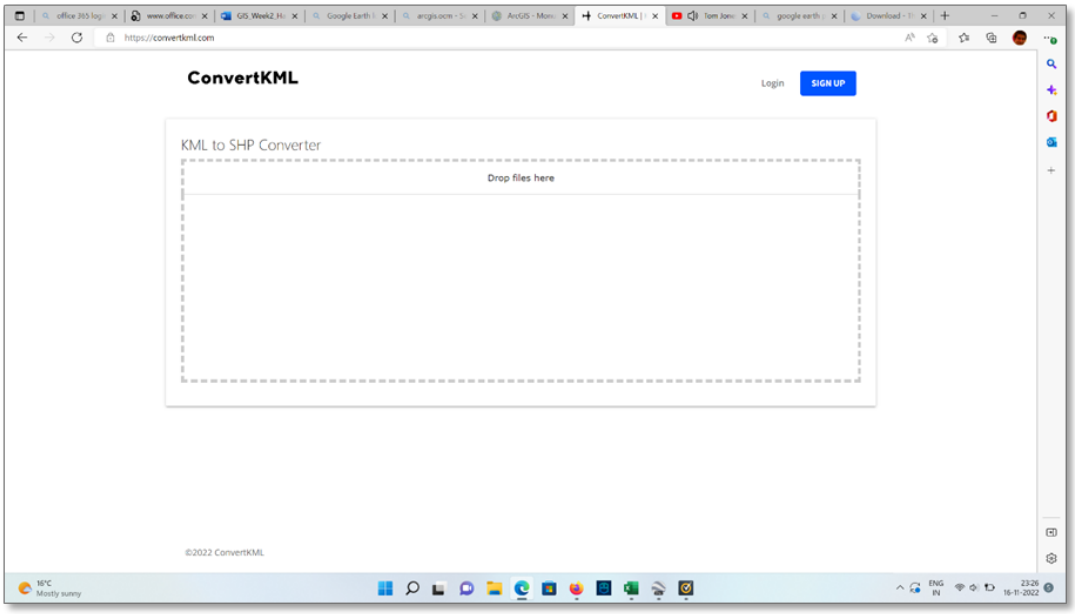


Figure 10: convertkml.com interface

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.

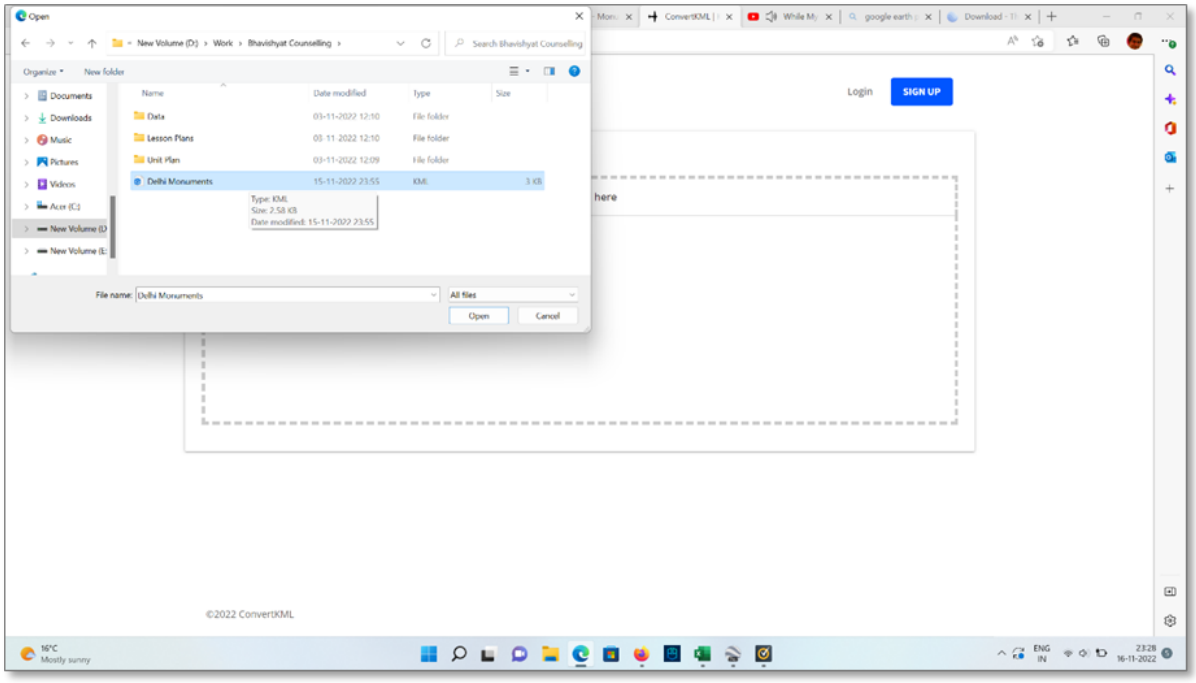


Figure 11: Adding kml files to convert them to shp

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'.

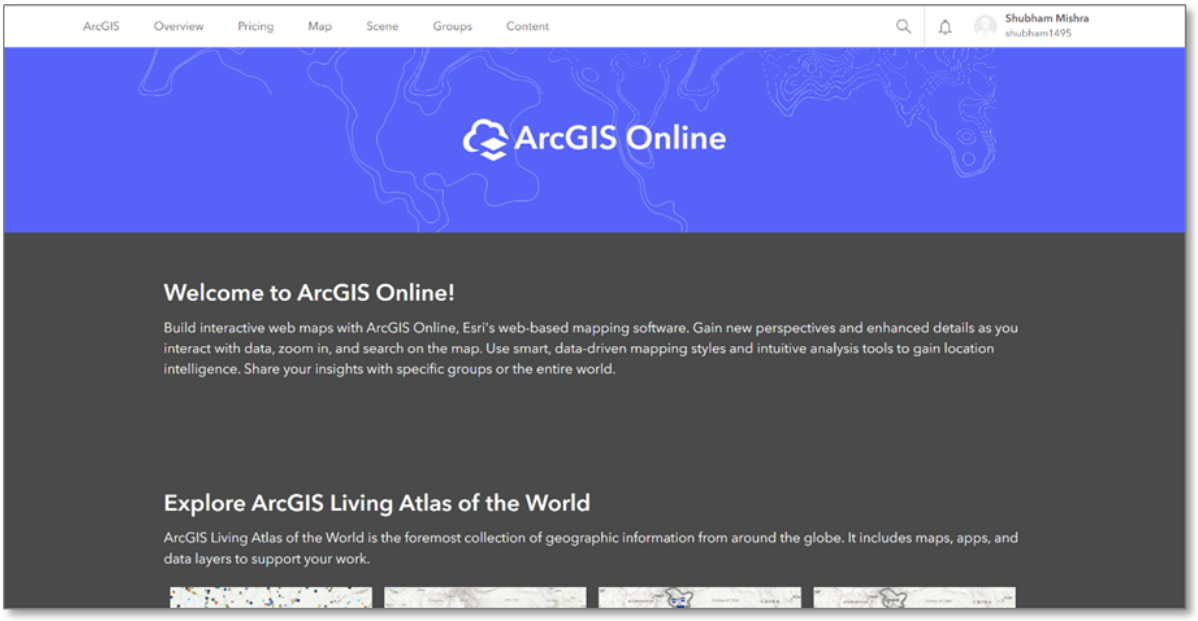


Figure 13: ArcGIS Online homepage

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.

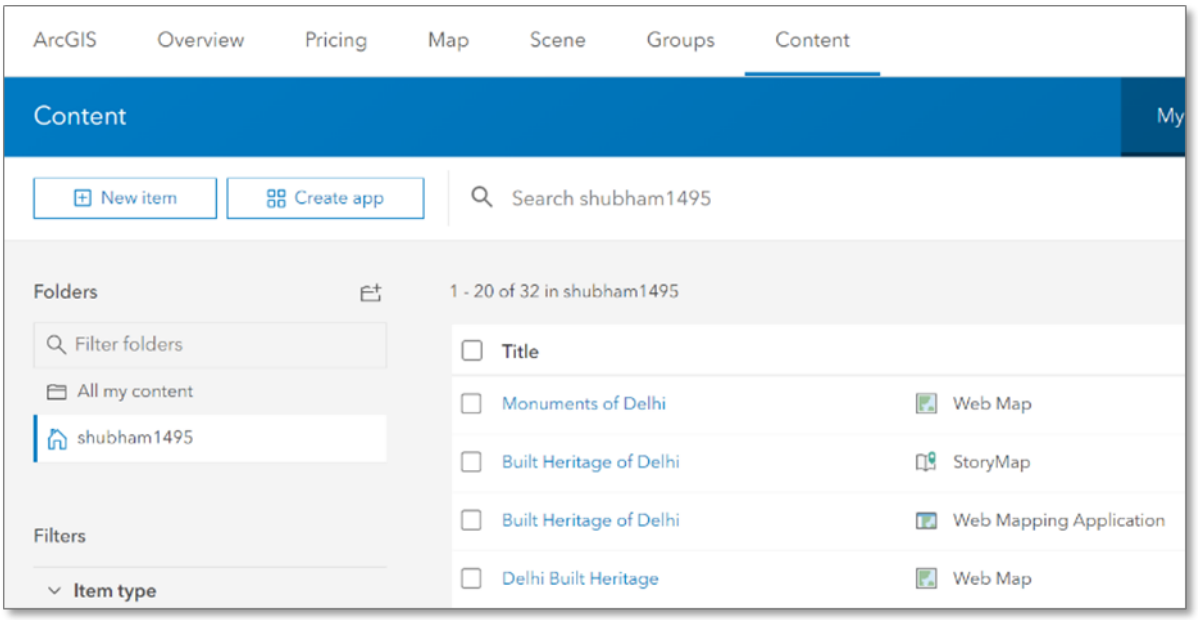


Figure 14: ArcGIS Online content page

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.

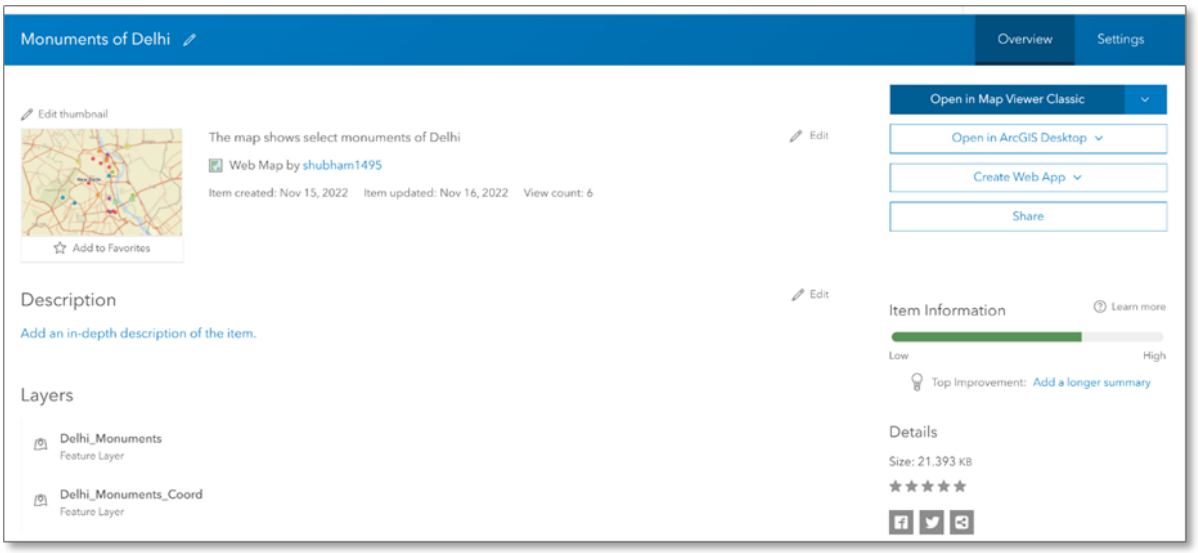


Figure 15: Monuments of Delhi page

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.

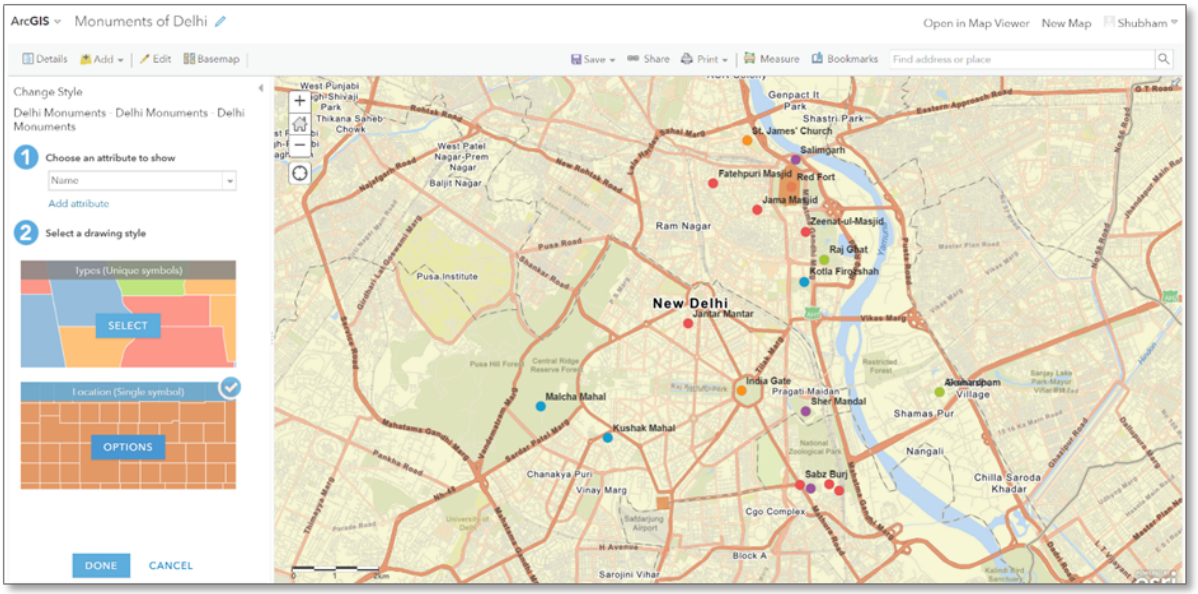


Figure 16: Stylizing a polygon shapefile in ArcGIS Online

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'.

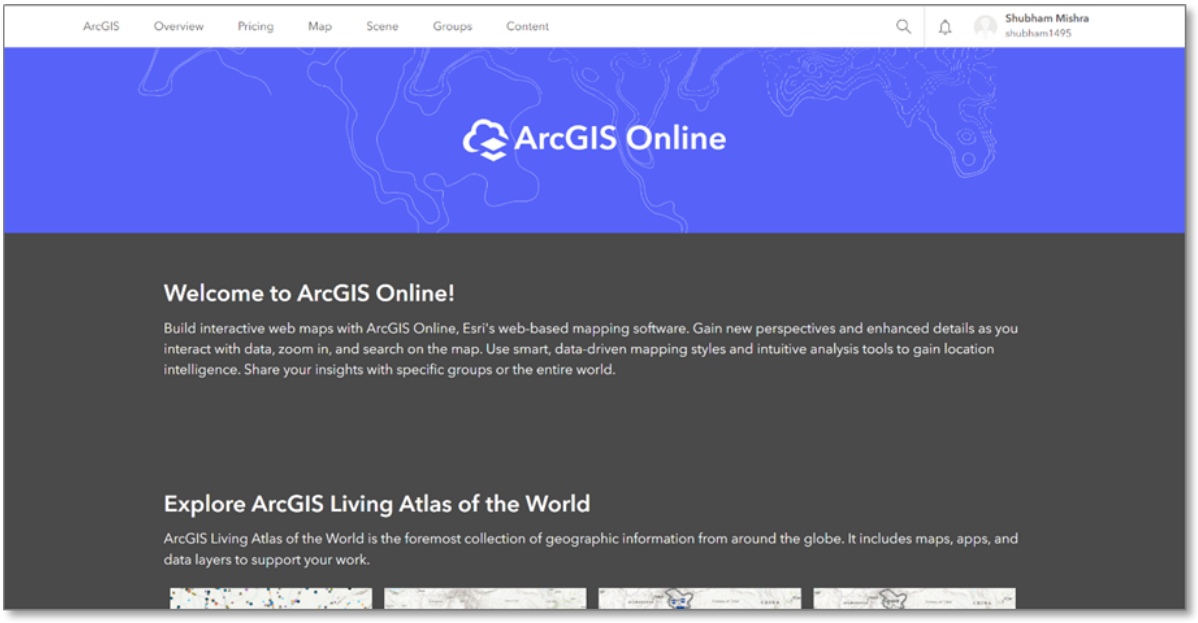


Figure 1: ArcGIS Online homepage

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.

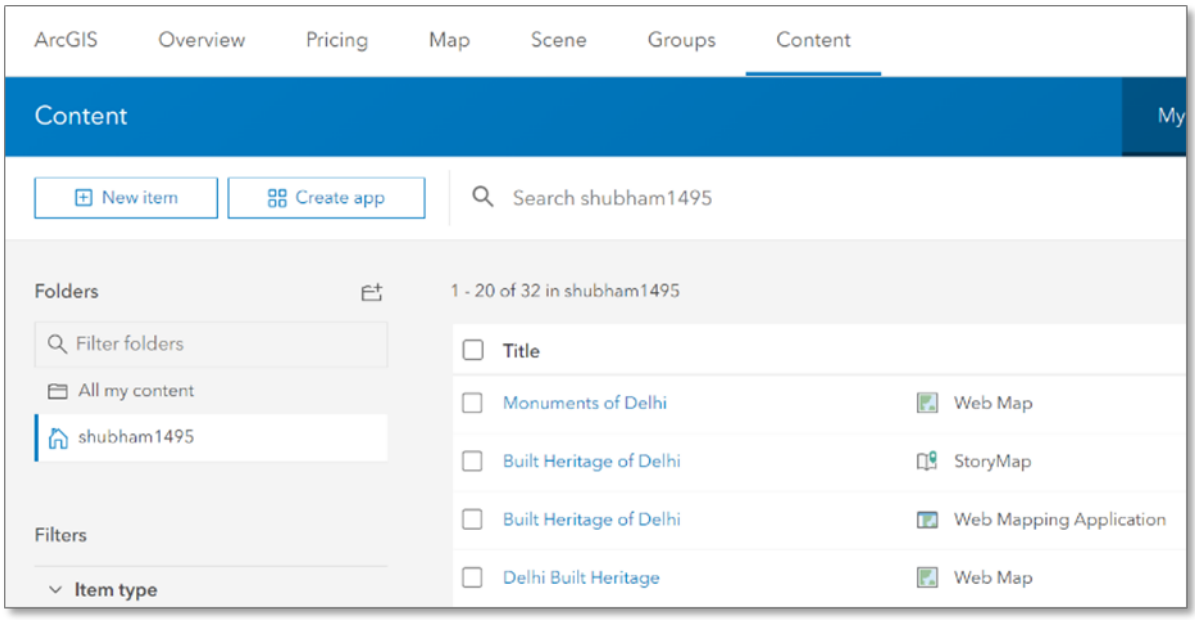


Figure 2: ArcGIS Online Content page

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.

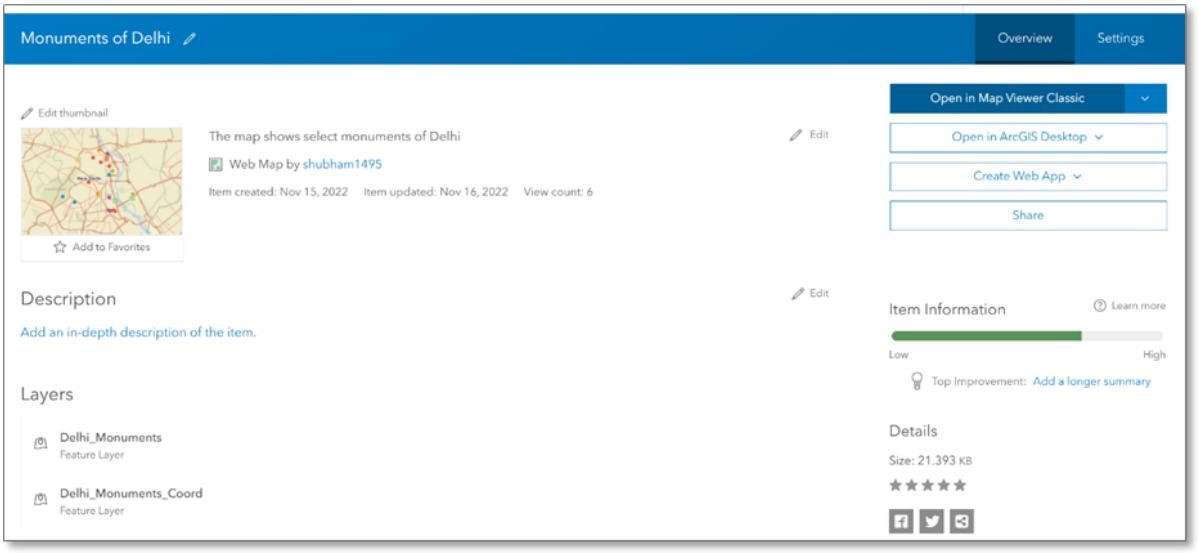


Figure 3: Monuments of Delhi page

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.

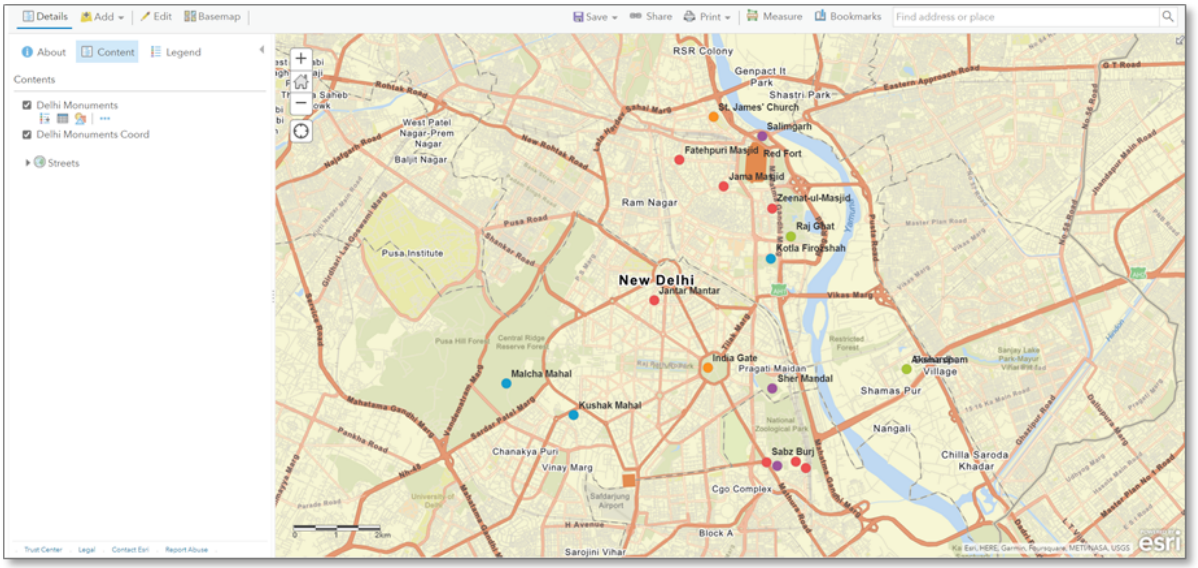


Figure 4: Monuments of Delhi web map

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

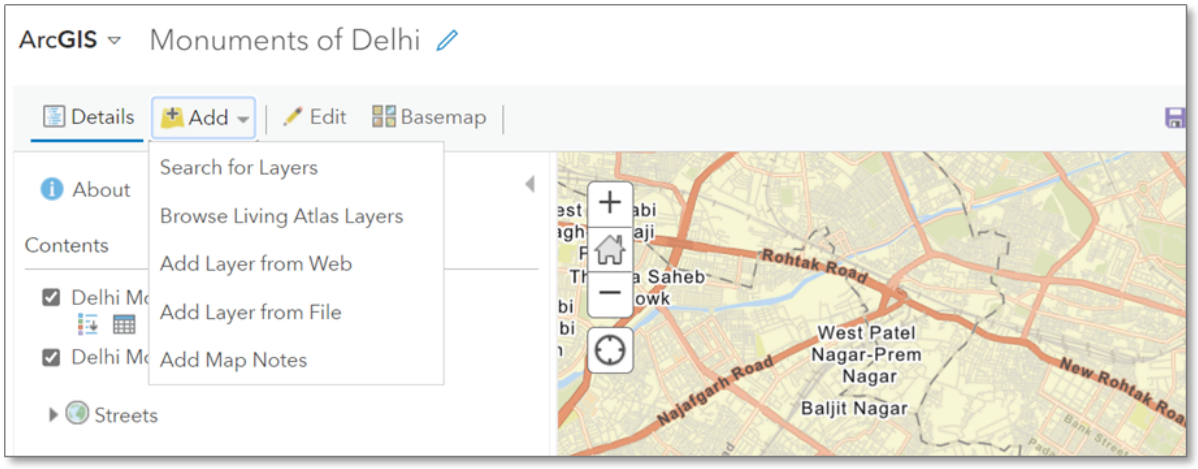


Figure 5: Adding Map Notes

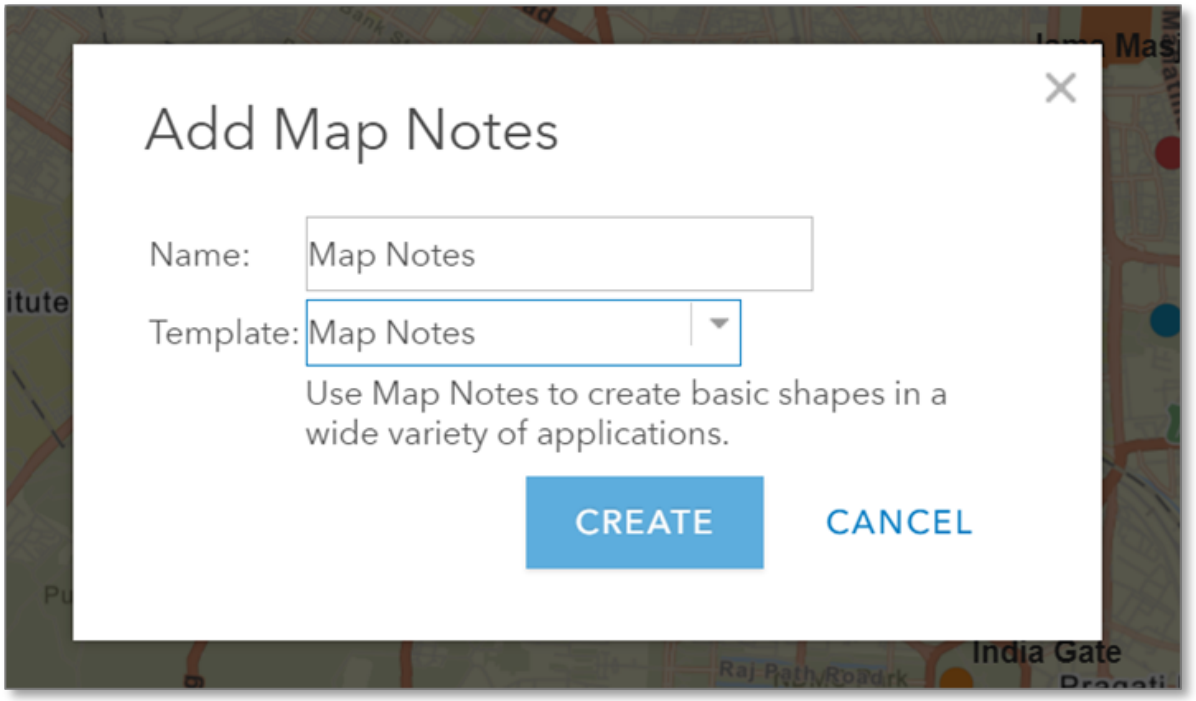


Figure 6: Map Notes dialogue box

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.

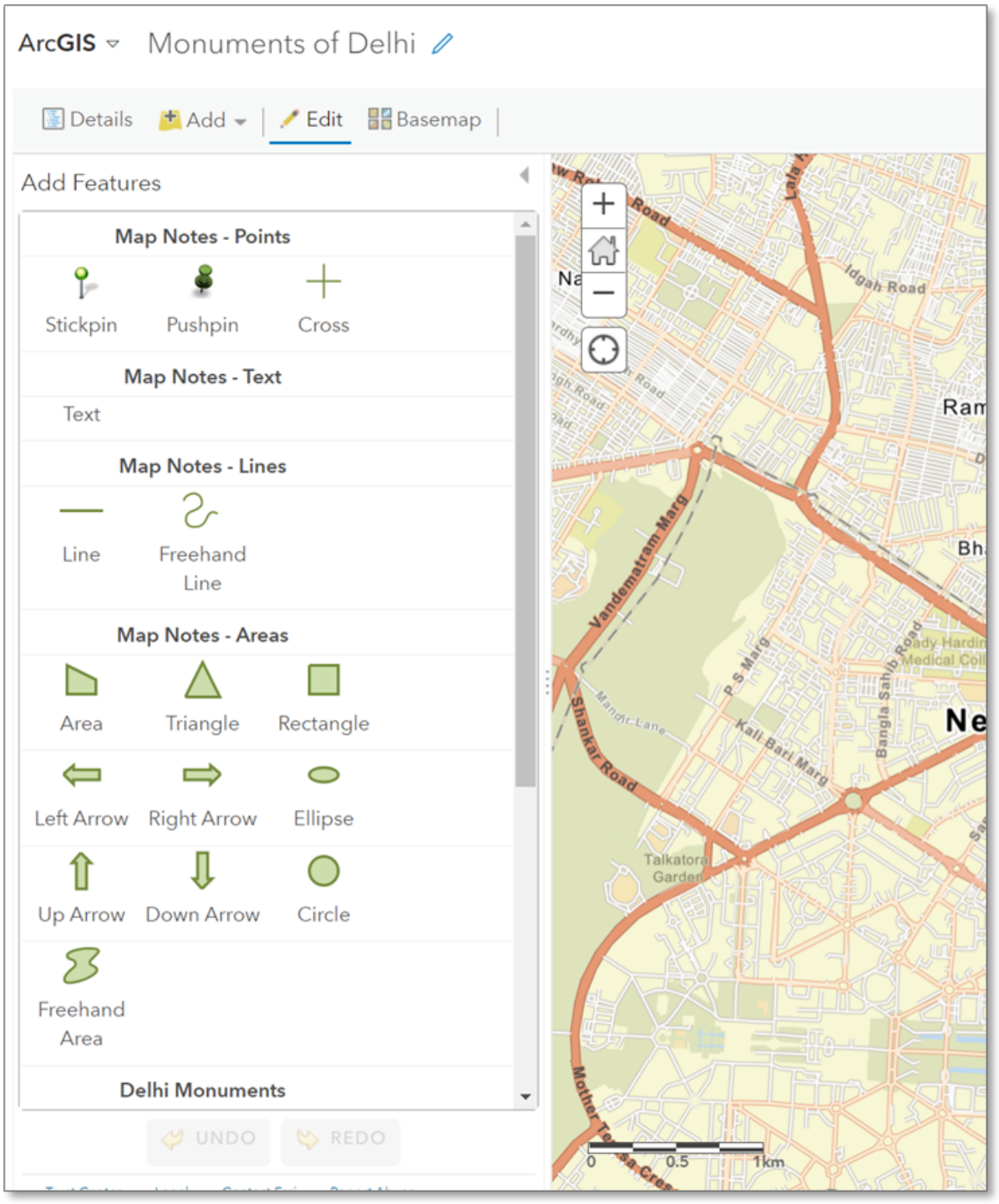


Figure 7: Map Notes panel

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.

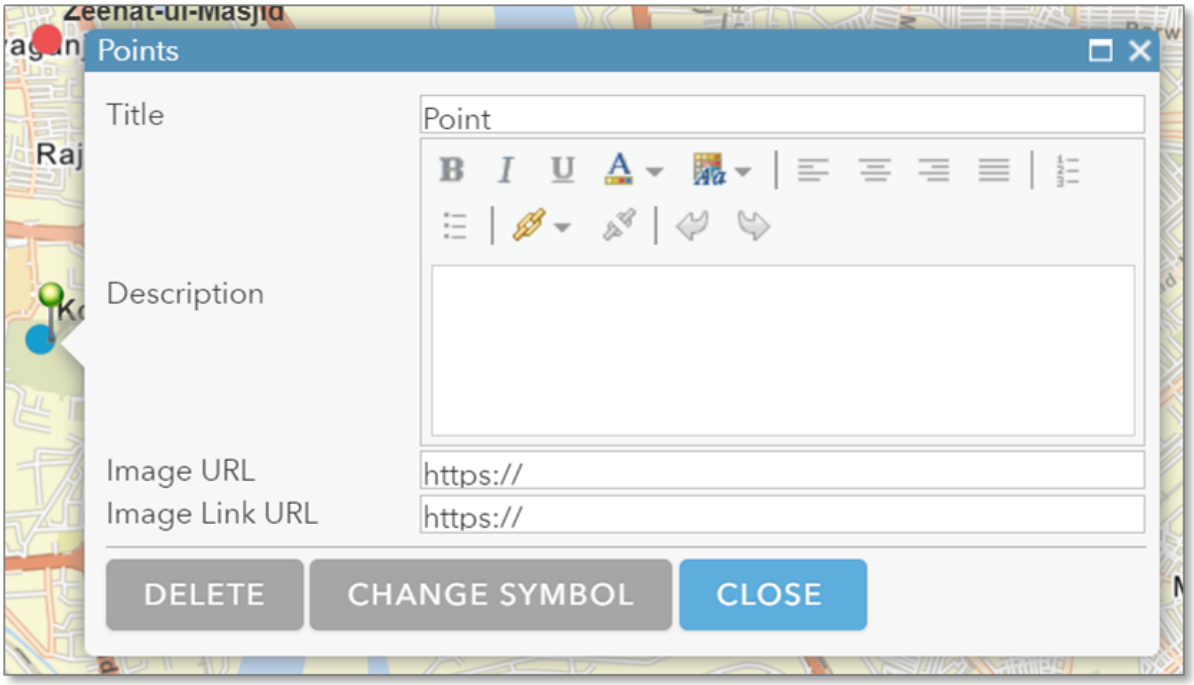


Figure 8: Adding text to the Map Note

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'.

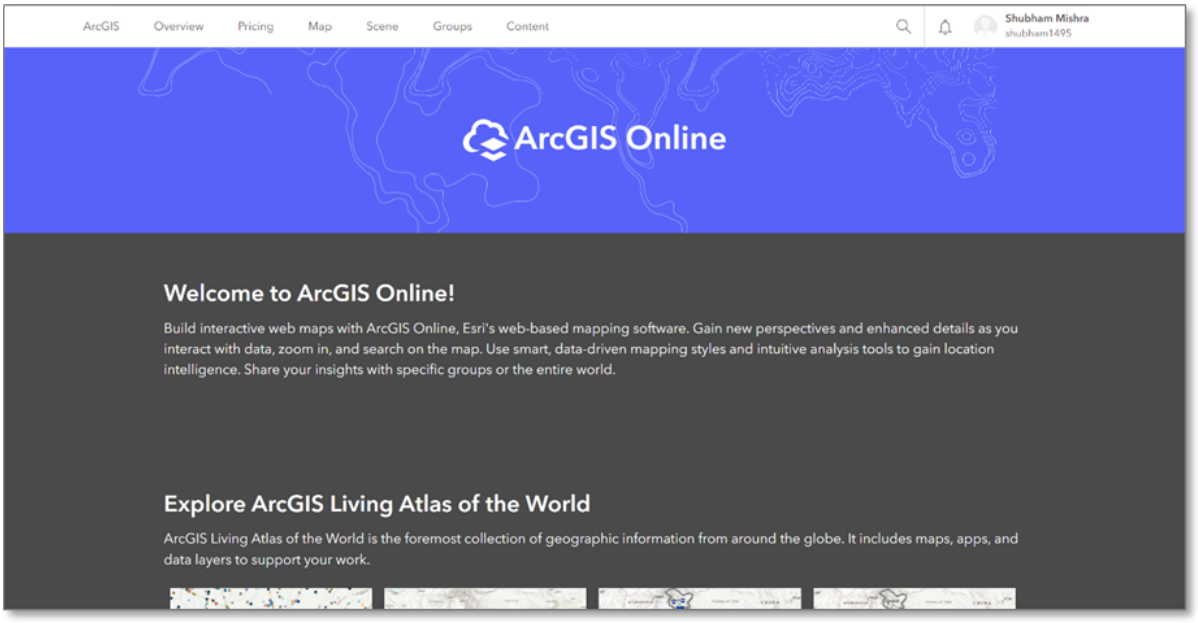


Figure 1: ArcGIS Online homepage

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.

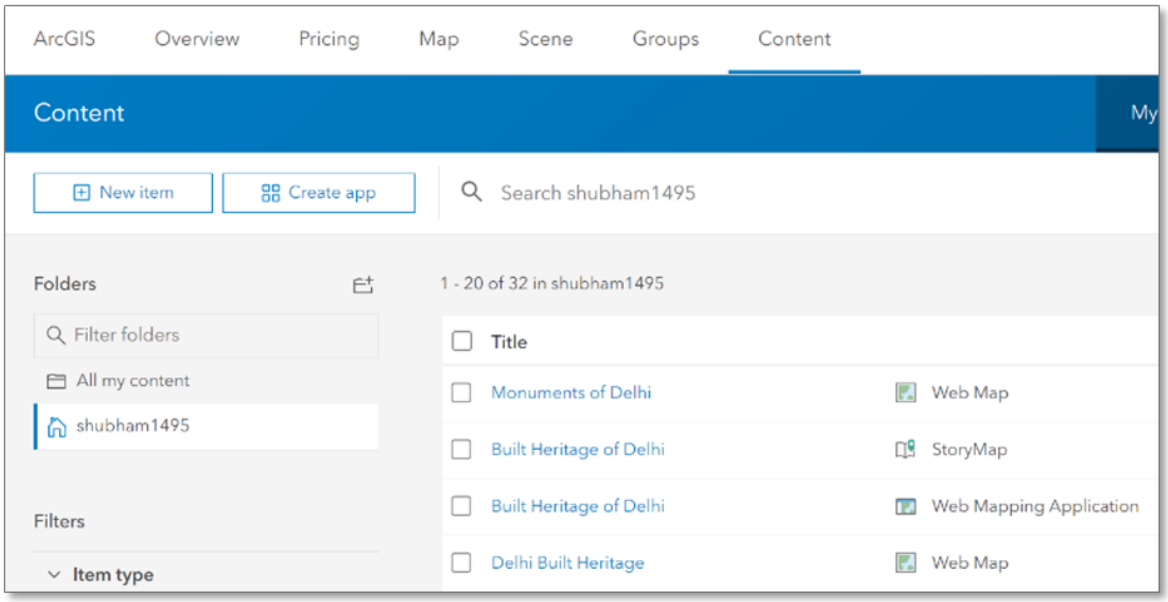


Figure 2: ArcGIS Online Content page

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.

