The Use of Geographic Information System (GIS) to Design Digital Mappings of Amarah City

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Abstract

The present study aims to identify the essence of digital mappings and how these digital mappings may be prepared and designed by using Geographic Information System (GIS) in order to create a database on Geoinformation that contains urban, social and economic data of Amarah city. Primarily, these data may be used by decision-makers, researchers and all cartographers as well as the ability to add, update and adjust these maps through the associated geographic database.

Keywords: Base-Maps, Geographic Information System (GIS), Digital Mappings and Geo-data.

استخدام نظم المعلومات الجغرافية في إنتاج خرائط رقمية لمدينة العمارة

ملخص البحث

تم في هذه الدراسة التعرف على ماهية الخرائط الرقمية وكيفية اعدادها وإنشائها عن طريق استخدام نظم المعلومات الجغرافية من اجل بناء قاعدة معلومات مكانية تشتمل على بيانات عمرانية واجتماعية واقتصادية لمدينة العمارة ، حيث يمكن الاستفادة منها بالدرجة الاولى لمتخذي القرار والباحثين وكافة مستخدمي الخرائط ، وكذلك امكانية الاضافة والتحديث والتعديل على هذه الخرائط عن طريق قاعدة البيانات الجغرافية المرتبطة بها .

الكلمات المفتاحية

خرائط الاساس ، نظم المعلومات الجغرافية ، الخرائط الرقمية ، البيانات الجغرافية

Introduction

A map is the closest representation of a spatial reality or a part of it (Badaw, 1997,p. 31). Map has a great importance, through which we can identify many details that we need about any place on earth and the importance of the map increases with the development and rapid growth that humanity is going through at the present time, by the development of human and the development of the place by doing, the need for the map to describe phenomena and observations on the scale of the city and village and its natural elements such as mountains, valleys, rivers, seas and those elements of human-made such as buildings, roads, tunnels, bridges, parks etc.

Since ancient times, Muslims have been interested in maps.So, Abu Abdullah Muhammad al–Idrisi who created the Tabula Rogeriana, one of the most advanced medieval world maps is a Muslim. (Abdul Hakim, 2009,p.35)Through the ages, the map has undergone major developments until the Information Age "also known as New Media Age, the Computer Age or Digital Age", in which the map becomes a new form such as GIS that is considered as a qualitative and quantitative transition of the map and the mapping sciences.

Statement of the Problem

The architecture, social and economic map of Amarah city has undergone many changes and developments, keeping up with these developments and changes. Many entities have sought to map the city to reflect these changing phenomena, including The Department of Urban Planning and Design in Maysan (Business Projects Company)(Engineering House, 2007)as well as the Directorate of the municipality of Al–Amarah. But these efforts have not been integrated to produce a map that can be used primarily by the decision makers and then by the researchers, scholars and investors. Therefore, this study will take on the responsibility of updating these paper maps and reproducing them in the form of digital maps and building a geographical database.

Significance

The importance of this study is that it will enable planners, decision makers, researchers and all map users to access digital maps of Al–Amarah city containing urban, social and economic data. It is also possible to add, update and modify these maps through the associated geographical database.

Aims of the Study

The present study aims at producing, improving and updating digital maps of Al– Amarah city, and links these digital maps with geographical database at neighborhoods by updating urban and population data and public services of the city by neighborhoods.

Limitations

1. Place limits: The limitations of the study is represented in Al–Amarah city, the center of Maysan province in southern Iraq, were between two viewing circles $(31.42^{\circ} - 32^{\circ})$ north and two longitudes $(46.52^{\circ} - 47.22^{\circ})$ east, with an area of (202,132) km², Its

population (559,975) of the total population of the province (1091015) (Ministry of Planning Republic of Iraq, 2018), it is 390 km from Baghdad and (184) km north of Basra city, and from the Iranian border (50) km map (1).

