

Using of Geographical Information System (GIS) as a Tool for Supporting the Management of the National Economic Resources

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ABSTRACT GIS (geographical information system) are commonly used as planning and analysis tool in industrial countries, that is because GIS are important technical tool in the current information systems so, this tool takes a wide interesting from the user to manage m analyze and support the process of decision making in different sectors as, transportation, health, marketing, agriculture, environment and natural resources .However, GIS have a critical role in supporting the decisions of nature resources, all role these encourage the researcher to conduct the role of GIS in supporting the management of national economic resources.

I. INTRODUCTION

The concept of continuous improvement increases the importance of economic, social and political for the economic resources as the amount of the country incomes which is the most directions of the economics improvement. The mental and environment resources management maintain the resources and develop it, and improve the accounting that available through close them. Putting the plans which distribute them in its different uses and putting programme to improve and develop these resources. Also, take all the progress to organize and control the uses of these resources and utilize them in the best way. All of these procedures to protect them from dangers which destroy them and lose less without making any negative effect upon the environment. Therefore, Its necessary to find different information and qualitative and quantitative data about the resources and any other information that related to them, and to rely on appropriate tool in the steps of gathering, analyzing, treating and storing these information which could support the process of managing resources, by good information which lead to improve the performance of these process, and help in taking the right decisions.

While the (GIS) are one of the most important tools of information technology which have a wide uses, we can take a look at the role that can be played by this system in term of enhancing the resources management. Because it is one of the most important polices of sustainable

development, which the government used to face a lot of vision of uses in producing information and support the national information system in Jordan through the following points:

- 1 the importance of resources management in development
- 2 system of information geography and management of the national resources
- 3 visions of using the style of (GIS) in producing the information in Jordan.

II. THE IMPORTANCE OF THE RESOURCES MANAGEMENT IN THE DEVELOPMENT

First: The Concept of Resources

Resources mean the utilities which come from the result of interaction between the natural economical and human environment. Utilizing these resources make the process of the interaction between ground and human in the economical activities, such as; agriculture, irrigation, hunting, industrial etc.

Resource is a fund that has economical value and creates utilities by its uses. The total balance from one resource in a period of time is constant while the goods and services which produced by this resource are considered as a current. For example, all the resources inside the ground and its surface are constant, while the agriculture product and industrial are considered variable resources, changed with time.

Saleh (2002) reported that to economize the

resource people must employ capital and technology to exploit the natural resources. In other word, the economic resources are the final result of the interaction of people (work), earth, and capital.

Haroon (2002) observed that the economic resources consist of three excellences: scarcity, variation uses and the ability of being mixed by different rates to produce different goods. Scarcity means the disability of the available resources to satisfy people needs. We can see this by comparing between the available resources and the resources that need to satisfy the people wants. Variation uses means; what the economic and services resources are characterize. Variation uses depends on two factors which are: the specialization range, and the technological progress. We can see the use of petroleum product to produce a mass of goods like; Gasoline, Kerosene, and other goods that use as sources of energy. Also, we can see economic resources have ability of mixing by different rates to produce goods and services, through the goods that required mixing the resources by constant rates which not available to change.

Second: Managing Resources and Development

The economic policies did not concern about the environment considerations, until the appearance of continuous development (C.D.) concept, which appears at the first time at Stockholm conference in 1972, which talked about the human environment, through what the document of conference indicate of the necessity of putting the ecology among the improvement policies and the uses of the natural resources in the way which assure its existence and its continuity to the next generation. Scally (2006) reported that complex environmental challenges increasingly demand sophisticated solutions. GIS for environmental management determines the ways that GIS is fulfilling the need of humanity to better manage, protect, and preserve the environment.

Also, the conference of earth in Rio Janeiro in 1992, and the international conference about the C.D., in 2002, in John Asburg, all of them assure that the C.D. is an important step in order to avoid the environment deterioration. Al-Sheikh (2002) observed that if the development dose not achieves the environment conditions as well as the human needs it will not be a good improvement.

Maintaining the resources and the environment has to be in the first development priorities, which have to gather its policies in order to treating the scarcity and resources limitation by the continuous maintenance of these resources as developing it from one side and remedy of the environment effect on development, by best utilizing of these resources from the other side. Lang (1998) reported that as global population continues to grow, human must learn to balance consumption and conservation of the plant's scarce commodities. GIS technology brings anew perspective to the challenges faced by natural resource managers: how can agricultural yields are improved without depleting the soil? Where timber should be cut to best protect endangered species? How can landscapes be after the extraction of oil or minerals? What can be done to keep development from choking rivers and coastlines with site?

