

Introduction to Geotechnology

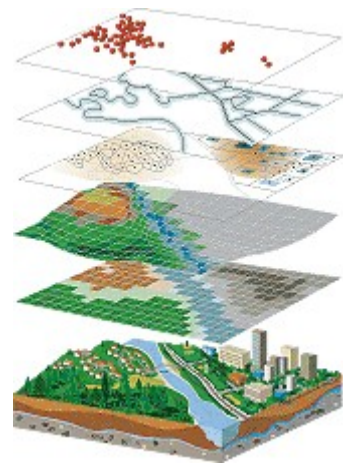
Unit – 5 Remote Sensing Based Mapping

5. Geoinformatics: Definition & Concepts – Input Sources (Satellite, Aerial & Ground based) - Computer based Geospatial data base generation – data modeling on Natural Resources, Eco Systems & Natural Disasters – Information Systems. 6hrs.

- **Geoinformatics** is an IT assisted appropriate technology to address the problems of geosciences and related branches of other sciences and engineering.
- Geoinformatics combines
 - geospatial analysis and modeling
 - development of geospatial databases
 - information systems design
 - human-computer interaction and
 - both wired and wireless networking technologies.



GIS

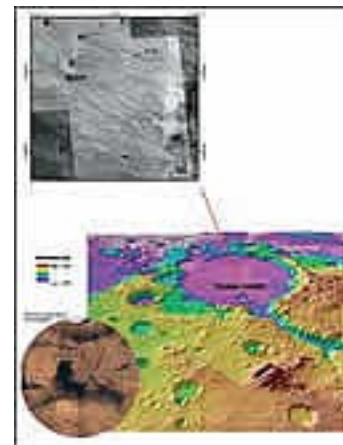
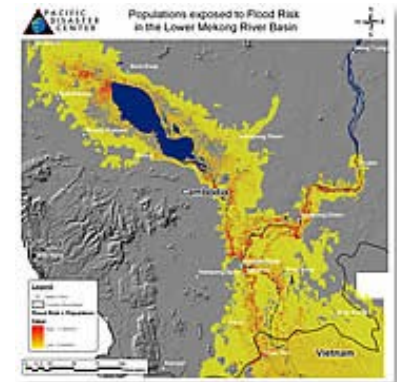


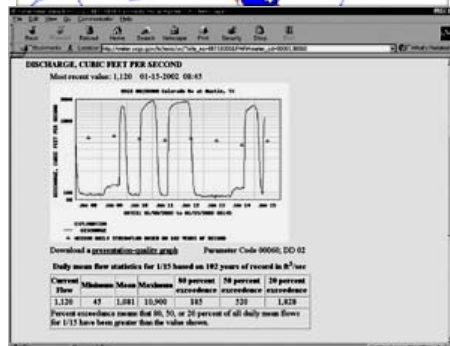
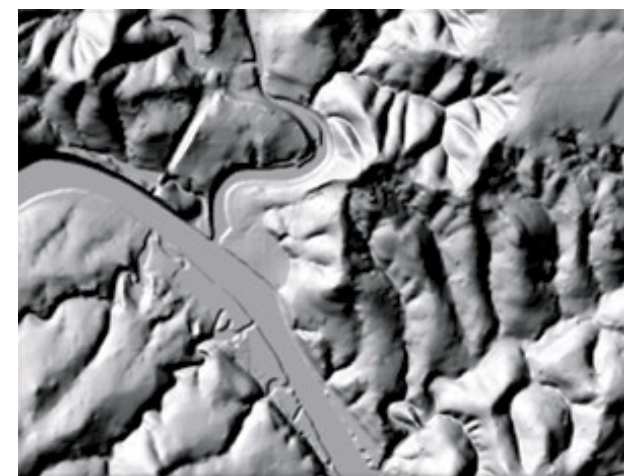
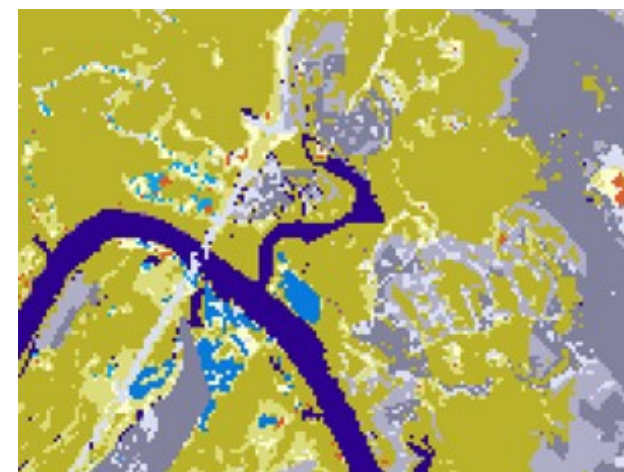
Capability based definition:

- **Geographic information system (GIS)**, is a computerised/digital system for capturing, editing, manipulating, systematically storing, analyzing, integrating, modeling, visualizing, sharing, retrieving, and representing/displaying huge quantity of both ***spatial*** and associated ***attribute data*** with customization and automation capabilities.

What can be done with GIS?

- Map where the things are
- Map quantities
- Map densities
- Find what's inside
- Find what's nearby
- Map changes
- Develop Models
- Automate processes ...





Applications

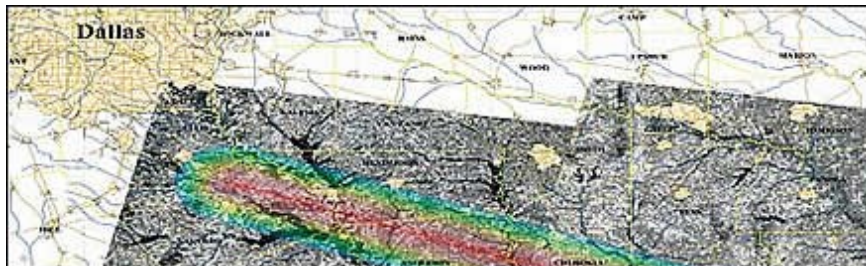
Many fields benefit from geoinformatics, including the development of

- in-car navigation systems,
- automatic vehicle location systems,
- transportation planning and engineering,
- environmental modeling and analysis,
- urban planning,
- telecommunications,
- agriculture,
- farming,
- public health, and so many other endless types of users.