2. Time limits: Representing by creating a digital map of Al–Amarah city in 2019.



1. Theoretical Background

1.1 Map Definition

A map is a symbolic depiction emphasizing relationships between elements of some spaces, (R.L Singh, 1992,P1) such as themes, regions or objects. Map has a great importance, through which we can identify many details that we need about any place on earth and the importance of the map increases with the development and rapid growth that humanity is going through at the present time, by the development of human and the development of the place by doing, the need for the map to describe phenomena and observations on the scale of the city and village and its natural elements such as mountains, valleys, rivers, seas and those elements of human-made such as buildings, roads, tunnels, bridges, parks etc.

The map has gone through many stages through which it has evolved since the era of al-Idrisi, who created the first map of the world to reach to the present time, which is the era of technology and development, where no one is hidden from the development of science from the development surpassed by all the previous times and appreciations mostly due to the use of computers to store data quickly and accurately paved the way for the use of many complex processes and cannot be implemented manually and thus the results obtained by human became much more accurate than the previous and became the maps using modern computers and programs more detailed and more accurate than before, where the map became produced based on satellite images or aerial images taken by aircraft or satellites, because these images provide us with the details of the regions, especially those that are difficult to reach, and one of the

most important programs currently used in the production of maps is GIS because of the possibility of these programs to deal with satellite and aerial images, which allows the programs to produce an integrated and accurate digital map based on these satellite images.

1.2 Geoinformation "Geodata" Definitions

Geographers argue that geographical data is divided into four sections: spatial data, statistics showing a phenomenon in a place or location, data of a linear character, data of one length and possibly some kind of width such as roads and rivers, data with a spatial character, statistical data for a particular phenomenon with two dimensions on a particular area of the map such as climate type, natural characteristics, and data of a single length, and three–dimensional data such as population(Bin Salma, 1995, p. 8).

1.3 Geographic Information System (GIS)

The basic concept of GIS is to access good solutions and decisions based on the processing and analysis of data and information of different types after linking them to their geographical location, so that GIS is distinguished from the rest of the information systems by the power of their analysis of information related to their correct geographical location and spatial relationships between data (Al–Safi, 2013,P. 31).

GIS components can be identified by the following elements:

• Users or people : They are the most important components of this system, the human element is the one who develops the procedures and define the system.

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• Data: aerial photographs, maps, statistical tables, descriptive information, etc.

• Hardware: A component that affects the speed and quality of analysis and handling of information.

• Software: from different programs and databases.

•Methods and Procedures that manage the relationship between different components.

1.4 Previous Studies

When reviewing the previous studies, it was found that this topic has won the attention of a number of Arab governments as well as the interest of a number of researchers, so it is possible to clarify these studies as follows:

1.4.1 Mapping the Direction to Makkah 2002

The project aims to create an audited Base Map for the study area, so the construction of the base map or its updating if any is considered the most important steps of the project, on which many negative results depend if the map is not modern and accurate appropriate to the project and the nature of the work has been adopted in The base map of Mecca on vector map maps with an international geographical projection (Universal Transverse Mercator UTM) in the kilometer coordinates of Saudi Arabia, which was prepared for the Secretariat of the Holy Capital by the Office of the Environment in 1416 and from maps Hard Copy with a scale of 2500:1 Where the base map of Mecca was produced from these maps and was carried out by a field urban survey of the spring of 1424 at the level of the schematic block and updated the map by a modern space photographer in 2002 for Mecca of the Type Quick by 0.60 cm.

1.4.2The Geographic Information Systems (GIS) in Dubai City 1991

The project began in Dubai City in 1991 as a map-keeping system Computer-aided design (CAD System) where it was used for surveying, mapping, charts and certificates of non-objection in accordance with the nature of the work and facilitates it and adds value to the productivity, increase it and improve its quality and reduce long-term expenditures, the project aimed at the beginning working on the collection of geodesic data and planning and data producers such as surveyors and planners. The introduction of paper charts in the system was completed in 1992 and has now been expanded to include (250) users in various departments, most of them technical departments. Then in 1995 this system was used in planning in determining land uses and physical characteristics.

