

Geospatial Technologies

Day 2- GIS (theory and hands-on)

26 February 2024

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(Funded by IDRC)

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Theory

- Revisiting - GIS
- Data representation format – Vector and Raster (Various file formats)
- Concept of projection system
- Concept of Scale
- Different types of Thematic Maps- selection and purpose

Practice

- Opening shapefiles and other files in QGIS
- Working with attribute table
- Data linking
- Creating and modifying vector files
- working with symbology
- Creating Thematic Maps in QGIS (Choropleth, Isoline etc.)
- Preparing map layouts



A Geographic Information System (GIS) links locational (spatial) and database (tabular) information and enables a person to visualize patterns, relationships, and trends. This process gives an entirely new perspective to data analysis that cannot be seen in a table or list format. The five components of a GIS are listed below.

HARDWARE

The hardware is the computer and peripherals on which the GIS operates. Today, this could be a centralized computer server running the UNIX or Windows NT operating systems, a desktop PC, or an Apple Macintosh. The computer may operate in isolation or in a networked configuration.

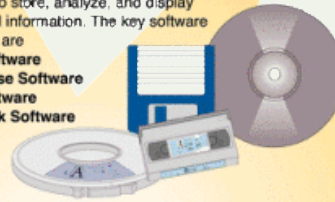
- Computers
- Networks
- Peripheral Devices
- Printers
- Plotters
- Digitizers



SOFTWARE

GIS software provides the functions and tools users need to store, analyze, and display geographical information. The key software components are

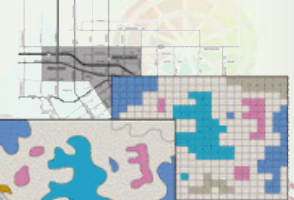
- GIS Software
- Database Software
- OS Software
- Network Software



DATA

One of the most important component of GIS is the data. It is absolutely essential that data be accurate. The following are different data types:

- Vector Data
- Raster Data
- Image Data
- Attribute Data



GIS

PEOPLE

GIS technology is clearly of limited value without people to manage the system and to develop plans for applying it. Users of GIS range from highly qualified technical specialists to planners, foresters, and market analysts who use GIS to help with their everyday work.

- Administrators
- Managers
- GIS Technicians
- Application Experts
- End Users
- Consumers



METHODS

Methods are well designed plans and application-specific business rules describing how technology is applied. This includes the following:

- Guidelines
- Specifications
- Standards
- Procedures



GIS

A set of tools or systematic integration of hardware and software for

Collecting
Storing
Manipulating
Retrieving
Transforming and
Display of Spatial Data

from the Real World

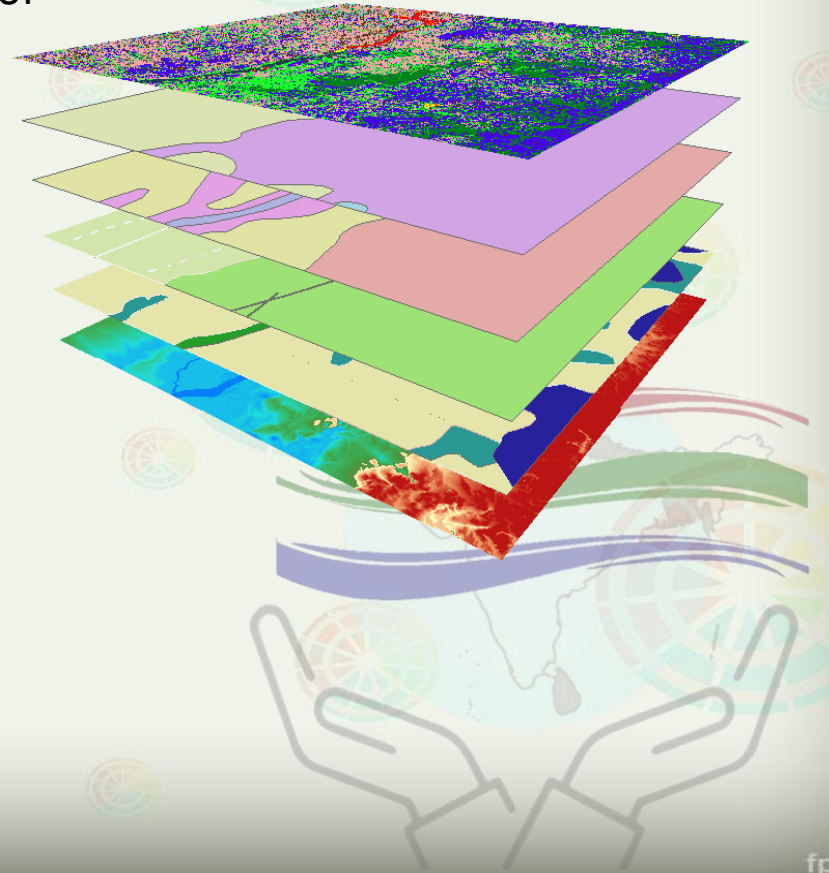




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Image © 2024 Airbus
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2020 m

Google Earth

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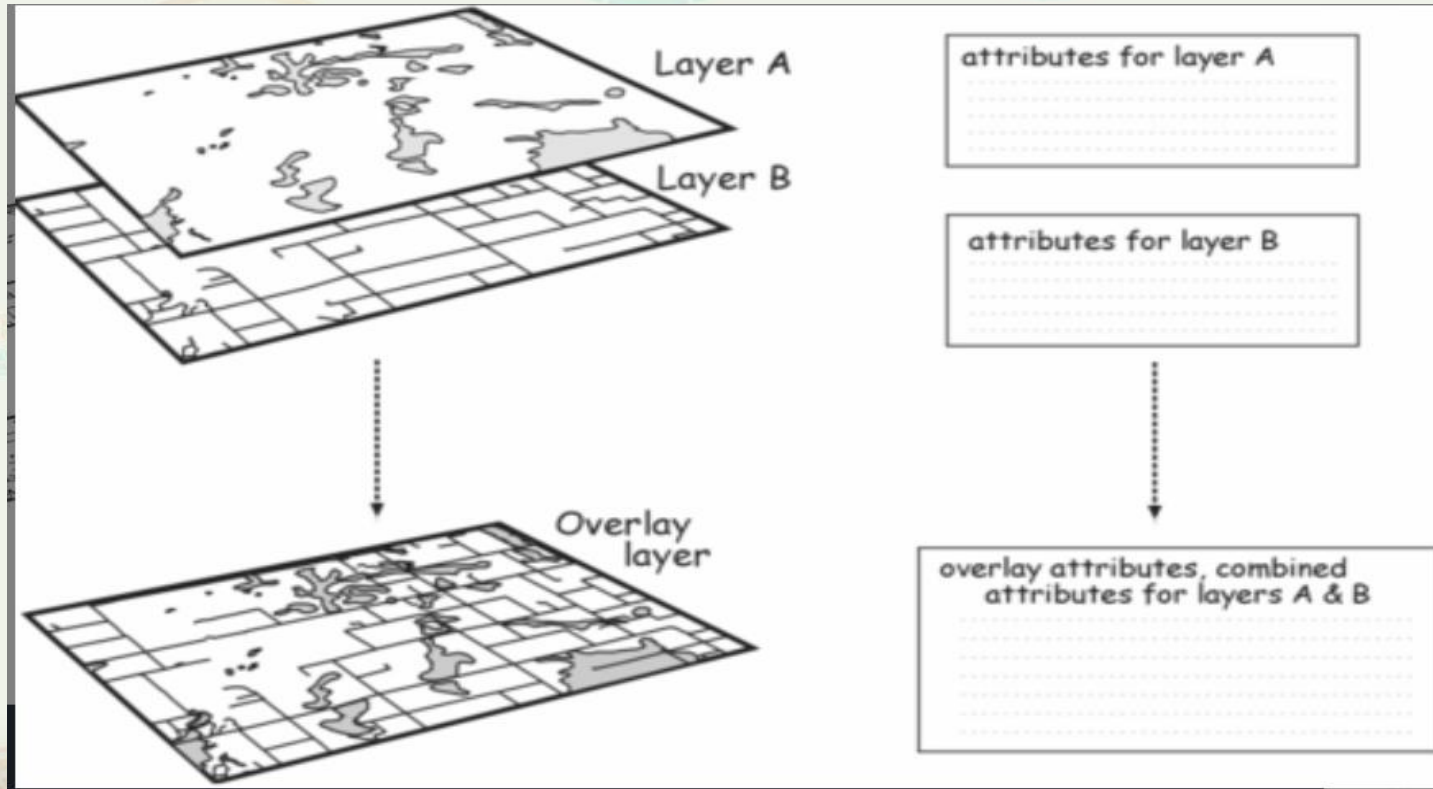
Google Earth