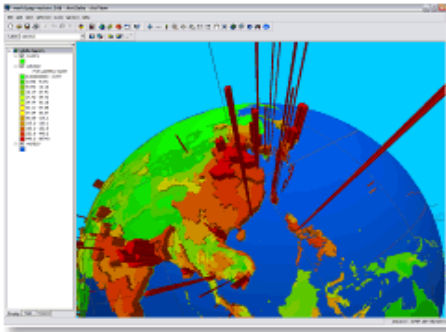
GIS

GIS can be viewed in three ways:

- **The Database:** GIS is a unique kind of spatial database of the world (geodatabase).
- It is a “Spatially Referenced Information System for all Resources”.



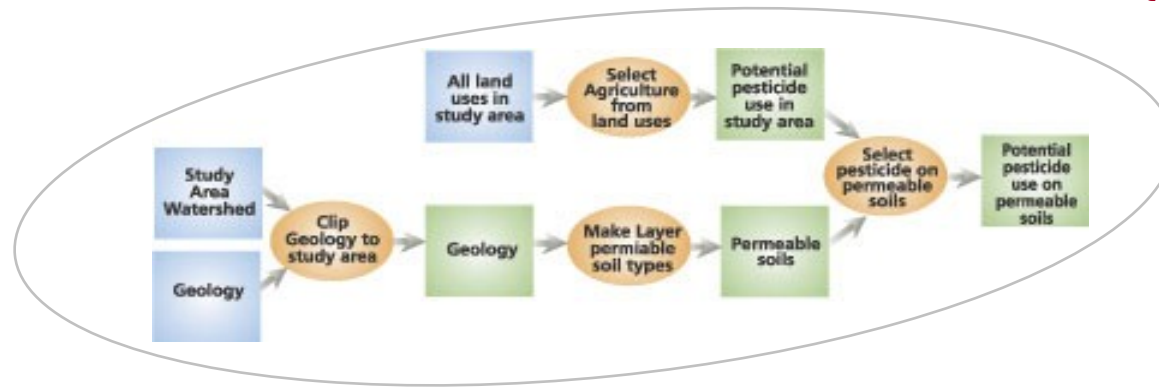
- **The Map** : GIS is a set of intelligent maps and show features and feature relationships on the earth's surface. Maps of the underlying spatial information can be constructed and used as "windows into the database" to support queries, analysis, and editing of the information.



- **The Model :** GIS is a set of information transformation tools that derive new spatial datasets from existing datasets. These geoprocessing functions take information from existing datasets, apply analytic functions, and write results into new derived datasets.

Hydrocarbon
Exploration

Precious Metal
targeting

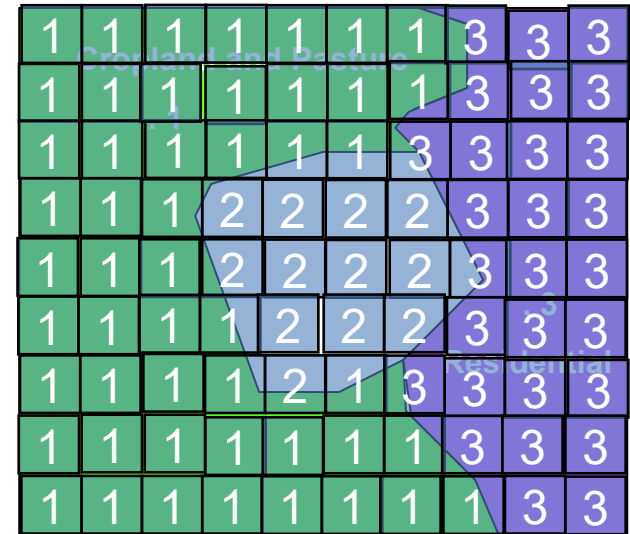
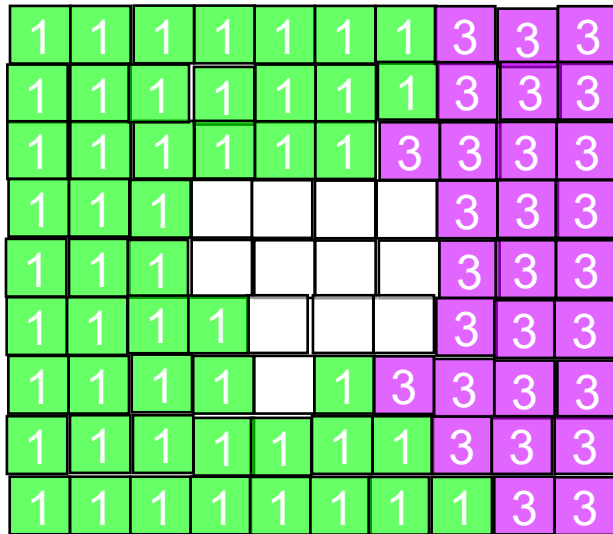


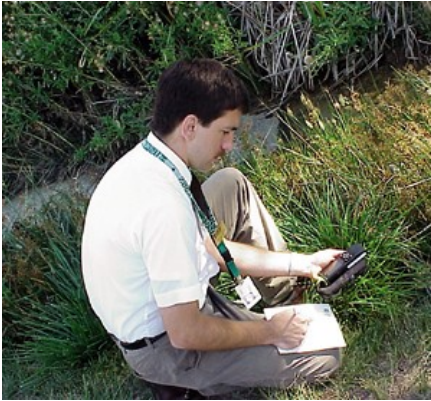
Tsunami
forewarning

Soil erosion
functions

Landslide
Hazard
zonation

GIS Data Representation



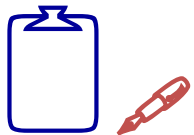


Collecting latitude and longitude coordinates with a Global Positioning System (GPS) receiver.