The continuous maintenance of resources is achieved by managing them in the best way through all the procedures that allocate the available resources, and planning, organizing and controlling the way they can be used. Availability of different information and data, about resources and the problems that face them, could be essential for implement the procedures for managing these resources.

Following the problems that belong to natural resources:

1. Allocate the resources and determine their quantities, also, classify them and study their life cycle.
2. Show the present and prospective uses of the resources.
3. Design studies and researches to develop resources and reveal of the new uses
4. Control and Assess Risk: This can be done by controlling and organizing of methods of utilizing the natural resources. To study the dangers that could destroy them and also to determine its negative use
5. Assess and control the structure of the resources management this can be done by appraising the present structure and the availability of creating new structures.
6. The Environmental Assessment: by studying the activities effect of the resources management and economic projects that used for the resources by Ecology systems; that is the impact of these activities on the

environment and its negative impact on it. Also, this study helps monitoring the pollution and trying to reduce its effects.

7. The Economic Assessment of the Resources: by analyzing the return and cost of using resources by comparing the economic return with its using costs which comes from the onus of losing the resources adding to it the expenses of the of environment protection programme, from the result of pollution effects which causes by the uses of these resources. This analysis can be used to determine the costs of the environment protection programmers and the cost of allocating the resources, all that can achieve keeping the environment saved in one side and to achieve rates of development target by achieving more benefit from using these resources from the other side. Maantay and Ziegler (2006) observed that GIS for the urban environment focuses on the use of GIS in urban planning and problem solving, and is aimed at both large and areas. It will be of interest to all parts who want to learn more about how they might apply GIS to their daily practices, be they in urban planning, public health, urban environmental assessment, risk and emergency management, geographical analysis, or sustainable community development. It will become analysis, or sustainable community development.

IV. GEOGRAPHICAL INFORMATION SYSTEMS (GIS) AND RESOURCES MANAGEMENT

The beginning of the sixties witnessed actually use of the (GIS) in Canada and the only use of it is to store data. Then continuing to develop these systems to improve the effectiveness and quality of the information that produced specially after the continuous development which the world witnessed in the last two decades of twentieth century in technology.

Today these systems have a critical role from the users of information technology, as an effective and strong device to manage and analyze data and to enhance decisions. Also, it has a wide use while it was still limited in some fields, and it start to be used in many different fields such as; health, transportation, agriculture, business administration, and geomarketing.

Before talking about the role that performed by these systems in the field of resources management, we have to understand the concept of these systems and the requirements of its working and its activities:

1. The Concept of Geographical Information System (GIS), and the Requirements of its Working: Geographical Information System (GIS) define as a technique uses computer to gather, enter, treat and analyze the descriptive data which connected by geographical reference and transform it to information suitable for its users.

These systems require the following:

- A) *Physical Resources:* These are presented by the equipments used for systems working and the devices that needed for linking with the information resources.
- B) *Human Resources:* There are two kinds of human resources:
 - 1 Specialists: Such as programmer, controller of the system, manager at the data basis, cartography, and the topography.
 - 2 The final user of the information which produced by GIS.
- C) *Programming Resources:* These consist of the programme which helps dealing with the Information system (IS), in the computers equipments. It can receive the data, information and demands. Also, give the chance to control the data and analyze it then transform it to different forms, pictures and maps .

There are many programming used by GIS such as MAP inf.(Mapping program to find directions), MAP point(Mapping program to find directions), ARC inf., (Archive Application Framework), ARC view, (Archive Application Framework), ER-MAPPER, (Earth Resources), and ENVI. (Environment for visualizing images) Also, the programming that use the model Vector or Raster such as; IDRISI, (A software named after the name of a Muslim scholar Abu _Abdullah Al_Idrisi, developed by Clarks Lab) and (Geographic Resources Analysis Support System).

2. The Data in (GIS) and its Resources: Sale (2000) reported that GIS consists of many phenomenons, and each phenomenon connected by a huge data and information related to it, which either at the same place or descriptive information. The first one clear out the relation of this phenomenon in term of place, which

means clear out its geographical location? While the other is descriptive information of this phenomenon, like its form, height, color, and ...etc., it could go beyond this by describing its qualities or effects on the other phenomenon even to do mathematical processes such as the number of the phenomenon's factors and its size or any other statistical information .