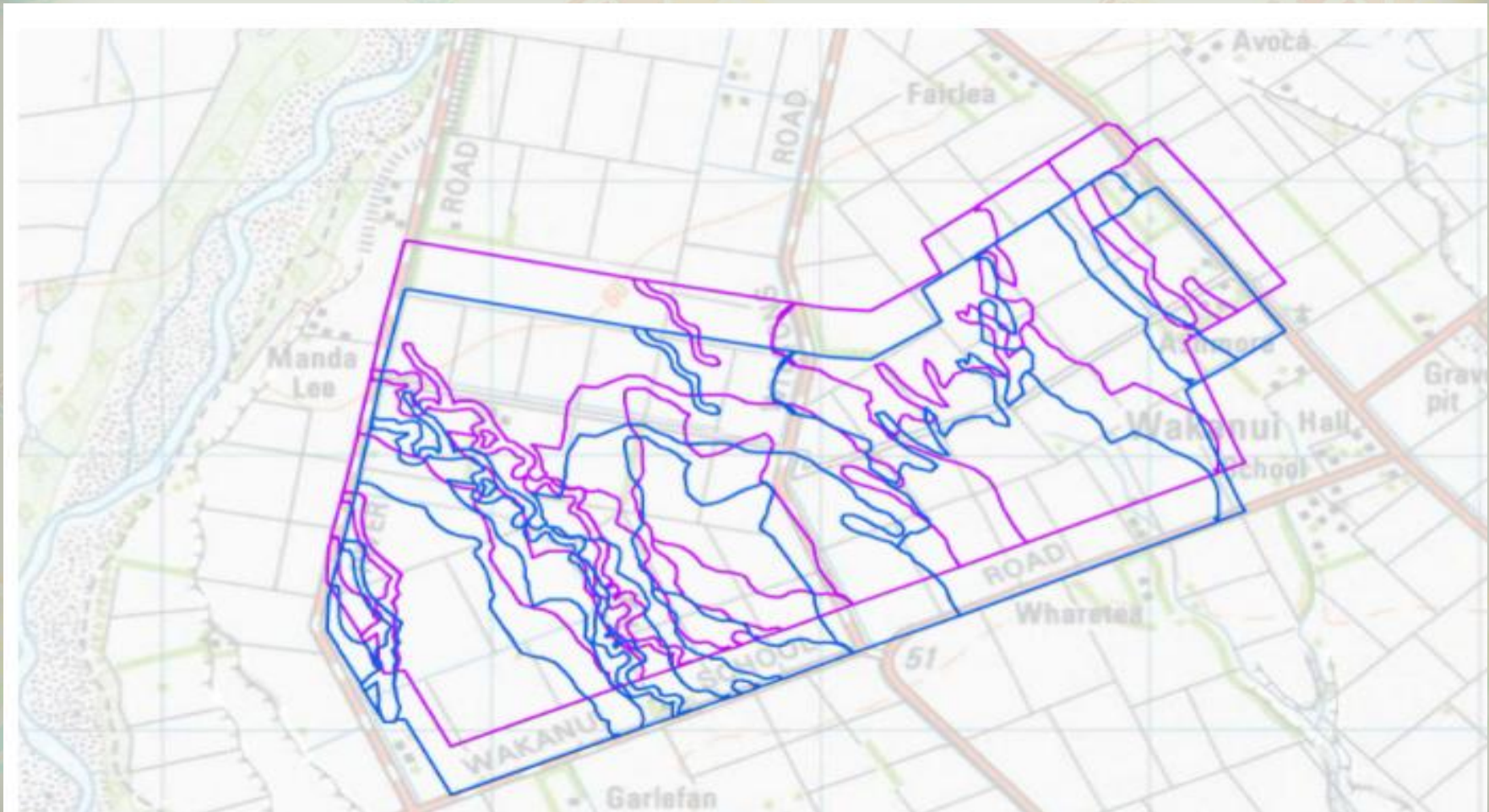


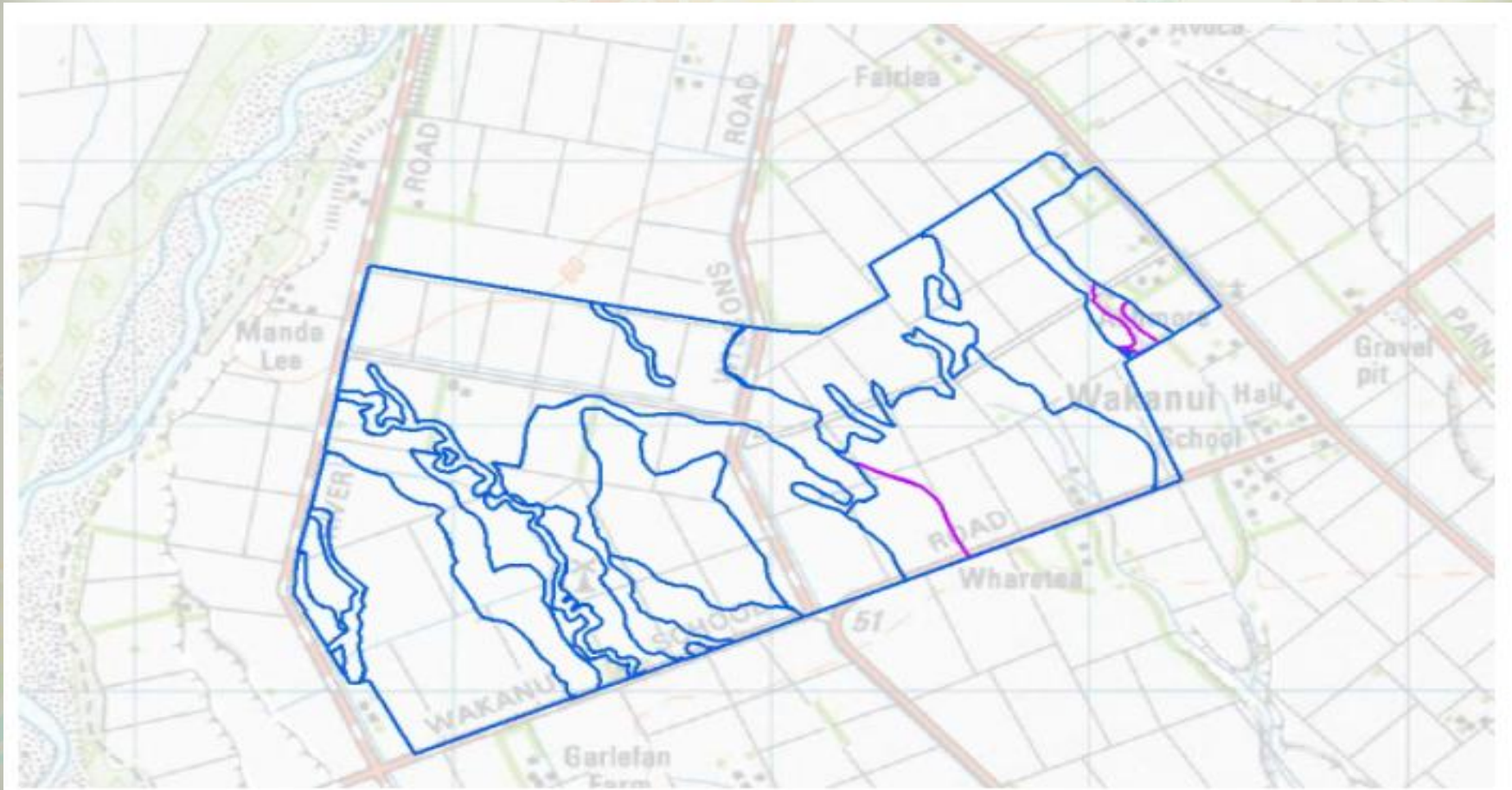
Image © 2024 Airbus

Google Earth

Superimposition

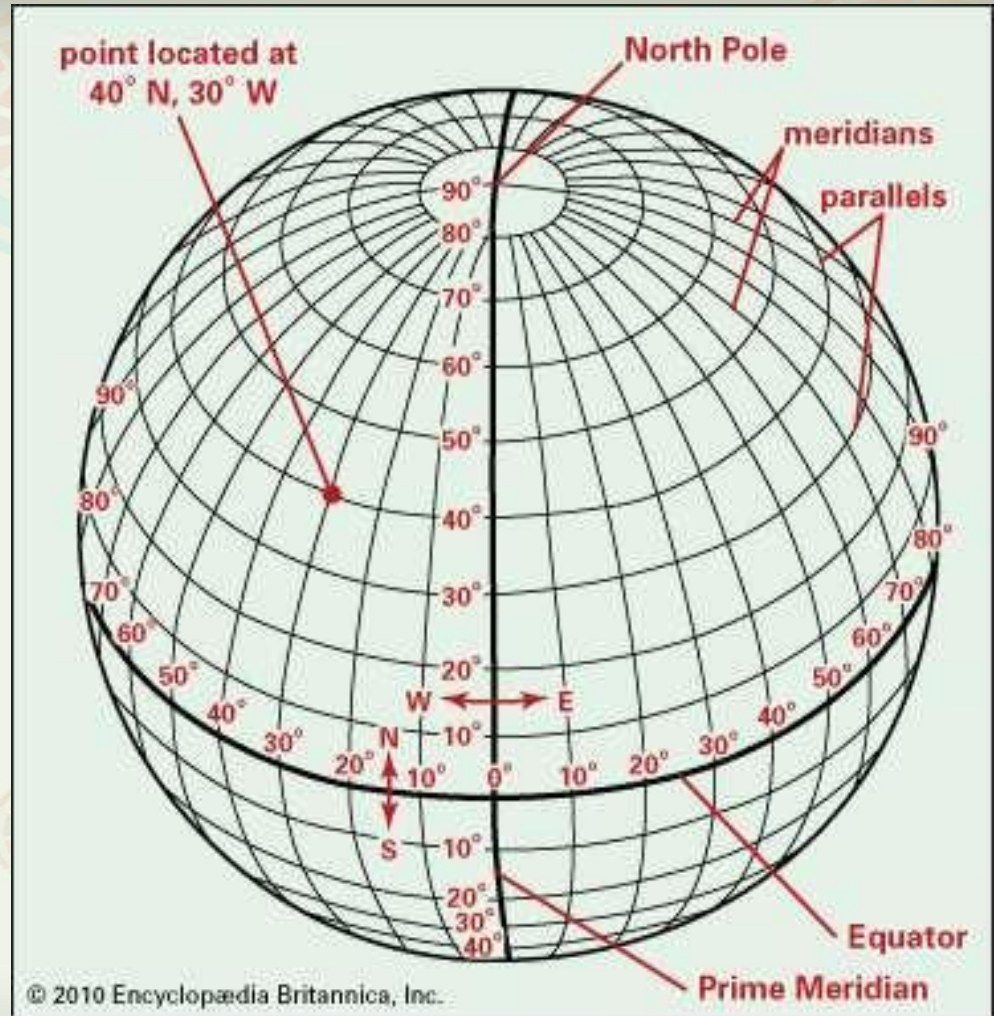






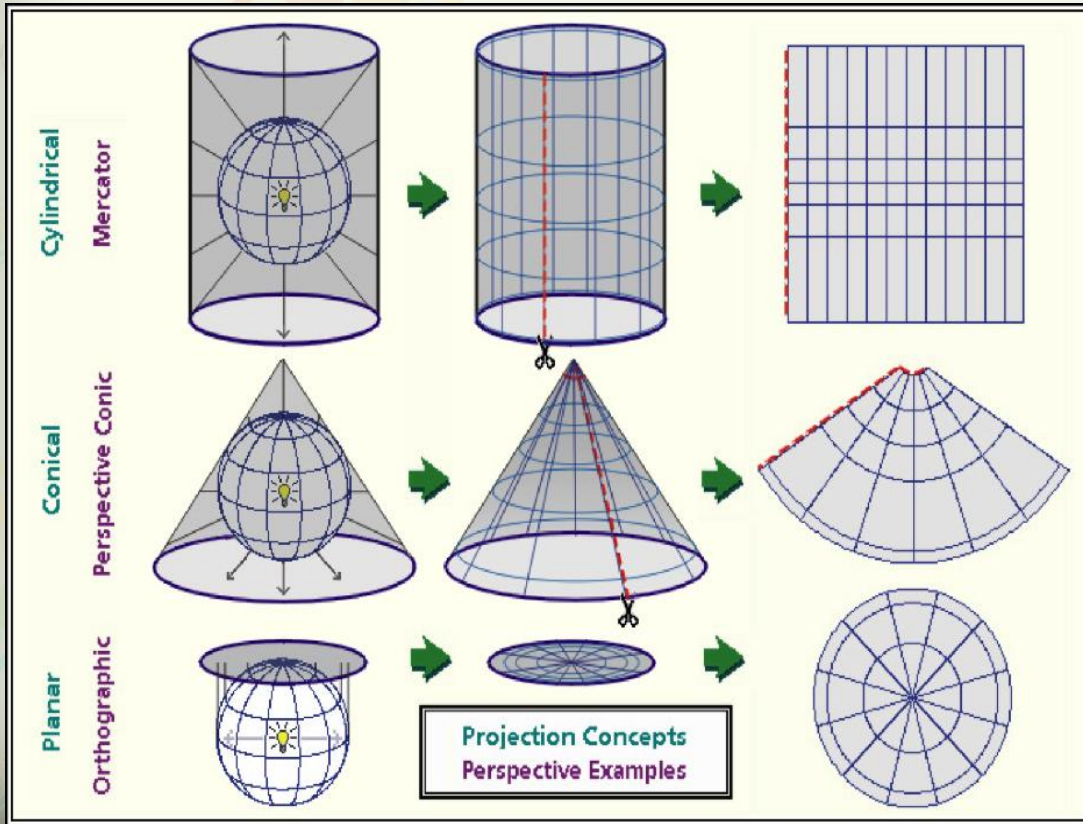
Geographic and Projected coordinate systems

Latitudes/parallels
Longitudes/meridians
Equator
Prime Meridian



Map Projection

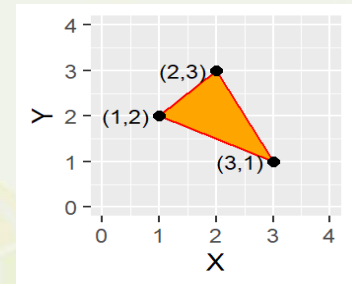
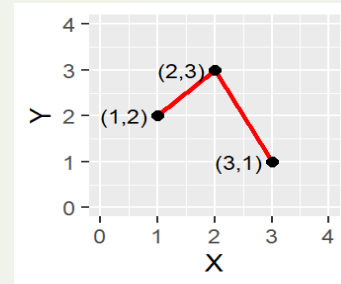
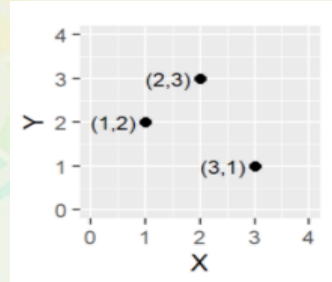
