

Geospatial Technologies

Day 1- GIS, RS and GPS

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(Funded by IDRC)

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GEOGRAPHIC INFORMATION SYSTEM (GIS) SOFTWARE MARKET

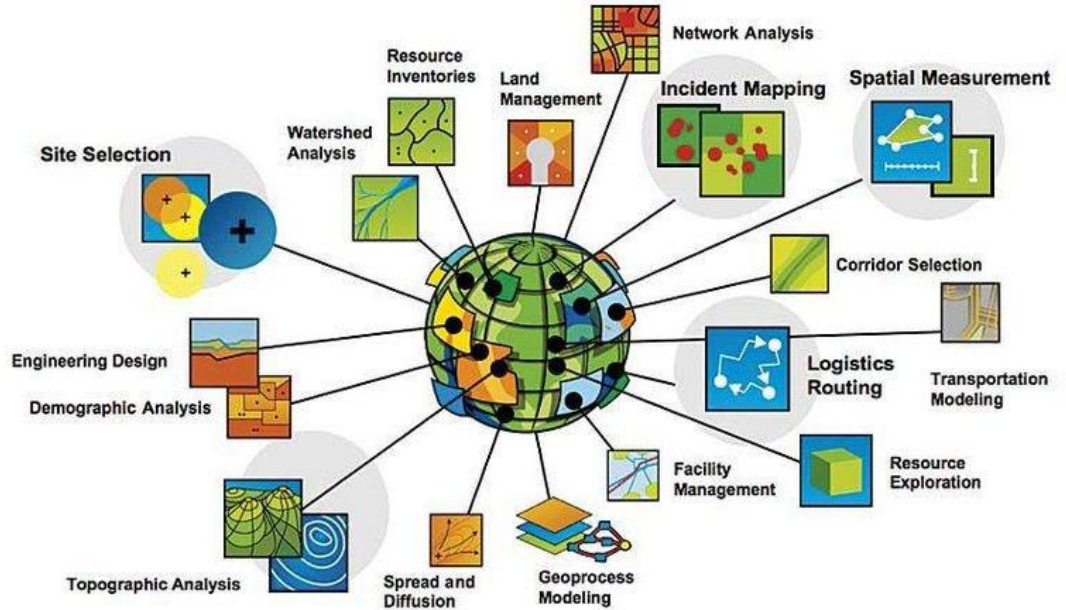
OPPORTUNITIES AND FORECAST, 2020 - 2030

Geographic information system (gis) software market is expected to reach **\$25.5 Billion** in 2030

Growing at a **CAGR of 15.2%** (2021-2030)

Why GIS

GIS Is Being Applied Around the World *Across Many Disciplines, Professions, and Organizations*

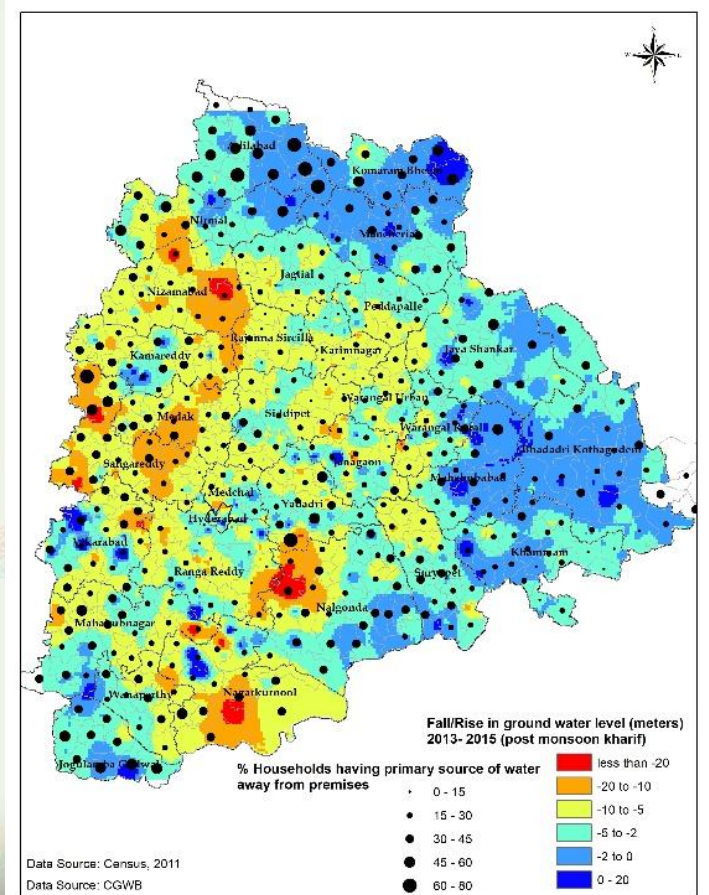
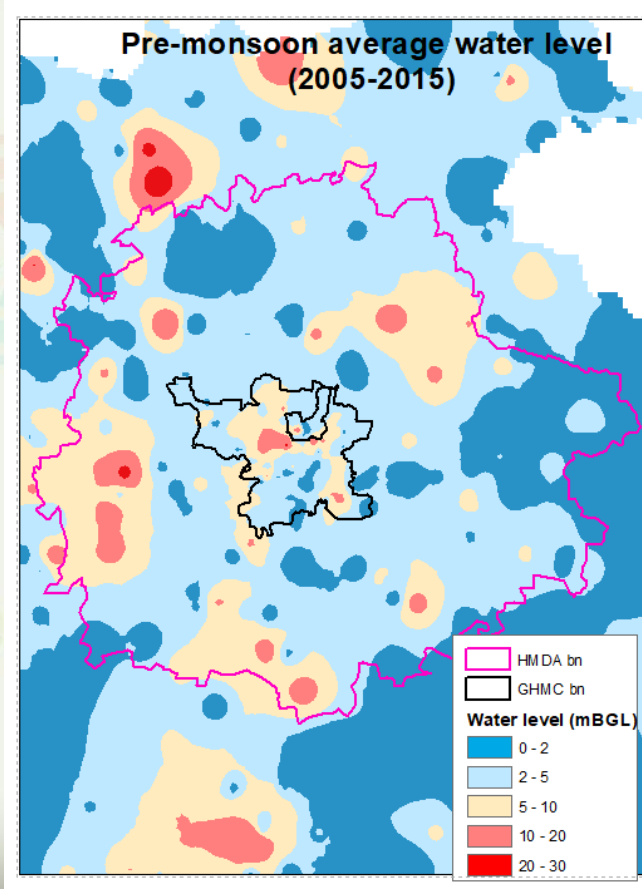


