

CE-318L: GIS/RS APPLICATION TO CE (GEO INFO ENGINEERING) LAB 1

LECTURE – 01

INTRODUCTION TO GIS
(PART – I)

Course Instructor:
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Content

- Introduction to the Course
- What is GIS
- Application and Importance of GIS

Introduction to the Course

- **Course Name:** GIS/RS Application to CE (Geo. Info. Engg.)
- **Course Code:** CE318L
- **Course Type:** Lab
- **Credit Hours:** 01
- **Software:** QGIS (Available at www.qgis.org)
- **Textbook:** QGIS Training Manual (Available at www.qgis.org)
- **Reference Materials** will be uploaded on instructor's blog (www.hizbblog.weebly.com or www.teachoholica.blogspot.com)

Introduction to the Course

- **Course Objective**
 - To learn basic usage of GIS software for developing an effective GIS capable of solving engineering problems.
 - To learn application of GIS in Civil Engineering

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Introduction to the Course

- **Course Outline**
 - **Mid Term**
 - Module 01: Introduction
 - Module 02: The Interface
 - Module 03: Creating a Basic Map
 - Module 04: Classifying Vector Data
 - Module 05: Creating Vector Data
 - **Final Term**
 - Module 06: Vector Analysis
 - Module 07: Raster Analysis
 - Module 08: Plugins
 - Module 09: PostGIS

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Introduction to the Course

- **Grading Criteria**

■ Mid Term	25 %
■ Final Term	25 %
■ Viva-Voce	25 %
■ Sessional	25 %
■ Assignments	08
■ Quizzes	07
■ Mini Project	05
■ Class Participation	05
■ Caution!	
■ <i>Late Submission</i> of home work shall carry zero credit	
■ <i>Plagiarism/copying</i> may lead to cancellation of task.	

What is GIS?

■ Definitions

- A **G**eographic **I**nformation **S**ystem (GIS) is a computer system capable of assembling, storing, manipulating, analyzing and displaying geographically referenced information, i.e. data identified according to their location.
- **Geographic** relates to the surface of the earth.
- **Information** is a knowledge derived from study, experience, or instruction.
- **System** is a group of interacting, interrelated, or interdependent elements forming a complex whole.

What is GIS?


■ Functions of GIS


- **Data collection**
 - Capture data
- **Data storing, processing & analysis**
 - Store data
 - Query data
 - Analyze data
- **Output production**
 - Display data
 - Produce output

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What is GIS?


■ Functions of GIS

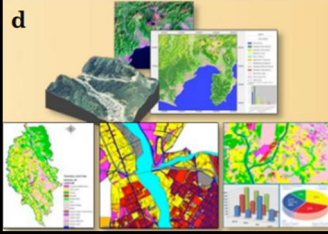
a 

b 

Data Collection

- Using GPS & RS
- Paper Maps



d 

Data Storing, Processing, Analysis

- Computer Hardware
- Computer Software

Output Production

- Statistical Report
- Maps

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What is GIS?

■ Basic Elements of GIS

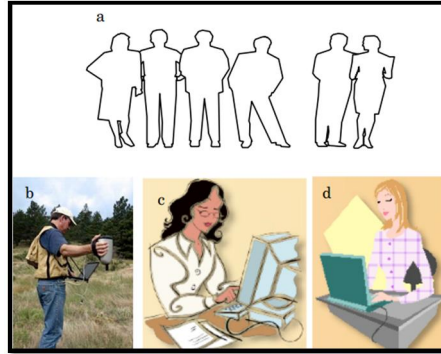
- People
- Data
- Software
- Hardware
- Procedure/methods

What is GIS?

Basic Elements of GIS

1. People

- People are most important part of a GIS
- Define and develop the procedures used by a GIS
- Can overcome the shortcoming of other elements (but not the vice-versa)



- Ground truth data collection
- Data storing, processing and analysis

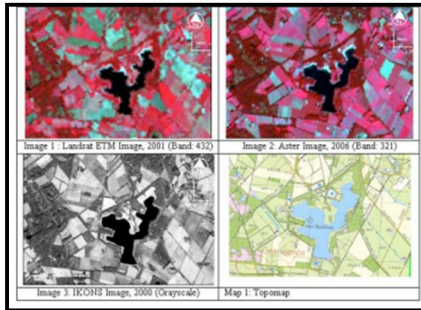
What is GIS?

