Definition and Development of GIS

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Definition of Geographical Information System:

There are different definitions for Geographic Information System, each developed from a different perspective or disciplinary origin. Some focus on the map connection, some stress the database or the software tool kit and others emphasis applications such as decision support. Defining a GIS can be done by either explaining what it can do (Functions) or by looking at the components. Both are important to really understand a GIS and use it optimally. An analysis of the three letters of the acronym GIS gives a clear picture of what GIS is all about:

1. A geographic information system (GIS) is a computer-based tool for mapping and analyzing things that exist and events that happen on earth. GIS technology integrates common database operations such as query and statistical analysis with the unique visualization and geographic analysis benefits offered by maps — Environmental Systems Research Institute *(Environmental Systems Research Institute- ESRI).*

2. GIS is defined as a computerized system for capture, storage, retrieval, analysis and display of spatial data describing the land attributes and environmental features for a given geographic region, by using modem information technology *(Thurgood, 1995)*

3. GIS is a system of hardware, software, and procedures designed to support the capture, management, manipulation, analysis, modeling, and display of spatially referenced data for solving complex planning and management problems *(Rhind, 1989)*

4. GIS is defined as a decision support system involving the integration of spatially referenced data in a problem-solving environment. *(Cowen, 1988)*

5. GIS is defined as a powerful set of tools for collecting, storing, retrieving, at will, transforming and displaying spatial data from the real world *(Burrough, 1986)*

6. GIS is any manual or computer based set of procedures used to store and manipulate geographically referenced data. *(Aronoff, 1989)*

7. GIS is an institutional entity, reflecting an organizational structure that integrates technology with a database, expertise, and continuing financial support over time *(Carter, 1989)*

8. In the strictest sense, a GIS is a computer system capable of assembling, storing, manipulating, and displaying geographically referenced information, i.e. data identified according to their locations. Practitioners also regard the total GIS as including operating personnel and the data that go into the system *(United States Geological Survey- USGS).*

9. GIS is an integrated system of computer hardware, software, and trained personnel linking topographic, demographic, utility, facility, image and other resource data that is geographically referenced *(National Aeronautics and space Administration- NASA).*

Development of Geographical Information System:

GIS has experienced a huge development since its early days. With the popularization of GIS technologies, and thanks to the help of all other disciplines that use GIS and rely on it, the field of GIS has been redefined and expanded, especially in the last years.

We can locate the origins of GIS in the sixties, when the first GIS applications appeared. The two main reasons for this were the increasing need of geographical information and the appearance of the first computers.

The theoretical foundation of GIS was laid a few years before, with the development of new approaches in the field of cartography, such as quantitative cartography, which seemed to predict the future needs that the use of computers and geographical data would bring.

The first relevant experience that combined computers and geography can be found in 1959, when Waldo Tobler defined the principles of a system called MIMO (map in--map out), with the purpose of applying computers to the field of cartography. He defined the

basic ideas for creating, encoding, analyzing, and rendering geographical data within a computer system.

The first GIS was the CGIS (Canadian Geographical Information System). It was developed in Canada in the early sixties by Roger Tomlinson, who is popularly known as the ``father of GIS''.

In the mid-sixties, two applications, SYMAP and GRID, laid out the theoretical foundation for the analysis of **raster** and **vector** data, the two main approaches for encoding and storing geographical information (we will explain them in detail in the upcoming chapters). The main ideas for performing analysis in raster GIS were defined by Dana Tomlin with his **map algebra**.

During the sixties, the field of GIS starts developing itself from those seminal works. GIS is not anymore an experimental tool, and it starts to become and important part of the cartographic world.

From this moment, GIS evolves through several different periods, moving very fast thanks to the influence of many external factors. This evolution affects the discipline of GIS itself, the technology it involves, the data, and also the theories and techniques it is built on.

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