GIS Data can be Classified by

1. *Geographical and Environmental Information:* Such as data that determine the geographical location, cartographic data, and data of topographic maps and others that related to natural resources and other environment systems. The environmental data model incorporates geologic, hydrgeologic, hydraulic, and contaminant information that our geographic information system (GIS) analyzes and visualized maps such as:

- aquifer vulnerability
- hydrostratigraphic cross- sections
- interpreted geologic surfaces
- groundwater recharge flux
- potential contaminant sources

2. *Economical and Social Information:* that pertain population, construction, communication, health etc.

Sale (2000) observed that gathering locative and descriptive data about the phenomenon, or the other phenomenon can be classified into four categories.

- a) *Writing Resources:* These are
 - Statistical (population, constructions, agriculture, industrial, telecommunication).
 - Documents, reports, advertisements, and government prints.
 - Books, references and scientific letters.
- b) *Documentary Sources:* This include
 - All kind of maps such as topographic, details, geology, weather.
 - Atmospheric photographs in different measurements; white and black colored
 - Spectrum electro magnetic; prints, different measurements in count and clarity, it could be like paper picture or recording on mixing maps.
- c) *Field Studies:* This happened in:
 - Purpose of gathering data and information about the studies phenomenon and that comes through observing and gathering information, photographic and questioners.

d) *External Resources:* this includes the information nets which provide a big amount of information like internal information that provided by academic and government departments and libraries. Also, external information likes the one that established by international organizations or by internet.

3. GIS Activities

GIS consist of four activities:

A) *Data Entry:* After determine the descriptive and the locative data that needed for the system users, it entered with using some tools like:

- Scanner or digitizer to transform the traditional maps to digital maps.
- Mouse and key board, and disks.
- Atmosphere photo and using a system to define the locations (GPS) through communicating by spot land sat.
- Environmental observation equipments.
- The connection between the internal and external information

B) *Data Processing:* These include - gathering and analyzing data and ensure its, correction, and clarity of errors, classify it in order to transfer it into the required information as a programs developed.

C) *Data Storing:* All data store in a way, which is easy to get back to it when it is necessary. Storing instruments must have a wide memory such as: Hard disks, and Magnetic Disks.

D) *Output and Show Data:* the output is the final process of the (GIS) which represent the outcomes that being achieved, after implementing the previous processes. All data comes out in many pictures; and these are the (maps, forms, and lists ...etc.). The output could be done through the color display, on disks, maps, laser printer or reports.

In the maps case must consider the necessary and technical things in the maps as (measure, graph title, slides, keys, symbols and others). It could show the maps in the information geography in different techniques as:

- Data pattern that accrue with the coordinate (X, Y) or the initial data which present metric of point.
- Layers way, which shows each layer with

the geographical distribution for the information with different nature within the pattern of (vector or raster).

- the technique of dish of the industrial satellites, with their three dimensions, the most use in term of showing and analyzing the data that include vertical and horizontal form; an example for its use is the findings of oil, exploring metals and in the weather forecasting.

4. The Role of (GIS) in the National Resources Management

Jordan has huge natural, human, and economic resources. These resources are different and play a critical role in the national economy, then in the development process. These resources require a good consideration, care and big efforts in order to achieve best utilize and continuous maintenance. We can see the role of GIS in improving the national resources management and support it through many aspects:

Data Management: GIS contribute in construct an information digital base geographical feed-back about resources which have which have different and continuous needs of information to manage these resources and to support the decisions that related to them through: a) the ability of assimilation and storing a huge amount of data. By gathering data and process it in the way that make the ability of going back to it at any time. This can save time and efforts that will waste.

Seeking for the information in the documentary statement with flexibility responding the changeable management resources and adapt with it.

- The ability of reviewing data and conform it to the original to recognize the errors and correct them in the fast and easy way, to be more accurate.
- The flexibility in entering a new descriptive and statistical data or by removing previous data.
- The ability to update data and renew it, especially the one that change every time and require reviewing and updating all the time.
- The ability of showing different collections of data at the same time.
- The ability of linking with external data base (Net Working).