Basic Elements of GIS

2. Data

- Data is the information used within a GIS
- Since a GIS often incorporates data from multiple sources, its accuracy defines the quality of the GIS.
- GIS quality determines the types of questions and problems that may be asked of the GIS

Remote Sensing & Topographic Data



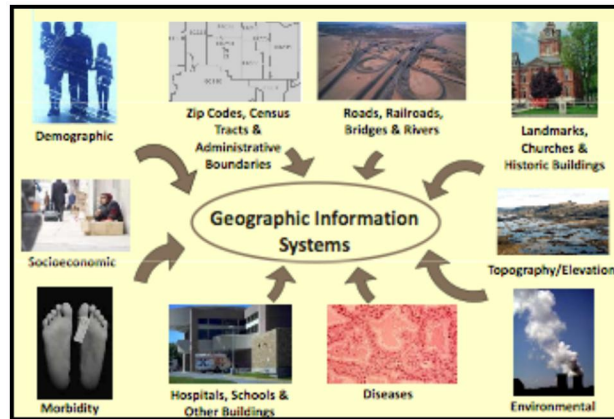
Truth Data

Obs. Point	GPS Reading		Present Landuse	ETM Image 2001 Class Name	IKONOS	Topographic Map Legend Class
	X	Y				
11	351642	5783025	Forest	Forest	Forest	Forest
18	350935	5783163	Bar Land	Grassland	Grassland	Grassland
17	351090	5782900	Arable Land	Grassland	Grassland	Grassland
20	350700	5783200	Forest	Forest	Forest	Forest
23	351100	5783000	Grassland	Arable Land	Arable Land	Arable Land

What is GIS?

Basic Elements of GIS

2. Data (More Examples)



What is GIS?

Basic Elements of GIS

3. GIS Software

- It encompasses not only to the GIS package, but all the software used for databases, drawings, statistics, and imaging.
- The functionality of the software used to manage the GIS determines the type of problems that the GIS may be used to solve.
- The software used must match the needs and skills of the end user.

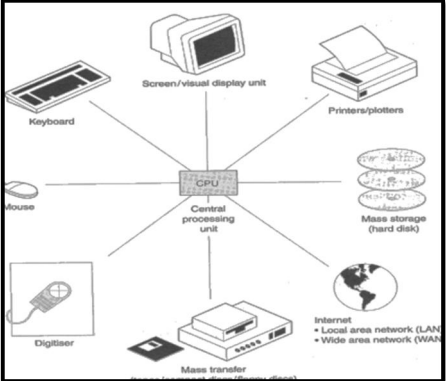
Popular GIS Software

- ArcGIS
- QGIS
- MapInfo
- Edras Imagine
- ENVI, etc.

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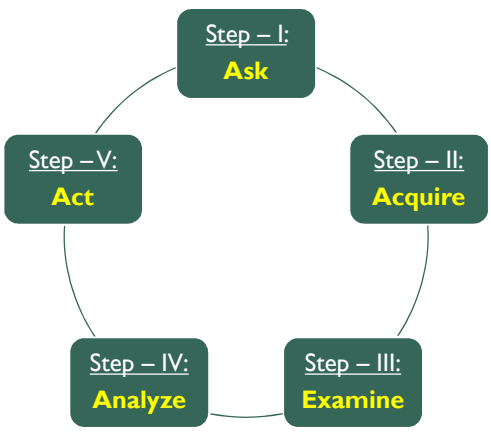
What is GIS?

- **Basic Elements of GIS**
 - 4. **Hardware**
 - The type of hardware determines, to an extent, the speed at which a GIS will operate.
 - Additionally, it may influence the type of software used.



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Applications and Importance of GIS



A Typical Framework for GIS Analysis

Applications and Importance of GIS

■ Site Selection and Evaluation for Power Generation



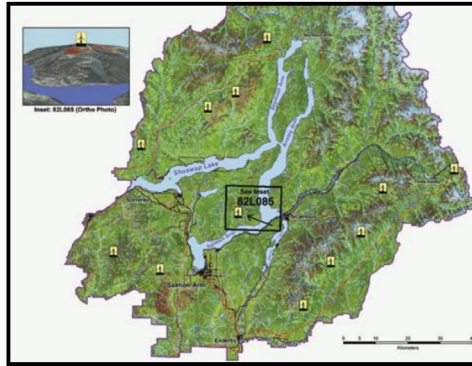
Applications and Importance of GIS

■ Site Selection and Evaluation for Power Generation

- Generation site placement studies are supported using GIS.
- For example, building a hydropower station requires thorough studies of geological lithologies, water drainage patterns, surface, and subsurface structures.
- The geological, structural configuration is essential to understand the strengths and weaknesses of the area so the project can be implemented in suitable terrain.
- GIS is used to process this data to show, for example, the hydropower potential of an area.
- GIS is used to layer additional data on the DEM such as catchment boundaries, drainage networks, and location of major habitation and environmental factors.

Applications and Importance of GIS

■ Site Selection and Evaluation for Power Generation



Wind turbine placement model considers wind patterns, environmental impact, elevation, transmission lines, and so forth.

