

CHAPTER 1

Geospatial Overview

Learning Objectives

By the end of this chapter students would be able to understand :

- 1.1 Introduction to Geospatial Technology.
- 1.2 Why to study Geospatial Data
- 1.3 Importance of Geospatial Technology.

1.1 Introduction to Geospatial Technology (GT)

Earth is composed of various landforms. The Geospatial Technology captures, studies, and analyzes these features for better management of the resources. We live on a living planet called earth. The earth is composed of various Natural features and Manmade features.

Natural Features

The landscape features that were created by natural processes are called Natural Features. For example, rivers, mountains, hills, valleys, trenches, lakes, deserts, oceans, glaciers, forests etc.



OUR PLANET EARTH



MOUNTAINS



FOREST



RIVER

Fig. 1





Manmade features

The features which are made by human beings are called Manmade Features. For Example, roads, buildings, reservoirs, dams etc.



Building



Road



Agriculture Land



Dams and Reservoirs

Fig. 2

These Natural and Manmade features can be represented on various maps such as physiographic maps, topographic maps, administrative maps, atlas, road maps, city maps or can be viewed within a computer system in terms of various map data layers. Different layers of information like vegetation, water, forest, soils of the same place can be placed one above the other and shown on a single map.

All the features of earth surface whether Natural or Manmade occupy space and have definite geometric shape and size on the surface of the earth. Therefore these features are called Geospatial 'Geo' means Earth and 'Spatial' implies definite Shape and size in space).



PHYSIOGRAPHIC MAP OF INDIA

Fig. 3



TOPOGRAPHIC SHEET

Fig. 4

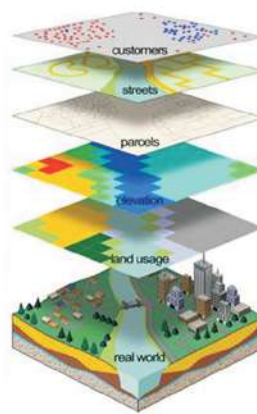
Topographical Maps:

Topography is a pictorial representation of a place. This is normally represented in maps. It shows small areas with lots of details like manmade and natural features.



ROAD MAP OF INDIA

Fig. 5



DATA LAYERS IN GIS

Fig. 6

Map Data Layer

It is a combination of different type of data set and overlaid as shown in Picture. It is maintained as separate datasets. For example, roads could be one layer, water feature another and building still another.





Geospatial technology is used for visualization, measurement and analysis of features or phenomena that occur on the earth. This technology captures and stores the geospatial data along with its Spatial and Non-Spatial Information.

1.2 Why to study Geospatial Technologies (GST)?

Geospatial is a term widely used to describe the combination of spatial software and analytical methods with geographic datasets. Traditional technique to generate natural resources status is time consuming and expensive. The natural resources status includes area, production, productivity of crops, irrigation facilities, rain fed area etc. This information can be generated using GIS and Remote Sensing technology and would be cost effective and time saving.

Geospatial technology includes three different technologies that are all related to mapping features on the surface of the earth. These three technologies are Remote Sensing (RS), Geographical Information Systems (GIS) and Global Positioning Systems (GPS).

A Remote Sensing (RS)

Remote sensing is the term used to describe the act of gathering data from a distance. This distance can be small or large. Remote sensing uses electronic sensors without direct contact; some means of transferring information through space must be utilized.

Remote Sensing is the science and art of acquiring information (spectral, spatial and temporal) about material objects, area, or phenomenon, without coming into physical contact with the objects, or area, or phenomenon under investigation.

Remote sensing uses satellites to acquire information about earth's surface. Satellite provides a means for looking at a very large area of the World in a very short time. Satellite Sensors collate pictures of the earth from space using electromagnetic radiation covering a range of frequencies, from radio waves to gamma rays. As Remote

sensing gives the picture of a very large area in a short time, it helps to plan and manage the natural resources. For details about Remote Sensing refer to Chapter 3.

Geographic Information System (GIS)

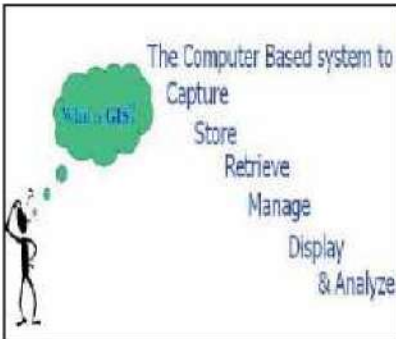


Fig. 7



Fig. 8

GIS is a computer system for capturing, storing, checking, integrating, manipulating, analyzing and displaying data related to positions on the Earth's surface. GIS allows us to view, understand, question, interpret, and visualize data in many ways that reveal relationships, patterns and trends in the form of maps, globes, reports, and charts. Therefore, GIS helps to answer questions and solve problems. GIS stores information about the real world as a collection of thematic layers that can be used together. Layer can be anything that contains similar features such as Buildings, Streets, Rivers, Vegetation etc. Details are discussed in Chapter 4



Concept of GIS

Fig. 9

GIS is defined as an information system that is used to store, retrieve, manipulate, analyze and output geographically referenced data or geospatial data in order to support decision making for planning and management of land use, natural resources, environment, transportation, urban facilities and other administrative records.





