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The Geomorphological Aspects in Diyala Governorate and the Possibility of Investing Them for Tourism Activity According to the Perspective of Sustainable Development Using RS and GIS Techniques

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Abstract

Diyala Governorate has many unique and diverse geomorphological features that the region enjoys, which are among the attractions for natural tourism, as the natural environment is considered a maker of tourism. The importance of geomorphological aspects as components of natural tourism is due to their association with tourism and entertainment, as a result of the enjoyment of many geomorphological aspects of the beauty of its natural landscape on the one hand, and on the other hand, the association of these manifestations with different types of tourism activity. Any tourist area as it is the main factor for tourist attractions, such as the presence of the Hamrin hills, and sand dunes. Planning for the development of tourism activity in the governorate is carried out through the use of RS and GIS technologies, through the preparation of designs, maps, and determination of tourism development sites based on field studies, satellite images, visuals and base maps. As well as working on developing infrastructure and linking the study area with neighboring cities and providing paved roads for easy access to it, which attract tourists and affect the sustainable development in the governorate.

Keywords

Tourism activity, sustainable development, RS and GIS technologies

JEL Classifications: J11, F43

1. Introduction

The natural capabilities of Diyala Governorate and its natural geographical capabilities, which are represented in the geological structure, forms of the earth's

surface, climate, water resources, and plant and animal life. As for the human geographical capabilities, it is represented in the population, historical and archaeological monuments, religious shrines and folklore.

These geographical potentials turn into economic wealth if they are exploited by man. Today's tourism activity represents a civilized and behavioral phenomenon on the one hand, and an economic and social phenomenon on the other hand, and it is one of the most important industries of the modern era for its contribution to the development of the economies of countries.

The relationship between tourism activity and sustainable development has taken different forms, either as a conflict and conflict relationship so that tourism development processes take place in isolation from preserving the environment, or there is coordination and integration between them through sustainable tourism development and this is done through the application of laws governing the environment for the purpose of ensuring the continuity of its components It is capable of renewal and survival for future generations. Therefore, it represents a process of change in which the exploitation of resources, investments, technological development and institutional change are in harmony with the tourism activity and works to enhance the possibility of linking the present with the future (1) (Molokhia, 2005).

Diyala Governorate is characterized by the natural and human geographical capabilities that it possesses and makes it a tourist area that includes many tourist, historical and archaeological sites, which constitute an impact factor in the local and regional tourism activity.

2. The Problem of the Study

A - Do the geomorphological features have an effective role in the tourism activity in the region?

B - What are the problems and obstacles to sustainable development in the governorate, and the most important solutions needed to address these problems and for the purpose of benefiting from them in the areas of sustainable development in the governorate.

3. Hypothesis

-1Are the natural geographical elements and geomorphological features used in a way that is compatible with the tourist activity in the governorate?

-2Does tourism activity have an effective role in sustainable development in Diyala Governorate?

4. The Importance of Research

A - The importance of tourism activity in the global and national economy, and this in turn is reflected in the sustainable development in the governorate.

B - Benefiting from the applications of modern RS and GIS technologies in planning the tourism activity, which in turn contributes to providing a geographical and scientific basis for transforming these tourism potentials into an economic force for the governorate.

5. Research Objectives

A - Highlighting the geomorphological features and determining the optimal places for sustainable development in the study area.

B - Determining the strengths and weaknesses that determine the possibility of developing tourism activity in the region.

T- Drawing a map of sustainable development for the region.

6. Study Methodology

The study relied on the descriptive and analytical approach by identifying the current situation of the governorate and the possibility of investing in it in tourism, using the applications of modern RS and GIS technologies to determine tourist sites, and using satellite visuals to determine the natural geographical capabilities that can be invested in tourism purposes.