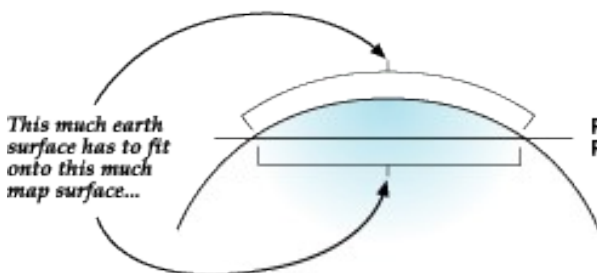
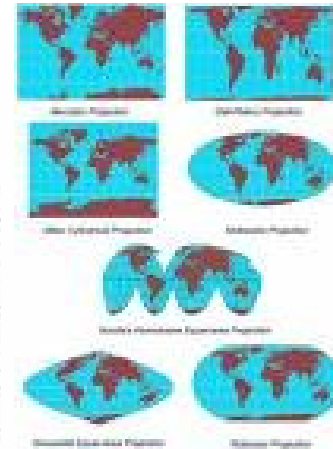
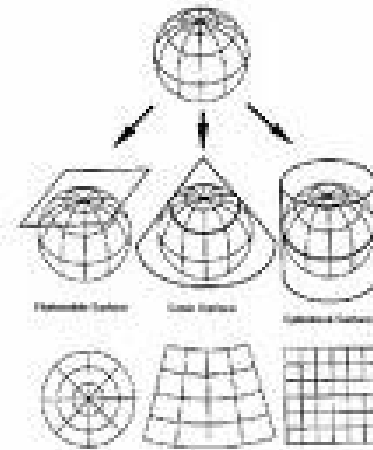
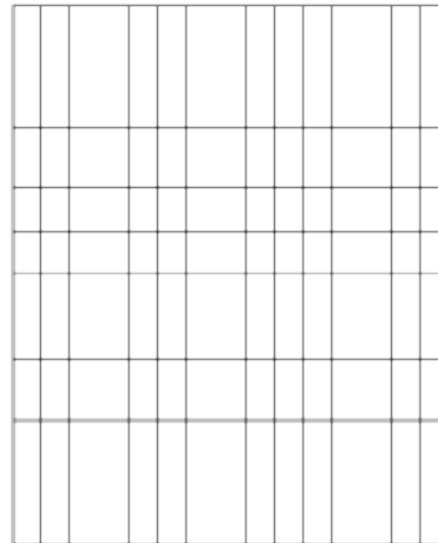
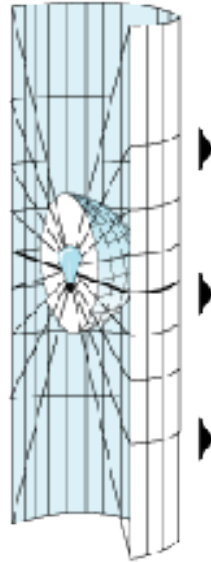
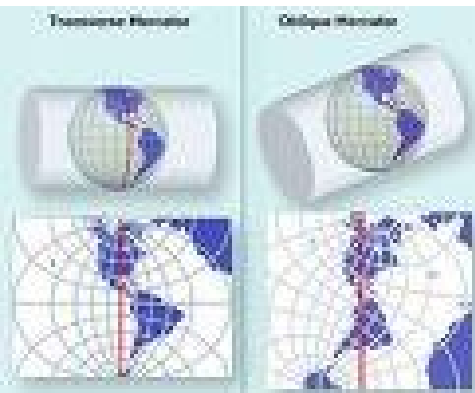


Scanning paper maps to produce digital data files for input into a GIS.

Data Sources & capture



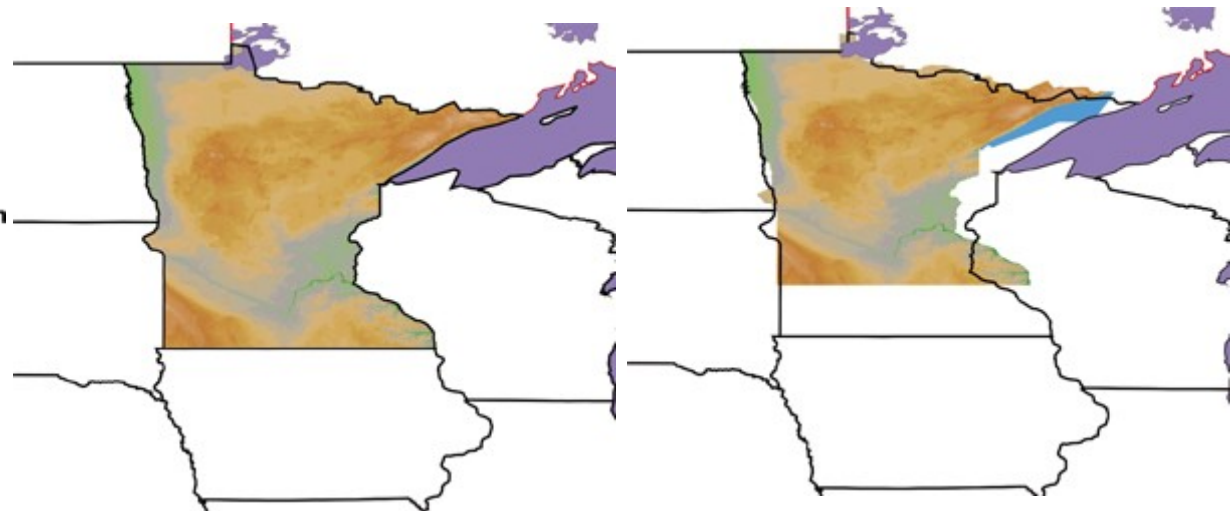
Projection and registration



This much earth surface has to fit onto this much map surface...

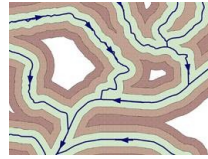
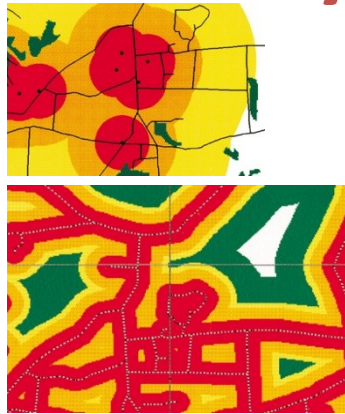
therefore, much of the earth's surface has to be represented smaller than the nominal scale.