Becoming an Instrument of Evolution

Why GIS



Why GIS



Why GIS

Watershed Area

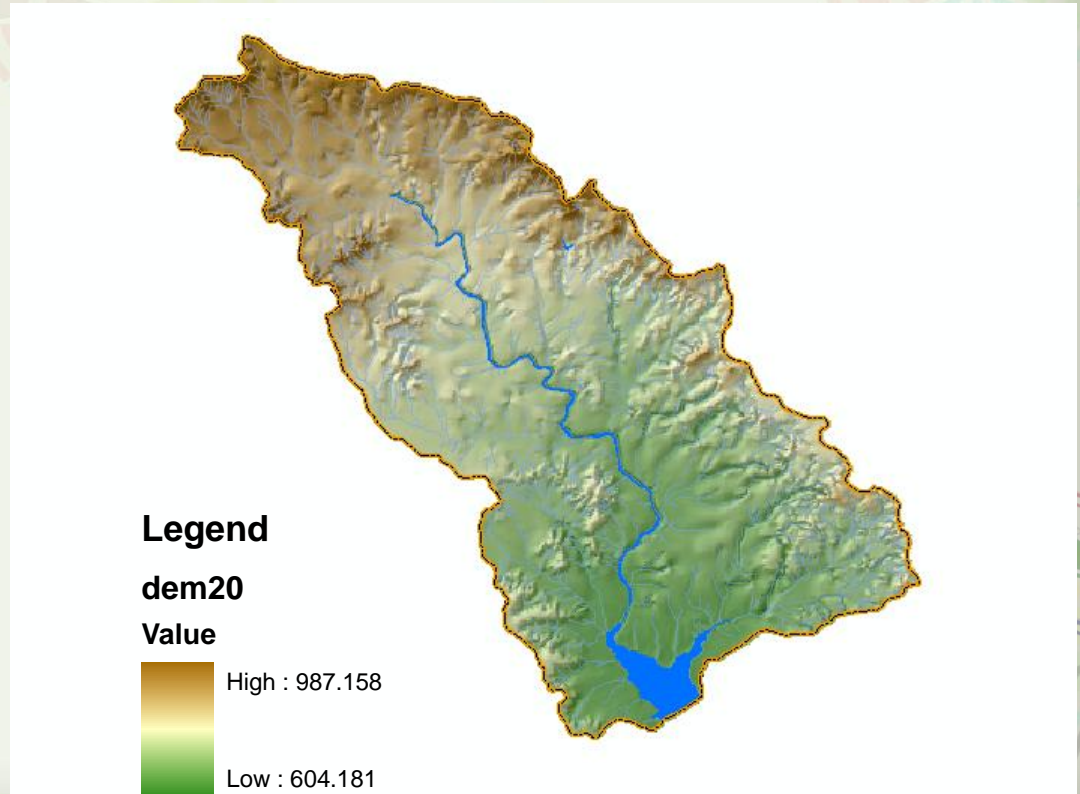
Spot Height

Contour

Waterbodies

Drainage

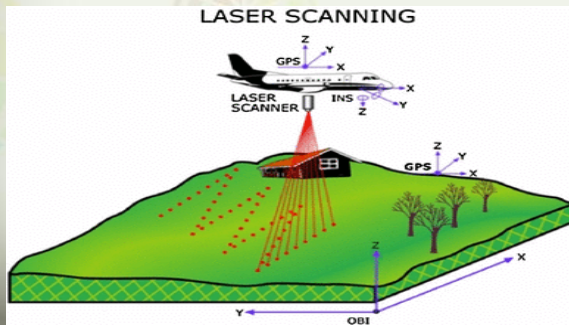
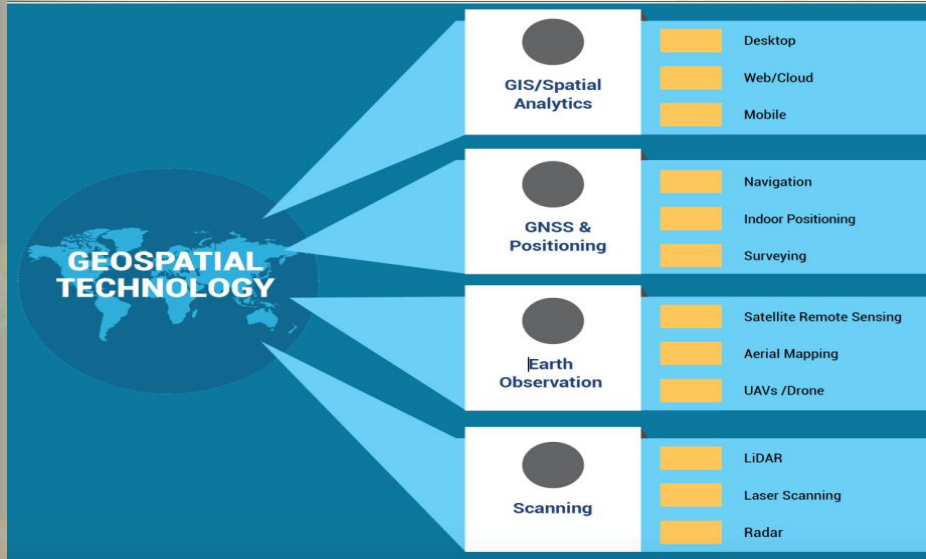
Final Output



