Inter-Agency Coordination Turkey

INTRODUCTION TO MAPPING AND GIS FOR HUMANITARIAN USE

Emergency humanitarian maps enable the geographic visualization of life-saving objectives and act as a conduit for the communication complex information for a coordinated humanitarian response. This guide focuses on the introduction level GIS.

WHAT IS GIS?

Geographic information system (GIS) is a system designed to **integrate**, **store**, **edit**, **analyze**, **share**, and **display** spatial or geographic data. GIS applications such as QGIS are tools that allow users to create interactive queries (user-created searches), analyze spatial information, edit data in maps, and present the results of all these operations.

FUNCTIONS OF GIS

1. DATA CAPTURE

Data used in GIS comes from many sources, is of many types, and is stored in different ways. A GIS provides tools and methods for the integration of data in formats that allow it to be compared and analyzed.

2. DATA MANAGEMENT

After data is collected and integrated, a GIS provides facilities that can contain and maintain data. Effective data management includes: data **security**, data **integrity**, data **storage** and retrieval, and data maintenance.

3. SPATIAL ANALYSIS

Spatial analysis is the most distinctive function of a GIS when compared to other systems such as vectoral drawing software. Spatial analysis includes such functions as spatial interpolation, buffering, and overlay operations.

4. PRESENTING RESULTS

One of the most effective aspects of a GIS is the variety of ways in which information can be presented once it has been processed. Visual presentation is one of the most remarkable capabilities of a GIS, which allows for effective communication of results Traditional methods of tabulating and graphing data can be supplemented by maps and three-dimensional images.

5Ws for GIS

1. WHAT IS AT? (LOCATION)

This question seeks what exists at a particular location. A location can be described in many ways using, for example, a place name, postal code, or geographic reference such as longitude/latitude.

2. WHERE IS IT? (LOCATION)

This question requires spatial data to answer. Instead of identifying what exists at a given location, one may wish to locations where certain conditions are satisfied (e.g., a non-forested area of at least 2,000 square meters, within 100 meters of a road, and without slump; we are searching a camp location).

3. WHAT HAS CHANGED SINCE? (TREND)

This question might involve both of the first two and seeks to find the differences within an area over time (e.g., changes of the population figure over the last ten months).

4. WHAT SPATIAL PATTERN EXISTS? (PATTERN)

This question might be asked to determine whether over populated places are occurring in a pattern. It might be just as important to know how many anomalies there are and where they are located.

5. WHAT IF? (MODELING)

This question is posed to determine what happens if, for example, the rate of the population increase continues for a certain amount of time, how long does city infrastructure endure for such load. Answering this type of question requires both geographic and other information.

GEOGRAPHICAL DATA

There are two important components of geographic data:

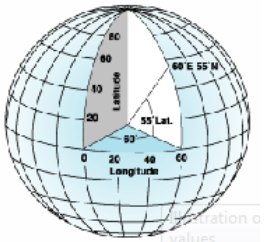
LOCATION (Spatial Data)

Location specifies the geographic position of a feature or phenomenon by using a **coordinate system**, defined by **Latitude** and **Longitude** or **X** and **Y**.

ATTRIBUTES (Properties of the Data)

The attributes of the data refer to the properties of spatial entities such as identity such as province name, land cover, elevation, population figure. They are often referred to as non-spatial data since they do not in themselves represent location information.

COORDINATE SYSTEM



Coordinate system defines the location of a point on a planar or spherical surface and it is a reference used to represent the locations of geographic features, imagery, and observations, such as Global Positioning System (GPS) locations, within a common geographic framework. Each coordinate system is structured by the 3-dimensional, geographic, 2 dimensional or planimetric framework.

A geographic coordinate system (GCS) enables every location on the Earth to be specified by a set of numbers or letters, or symbols. GCS uses 3-dimensional spherical surface to define locations on the earth.

A projected coordinate system (PCS) is defined on a flat, two-dimensional surface and has constant lengths, angles, and areas across the two dimensions. A PCS includes a map projection, a set of projection parameters that customize the map projection for a particular location, and a linear unit of measure.

