

Remote Sensing and Geographical Information System: Impact on the State

Introduction

The greatest challenge faced by engineers, decision makers, managers and planners is the assurance of land sustainability (for rural and urban lands). Concerning the food provision, education, social services, health, transportation (rail network and roads), exploitation of natural resources, development of infrastructure, industrial development, telecommunication, population control, and environmental protection for accelerated development of a country and its effort to recover its economy without the destruction of the environment for future generations, the land sustainability is one of the key elements of the modern society development. The surfacing and modern technology use of Geo-information has been considered useful in environmental information development, and database for land management as a tool for sustainable land and information development for the environment, which include the rural and urban lands. If the infrastructure of a town is old, or not developed adequately, or is under increasing pressure, it can not be measured with the help of advanced technologies (Abiodun, 1993, p. 22), thus reducing the town economical capacity. The sustainability of an urban area is correlated highly with the capacity of natural resources of the environmental system. Development that is sustainable over a long term cannot be feasible where the environment is deteriorating. At the same time, unmanaged and unplanned urban growth can lead to the destruction of natural resources. The pressure of population on environmental productive capacities, have in past cases lead to the creation of environmental refugees through displacement. In recognition of the above-mentioned means of development, The United Nations Center for Human Settlement (UNCHS), Environmental relationship launched a global project, aiming to handle the challenges of urban development sustainability. Thus, the need for the digital maps of

various selected towns or cities of the world emerged. The importance of remote sensing and geographical information systems is in enhancing the development of towns and cities all over the world.

One of the basic reasons for the rapid expansion of Remote Sensing (RS) and Geographical Information System (GIS) in the world include the need for special data knowledge to enhance decision making. The tremendous success of the RS and GIS systems also owed a lot to the fact that English was an international language; it must be mentioned that the internet expanding capabilities also played their role in establishing the RS and GIS systems. Knowledge of the impact and use GIS is vital, and the most important in the application and understanding of GIS in disciplines that are traditional. Though the local needs of institutions differ around the world, courses on GIS, to an extent are becoming global. For example, various universities around the world are using the core curriculum on GIS developed by the University of California. In addition, international universities are specializing in GIS, thus, helping UNIGIS overcome political, cultural and other boundaries, and develop the Internet communication, making the WorldWideWeb a global assess tool. Applying the globalized approach to the cyberspace, with learning at distance as one of its roles, more institutions are what GIS offers, including all degrees one can get and courses one can take. The Internet also has played a role in up to date information flow; for example, students in developing countries in the past, were dependent on source that were out dated to obtain GIS/RS information. Today, information's that are current can be obtained within minutes. With information at finger tips state department can assess information at ease to enhance decision making and this will in turn propel the development of a country.

GIS and RS Penetration in the UAE Market

The United Arab Emirates (UAE) were established in 1971, and are currently composed of seven emirates, making a federation with an area of 83,600 square kilometers, its population being approximately three million with a 6.5 % growth rate annually. To meet population growth, and attain development that is sustainable, UAE is moving towards the use of GIS and RS. The first step in resource management is data availability. However, there are numerous advantages of data in digital form, one of which is easy to manipulate and manage. As a result, one can achieve an efficient leading position in relatively little amount of time and, hence, with minimization of costs required to generate a product. The UAE lack land use data and RS seem to be a perfect example of data source for the UAE. The availability of satellite data from ENVISAT, ERS-1-2, and SPOT, as well as satellite from commercial imagery, such as QuikBird, has played important roles in the development of the state. Based on use and developing need, special GIS and RS labs have been built throughout UAE by various agencies. These are used for land mapping, water and electricity management, oil exploration, sand dunes delineation, and the management of telecommunication. This has enhanced the decision making in the various sectors, and thus the growth of the UA, which is an important factor militating against the penetration of GIS and RS in the UAE in the economy. The oil revenue places the UAE is currently in a position better than those in the other developing countries due to the GIS and RS infrastructure. However, GIS and RS diffusion is not equal in the UAE (Crystal, 1997, p. 24).