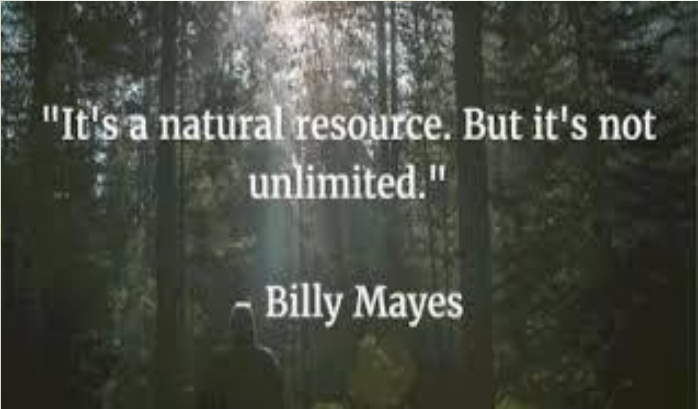
Why GIS

- Understand and Visualize Geospatial Data
- Enhance Emergency Response and Disaster Management
- Optimize Planning, Decision Making and management (water resources, land resources etc)

Geospatial Technologies



Geospatial Tools for Water Resources Management



"It's a natural resource. But it's not unlimited."

- Billy Mayes

We are producing enough food enough for 17 Billion people, but we are only 7 Billion people, but close to half the population is starved, not because resource is lacking, simply because consciousness is lacking, we are still thinking 'YOU vs ME', we are not thinking 'WE'

Sadhguru

GIS, GPS, RS

GPS helps to fill
this information

GIS – Describing Our World

We can describe any element of our world in **two** ways:

*Location Information:
Where is it?*

*Attribute Information:
What is it?*

Species: Oak
Height: 15m
Age: 75 Yrs
Condition: Good

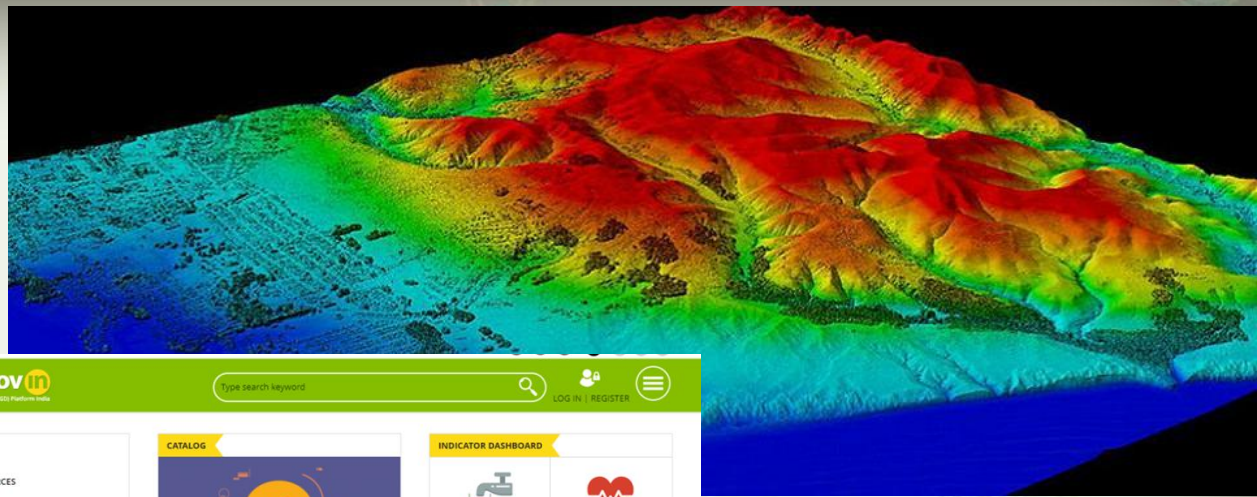
51°N, 112°W

This can come from

- Remote Sensing
- Secondary data
- Primary data

Part 2- Data from either

- Remote Sensing
- Secondary data
- Primary data



data.gov.in
Open Government Data (ODD) Platform India

Type search keyword

LOG IN | REGISTER

ANALYTICS

- 479,474 RESOURCES
- 9,997 CATALOGS
- 175 DEPARTMENTS
- 29.64 M TIMES VIEWED
- 8.6 M TIMES DOWNLOADED
- 354 CHIEF DATA OFFICERS
- 77,588 APIS
- 2,254 VISUALIZATIONS

CATALOG

Udyog Aadhaar Memorandum (MSME Registration)

INDICATOR DASHBOARD

Drinking Water And Sanitation	Health
Transport	Labour And Employment
Economy	Education
Industries	Demography

APIS

Real time Air Quality Index

Get data on Air Quality Index of various locations of India. This data has been updated every day.

SECTORS

- Catalogs
- Datasets
- APIs
- Visual Access
- Services
- Documents
- Forms
- Schemes

Water and Sanitation

APPs GALLERY

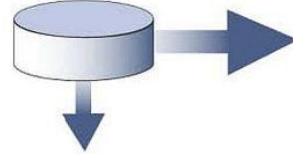


GIS links maps to databases and creates a visualization of data, and allows interactivity between the map and the data in a database.

