Understanding GIS

- A geographic information system (GIS) is a system designed to capture, store, manipulate, analyze, manage, and present spatial or geographic data.
- GIS is a system that integrates hardware, software, and data for capturing, managing, analyzing, and displaying all forms of geographically referenced information
  - specific data types, data access methods and spatial data analysis methods, visualization of results
- GIS gives better picture and understanding of the real-world
- Organizations use GIS to solve problems and improve processes; spatial planning

Components of GIS

GIS integrates the five key components

- *GIS software and hardware*
- *Data*
- *People*
- *Policy and procedures /* methods of implementation



Components of GIS

Software and Hardware:

- **Hardware**: Computer and associated hardware used for data capturing and dissemination: GPS, digitizers, Scanners, Printers, plotters
  - requirement of GIS software
- **Software**: provides the functions and tools needed to store, analyze, and display geographic information
- Several GIS software are available
  - Free and Open source: QGIS, ILWIS, GRASS GIS, SAGA GIS, MapWindow, etc.
  - Proprietary software: ArcGIS (ESRI), GeoMedia, MapInfo, SuperGIS, IDRISI, etc.
- Decision is based on the institution requirement
  - Size of data handled; Cost of the software; Functionalities provided, etc.
  - day-to-day operating procedures and costs; staffing requirements and costs;
  - Maintenance costs; application development and cost
  - user training and costs; etc.

Components of GIS

* **Data:** is important part of a GIS
* The most expensive component of a GIS.
  * due to the high costs of data acquisition, especially using remotely sensing earth observation satellites.
* Building the database also takes a lot of time, and large amount of money.
* Implementing a Geospatial database requires planning and choosing the right information base for the particular application of an organization/business.

Components of GIS

- **The people**: transform the geographic/(geo)spatial data in a form usable by every one, the geospatial information.
- GIS is an interdisciplinary field that requires varied backgrounds of **expertise (the people)** depending on the applications in use
- **Policies and Institutional frameworks:** also important for a functional GIS.
  - The interest and willingness of decision makers to exploit GIS technology, and
  - The organizational setup for collecting spatial data, analyzing, and using the results for planning and implementation

Functionalities of GIS

* GIS Data input, storage and retrieval
* Data manipulation and analysis
* Data output/display or visualization
* Database management

Applications of GIS

* 80% of all data are related to a geographical position
* Nearly every problem has some component of location information
* GIS technology is used by a variety of professionals for a broad range of applications
* Users: Government offices, research organizations & academia, International/UN agencies, etc. for decisions support, planning, research, etc.

Applications of GIS

Examples of applications:

* Water Resource Management
* Land degradation, Land use and Land cover change
* Disaster Risk Management
* Climate Change Mitigation and Adaptation
* Food Security and Poverty Reduction
* Health and Telemedicine
* Land Administration/Cadastre,
* Socio-Economic mapping,
* Utility Management,
* Transport
* Media (e.g. TV: for Reporting, Marketing, Advertising, etc.)