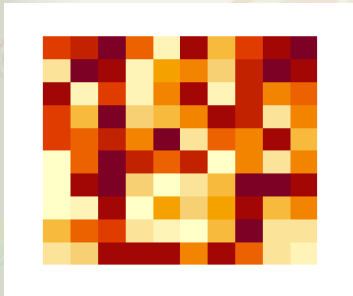
A systematic arrangement of parallels and meridians on a plane surface representing the geographic coordinate system.



It allows to combine and overlay the several maps with minimum distortion

Ground to image
Image to Image

Data Representation



Point

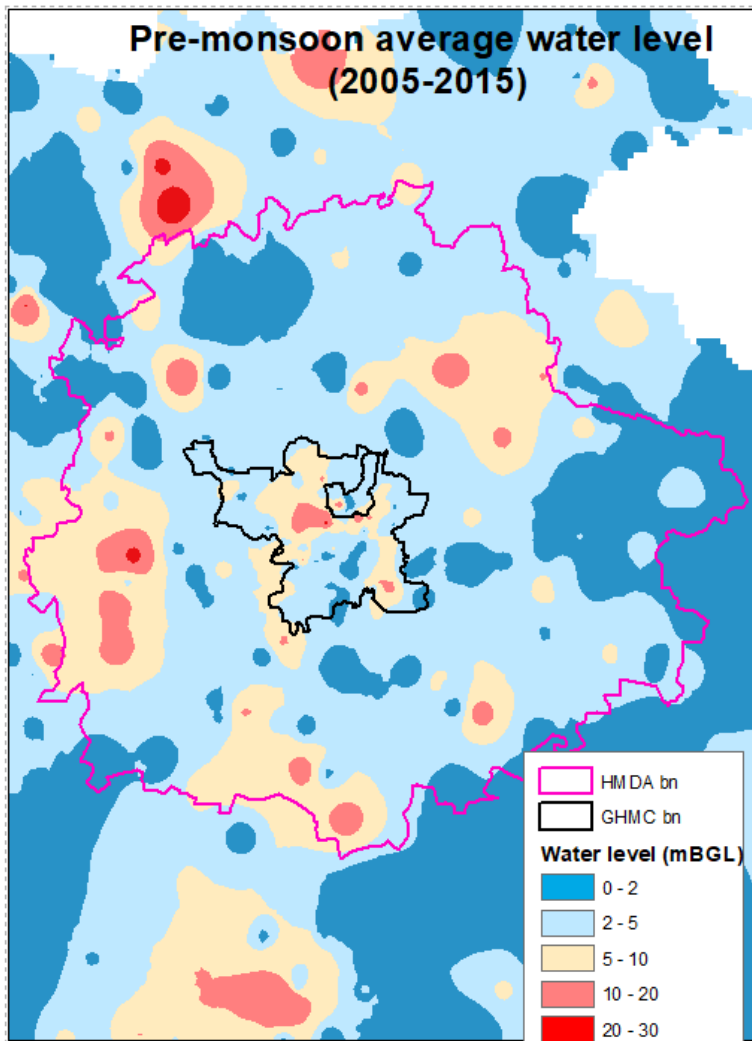
Polyline

Polygon

Raster data

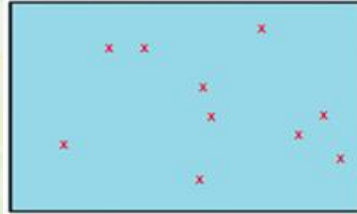
Vector data

Pre-monsoon average water level (2005-2015)