Projection Plane

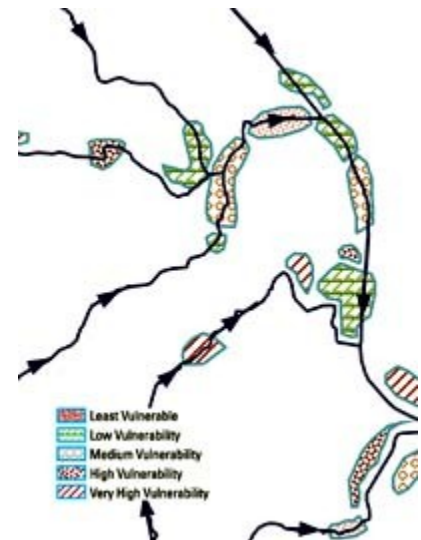
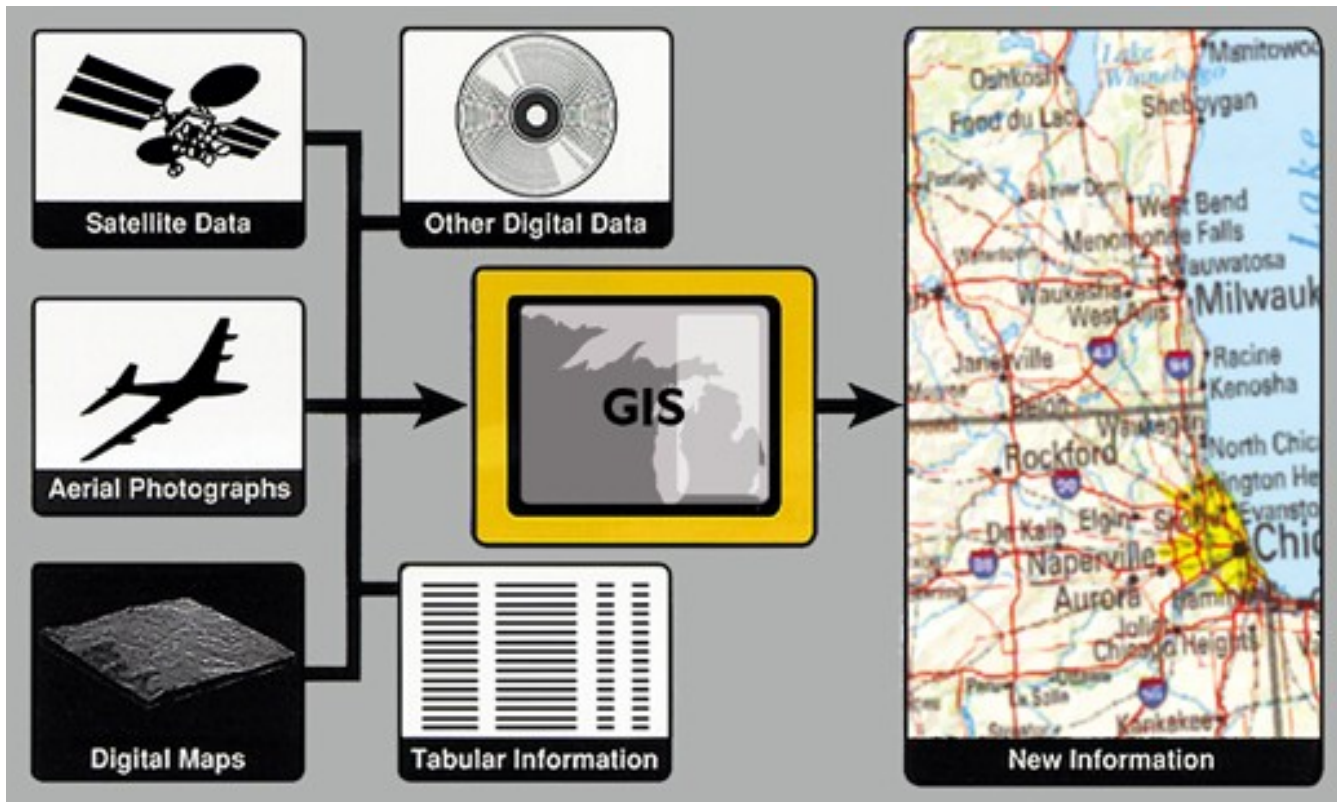
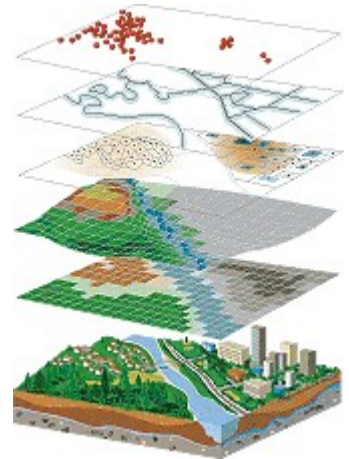


GIS Data Analysis & integration

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-
-
-



Data integration is the linking of information in different forms through a GIS

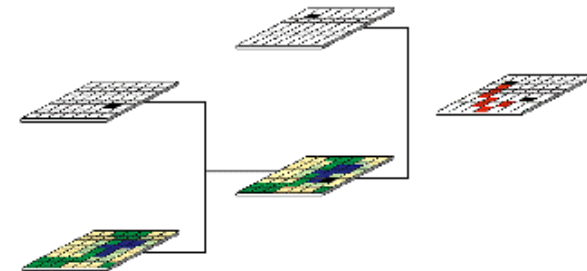
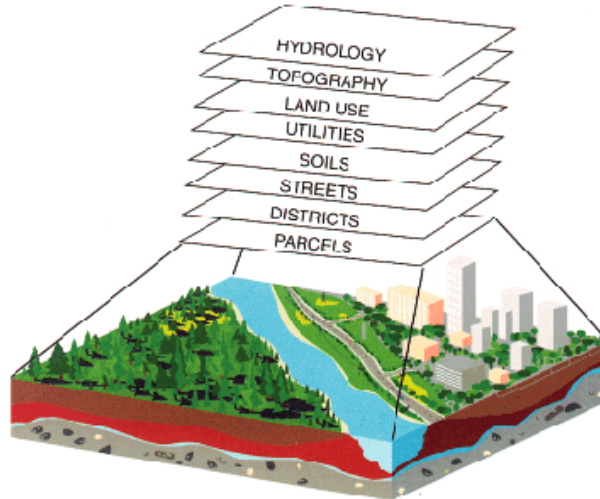
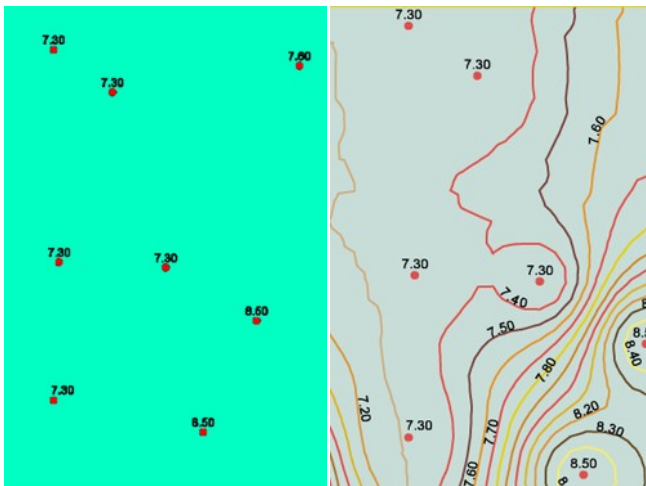


Data modeling

A model is a representation of reality.