Emit the Objective Maps: The objective maps presented at the geographical maps, which prepare in order to show of geographical distribution for at least one phenomenon. It could be statistical if it translate geographical information resulted from searching processes or gathering statistical according to certain area, also, it could be descriptive if it determines positions of natural phenomenon, or economic structure, and it become systematical when determine the uses of lands for example.

Introducing the objective maps is one of the most important fields that shows the role and importance of the GIS in improving the performance of resources management process by looking at:

- GIS, could show a huge and various information connected by direct or indirect way with the resources by signing at the geographical maps which prepared by programs promoted for this purpose. In the other side we find an activity of the special associations in preparing maps is limited for the number of a certain maps, and for limited period of time that satisfy the resources management needs .
- The way of (visualization) of the locative and statistical information on the maps which is composed by these systems, in showing a clear vision better understanding for the qualities through the visual and digital analysis to contribute rationalization in using the resources and saving time that use for making decisions. Whereas the information in the maps are more important from that in the written reports.
- GIS, have the ability of updating objectives maps by introducing new maps for new data and new information.
- GIS also, contribute in reducing the cost of developing the maps by minimizing the time used and save a lot of its productions expenses, as they prepared automatically. Also, GIS help preparing maps that have less errors comparing with the errors in the conventional maps that caused by people or by using it frequently.

Statistical and Locative Analysis and Support Decisions: The strength of GIS appears through the ability of statistical and locative analysis for the information that relate to the

geographical position; where GIS are important tool and, for analyzing and casting the future changes. In this way they accomplish of the management of resources, and save time and efforts that needs for selecting and analyzing data which support procedures of planning, organizing and controlling of resources. There are some examples of analysis process kind that comes from these systems in order to serve resources management: -

Using the Query Languages: That help gathering data, and to replay for these query that present in resources management to support the decisions which either concern of determine the appropriate locations for building future projects or forecasting of future changes such as resources productivity development.

Locative Analysis: through analyzing the map itself or accord many maps to search for the information that pertinent to determine the locations or distance measurement, or define the relation between the geographical distributions for two or more variables for example: water resources and population distribution.

Statistical Analysis: all the statistical methods can be applied on the data that available on the data base such as: means, symbols, correlations and the diagrams. Also, it could classify the storing data which is appropriate for the applied statistical analysis for example; measuring the correlation between the resources consumption and the factors that affect it.

Therefore, applying of the GIS in the field of resources management will help in a big role in improving its performance, and make it more effective, because they have clear and flexible facts, also, clarity and simplicity of getting these facts, beside the saving in the time and efforts that need when entering and processing data into information.

In the other side, Applying (GIS) require human and fiscal resources, and allocating a lot of financial resources, also, some other things, like updating programs and the data formatting. This will generate high quality utilities of using the new information which supported by these systems achieved without any doubts is higher than the cost of its working. Greene (2000) observed that using geographic information for more effective government tells the stories of how those on the front lines of public service, such as teachers, administrators, analysts, legislators, and police, are bringing new power

and vitality to their missions. GIS is allowing them to tax money more fairly, to protect life and property more effectively, urban rural constituencies in new and more efficient ways.

V. USING OF GEOGRAPHICAL INFORMATION SYSTEM IN PRODUCING ECONOMICAL INFORMATION IN JORDAN

To develop plans, the planners need a clear policies, enough data and information about the economic, nature, and human resources, that is to make the philosophy of development clear in their minds.

The continuous development of information technology and telecommunication encourages the decision makers in Jordan to use this development to improve the quality of information that used in its activities.

Using of geographical information system (GIS) in Jordan is very common, there are many courses in undergraduate and graduate programs in Jordan universities, also there is special center in Jordan for geographical studies, this center plays critical role in supporting the decision making centers with needed information, but this center needs more efforts to develop it and to develop its role with other centers in other countries.

VI. CONCLUSION

Geographical information system (GIS) has a critical role in managing of national resources. Accordingly, the researcher recommended the following: -

1. It's important for Jordanian geographical center to coordinate its efforts with the efforts of other researching centers internal and external of Jordan.
2. It's important for Jordanian geographical center to contact the other geographical information system centers in all over the world in order to cooperate with them when ever necessary.
3. It's necessary to open new special programmers in Jordan universities in undergraduate and post graduate dealing with geographical information system (GIS).
4. It's important to arrange activities that related to geographical information system (GIS) as, conference and discussion. Also, it's

important to publish special journal in geographical information system (GIS).

5. It's important to support Jordanian geographical center with the professional person, tools, and programs.

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