

GEOGRAPHIC INFORMATION SYSTEM: A MODERN TOOL FOR MAPPING AND MANAGEMENT OF RESOURCES

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A Geographic Information System (GIS) is a system of computerized information storage, processing and retrieval that has hardware and software specifically designed to handle georeferenced spatial data and corresponding attribute information. The spatial data are commonly in the form of maps, which may depict topography, water availability, soil types, forests and grasslands, climate, geology, population, landownership, administrative boundaries and infrastructure (main roads, railways, power grids, communications networks). The possibility of merging several maps in a single operation, known as "overlaying", is a key GIS function

Most sustainable development decisions are inherently multidisciplinary or cross-sectoral, because they require trade-offs between conflicting goals of different sectors. However, most natural resource development agencies are single-sector oriented. Geographic Information System (GIS) technology can help establish cross-sectoral communication - by providing not only very powerful tools for storage and analysis of multisectoral spatial and statistical data, but also by integrating databases of different sectors in the same format, structure and map projection

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in the GIS system.

The importance of this integrated approach to development and management of natural resources have been emphasised in many international fora on sustainable development. The 1992 United Nations Conference on Environment and Development (UNCED) devoted Chapter 10 of its Agenda 21 to this topic, noting that : "...Expanding human requirements and economic activities are placing ever increasing pressures on land resources, creating competition and conflicts and resulting in suboptimal use of both land and land resources. If, in the future, human requirements are to be met in a sustainable manner, it is now

essential to resolve these conflicts and move towards more effective and efficient use of land and its natural resources. Integrated physical and landuse planning and management is an eminently practical way to achieve this. By examining all uses of land in an integrated manner, it makes it possible to minimise conflicts, to make the most efficient tradeoffs and to link social and economic development with environmental protection and enhancement, thus helping to achieve the objectives of sustainable development. The essence of the integrated approach finds expression in the coordination of the sectoral planning and management activities concerned with the various aspects of land use and land resources."

This provides a general introduction to Geographic Information System technology, explores some of its most common applications (including FAO's use of GIS), and supplies a page of links to digital datasets available worldwide.

The importance of GIS as a unifying means of handling geospatial data, including often mandatory inputs from remote sensing, warrants an extended explanation of how it works and what it does. This is the subject of Section 15. In Section 1 you will learn how computers with appropriate software are an essential part in processing, manipulating, and integrating data such as is the output of Landsat and other systems. It is safe to say that today, without computers, remote sensing from space would be next to impossible.

Geographic Information System has immense possibilities. It is one of the most talked about technological fields that incorporate graphical features with tabular data in order to analyse real world problems. It all started in the sixties with the discovery that maps could be programmed using simple code and then stored in a computer allowing for future modification when necessary. In the days of hand cartography when maps had to be arduously created by hand, even small changes required the creation of a new map. The earliest version of GIS was known as computer cartography and involved simple line work to represent land features. This made way for the concept of

overlaying different mapped features on top of each other to determine patterns and causes of spatial phenomenon.

At the simplest level, GIS can be thought of as a high tech equivalent of a map. However, not only can proper maps be produced far quicker and more efficiently, the storage of data in an easily accessible digital format enables complex analysis and modeling not previously possible. The reach of GIS expands into all statistical method of analyze attribute and geographic information. The end result of analysis can be derivative information, interpolated information or prioritized information.

Gautam says, "as there exists a perceived gap between industry and academic in IT/ Technological education, the same applies to GIS. This sector has enormous utility and can be successfully utilized in municipalities, pollution control, environmental issues, gram panchayats. GIS is an effective tool to enhance efficiency and productivity. However, it gives me no comfort to say that much needs to be done to employ this tool exhaustively. It is an extremely focused area. The institutes imparting courses related to GIS need to play a proactive role in creating awareness for its utility. We must come alive to the need of a dynamic situation of the future.

Applications of GIS technology:

An easy way to think of how GIS can be applied is to think in terms of the questions that the user might want answers to. As has been mentioned, one of the first steps when setting up a GIS is to survey the potential users to determine their information needs, and to identify those needs that can best be met by GIS - incorporating various combinations of data retrieval and transformation.

The ultimate use of GIS lies in its capability for modeling: constructing models of the real world from digital data bases, and using these models to simulate the effect of a specific process over time for a given scenario. Modeling is a powerful tool for analysing trends and identifying factors that affect them, or for displaying the possible consequences of planning decisions or projects that affect resource use and management.