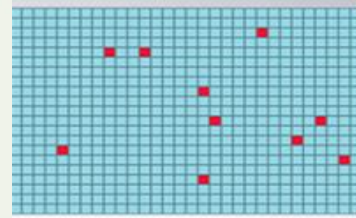


Vector and Raster data models

File type	extension
Esri Shapefile	.SHP, .DBF, .SHX
Geographic JavaScript Object Notation (GeoJSON)	.GEOJSON .JSON
Geography Markup Language (GML)	.GML
Google Keyhole Markup Language (KML/KMZ)	.KML .KMZ
GPS eXchange Format (GPX)	.GPX
IDRISI Vector	.VCT .VDC
MapInfo TAB	.TAB .DAT .ID .MAP .IND
OpenStreetMap OSM XML	.OSM
Digital Line Graph (DLG)	.DLG
Geographic Base File-Dual Independent Mask Encoding (GBF-DIME)	No extension
ArctInfo Coverage	No extension



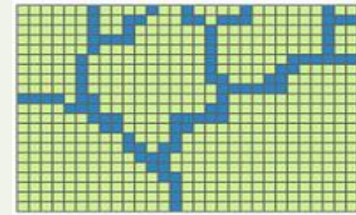
Point features



Raster point features



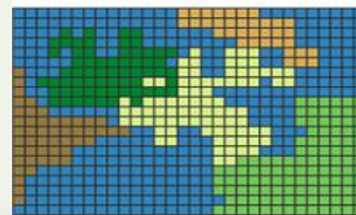
Line features



Raster line features



Polygon features



Raster polygon features

File type	Extension
ERDAS Imagine (IMG)	.IMG
American Standard Code for Information Interchange ASCII Grid	.ASC
GeoTIFF	.TIF .TIFF .OVR
IDRISI Raster	.RST .RDC
Envi RAW Raster	.BIL .BIP .BSQ
PCI Geomatics Database File (PCIDSK)	.PIX
Esri Grid	No extension

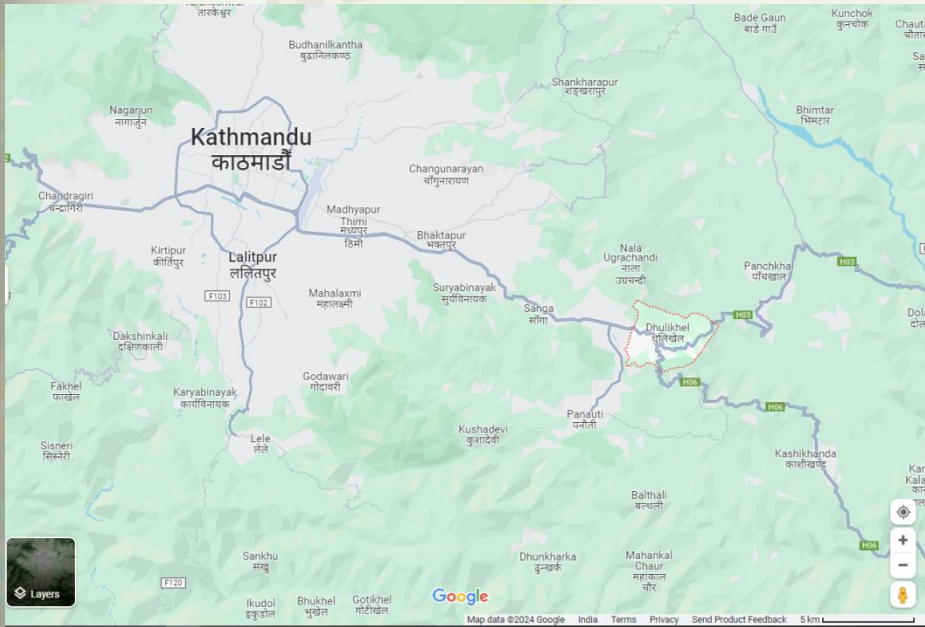
Some examples

- Raster – Satellite images, Elevation data etc.
- Vector –
 - » Point
 - » Line
 - » Polygon

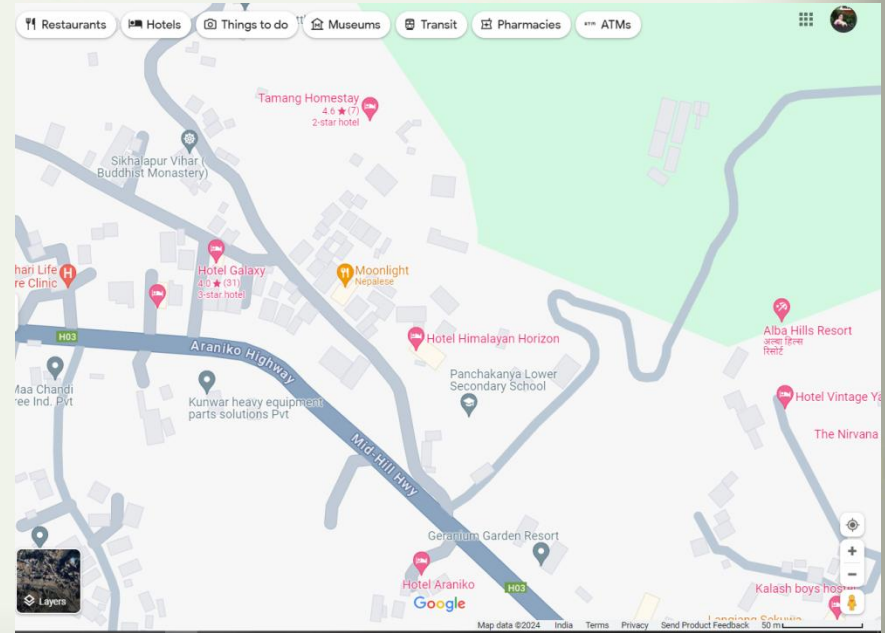


Large and Small scale maps

A

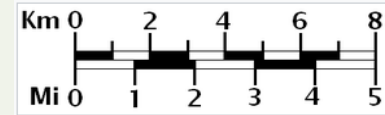


B

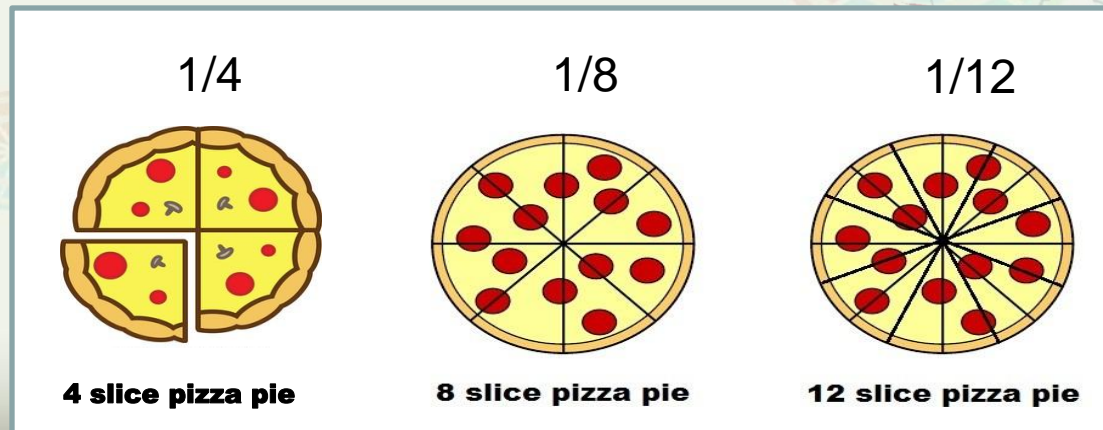


Scale

- Scale is the relationship between distance on the map and distance on the ground.



- A map scale might be given in a drawing (a graphic scale), or is given as a fraction or a ratio-1/10,000 or 1:10,000.
- Numeric scale - What does it mean by 1:10000?



Example 1



2 cm = 100 meters
Scale 1:5000

Large scale or small???