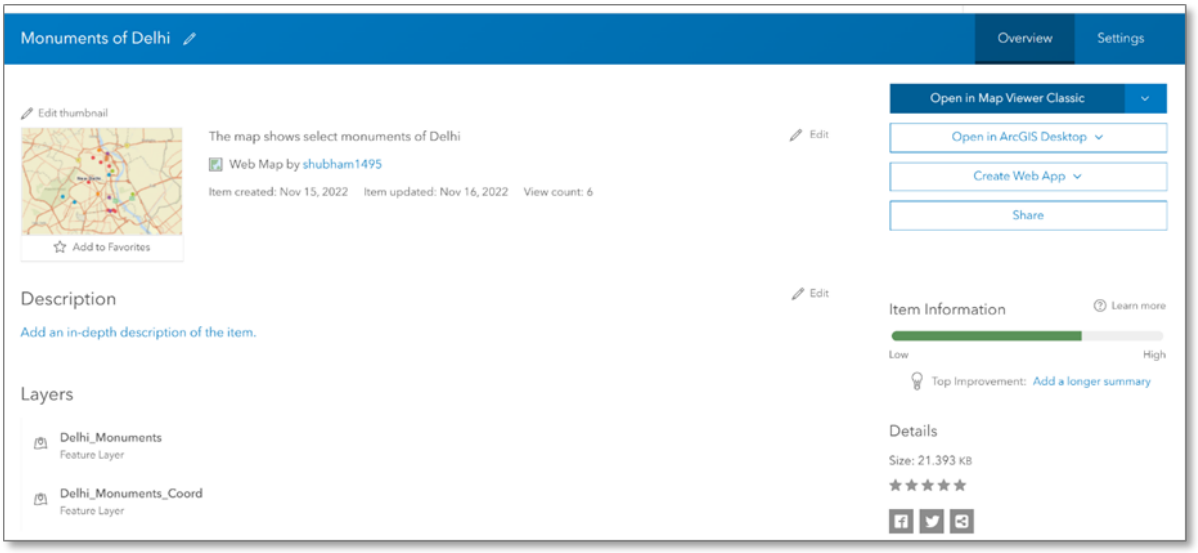


Figure 3: Monuments of Delhi page

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

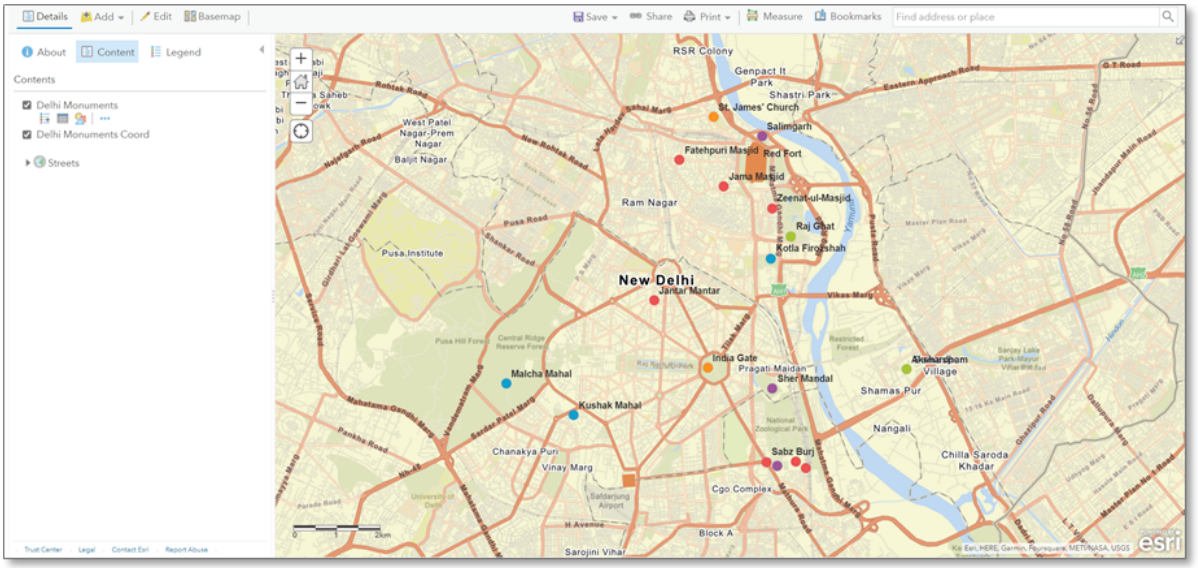


Figure 4: Monuments of Delhi web map

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.

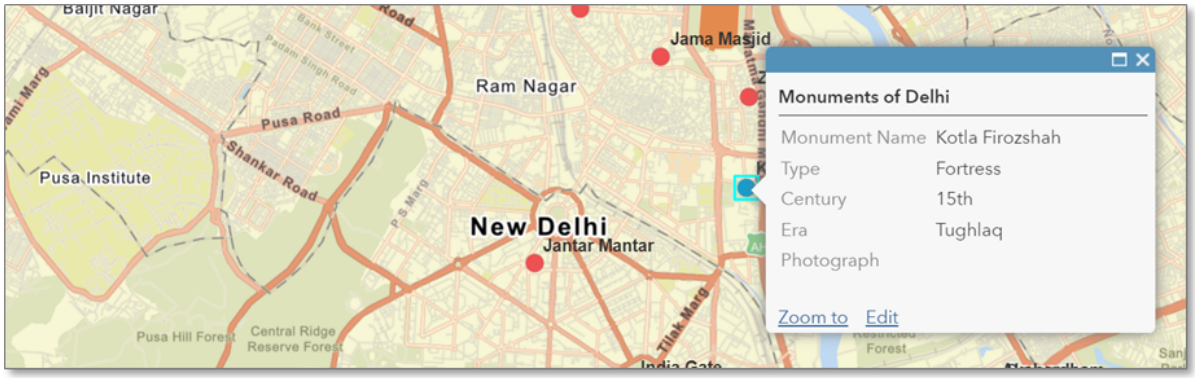


Figure 5: Editing the pop-up box

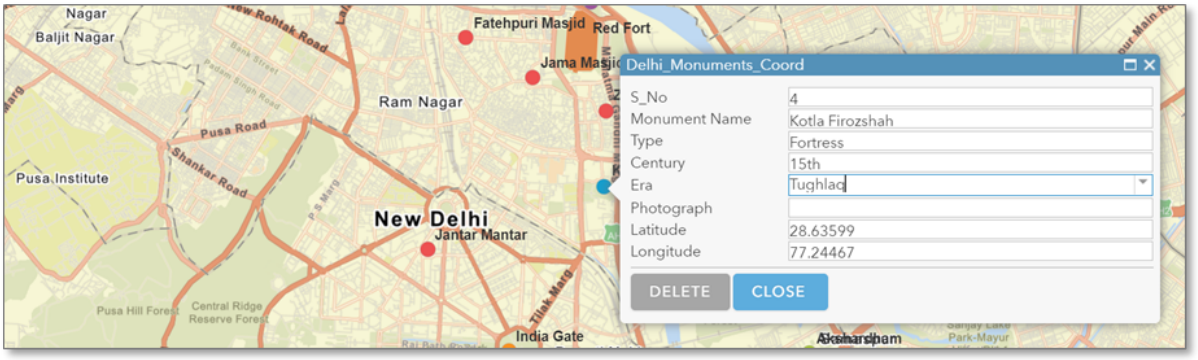


Figure 6: Pop up box in edit mode

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.

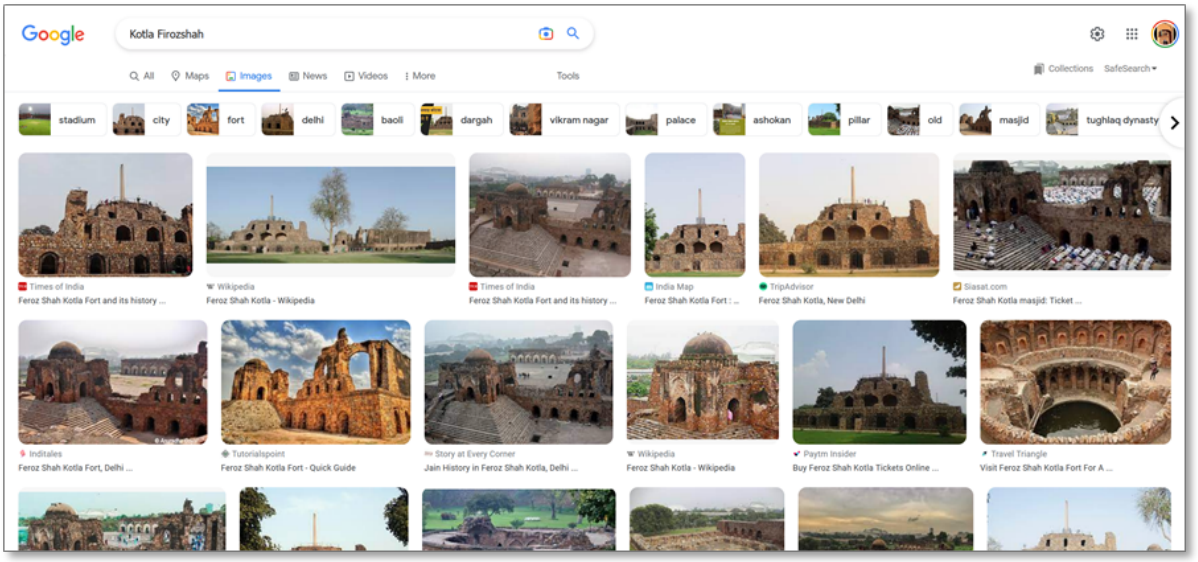


Figure 7: Result of image search for Kotla Firozshah

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.

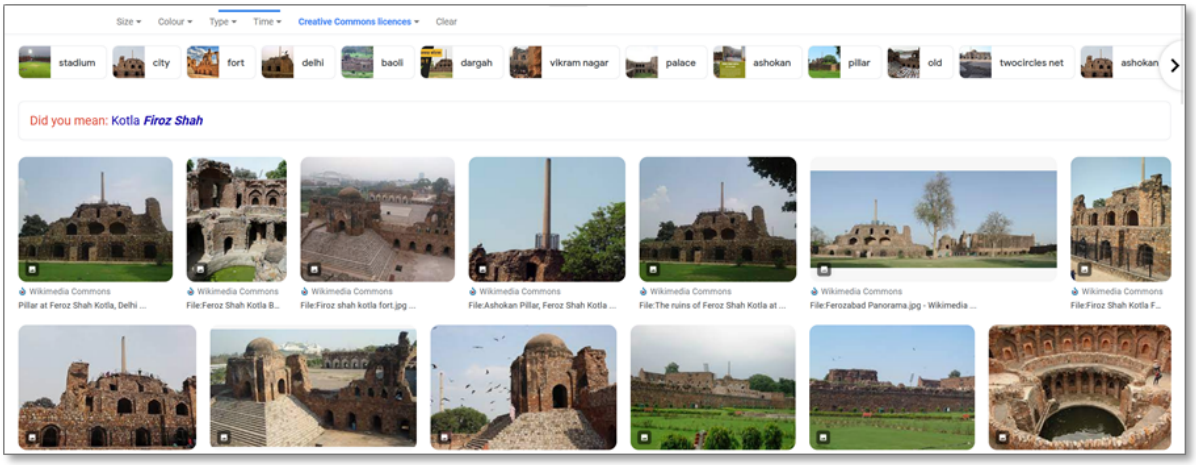


Figure 8: Kotla Firozshah images licensed under Creative Commons

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.

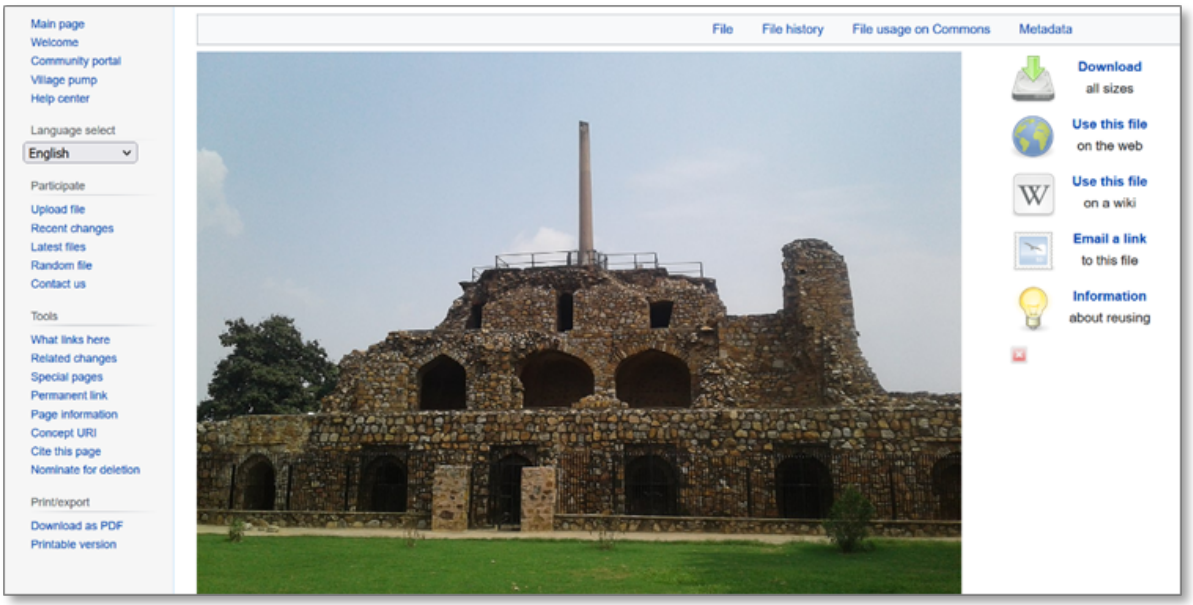


Figure 9: Wikimedia Commons page for Kotla Firozshah

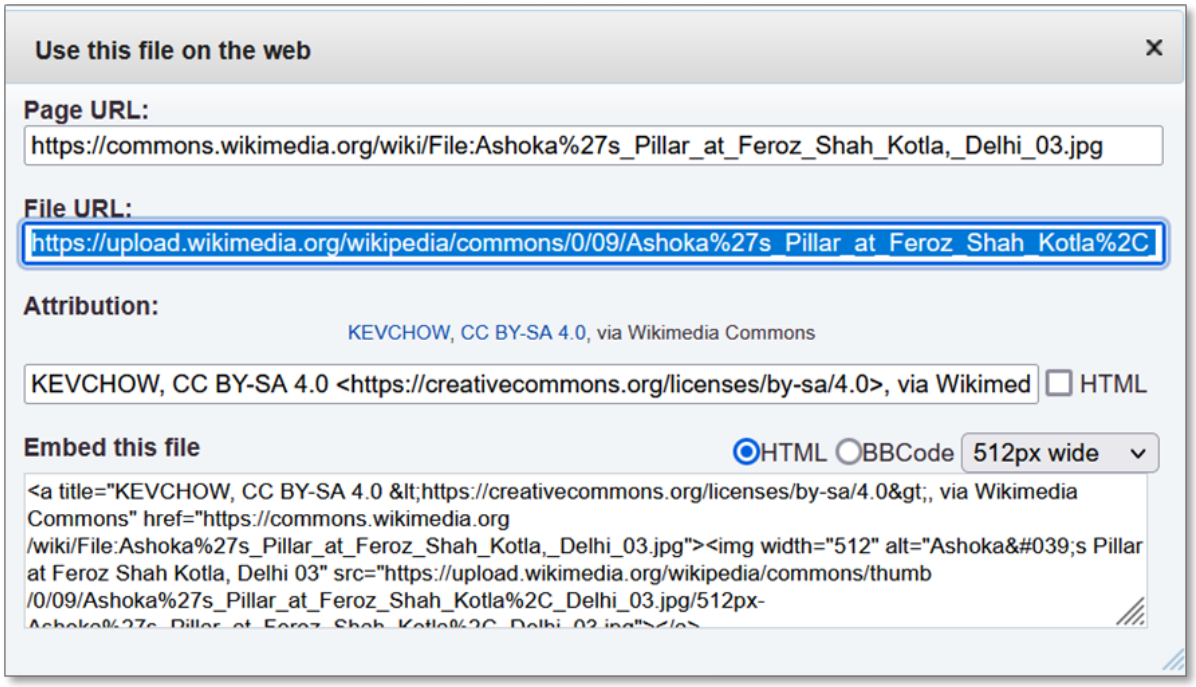


Figure 10: File usage options

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.

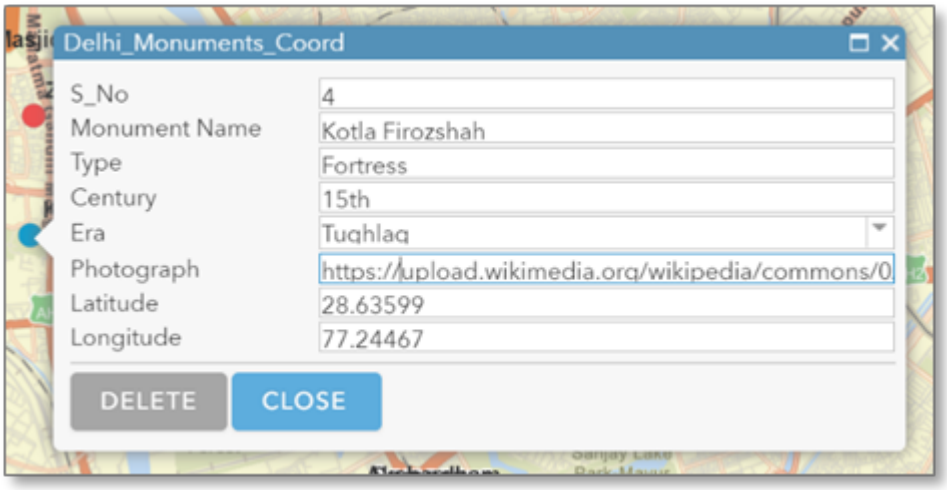


Figure 11: Adding image URL to the feature layer

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).

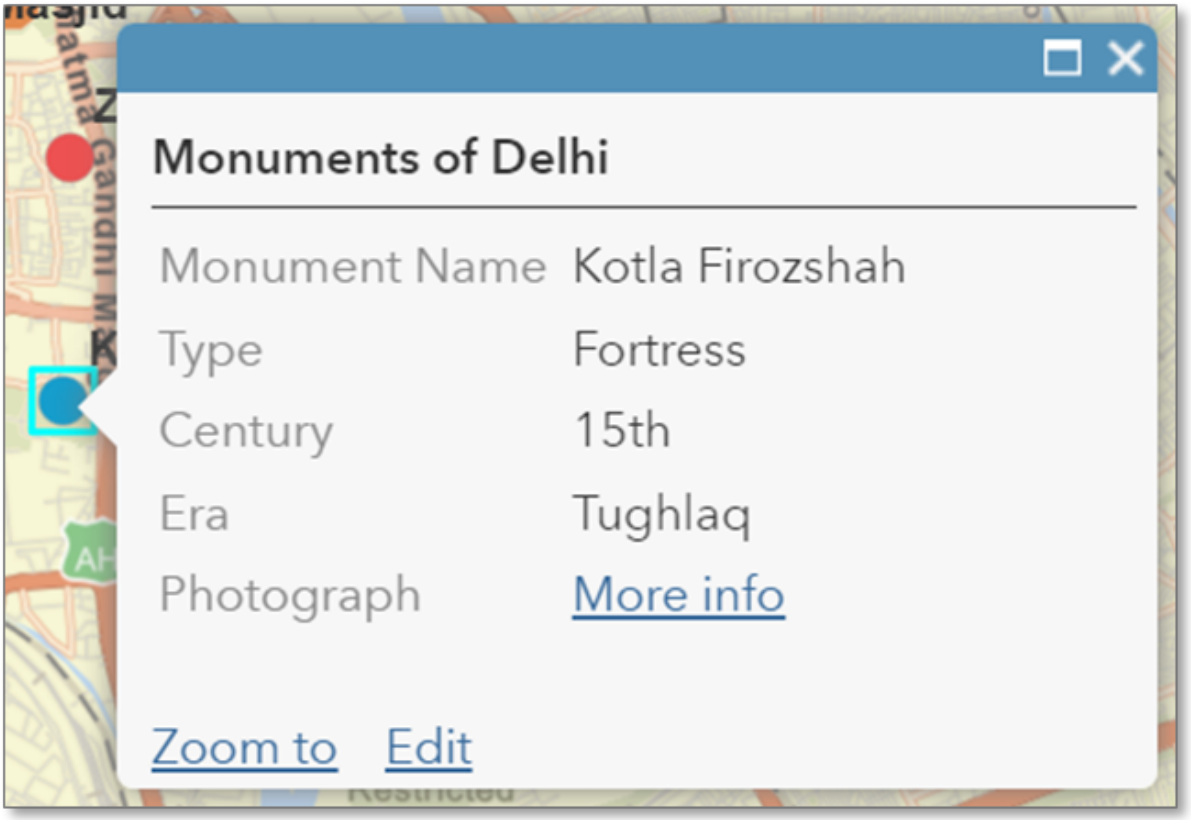


Figure 12: Layer pop-up with hyperlink to the image

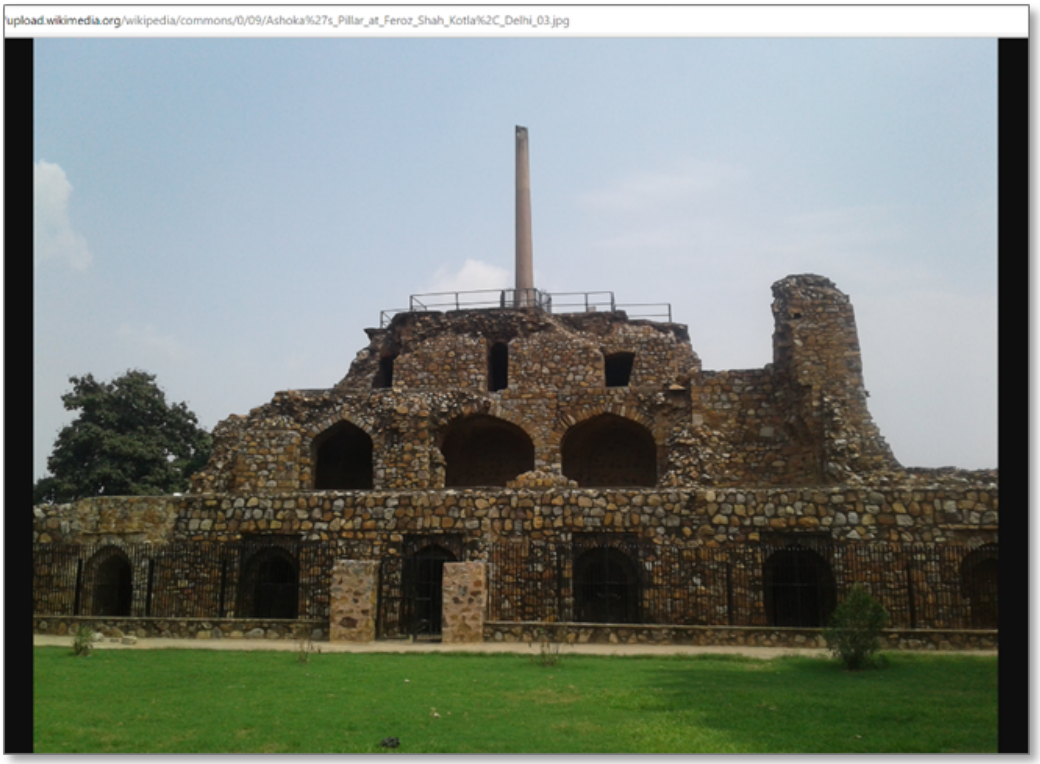


Figure 13: Feature image opens in a new tab

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…

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’.

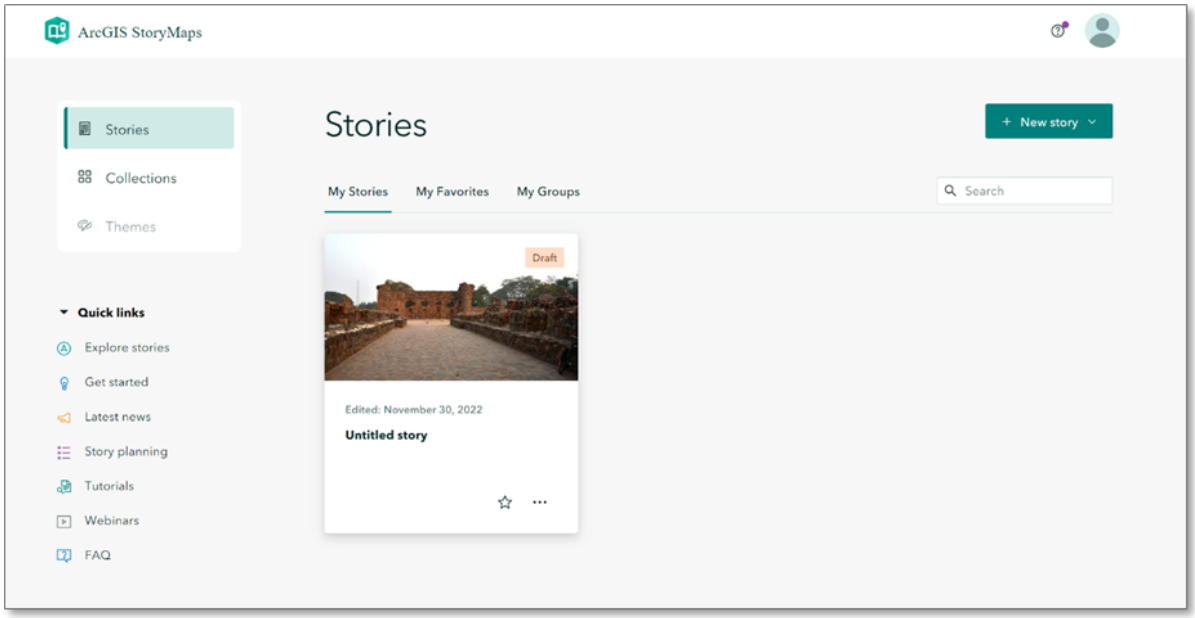


Figure 2: ArcGIS StoryMaps homepage

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.

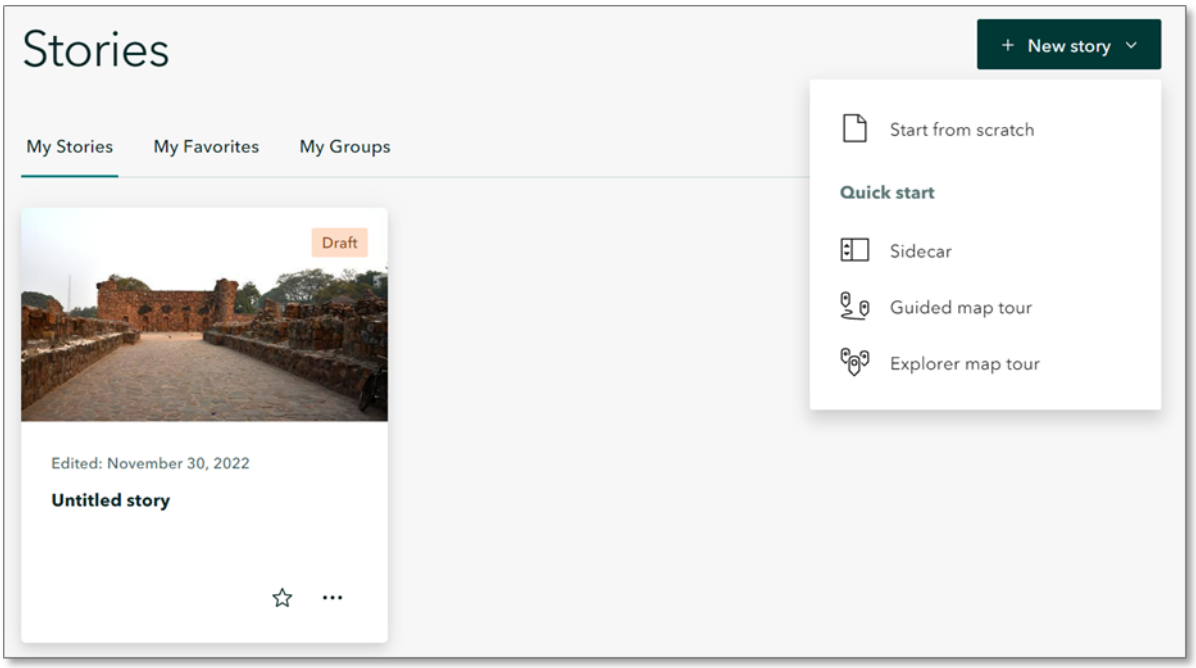


Figure 3: Options for starting a StoryMap

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

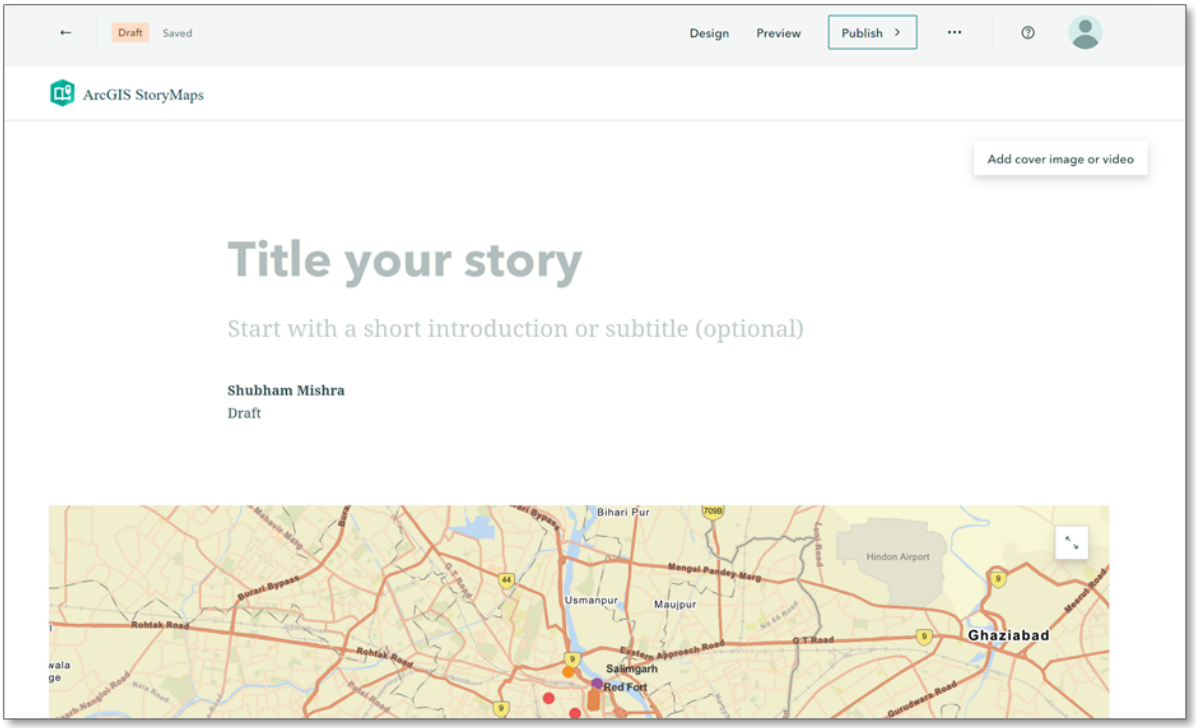


Figure 4: The Story Builder page

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.

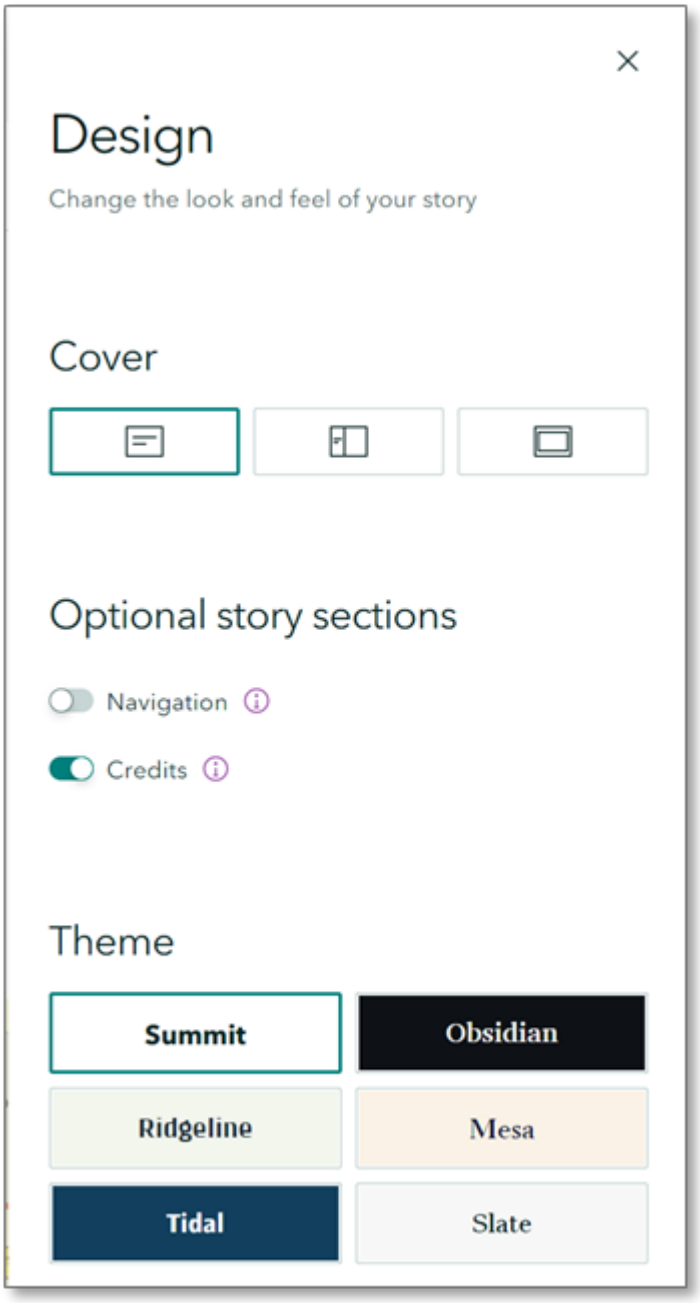


Figure 5: Design options for the StoryMap

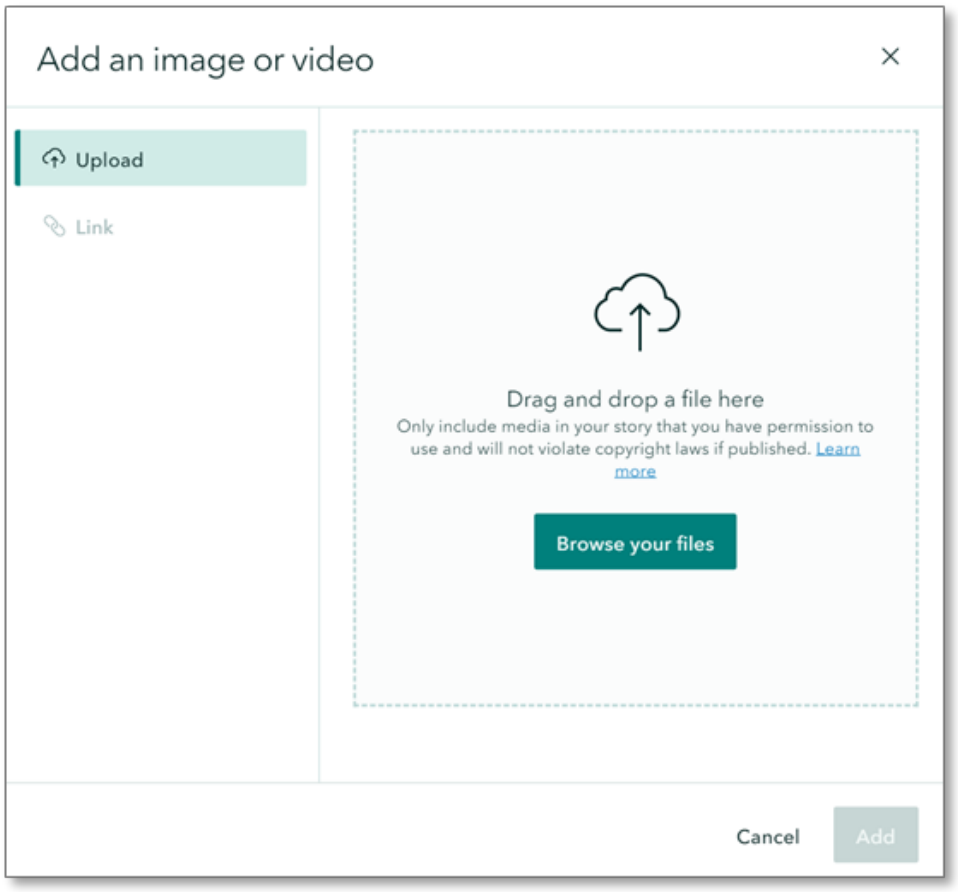


Figure 6: Adding an image or a video as cover

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.

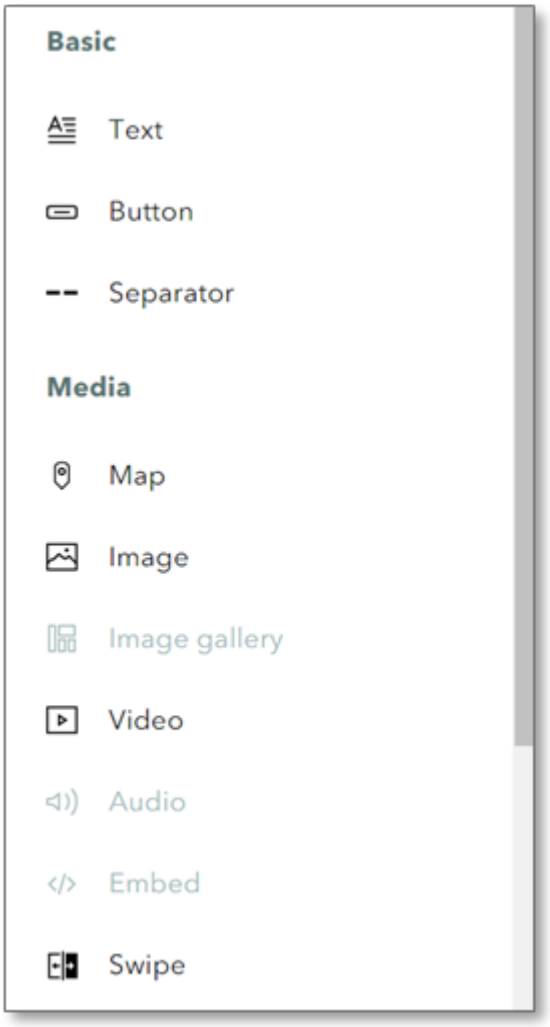


Figure 7: Adding content to the StoryMap

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.

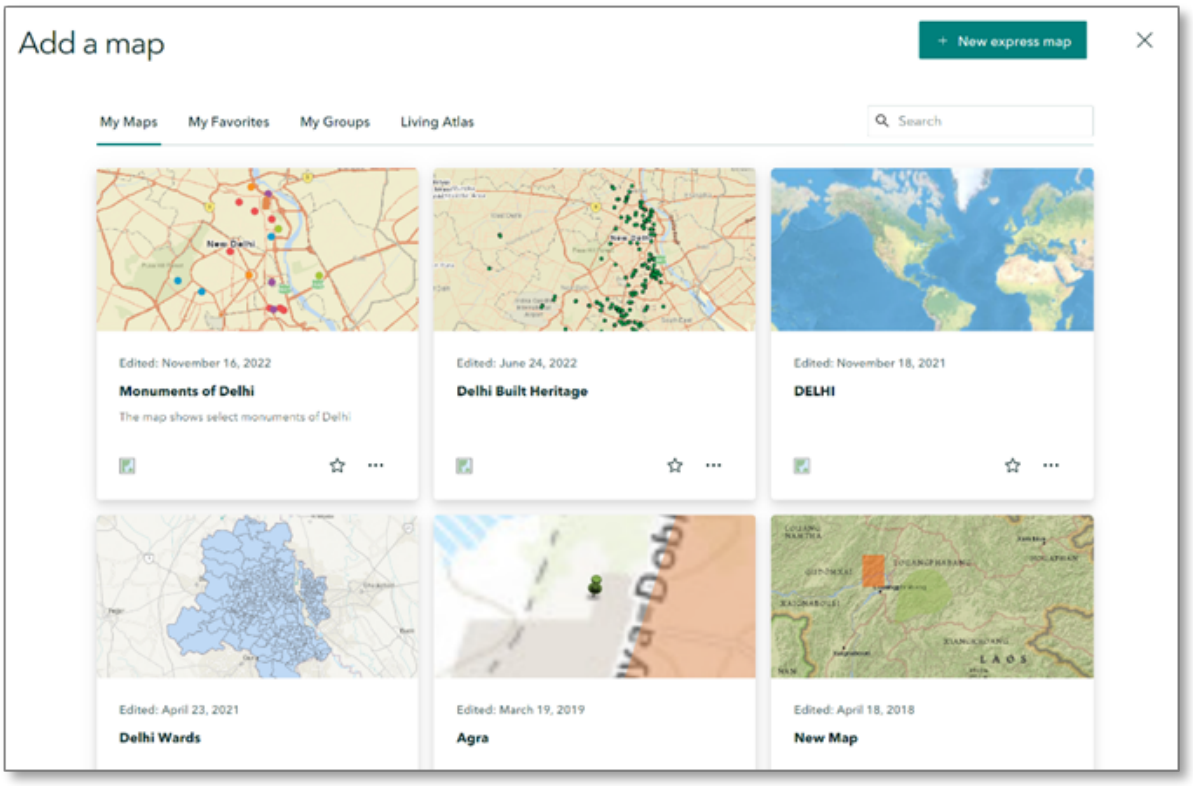


Figure 8: Add a map

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.