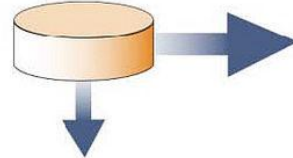


Data source

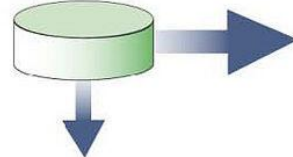
Street data



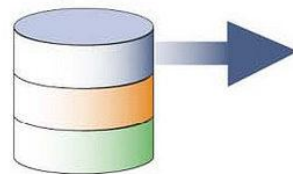
Buildings data



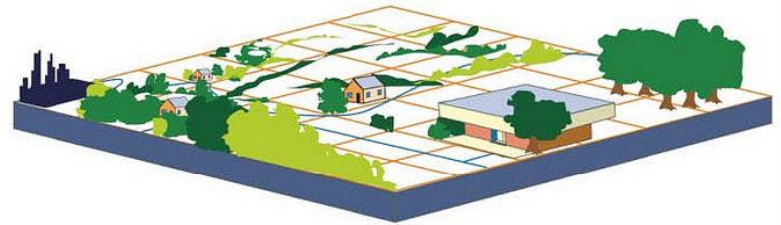
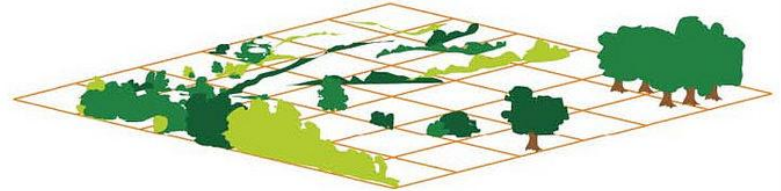
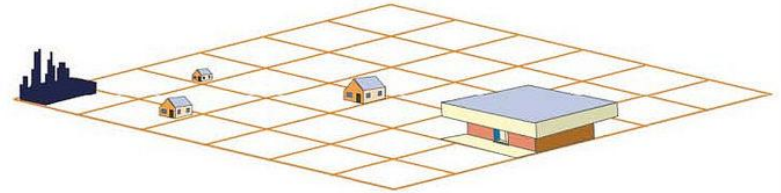
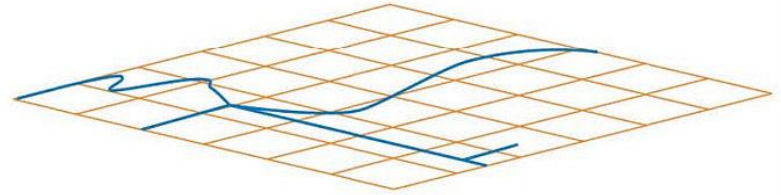
Vegetation data

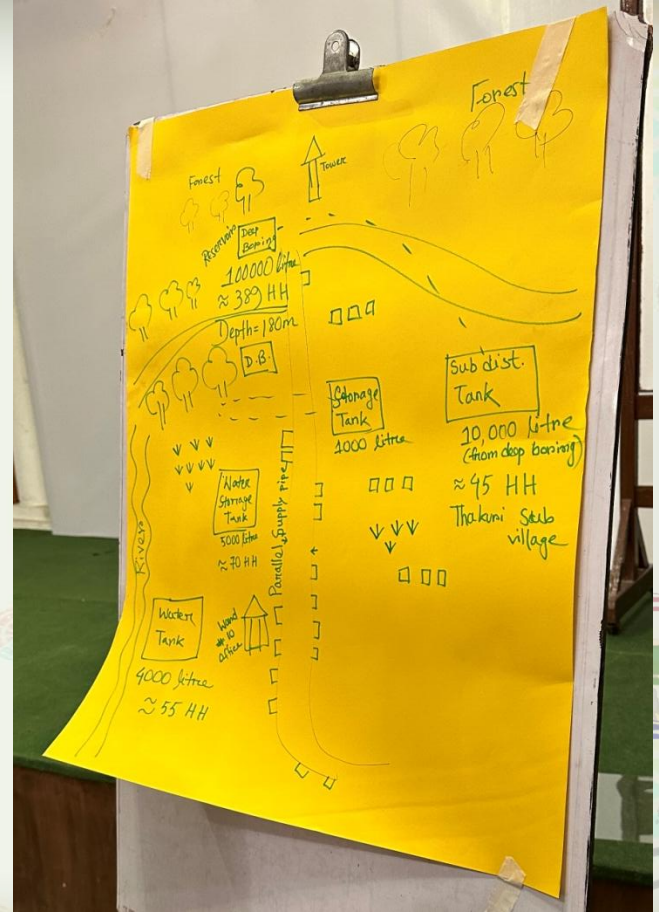
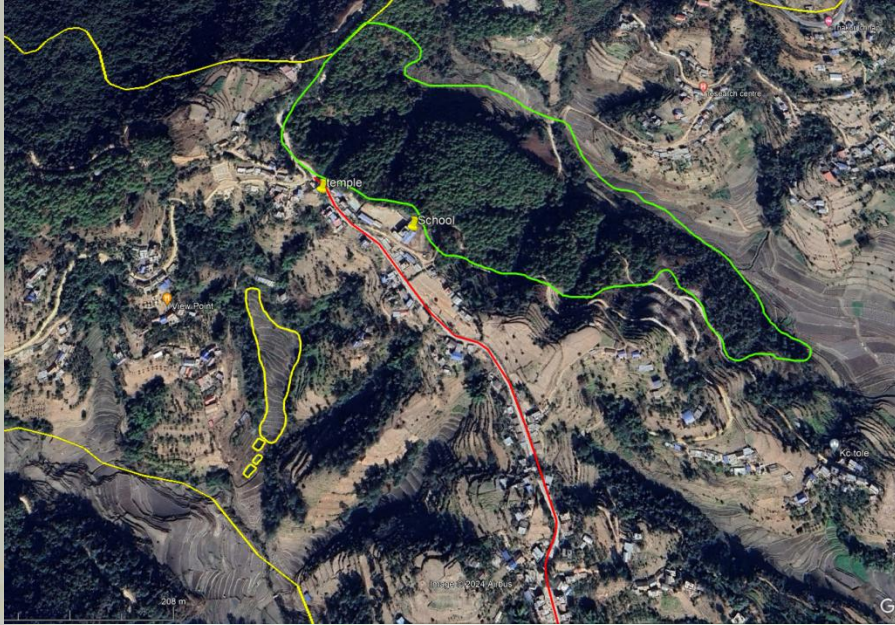