Example 2

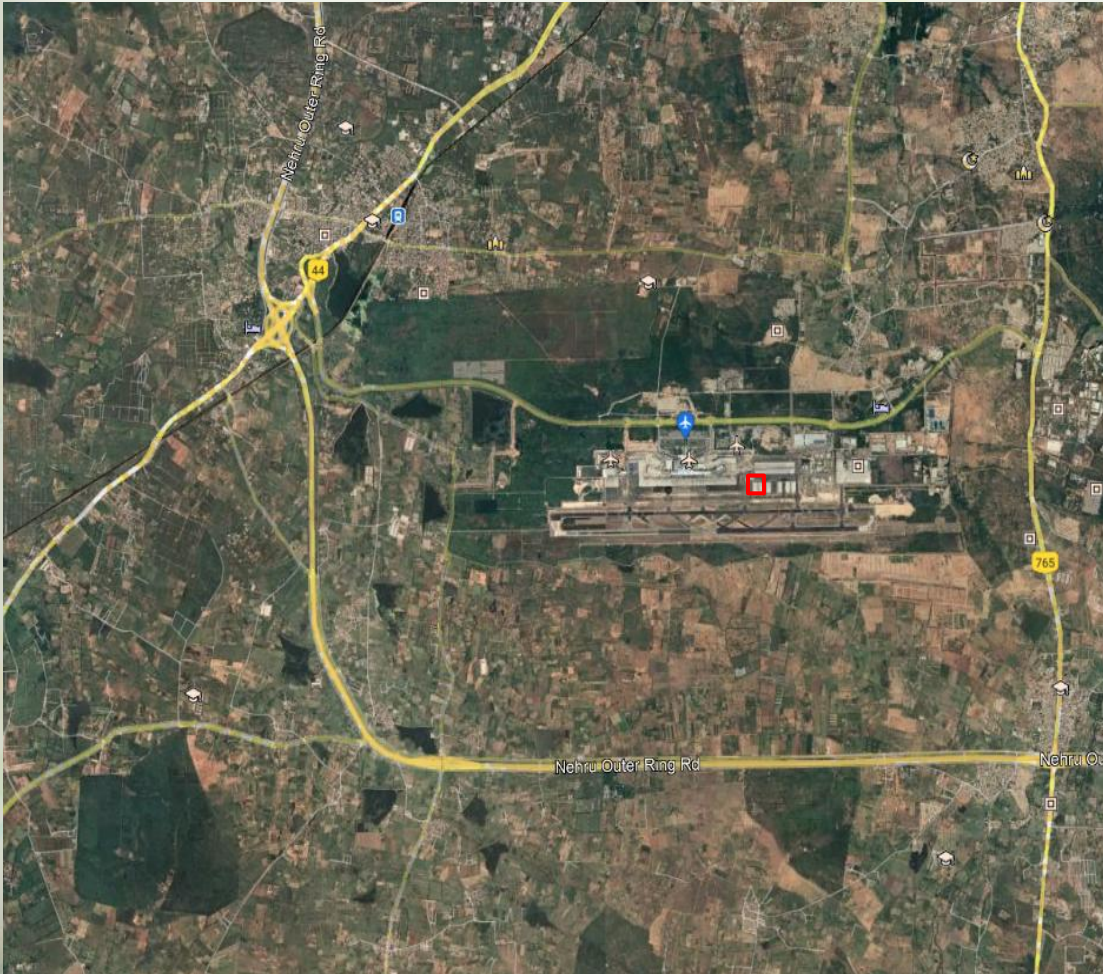


2 cm = 1000 meters

Scale 1:50000

Large scale or small???

Example 3



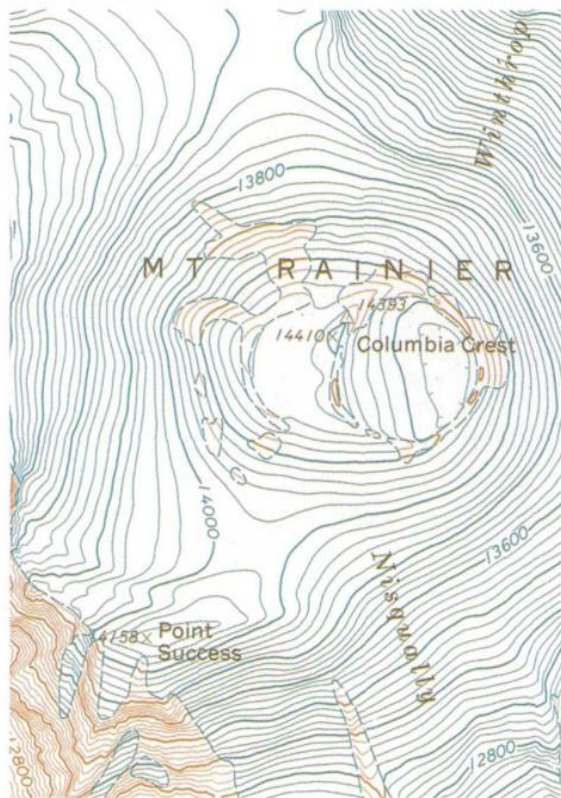
2 cm = 5 km

Scale 1:250000

Large scale or small???