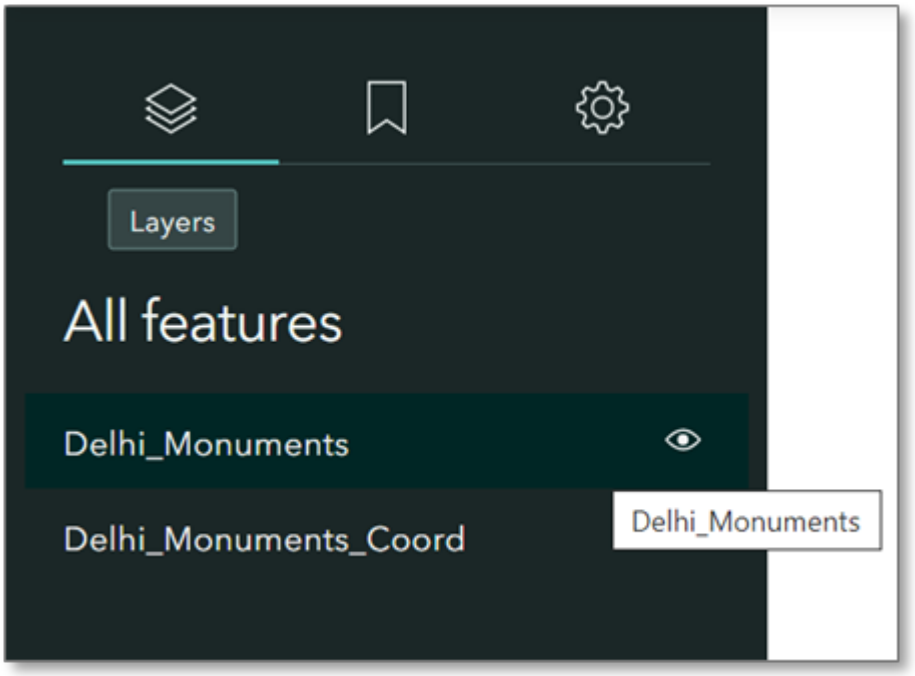


Figure 10: Switching on / off a layer

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.

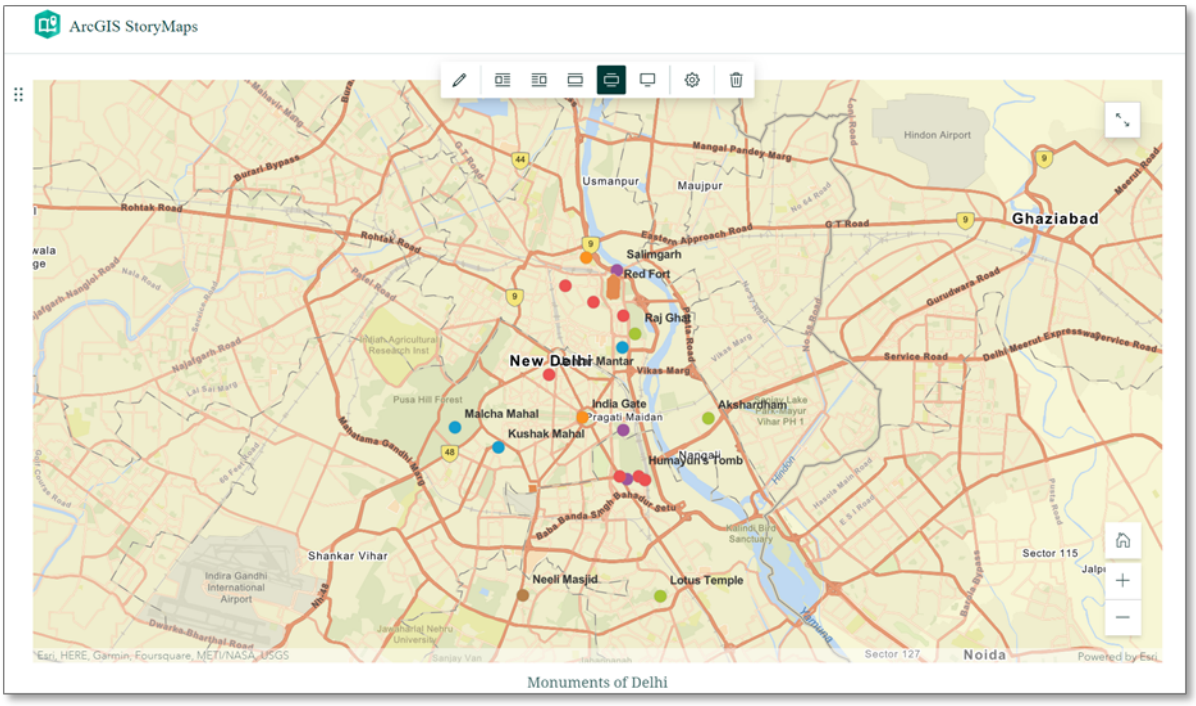


Figure 11: Map placed in the StoryMap

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.

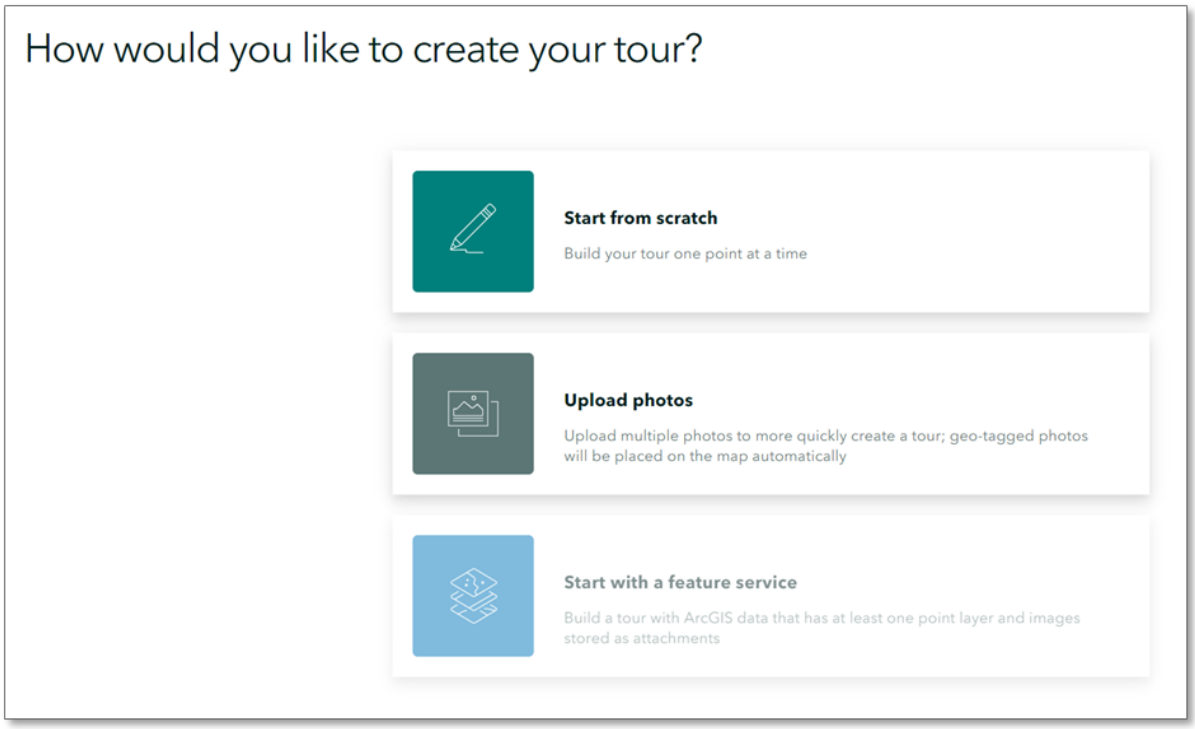


Figure 13: Creating a Map Tour in the StoryMap

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.

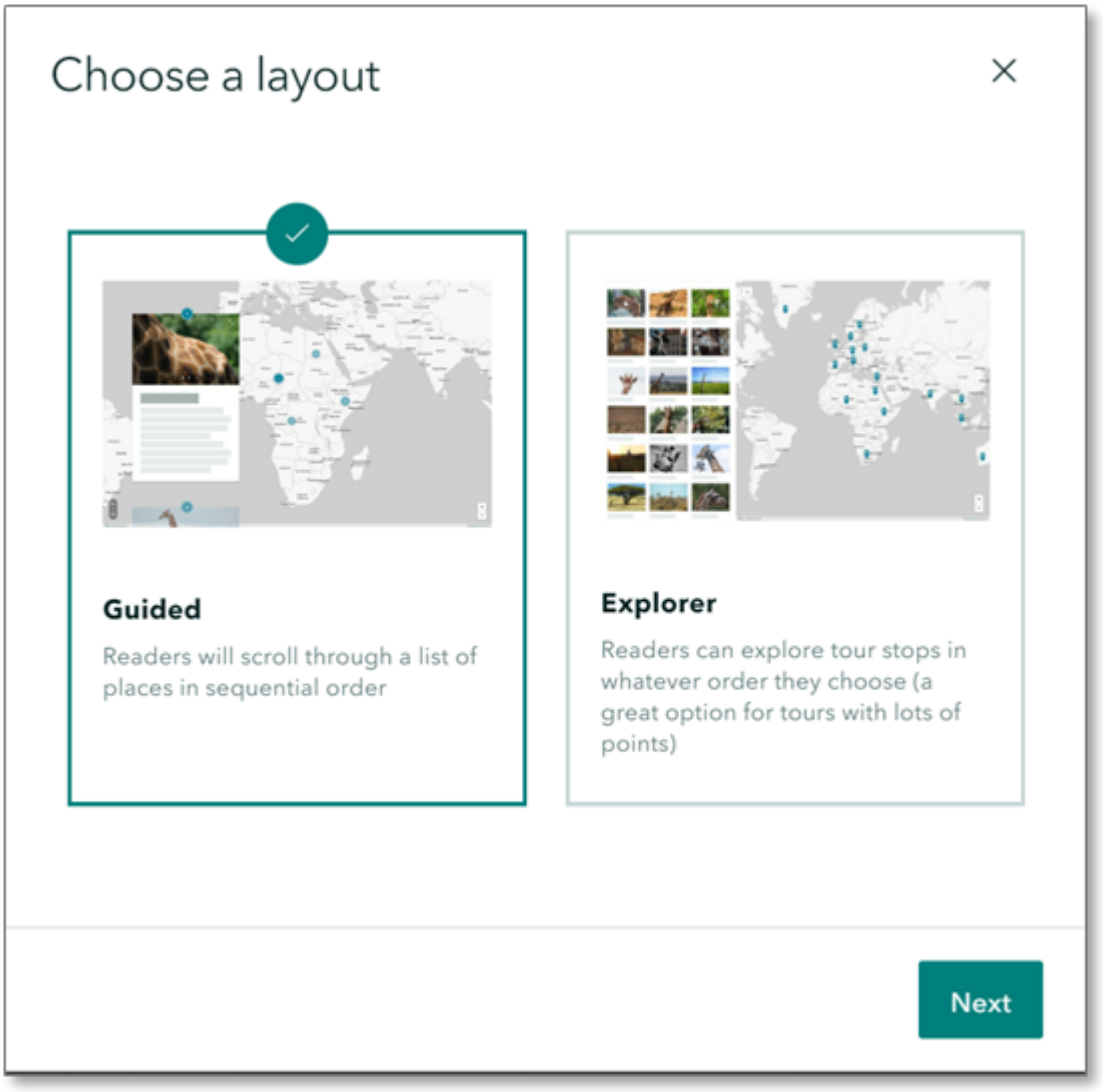


Figure 14: Choosing a layout for Map Tour

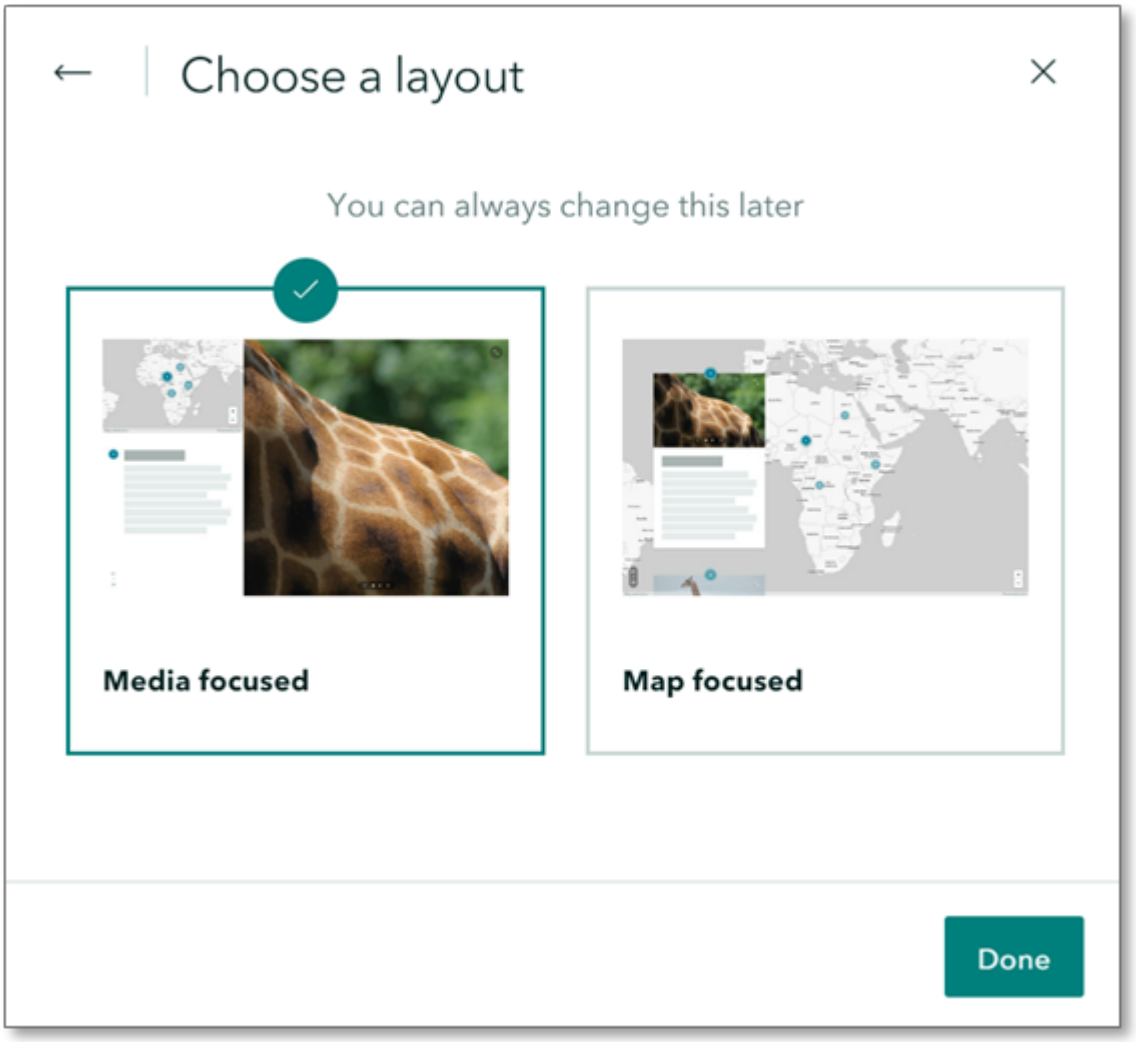


Figure 15: Choosing a layout 2

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

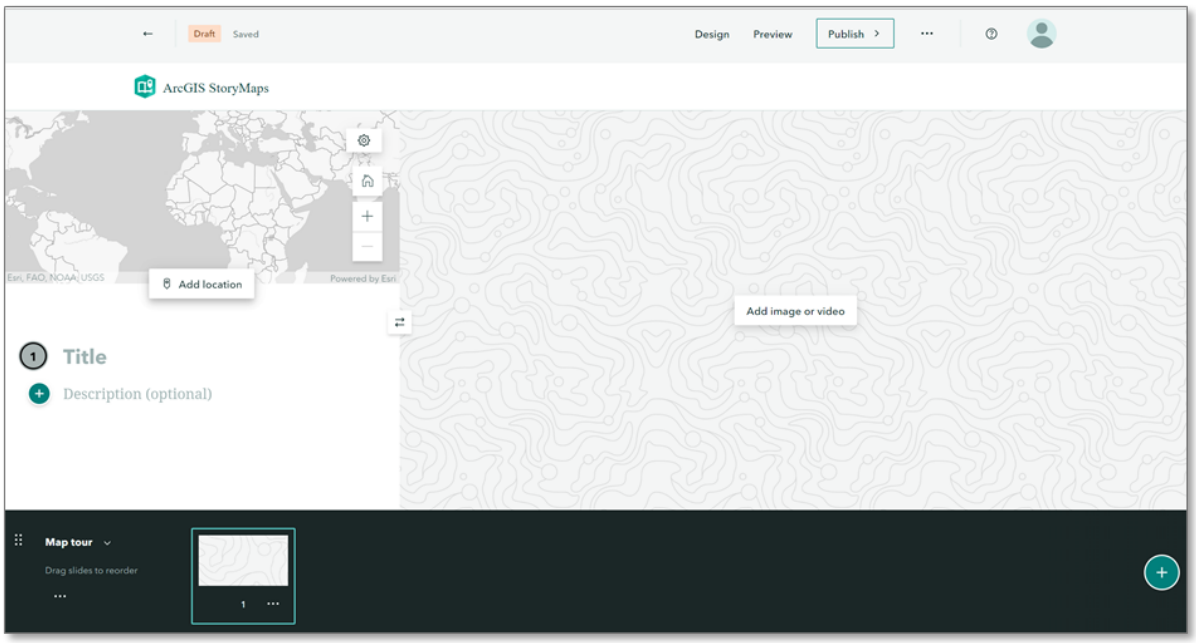


Figure 16: Making the Map Tour

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

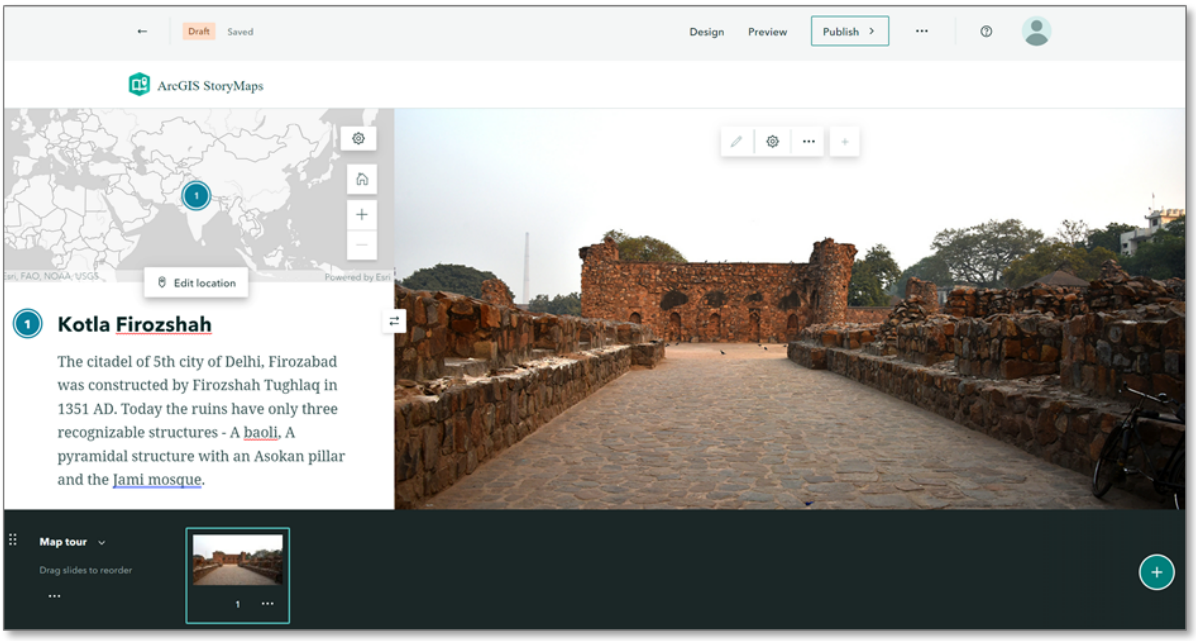


Figure 17: Map Tour with the first stop

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.

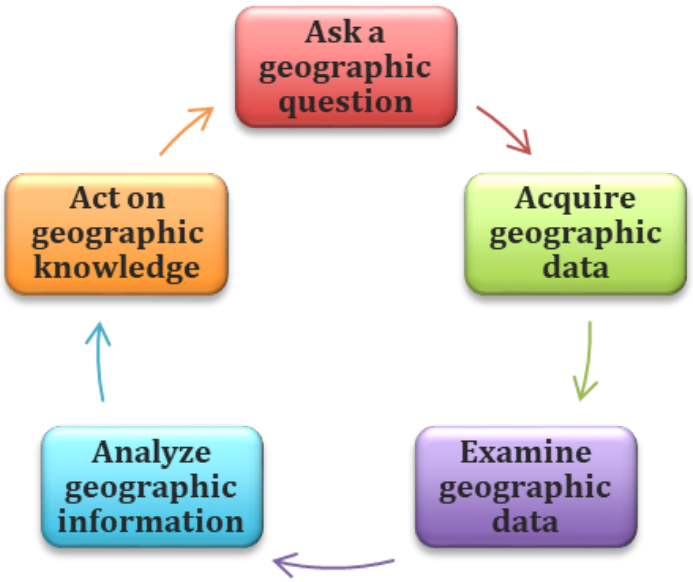
Understanding the Application of GIS in different fields

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?

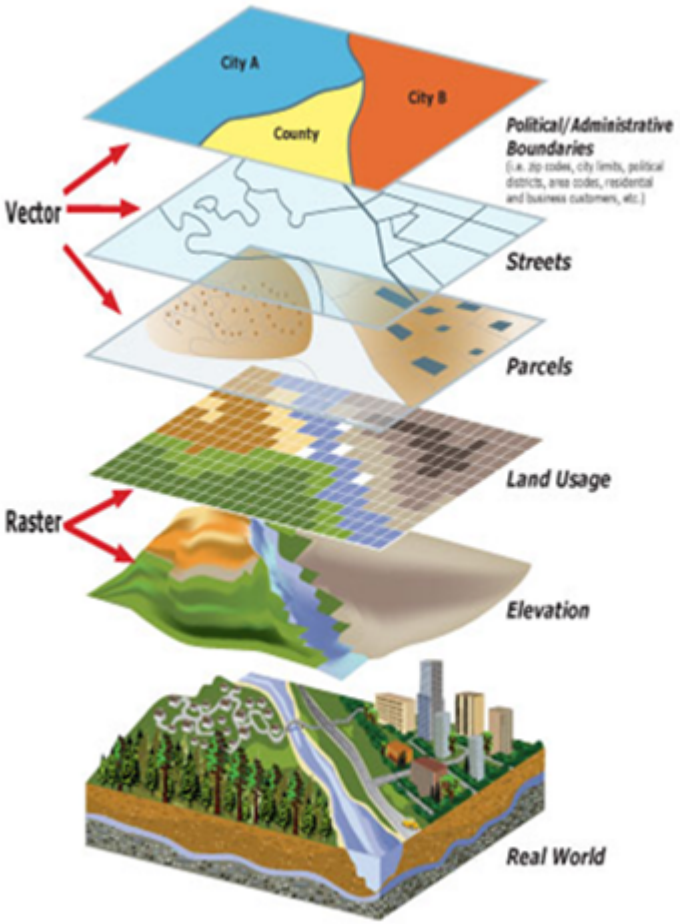
Since GIS data is made up of map representations and tables of characteristics, a GIS can handily solve queries and identify things. “Please computer find for me all cities of one million or more people where rainfall is less than 10 inches per year.” The important thing is that you now understand the 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

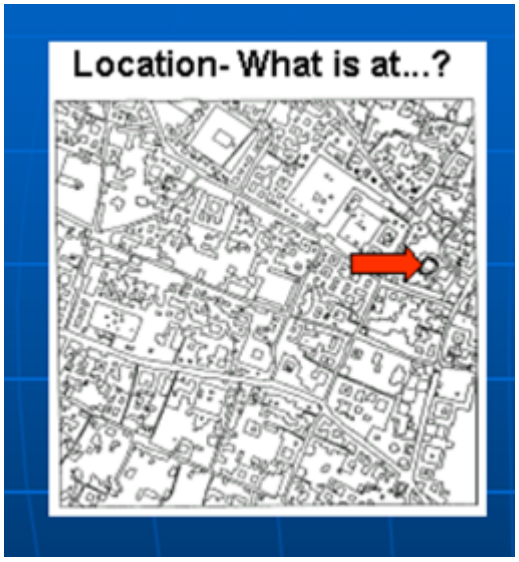


Questions GIS can Answer

- 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.

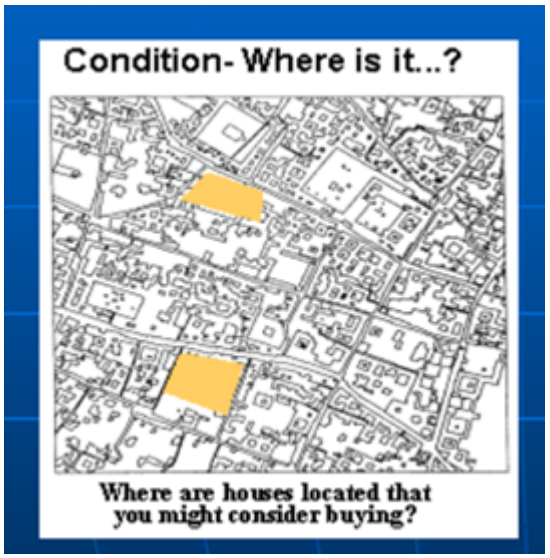
What exists at a particular location?

- 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.



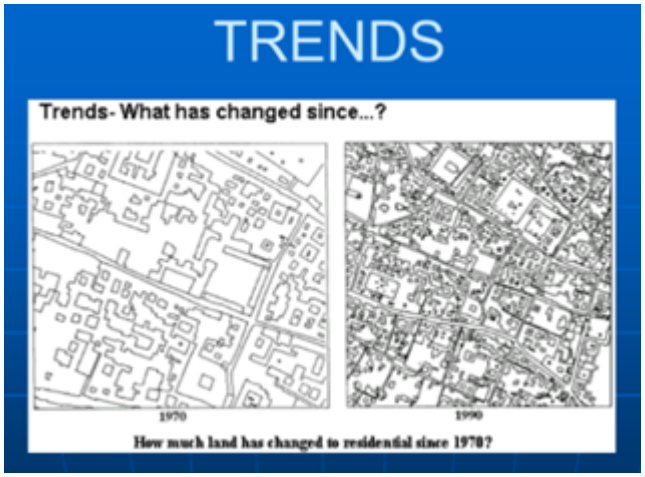
Where is a particular object located?

- 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.

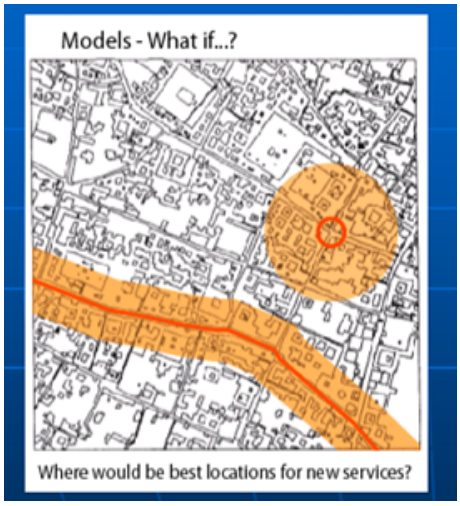


What is the spatial pattern?
What pattern exists...?

- 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.



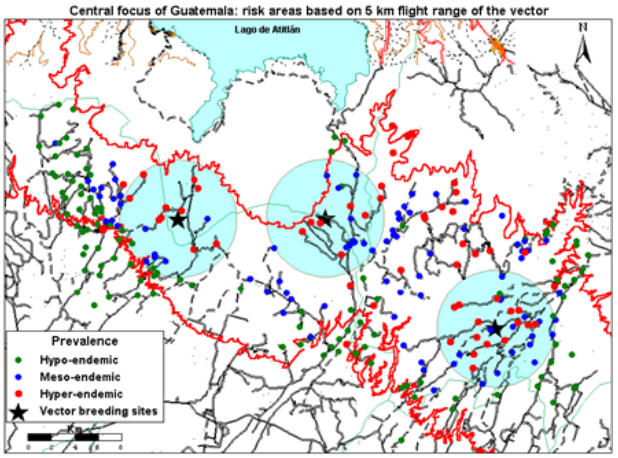
What can you do with a GIS?
Geographic Information Systems (GIS) have various applications, and technological advancements have significantly enhanced GIS data, specifically how it can be used and what can be achieved as a result. Geographic Information Systems are powerful decision-making tools for 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

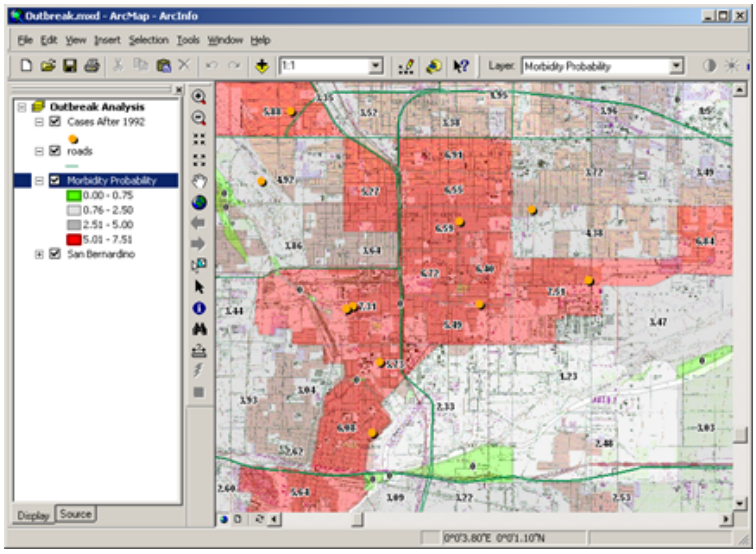
GIS Applications

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

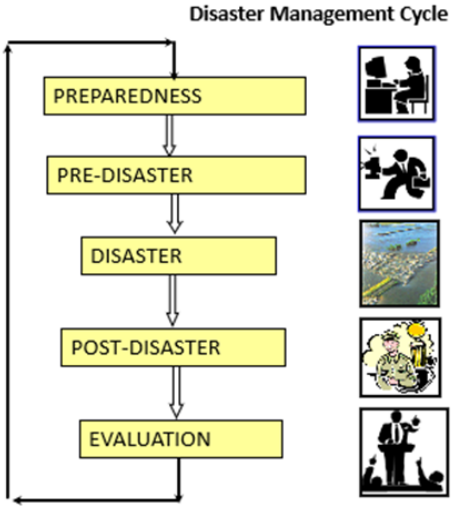


Outbreak Analysis

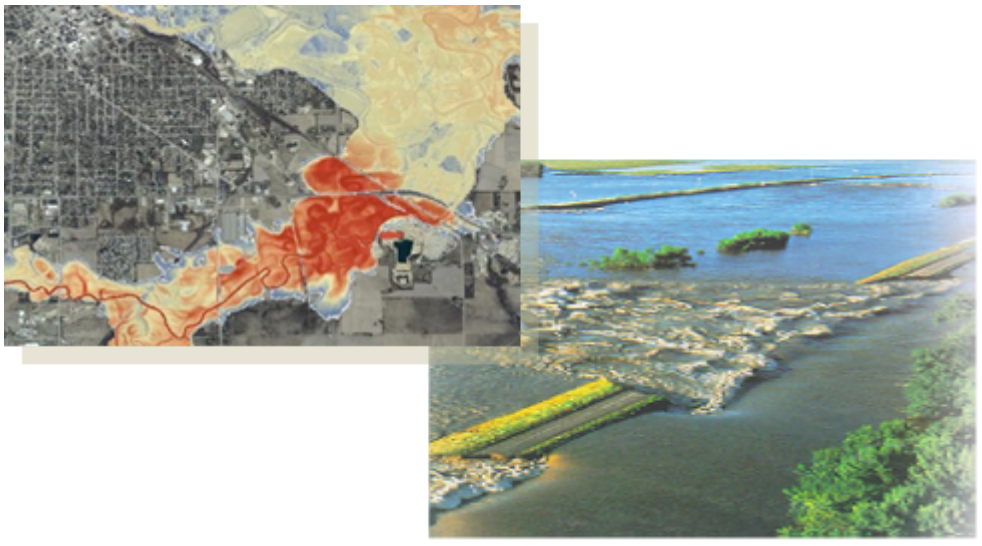


GIS for Disaster Management

- 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

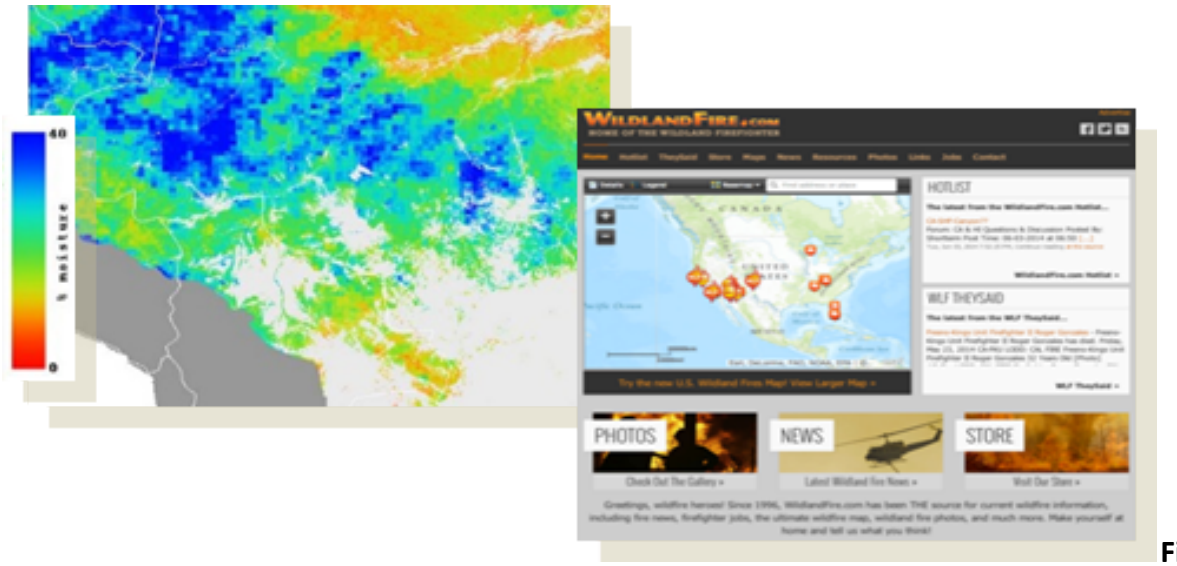


Flood Assessment

TISS_WOW_G9: 2.6 GIS Career I. p307

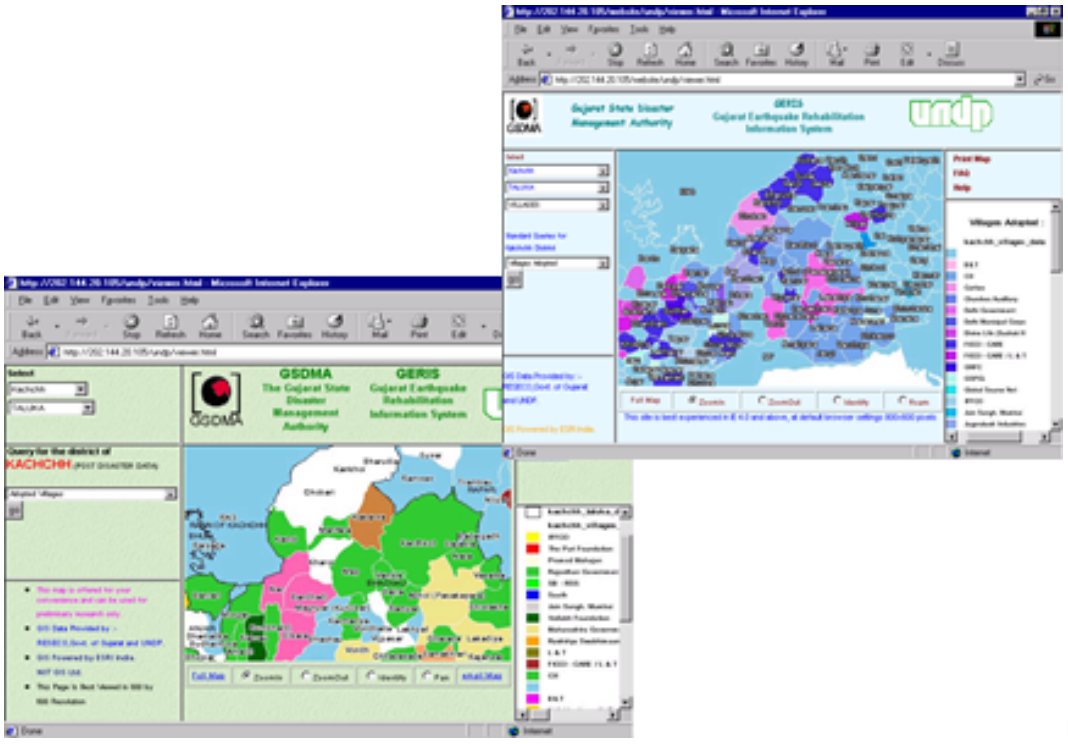
- Forest Fire
- GIS enables Forest fire risk zone analysis and mapping is necessary to prevent the spread of fire by detecting the areas where fire can start and easily spread.

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

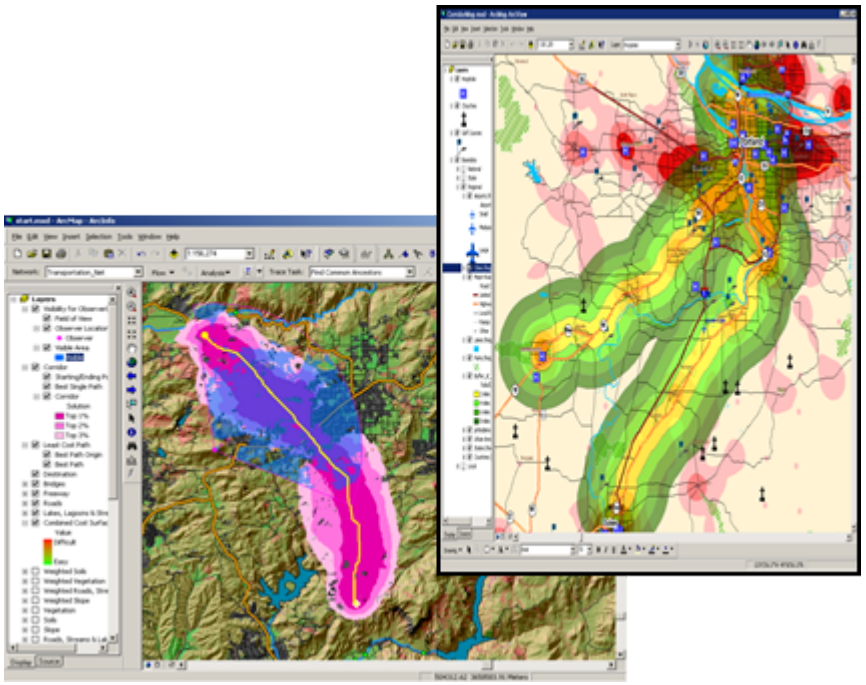
- Military Operations

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.