GIS and RS in Education in the UAE

More colleges and universities each day seek information on how to start GIS and RS programs, created to enhance the development of the UAE. Another reason concerns the developmental issues, namely, the upgrading of education technologically,

the need to identify new funding sources, the demand for more professional approaches for the sphere of education.

Emirate Telecommunication Cooperation

Since Emirates Telecommunication Corporation was established, it has succeeded in UAE transformation as one of the most advanced countries existing in today's world, in terms of telecom services (Baker, 1998, p. 43). The launching of Asynchronous Transfer Mode (ATM), Etisalat work majorly is of geographic origin. For example, one has to know the location of telephone lines, fiber optics lines, switches, radio/ television stations for better head-office coordination. GIS history in Etisalat has existed since 1989, at the introduction of graphic data systems (GDS). There was an adoption of these systems in all the branches, and now almost all the engineers know the basics of the technology functions, which include displaying Etisalat network graphically. The jobs potential for the graduates for GIS in companies like Etisalat is very high (Crystal, 1997, p. 23).

Remote Sensing and Fishing in Chile

Along the coast line of Chile, swordfish is one of the most valuable species and is the source of revenue for artisan fishers. Climatic conditions affect many of these fish, and seasonally the latter are found in the areas where the surface temperature of the sea varies by just a few degrees alongside thermal fronts. In order to locate the fish, thermometers are used by fishers as well as water colour check to locate phytoplankton, since the latter is the main food of the fish (ADWEA, 2003, p. 23). As a rule, the operation of sea inspecting takes about two or three days. 40% of the operating cost is spent on prospecting. A simple method was developed by Researchers; the newly adopted idea demands that maps that are timely to assist in fish location should be produced. The project, tagged SATAL, makes use of data in map

preparation of the likely location of the fish. The use of maps has enhanced the number of fish catch, and the season for fishing has also increased. The revenue of the fishers has changed as a result of the use of maps, in addition to the vast experience the fishers gained (Burrough, 1998, p. 78).

Maps Impact

Better opportunities have been created as a result of allowed access to the technology for communities. There can be no doubt that if the technology would have been made available only to large companies, the mankind would have suffered great losses. Over the last few years, the use of remote sensing has spread in Chile. In addition to the recently acquired satellite tracking station by SATAL project, a number of communities had an increased interest in discussing fishing topics as a result of the SATAL bulletin. The involvement of fishers in project work, such as the gathering of data, helped in building the capacity of the fishers and extending the nation, as Hastings (1991, p. 56) asserts.

The use of GIS and RS for District Administration

The technology of information based on GIS or RS, has an important role to play for, interdepartmental preparedness, information sharing, optimize response, post event recovery, mitigation, and planning. Accurate, reliable, and offering meaningful information remain one of the most important components when it comes to management efforts. The data collected from satellites is suitable for the implementation of development schemes and monitoring temporal variables at varying scales. In the recent past, spatial analyses were carried out with the help of satellite images of different resolutions. With the present satellite images that are of high resolution, more detailed features can now be observed on the ground. Monitoring and managing

possibilities resources at farm level, is now a reality. Frequent data are integrated with other source data to meet requirements of application (Baker, 1998, p. 45).

According to Loveland & Belward (1998), considerable effort has been made by Maharashtra state so that the developmental activities undertaken could have a positive effect on the situation. With modern technology used to enhance management efficiency of natural resources, and administration support in the state, in the last decade, the Maharashtra Remote Sensing Application Center (MRSAC), has pioneered the utilization and promotion of GIS and RS for the mapping of natural resources, which is already a great success. For proper drawing of the appropriate action plan based on ground implementation, the general information from remote sensing generation is required. Predetermining socio-economic relations, the infrastructure described above might prove the most efficient and adequate means for enhancing the national well-being (Longley, 2003, p. 67).