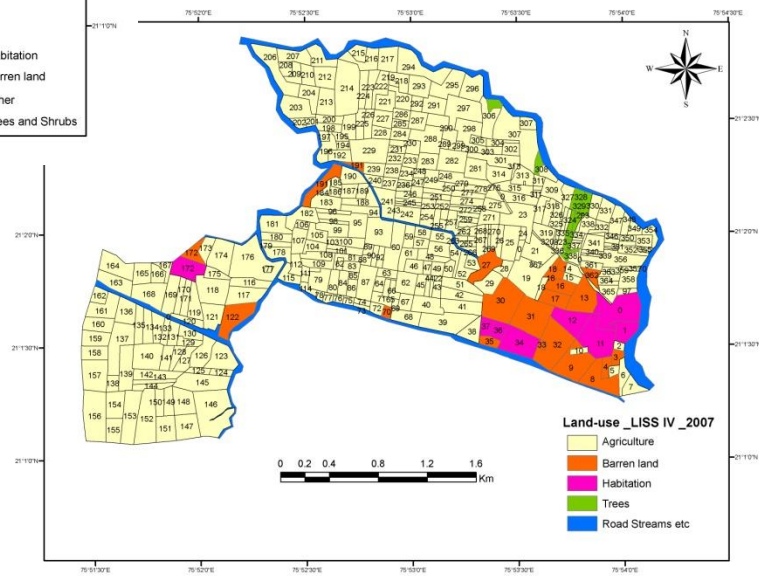
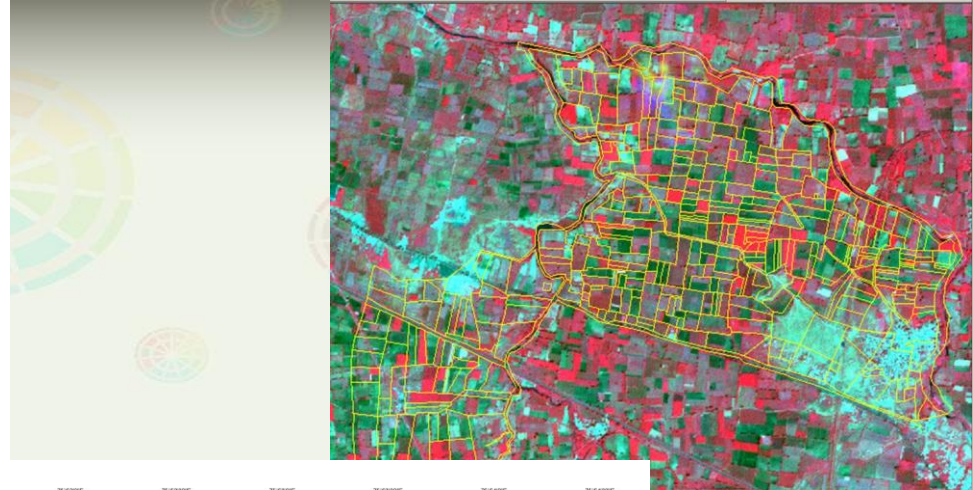
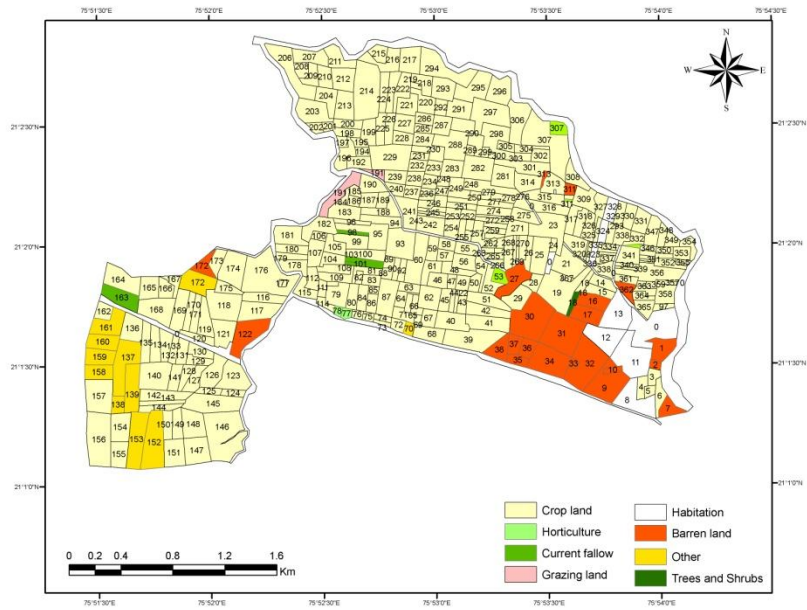
Integrated data



Data layers







Top ranking GIS softwares

Esri – Products include Arc GIS pro, Arc GIS desktop, ArcSDE, ArcIMS, ArcWeb services and ArcGIS Server

QGIS – Powerful cartographic and geospatial data processing tools with extensive plug-in support

Intergraph – Products include G/Technology, GeoMedia, GeoMedia Professional, GeoMedia

ERDAS IMAGINE – Products include Leica Photogrammetry Suite, ERDAS ER Mapper – good for image processing

Autodesk – Products that interface with its AutoCAD software package include Map 3D, Topobase, and MapGuide.

ENVI – Utilized for image analysis, exploitation, and hyperspectral analysis. WebMap, and add-on products for industry sectors, as well as photogrammetry.

MapInfo – Desktop GIS MapInfo Professional.