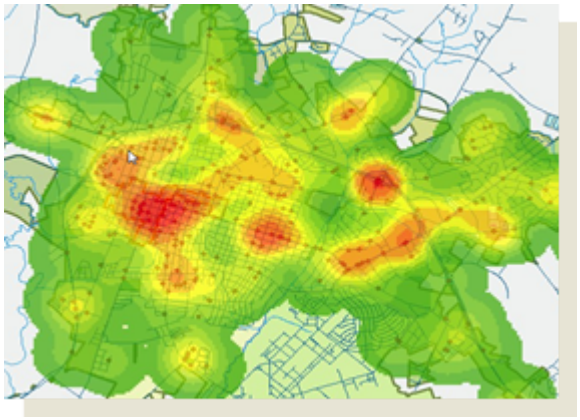


GIS for Public Safety

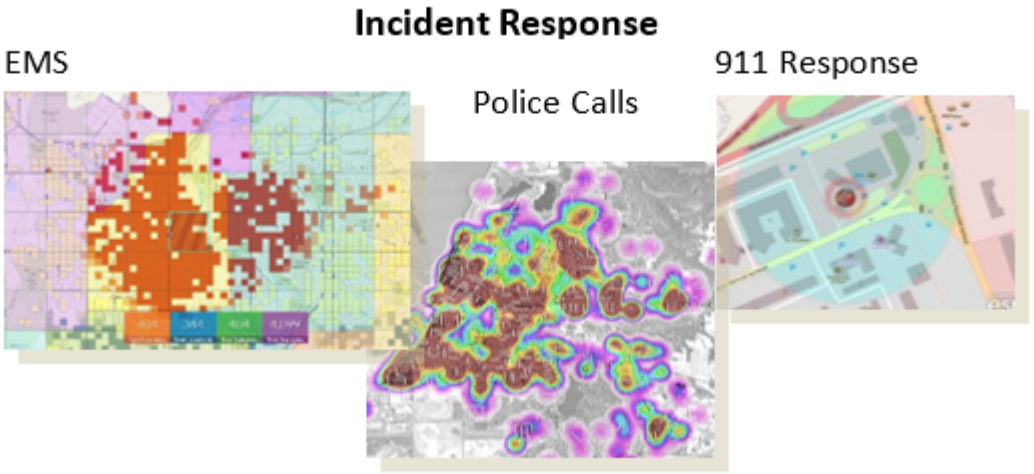
GIS can also be used to get critical information to emergency responders upon dispatch or while en route to an incident to assist in tactical planning and response. GIS helps identify potential suspects to increase investigators' suspect base when no leads are evident. GIS plays an important role in 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

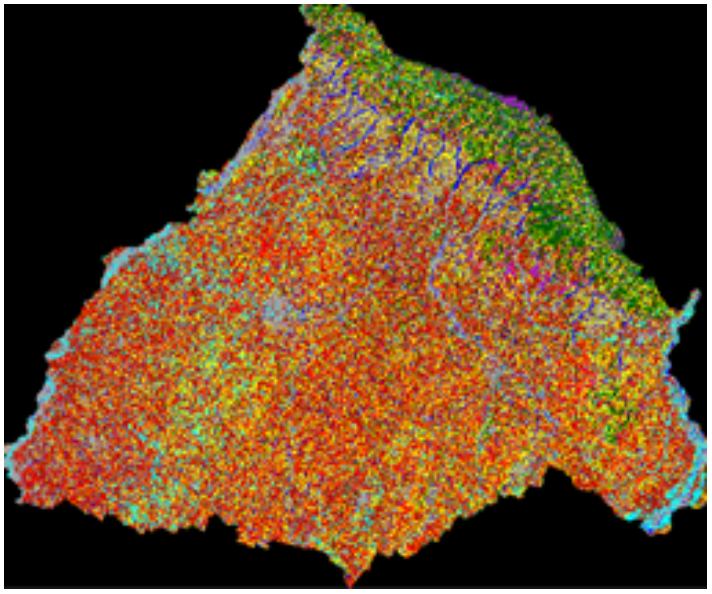
GIS is helping save lives in the public safety and security area by
- improving incident response,
- finding patterns of crime,
- helping us understand the implications of social and ethnic violence
-provide mapping solutions for crime analysis, criminal tracking, traffic safety, community policing,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



Crime Analysis

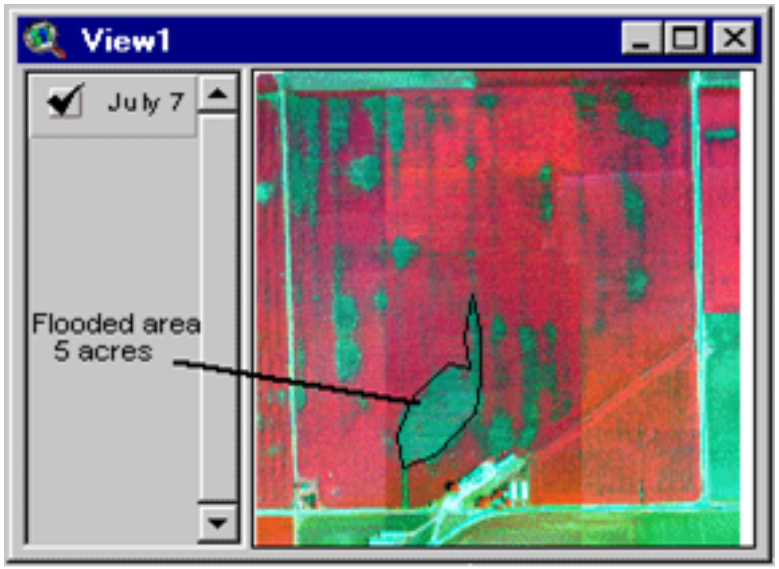


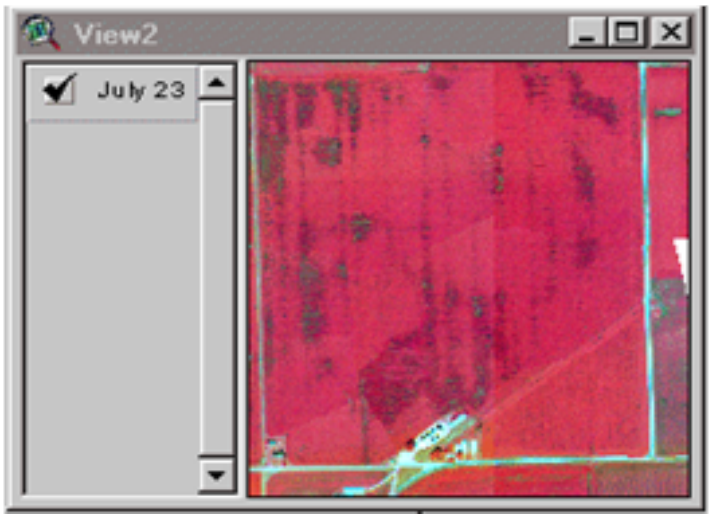
GIS in Agriculture
- Precision Farming
- GIS greatly contributes to managing timely, accurate, cost-efficient and repetitive information about agriculture.
- Monitoring Crop Yield and Health
- GIS enables monitoring of crop growth, health, and accurate or near accurate prediction of yield



Analyzing Agriculture Yields

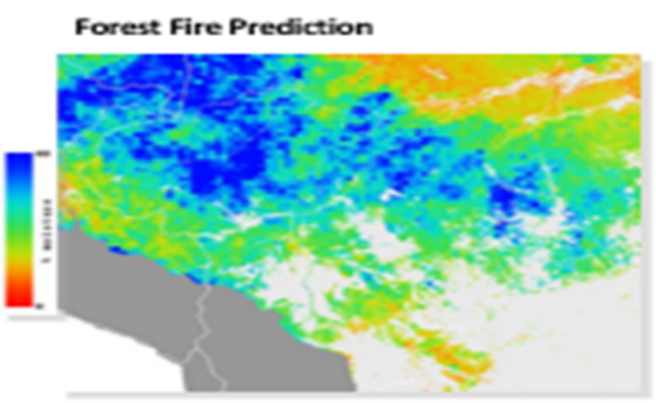
• For instance, by applying GIS technologies can be of great use for monitoring the development process of crop, identifying affected areas, determining soil quality condition, yield forecasting, visualizing real topography of crop fields and other spatial analyses in modern agriculture or elevation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





GIS in Forestry

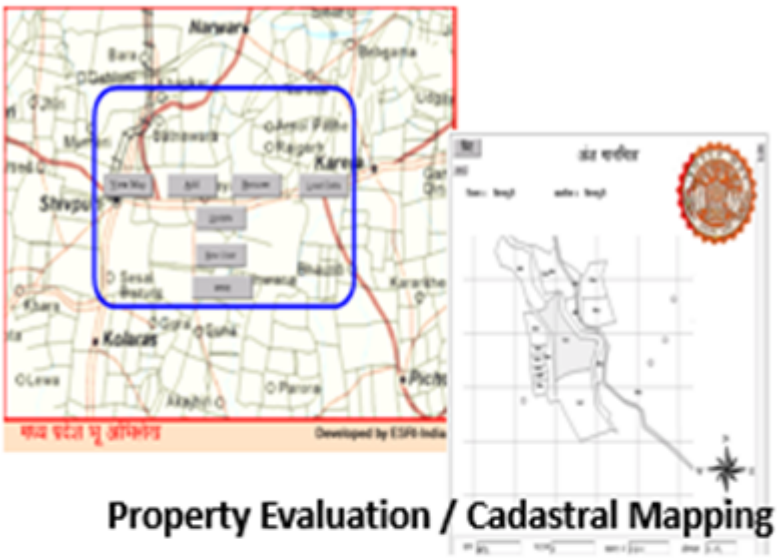
- Forest Fire Monitoring
- GIS has been quite effective in Management activities which include fire prevention, wildlife control, prescribed burning, and post fire recovery actions
- Forest Resource Management
- GIS helps in Restoration of the forest, Inventory of all types of vegetation species, maintaining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

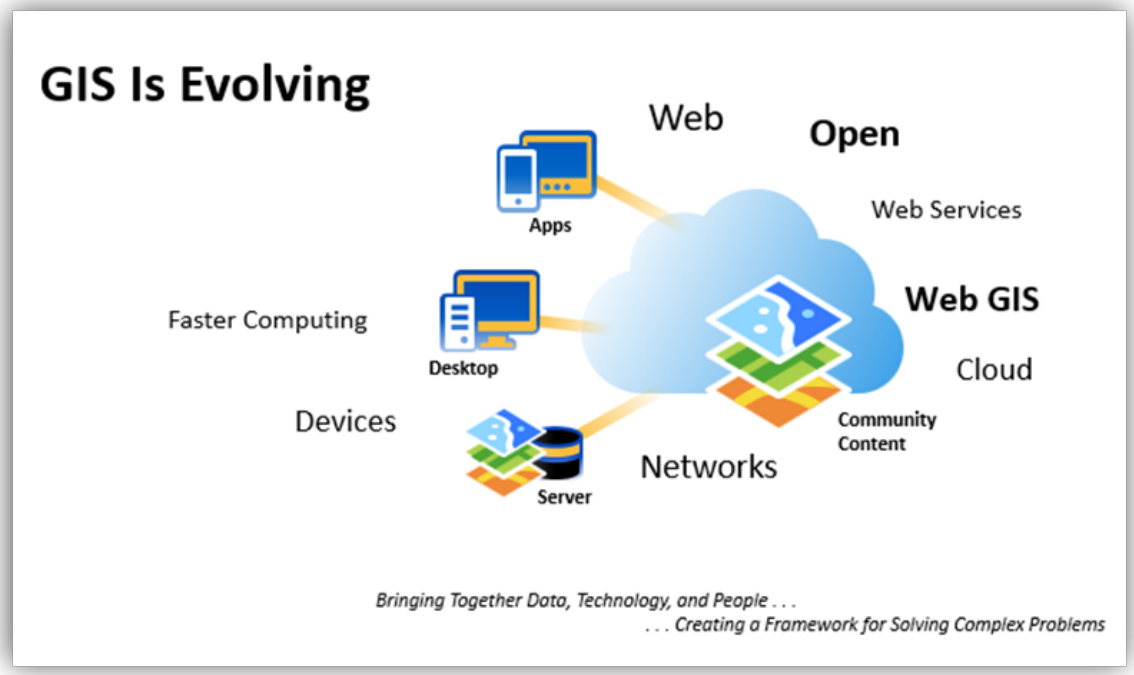
Understanding GIS Career
GIS is Changing How We Think and Act

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.

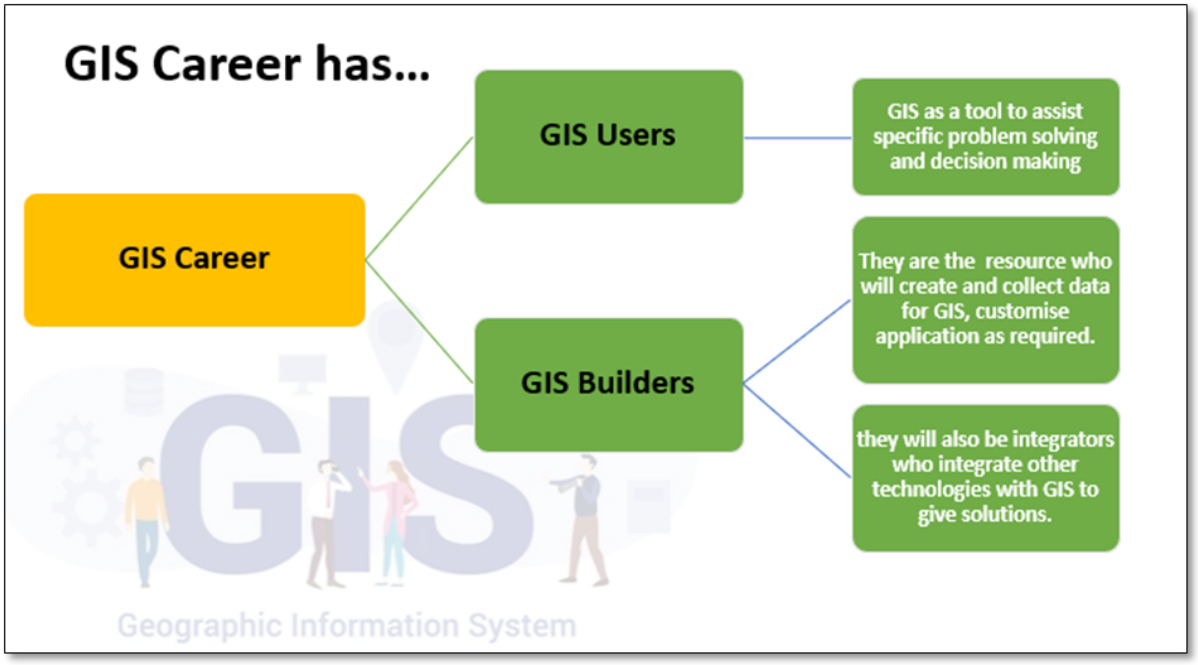
The only way to truly become proficient in GIS is to simply use it. The coursework will only serve to provide a base knowledge of the field and without some form of practical experience, most companies will not be interested in hiring.

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.

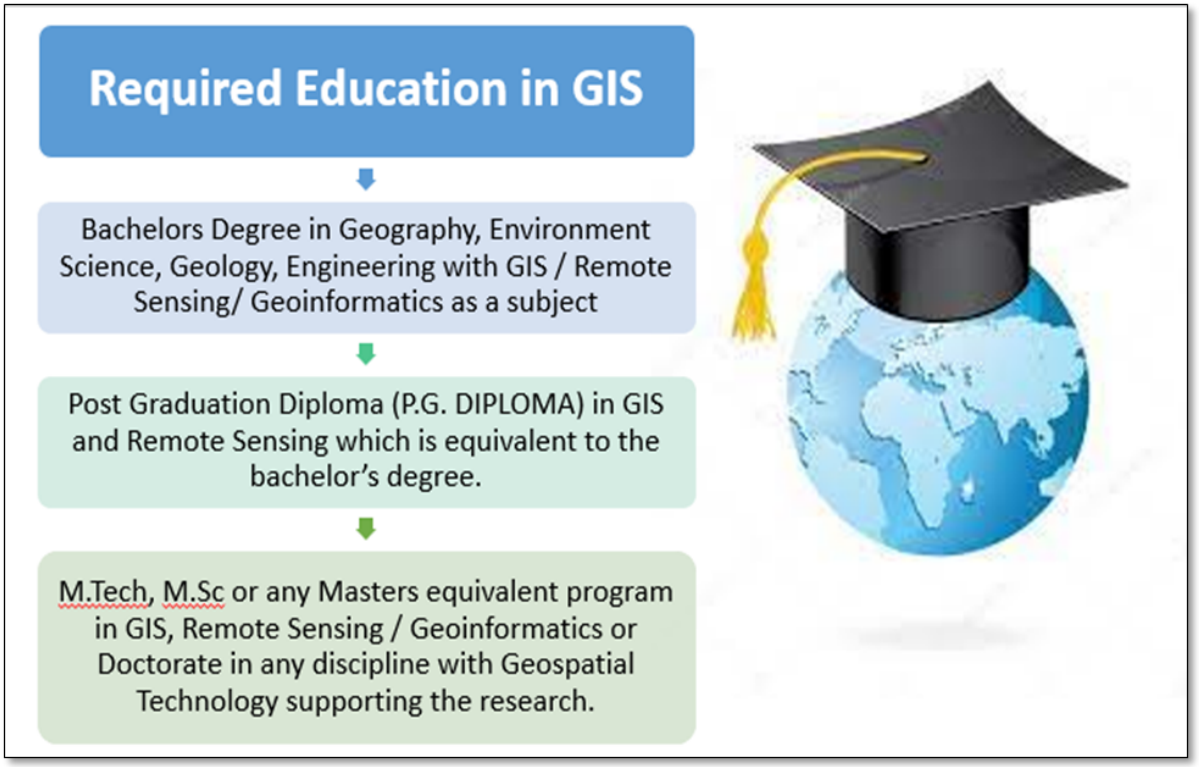


Major Responsibilities in a GIS Career

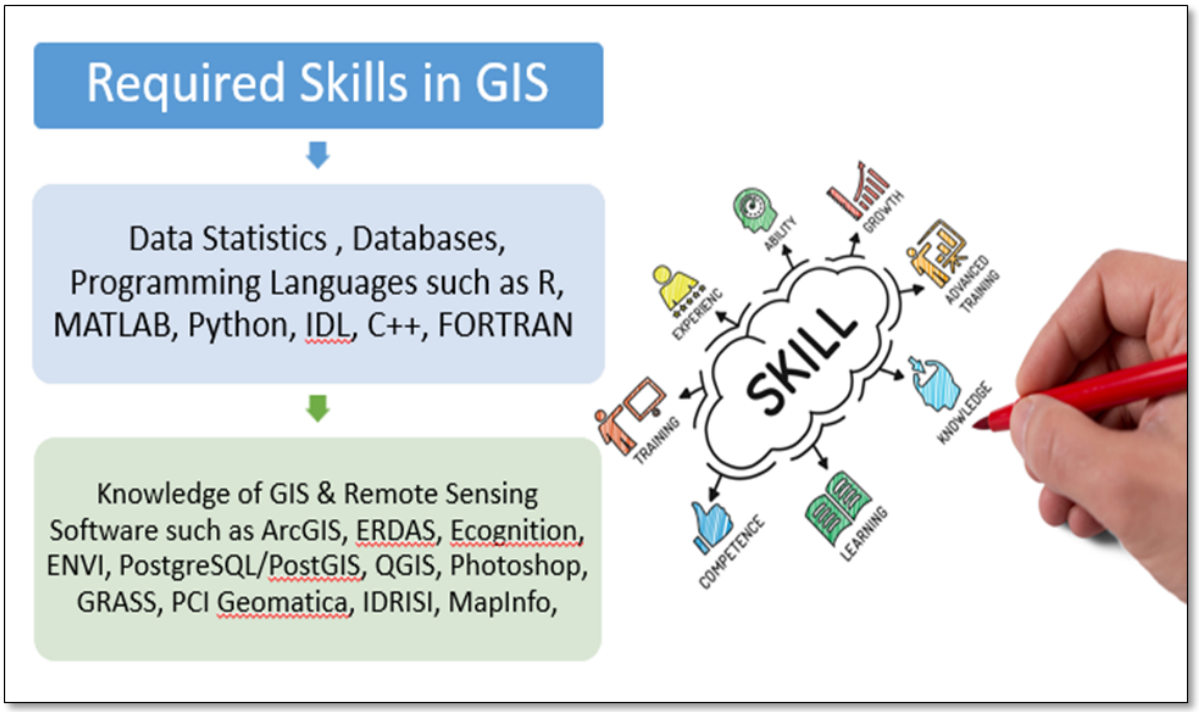
These are some of the Job responsibilities you will come across in a GIS Career

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

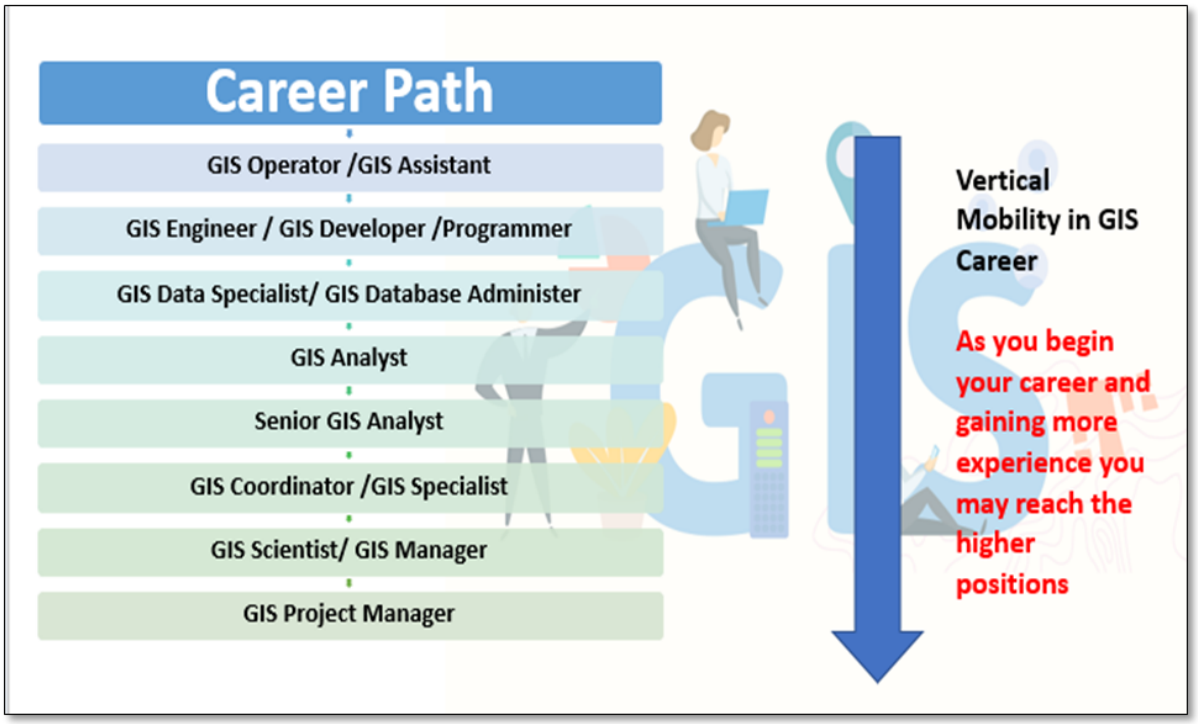
Required Education in GIS



Required Skills in GIS



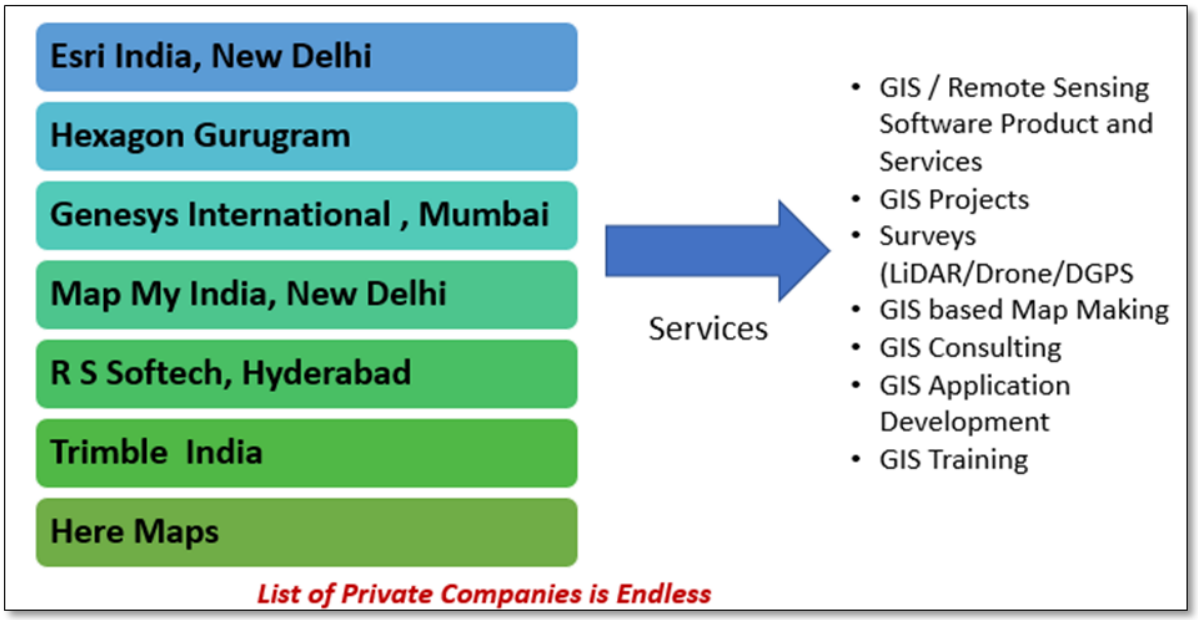
Career Path



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

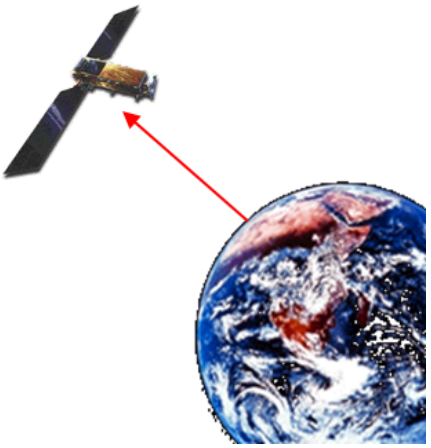
Sustainability initiatives are crucial today when climate changes affect people around the globe so dramatically. Smart technologies can help governments and businesses reduce their carbon footprint. GIS

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.

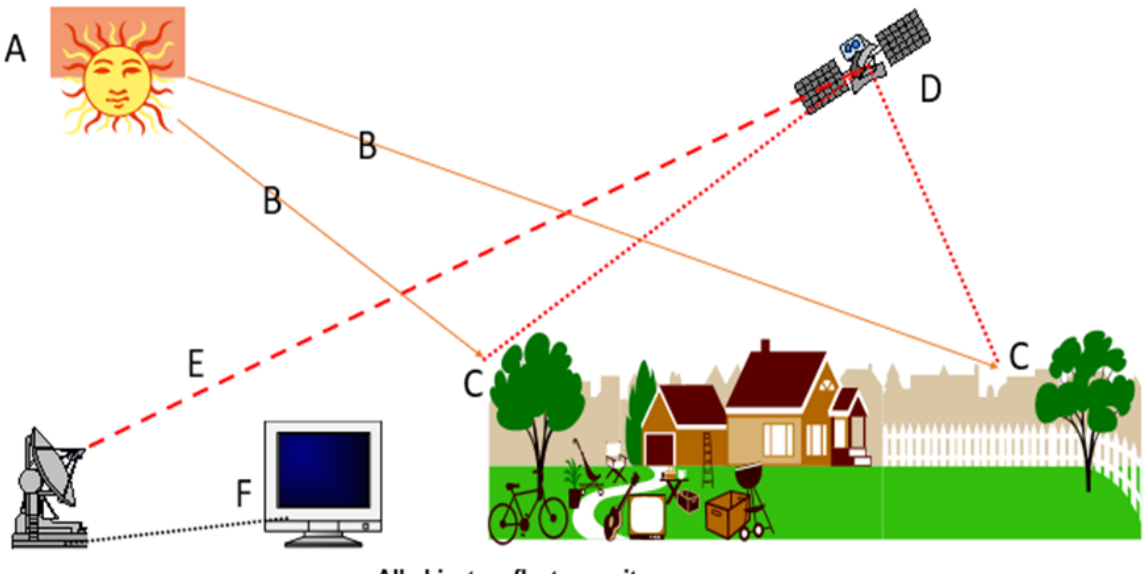
#7 LIDAR
This is the new trend in GIS technologies. Light Detection and Ranging (LiDAR) is one of the new trends in GIS we cannot miss. LiDAR is a major support to geospatial technology as well as an industrial revolution. It's used in various mapping applications, including forestry, urban planning,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

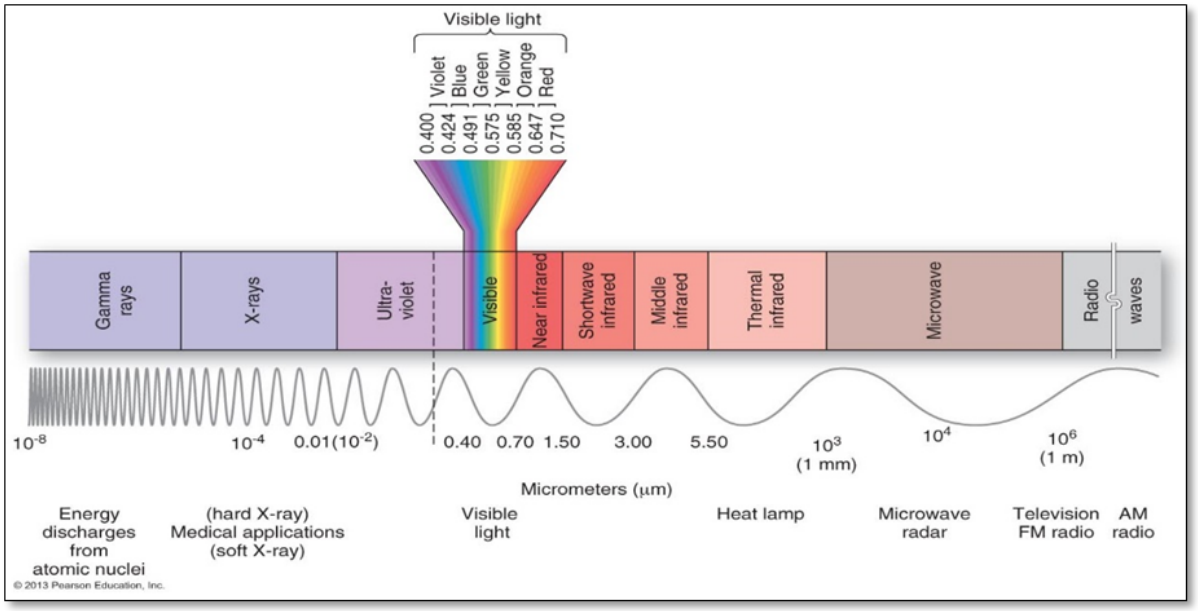


Remote Sensing Process

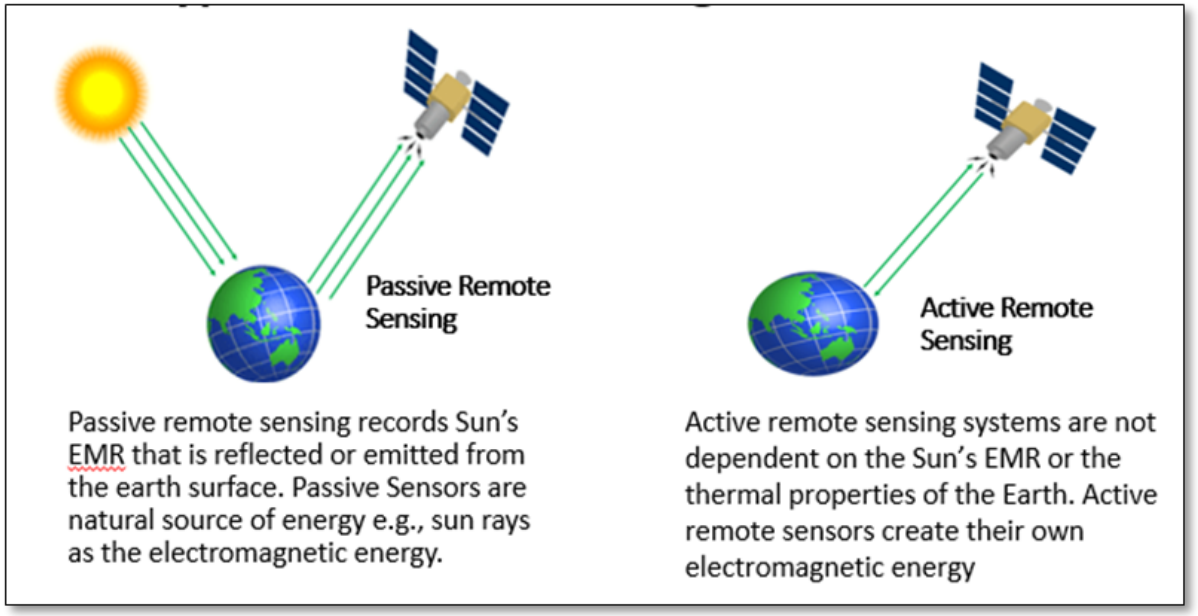


1. Energy Source or Illumination (A) - the first requirement for remote sensing is to have an energy source which illuminates or provides electromagnetic energy to the target of interest.
2. Radiation and the Atmosphere (B) - as the energy travels from its source to the target, it will come in contact 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

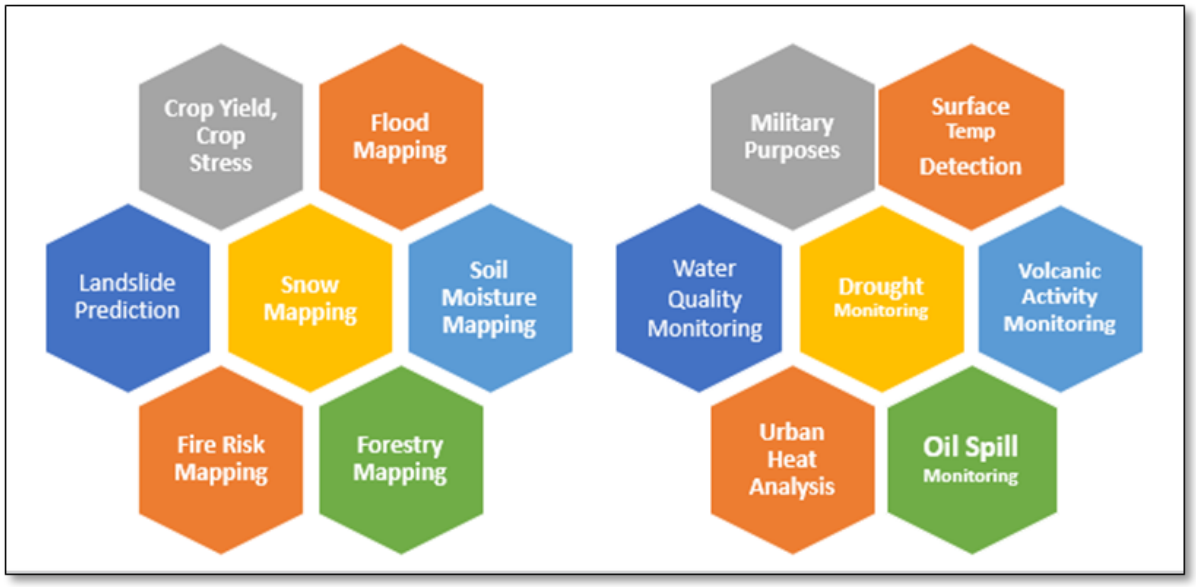
Electromagnetic Radiation/Spectrum (EMR)
In the field of remote sensing, we are mainly concerned with the interaction of light with the earth surface features. White light is a bundle of electro-magnetic energy also known as Electo magnetic radiation or spectrum
What are the sources of E.M. energy?
a) 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

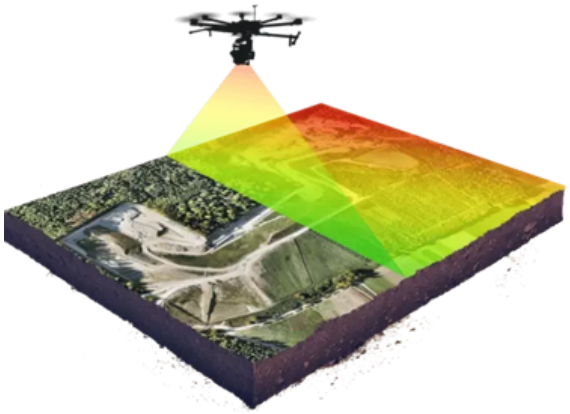
Benefits of Drones Technology

- 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

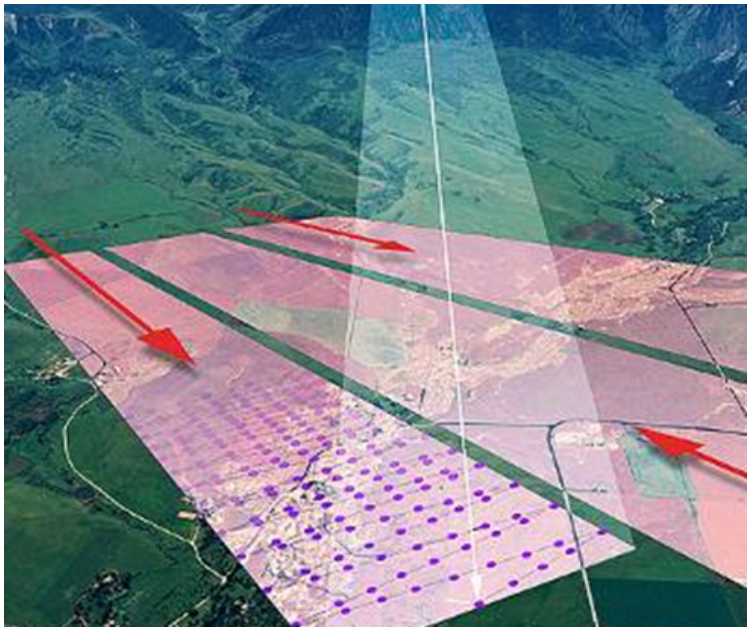
There are two types of LiDAR Platform

- 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

3.1 Urban Planning: An Introduction

Urban planning in ancient India showcased a remarkable understanding of spatial organization and architectural principles. Several ancient Indian cities, such as Mohenjo-Daro and Harappa of the Indus Valley Civilization (around 3300–1300 BCE), stand as testament to early urban planning practices. These cities were carefully planned with streets in a grid pattern and included multi-storied buildings. Water supply and sanitation systems were sophisticated for their times.

Today, 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 opportunities. 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 skill sets to read cities and understand relationships between the diverse range of places and people inhabiting and shaping the present and future of cities.

The challenge of effective Urban Planning in India has remained a persisting conundrum for decades. Plans are often far removed from the changing needs of local communities, businesses, inhabitants and workers. Central to the problem are several scales of disjuncture: The first, fundamentally, is a fragmented understanding of how cities work. Second, is the lack of implementation of Constitutional provisions for political and financial empowerment of cities. Third, the function of planning for cities continues to remain vested with State governments as opposed to local governments, despite increase in the pressures of urbanization in India. Fourth, is the separation of spatial/ land use planning from economic and social development for cities in planning legislation and practice. Fifth, resulting from the first is the absence of local area planning/ urban design in mainstream planning frameworks. Sixth, is the lack of integration of infrastructure planning and development with spatial plans and urban design schemes. The role of the urban planner as a change maker is crucial given these long-standing issues. This course comprises four units which expose students to all these dynamics in the field of urban planning. This Applied Learning Module on Urban Planning envisages to impart theoretical as well as practical knowledge on various aspects of Urban Planning to the students.

Sessions in this module consist of:

- Concepts
- Exemplar resources + activities with discussion
- Exercises and Assignments

3.2 Lesson Plan

Week 1: Reading Urban Places through a Planner's lens

Important Concepts

- Linking urban experience with strengths and weaknesses of the city; raising questions on who plans for our cities.
- 'Reading' and mapping urban spaces through the urban planner's lens.
- Understanding the role of Urban Planning and its various components, (addressing public problems, improving quality of the built environment (better streets, natural light and ventilation for buildings), better civic amenities such as public health care centres, municipal schools, parks and gardens, maidans etc).