Due to the inherent complexity of the world and the interactions in it, models are created as a simplified, manageable view of reality.

Models help to understand, describe, or predict how things work in the real world.



Binary model

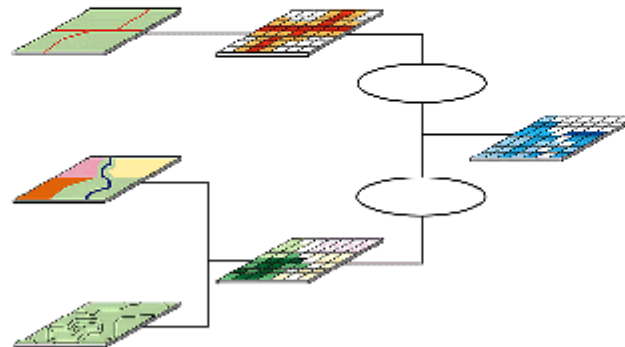
Process model

Index model

Regression model

...

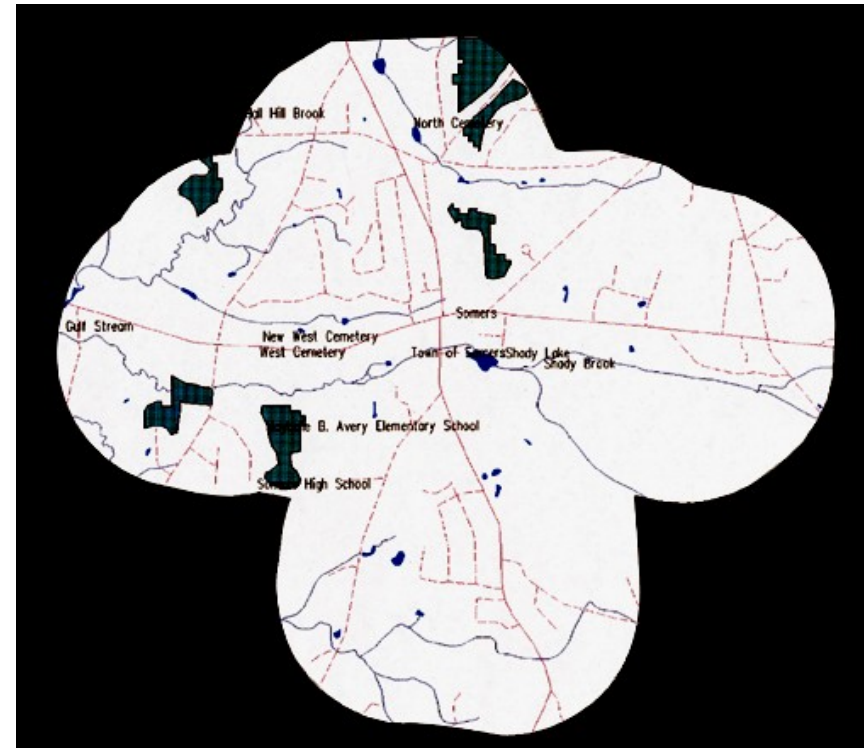
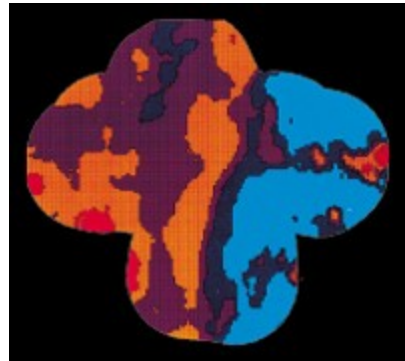
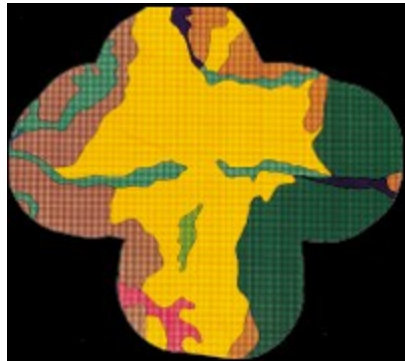
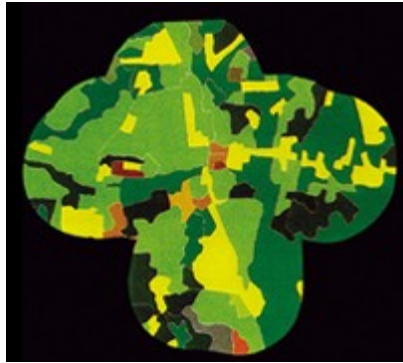
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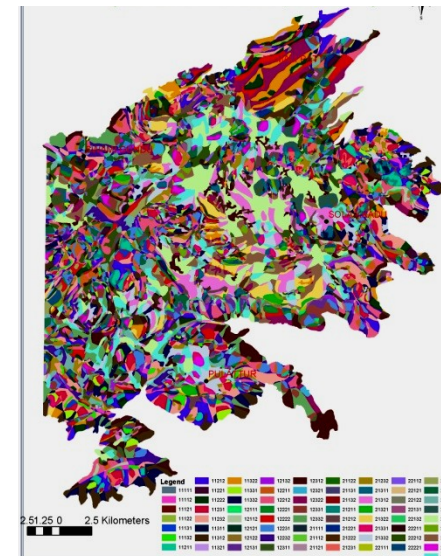
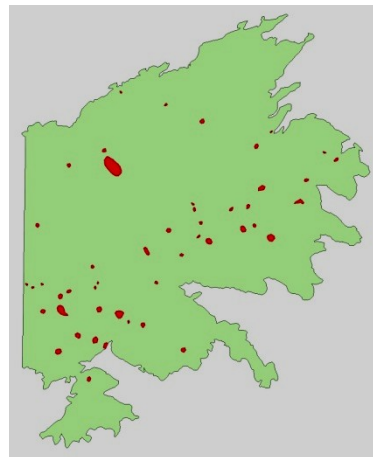
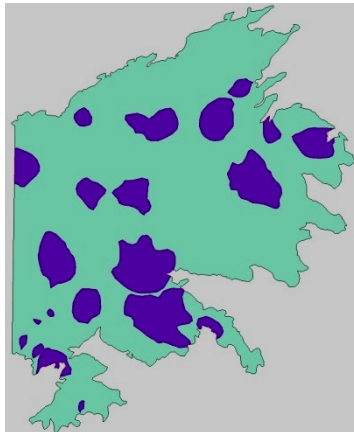
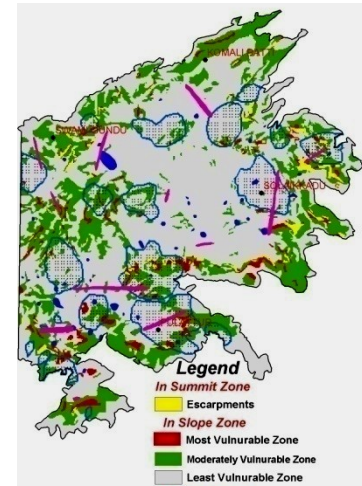
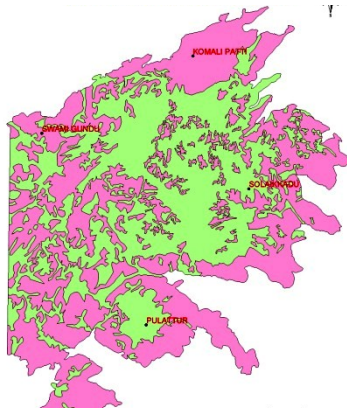
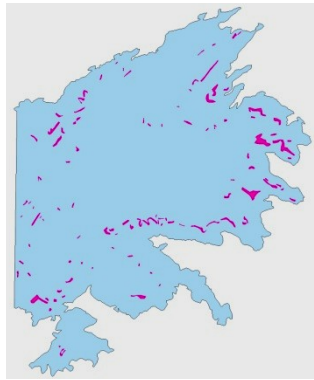