Applications and Importance of GIS

■ Site Identification for Small Hydroelectric Schemes

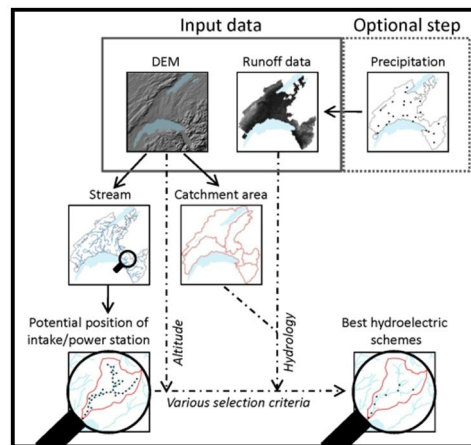


Figure adopted from Joanne Félix and Antoine Dubas

Applications and Importance of GIS

■ Network Viewing Solutions

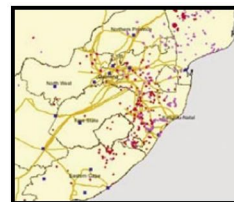
- Intelligently building a transmission line network requires precise planning, costing, scheduling, etc.
- Use GIS for selecting suitable areas, finding the optimum path, creating the profile analysis, engineering design of towers and wires, surveying support, and estimating costs.



Applications and Importance of GIS

■ Right-of-Way Solutions

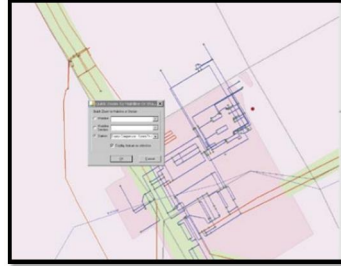
- GIS is used to manage right-of-way activities including planning and management, property appraisal, property acquisition, property/asset management, asset relocation, vegetation management, and corridor preservation.
- Use GIS to buffer and overlay right-of-way requirements for tower placement, query features to identify property owners and other land information, and perform geospatial analysis to direct tree-trimming efforts.



Applications and Importance of GIS

■ Asset Management Solutions

- By providing a geographically oriented view of the electric generation and transmission structures, devices, and network, GIS helps electricity generation and transmission utility managers visualize, analyze, and understand their facilities.
- The generation department can use GIS for tracking maintenance history of equipment in generating facilities.



Applications and Importance of GIS

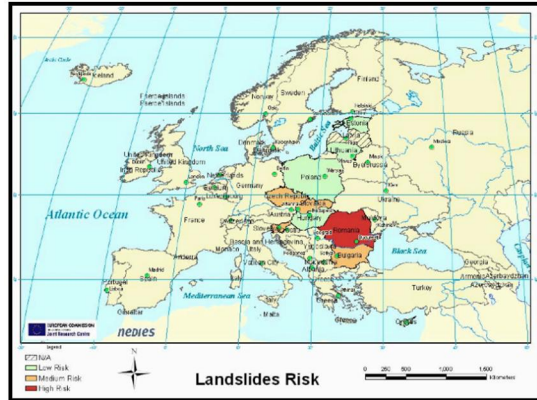
■ Land Management Solutions

- Utility organizations that accumulate land must perform the accompanying records and land management duties.
- GIS supports land data storage and organization, surveying, mapping, and more. The result is fast access to maps, comprehensive data, and reduced costs.



Applications and Importance of GIS

■ Landslide Risk Mapping

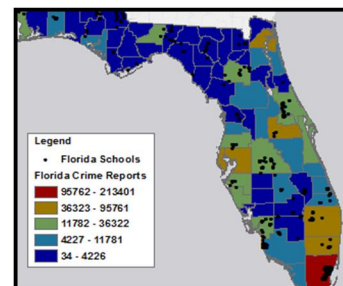
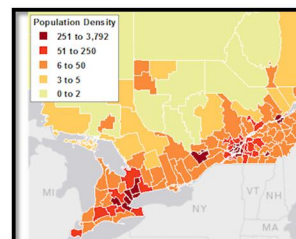
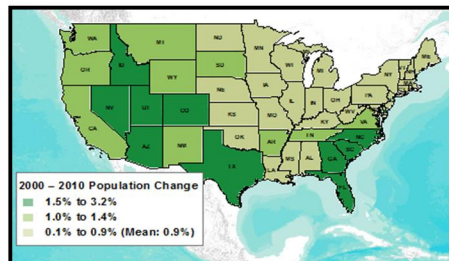


Using GIS Low risk, medium risk and high risk landslide locations can be readily identified and used while planning facilities such as transmission towers and other infrastructure.

Applications and Importance of GIS

■ Other Applications

- Population Analysis
- Crime Studies
- Many more



References

- ESRI
- QGIS Training Manual
- Harvard Mapping Division