Learning Standards

- Students explore urban places and reflect over their experience of the same.
- Students learn how to read urban places, their strengths and weaknesses, by walking through them and making keen observations; students think about what needs to be done to improve the quality of urban places.
- Students reflect on their experience and observations from walking through urban places and draw a sketchy map of the place showing its strengths and weaknesses (main activities, landmarks, places where people congregate, places which feel good, places which need to be improved, missing amenities) components of urban planning and are able to use it to create a map of an urban space.

Inquiry Questions

1. How to read a place through an urban planner's lens?
2. How to understand the strengths and weaknesses of urban places by drawing a reflective map which captures their experience of urban places.
3. How to mentally categorise the strengths and weaknesses of urban places into parameters and components of urban planning (land use, design of streets/ built environment, civic amenities and infrastructure).

Lesson Plan: Week 1 Day 1

What do we know about Urban Planning?

Classroom Inquiry Process	Resources
Lesson Aims: ● Students' interest in urban planning is activated ● Students reflect on their personal urban experience of the city or the locality they live in. ● Students analyse the city's strengths, weaknesses and start to visualise themselves in the role of urban planners. **Activity Title: The Urban Experience** (40 mins) The first activity is a class wide, collective one. The teacher will solicit open ended responses from students on their experience of cities. The intention is to have students bring to memory features of the urban spaces around them. Also, as part of the discussion they reflect over the strengths and weaknesses of these spaces and also listen to their peers, in order to develop a wider understanding about the diversity of places and inhabitants that cities are made up of. Given below are question prompts that the teachers may use to drive the discussion. **The teacher will ask students to use their Week 1 Day 1 student handout to follow the session at this point**. He/ she/ they will prompt students with specific questions: ● Which city is your family from? How do you associate with that city? (Since Delhi has many immigrants, this is to identify the place from which students originated. Students themselves may have been born in Delhi but their parents or forefathers might have migrated from elsewhere, they can mention this. In a few cases, the students families might be natives of Delhi for as long as they remember) ● Where do you live and where do your parents work? Where are the main employment areas in Delhi? ● What do you observe and feel when you walk through wide tree lined vistas, for example streets near the Lodhi Gardens? ● How does it feel to live and walk in crowded areas, for instance, Chandni Chowk or the Shahjahanabad area? Safe, secure and a sense of community or a sense of inefficiency? ● In your experience, how are old city areas different from newly planned localities? ● Where do you play with your friends in the evenings? Any sport? ● What are the types of gardens, parks and maidans you use? ● Do you have to travel a long distance to go to a shop for day- to-day groceries or are these shops at a five-minute walking distance from your home? Do you think it is good to have daily shops around your homes? If yes, of what size? Super markets or small shops? ● Is your neighbourhood noisy? Why?	Week 1_Unit 1_Day 1_Student Handout

- Do you have medical care near your home, such as hospitals, at an affordable price?
- Are your streets provided with footpaths and organised two and four wheeler parking spaces?
- Do you see a variety of architecture or are the buildings in your locality more or less uniform in the way they look? What do you feel is needed for a place to feel inviting – uniformity or diversity in appearance?
- Do you think the city is welcoming or inclusive of people with disabilities

ttps://youtu.be/_wF7ybKfWG8

The teacher may play a documentary at this stage to provide a sense of the diverse range of places in a city such as Delhi (10 minutes)

Prompts for the teacher:-

Students may respond in diverse ways, listed below are some examples of expected responses :

- My family is from Ranchi, Jharkhand.
- Mine is from Jalandhar, Punjab.
- Delhi we understand, is the political capital of India
- There are many markets in our city. We have vegetable markets in our locality - There are areas which sell mainly construction materials like stone etc - There are IT Parks, large vegetable markets as well.
- Places such as NOIDA and Faridabad have hazardous industries also. There are many trucks parked there.
- There are many large scale transport networks – metro rail, airports, railway stations, bus stations etc.
- Lodhi Gardens are spacious – they accommodate people from all over the city and are meant for all
- Chandni Chowk feels like a safe space when it is not overcrowded. Otherwise, women and children may feel overwhelmed.
- Old city areas have narrower streets than new localities. Old city areas have jam-packed houses and buildings, no space between buildings. That makes natural light and ventilation poor.
- My locality is very congested and noisy. We have a motorcycle workshop and a bar & restaurant
- My locality is congested but very lively, there are many street vendors, children playing on the street, crowded corner shops
- My locality is a spacious neighbourhood. There is a lot of greenery. We have many parks, gardens and a maidan also.
- We have a wide range of sizes of maidans, parks and gardens in the city. For day to day games like cricket, we play on the streets. For school sports, we use the maidan next to the school.
- Our area has a large hospital/ ours does not/ we have a public health centre and many private hospitals – but the private hospitals are expensive.
- We have organised parking in our area, but the streets with commercial activities have haphazard parking.
- We have no footpaths on our street. Footpaths are made in the city only for newly planned areas. Even where we have footpaths, they are fully occupied by shops spilling over onto them.

- People are too busy doing their own thing, we don't even know who our neighbours are
- During the lockdown recently, people living on our street really came together to help each other
- We keep asking our neighbours to not throw garbage in front of our house, but no one cares.
- There are several fruit and vegetable vendors in most localities of Delhi
- Recently, several poor people got evicted from along the railway tracks
- The Qutub Minar (or Humayun's Tomb/ Lal Quila) in Delhi are important monuments
- Our locality has nice large maidans for us to play
- There is too much noise in my neighbourhood because we have small industries next to houses
- I live in a crowded locality, in a congested house. My neighbours also do not have enough natural light and ventilation in their homes. Mumbai is very crowded
- We have large traffic jams and polluted air everyday
- Bangalore has many trees but also a lot of traffic congestion
- We do not have enough open spaces to play in our neighbourhood
- The garbage dump near our place never gets cleared
- The metro rail is very good. It has reduced my travel time to school almost by 30 minutes.

It's best to get as many responses as possible since hearing each other will stimulate the imagination of students and will let them know that their own surroundings are different from those of others.

On receiving these responses, the teacher may ask the second set of questions:

- "As you have seen, places in cities are diverse. Some places are less equipped with civic amenities and good quality of built environment than others. Given this unevenness in access to basic amenities, who in your imagination is responsible for the city to have all the facilities to achieve a basic minimum quality of life? Who plans and implements the plans?

The teacher may prompt students to receive the following possible responses:

- ➔ "Is it the government's role? (yes, government's role is to address public issues/ problems and provide parity for all)
- ➔ Which departments in the government? (municipal corporation and its many sub-departments)
- ➔ Is it people themselves who manage their civic needs in the old city areas or traditional localities? If yes, is that reasonable? (the government must attend to all parts of the city for a certain set of basic amenities)
- ➔ Often, spacious, gated planned areas are privately managed, with no intervention of the government. Is that an acceptable practice? (spaciously designed gated residential and office complexes tend to consume an excessively higher quantum of resources- water, power, money, human resources etc.)

➔ What role should private shopkeepers/ shop owners/ businesses play in good maintenance of urban places they occupy?" (comply with government rules and norms).

The teacher must summarise that the answers to these questions are often quite complex; understanding these need much more knowledge and study. The intention of raising these questions is to invigorate students to think about these things. Then the teacher moves on to say:

"Given your preliminary exposure to places in a city, what do you think are the parameters of planning? In other words, what is it that needs to be planned by the government, in order to achieve a decent quality of life for a city's inhabitants?"

Students are likely to respond to this question in random ways that may not necessarily follow a sequential order or by particular themes (as shown in the table below).

The teacher should ask students to refer to the Student Handout pertaining to Week 1, Day 1, Activity 1. The handouts have boxes available for students to record their observations.

At the same time students may raise their hands and respond to the teacher. The teacher must use the black/ white board to categorise student's responses in a tabular format given below:

Identity, Vision for the City ● Technology: It is the IT City of India ● Power: It is the capital of India Finance: It is the finance hub of India	**Identity, Vision for the City** ● Technology: It is the IT City of India ● Power: It is the capital of India Finance: It is the finance hub of India
People and sense of place ● People are too busy doing their own thing, we don't even know who our neighbours are ● During the lockdown recently, people living on our street really came together to help each other We keep asking our neighbours to not throw garbage in front of our house, but no one cares.	**Private property** ● Congested buildings, not enough natural light and ventilation ● Haphazard development ● Orderly and planned development ● IT tech parks with spacious layouts

Week 1_Unit 1_Day 1_Student Handout.docx

Types of economic activities	Infrastructure and amenities
● Construction industry markets, vegetable markets, timber yards. ● Wholesale vegetable markets ● Hazardous industries ● Truck parking and movement	● There are many transport infrastructures: bus, metro, airport, railway stations ● We have frequent buses from our place to my school. I am very happy about that ● We do not have enough space to play safely in our neighbourhood. But my friend's locality is much better ● Similarly, we do not have enough hospitals and schools. We have to go to their locality for these We have large maidans and gardens in our neighbourhood. People from all over the city come here.

After noting down the categories, the teacher should encourage students to align their response to the categories he/ she has written on the board.

Before erasing the blackboard, the teacher must document the content as a photograph. In Session 03 of Unit 01, the teacher will be required to project this table on a screen for student's reference.

Activity Title: Reflecting on the Strengths and Weaknesses of Cities (30 minutes)

Week 1_Unit 1_Day 1_Student Handout

In the second part of the session, the teacher will deepen the discussion. She/ he/ they will explain to students the importance of understanding the strengths of cities and how planning can build on them. Also there will be discussion about the weaknesses of cities so as to alleviate them through several types of interventions, urban planning being one of the solutions.

The teacher will ask students to use their handout for Week 1, Day 1, Activity 2, which contains two large boxes where students can write their reflections about strengths and weaknesses of places they remembered.T

To start the discussion, the teacher can say, - "Now that you have shared your observations and experience of cities, please reflect on the same places and

share with everyone what you observe as strengths and weaknesses of your city, Delhi or your locality."

The teacher nudges each student to translate their initial reflections into strengths and weaknesses of the city. By looking at the table written on the black board, which has randomly placed observations, the teacher asks students to match their observations with strengths and weaknesses (such as the below), and speak/ read them out aloud.

The teacher must provoke students to think if what is a strength for one student could be a weakness for another. For example, a gated residential neighbourhood may seem a strength to one student because of the good quality of life it offers. To another, it may seem like a weakness because gated privately managed localities tend to consume much more resources, without any returns to the municipal government.

What needs to stay or be reinforced (strengths)	**What can improve or is inadequate (weaknesses)**
● All open spaces ● Public transport ● Historical areas and monuments ● Expressways and flyovers? (raise question: where should flyovers go? In strengths or weaknesses) ● Natural areas (forests, wetlands, low lying areas with riparian vegetation) ● Planned residential developments ● Business districts	● Need more open spaces for the city ● The air needs to become cleaner in Delhi, we need more trees ● More hospitals in all the localities ● The river Yamuna needs to be cleaned

Conclusion (15 minutes)

The teacher captures and categorises responses from students on the board and explains to them the following:

- The experience of urban places is important to understand how cities work, what their strengths and weaknesses are.
- Understanding the strengths and weaknesses of a city is important for the purpose of deciding how cities can be made better places to inhabit through equitable distribution of amenities and infrastructure through urban planning.
- That urban planners gain an in-depth knowledge of the strengths, potential weaknesses and inadequacies of a city, and use this knowledge to reinforce strengths of cities and address their weaknesses as public problems.

The teacher concludes the session by explaining the relevance of what has been discussed with respect to urban planning in India. He/ she/ they explain(s) that

the purpose of planning is to foster some informal norms and frame regulations for ensuring access to basic services, a good quality of built environment and a decent quality of life for all. The teacher closes by summarising the aspects discussed in class under the heading of components of urban planning: **Purpose and Components of Urban Planning:** 1. Alleviation of problems and achieve a decent quality of life 2. Provisioning the minimum civic amenities for all 3. Developing regulations to channel a good quality of built environment in public and privately owned, managed residential, work and recreational spaces. 4. Reserving land for civic amenities such as public health care centres, municipal schools, parks and gardens, maidans 5. Plan for future infrastructure projects metro rail, water, sewerage networks 6. Allocate investments for priority development and monitor plan and project implementation The teacher projects the above slide at the end of the first session and concludes the session. Before closing the session, the teacher then announces the next exercise, i.e., *Reading Urban Places.* The teacher gives the following instructions to students for the next class: ● "All students shall gather at the same classroom as today, tomorrow, in the school. ● We will walk through one locality, experience its qualities, strengths and weaknesses, and interpret these experiences through an urban planner's lens. ● We will observe how quality of places is defined by the configuration of land and buildings, regulation for different kinds of uses (residential, commercial, industrial, civic amenities, transport infrastructure, and so on), which amenities are provided, who makes these provisions (public or private agencies) and to what extent these places have a good quality of life."	

Lesson Plan: Week 1 Day 2
Reading and walking urban places

Classroom Inquiry Process	Resources
Lesson Aims: ● Students get to see diverse characteristics of a locality- planned, unplanned, areas occupied by the middle class and economically weaker sections; economic activities spilling over onto the street; orderly stores and shops, etc. ● With observation and guided discussions the intention of the session is to have students connect their observations to key components and instruments of planning and governance subsequently. ● To make students think about patterns of Land use for private and public purposes, and how this influences urban planning. **Activity Title: Reading and walking urban places (90 minutes, 500-600 metres, along an easy to walk route)** The teacher needs to be thoroughly prepared for taking students on the walk. He/ she/ they need to prepare a toolkit for themselves. This toolkit may include (but not be restricted to): ● A map such as the Google map, with all streets, major and minor landmarks shown. ● Newspaper articles or other local media clippings about local places and their significance (for example, about street food in a particular locality; efficiency of a medical health care centre, walkable streets in a locality etc). ● The Existing Land Use Map from the City's Master Plan, here, Draft Master Plan for Delhi 2041. ● See, teacher's toolkit attached. Using this toolkit, the teacher and her/ his/ their assistant will rehearse the entire walk. He/ she will trace the exact path of the walk along with an assistant and make specific notes of observation points/ places. Pointers for making notes during the rehearsal: ○ Type of land use, building use ○ Compatibility or incompatibility of land uses ○ The nature of the built environment (crammed spaces, spaciously laid out streets and houses/ buildings, the extent of natural light and ventilation) ○ Making distinctions between public and private lands ○ Types of civic amenities: public and private (open spaces, health centres, hospitals, schools, colleges, police stations, garbage segregation centres and so on, disability access) ○ Strengths and weaknesses of places along the path The role of urban planning and urban planners: ● To plan for sustainable, inclusive and competitive future and development of cities	Unit 1-TEACHER-TOOLKIT  Week 1_Unit 1_Day 2_Student Handout

- To regulate land use and development on public and private land
- To make land available for public purpose
- Infrastructure planning and development

At the time of the activity, the teacher:

- ***Will ask students to use their Week 1 Day 2 Student handout to follow the session.***
- ***Distributes the Google map print out on A3 size paper, with the path marked, to each student as a handout.***
- Traces the exact same path as pursued during the rehearsal. The teacher will generate a discussion with students on their observations along the way.
- Nudges the students to reflect on their experiential observations from Session 01
- Asks students to comment on the following aspects pertaining to planning, as they traverse the walk:
  a. Spatial experience: congested locality, spatially planned areas
  b. The class of people occupying a locality (income, assets- cars/ how large is the house, architectural features)
  c. Land use: residential, commercial, office, mixed. The teacher will point to facades, desks visible through glass windows, shop windows, clothes drying in balconies etc. as indicators (land use surveyors indeed use these clues to conduct land use surveys as one of the first steps in urban planning) – point out that this is also a job.
  d. Building use: nature of office based on the office name boards on buildings, architectural features of functional use.
  e. Demand for certain kinds of residential (small, medium, large, single family dwelling units or apartments), commercial functions (high, middle or low end), types of services sector activities (IT, hotels, banks, health-care, others)
  f. Ward office, by pointing to the board on the building. The teacher will have to explain that cities are governed by municipal corporations. Municipal corporations consist of two wings: the administrative wing and the executive wing. The administrative wing is led by officers of the Indian Administrative Service or State Administrative Service cadre. The executive wing is nominally led by the appointed Mayor at the level of the City and directly elected Councillors at the level of the Ward, which is the smallest level of political disaggregation in a city.
  g. Parking on-street (haphazard or orderly, paid or free), in building basements (or building basements meant for parking are taken over by commercial uses).
  h. Building violations: protrusions from buildings, last floors, informal shacks etc
  i. Building extensions – violations onto footpaths
  j. Nature and size of amenities available at a Ward level in a city: Municipal primary, secondary and high schools; Primary Health Centres, Government hospitals, Super Speciality Hospitals (TB Sanatoria for example); Cemeteries, Open spaces; Police Station; Shelters for the homeless; Multi-purpose Halls etc. In Unit 02, the teacher will link these with the prescriptions of MPs

k. Tree-scape, streetscape, including a sense of enclosure on the street/ park/ garden, reduction in temperature in areas with many trees and a sense of calm and mental well-being.
l. Private plants and gardens and the level of upkeep
m. Physical infrastructure, including Ward-level Water Tank, city and local level drains, sanitation networks, solid waste and its collection-disposal systems.
n. Transport and mobility: mass transit stations, bus stops/ stations, para-transit stations (autos, cabs, etc), walkability, street design for bicycles/ soft mobility modes, universal accessibility (disability friendly).
o. Whether public places have been maintained well; if yes, it indicates that the municipal corporation or the state government prioritises investment to the Ward. It may also be an indication of a powerful local citizenry or inhabitants who bear a good sense of custodianship of their neighbourhood.
p. Signage
q. Noise levels, city lights at night (teacher may ask students to make observations at night).
r. Others…

Anticipated responses

Throughout the walk, the teacher will need to nudge students to evoke observations on all points listed in the section above among other responses that may be relevant at the site of the walk.

The teacher may expect responses as below:

- These shops are all commercial land use
- These are individual bungalows, while the other set of houses are apartments
- There is a lot of garbage problem here
- This primary school looks neglected/ or / this primary school looks very lively - the playground is large
- This park has a nice garden, well maintained, with beautiful trees
- There is no large hospital in this area
- The roads have too many potholes and are not well maintained
- Some people are standing in long lines to collect water from a public tap
- Parking on the street is not very organised
- Auto Rickshaws have a proper designated place around the metro station
- Footpaths are wide and designed for wheelchair movement also
- There are no sign boards for major destinations
- Buildings are too close to the street, with no buffer space (probably pointing to a violation of building bye laws)

These observations may point towards:

- Quick and more animated responses to land use and building use.
- Relatable experience with some amenities but no connection to some others; for example, maidans are probably commonplace for them,

whereas, cemeteries or a Ward office may not be known places - the teacher will have to explain in such circumstances.

- Students may fail to see connections between various aspects of places they see. For example, they may not be able to assess that congested layout of streets are generally areas occupied by economically weaker sections. They can also not read that this locality may not be a priority for the city. Hence, investments in public infrastructure may be weak and the locality may be poor in its sanitation levels.
- Observations on building violations or parking violations are difficult to explain, because students are not yet exposed to the idea of development control regulations or building bye-laws in master planning.

To these responses, the teacher asks students if they think planning and management of urban places will help address some of the problems. The teacher also asks students who they think must plan for our cities.

Conclusion:

The teacher may conclude the session by stopping at a park or a place that allows about 30 people to gather. The teacher will summarise the many observations by students, while reflecting on the strengths and weaknesses exercise done in Session 01. She emphasises how the many observations made are from an urban planner's lens. She points out that an urban planner's focus is to assess problems in places, such as good quality of housing, work places, amenities etc., and make proposals to alleviate them in the future; to understand strengths of urban places and build on them for the future.

After recapitulating the strengths and weaknesses of the place visited, the teacher will announce the activity for Session 03. She will say that, "The activity in Session 03 is to prepare a map of the locality they visited in Session 02 from an urban planner's lens, and highlight the problems they observed and propose solutions". For the exercise everyone must bring colour pencil sets. Chart papers will be provided in the class."

Lesson Plan: Week 1 Day 3
Preparing a Diagnostic Map

Classroom Inquiry Process	Resources
Lesson Aims: ● Explore the role of an urban planner through a hands-on activity requiring problem solving ● Prepare a map showing the main land uses, amenities, strengths and weaknesses/ problems ● Think of solutions to problems while building on the strengths of the place **Activity: Thinking like an urban planner: Making intuitive diagnostic map (60 minutes)** The teacher may follow the following steps to guide the students for making the map: ● ***Step 01: The teacher will ask students to use their Week 1 Day 3, Activity 1, Student handout to follow the session.*** The teacher asks students to refer to the Google map in the concerned session, of the path of walk they traversed the previous day and some photographs from the site on the screen, for student's reference. ● ***Step 02: Hands out A3 size Google Map of the locality they visited to each student.*** ● ***Step 03:*** Ask students to draw streets on this A3 map; the teacher also guides students to draw major streets as wider and minor streets with relatively narrower thickness. ● ***Step 04***: Walks about the class and guides students to identify key landmarks, from their memory of being on the site, the previous day. ● ***Step 05:*** Once the base map is ready with each student, the teacher asks each student to draw from memory, what they observed and discussed while on the site: 1. The strengths, weaknesses and problems they observed at particular locations 2. Types of land uses (residential, commercial, open spaces, medical amenities, education amenities, etc), compatible-incompatible land uses, level of access or lack of access to civic amenities. 3. Level of availability of infrastructure: transport, water, solid waste management, etc. 4. Map other problems observed such as garbage pileup, overcrowded bus stops, local flooding, haphazard street parking, universal accessibility and so on. This activity will allow the students to start thinking like an urban planner giving them a hands-on experience of the field and also help them in going to the next activity and next week's sessions about the components and process of urban planning. **Activity Name: 'Acting like an Urban Planner' (30 mins)**	Week 1_Unit 1_Day 3_Student Handout

Once students have made the intuitive map, the teacher asks students to think about what they would each do, if they were an urban planner and were entrusted with the task of suggesting solutions to the problems, while building on its strengths.

To enable this activity, the teacher may follow the steps below:

- Hands out to each student, a second A3 Google map of the same place or asks students to use the handout for Week 1, Day 3, Activity 2 to follow the session.
- Asks students to refer to the first map they drew and make a map of solutions.
- Walks about the class guiding students to draw intuitively: for instance, draw circles around places which need attention, draw arrows to show how some linkages may be improved in the area/ streets/ parks may be improved, new amenities may be added on vacant sites or built on existing health/ education amenities, etc.

Once students complete this map, the teacher asks students to pin up the two maps they have made on the walls in the class. (Cello tape is made available). The teacher:

- Randomly asks 4-5 students to explain what they had on their minds while making the strengths and weaknesses map and the solutions map.
- Writes student's explanations on the blackboard in bullet points.

Conclusion

For conclusion the teacher will bring into focus the fact that the two activities that the students did lays the foundation of the role of an urban planner. On one hand she/he must think of spaces that need problem solving and on the other she/ he must think of strengths that must be accentuated to build balanced spaces that meet the needs of a diverse population.

The teacher will also mention that next week they will learn about the Components of urban planning. Who should prepare plans and What should be a good planning process?

Week 1_Unit 1_Day 3_Student Handout

Week 2: Process of Urban Planning

Important concepts

- Understanding the legal framework for planning at three scales: national, state and local
- Making sense of three complex questions:
    1. What are the types and components of planning?
    2. Who should prepare plans?
    3. What is a good planning process?
- Exposure to debates: congestion, density, mixed land use, informal settlements.

Learning Standards

Students gain in depth understanding on what planning is, what is required by law, what is the current practice, what are the issues and contentions, whom is it beneficial for and how we should plan in order to make planning inclusive.

Inquiry Questions

1. What is urban planning?
2. Is urban planning important?
3. What does the Constitution of India say about urban planning?
4. What are the laws related to urban planning?
5. What are the commonly used instruments for the process of Urban Planning- Eg, Zoning, FLoor Space Index etc.

Lesson Plan: Week 2 Day 1
What are the types and components of Urban Planning?

Classroom Inquiry Process	Resources
Lesson Aims: • To introduce three types of planning processes • Statutory land use planning • Urban design schemes • Infrastructure projects **Activity 1: Terminology and Context-setting** Before doing the activities on this day, it is important for the teacher to explain certain technical terminologies to the students and also explain to them the technical context within which the activities will be conducted and discussed. This is given below: The teacher will explain the following terminologies: • **Statutory planning:** a set of regulations prescribed by the government which have to be mandatorily implemented. • **Land use:** the type of activity on a parcel of land (residential, commercial, office, open spaces etc) • **Existing land use map:** A legal documentation of land use existing at a particular point in time. The preparation of the ELU is mandatory in land use planning. • **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. • Master Plans are generally delineated into smaller areas known as Planning Sectors, for which Zonal Development Plans are required to be made. • Master Plans are generally made at the level of the city and do not generally include local area plans/ or urban design schemes/ detailed Zonal Development Plans. It is expected these will be taken up at the Ward level. • In the current practice, Master Plans do not think about large scale transport and other infrastructure projects as catalysts or forces that may shape growth in certain directions. Master Plans make a general list of infrastructure projects which could be taken up over the course of the Plan implementation period. However, the alignment of these projects is neither consciously integrated with places of employment nor mapped in the Master Plan as projects that require to be prioritised. • The imagination of urban planning is presently incomplete and fragmented. Hence, the main components of planning for a city are: City level land use planning, local level urban design-planning schemes, and infrastructure projects.	**Urban planning** 

After explaining the terms and the context the teacher will use a slide presentation, to explain that there are three main types of urban planning activities:

1. Statutory land use planning, which involves understanding whether buildings and places are mainly residential, commercial, offices etc in use
2. Urban design projects/ schemes, which involve proper design of street networks, streets, open spaces, civic amenities.
3. Large infrastructure projects such as airports, railway stations and rail lines, highways and roads, bridges, water supply, sewerage etc.

With this backdrop, the teacher commences the first activity with students. The objective is to expose students to the three key components of planning.

Activity Title: Types of land use categories in statutory planning (40 minutes)

This activity focuses on the first component of urban planning, that is, statutory land use planning. In this activity students will be guessing the land use category ascribed in the existing Statutory Land Use Map which is part of the Master Plan for Delhi 2041 (or in its absence the Master Plan for any other city in India. Note, the teacher toolkit contains Master Plan 2015, Bangalore).

First, the teacher asks students to refer to their handout for Week 2, Day 1, on Types of Land Use Categories. This toolkit includes a diverse range of places and buildings, on a large poster or a powerpoint presentation. These may include, but not be limited to:

- An informal area, such as Shahjahanabad, Delhi
- Planned residential neighbourhoods such as Vasant Kunj, Vasant Vihar etc
- Juggi jhopdis
- Apartment complexes
- Commercial areas such as Karol Bagh
- Office and business districts such as Connaught Place
- Industrial sites such as in Faridabad/ Meerut
- IT Parks
- Large open spaces such as the Central Vista
- Large hospitals
- Delhi University campus
- Jawaharlal University
- Government offices such as Nirman Bhavan
- Heritage precincts and heritage buildings such as Humayun's Tomb
- The Yamuna River pollution
- The metro rail
- The Delhi International Airport
- Dilli Haat
- The teacher may add images they think are familiar to them/ or are important.

- Then, the teacher asks students to intuitively suggest land use categories for each. (Students are likely to read some places as singular land use categories, and some others as mixed of many. The teacher may need to prompt students with questions

Week 02-TOOLKIT

Week 2_Day 1_Student Handout_Champaka

such as: Is this a commercial or office land use? Is this a hotel or a residential land use? What land use will you categorise a Juggi in? Is this a park or a maidan and so on.". The teacher must nudge students to be as natural in their imagination as possible and not guide them to think in urban planning terminology. For instance, for a building which has a medical clinic, shops, offices and apartments, the teacher may put down all the uses rather than suggest mixed use as a category).

- Once students complete guessing land uses against each image, the teacher will show students the section of the DDA Act (Section 2b), which prescribes a particular set of land use categories (**see, slide in teacher's toolkit,** showing Residential, Commercial, Industrial, Open Spaces, Civic Amenties etc). These land uses have been in use since 1957, when the DDA was set up. Urban planners today have been contemplating whether
- Students will be able to compare their own insights against the mapping in MPD 2041. There are likely to be variances in the DDA's reading of structures as land use categories and students reading of them.
- **The teacher asks students to use their handbook to record their observations. Students take out their worksheets with a table such as the one below: :**

	Student's guess of land use	**Land use as per DDA's MPD 2041**
An informal area, such as Shahjahanabad, Delhi		
Planned residential neighbourhoods such as Vasant Kunj, Vasant Vihar etc		
Juggi jhopdis	Traditional land uses	Residential/ juggi
Apartment complexes	Houses and club, sports centres	Residential
Commercial areas such as Karol Bagh	Mixed use	Commercial

Office and business districts such as Connaught Place	Office	
Industrial sites such as in Faridabad/ Meerut	Industry	
IT Parks	Office	Mixed use
Large open spaces such as the Central Vista	Open space	
Jawaharlal University	Education	
Government offices such as Nirman Bhavan	Public and semi-public	
Humayun's Tomb, Jama Masjid	Religious	Public and Semi-Public, heritage
The Yamuna River pollution	Environmentally sensitive	
The metro rail	Transport	
The Delhi International Airport	Transport	
Dilli Haat	Cultural	Public and Semi-Public
Large hospitals	Health	

Delhi University campus	Education	

Prompts for the teacher:

The teacher will ask students to carefully think through land use categorisation. For instance, if a student reads slums as residential, he/ she will ask the students:

- Do slums have only residential uses? Do they not have other land uses, such as small scale industrial activities etc?
- Are old city areas residential, commercial, industrial in their land use, or a mix of these? Aren't these sites also heritage sites? Is heritage site a land use?

Students may find several mismatches in their land use categorisation vis a vis the DDA's. Some places indicated as a mix of commercial and residential may be shown by the DDA as purely residential on the Existing Land Use Map. Places they considered as educational may be indicated as commercial. Slums may be shown as residential. Some areas may be just shown as white areas. Students may raise questions about why this disjuncture exists. The teacher will explain how many of these categories have not been revised since the 1960s, when planning legislation was first crafted in India.

- Using a few slides the teacher may show a few instances of where disjuncture generally occurs, : Slums, mixed land use, ecologically sensitive areas shown as residential/ commercial land use, (See corresponding toolkit for examples from the Master Plan for Delhi)

This Activity will help students perceive places in a city and how planners interpret them as Land Use Categories. It will also build an understanding about what the DDA Act prescribes. They will also learn that although the DDA prescribes Land Use categories, the ground realities don't always conform to these land use categories. The teacher can help the students to infer that the planning norms have not evolved to meet the dynamic nature of ground realities.

Activity Title: Types of urban planning (40 minutes)

The aim of this activity is to help students understand different types of planning efforts: statutory land use planning, urban design schemes and infrastructure projects.

Before beginning the activity the teacher explains the different types of planning efforts - statutory land use planning, urban design schemes involving urban renewal and green field development and infrastructure projects.

Statutory Planning: Legal designation of public and private land parcels as particular land uses: residential, commercial, offices, industrial etc. This is accompanied by regulations for how much can be built on a public or private parcel of land.

Urban design schemes: Local area plans and designs for streets, open spaces, form of buildings, building-line along streets, giving an aesthetic image to a place, providing all public amenities needed at the neighbourhood level.

Green field development: Designing townships and neighbourhoods in cities on vacant land, where no other buildings may exist.

Infrastructure projects: transport infrastructure such as airports, metro rail or in the water sector, for dams, drains, conservation of lakes and water courses, sewage treatment plants etc.

The **teacher asks students to source their handouts and look at the screen which shows a powerpoint presentation with images of several 'types of urban places' and projects in Delhi. Some of these images are the same as the ones used in Activity 1.** These may include landmarks, monuments, planned residential areas, urban villages, slum settlements, commercial areas, industrial developments, health centres, education institutes, office complexes, government offices, utility infrastructure, old city precincts, heritage sites, ecologically vulnerable areas, transport infrastructure projects, new mixed use developments and so on. Images may specifically include:

- An informal area, such as Shahjahanabad, Delhi
- Planned residential neighbourhoods such as Vasant Kunj, Vasant Vihar etc
- Juggi jhopdis
- Apartment complexes
- Commercial areas such as Karol Bagh
- Office and business districts such as Connaught Place
- Industrial sites such as in Faridabad/ Meerut
- IT Parks
- Large open spaces such as the Central Vista
- Large hospitals
- Delhi University campus
- Jawaharlal University
- Government offices such as Nirman Bhavan
- Heritage precincts such as XXX and heritage buildings such as Humayun's Tomb
- The Yamuna River pollution
- The metro rail
- The Delhi International Airport
- Dilli Haat
- Others

Taking students through these photos one by one, the teacher asks students to use their handouts and intuitively categorise each into specific types of land use planning, urban design schemes and infrastructure projects. Just as is shown in student handouts, the teacher then draws a table on the board categorising the places/ infrastructures into three key types of urban planning efforts: Land use planning, urban design scheme, infrastructure projects.

A sample of what students may use as resource material and the teacher may draw on the board is shown here:

	Land use planning	Urban design scheme	Infrastructure development
An informal area, such as Shahjahanabad, Delhi	White zone		
Planned residential neighbourhoods such as Vasant Kunj, Vasant Vihar etc	Residential		
Juggi jhopdis	Juggi		
Apartment complexes	Residential		
Commercial areas such as Karol Bagh	Commercial/ mixed use		
Office and business districts such as Connaught Place	Office		
Industrial sites such as in Faridabad/ Meerut	Industry		
IT Parks	Office/ mixed use		

Large open spaces such as the Central Vista	Open space		
Jawaharlal University	Education		
Government offices such as Nirman Bhavan	Public and semi-public		
Heritage precincts such as Chandani Chowk, and heritage buildings such as Humayun's Tomb	Heritage zone		
The Yamuna River pollution	Environmentally sensitive		
The metro rail	Transport		
The Delhi International Airport	Transport		
Dilli Haat	Cultural		
Large hospitals	Health		
Delhi University campus	Education		

Teacher prompts

For each image, the teacher may ask students questions such as the following, to elicit their responses: • What is this image showing? • Is it a place where people live, work, play or all? • Is it a public amenity or a large scale infrastructure project? • Is this a place which is amenable to planning (for informal settlements and old city areas)? 1. This activity will help students understand that the city comprises places which can be categorised into components of urban planning. 2. They will also get a clearer understanding of the three types of urban planning efforts: land use planning, urban design, infrastructure development. 3. Only some places are amenable to urban design focused on the built form. 4. All places in the city are categorised under a land use category 5. Not all places in a city are subject to all three components 6. Historical and informally settled areas may not be under the ambit of land use planning, urban design or infrastructure development.	

Lesson Plan: Week 2 Day 2
Statutory master plans

Classroom Inquiry Process	Resources
Lesson Aims: To orient the students to ● Planning mandates at the national level; and nature of their implementation ● Planning laws and process mandated at the State government level and participatory planning ● Planning process innovations at the local level: Main Bhi Dilli Campaign on how highly technical plans can be communicated in simple language to the general public The teacher asks students to refer to their handouts and introduces and explains some terminologies at the outset: ● **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, when India liberalised its economy, to allow foreign investors/ companies to contribute to India's economic growth. Cities became important engines of growth in 1992. The 74th CAA was passed to acknowledge the importance of cities as a local self- government. Until 1992, cities were to be governed by State governments. However, most State governments have not devolved power to 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. ● **State level Town and Country Planning Acts**: Post independence, to ensure planned development of cities in India, the Union government established the Town & Country Planning Organisation (TCPO), in Delhi. The TCPO prepared model Town & Country Panning Laws for State governments to emulate and enact their own. State governments prepared their own TCPAs in the period 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. ● **Planning Authority:** As per the TCPAs, the State government is required to appoint the Planning Authority. As per the 74th CAA, the Municipal Corporation is required to prepare master plans. This is because the municipal corporation comprises elected representatives who are accountable to inhabitants of cities. However, since the 74th CAA is not implemented in most States, most State governments appoint the Development Authority as the Planning Authority. In this way, the DDA in Delhi is appointed the Planning Authority. However, DAs preparing master plans means that master plans are prepared purely as technical processes.	

The process is held without participation of the public, mediated by local level corporators.

- Public participation: Post liberalisation of the Indian economy, the number and types of actors involved in decision making spaces were amplified. Several not for profit organisations were established in the country. Considering the absence of a public participatory process in master planning, these organisations have advanced the significance of democratic decision making processes. In master planning, these not for profit organisations 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.

Activity Title: National level mandates for Master Planning (30 minutes)

The aim of the activity is to have students understand that the Constitution of India mandates that municipal corporations must prepare statutory master plans for cities, while Development Authorities that are appointed as the Planning Authority in almost all states in India.

The teacher asks students to refer to their handouts for Week 2, Day 2, Activity 1.

Week 2_Day 2_Student Handout_Champaka

First, the teacher displays the statement of objects of the 74th Constitutional Amendment Act (CAA) and asks students to identify who the 74th CAA prescribes as the legitimate authority to prepare master plans.

➔ Students may take time to respond. Some may point out the clause stating who should prepare the plan.
➔ The teacher explains that the state legislature is required to devolve its current functions of plan preparation to the local government, that is, the municipal corporation. The teacher may explain to the students some reasons for why city governments must prepare plans rather than State governments.

- Democratic governance implies decentralised decisions; therefore, the 74th CAA mandates that decisions for cities must be led by the municipal corporation.
- Indian cities are very large in their population, ranging from 30 million (Delhi), to 10-12 million (Mumbai, Bengaluru, Hyderabad), 5-10 million (Ahmedabad), 1 million and lower. Such large populations need plans to be prepared locally rather than at the level of State governments.

Second, the teacher displays the planning process stipulated in the DDA Act. The teacher asks students to compare the mandates of the 74th CAA and the stipulations of the DDA Act. To evoke meaningful responses, the teacher projects the clauses of the 74th CAA and the DDA Act, one next to another, on a slide (see, teacher toolkit). Students are likely to be silent. Few responses may come:

- The teacher nudges students to point out differences on three aspects:

➔ What do the two laws say on who should prepare plans?

Ans: Municipal authorities as opposed to Development Authority

➔ What are provisions for at what scale plans should be prepared?

Ans: City and local levels as opposed to the current practice of city level only

➔ What should be the planning process?

Ans: A participatory process- the act does not have space for participation.

Having raised this question, the teacher projects a slide of the current institutional arrangements, in the planning process, including all the above three questions. The teacher asks students to point out an alternative institutional arrangement that addresses the 74th CAA. The teacher captures students' responses on the black board (see, teacher's toolkit for flow charts).

Activity : Participatory planning (30 minutes)

The purpose of the activity is to help students understand participatory planning and its role in master planning and to expose them to campaigns such as the Main Bhi Dilli Campaign. The activity will also give students a glimpse into how highly technical plans can be communicated in simple language to the general public

- Why public participation should become an important part of the planning processes in India
- Why all planners must be trained to participatory processes

The teacher initiates the activity. The teacher asks students to refer to their handouts for Week 2, Day 2, Activity 2.

Week 2_Day 2_Student Handout_Champaka

He/ she draws a flowchart with the planning process (see attached slide deck). The teacher asks students to come up to the board and point out at what points in time they think participatory processes must be initiated by the Planning Authority.