GRASS GIS – Geospatial data management, vector and raster manipulation

ILWIS (Integrated Land and Water Information System) – Integrates image, vector and thematic data

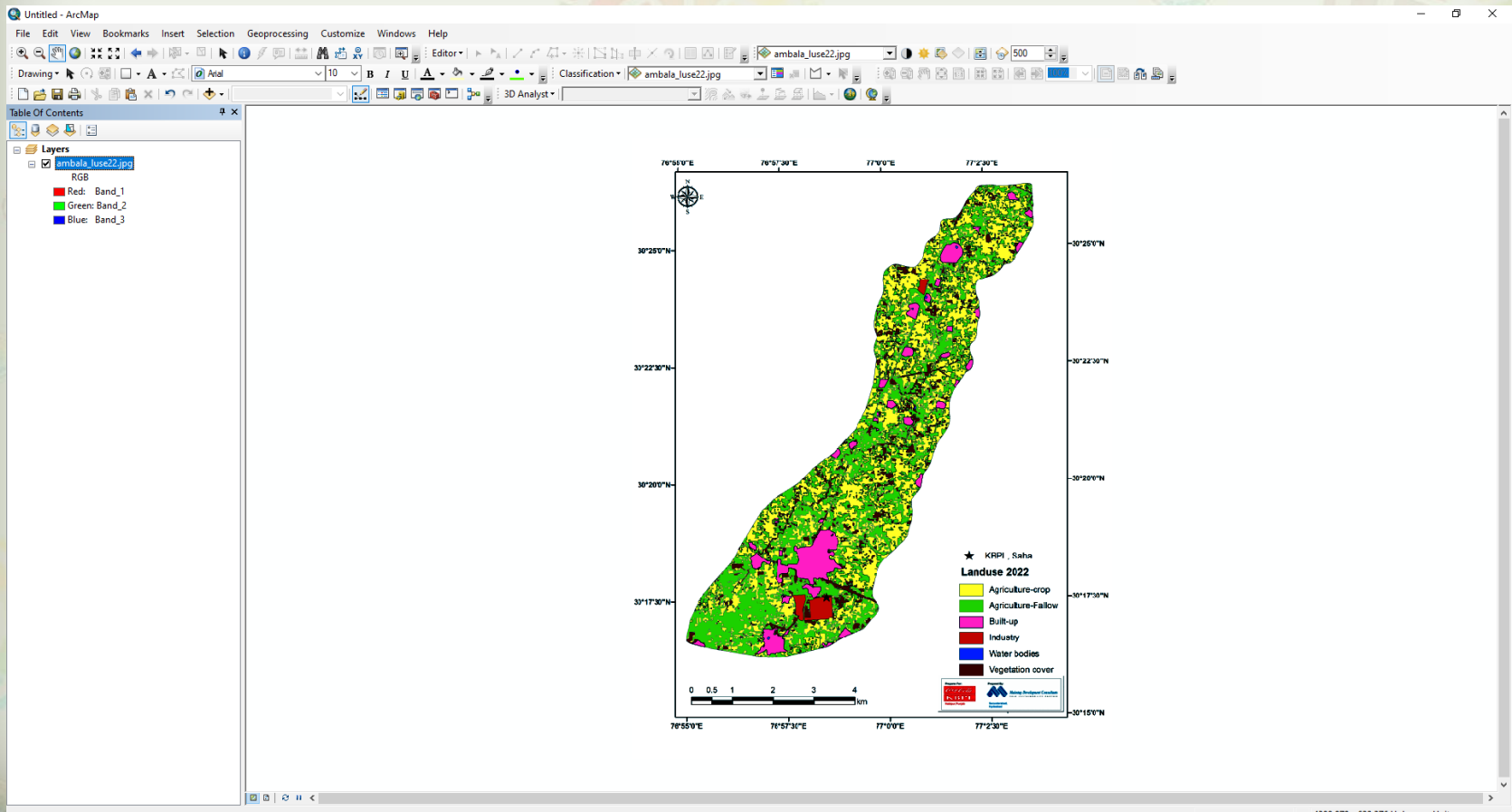
MapWindow GIS – Free desktop application with plugins and a programmer library

SAGA GIS (System for Automated Geoscientific Analysis) – Tools for environmental modeling, terrain analysis, and 3D mapping

QGIS 3.22

The image shows the QGIS 3.22 desktop application interface. The title bar at the top reads "Untitled Project - QGIS". The menu bar includes Project, Edit, View, Layer, Settings, Plugins, Vector, Raster, Web, Mesh, SCP, Processing, and Help. Below the menu bar is a toolbar with various icons for navigation, editing, and processing. The main workspace is currently blank. On the left side, there are two panels: "Browser" and "Layers". The "Browser" panel shows a tree view of the file system, including Favorites, Spatial Bookmarks, Home, and various drives and folders. The "Layers" panel is empty. At the bottom of the interface, there is a status bar with a search field (Type to locate (Ctrl+K)), coordinate information (Coordinate: -1.528,0.021), scale (Scale: 1:1030728), magnifier (Magnifier: 100%), rotation (Rotation: 0.0°), and render status (Render: EPSG:4326).