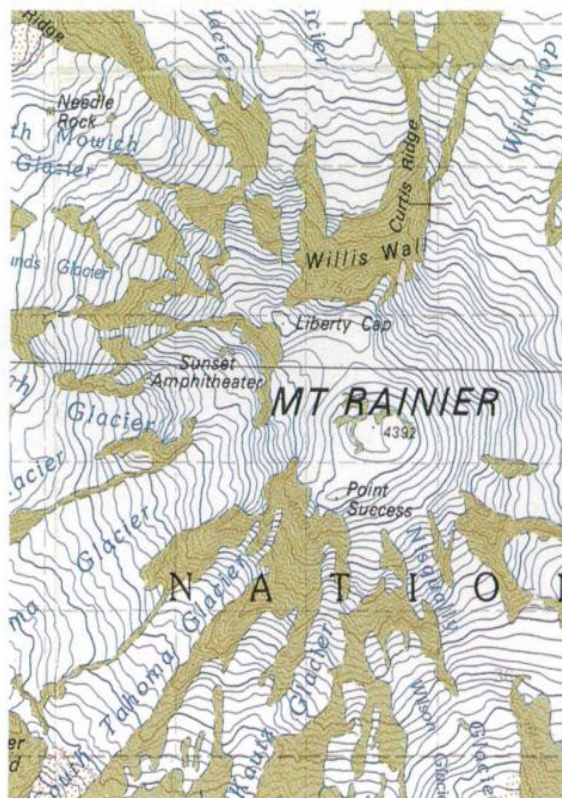
Large, medium and small scale maps

A



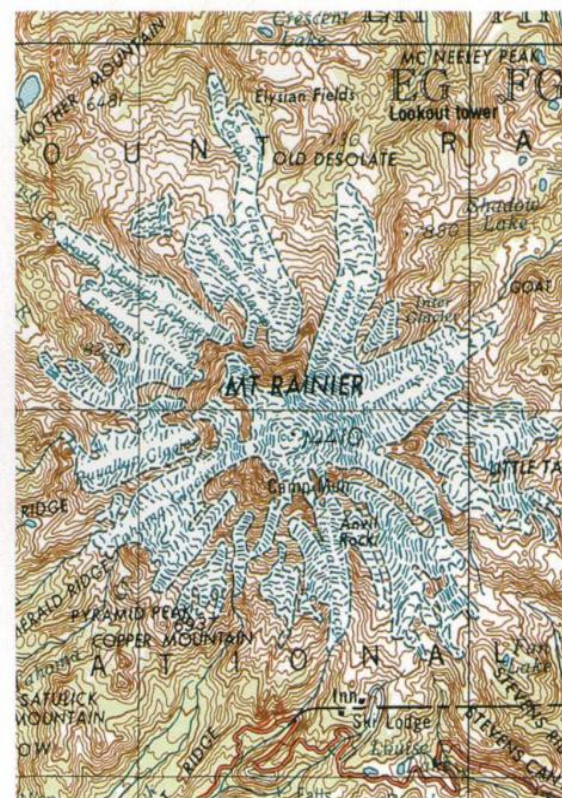
1:24,000 scale

B



1:100,000 scale

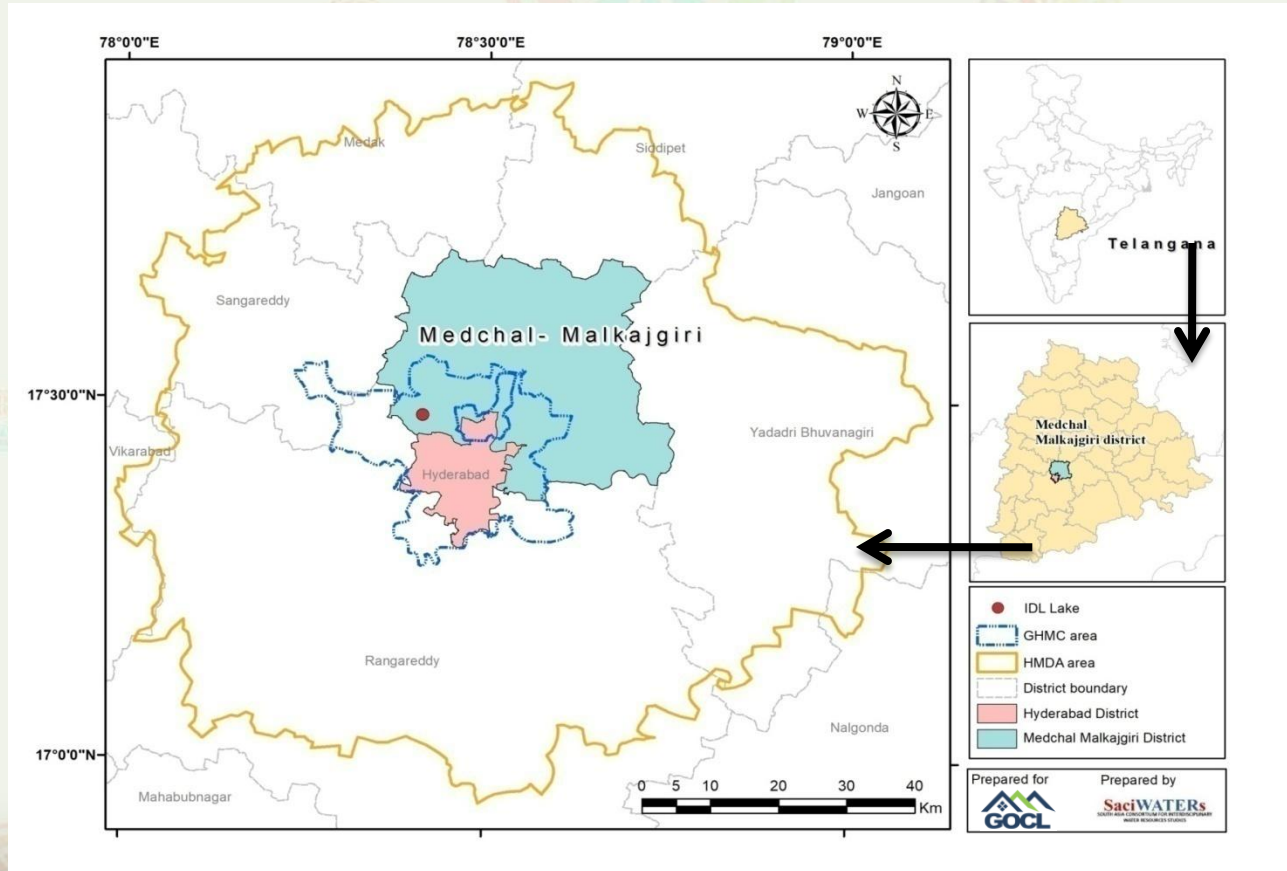
C



1:250,000 scale

Cartographic generalization

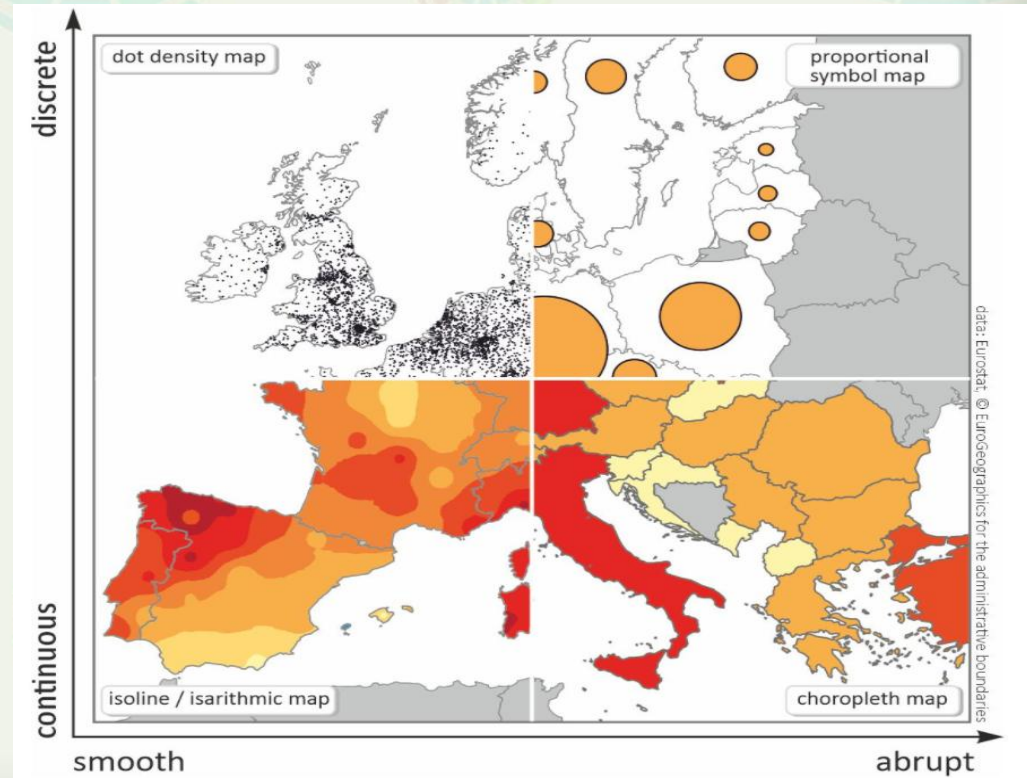
Multi-scale/pyramid approach



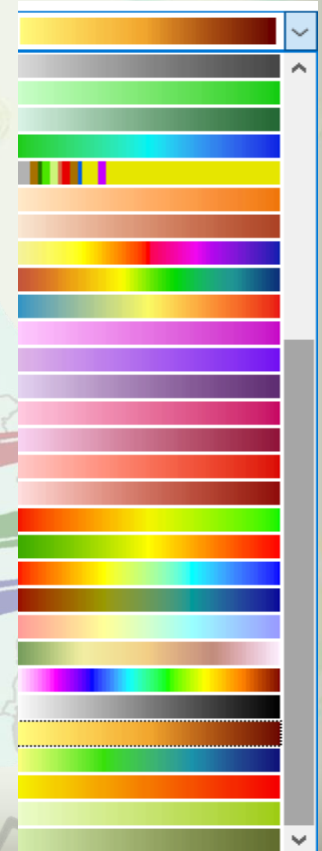
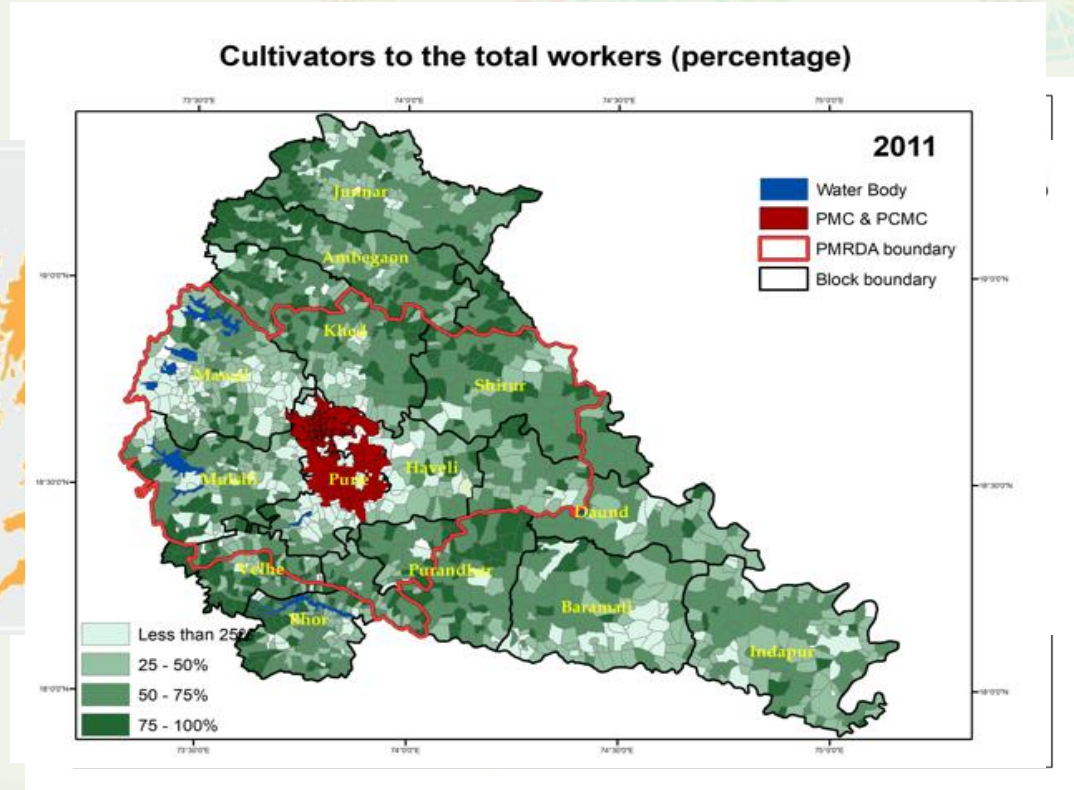
Single Variable mapping

Single variable mapping–

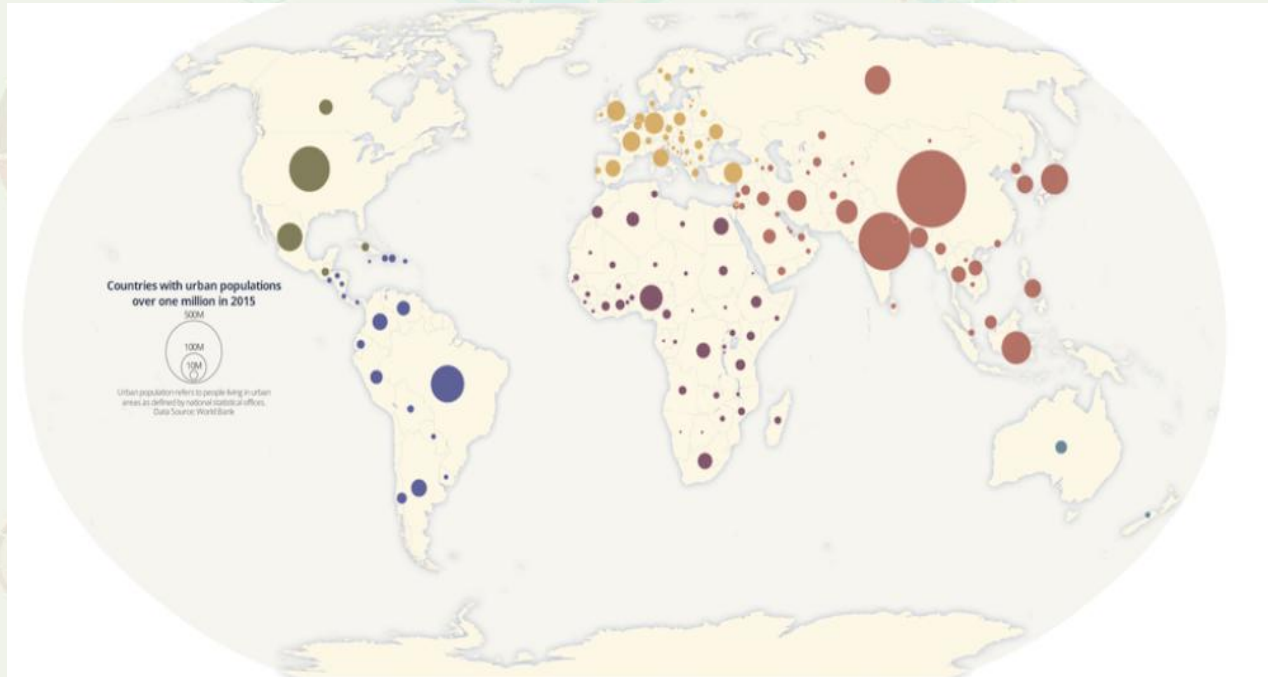
- Choropleth maps
- Proportionate symbol maps
- Dot density maps
- Isoline map