The flow chart below 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 finalises 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 work space is 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

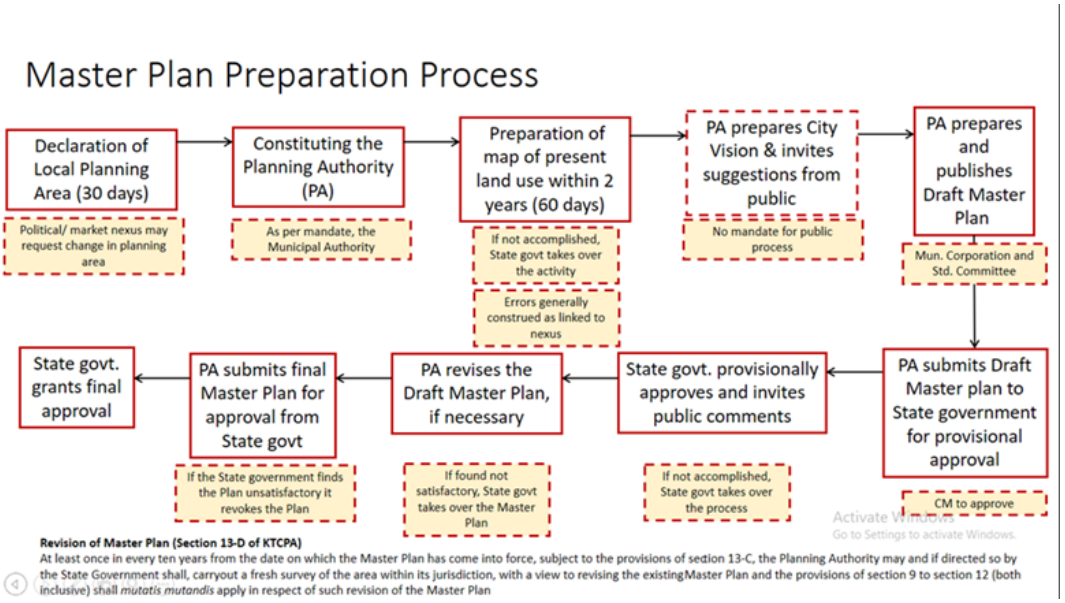


Fig 6.0: Master Plan preparation process as per the Karnataka Town and Country Planning Act 1961

Students make a note on their handouts across these stages where they think a participatory process is needed. They also draw circles around segments of the statutory planning process and its components which seem to be unclear to the general public.

Then, the teacher asks students to respond to the following questions:

“As you can see, a lot of the planning happens without participation of the citizens and their elected representatives. What do you think could be the problems arising from this?”

Take student responses and add these points in the discussion: :

- State governments really do not know the problems at the city and local level: for example, the Shahjahanabad area, juggi-jhopdis in Delhi; arterials with severe traffic jams in cities; places facing severe local flooding.
- Since elected representatives are not involved in planning, we never know that a master plan is being prepared. So we never get the chance to express ourselves and do not receive what they promise: Expressing oneself is then channelled through protests alone or through Public Interest Litigations. Example, the DDA proposed ‘mixed land use’ as a category in the 2021 Master Plan for Delhi. Since there was no public process prior to taking the decision, there were massive protests against the rule in 2007.
- Uneven access to health, education services, better quality of life are a result of concentration of political power at the state level. Example, places which

have influential people residing in them, often manage to get services. Others tend to suffer.

Example, planned developments such as Vasant Kunj and Vasant Vihar have good access to civic amenities provided by the Municipal Corporation or Development Authority or other State government agencies.

With the help of this activity the students will learn,

- The 74th CAA is mostly not implemented for cities. This is because state level politicians do not wish to devolve power to local levels.
- Development Authorities prepare statutory master plans; however, without any democratic oversight.
- Plans are prepared at the macro level of the city. Planning laws make no provisions for local level plans. This is because state level officials do not wish to devolve powers to the local and Ward levels; and city level officials do not wish to empower Ward level officials.
- The role of the planner is challenging, to strengthen local governments, bring transparency, prepare plans to meet actual problems on the ground and facilitate their effective implementation.

References for Session 02: Also, see Students Handouts

1. Statement of Objects: 74th Constitutional Amendment 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;

2. Article 243 W:

(*a*) the Municipalities with such powers and authority as may be necessary to enable them to function as institutions of self-government and such law may contain provisions for the devolution of powers and responsibilities upon Municipalities, subject to such conditions as may be specified therein, with respect to—

(*i*) the preparation of plans for economic development and social justice;

(*ii*) the performance of functions and the implementation of schemes as may be entrusted to them including those in relation to the matters listed in the Twelfth Schedule;

(*b*) the Committees with such powers and authority as may be necessary to enable them to carry out the responsibilities conferred upon them including those in relation to the matters listed in the Twelfth Schedule.

1. 12th Schedule of the Constitution of India

1. Urban planning including town planning.

2. Regulation of land-use and construction of buildings. 3. Planning for economic and social development. 4. Roads and bridges 5. Water supply for domestic, industrial and commercial purposes. 6. Public health, sanitation conservancy and solid waste management. 7. Fire services. 8. Urban forestry, protection of the environment and promotion of ecological aspects. 9. Safeguarding the interests of weaker sections of society, including the handicapped and mentally retarded. 10. Slum improvement and upgradation. 11. Urban poverty alleviation. 12. Provision of urban amenities and facilities such as parks, gardens, playgrounds. 13. Promotion of cultural, educational and aesthetic aspects. 14. Burials and burial grounds; cremations, cremation grounds; and electric crematoriums. 15. Cattle pounds; prevention of cruelty to animals. 16. Vital statistics including registration of births and deaths. 17. Public amenities including street lighting, parking lots, bus stops and public conveniences. 18. Regulation of slaughterhouses and tanneries.	

Lesson Plan: Week 2 Day 3
Participatory Planning

Classroom Inquiry Process	Resources
Lesson Aims: ● Orient students to forms of public participation processes underway: 1. Delhi: Main Bhi Dilli Campaign, which communicated the plan in simple language to the masses 2. Smart Cities Mission: A wide range of creative public process interfaces, including workshops, challenges, hackathons etc. **Background (for the teacher)** 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 decision making. Notwithstanding this anomaly, civil society organisations and Ward level Residents Welfare Associations in cities have proactively taken the initiative to organise social groups to understand several technically drafted legal conditions, rules and regulations that bear implications for quality of life for all. This session focuses on the Main Bhi Dilli Campaign, driven by multiple civil society organisations and academicians. 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 the society, especially the under-privileged, 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 title: Main Bhi Dilli Campaign (60 minutes)** The purpose of the activity is to make students understand that urban planning must be an inclusionary process; decisions made must respond to people's needs, not made in isolation. A key objective is to have students realise their individual and collective role is important in decision making. (Refer to **Week 2_Day 3_Student Handout_Champaka)** **Backdrop** The teacher shows a brief presentation of the Main Bhi Dilli website. She/ he explains the philosophy behind the campaign, which includes: ● A people's campaign to make Delhi more representative and inclusive, equitable, just, sustainable. ● Make the process of preparing the Delhi Master Plan as public as possible. ● Enable citizens to have the capacity to understand, engage and shape the	**Week 2_Day 3_Student Handout_Champaka** 

Plan.

- That the Plan is a reflection of how the people in the city work and live.
- The aim is to collectively reinvent Delhi

Film:

The teacher then shows a short film, involving a panel discussion with professionals, planners, civil society activists involved in the Main Bhi Dilli Campaign.

Urban ARC 2022 | Panel 8: Navigating and practicing planning: Urban practitioners in dialogue

Credits: IIHS Urban Arc, 2022

The teacher then asks students to refer to their handouts and fill in responses to the following questions:

- Based on your exposure to statutory master planning, how would you imagine a public process?
- What are the components of a campaign that aims to communicate the Master Plan for Delhi?
- What types of tools should the campaign employ to expand simple communication of the Plan?

The teacher nudges students to imagine a public process. While the students are thinking the teacher could catalyse the process with the following points.

- How can a city-wide campaign be organised, not just in some localities
- The campaign must be represented by several organisations in the city, and not only by one leader, therefore requires a lot of coordination.
- A process could be followed that explains every step of the master planning process to the general public.

Some of the Components of the campaign could be:

- Vision
- Outputs
- Structure of deliberations
- Activities
- Locations
- Timelines
- Outcomes for incorporation in the Plan

Various Tools that could be used include:

- Games for general public to understand the Plan and participate in expressing their expectations from the Plan
- Publications and articles in local language
- Sectoral reports and workshops

Urban ARC 2022 | Panel 8: Navigating and practicing planning: Urban practitioners in dialogue

Activity : Envisioning your own Delhi (45 minutes) **The teacher asks volunteers in the class to form smaller groups and lead the process of collating insights on what each student thinks Delhi needs and that master planning must address.The teacher asks students to refer to the Handout for Week 2, Day 3, Activity 2.** The teacher collates all the sheets submitted by students and displays them on the board for everyone to see. She/ he conveys that these messages will be communicated by them to the DDA **Closure:** The teacher closes the session by summarising learning outcomes Learning outcome - Students are aware of the importance of: ● Social organisation, ● Simple communication, ● Participation ● Leadership ● Coordination ◆ Students understand that urban planning should be a wider communication between the state and the society Students feel empowered to know that through urban planning, they can influence change for the better.	**Week 2_Day 3_Student Handout_Champaka**

Week 3: Planning Instruments: Zoning, Floor Space Index, Reservation of Land for Public Purpose

Important Concepts

- Zoning Regulations or Development Control Regulations.(ZRs or DCRs prescribe permissible land uses, prohibited land uses, how much you can build on a parcel of land in relation to road width and limits to free car parking on a parcel of land). .
- Floor Space Index. (Floor Space Index is an indicator of how much one can build on a parcel of land)
- Reservation of land for public purpose

Learning Standards

- Students learn what are Zoning regulations and Development Control Regulations and also understand the ideal Zoning regulation for a livable neighbourhood.
- Students are exposed to the concept of Floor Space Index as a key instrument used by planning authorities, to control development of buildings in the city.
- Students understand the concept of making land available for public purpose which is an obligatory function of Municipal Corporations and Planning Authorities.

Inquiry Questions

1. What are Zoning regulations and Development Control Regulations? What is the ideal for these?
2. What is Floor Space Index? How do planning authorities use it?
3. What is 'public purpose' and why is land supposed to be reserved for it?

-

Lesson Plan: Week 3 Day 1
Zoning Regulations or Development Control Regulations?

Classroom Inquiry Process	Resources
Lesson Aims: ● First, to imagine a Zoning Regulation they feel is most suited for a liveable neighbourhood ● Second, to understand components of land use and zoning regulations in Town & Country Planning Laws and Master Plans ● Third, to assess how the current pattern of Zoning Regulations could be better crafted. To build a base for this session the teacher will first explain the following terms to the students, ● Land use: the type of activity on a parcel of land (residential, commercial, office, open spaces etc) ● Existing land use map: A legal documentation of land use existing at a particular point in time. The preparation of the ELU is mandatory in land use planning. ● 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. ● Mixed land use: Places and buildings which have not just one land use, such as residential or commercial or civic amenity. They have multiple land uses. For instance, in traditional, old city areas, each building may have commercial, residential and industrial warehouses. ● ZR/ DCR: A set of parameters which qualify 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, rules for car parking on a parcel of land. **Activity Title: Parameters of a residential locality with good quality of life (60 mins)** The purpose of this activity is to equip students to think about what makes a place liveable and what qualities of urban places amongst many aspects need to be regulated. The teacher starts by asking the students to think of places in Delhi or other cities where they think the Quality of life is good. **At this point, the teacher asks students to refer to their student handouts (Week 3_Day 1_Student Handout), which include an initial set of names of several types of places that students may be familiar with, in Delhi. Students are required to add to the list of diverse urban places.** Students may respond with a list of localities which could include - ● Janakpuri	**Week 3_Student handout** **Week 3_Day 1_Student Handout**

- Cantonment area
- Vikaspuri
- Chandni Chowk
- Shahjahanabad
- Vasant Kunj/ Vasant Vihar
- Kalkaji
- Karol Baug

These places are indicative and the teacher may add more places in the student handouts based on their comfort with places in Delhi and their own experience and knowledge of Delhi. The criteria is to include places with diverse characteristics. The teacher will then categorise these localities into mainly residential localities (Janakpuri, Vikaspuri, Kalkaji, Vasant Kunj, Vasant Vihar) and others as mixed use areas involving residential and commercial activities (Chandni Chowk, Karol Baug, Shahjahanabad).

The teacher will prompt the students with these questions-

➔ What features of these places make them attractive to you?

➔ Why do you think these places have a certain quality of life?

The students might respond in different ways, while listing some features of the old city areas and of planned residential areas. The teacher will ask students to note down these qualities in their handouts.

For old city areas:-

- Vibrant lively areas
- Close family members live nearby, so, easy to meet family and friends often
- Ease of access to shops
- Small houses are easy to maintain
- Crowding can get disturbing sometimes due to excessive noise and pollution from vehicles on the street
- Roads are not always maintained, garbage not always collected, so it can be a nuisance.
- Buildings do not have enough natural light and ventilation because they are closely packed and attached with one another

For newer planned residential developments:

- Large streets
- Not too many traffic jams
- Many trees on the streets
- Mainly residential area
- Not too much commercial activity, so no noise pollution, less air pollution also
- Buildings have spaces around them, hence have good natural light and ventilation

Using students' inputs as reference, the teacher will ask the students:

➔ What are the parameters that the Master Plan must include as regulations for

a place to have a good quality of life?

As a sub-part to the question - What are the parameters that the Master Plan must include as regulations that make the city a good place for adolescents. (The intention here is that the students think about what they want from the city)

Here, again, the teacher asks students to use their handouts and make a list of parameters students think can be regulated and aspects they think should not be regulated. Students are likely to answer in non-technical/ colloquial terms:

- Whether a place should have shops and homes next to each other
- To not have automobile workshops next to houses
- To not have small scale factories next to houses
- To have household industries next to houses because some people cannot afford to hire a separate space and commute everyday to work far away
- Wide roads with many trees
- No parking on the streets
- Parking on the streets
- Shops must provide parking but they violate
- Daily solid waste management
- Better bus services and traffic management
- Less traffic congestion and air pollution
- Natural light and ventilation for all buildings
  - Less traffic around the schools
  - Adequate and functioning street lighting
  - Playgrounds within easy access

The teacher then collates these responses into some key categories on the black board and explains to the students that urban planners are always making assessments on which of these parameters can be/ must be/ must not be regulated in the Master Plan so that the citizens can have a good quality of life. The teacher explains that these parameters of regulation must be linked with social habits, economic practices and cultural lives of communities/ inhabitants in cities.

- Land use
- Buildings with space around
- Street width
- Parking
- City management

The teacher will prompt students to express a range of social values which could be represented in the form of Zoning Regulations. For example, one tree per plot of land; rain water harvesting and ground water recharge or spaces for children to play in maidans and so on.

At the end of this activity, students would have a list of qualities of urban places which they think can be regulated and cannot or should not be regulated. The teacher asks students to write these down in their handbook. The teacher then takes up the next activity where students read the Zoning Regulations in the master plan of a city. Students compare their own insights on what should be regulated

with what the real life example includes.

TPD-Week-3

Activity Title: Content of ZRs or DCRs (60 minutes)

This activity will help the students to understand what the Master Plan regulates in the built environment.

Using a powerpoint presentation, the teacher displays the Zonal Regulations of Bengaluru.

It includes:

- Permissible land uses: Main land use, Ancillary land use
- Non-permissible land uses
- Floor Area Ratio (or Floor Space Index)
- Road width in relation to FAR
- Parking regulations

The teacher then shows the Zoning Regulations of the Master Plan for Bangalore or Delhi.

It includes:

- Definition of the land use
- Permissible land uses: singular land uses such as residential, commercial, industrial, office, open spaces etc.
- Road width in relation to Floor Area Ratio (Floor Space Index)
- Parking regulations

The teacher will first tell students that these are highly technical words. The teacher asks students to think about what the Parameters in Zonal Regulations seem to indicate in common sense terms? **The teacher asks students to write down their responses in the handout.**

Students may give diverse responses including:

- Level of crowding is not regulated/ prescribed
- Level of noise or air pollution is exempted
- Solid waste management, traffic management are excluded
- Mix of land uses is allowed in a building in Bengaluru, but to what extent this should be allowed so that it does not become a nuisance is not mentioned
- Disaster risk
- Environmental preservation/ biodiversity

The teacher asks another question:

Should road width be a critical factor in defining how much can be built on a parcel of land?

Students may respond:

- Yes, because narrow roads cannot take too much traffic
- No, road with should not be a factor, the network of public transport should be

the main criteria
- It is the network and pattern of roads which should be a key criterion for decision on how much can be built on a parcel of land, not merely the street width.

The teacher shows a slide of road networks with a chequered gridded pattern, and another, a village, structured on a rhizoidal pattern of streets, not grids.

For the above questions, the teacher may prompt the students:

- What does permissible land use mean? The answer is that land use proposals must pay attention to compatibility. Example, a hazardous industrial site cannot be located next to a residential area.
- Is road width a necessary parameter for defining how much one can build on a parcel of land? For example, should the number of floors on a parcel of land be based on its location in the street network pattern (Chandigarh type gridded streets or a village with streets that has dead ends) or on road width? These are questions to provoke students to think about places they usually take for granted. The teacher explains that urban planner consciously measure all these aspects in their daily lives.

Question 03:

The teacher will nudge the students to think and ask them the following question,

What is different in the list you all have suggested, versus what the Zonal Regulation prescribed in our cities?

Teacher prompt:

Students may say:

- “We thought all places in our city has a mix of land uses - residential, commercial etc. However, the example has mainly one type of land use
- We thought providing water supply, employment, better quality of schools and hospitals, better transport are all part of Zoning Regulations in urban planning. But, these aspects are not written in any of the zones.
- We also recall the Article 243W of the Constitution of India, which states that the function of planning is to ensure economic development and social justice. So, we felt it is important to include social values such as inclusion, the right to the city and equal access to fundamental rights (water, land, eduction, heath, walkability etc)
- Walkable streets for a locality is not mentioned in the Zoning Regulations
- Parameters for ensuring disaster risk aversion is important
- Environmental protection in all localities is another aspect which we think must be part of Zoning regulations”

After student’s share their insights, the teacher will summarise the responses from students and will remind them of the takeaways from the day’s session -

1. Parameters that must be regulated as a basic minimum in order to ensure a good quality of life in urban places,

2. Parameters which are presently included in Zoning Regulations of Master Plan 3. Parameters still to be included in Zoning Regulations of Master Plans.	

Lesson Plan: Week 3 Day 2

Classroom Inquiry Process	Resources
Lesson Aims: ● The aim of the session is to expose students to the concept of Floor Space Index as a key instrument used by planning authorities, to control development of buildings in the city. Using a presentation, the teacher first explains the terminologies associated with the session, so that a base is formed for the activities, **Floor Space Index:** Town and Country Planning Acts legislated by State governments in India define Floor Space Index as: FSI = Total Built Up Area of a Building / Total Parcel Area **The teacher asks students to refer to their handouts which includes images of how Floor Space Index is generally calculated.** The teacher explains that generally, Development Plans for cities do not adhere to this definition. A series of exceptions are made to computation of FSI in a building. For example, more than 80 architectural elements, such as porch, balcony, mezzanine floor, stairwell, lift shaft, etc. are not counted as FSI consumed in a building. This implies that the owner of the building who is developing the building violates the regulation. The owner also pays less fees to the municipal corporation for development charges, than actuals. **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. **Condonation of violation:** Once the Planning Authority and Municipal Corporation recognise this violation, they levy a penalty on building owners to regularise violations. Many of these violations and their regularisations over time have accrued to give rise to more construction than places can handle and frequent flooding. **Development charges**: For every Square feet of a building constructed by a private parcel owner, the municipal corporation and other agencies incharge of infrastructure delivery levy a development charge on the private parcel owner/ developer. These charges are levied at a highly subsidised rate for the services provided by these government organisations. **Activity Title: Computing Floor Space Index (30 minutes)** The purpose of the Activity is to understand the concept of Floor Space Index from a technical view and make mental connections with how the different ways of using this planning instrument can affect real estate markets, builder's/ developer's behaviour and buyer's choices in their investment in land and	Week 3_Day 2_Student Handout 

property.

The teacher explains the concept of Bulk FSI and Net FSI.

Bulk FSI includes all architectural elements in a building.

Net FSI excludes a whole range of architectural elements in the computation of FSI. For example, balconies, mezzanine floors inside homes, kitchen lofts, lilly ponds and terrace gardens, etc.

The teacher explains that the implications are the following:

- At the start of a building construction the builder must receive approval on a sanction plan from the municipal corporation
- Thereafter, the builder must pay development charges to the municipal corporation at various stages of the construction process based on the FSI consumed on a parcel
- The more the FSI, the higher the development charges collected by the municipal corporation
- For the builder, defining Bulk FSI for determining development charges is not useful because the developer ends up paying the same level of development charges for privately owned apartment spaces as well as the common spaces in an apartment. For example,

The carpet area of an apartment = total area of the apartment unit minus wall areas, balconies and external features

Built up area of an apartment = total area of the apartment unit including wall areas, balconies and external features

Super built up area of an apartment = total area of the apartment unit including wall areas, balconies and external features abutting the apartment + a certain % of the area of the lift shaft, staircases, porch of the apartment, parking area, commo water tank, transformer, common amenities etc.

The builder prefers to show Net FSI on the sanction plan. That will allow the builder to pay less Development Charges to the municipal authority. So, the builder will not pay Development Charges for areas shown as balconies, mezzanine floors inside homes, kitchen lofts, lily ponds and terrace gardens etc. In reality, what the builder company actually does is that while the company saves money on paying Development Charges on exempted items, it sells all areas marked as exempted from FSI calculation as saleable areas, making more profits. For instance, balconies are converted into study rooms. Areas shown in the sanction plan as lilly ponds are sold as bedrooms, mezzanine floors are sold as guest rooms and so on. In the bargain, the municipal government loses revenues.

However, the municipal corporation infact prefers to regulate Bulk FSI because it will receive higher revenues.

But, due to strong capacities and demands of the builder groups, most of our cities have Net FSI prescribed in their Zoning Regulations.

This Activity 02 is about letting students calculate the difference between Bulk FSI and Net FSI and also calculate the amount of revenue losses that occurs to the municipal corporation due to the prevalence of Net FSI in our master plans.

The teacher asks students to look up their handouts.

To start the activity the teacher displays a photo of existing apartment buildings in Bengaluru. The teacher provides the following information about the building:

Number of floors: 8
Total floor area: 1000 square Foot
Total parcel area: 2000 square Foot
Total area occupied by architectural elements exempted from FSI computation: 250 square Foot per floor
Development charges per FSI consumed: Rs. 10,000/-

A) The teacher first asks students to compute the bulk FSI and net FSI for the building

Students may compute as follows:
Bulk FSI = (8 X 1000) / 2000 = 4.0
Net FSI = (8 X (1000-250)) / 2000 = 3.0

B) Then, the teacher asks students to calculate the total development charges levied for the Bulk and Net FSI

Students will calculate as follows:
Development Charges on Bulk FSI: 4.0 X 10,000 = INR 40,000/-
Development Charges on Net FSI: 3.0 X 10,000 = INR 30,000/-

The teacher asks students:

“What is your inference from this activity?”

Students are likely to say:

- Development charges on Bulk FSI are higher than on Net FSI.
- The municipal corporation loses 30,000/- INR for every 3.0 FSI consumed in the city.

Teacher prompts:

Students are likely not to make a connection that it is the Municipal Corporation itself which has wilfully introduced the concept of Net FSI, which includes reduction in computation of actual built up area consumed. So, the teacher nudges students with another question:

Question:

Why has the municipal corporation then wilfully deviated from Bulk FSI as prescribed in the TCP Act? Why has it introduced the idea of Net FSI, and reduced its own formal revenue income?

Students may not understand that it is pressure from real estate developers due to which the Municipal Corporation / Planning Authorities have adopted the concept of Net FSI. The teacher can explain this and also clear doubts of students about this issue.

A takeaway is that these technical instruments in urban planning are infact embedding a wide range of social relationships and financial transactions, which may not may not be good for the government and public interest, depending on the way the instruments are used.

Activity 02: Development Regulations and their Implementation (30 minutes)

The purpose of this activity is to help students in understanding the meaning of violation of development regulations. **The teacher asks students to refer to their handouts.**

The teacher first shows a table on the Zoning Regulations or Development Control Regulations. This table shows that for a parcel of size 2000 sq ft, of residential land use, along a street of width 45 m, the permissible Net FSI is 2.75.

Then, the teacher shows the photo of a building on a slide, along with the following information.

Total parcel area: 2000 sq ft

Total floor area: 1000 sq ft

Total area under exemptions: 250 sq ft per floor

Total number of floors: 8

The teacher asks students to calculate the Net FSI of that building.

Road width: 30

Net FSI = (8 X (1000-250)) / 2000 = 3.0

The teacher then points students to the Development Control Regulations chart and asks them to compare what the regulations prescribe versus what is actually consumed.

The teacher will explain to the students that the Planning Authority or Municipal Corporation often expose these violations only when our cities face flood risk or other hazards such as an outbreak of fire. At this point, the Municipal Corporation either bulldozes these violations in apartments or charges a penalty on condonation of violation.

This exercise helps students understand how FSI rules are manipulated in reality and that in India plans really have not worked.

Learning outcomes

- One, that the Planning Authority and Municipal Corporations themselves

willfully deviate in the definition of FSI from what is prescribed in the Planning Legislation. ● Two, the implementation of FSI is largely violated in all cities in India. The Panning Authority or the Municipal Corporation which is accountable to implement Development Plans/ Master Plans, levies penalties or imposes itself as a monitor of violations, only much after the violations are made. ● Three, statutory planning in India has therefore remained a conundrum given that the Planning Authority and the developer both do not adhere to rules in one way or another.	

Lesson Plan: Week 3 Day 3
Reservation of Land for Public Purpose

Classroom Inquiry Process	Resources
Lesson Aims: ● To make students understand that Constitutional provisions for obligatory functions of Municipal Corporations are implemented through Master Plans/ Development Plans. ● To help students to understand the system of planning standards through which master plans decide - how much land should be reserved for public purpose. ● To help students see that this top-down approach to defining planning standards does not often meet real needs on the ground. Before starting activities the teacher will explain some basic terms which will form the foundation of this Unit. ● **Basic services:** include social infrastructure (health, education amenities, open spaces, municipal markets, slaughter houses, cemeteries, home for the elderly, home for children without homes, home for the homeless, and so on); physical infrastructure (water, road, drainage, sewerage, solid waste management); utility infrastructure (power, telecommunications, transport, freight). ● **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 normalised 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 primary health centre 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. ● **Reservation of land for public purpose** 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: Land for Public Purpose and Open Space standards (45 minutes)** The purpose of this Activity is to help students understand the problem of the top down approach to making land available for public purpose, through the example of open space standards. **The teacher asks students to refer to their**	**Week 3_Day 3_Student Handout**

handouts and displays the exercise on the screen also.

- The teacher displays a map of municipal wards in Delhi, within the jurisdiction of the Municipal Corporation of Delhi.
- The teacher then shows planning standards for Delhi, Mumbai and some international cities, for open spaces, health and education amenities, on a slide. This is shown as per capita space.
- Then, he/ she shows three images of Existing Land Use maps of one Ward with all civic amenities and a table showing total area occupied by each ward and its population. These are preferably three very different types of urban places: dense, sparse and medium density.

The exercise:

The teacher then, gives an exercise:

"Compute total per capita space available in each of these wards for open space."

Methodology:

The teacher explains the methodology students must use:
Step – 1: Read the scale of the map. Then, apply the scale of the map to measure the open spaces on the Ward Map
Step – 2: Read the Ward Map in the Master Plan for Delhi 2041 and note down the total population of the Ward.
Step – 3: Divide the total area of open space available in the Ward by the total population of the Ward. This gives the per capita open space available in the Ward
Step – 4: Compare the per capita availability of open space to the planning standards.

- The teacher explains to students, how to read the scale of the map

Students may produce the following type of output:

A) High density area:
Total per capita open space: 0.5 sqm
B) Medium density area:
Total per capita open space: 1.0 sqm
C) Sparsely dense area:
Total per capita open space: 1.5 sqm

Question:

The teacher will end the activity by asking students:

"What do you infer?"

Students are likely to say:

- Well planned areas have better access to open spaces- they have a good quality of life

- Traditional settlements have very little access to open spaces
- Medium density areas which are mainly commercial in nature have a reasonable level of open space amenity. This may be okay because the land use is mainly commercial and not residential.

The teacher ends the activity with a discussion on the nature of distribution of open spaces in the city – who has adequate supply, who does not, how does the local government prioritise funds for ward level public amenities.

Activity 2: Capturing Local Needs (30 Min)

The purpose of the Activity is to expose students to a pedagogic tool for capturing local needs.

The teacher asks students to refer to their handouts to make notes and write down their observations/ insights:

- Displays Existing Land Use (ELU) maps of three congested Wards in Delhi that students worked on in Activity 01.
- Divides the class into groups of 5 students each. Each group picks an ELU of one Ward.
- Asks each group to study the table on the ELU map and note the total amount of vacant land in each Ward.
- Projects on the screen, the existing and projected population of the Ward, as written in the Master Plan for Delhi 2041.
- Projects on the screen, planning standards according to URDPFI Guidelines, for open spaces, health and education amenities.
- Asks students to compute how much vacant land is required in the Ward if the Plan has to meet Planning Standards of the URDPFI Guidelines.
- Asks each group to calculate land requirement for their respective Wards for open spaces, primary health centres and primary schools.
- Asks students to match the vacant land available with demand for open spaces, health and education amenities.
- It is likely that the Wards have very little vacant land available, and a high demand for land for health, education and open space amenities.

Question:

The teacher asks:

“What do you infer about the extent of land available for public purpose versus the land needed according to planning standards?”

Students are likely to say:

- There is a lot of demand for amenities but almost no vacant land available.
- We have calculated the demand using the URDPFI Guidelines. But, we do not really know what the local people want.

If students do not state the second point, the teacher must prod students to state this point. If students state the point on their own, he/ she must commend them and reinforce the point.

Then, he/ she explains using the example of Development Plan Greater Mumbai, how planners innovated a tool to overcome this top-down approach of using ambitious planning standards to capture local demand. On a slide the teacher: ● Shows a set of radar graphs which represents three Wards in Mumbai. ● Explains that the blue line represents for each Ward, what the Planning Standards mandate. The red line indicates the existing status. Explains that these graphs were used by the Municipal Corporation of Greater Mumbai in the development plan preparation to capture real local needs. ● These radar graphs were displayed as posters at the Ward level. ● People at the ward level voted for an amenity they really needed ● Scarce land resources were then reserved for the amenity that the community suggested they needed, rather than following the planning standards alone. The teacher concludes the session by reiterating two things: ● Reservation of land for public purposes is today done using planning standards. These standards, recommended by the national level URDPFI Guidelines, are ambitious. Municipal governments and planning authorities do not have the financial capacity to acquire the land reserved and develop amenities. Also, vacant private land in cities comes at a premium and is scarce. So, land needs to be judiciously used. ● A relational approach to reserving land for public purpose, based on real local needs rather than planning standards is needed. Planners must develop several smart tools such as the Radar Graph, to help the government channel their investment where most needed.	

Week 4: Urban design

Important Concepts

- Understanding how physical aspects of places in cities have an impact on quality of life.
- A comparison of satellite images of different cities across the world and in India to understand the relationship between built and unbuilt spaces in a city and its impact on simple aspects related to quality of life, such as natural light or ventilation within buildings.
- National government initiatives which advanced urban design of places in cities using the Smart Cities Mission (SCM) as a case in point.
- Design interventions made through the SCM aims to improve quality of life, while also raising questions about whom these urban design interventions benefit.
- Understanding urban infrastructure finance and Capital Investment Planning Framework

Learning Standards

- Students are exposed to understanding how physical aspects of places in cities have an impact on quality of life.
- Students also understand urban design as the relationship between the built and the unbuilt spaces.
- Students will learn about infrastructure development as a core component of urban planning.
- Students will also be exposed to - city-wide urban design and infrastructure projects and their pursuit through nationally sponsored schemes using the Smart Cities Mission as a case in point.
- Students will be exposed to the concept of municipal finance and different types of models and financial instruments.
- Students will understand the challenges of the government to allocate funds for projects in cities.

Inquiry Questions

1. How physical aspects of places in cities have an impact on quality of life.?
2. How do national government initiatives advance urban design of places in cities?
3. For whose benefit are Urban Design Interventions like Smart Cities Mission made?
4. How is the implementation of the Master Plan financed?
5. What are Public Private Partnerships and how are they used by the Government to finance infrastructure projects in cities.

Lesson Plan: Week 4 Day 1
Urban design concepts

Classroom Inquiry Process	Resources
Lesson Aims: ● First, to expose students to understanding how physical aspects of places in cities have an impact on quality of life ● Second, get students to understand urban design as the relationship between the built and the unbuilt. **The teacher first explains the following terminologies to form a base for the session. The teacher requests students to refer to their Handouts (Week 4_Day 1_Student Handout) in order to understand the concepts spatially:** ● Urban design: 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 of streets and public spaces. ● 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, cultural practices and livelihood patterns of people. At the same time places in cities are subject to pressures of modernity, technology 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. ● Gridded streets and city block: Laying out the design of a city, a neighbourhood, 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 are connect adjoining localities ➔ Minor streets: which 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. ● Human centric streets: Industrialisation world over, brought with it a demand for speed and efficiency. Robert Moses in the United States, for instance, advanced high speed expressways, flyovers in New York, to support an efficiency oriented society, made possible through the use of private automobiles/ the car (mid 1960s). 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. An independent India, national government institutions such as the Indian Roads Congress (IRC) defined road standards with speed and efficiency as goals. After liberalisation 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	**Week 4_Student handout** **Week 4_Day 1_Student Handout**

important criteria in the design of streets and street networks. This meant optimising 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 carriageway, footpaths, green ways along the footpaths that ensure ease of movement for the elderly, women, children, and persons physically challenged or needing assisted mobility.

- 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 area is built up. It shows the level of built up density or sprawl. It is a strong tool for comparative assessment across cities.

The teacher shows images on a slide deck or a presentation, in order for students to understand the concepts clearly.

With the above backdrop the teacher undertakes two activities:

Activity Title: Understanding the city as a fabric (1 hour 40 mins)

The purpose of this activity is to understand the city as an interweaving of multiple forces: social, economic, cultural, historical, technological and spatial.

The teacher asks students to refer to their handouts and make their notes and observations to questions asked in class.

The activity involves looking at satellite images of various street networks of cities across the world and in India, at the same architectural scale (1:5000 or so), understanding what these distinct street patterns mean in terms of real life experience, usage, safety and comfort on the street. Students will understand that Indian cities have only some localities with planned streets. Most parts of Indian cities are left to grow in unplanned ways, leading to traffic jams, flooding, extended travel time, increased respiratory health issues etc.

Sub-activity 01: Reading urban fabrics (30 minutes)

The teacher projects a slide deck on the screen, and explains the exercise to the, as follows:

“We will now take a look at multiple satellite images of cities across the world. These are all taken at the same eye level from the earth. You can see how some cities have wide road networks. Others have narrow street networks. We will then take a look at photos from the cities to understand what the quality of life is on these streets”.

The slide deck will include satellite images of:

a) Shahjahanabad and old city fabrics in India, Las Vegas, Los Angeles
b) Old city precincts in India and City centre Paris
c) Barcelona, Mexico
d) Lutyens Delhi, Washington DC Mall

e) Mission District San Francisco, DDA layouts Delhi, Pondicherry
f) Unplanned areas in peri-urban areas in India versus Bangalore Development

Authority's (BDA) Layouts in Bengaluru

Question: The teacher asks students to make general observations about the places. The teacher may ask a question:

"What is the sense of place you have from looking at these satellite images?"

Students may respond:

- Shanjahanabad and old city areas look very dense
- Las Vegas looks very grand, almost as though there are no people. It is meant for cars.
- Paris has many narrow streets but seems well navigable and managed
- Barcelona's satellite image shows wide roads and tightly packed blocks. Same with Paris and Mexico in a way.
- Lutyens Delhi and Washington DC have a majestic feel about them
- Unplanned areas in Bengaluru's peripheries look chaotic whereas BDA layouts look organised

The teacher compliments students. The next exercise is given: to prepare figure ground maps of all the places, to understand the relationship between the built and unbuilt areas.

Sub-activity 02: Figure Ground Maps (45 minutes)

The teacher hands over to student's, plain maps of exactly the same areas shown on the screen.

Then, the teacher asks students to refer to their handouts and make their notes and observations to questions asked in class.

The teacher asks students to colour all the built up areas black and leave the streets, parks and open spaces white. The teacher may put up a sample of the figure ground map on the same slide deck, for students to have a sense of what is expected. Once students finish the maps, they are asked to pin them up on the wall. Black and white mapping shows stark differences between Shahjahanabad and Las Vegas or poorly planned and fragmented peri-urban areas in Bengaluru and planned developments of Barcelona. The teacher asks students to read these maps aloud and share their observations.

Teacher prompts, The teacher may ask:

- What differences do you see between Shahjahanabad's streets and the roads of Las Vegas?
- What do the streets of peri-urban Bengaluru tell you?
- What is common between the fabric of Mission District San Francisco, DDA layouts Delhi and Pondicherry?

The following observations may emerge:

- Shahjahanabad shows large swathes of black and thin strips of white for streets, whereas Las Vegas shows vast white patches of streets which are almost as large as a few blocks of Shahjahanabad.
- Peri-urban areas of Bengaluru show how disconnected the streets are whereas the gridded streets of BDA layout are well linked
- Mission District San Francisco, DDA layouts Delhi and Pondicherry all have a pattern of planned streets, with streets laid out on a grid network

Sub-Activity 03: Linking place to fabric (30 minutes)

The teacher then displays on the screen; images of the urban places they have drawn figure ground diagrams for. Students participate by raising their hands in connecting their findings from the figure ground diagram to the photo of real life on the street.

Again, the teacher asks students to refer to their handouts and make their notes and observations to questions asked in class.

Teacher prompts: Teacher may ask the students:

- "What do the photos and figure ground maps together tell us about the nature of the place?"
- "What would you as an urban designer do to improve the place?"

Some responses students may make are:

➔ Shahjahanabad is a densely packed place without much breathing space between buildings. It needs to be redeveloped in some ways to allow for more natural light and ventilation into the buildings

➔ Roads in Las Vegas are very wide. They have 16 lanes on the main corridor. This can easily be reduced to 8 if not lesser. In its place, some trees or greenery suited to the climate of Las Vegas can be planted. The entire city is rather extravagant.

➔ Our/ BDA layouts appear to be nice places to live. They do not have extravagant use of land like Las Vegas or congestion like in our old cities.

The teacher synthesises their responses, compliments students and concludes the session.

Conclusion

The teacher concludes the session with three key takeaways:

- One, urban fabrics provide a good sense of the nature of a place. Aerial photos are a great tool to understand strengths and weaknesses in urban places.
- Two, Figure-Ground Maps are a strong tool to understand the nature of built up area: very dense, sparse, ventilated, claustrophobic, etc.
- Three, co-relating photos of places with Figure Ground Maps and satellite imagery allows urban designers to understand places in a more grounded

way. Urban designers generally use these three techniques to understand the nature of places in a city prior to embarking on field work. The teacher explains that with this backdrop, they will move to the next session on how the Smart Cities Mission of the national government incorporates urban design. Learning outcomes ● Exposure to how cities are mapped using satellite images ● Exposure to urban design tools and how urban designers use these tools to understand nature of places ● Indian cities seem to consume much lesser land for built up development. Its peri-urban areas need attention for urban design and planning. Its planned layouts make good urban places of inhabitation.	**acher resource week 4** 

Lesson Plan: Week 4 Day 2
Programmes in Urban Planning

Classroom Inquiry Process	Resources
Lesson Aim The purpose of this session is two-fold: ● First, to expose students to infrastructure development as a core component of urban planning (refer Unit 2, session 04). ● Second, to help them understand how integrated, city-wide urban design and infrastructure projects are undertaken for cities, through nationally sponsored schemes. The Smart Cities Mission is a case in point in this session. **Key concepts** ● National Government Schemes for urban infrastructure development ● Smart Cities Mission ● Pan city projects ● Area Based Development ● Special Purpose Vehicles **<u>Session details</u>** **<u>Backdrop:</u>** *The teacher first explains terminologies:* - *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 the 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 liberalisation. After liberalisation of the economy in 1991, the focus on urban development was concerted. The GoI launched several schemes to augment 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 interventions:

- o Pan city projects
- o Area Based Development
- § Redevelopment
- § Greenfield development
- § City Improvement (Retrofitting)

- ***Special Purpose Vehicles:*** Projects under the SCM are governed under a Special Purpose Vehicle. For every city under the SCM, a SPV is established as the Smart Cities Company. This company is constituted under the Companies Act 2013, not under the State Municipal Corporations Act. Each Smart Cities Company has shareholding partners including departments from the National and State government levels. The Municipal Commissioner of a city is generally appointed the CEO of the SPV. The Smart Cities SPV is, however, independent of the Municipal Corporation's functioning and has no presence of elected representatives. The SCM SPV is incharge of design, construction of projects conceived within the ambit of the Scheme.

The teacher explains the above key terminologies and then announces the activity.