ARC GIS Desktop v 10.3



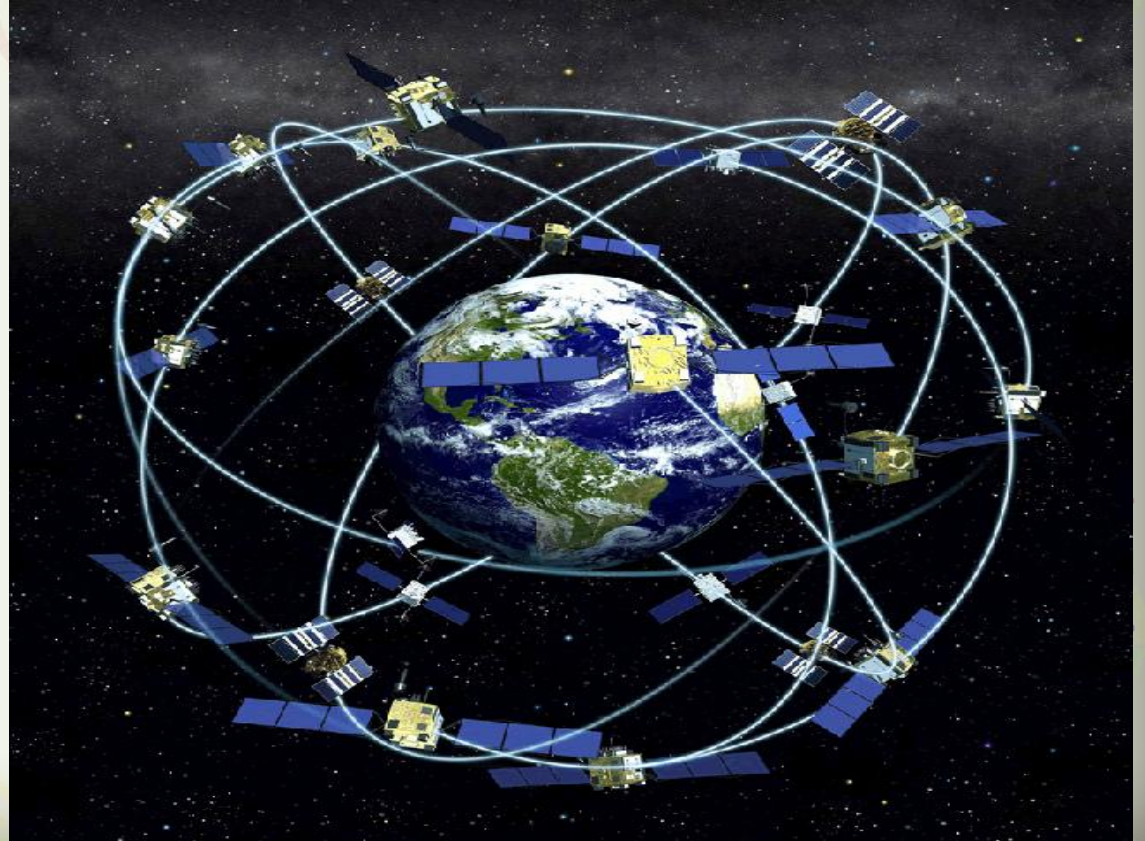
ERDAS v 15

The screenshot displays the ERDAS IMAGINE 2015 software interface. The main window shows a 2D view of a satellite image with a blue river network overlaid. The interface includes a menu bar (File, Home, Manage Data, Raster, Vector, Terrain, Toolbox, Help), a toolbar with various processing tools, and a main workspace. The workspace title is "2D View #1: sen_22mar2017.img (Layer_3)(Layer_2)(Layer_1)". The left sidebar shows a tree view with "2D View #1" expanded, containing "sen_22mar2017.img" and "Background". A "Retriever" panel is visible at the bottom left. The main workspace contains a compass rose and a large satellite image with a blue river network overlaid. The software title bar reads "Untitled: 1 - ERDAS IMAGINE 2015".

How does GPS work

Space Segment

- 24 satellite vehicles
- 6 orbital planes
- Orbital period of 11 hr 55 min
- 20,200 km elevation above Earth
- Five to eight satellites visible from any point on Earth

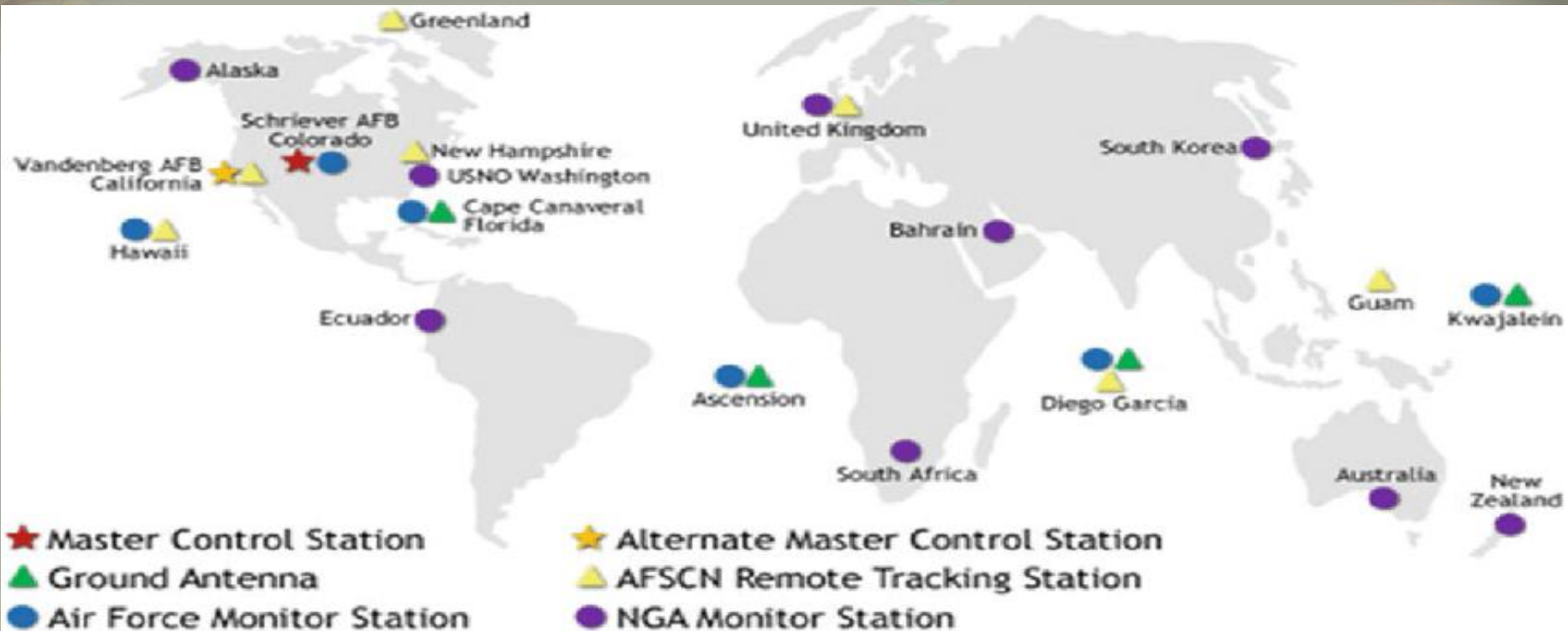


How does GPS work

Ground Segment

- Monitor and control GPS satellites
- One master control station (MCS)
- Five monitor stations
- Three ground antennas