At the continental level, for example, terrain maps can be combined with hydrologic maps and climatological data to produce maps of land suitability for various types or intensities of use, or specific crops. Demographic and administrative data can be added to provide projections of future supply-and-demand scenarios by region or country.

At the national and local level, possible GIS applications are almost endless. For example, to decide on the best potential sites for growing a certain cash crop, the agricultural planner might use geographic data bases combining soils, topography and rainfall to determine the size and location of biologically suitable areas, and then overlay this with landownership and transport infrastructure, labour availability and distance to market centres. Further, he or she could then change the characteristics of various attributes over time to determine the probable impacts of changing circumstances, such as the effects of a drought, the rise or fall of domestic or world prices, or the development of additional roads.

Applications of GIS to fisheries can take many forms. However, it is convenient to categorize them first of all as applications in capture fisheries and in aquaculture. For capture fisheries, GIS can deal with the spatial aspects of the three main fishery "realms", both individually and collectively - the environment, the fishery resources and the fisheries. GIS, using information from a variety of sources, including passive and active remote sensing, can predict where the fish will be, can be used for management, control and surveillance (e.g. monitor fishing) and can optimize fishing operations such as trade-offs between distance to fishing grounds and markets.

In aquaculture, GIS has been used to forecast development prospects using suite of parameters that vary geographically. Basically, this kind of application reduces to two broad questions: a) what is the suitability of any given area for the culture system (e.g., soil suitability for the construction of fish ponds) and b) what is the suitability of an area for fish growth (e.g. favourable temperature regime). Another GIS application is for the

management of expanding aquaculture in the context of other, competing uses of land and water. The pertinent question here is: How much is too much?

Forestry planners can use GIS to monitor the impacts of deforestation, and to plan the timing and type of timber management practices based on information on soil types, species requirements, growth and yield, and even to assess the visual impacts of timber harvesting in sensitive scenic areas.

The wildlife manager can use GIS to determine the size and location of animal populations, to map supply-and-demand relationships to meet consumption needs, or to determine areas having high food and habitat potential for specific species.

In summary, what the GIS provides is a means of converting spatial data into digital form that can then be displayed, manipulated, modified and analysed and reproduced quickly in a new format, available for either visual display or hard copy reproduction. Conventional (paper) maps, in contrast, are time-consuming to prepare manually, and the display and analysis of changed data or the comparison of more than one set of map data (soil and vegetation, for example) requires additional manual labour.

The digital data can also be easily transmitted from one user to another or from one GIS to another merely on disk, tape or by the Internet. As digital maps come into wider use, the cost of digitizing can be shared by many users. In fact, some digitized maps on CD-ROMs cost less than the same maps on paper. As networks and libraries of databases grow, information exchange should reduce the need for redigitizing regional or national maps and other geographic databases that are in common use.

Which are the industries that require services of GIS Professionals?

GIS is important to almost every sector. Be it the army, FMCG, Oil mining, Telecom. Wireless technology; municipalities, media, GIS is crucial. It is an essential mapping and analytical tool for any kind of data that is of relevance to the Industry.

What is the ideal career path of a GIS professional?

First is digitization, which is usually done by fresher then is analysis which requires augmentation of the map with relevant data. Another important aspect is the creation of relevant GIS software so that data can be accessed in a customer friendly fashion. An average user seldom knows whether it is GIS information that he or she is accessing. All that one is concerned is some information which one needs to access for a particular reason - lets say the data on circulation of news dailies in a particular area by a media house. Proper software has to be designed for the customer.

Why GIS as a career choice?

It is a career that is Recession proof – the planning and development sector continues to grow, regardless of economic conditions.

It is a career with the shortest gestation. For the bright young graduates emerging from the colleges of India who cannot take the tortuous path of spending huge sums on everyday obsolete computer courses this seems to be an opportunity to take on the world with one composite course in just 3-4 months and reap the benefit of being in the high growth GIS career forever.

GIS professionals are in tremendous demand in a GIS industry. In future it will be in every sector be it government or private business or planning. A career that will travel with you- GIS professionals are in demand all over the country. Your skills will open doors for you any where you choose to live in India. There is also a huge demand for GIS professionals abroad.

Who can aspire to be GIS professionals?

Any graduate and even under graduates who have some knowledge of mathematics and geography (higher Secondary level) are eligible for this career. The most important part after this is the requisite training so that the individual is capable of handling GIS software and analyzing them at the same time. It also involves decision making capabilities and thus generating reports also. Training one again is the key to a successful career.

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