Activity 01: Urban design of an Area Based Solution zone (60 minutes)

Using a slide deck, the teacher explains the context of SCM in Bhubaneswar:

- Bhubaneshwar city is the capital of Odisha state
- It has a population of 8.40 lakh people
- The city's municipal corporation limits cover an area of 186 sqkm.
- The Smart Cities Scheme covers an area of 186 sqkm
- Within this area, a flagship project of the city is the Area Based Development, covering an area of 985 acres, located in the Bhubaneswar Town Centre District (BTCD).
- The BTCD area includes a host of issues and solutions which have been developed by the Bhubaneshwar Smart City SPV.
- Let's take a look at the present ground realities of the place. We can then put down a few criteria for design, work in groups and come up with urban design schemes for this area. Then, we will compare our designs with what the SCM SPV has designed for this area.
- The Area Based Development precinct area includes the following types of places:
  - o The Lake Neutral
  - o Janpath
  - o Railway station
  - o Housing development project
  - o Satyanagar institutional core
- The Area Based Development precinct includes the following urban systems:
  - o Road, transport and mobility

Week 4_Day 2_Student Handout

o Drainage, sanitation o Housing for the Economically Weaker Section o Educational institutions - It constitutes the following types of population and stakeholders: o Formal businesses in the CBD o Informal financiers and informal economic activities such as vendors of fruits, vegetables, essential commodities o Residents, slum dwellers o Business entities related to private education o Public institutions o Government offices - The following are the key issues faced in this area: o Un-walkable streets o Polluted lake and drainage channels o Traffic congestion at intersections o Air pollution o Poor quality infrastructure and housing for slum dwellers - The place requires the following improvements and interventions: o Walkable streets o Congestion free traffic intersections o Cleaner air o Clean lake, segregation of drainage and sewerage o Improved infrastructure and better quality housing for slum dwellers - Drawings of the site are shown on the screen - Please form groups of 4 or 5 members - Here is a drawing of the area/ site on the screen. The same drawing is being handed out to each group in an A3 sheet format. Each group is also given multiple blank sheets of A3 paper, to make sketches or jot down your proposals in bullet points. - Each group needs to think of design solutions to meet the improvements the place is seeking to introduce. Groups are given 30 minutes to prepare design sketches on the map, draw their imaginations on other A3 sheets of paper, and write down their design solutions on the A3 sheet of paper. The teacher then asks student groups to pin up the design proposals on the board. Each group representative is given five minutes to explain. The teacher and students applaud at the students' efforts. Then, the teacher returns to the slide deck and shows the types of interventions that urban design experts have made. Through attractive maps, images, sketches and drawings, prepared by urban designers, students gain as sense of the nature of work that urban designers do. The teacher concludes the activity by summarising the types of interventions students have thoughtfully proposed and what more they can achieve if they train	

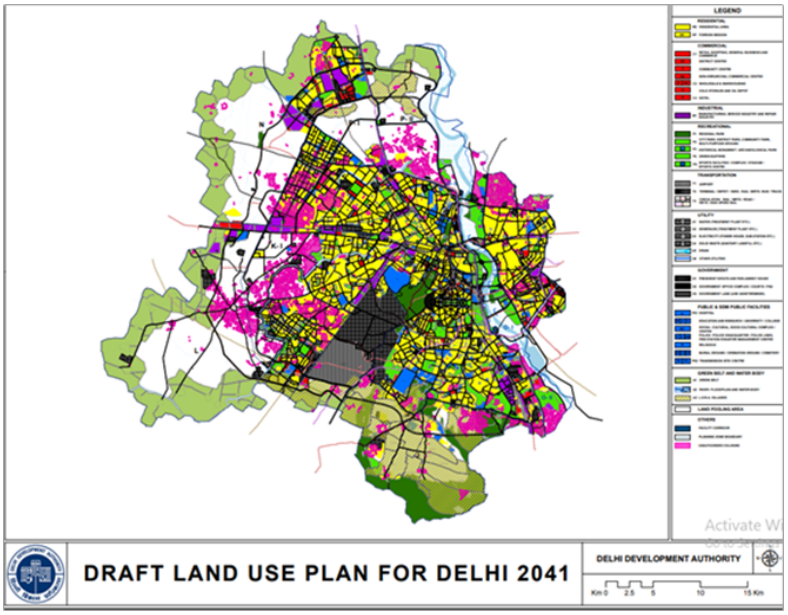
as urban designers. **Special section on Educational Programmes** 1. To expose students to multiple institutes in the country which offer professional programmes, certificate courses and short courses in urban planning and design. 2. To help the students understand who can apply and what the application process entails.	

Lesson Plan: Week 4 Day 3
Project Work

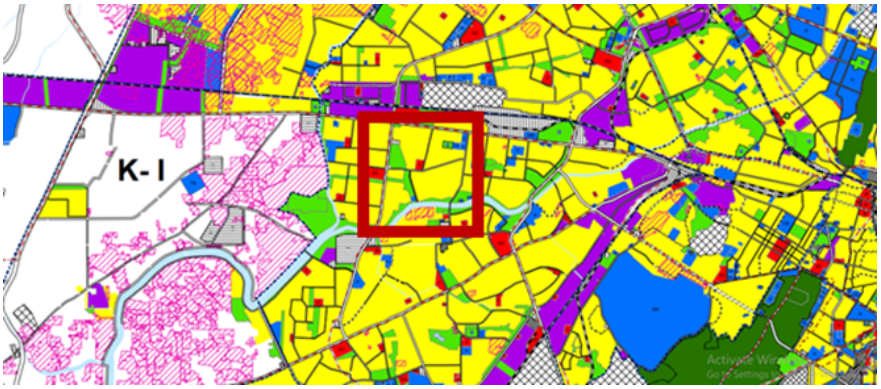
Classroom Inquiry Process	Resources
Lesson Aims: ● To provide students an opportunity to reflect on all the units and learnings. ● To provide students the possibility to hypothetically experience a real life situation in urban planning and dilemmas of the urban planner and planning authority. **Project Work** This project work brings together the learnings from all the four units spanning the four weeks of teaching. The four weeks involved learnings from reading and mapping urban places, understanding constitutional values that form foundations to urban planning, national level legislation for components of planning, the actual practice of urban planning on the ground and its contentions, planning process, problems in the current use of planning instruments, national schemes for urban design of places, infrastructure projects and finance models for implementation of plans and projects. Through these units' students learn about how urban planning is practised and perceived as a highly technical process, but, the actual transactions take place through the regulations and urban planning instruments themselves. They learn that urban planning and regulation is about multiple markets. It is about making land available for public purpose/ basic services for all, especially marginalised communities. Based on this learning, the teacher gives two exercises to students, as included in the Handout. **1. Group Exercise 01: Role Play** 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 teacher asks students to refer to their Handouts*** **The context** You have the following information: 1. The site is a hypothetical setting, which has the following character: ● A bustling commercial street ● A well planned residential area	**Week 4 Session 3_Project Work_ALM Urban Planning_Teacher Lesson Plan** **ALM_URBAN PLANNING_PROJECT WORK STUDENT HANDOUT**

- An adjoining informal slum settlement
- A nullah passes through the development which often floods
- 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 billboard 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 yourselves with the Zoning Regulations for the intervention:

- Floor Area Ratio of 3.5
- Proposed permissible land use: Mixed: Residential and commercial
- Buffer from drain: 10 meters
- 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

- No objection certificate from the Planning Authority- the Development Authority
- No objection certificate from the Municipal Corporation
- No objection certificates from officials from water supply and sewerage department
- No objection certificate from the electricity department
- No objection certificate from officials from environment department
- No objection certificate from officials from pollution control board
- No objection from Traffic Police
- No objection certificates from Ward Committee Members including Ward Level officer from the Municipal Corporation, elected Ward Councillor,

representatives of the neighbourhood, informal settlements
- 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).

Teacher prompts

Each member will put forth their argument (teacher prompts to nudge students):

- Builder says that the development will bring good quality of life to all residents and set the example of a new way of sustainable living where live-work and play are all on the same plot. High rise development will mean compact development. It will allow much open spaces on the plot, allow greater natural ground area and recharge of ground water. The office complex, gym, pool, shopping mall and club house allows people to use facilities on the same plot. They do not need to travel long distances.
- The residents from the planned neighbourhood oppose the development saying there will be more crowding on the streets, greater noise from vehicles, more air pollution and nuisance due to on street parking. Residents are also opposed to potential increase in flooding from the nullah due to more impervious surfaces. Residents and local shopkeepers feel that the intervention will increase traffic congestion and air pollution.
- Slum dwellers oppose the development as 50% of them will be evicted due to the intervention. They oppose being moved out from a place they have historically occupied. To find new jobs in a new location will be difficult. They will also be moved away from the rest of their family.
- The activists are against the development because they argue that the new development is an exception to the zoning regulation which demarcates this patch of land as a natural area to be protected. The new development will also evict slum dwellers. The slum dwellers have the right to the city and this development will violate human rights.
- The water supply department may explain whether there is adequate supply of water or not. The planning standards require 110 litres of water per person per day. But, this is very high. The teacher will nudge students to think about water harvesting and suggest that the water department will insist the developer shows rain water harvesting and treated sullage water to be used for landscaping etc.
- The sewage department will similarly insist on a treatment plant for the intervention
- Municipal corporation solid waste department will insist on waste segregation plan to be submitted and provide figures for what is expected from the residents
- The Development Authority states that the development is maintaining all

regulatory conditions and will potentially increase the natural ground area on the site. It will also provide them development charges and recurring property tax revenues to the municipal corporation. They also show how the property is not violating any of the Zoning Regulations. The Zoning Regulation allowed development after a 10-meter buffer which the builder complied with

- The activist argues that a 10 m buffer was not adequate. They explain that the last time it rained heavily, the entire area got flooded. The
- The residents argue that their area will be flooded causing more
- The Urban Planner member will explain positives and negatives in the synthesis slide and arrived at a decision on whether to permit the development, if yes, conditions under which permissions are granted.

- The planner will call for a consultative meeting where all members are present. The planer will structure the discussion by allowing each actor to speak for about 3 minutes:

    - Builder to make the presentation on the project
    - Development Authority and the Municipal Corporation to make the first bid to pass the sanction plan
    - Residents from the planned area, slum dwellers, activists, shop keepers/ owners, others onsite to oppose the development and the development authority's proposal.
    - The urban planner to reconcile all the inputs and take a decision through consensus. There could be two types of decisions which groups opt for. One a compromised decision which may make no one fully happy and no one fully unhappy. Another decision, to not give permissions to the project, making the builder and the builder unhappy.

Once students playing different roles put forth their arguments, the one playing the role of the urban planner will lay out the order of arguments from each group member – whether in favour or against the development (3-4 minutes each).

Through consensus building and participation, the independent urban planners must synthesise all arguments and make a case in favour of a good quality of life for the people and sufficient revenue generation for the authorities. These solutions may vary and are project assignments for students.

The teacher may guide students to refer to examples of good apartment complexes which are sustainable and respect nature based solutions, are inclusionary in nature, with housing for the economically weaker section.

Exercise 02: Individual Reflective Essay

The teacher announces the following individual exercise

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	

3.3 Module Project

You will have to do a group project for this module. 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. The teacher provides them the following information:

1. Your group may select one of the two public problems that urban planning process can resolve:
    1. Traffic congestion
    2. Frequent flooding
2. Your group will also select a site/ location you know fairly well, near your school/ home. Now, imagine that this location you have selected has the following types of places:
    1. An informal slum settlement
    2. A well planned area
    3. A bustling commercial street
    4. A traffic congested junction
    5. A nullah which often floods
3. A new development is being proposed on this commercial street. It has a mixed use building accommodating 50 apartments, 10 offices and a shopping mall is coming up on that site. This mixed use development is located on the commercial street and right next to the drain that floods during monsoon. This development will accommodate 50 families/ approximately 200 people, 100 cars and 50 two wheelers, and visitor's vehicles.
4. 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).
5. The planning authority and municipal corporation want the development because it will generate them revenue. 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. Urban planners, traffic experts and environmental planners are to address the solution.
6. By assuming roles, you will all play out a scenario of how a decision can be negotiated.

Actors for the two problems

Traffic congestion:

An Urban Planning officer from the DDA (incharge of MPD 2041), an Urban Planning officer from Municipal Corporation of Delhi (incharge of road networks and road quality), an officer from the Delhi Regional Transport office (incharge of registration of new vehicles), an Urban Planning officer from Municipal Corporation of Delhi (incharge of building permits), two residents from the locality (demanding solution to the problem), one independent urban planner, one representative from the slum, one representative from the real estate company building the mixed use development.

Flooding:

An Urban Planning officer from the DDA (incharge of MPD 2041), an Urban Planning officer from Municipal Corporation of Delhi (incharge of drainage and water pollution), an Urban Planning officer from Municipal Corporation of Delhi (incharge of building permits), an officer from the Delhi Pollution Control Board (incharge of effluent discharge and building permits), two residents from the locality (demanding solution to the problem), one independent urban planner, one representative from the slum, one representative from the real estate company building the mixed use development.

The task for the student group:

- One student from the group will present the problem for either traffic congestion or flooding, using a slides presentation.
- Each member playing a role will put across their argument.
- One student from the group will lay out the order of arguments from each group member – whether in favour or against the development (3-4 minutes each).
- Each member of the group presents their argument to the urban planner/ traffic planner/ environmental planner.
- Through consensus building and participation, the independent urban planners must synthesise all arguments and make a case in favour of a good quality of life for the people and sufficient revenue generation for the authorities.
- All group members agree on the solution

All the very best and enjoy the exercise of becoming urban planners!

3.4 Formative Assessment Rubric

Sub Task 1 Rubric:

Formative Assessment Components	1-2	3-4	5-6	7-8	Evidence
Individual Role in the Group ***(Critical Thinking & Decision Making)***	Learners are minimally engaged – they are uninterested in the role assigned to them, and exhibit no understanding of their role and its expected position whatsoever.	Learners participate to some extent – they are somewhat aware of the role and make at least some of the arguments in support of their respective cases.	Learners are keen to speak and eloquently argue their respective cases. They are well aware of where they stand and logically present their case with the help of the points provided in the evidence.	The learners are not only aware of their role in the group but are also adaptive and are able to re-collect information on the planning process in India to point out how some of the other characters in the group are able to manipulate / use loopholes in the planning process to their advantage.	Each member of the group is actively involved in his/her group discussions, is able to analyze the task at hand, evaluates the points in support of or against his/her stand and presents logical arguments to support the case of the role he/she is playing. The evidence of this will be seen as follows: **The builder –** *- High Quality of Life for everyone* *- Development being an example of a new way of sustainable living where live-work and play are all on the same plot.* *- No need for long-distance travel.* *- Compact development, with more area for open spaces, groundwater recharge.* **The Residents –** ***-*** *Increased congestion on the streets.* *- Increased pollution* *- Possible increase in flooding from the Nallah.* **The Slum-Dwellers –** *- Oppose the project since 50% of them will be evicted.* *- Difficulty in finding jobs in new locations* *- Possibility of being moved away from the family/community.* **Activists –**

					- Violation of human rights of the slum dwellers *- Violation of the Zoning Regulation* **Development Authority –** *- All regulatory conditions met by the developer* *- No violation of Zoning Regulations* **Urban Planner –** *- Shall listen to all arguments* *- Arrive at a decision through consensus* These are some of the main points that the teacher will look for in each role. However, he/she should not restrict the students to only these points and also look for arguments that are based on information about the planning process in India gained by students in this module.

Sub Task 2 Rubric:

Formative Assessment Components	1-2	3-4	5-6	7-8	Evidence
Group Presentation ***(Communication & Presentation)***	The group members may be on good ground individually but are aloof and show no interest in finding common ground to the problem at hand.	The group members present sound arguments for their respective cases. The discussion is somewhat structured, the solution is in favor of	Each role player has presented his/her case logically and concisely. The group is able to reach a decision but there seems to be a lack of consensus	Each role player has presented his/her case logically, concisely. And coherently. They are patient with each other, the urban planner shows no bias whatsoever and the group is able to reach a	Led by the student in the role of Urban Planner, other students in the group will present their respective cases and arrive at a consensus about the development project: *Having listened to all concerned parties the group led by the urban planner is able to arrive at a decision about the project.* *The decision is either a compromised one (where no*

	Each player has taken a hard stance to his/her position. There presentation is completely incoherent.	only one stakeholder and makes the rest unhappy.	building in the approach.	consensual decision. They are also able to show their versatility by suggesting a solution that is drawn from the wider understanding of the topic gained throughout the module.	*party is fully satisfied or completely unsatisfied) OR not giving the go ahead to the project (making the builder unhappy).* *The solutions may vary, and the teacher may go beyond the points presented in the project document to assess the students. For example, the urban planner after listening to all the arguments may arrive at a solution which takes care of all the stakeholders in some way or the other.* *The group is able to draw from real life examples of inclusive housing projects based on nature-based solutions.*

3.5 Teacher Professional Development Guide

The Teacher Professional Development Guide is designed to assist with the delivery of professional development sessions on the Applied Learning Module: 'Urban Planning'.

MODULE OVERVIEW

Urban Planning involves shaping sustainable, livable and inclusionary futures for cities, through norms, guidelines, rules, regulations and procedures. The process requires a combination of multiple skillsets: A) reading the city, i.e., understanding how a city works, comprehending the nature of relationships between diverse communities, migrants, commuters, businesses, business groups, markets, non-markets and so on. B) Ability to read and interpret laws and understand government procedures. C) Technical skills to conduct statistical analysis. D) Critical thinking, to question prevailing practices that do not work. E) Representational abilities to speak with a wide range of people from diverse backgrounds, write effectively, whether government reports, policy briefs or news-articles, essays on specific themes or for the masses. F) Understand models of financing of plan implementation. The ALM on Urban Planning exposes students to all these key skillsets that urban planners are trained on and build up over time.

The ALM includes lesson plans, handouts for students and toolkits for teachers. The process of knowledge transfers from the urban planning experts to teachers engaging with interested students is envisaged through five online sessions. This Teacher Professional Development Guide explains the structure and content that will be shared during these TPD sessions.

MODULE OBJECTIVES

Objectives of the TPD Training of the module -

. Expose teachers to the domain of urban planning, a technical expert's profession through a simple mode of oral and visual communication.

. Enable teachers to employ simple methodologies to read urban places and understand how cities work.

. Expose teachers to foundational values of urban planning, enshrined in the Constitution of India, legislation pertaining to urban planning, anomalies between the Constitutional mandate and actual practice.

. Equip teachers to use urban planning instruments such as Zoning, Floor Space Index and Reservation of land for public purpose.

. Equip teachers to understand urban finance models mobilised by governments for financing the implementation of master plans and infrastructure projects.

OVERVIEW OF URBAN PLANNING

Urban planning is often misunderstood as a technical domain. Being engaged with urban planning means to understand and be more aware of urban life. Urban planners do not simply experience the city. They explore and investigate how places work, how places in cities evolve through history, whether urban places are equipped with adequate public/ civic amenities, infrastructure and housing for all, and if financial allocations are adequately made for ensuring equitable access, particularly for marginalised communities.

Urban planning processes in India is under the State government. State governments enacted the Town and Country Planning Acts in the 1960s and 70s. These laws are pending amendment to align with the 74th Constitutional Amendment Act 1992, which require organisations at the District, Metropolitan Region and Municipal levels to prepare plans. Urban plans however, are prepared mostly by Development Authorities. Master Plans are envisaged as spatial plans. They are often disconnected from agendas of economic growth, infrastructure development and the premise of social justice. Plans remain poorly implemented in most Indian cities when prepared. The absence of a participatory planning process is one key reason for the challenge, among others, which includes the ability to strategically understand cities and foresee the future. Planning legislation presently also does not include financing the implementation of Master Plans or infrastructure projects. Urban planners are required to envision futures of cities within these constraints.

This ALM aims to provide a glimpse to students, of the role of an urban planner in the current milieu and what urban planners of the future must strive for, in order to alleviate many of these structural gaps.

SCHEDULE OF THE TRAINING

The training would be conducted online through five sessions stretched across five days. Each session would be of two hours in duration.

OVERVIEW OF THE TRAINING

Week 1

Session 1- It is a session, where teachers spontaneously share their 'urban experience and planning' with the expert, followed by an exercise to categorize their observations of cities under strengths and weaknesses. The session concludes with the experts' synthesis of components of urban planning as a response to teachers' reflections on the city's strengths and weaknesses.

Objectives-

- Teachers' interest in urban planning is activated.
- Teachers reflect on their personal urban experience of the city or the locality they live in.
- Teachers analyze the city's strengths, and weaknesses and start to visualize themselves in the role of urban planners; where people congregate, places that feel good, places that need to be improved, and missing amenities) components of urban planning and are able to use it to create a map of urban space.

Session 2- Building on the first, this session involves 'reading urban places', by virtually taking teachers on a tour of a locality of Delhi. Teachers learn how to discern land use zoning on public and private land, by reading about urban places.

Objectives–

- Teachers virtually learn to see diverse characteristics of a locality- planned and unplanned areas occupied by the middle class and economically weaker sections; economic activities spilling over onto the street; orderly stores and shops, etc.
- With observation and guided discussions, the intention of the session is to have teachers connect their observations to key components and instruments of planning and governance subsequently.

- To make teachers think about patterns of Land use for private and public purposes, and how this influences urban planning.

Session 3– It involves teachers engaging in 'mapping urban places' their strengths, weaknesses, and problems, including land use compatibilities and incompatibilities.

Objectives–

- Teachers explore the role of an urban planner through a hands-on activity requiring problem-solving.
- Teachers prepare a map showing the main land uses, amenities, strengths, and weaknesses/ problems.
- Teachers think of solutions to problems while building on the strengths of the place.

Week 2

Session 1- It draws on reflections from Unit 1 to consolidate two types of planning efforts and components of planning:

- Statutory land use planning;
- Urban design schemes at Ward/ local level;
- Infrastructure projects.

Objectives– The objective of this session is twofold:

- First, to introduce three types of planning processes
  - Statutory land use planning
  - Urban design schemes
  - Infrastructure projects
- Second, to lay out four key components of the above urban planning process:
  - Projections and future growth scenarios: population, employment
  - Planning instruments: Land use, zoning-development control regulations
  - A desirable two-tier planning process (urban design/ local area planning)
  - Types of infrastructure projects

Session 2– It provides an understanding of the planning process. It concludes with an understanding of how weak municipal governments and lack of participatory process lead to failure of planning. The session covers three aspects:

- Constitutional mandate to empower cities, involving state government's devolution of political power to municipal governments.
- Lack of participatory process causes failed plans
- Examples of participatory (Main Bhi Dilli Campaign, Smart Cities Mission)

Objectives-

To orient the teachers to-

- Planning mandates at the national level; and nature of their implementation
- Planning laws and processes mandated at the State government level and participatory planning

- Planning process innovations at the local level: Main Bhi Dilli Campaign on how highly technical plans can be communicated in simple language to the general public

Session 3– This session pertains to participatory planning processes. Teachers are provoked to think about the role and societal responsibility of urban planners in the context of weak city governments.

Objectives-

Orient teachers to the forms of public participation processes underway:

- Delhi: Main Bhi Dilli Campaign, which communicated the plan in simple language to the masses
- Smart Cities Mission: A wide range of creative public process interfaces, including workshops, challenges, hackathons, etc.

Week 3

- **Session 1-** It deals with the concept of Zoning Regulations or Development Control Regulations. Zoning Regulations are a key component of master plans. As a bundle of regulations, ZRs or DCRs prescribe permissible land uses, prohibited land uses, how much you can build on a parcel of land in relation to road width, and limits to free car parking on a parcel of land. Town and Country Planning Organizations prescribe certain categories of land uses: residential, commercial, office, industrial, public & semi-public, parks and gardens, road and transport, and utility infrastructure. This session provokes teachers to think about questions and implications on quality of life.

Objectives-

- To make teachers imagine a Zoning Regulation they feel is most suited for a livable neighborhood
- To understand components of land use and zoning regulations in Town & Country Planning Laws and Master Plans
- Assess how the current pattern of Zoning Regulations could be better crafted.

Session 2- It deals with Floor Space Index. Floor Space Index is an indicator of how much one can build on a parcel of land. It is the ratio between total built-up area and a key conundrum in urban plans is whether the city should be allocate uniform FSI or differential FSI. Should some places be allocated more development rights than others? This section helps teachers unpack this question through some activities.

Objectives-

To expose teachers to the concept of the Floor Space Index as a key instrument used by planning authorities, to control the development of buildings in the city. There are two issues:

- One, that the definition of FSI in the Town and Country Planning Act of State governments is not the same as the definition adopted by the Planning Authority.
- Two, generally, regulations pertaining to FSI, made in the Zoning Regulations, are largely violated in all cities in India. Then, as a means to penalize these violations, FSI is regularized by the Planning Authority or the Municipal Corporation which is accountable to implement Development Plans/ Master Plans.

Session 3- It focuses on the reservation of land for public purposes. It exposes teachers to two ways of thinking about how plans can reserve land for civic amenities. It is the obligatory function of municipal corporations and other sectoral departments to provide basic services: health, education, open spaces, water, drainage, solid waste management, bus/ rail stations, and so on. The Town and Country Planning Organization at the National government level published the Urban and Regional Development and Plan Formulation and Implementation Guidelines (URDPFI Guidelines) and planning standards as benchmarks for the planning authority's reference. Planning standards define how much amenity space should be available at the city and local levels. For instance, planning standards for open spaces in a metropolis are placed at 6 sqm per person. Indian cities are generally unable to meet this high standard. Similarly, for other amenities as well. The land is scarce and planning authorities must respond deftly to changing local needs. Through an activity, this session helps teachers explore innovative methods where citizens can vote for amenities they need.

Objectives-

- To make teachers understand that Constitutional provisions of obligatory functions of Municipal Corporations which are implemented through Master Plans/ Development Plans.
- To help teachers understand the system of planning standards through which master plans decide on how much land should be reserved for public purposes.
- To help teachers see that this top-down approach to define planning standards does not often meet real needs on the ground.

Week 4

Session 1- It deals with how physical aspects of places in cities have an impact on quality of life. The session involves a comparison of satellite images of different cities across the world and in India. Then, teachers prepare figure-ground maps in the classroom. These are co-related with actual photographs of places. The three tools are used to assist teachers to understand the relationship between built and unbuilt spaces in a city and its impact on simple aspects that afford the quality of life, such as natural light or ventilation within buildings.

Objectives-

- To expose teachers to understand how physical aspects of places in cities have an impact on quality of life
- Get teachers to understand urban design as the relationship between the built and the unbuilt.

Session 2- It exposes teachers to national government initiatives which advanced the urban design of places in cities. The Smart Cities Mission (SCM) is used as a case in point. Teachers gain an understanding of how the design interventions made through the SCM aim to improve quality of life, while also raising questions about whom these urban design interventions benefit.

Objectives-

- To expose teachers 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 through nationally sponsored schemes. The Smart Cities Mission is a case in point in this session.

Session 3- The last session is on urban infrastructure finance. The Capital Investment Planning Framework, which pertains to the implementation of urban design schemes and urban infrastructure projects which by norms, is required to be connected to statutory master planning processes.

Objectives-

- To expose teachers to the concept of municipal finance and different types of models and financial instruments
- To help them understand the challenges faced by the government to allocate funds for projects in cities

DETAILS OF THE TRAINING SESSIONS

The session would be conducted in two parts. The 1st part involves explaining the structure of the session and listing the two activities involved in the session. In the 2nd part, we will explain the session in detail by referring to the PowerPoint presentation created for teachers' reference. We will further explain the presentation in three stages. Firstly, teachers would be briefed about the objective of the session. Then, we will explain the key terminologies used in the session to make them familiar with the urban planning landscape and to gather their experience of the urban area. Lastly, we will engage them in the activities mentioned in the presentation. It would be a participatory engagement with the teachers.

Week 1: Session 1

The first session involves two activities of 30-40 minutes each. In the first activity titled, 'the urban experience' we will show a wide range of images from in and around Delhi to the teachers. It will solicit open-ended responses from teachers on their experience of cities. The intention is to have teachers bring to memory the features of the urban spaces around them. They will also be shown a short documentary to gather their responses to three important questions on urban planning in India. First, who, in their understanding, plans for all these places to achieve a basic minimum quality of life? Second, is it the government? Which departments in the government? Is it people themselves in the traditional localities? Is it the buyers in the spaciously planned areas? Is it shopkeepers/ shop owners? Third, what are the parameters of planning? In other words, what is it that needs to be planned by the government, in order to achieve a decent quality of life for a city's inhabitants? Their responses will be categorized in the following categories:

Identity, vision for the city	Quality of life	People and a sense of place
Private property	Types of economic activities	Infrastructure and amenities

The second activity titled, ‘strengths and weaknesses of cities will deepen the discussion. Here we will explain to teachers the importance of understanding the strengths of cities and building on them, and the weaknesses of cities to alleviate them through several types of interventions, urban planning is one of the solutions. They will be shown the same set of images again but now to translate their initial reflections into strengths and weaknesses of the city. They will now make a table with strengths and weaknesses (such as the one shown below), and one by one, read them out.

What needs to stay or be reinforced (strengths)	What can improve or is inadequate (weaknesses)
• All open spaces • Public transport • Historical areas and monuments • Expressways and flyovers? (Raise the question: where should flyovers go? In strengths or weaknesses) • _____ • _____	• Need more open spaces for the city • The air needs to become cleaner in Delhi, we need more trees • More hospitals in all the localities • The river Yamuna needs to be cleaned • _____ • _____

This activity is conducted in order to develop a wider understanding of the diversity of places and inhabitants that cities are made up of. It would be an activity-based participatory engagement with the teachers.

Week 1: Session 2

The second session titled, ‘reading and walking urban places’ will be an explanation of how teachers need to instruct the students to go on a walk in their respective localities. The teachers will be shown a sample map from the presentation with all streets, and major and minor landmarks. Using this map, we intend to nudge the teachers to reflect on their observations of the urban areas and think of the following aspects- spatial experience, land use, building use, class of people occupying the locality, building extensions and violations, physical infrastructure, transit stations, parking on streets, signs, street lights, etc. The aim is to evoke observations on the points listed above among other responses that may be relevant at the site of the walk.

Week 1: Session 3

After recapitulating the strengths and weaknesses of the urban places, the first activity in the third session is a guide for teachers to follow certain steps while making their own map of the places they shared their observations and experiences about. In this session, they will be expected to draw major streets as wider and minor streets with a relatively narrower thickness. Identify key landmarks from their memory of being on a site earlier. They will also mark the strengths, weaknesses, and problems they have observed at particular locations, types of land use (residential, commercial, open spaces, medical amenities, education

amenities, etc), compatible-incompatible land uses, level of access, or lack of access to civic amenities, level of availability of infrastructure: transport, water, solid waste management, etc. They can also map other problems observed such as garbage pileups, overcrowded bus stops, local flooding, haphazard street parking, and so on.

The second activity titled, 'acting like an urban planner', is to make the teachers think about what they would each do if they were an urban planner and were entrusted with the task of suggesting solutions to the problems while building on their strengths. They will draw circles around places that need attention, draw arrows to show how some linkages may be improved in the area/ streets/ parks, new amenities may be added on vacant sites or built on existing health/ education amenities, etc. This activity will allow the teachers to start thinking like urban planners giving them a hands-on experience in the field and also helping them in going to the next activity and next week's sessions about the components and processes involved in urban planning.

Week 2: Session 1

In the first session, we will explain the important terminologies to the teachers. Some of these include: what is statutory planning? What is meant by land use? What is the difference between an existing land use map and a proposed land use map? Then we will explain the three different types of planning processes to the teachers. These are- Statutory land use planning, urban design schemes, and infrastructure projects.

To take the session further, we will encourage teachers to participate in the first activity titled, 'types of land use categories in statutory planning'. The activity will focus on the first component of urban planning, that is, statutory land use planning. This activity will involve guessing the land use category ascribed in the statutory Existing Land Use Map in the Master Plan for Delhi 2041. We will display a diverse range of places and buildings, in a PowerPoint presentation. Then, we will ask the teachers to intuitively suggest land use categories for each. They are likely to read some places as singular land use categories, and some others as mixed of many. Once we complete the invocation of land uses against each image, we will show the section of the DDA Act (Section 2b), which prescribes a particular set of land use categories. The teachers will be able to compare their insights against the mapping in MPD 2041. The activity will help the teachers to view places in a city as land use categories, understand what the DDA Act prescribes, and see the disjuncture between their own intuitive reading of land use categorization and the DDA's land use category prescriptions in the DDA Act.

In the second activity titled, 'types of urban planning', we will present the same images asking teachers to intuitively categorize each image into a specific type of land use. This will help the teachers to view a diverse range of places and infrastructures listed as part of different types of planning efforts: statutory land use planning, urban design schemes and infrastructure projects. The activity will help teachers understand that the city is comprised of places that can be categorized into three different components of urban planning and it will enable them to read places through the lens of the Existing Land Use Plan.

Week 2: Session 2

In the second session, we will expose teachers to key issues facing statutory urban planning and some solutions like planning mandates at the national level; their weak implementation, planning laws and processes mandated at the State government level, and the absence of participatory planning, planning process innovations at the local level: Main Bhi Dilli Campaign on how highly technical plans can be communicated in simple language to the general public.

We will also explain the key terminologies required for the session. These include an introduction and explanation of the 74th constitutional amendment act, State level Town and Country Planning Acts, planning authorities, and the importance and need for public participation.

In the first activity titled, 'national-level mandates for master planning', we explain what the statement of objects of the 74th CAA says and whom it identifies as the legitimate authority to prepare master plans. We will then show the DDA Act to the teachers to compare it with the mandates of the 74th CAA. The aim of the activity is to have teachers understand that the Constitution of India mandates that municipal corporations must prepare statutory master plans for cities, whereas, it is Development Authorities that are appointed as the Planning Authority in almost all states in India.

In the second activity titled, 'planning process', we will help teachers understand the absence of participatory planning in master planning. To expose them to campaigns such as the Main Bhi Dilli Campaign. It will give them a glimpse of how highly technical plans can be communicated in simple language to the general public. Why such a process must become endemic to planning processes in India. Why all planners must be trained to participatory processes. We will show them a flowchart of the planning process in India and ask them to point out at what points in time they think participatory processes must be initiated by the Planning Authority. Teachers will understand that the 74th CAA is mostly not implemented for cities. This is because state-level politicians do not wish to devolve power to local levels. Development Authorities prepare statutory master plans; however, without any democratic oversight. Plans are prepared at the macro level of the city. Planning laws make no provisions for local-level plans. This is because state-level officials do not wish to devolve powers to the local and Ward levels, and city-level officials do not wish to empower Ward-level officials. The role of the planner is challenging, to strengthen local governments, bring transparency, prepare plans to meet actual problems on the ground and facilitate their effective implementation.

Week 2: Session 3

The third session focuses on the participatory planning process. Firstly, we will explain the Town and Country Planning laws to the teachers and how these laws often do not incorporate participatory or consultative processes as integral to decision-making. Notwithstanding this anomaly, civil society organizations and Ward-level Resident's Welfare Associations in cities have proactively taken the initiative to organize social groups to understand several technically drafted legal conditions, rules, and regulations that bear implications for the quality of life for all.

To explain it better, in the first activity, we will show a short documentary on the Main Bhi Dilli campaign. It is to make teachers understand that urban planning must be an inclusionary process; decisions made must respond to people's needs, not be made in isolation. A key objective is to have teachers realize that their individual and collective role is important in decision-making. Based on the documentary we would nudge

teachers to think about how would they imagine a public process. What are the components of the campaign that it aims to communicate in the Master Plan for Delhi? What types of tools should the campaign employ to expand simple communication of the Plan?

Through another activity titled, 'visioning your own Delhi', we would ask teachers to provide their insights on what they think Delhi needs and that master planning must address. This will help them understand that urban planning should be a wider communication between the state and the society. They will feel empowered to know that through urban planning, citizens can influence change for the better.

Week 3: Session 1

The third week will delve deeper into the planning process. It will introduce the teachers to know how Master Plans rely on planning instruments to realize the future growth and development of the city. The teachers will be made familiar with three key planning instruments namely- Zoning Regulations (ZR), Floor Space Index, and reservation of land for the public purpose. It will compel teachers to think if mixed land use is good for a good quality of life and for whom? And how much to develop in the city and where?

The first session will expose teachers to the Zoning Regulations as proposed in different Master plans. It first requires teachers to understand some key terminologies like- land use, existing land use map, proposed land use map, mixed land use, and zoning regulations/ development control regulations. To make them think deeper about what makes a place livable and what among these aspects needs to be regulated, in the first activity, we will ask them if they could tell us what places in Delhi or other cities they have been to, to have a good quality of life. What in these places do they think makes them attractive? And why do they think these places have a certain quality of life?

In the second activity, we will show the zoning regulations in Bengaluru and Delhi. Then we will ask them to tell us what the parameters in the ZR indicate. And should road width be a critical factor in defining how much can be built on a parcel of land? The activity will allow them to assess the extent to which the ZRs/ DCRs meet their own imagination of a place with a good quality of life.

Week 3: Session 2

The session will expose teachers to the concept of the Floor Space Index as a key instrument used by planning authorities, to control the development of buildings in the city. It will expose them to the problem of deploying FSI in Master/ Development Plans and the Planning Conundrum. The key concepts that will be explained in the session include- Floor space index, how to compute FSI and what are the violations related to FSI, the condonation of the violations, and the development charges levied for violating the regulations.

To make it easier for teachers to understand, we will first make them understand the concept of FSI from a technical point of view. For this, the first activity titled, 'computing FSI', will enable them to arrive at FSI by mathematically calculating the FSI themselves. We will explain the steps in detail and also help them interpret their answers.

The second activity will equip the teachers to understand the meaning of violation of development regulations. Here the teachers will assess their own answers and compare the answers with the regulations prescribed by the planning authority. It will help teachers understand how FSI rules are manipulated in reality and how plans really have not worked in India.

Week 3: Session 3

The third session will make teachers understand how Constitutional provisions of obligatory functions of Municipal Corporations are implemented through Master Plans/ Development Plans. It will also help them understand the system of planning standards through which master plans decide how much land should be reserved for public purposes. They will see that this top-down approach to defining planning standards does not often meet real needs on the ground.

To help them understand better, we will engage the teachers in the activity where they will read the scales of three map locations, note down the total population of the locations, check the total open space available in the area and calculate the per capita open space available in the locations. The exercise will help them understand the nature of the distribution of open spaces in the city – who has adequate supply, who does not, and how the local governments prioritize funds for public amenities.

Week 4: Session 1

The last week will help teachers understand the urban design schemes and projects in India through the example of the Smart Cities Mission. They will also learn about the new financial instruments such as public-private partnerships and how the capital investment planning framework is connected to the statutory master planning process in India.

The first session will expose teachers to understand how physical aspects of places in cities have an impact on quality of life. Secondly, they will understand urban design as the relationship between the built and the unbuilt. For this, we will first explain some important terms. These include explaining what is urban design, urban fabric, gridded streets and city blocks, human-centric streets, and figure-ground maps.

In the first activity titled, 'understanding the city as a fabric', we will show the teachers satellite images of various street networks of cities across the world and in India. We will help them understand what these distinct street patterns mean in terms of real-life experience, use age, safety, and comfort on the street. Teachers will understand that Indian cities have only some localities with planned streets. Most parts of Indian cities are left to grow in unplanned ways, leading to traffic jams, flooding, extended travel time, increased respiratory health issues etc.

Week 4: Session 2

The purpose of this session is to expose teachers to infrastructure development as a core component of urban planning. Second, to help them understand how integrated, city-wide urban design and infrastructure projects are undertaken for cities, through nationally sponsored schemes. The Smart Cities Mission is a case in point in this session. To simplify it for them, we will explain the national government schemes for urban infrastructure development, Smart Cities Mission, and the Special Purpose Vehicles which govern the Smart Cities Mission in India.

To make it more engaging for the teachers, we will explain the process by taking the Urban design example of Bhubaneswar. Along with the teachers, we will look at the present ground realities of the place. We will then put down a few criteria for design, and come up with urban design schemes for this area. Then, we will compare our designs with what the SCM SPV has designed for this area.

Week 4: Session 3

The last session on Urban Finance will expose teachers to the concept of municipal finance and the different types of models and financial instruments. It will help them understand the challenges of the government to allocate funds for projects in cities. We will explain how master plan recommendations are financed, and what public-private partnerships are.