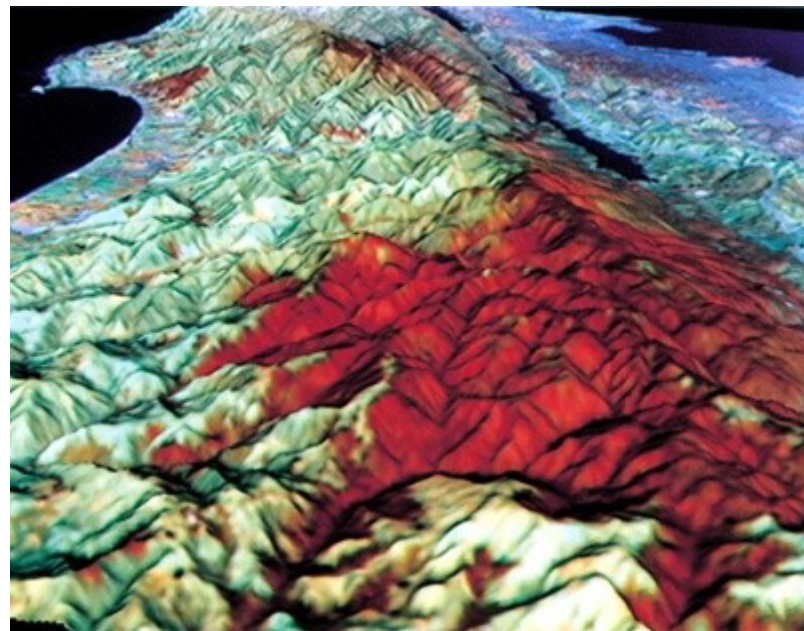
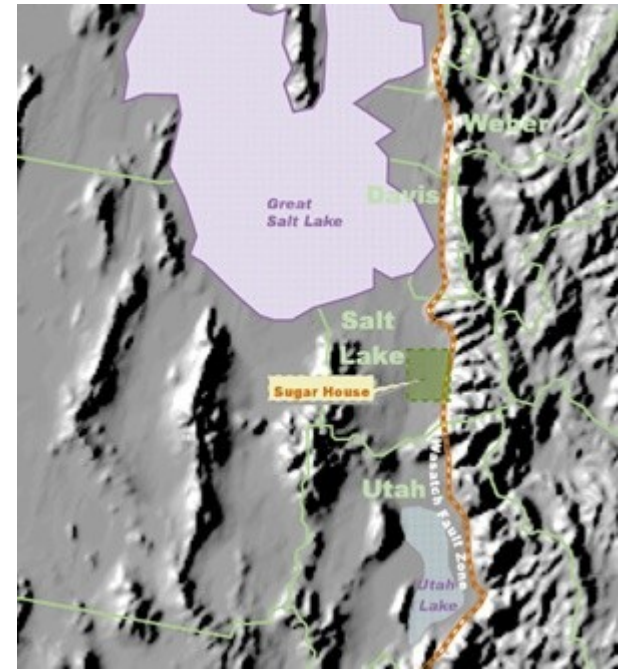
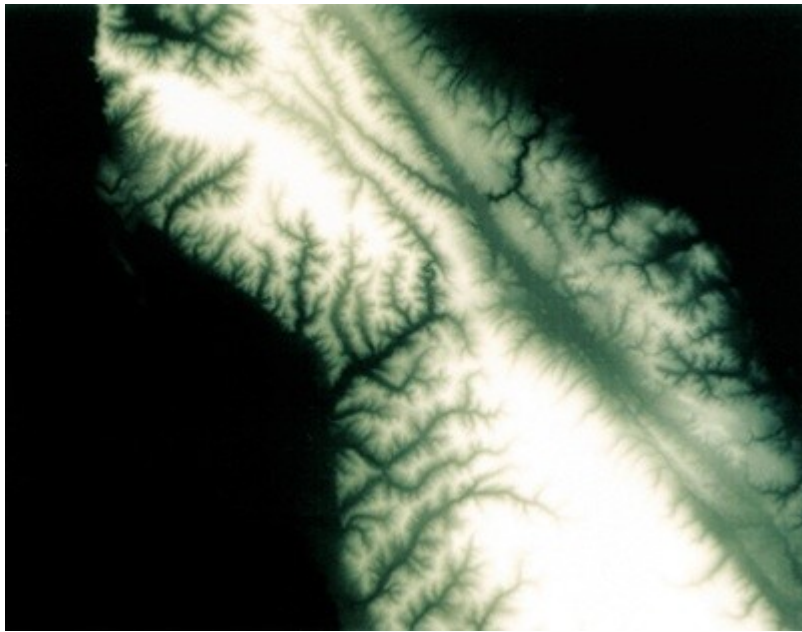
Complexity can be added through logic:

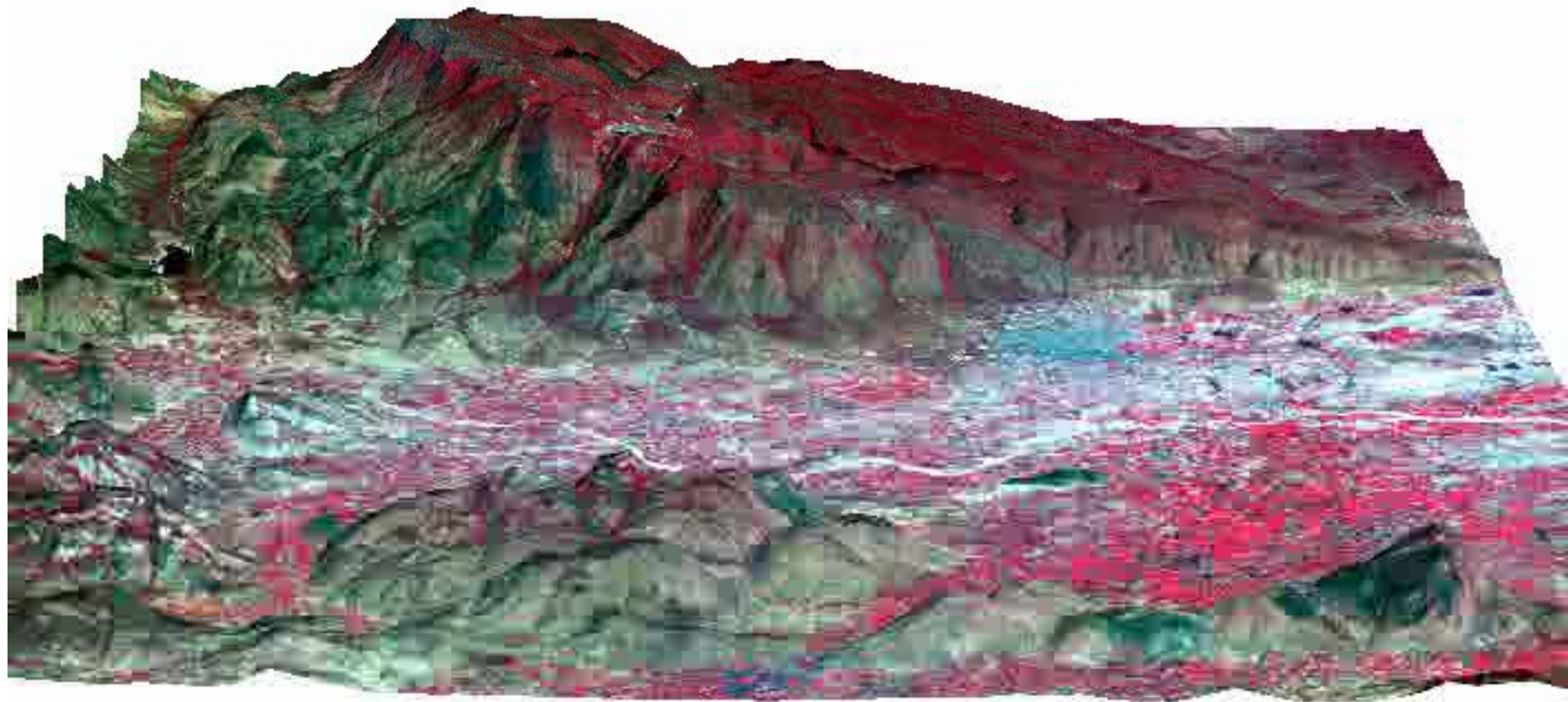


Identification of Potential groundwater well sites









- **Geoinformatics** is a recent and fast emerging integrated digital technology, involving powerful S/Ws and H/Ws for quick and accurate generation of valuable information for planning, decision making, implementation and monitoring of earth related activities.

GIS can provide **Query Based Information Retrieval System (QUBIS)** and **Spatial Decision Support System (SDSS)** for various developmental planning

- ➔ User defined, query based, spatial data retrieval / map display
- ➔ Display of non spatial data by linking spatial data
- ➔ Data listing, map wrapping
- ➔ Programming for automated mapping, spatial database generation, spatial / tabular analysis, spatial modeling and suggestion of remedial measures / providing action plan map, etc.

Problem Selection Statistics

- Natural Disasters Sector**
- Problems
 - Seismicity
 - Floods
 - Severity in Grade
 - VERY LOW
 - LOW
 - MODERATE**
 - HIGH
 - VERY HIGH
 - Over all Sever
 - Level of S&T Inter
 - Agency involved
 - Landslides
 - Tsunamis
 - Cyclones (last 25 ye
 - Coastal Erosion
 - Drought