B. Global Positioning System (GPS)

The Global Positioning System (GPS) is a U.S. space-based radio navigation system that provides reliable positioning, navigation, and timing services to civilian users on a continuous worldwide basis. Details are discussed in Chapter-5

Global Positioning System:

A Navigational system involving satellites and computers that can determine the Latitude and Longitude of a receiver on Earth by Computing the time difference for signals from different satellites to reach the receiver

1.3 Importance of Geospatial Technology

Geospatial Technology is the combination of GIS, GPS and RS technologies. Traditional techniques of collecting and analyzing the natural resources are time consuming and time expensive. The information on the status of natural resources includes area, production, productivity of crops, irrigation facilities, rain fed area etc. This information can be created and analyzed using GIS and RS technologies.

i Improved Organizational Integration

One of the main benefits of Geospatial Technology is improved management of an organization and resources. A Geospatial Technology can link data sets together by common location data, which helps departments and agencies share their data. By creating a shared database, one department can benefit from the work of another; and data collected once can be used many times.

ii Better Decisions

A Geospatial Technology is not just an automated decision making system but a tool to query, analyze the Geospatial data in support of the decision making process. For example, Geospatial Technology can be used to help to reach a decision about the location of a new housing development that has minimal environmental impact, is located in a low risk area, and is close

to a population center. The information can be presented in a few words clearly in the form of a map and an accompanying report, allowing decision makers to focus on the real issues rather than trying to understand the data, because Geospatial Technology products can be produced quickly & multiple scenarios can be evaluated efficiently and effectively.

iii Create Maps

In simple words, we often call Geospatial Technology "*Mapping Software*." We most often connect maps with physical geography, but Geospatial Technology is flexible enough to map any kind of terrain, even the human body. GIS helps to map any data as you wish. Creating and updating of maps with GIS is much faster than traditional manual or automated cartography approaches.

iv Cost Effective and Time Saving

As remote sensing gives pictures of very large areas in a short time and GIS manages them effectively, it is cost effective and time saving.

Let us wrap up what we covered in this chapter

- Geospatial Technology is used for visualization, measurement and analysis of phenomena that occur on the earth.
- We live on a living planet called earth. The earth is composed of natural and manmade features.
- Natural and Manmade features are represented on various maps these can be viewed in physiographic, topographic, administrative, road maps, city maps, atlas or can be viewed through computer system in terms of various map data layers.
- Various Spatial features overlaid on one another to prepare an integrated map are called map data layers.





- All Natural and Manmade features have definite geometric shape and size on the surface of the earth. Therefore, they are called Geospatial features.
- Geospatial technology captures and stores geospatial data along with its spatial and non-spatial information.
- Spatial information provides the size, shape and location of the features whereas non-spatial data provides related information about the data such as road's name, road's width etc.
- Geospatial technology includes three different technologies that are all related to mapping features on the surface of the earth.
- Geospatial technology includes three different technologies, i.e. Geographical Information Systems (GIS) Global Positioning Systems (GPS), and Remote Sensing (RS).
- GIS is defined as an information system that is used to store, retrieve, manipulate, analyze and output geographically referenced data or geo-spatial data in order to support decision making for planning and management of land use, natural resources, environment, transportation, urban facilities and other administrative records.
- Global Positioning System: a navigational system involving satellites and computers that can determine the latitude and longitude of a receiver on Earth by computing the time difference for signals from different satellites to reach the receiver.
- Remote Sensing is the science and art of acquiring information (spectral, spatial and temporal) about material objects, area, or phenomenon, without coming into physical contact with the objects, or area, or phenomenon under investigation.
- In our daily life this technology helps us as a decision making tool

Review

Very Short Answer Questions

1. Name the various features of earth?
2. Give examples for natural land features.
3. Give examples for manmade features.
4. Geospatial technology captures and stores the data in two ways. Name them.
5. Geospatial Technology includes three different technologies. Name them?
6. GIS captures and stores different layers of the same area such as forest, water, soil etc. True or False?
7. GPS is a navigation system which does not provide latitude and longitude. True or False?

Short Answer Questions

1. How would you represent Manmade and Natural Features? Give example.
2. What do you mean by Geospatial Features?
3. What is map data layer?
4. What is Geospatial Technology?
5. What is Geographic Information System (GIS)?
6. What is Remote Sensing (RS)?
7. What is Global Positioning System (GPS)?

Long Answer Questions

1. What do you understand by Geospatial Technologies? Discuss each of these in brief.
2. Explain the need, importance and scope of geospatial technology.