How does GPS work

User Segment

- Receive signal from satellites
- calculate current position and speed/direction



Open access data for Nepal

- Global data

<https://www.diva-gis.org/Data>

- Administrative boundaries

<https://download.hermes.com.np/nepal-administrative-boundary-wgs/>

- Household level data

<https://datacatalog.worldbank.org/search/dataset/0062658/Nepal-Spatial-Database>

- Other spatial data (Road/railways/waterways/buildings/educational facilities/other socioeconomic data)

https://data.humdata.org/dataset/?q=nepal&sort=last_modified%20desc&ext_page_size=25

- Toposheets at 1:250000 scale <https://maps.lib.utexas.edu/maps/ams/>
at 1:50000 scale

- Satellite data

- <https://earthexplorer.usgs.gov>

- <https://sentinel.esa.int/web/sentinel/sentinel-data-access>



Search Criteria Data Sets Additional Criteria Results

Search Criteria Summary (Show)

Clear Search Criteria

1. Enter Search Criteria

To narrow your search area: type in an address or place name, enter coordinates or click the map to define your search area (for advanced map tools, view the help documentation), and/or choose a date range.

Geocoder KML/Shapefile Upload

Select a Geocoding Method

Feature (GNIS)

Search Limits: The search result limit is 100 records; select a Country, Feature Class, and/or Feature Type to reduce your chances of exceeding this limit.

US Features World Features

Feature Name

(use % as wildcard)

State

All

Feature Type

All

Show Clear

Polygon Circle Predefined Area

Degree/Minute/Second Decimal

No coordinates selected.

Use Map Add Coordinate Clear Coordinates

Date Range Cloud Cover Result Options

Search from: mm/dd/yyyy to: mm/dd/yyyy

Search months: (all)



The provided maps are not for purchase or for download; it is to be used as a guide for reference and search purposes only.

<https://sentinel.esa.int/web/sentinel/sentinel-data-access>

Copernicus Open Access Hub

Insert search criteria

Advanced Search

Sort By: Ingestion Date

Order By: Descending

Sensing period

Ingestion period

Mission: Sentinel-1

Satellite Platform

Polarisation

Relative Orbit Number (from 1 to 175)

Mission: Sentinel-2

Satellite Platform

Relative Orbit Number (from 1 to 143)

Mission: Sentinel-3

Satellite Platform

Timeliness

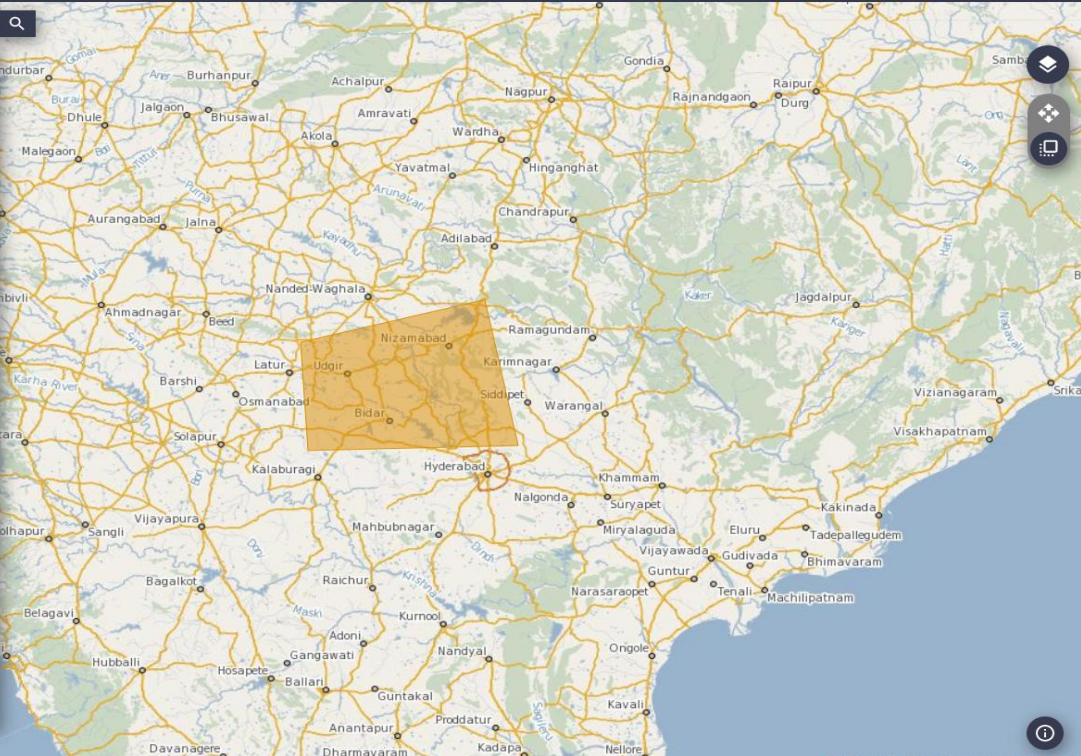
Product Type

Sensor Mode

Cloud Cover % (e.g.[0 TO 9.4])

Instrument

Lat Lon: 20.56, 79.85



Map showing a highlighted region in central India, likely the Deccan Plateau area, with various cities and geographical features labeled.