Blockwise Retrieval for

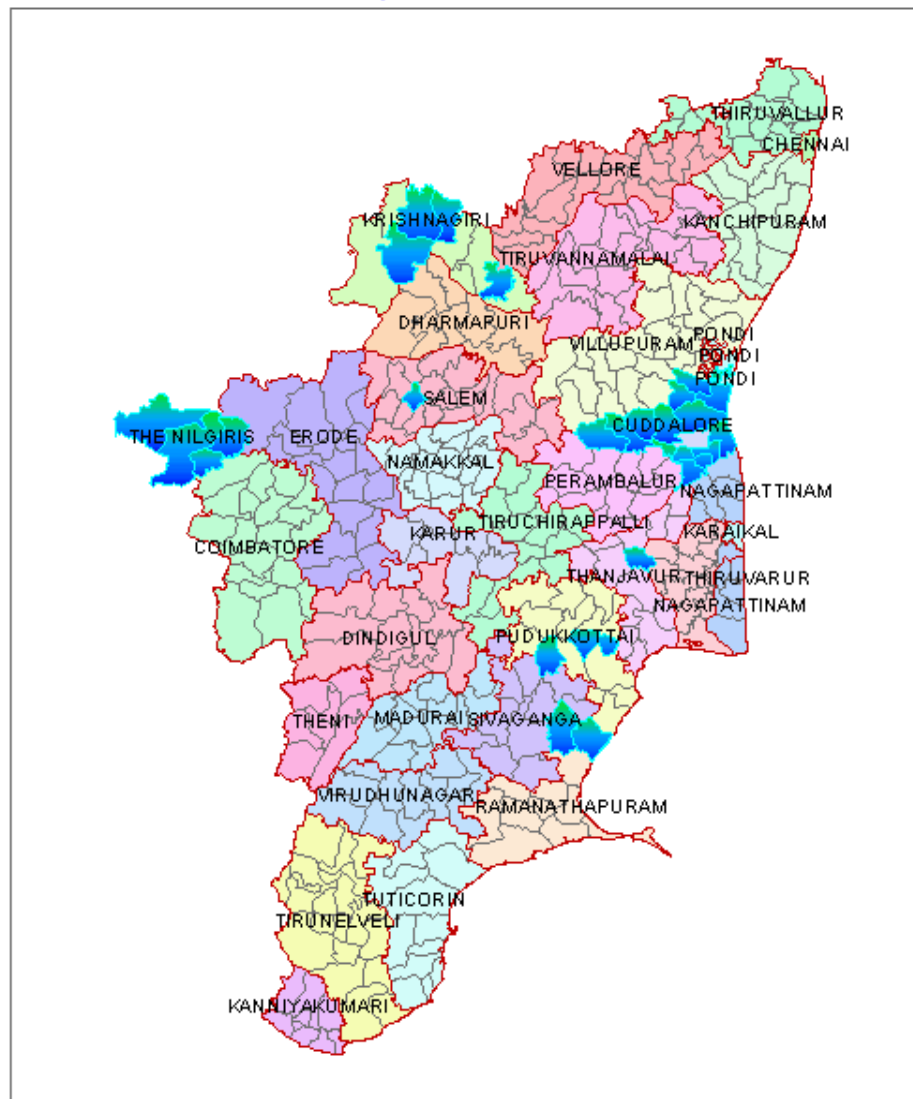
☒ Entire State

☐ Districtwise

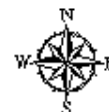
NATURAL DISASTERS SECTOR

Floods

Severity in Grades - MODERATE



30 0 30 60 km



Severity in Grades

- MODERATE
- TN_DISTRICT

Map Selection **View**

- Hospital Availability - Block Primary
 Available
 < 2
 2 - 4
 > 4
 Overall Availability
 available
 < 3 km
 3 - 6 km
 > 6 km

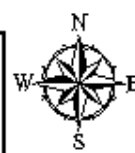
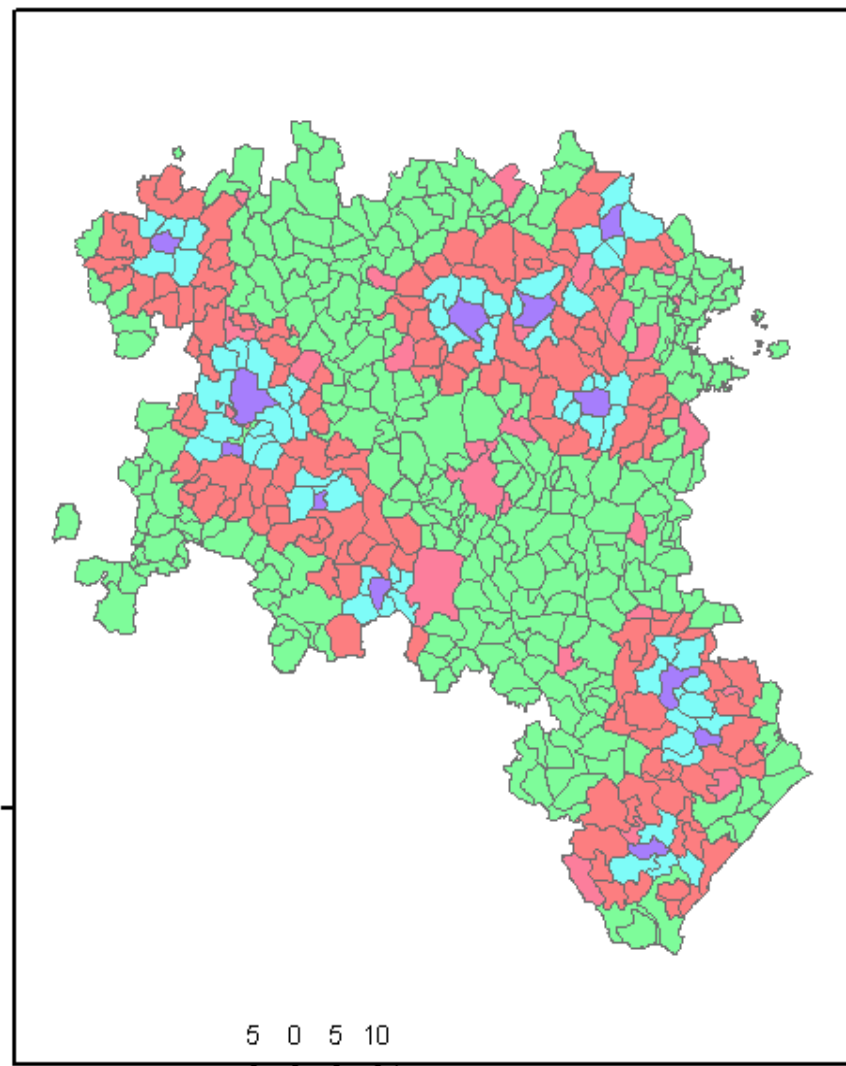
Overall Availability and Reachability

rs

☐ Districtwise
 ☐ Blockwise
☐ Talukwise
 ☐ Villagewise
☐ Mini Watershedwise
☐ Featurewise

78.31, 10.34 Decimal Degrees

Health Sector - Hospital Availability - Block Primary Health Centre Unavailable - Overall Availability and Reachability



Legend

- < 3 km
- > 6 km
- 3 - 6 km
- 0