Through the first activity titled, 'preparing a finance plan', we will expose teachers to how planners assist governments to prioritize projects in a city, benefitting different groups of people. We will take the case of Bhubaneswar, map the project areas, and determine the total budget available with the Bhubaneswar Smart Cities SPV for the implementation of these projects: 100 Crore Indian Rupees. We will help teachers estimate implementation and maintenance costs, prepare a roadmap across five years, fit the project cost requirements with the municipal budget available, and identify projects for which PPP and private sector investments can be explored. To assist the teachers, we will help them understand the scale of the project, ascribe project costs, prioritize projects and help prepare a roadmap for the upcoming years. The teachers will realize that the government has a limited budget and it cannot take up all the projects. Hence, some projects must be leased out to private contractors.

In the second activity, we will ask the teachers to tell us where they feel that the project must be undertaken by the government and what should be given to the private sector. We will gather responses from the teachers. Based on their responses, we will conclude that the answer to when the government may privatize is a complex one. The users of this privatized amenity are difficult to identify. We will tell them the risks of giving a public sector company the opportunity to invest in public infrastructure. If a lake is developed on PPP, then users have to pay to enter. Does that mean only a few who can pay can use the amenity? We will close the session with these open-ended questions for teachers to think about and summarize everything that has been learnt in all these sessions.

3.6 Student Handbook

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
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*	Smart Cities Mission Project for Bhubaneswar, Odisha, 2015 to date.
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*	

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:

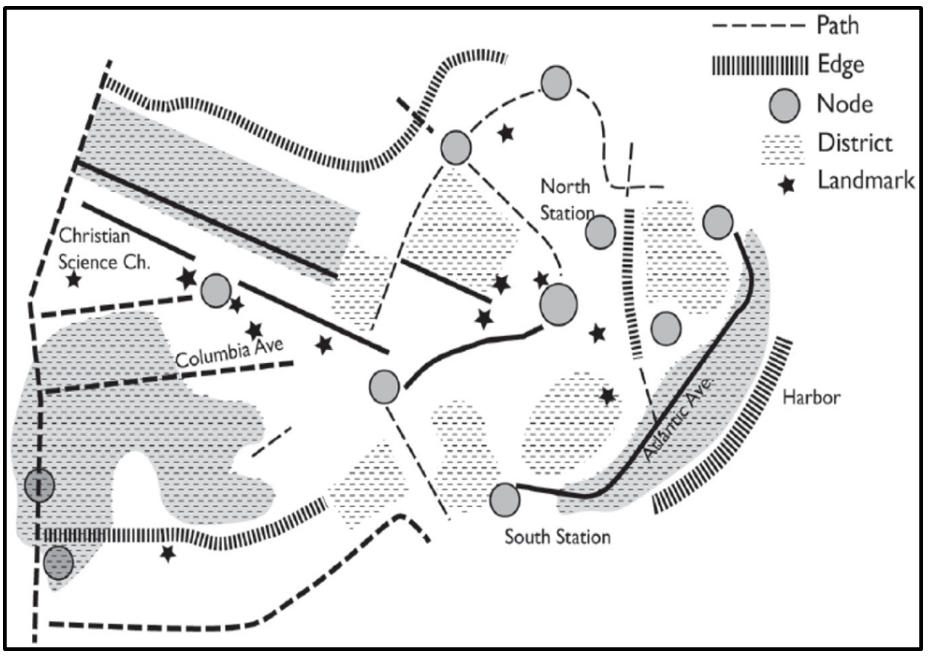
1. Urban experience and planning
2. Reading urban places
3. Mapping urban places

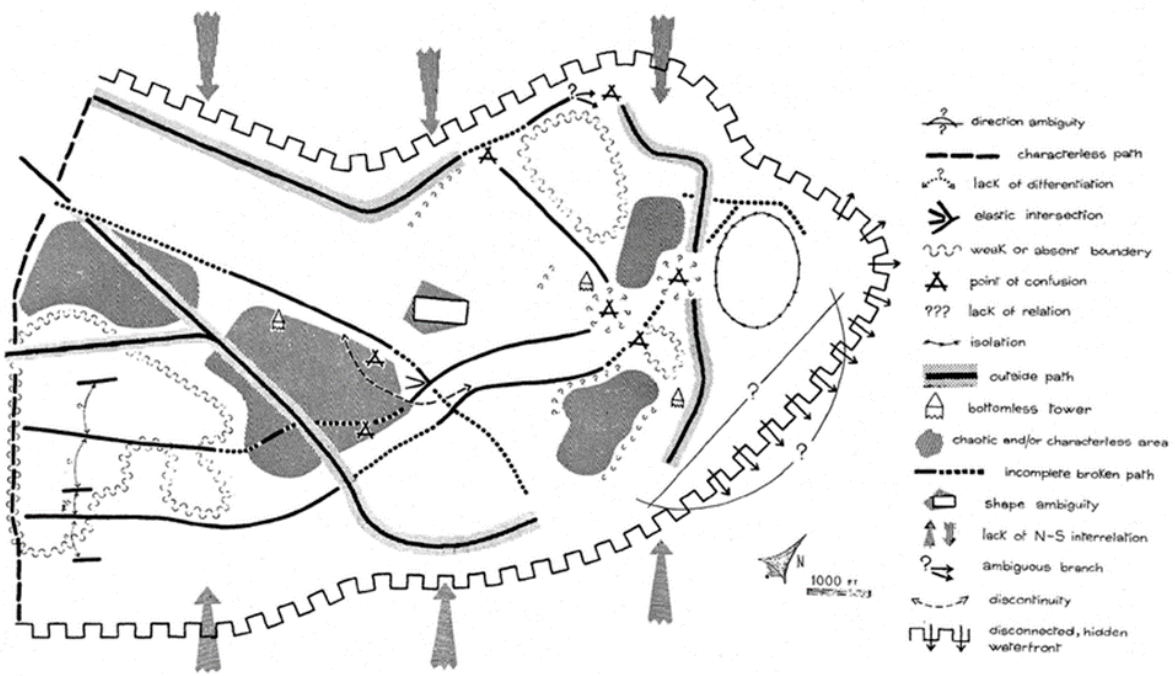
KEY CONCEPTS

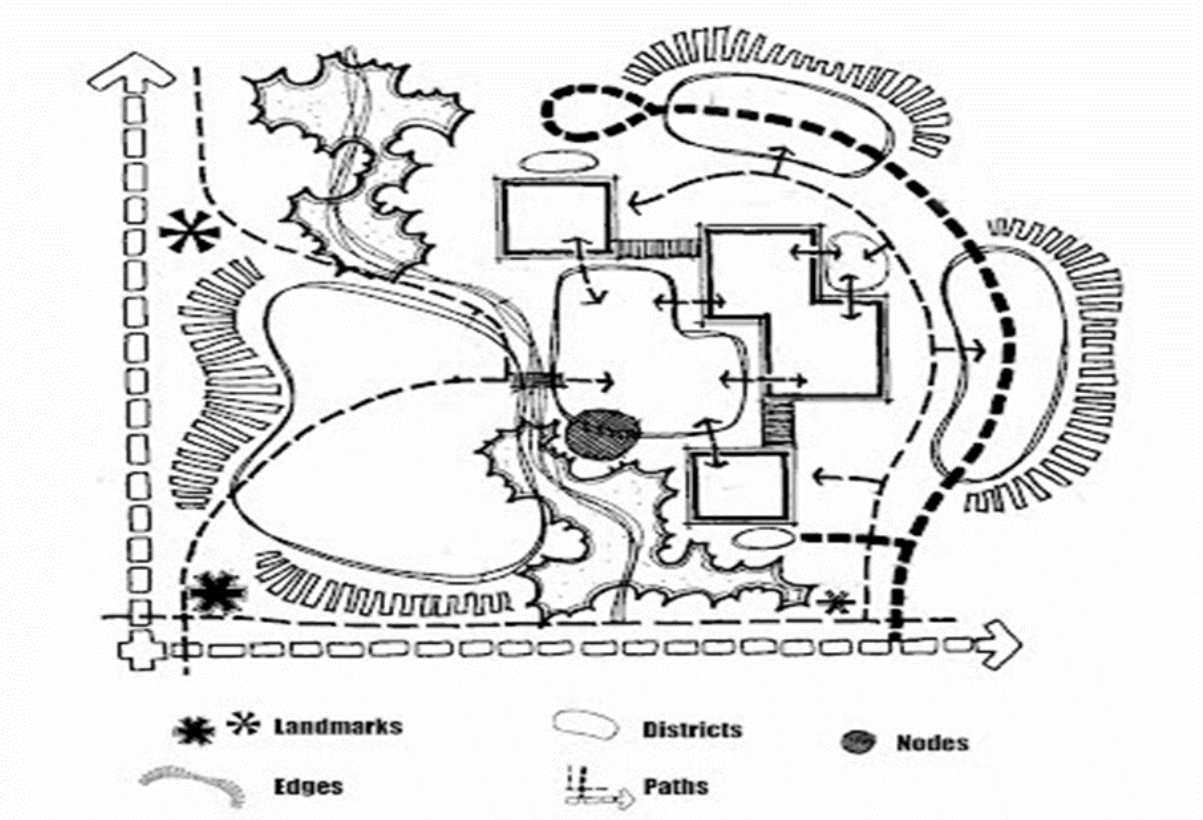
1. Strengths of urban places- access to good common infrastructure playgrounds, clean water, electric supply leading to faster commute, no traffic jams, better health for all, etc.
2. Weaknesses of urban places- Pollution, poor garbage collection, local flooding, not enough space for children to play, 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.

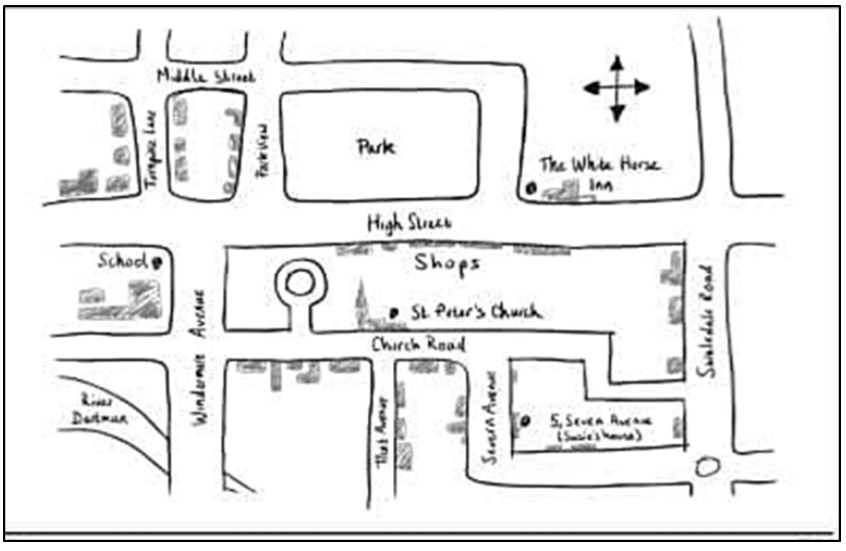
What should diagnostic maps for a city's master plan include?

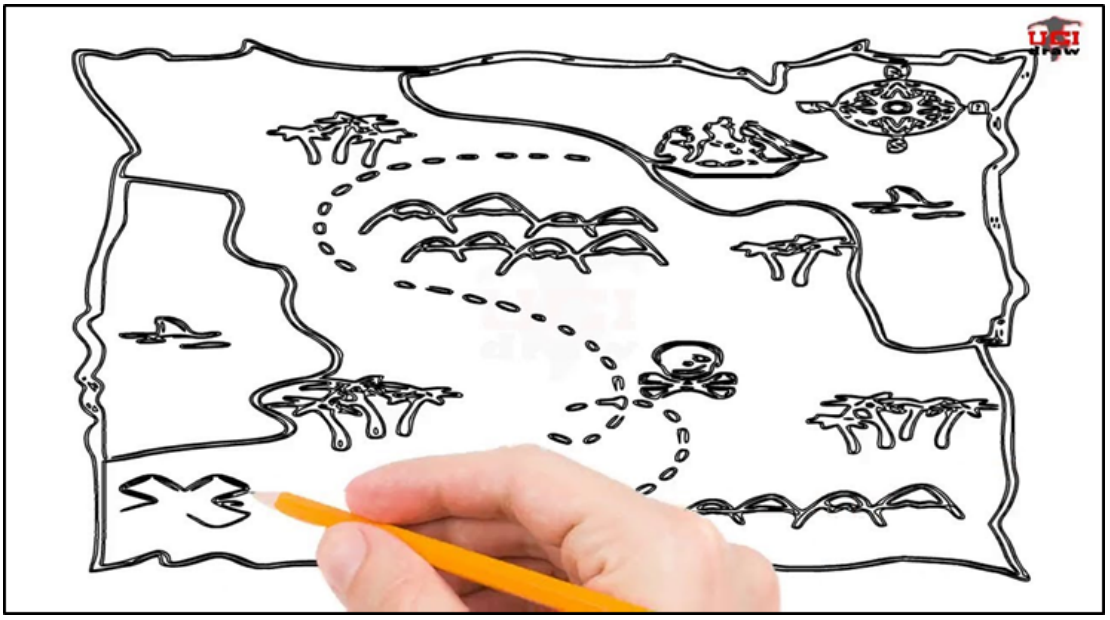
Maps prepared for city master plans may include analysis, recommendations, and proposals for a city's population, economy, housing, transportation, community facilities, and land use. It is based on public input, surveys, planning initiatives, existing development, physical characteristics, and social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

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

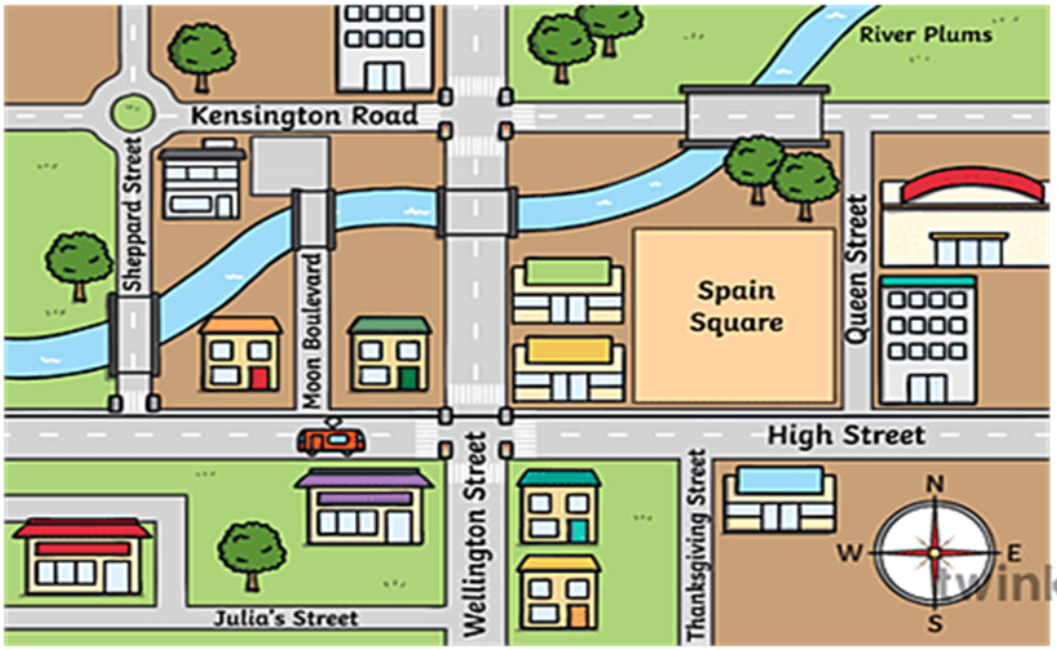
The Delhi Development Authority (DDA) is responsible for preparing the master plan for Delhi? Have you seen the various diagnostic maps prepared for the Master Plan for Delhi? Please collate some examples.

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.

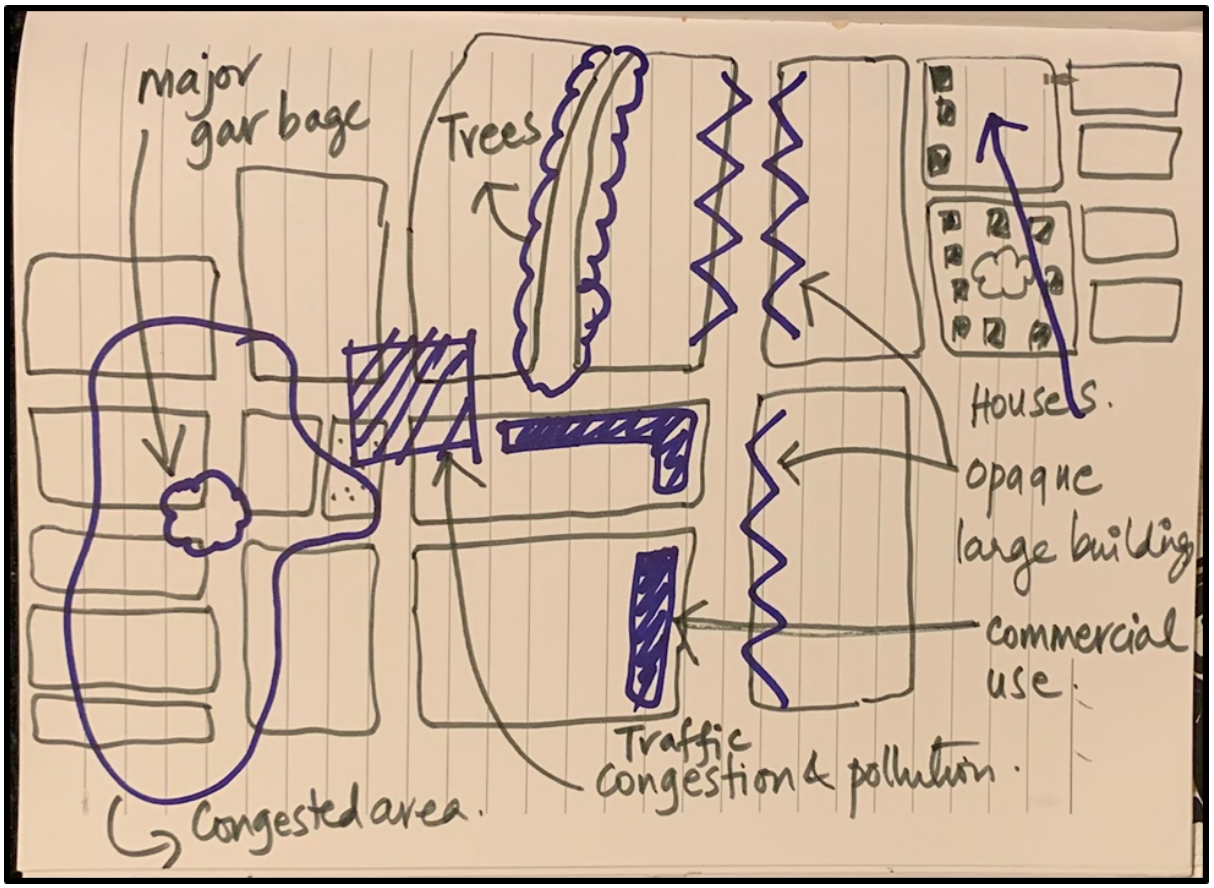


Please draw your map in the space provided below.

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?

_____

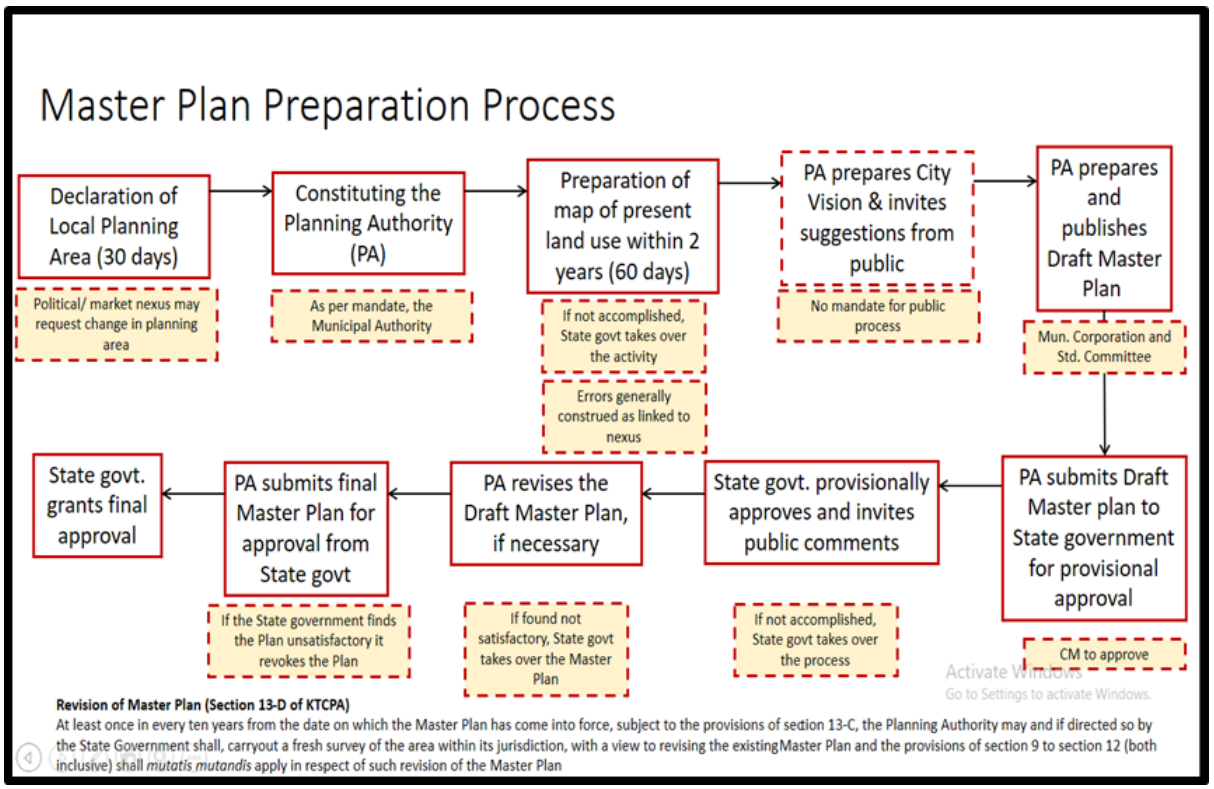
3. Who is the 'authority' in the Delhi Development Act?

_____

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

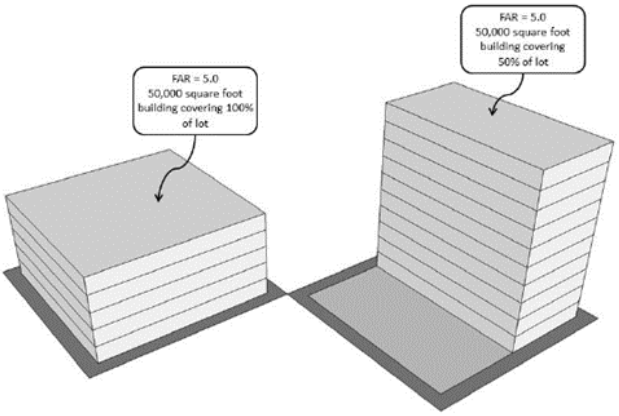


Fig 1.0: Diagrammatic representation of Bulk FSI

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?

_____

_____

_____

_____

_____

2. What differences do you see between Shahjahanabad's streets and the layout of the enclave in Las Vegas?

_____

_____

_____

_____

_____

3. Which of these places is human centric and which ones are car centric?

_____

_____

_____

_____

_____

Activity 2- Linking Place to Fabric

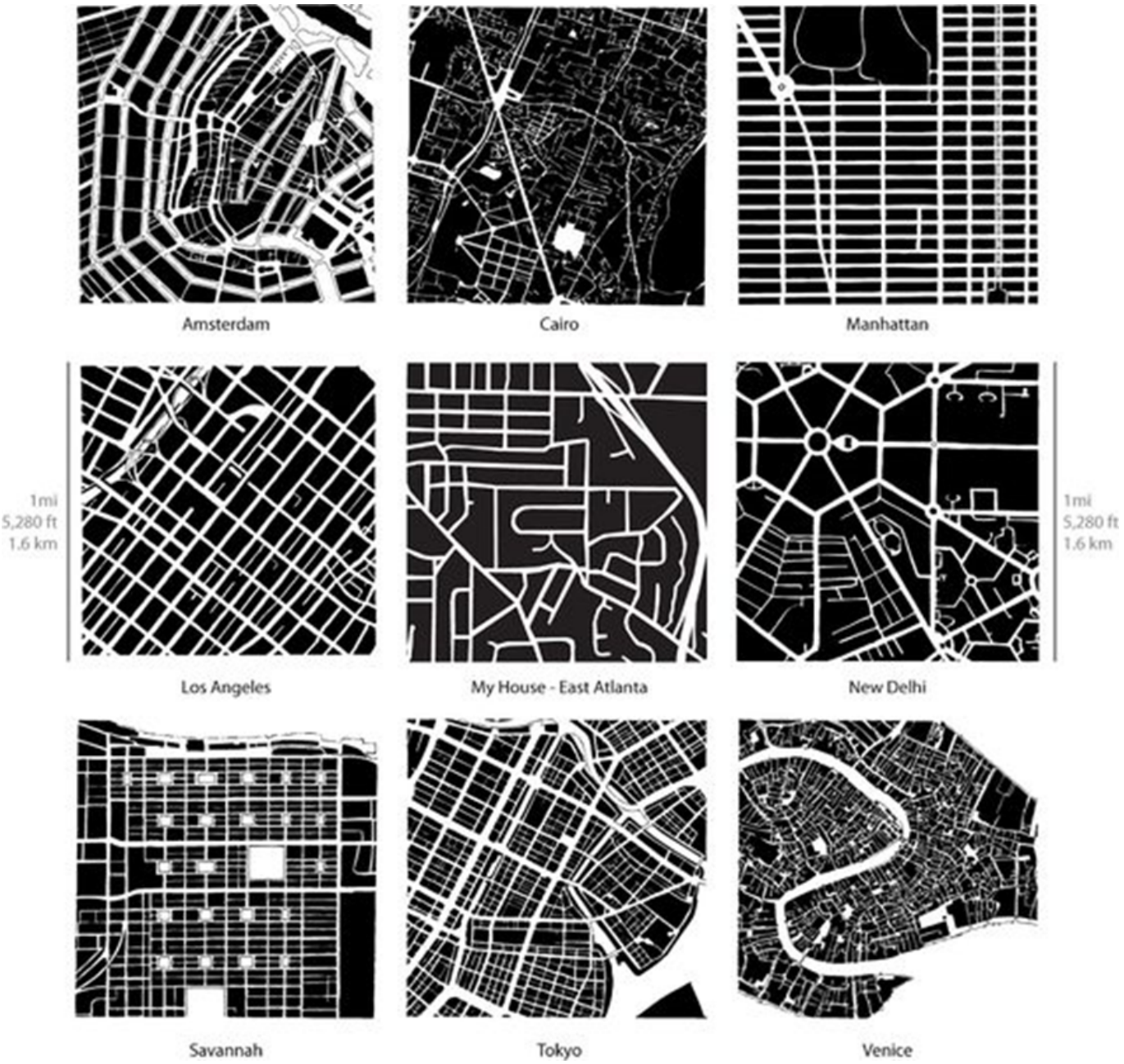


Fig 4.0: Figure Ground Diagrams of parts of multiple cities, drawn at the same distance of the eye from the ground (i.e., at the same scale).

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?

_____

_____

_____

_____

_____

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?

_____

_____

_____

_____

_____

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

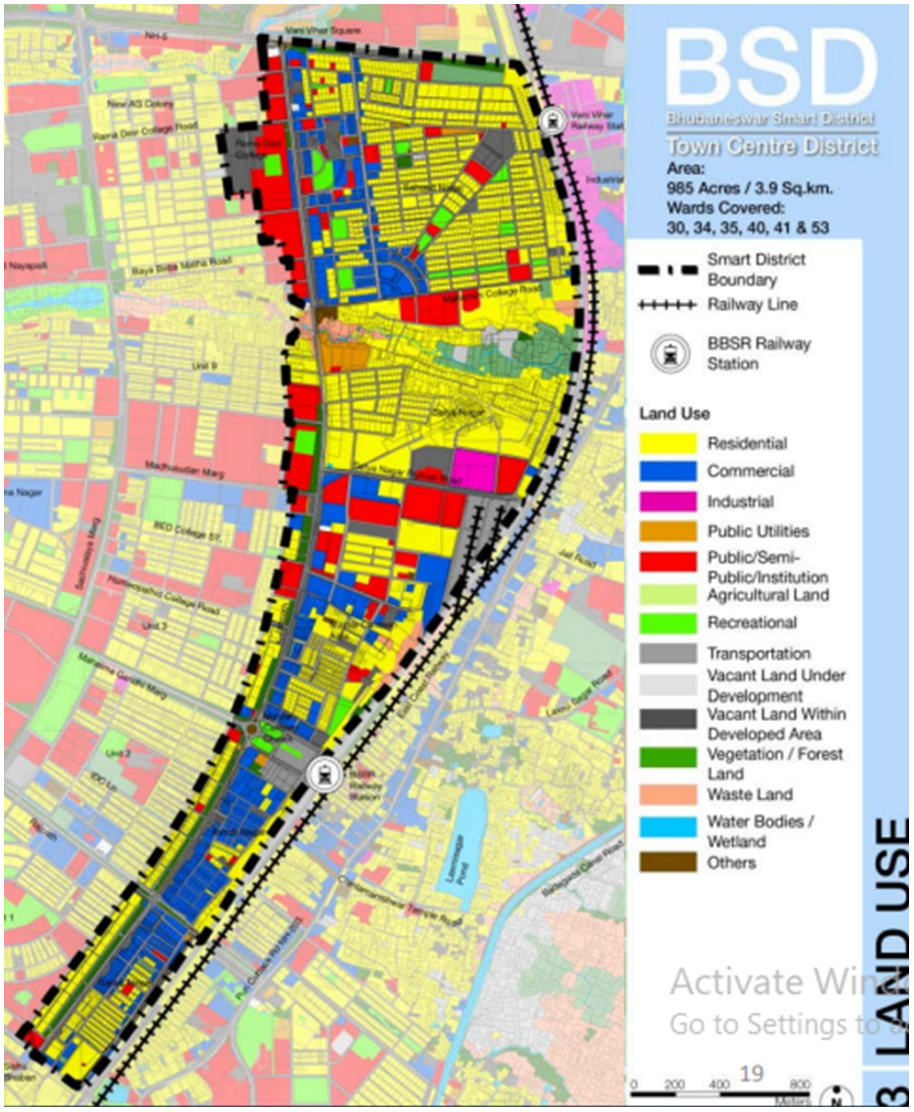


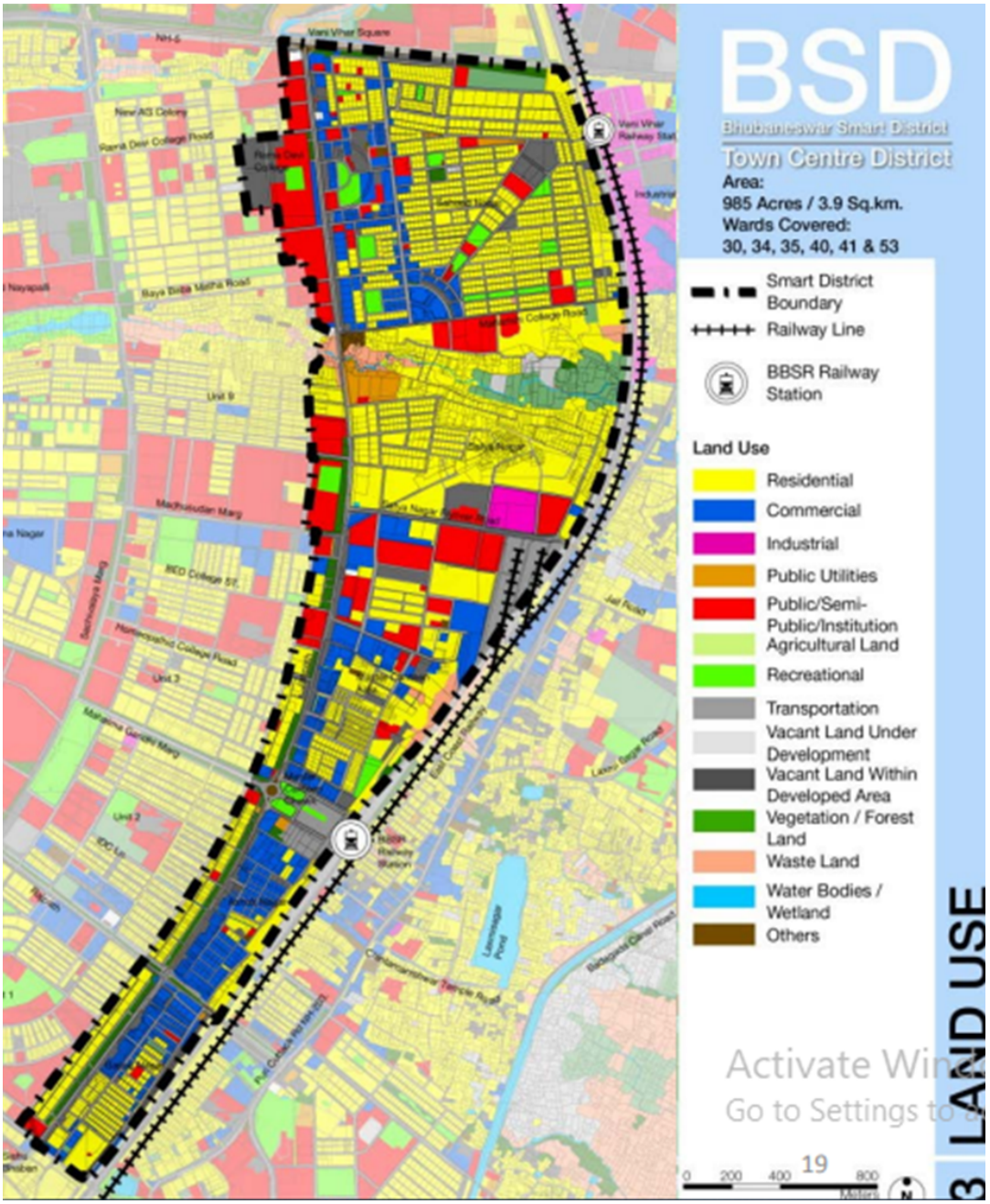
Fig 5.0: Specific Site, Land use map;

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:

_____

_____

_____

_____

_____

_____

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.

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.

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.

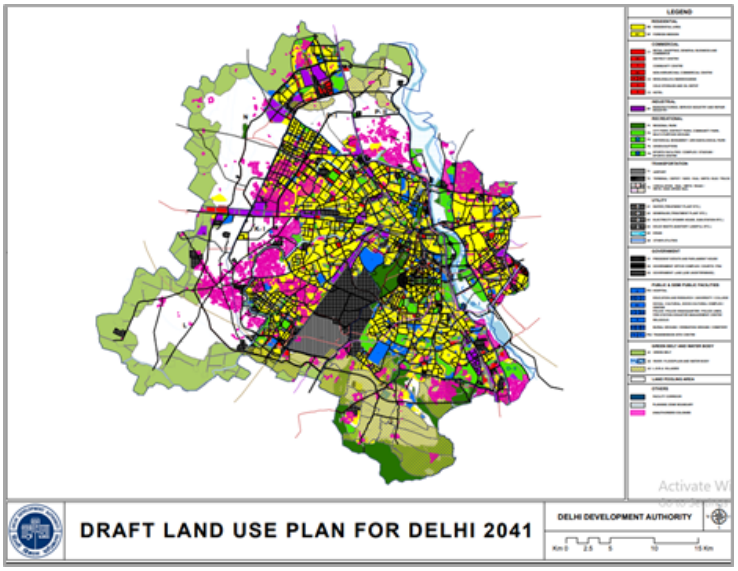
The context

You have the following information:

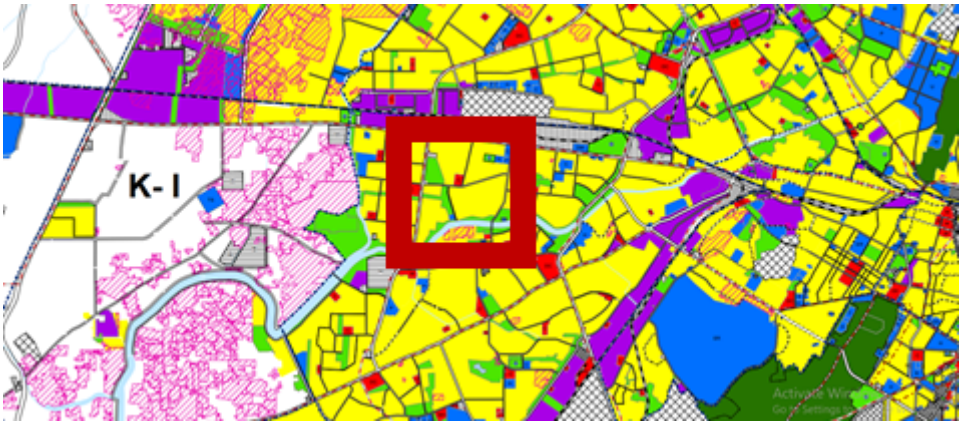
1. The site is a hypothetical setting, which has the following character:
    i. A bustling commercial street
    ii. A well planned residential area
    iii. An adjoining informal slum settlement
    iv. A nullah passes through the development which often floods
    v. A traffic congested junction
2. 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.

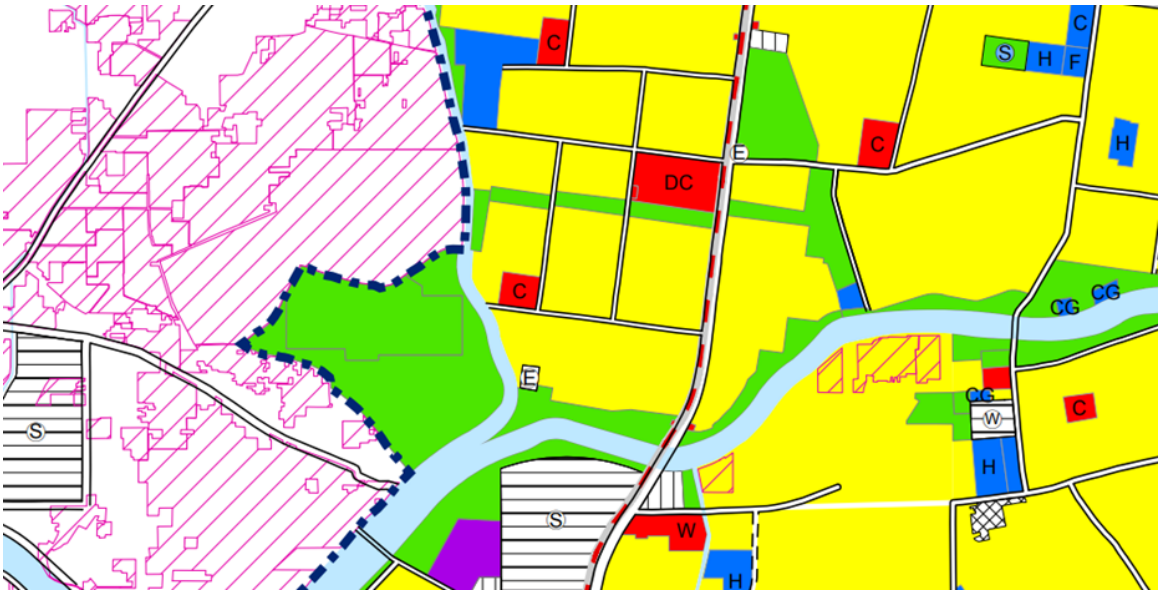
4. The builder submits the sanction plan to the Development Authority and Municipal Corporation. The Development Authority and the Municipal Corporation start to scrutinise the sanction plan for compliance with the regulations. The builder seems to have complied with all aspects of the Zoning Regulation, 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

_____

_____

_____

_____

_____

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

_____

_____

_____

_____

_____

Ward Committee Members, Residents of the planned layout adjoining the site

_____

_____

_____

_____

_____

Ward Committee Members, Residents of the slum settlement along the nullah

_____

_____

_____

_____

_____

Official from environmental and social activists

_____

_____

_____

_____

_____

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

_____

_____

_____

_____

_____

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.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____