GEOGRAPHICAL DATA MODELS

Spatial features in a GIS database are stored in either **vector** or **raster** form.

VECTOR DATA STRUCTURE

GIS data structures adhering to a vector format store the position of map features as pairs of x, y and sometimes z coordinates. Vector models can contain 3 different type of data, point, line and polygon.

A point is described by zero-dimensional objects that contain only a single coordinate pair, such as **province** or **district centers**.

A line is described by one-dimensional features composed of multiple, explicitly connected points, such as **rivers**, **roads** or **infrastructure networks**.

A polygon is described two-dimensional features created by multiple lines that loop back to create a “closed” feature, such as **administrative**, **international boundaries**.

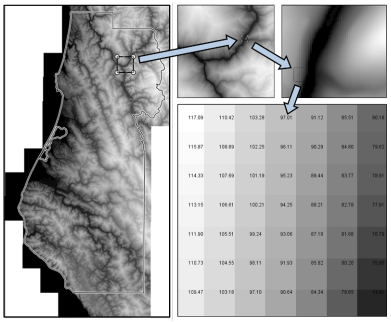
Point, Line and Polygon features

Vector format represents the location and shape of features and boundaries precisely. Only the accuracy and scale of the map compilation process, the resolution of input devices, and the skill of the data-inputter limit precision.

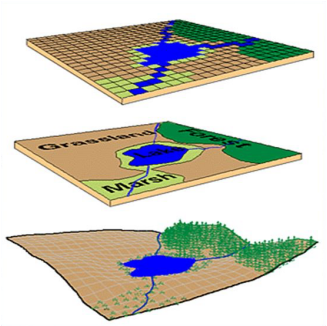
RASTER DATA STRUCTURE

Raster or grid-based format generalizes map features as cells or pixels in a grid matrix. The space is defined by a matrix of cells organized into rows and columns. If the rows and columns are numbered, the position of each element can be specified by using column number and row number. These can be linked to coordinate positions through the **coordinate system**. Each cell has an attribute value that represents a geographic phenomenon or nominal data.

Raster data mostly used for elevation, land-use, hillshade, remote sensing.



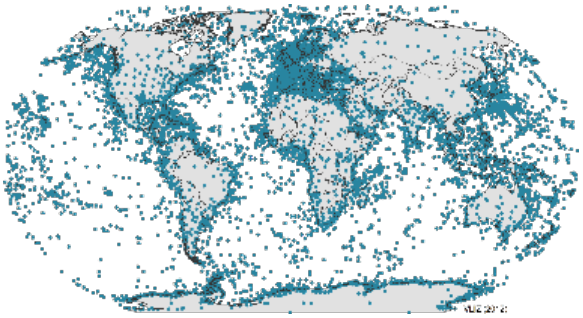
DIFERRENCES BETWEEN VECTOR AND RASTER DATA MODELS



In GIS, vector and raster are two different ways of storing and representing spatial data. While raster model has cells with an associated value and simplifying the reality slightly, vector model consists of individual points.

On the other hand, vector data is discrete, in contrast to the raster which is continuous. Both data model are answering the different type of data storage and representing.

On the left, there are 2 different representations of the same geographical location, one for raster (on top) one for vector (middle).



Vector (left) and Raster (right) data models representing Earth temperature.

MAPPING WITH GIS

GIS helps to represent the data from the **Real World** to an informative, understandable and accurate map with the help of mapping software. Our geography can be considered as a number of related data layers, as illustrated in figure. GIS software combines layers of information about a place to give an understanding of that place.

Which layers of information are combined depends on a purpose: for humanitarian example **administrative boundaries** of the provinces, and **central points** of these provinces changing sized circle by the refugee population.

A GIS stores information about the world as a collection of thematic layers that can be linked together by geography. In the strictest sense, a GIS is a computer system for collecting, storing, manipulating, and displaying geographic information.