1.4.3 Case Study to select the location of a public service facility in Syria using GIS:

This study aims to clarify the concept of GIS effectively and use it in solving problems related to planning and civil development, and to show the importance of using computers, software and modern technologies in such cases and to indicate it in a practical way, a planned city was used to conduct this study by identifying a suitable location for the establishment of a public service facility, it remains for the city administrators to identify and function. This study builds on GIS in creating an information base based on available maps and data. The data entered is then analyzed and processed based on the identification of preferred transactions to choose the location of a particular facility.

2. Practical Framework: The Procedures of the Study

The study approach is a descriptive based on identifying the sources of the study and then evaluating it and explaining some of its implications. The research community will be Al–Amarah city with its urban and population characteristics and public services. The instrument of the study is the digital map produced by GIS through the Arcgis 10.5 package. The study will include the following steps:

2.1 ArcGIS Enterprise Map

The base map was used by the Directorate of Al–Amarah city and then updated and produced a modern digital baseline map of Al–Amarah city covering all the neighborhoods within its borders. Map 1 shows this map.

2.2 Collecting Data

In addition to field work, information from the economic, social and urban surveys carried out by the Maysan Census Department was used. It will be processed and tabulated using GIS. The information includes:

• Social data is the population at the district level and population density.

• Public services for each district include health services, educational services, religious services, recreational services.

2.3 Designing Database and Linking Paper Information to it

The paper data collected in the previous phase by Excel was converted into digital data that was linked at an advanced stage to the baseline map by Arc map. The data available at the neighborhood level is linked to the living layer and that data at the plot level is linked to plots of land.

2.4 Data signed locationally by using GIS

With the capabilities of arc map, the data is signed spatially according to the layer it contains. The software can provide unlimited options in response to the user's desire to show this data in the form of digital maps.

2.5 Producing and directing digital maps

Also, prefer to the enormous capabilities of Arc map in the production and output of digital maps, this software has been used to produce maps for printing or export to other software that is easy to handle by other users. The maps produced and directed are reviewed and produced as the final way out of this research:

• Spatial distribution map of educational services (kindergartens, primary schools, middle schools, secondary school, preparatory schools, higher education institutions)

- Map of the spatial distribution of health institutions in the city of Amara (hospital
- health center specialized center popular clinic)
- Map of the spatial distribution of religious services in the city of Amara.
- · Spatial distribution map for leisure services

• Spatial distribution map for youth and sports services (sports stadiums – youth and sports centers – sports clubs)

• Spatial distribution map of cultural centres and public and private libraries



map (2) basic design map of Amarah City



map (3)



map (4) Spatial distribution map of educational services









map (7)

3. Conclusion and Recommendations

3.1 Conclusion

This study came up with digital maps of Al-Amarah city that include:

1. Update the baseline map, including the boundaries of neighborhoods and plots of land with different uses.

2. Building a good geographic data base containing urban, social and service data.

3. Employ GIS programs to produce all the maps needed by planners, researchers and decision makers according to the built-in database.

3.2 Recommendations

1. Continuously updating the geographical database in order to continue relying on this map. As if they are included within the requirements of the decisions of students of the Department of Geography for the undergraduate stage in the College of Education, University of Misan, and assigning them to survey some urban neighborhoods.

2. Use GIS software with its many analytical methods to produce digital analytical maps of many phenomena of interest to decision makers in the city.

Bibliography

- Abdul Hakim, M. S.-H. (2009,p.35). *Cartography.* Cairo: the Anglo-Egyptian Library.
- Al-Safi, M. S. (2013, P. 31). *Geographic Information Sciences*. Maysan: Muntadhar Printing Library.
- Badaw, A. i. (1997,p. 31). *Geographical Maps Design Reading and Interpretation.* Cairo: Dar Al–Fikr Al–Arabi.
- Bin Salma, N. M. (1995, p. 8). *Human Distribution Maps.* Riyadh: Al– Abykan Library.
- Engineering House, (. a.-a. (2007). modernization of the basic design of the city of Amara. Directorate General of Urban Planning. ministry of municipalities and public works.
- Ministry of Planning Republic of Iraq, M. o. (2018). *Annual statistical group.* Central Agency for Statistics and Information Technology.
- R.L Singh, R. b. (1992,P1). *Elements of Practical Geography.* New Delhi –LUDHIANA : KALYANI PUBLISHER.