Today, the database has been generated on natural resources by MRSAC on 1:250,000 and 1:50,000 scale for the Maharashtra state entirely. Themes on land use including soil, land cover, water sheds, drainage, hydro geomorphology, network of transport, and administrative boundaries are stored in data bases. Currently, MRSA has completed map database on geo referenced village. Since the databases can be operated in the environment of GIS (Baker, 1998, p. 12), it is feasible and easy to transfer the proposal of planning on village maps. The given database is important for water and soil conservation, watershed treatment, targeting ground water and impact assessment monitoring, besides the use for supporting the administrative system. The databases of the resources are archived at MRSAC data warehouse that can be accessed from the Internet (Longley, 2003, p. 67). One of the most Satellite images of high resolution are used for planning and monitoring of urban areas in the state of

Maharashtra state, with reference made especially to slum area monitoring, database generation on various facilities, and civic information development.

Abu Dhabi Water and Electricity System (ADWEA)

The department of water and electricity was established in 1966 by the Abu Dhabi Government. Its function was to provide reliable and safe water and electricity for its citizens, which was done to promote economic and social development of the Abu Dhabi Emirate. The electricity and water Department as of 1996 grew to a capacity of 3000MW and desalinated water of about 200 millions gallons. The electricity and water department in addition has employed a support and technical staff of about 20,000 employees. The Abu Dhabi Water and electricity authority in 1998 was established. The principal objective and goal of the ADWEA is the electricity and water industry privatization. The benefit of GIS has been recognized by ADWEA, and by 2002 the recognition resulted into GIS real project. 160 processes of business are addressed by the GIS project (Abiodun, 1993, p. 40). 25 offices were involved in the initiation, operation, design, maintenance and activities of the administration of the electricity and water transmission in the whole of the emirate. The Redlands Institute asserts that this venture cost US \$14 million, 180 contractor, 240,000 person hour. As a result, fourteen-month fast track project is one of the most comprehensive and aggressive utility enterprise implementation efforts ever undertaken anywhere in the world, according to what Hastings (1991, p. 32) says. These are the examples of the software used, ArcInfo (18), ArcSDE (1), ArcEditor (60), ArcIMS (1), and ArcView (105) (Hastings, 1991, p. 23). Presently, a special data base used for the water system and electricity network and users GIS application are made available at other authorities in water management.

Dubai Municipality

Virtually every UAE municipality, are starting to implement GIS. An example is the Dubai municipality, it was chosen after considering the GIS licenses number and GIS progress. Dubai municipality currently has Micro Station, Geomedia, MGE, in addition to other products as (ArcSDE (1), ArcInfo (2), ArcView (8), Arc Editor (2)), managing about eight computers. The basic Municipality use of the GIS is in updating master plans and utilities and mapping (Baker, 1988, p. 45). The latest technology is used by the municipality in mapping, the Continuous Operating Reference Stations (CORS) systems that help, engineers, surveyors, scientist, and others to make position of points for which data has been collected (Crystal, 1997, p. 34). The new technology has helped considerably the Dubai Municipality in eliminating the traditional land record keeping methods in paper files; and updated reliable data is kept in digital formats.

Dubai Municipality GIS is not limited to hard copy traditional products, but has transformed to a web-based GIS. The Dubai municipality GIS center has developed the GIS system that is online based (Crystal, 1997, p. 21), with the ability of pan, zoom in and out, hotlinks and info. The ability to search community by community, building and street number is an added ability. The classification of the search, is based on the type of needed service, for example, find a facility (hotel, bank), locate address, or locating a place. Not only the location map of the facility is provided by the system, but also the facility photo, facility address and other nearby facilities. Another major site advantage is the view provided by the X and Y coordinates of the facility under search, and aerial registered photographs with the maps and Arabic language support. With hand-held GPS receivers, pinpointing a location using X and Y coordinates is now becoming a part of everyday reality (Hastings, 1991, p. 89). Therefore, if the coordinates of a certain facility are found by a user, the GPS receiver can be used to identify the facility easily.

Conclusion

The UAE are a very good example of a fast-developing country, and GIS and RS are enhancing or contributing to the enhancement of this growth. Degrees in GIS and RS are offered by a number of universities in the UAE. And there is evidence of more degrees of such kind to come, which is the result of recognizing the new technology as a promising one. Though the expansion attempt of GIS and RS faces constant challenges, local resources, resource sharing and developed nation's sponsorship have been employed as measures to comb these hurdles. It is right to state that RS and GIS can contribute effectively to the development of a number of nations.

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