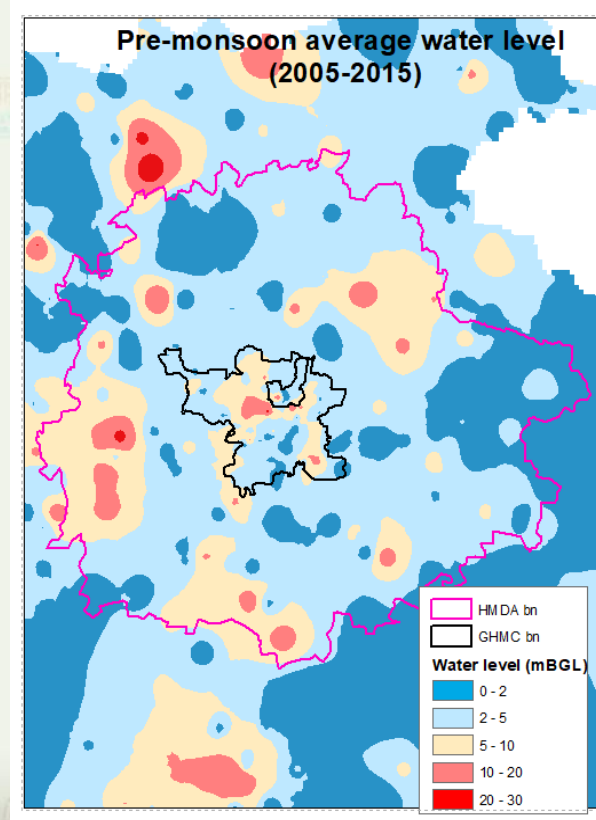
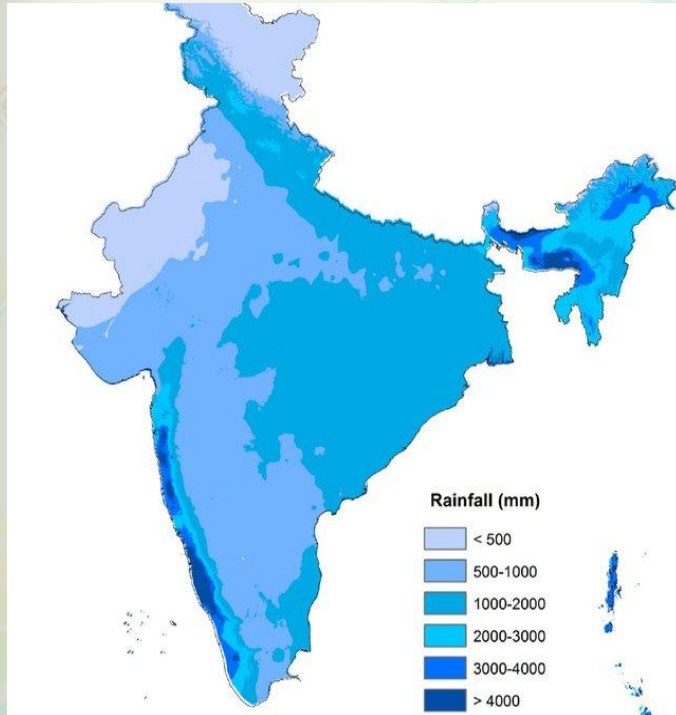
Choropleth maps



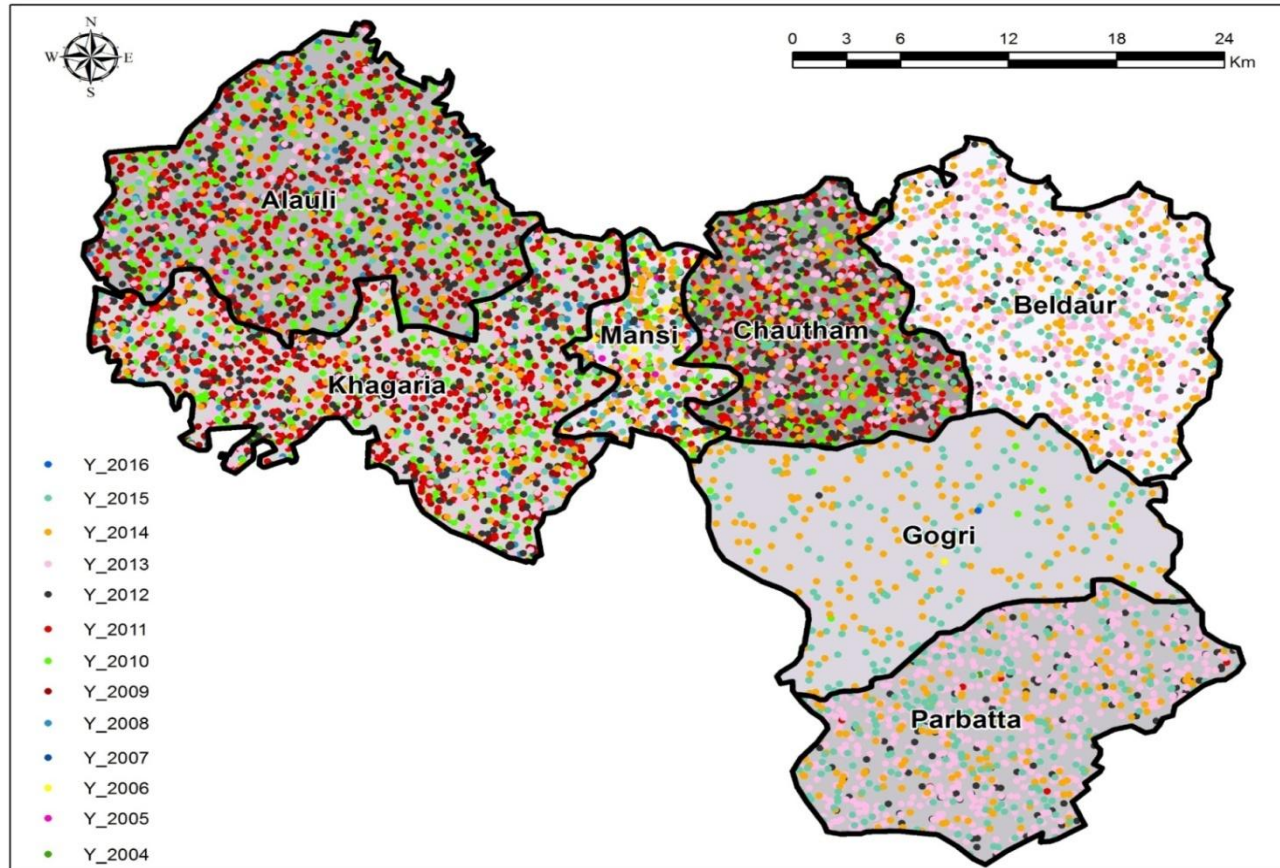
Proportionate symbol map



Isoline maps



Dot Density map



1 dot = 1
SHG

Multivariate (Bivariate) mapping

Multivariate variable mapping–

Bivariate Choropleths

Inter symbol

Intra symbol

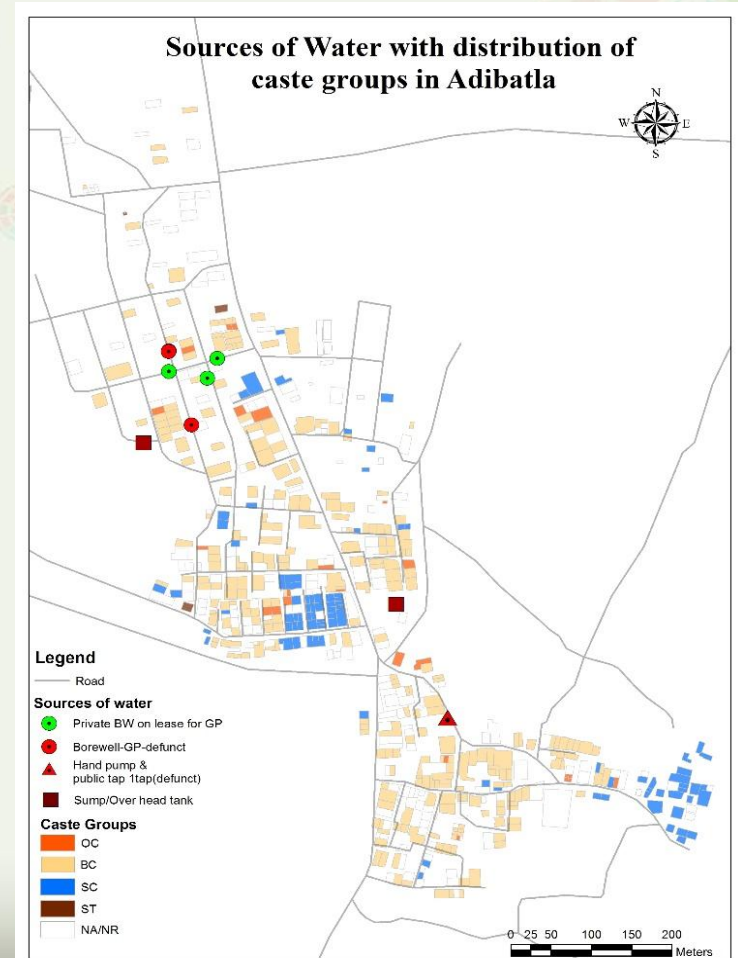
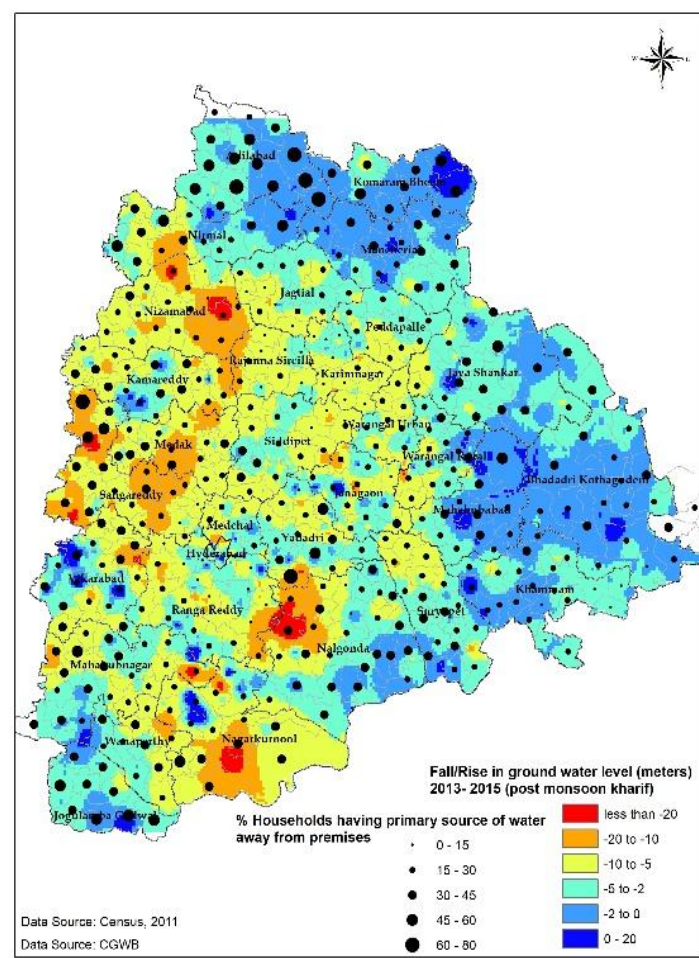
labels



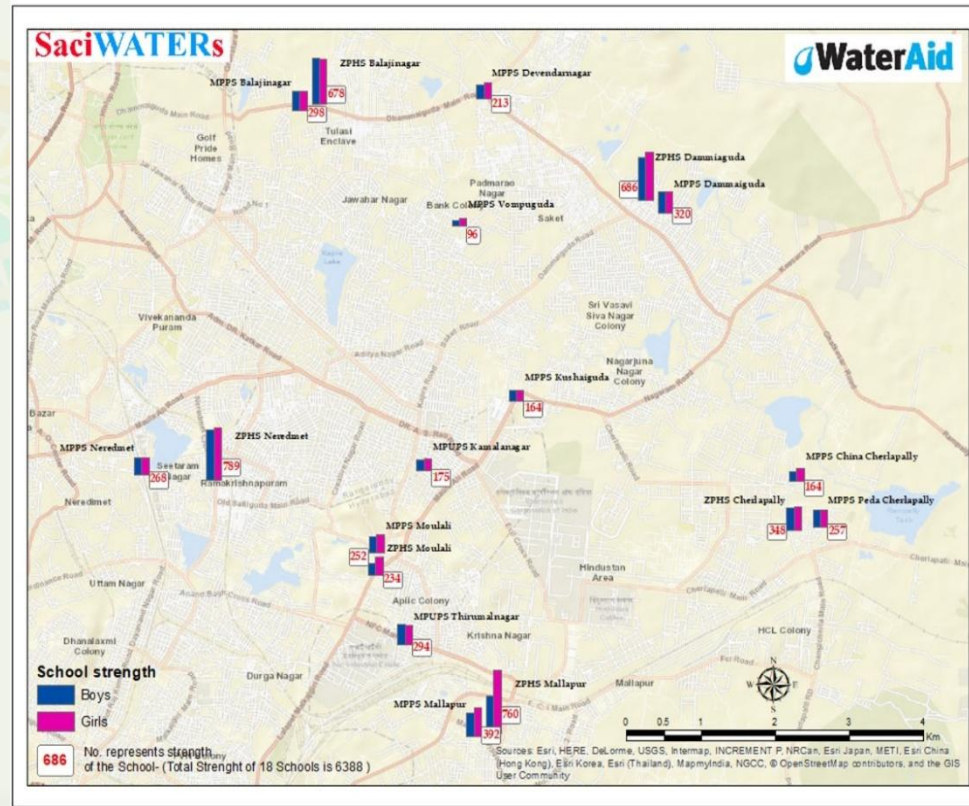
Bivariate Choropleths



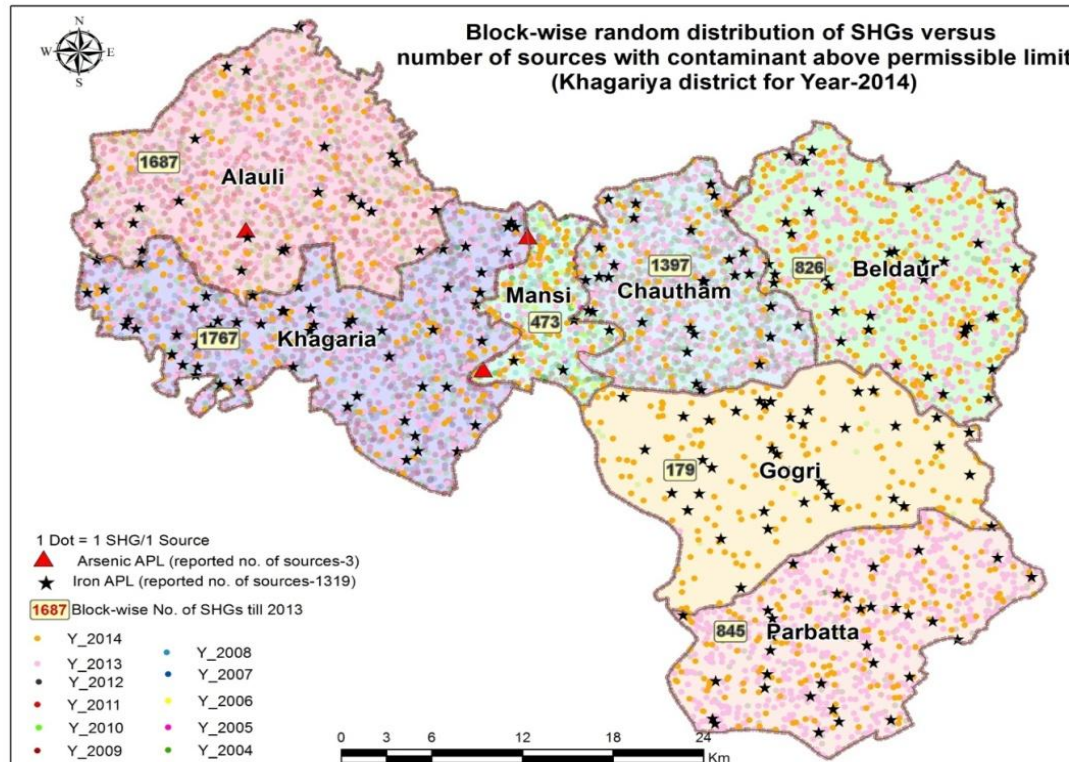
Inter-symbol



Intra symbol



Use of Labels



Map cosmetics

Data frame

Legend

Title

North Arrow

Scale bar

Citation

Inset map