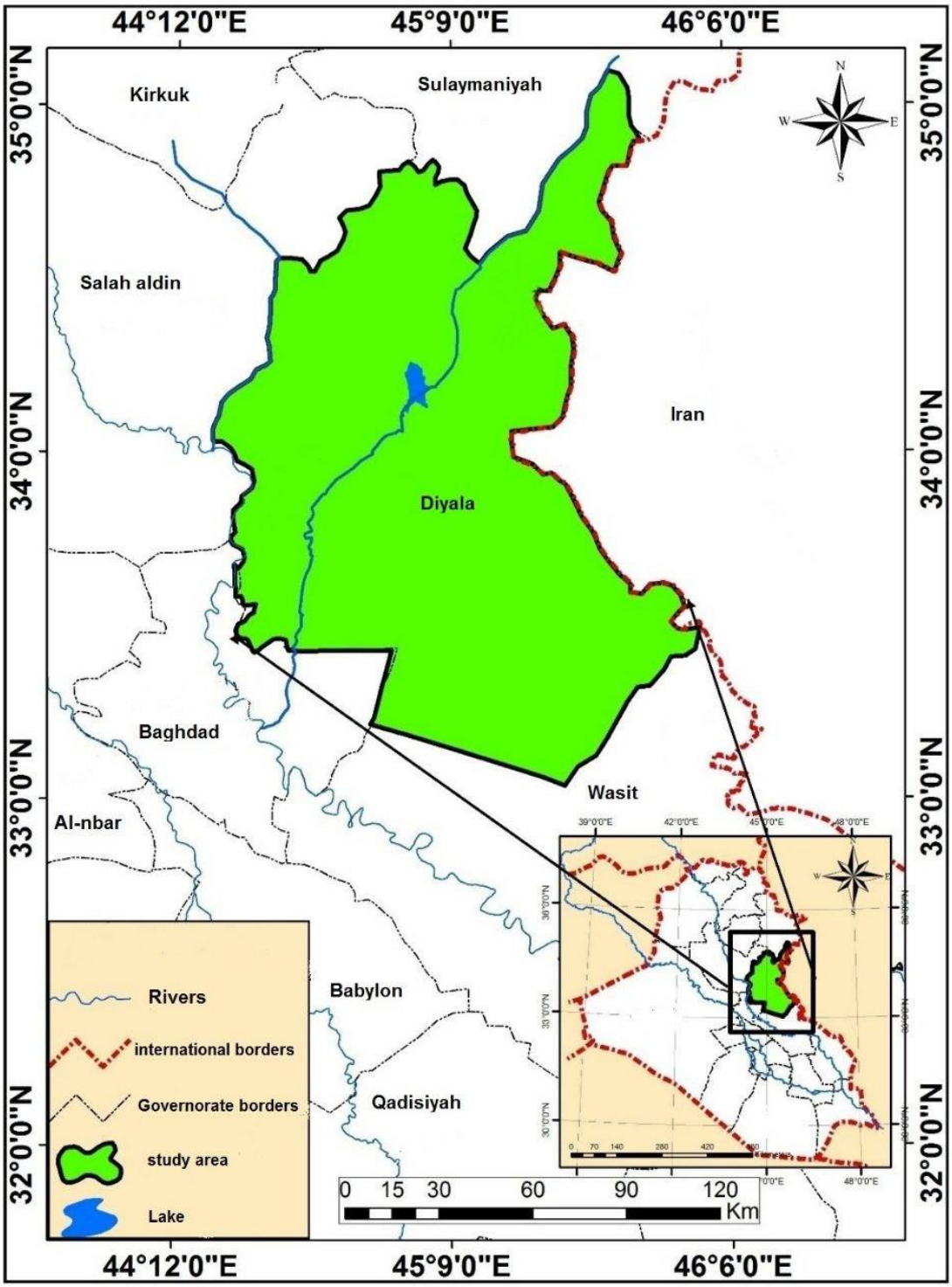
7. Boundaries of the Study Area

Diyala governorate is located in the eastern part of central Iraq, and it is one of the governorates that has international borders, and it is located within the subtropical widths in the northern half of the earth. Baghdad is 57 km, from the south was Wasit Governorate, and from the east is Iran. As for astronomically, it extends between latitudes(33^0 3^- — 35^0 6^-) in the north, and longitudes (44^0 22^- — 45^0 56^-) in the east, Map No. (1)), the area of the governorate amounted to (17,685 thousand km2) (2) (Cooperation, 2005), which constitutes (4.1%) of the total area of Iraq amounting to (435,052 km2), and Diyala governorate was called in the Abbasid and Ottoman eras the Khurasan Road, and the Diyala River was It is the main river in the governorate, which was previously known by the Syriac name (Tamra), which includes (19) administrative units, the number of districts (6), including the district of Baquba.

8. Natural Characteristics in the Study Area

First: The Geological Structure of the Study Area

The area is located in the northeastern part of the sedimentary plain, and the southeastern part of the undulating area. The geological history of the study area refers to the Cretaceous period (lower Cretaceous) when the waters of the Tish Sea began to advance.



Map 1. The Location of the Study Area
Source: The General Authority for Survey, the administrative map of Iraq, Baghdad 2002, the scale of the drawing is 1:1000000.

Eocene and Miocene in the third and fourth geological time (3) (Al-Khalaf, 1959). In the Eocene era, the study area was exposed to the Alpine movement, especially the northeastern parts of it, as this helped to raise the surface of the earth and form torsional mountains, which represent the range of the low folds, which represent the Hamrin ridge (4) (Jassim, 1987). In the Pliocene era, i.e. the late third time and early fourth time, the area was subjected to subsidence

operations, which led to the disappearance of gypsum sediments and limestone layers in the southern sections of them, which helped to form the sedimentary plain due to earth movements. The region was subjected to rapid lifting operations in the northern and eastern parts (5) (Mustafa, 1993). Through the stratigraphic sequence, it is noted that the area includes the deposits of the third time, which are:

1-Miocene deposits, which include the formation of Anjana (the Upper Knight), which represents a transitional stage from a limited marine environment to a continental environment. These deposits consist of sandstone, alluvial stone and limestone. Clay red due to the presence of iron deposits and these appear on the axis of the Hamrin convex fold.

2-Pliocene deposits include the following formations:

A- Al-Muqdadiya Formation (lower Bakhtiari) This formation contains layers of sandstone, gravel, silt, and clay, as well as river deposits (6) (Mustafa, 1993). This formation is characterized by the appearance of gravel in the Hamrin Dam and Diyala Dam.

B- Bay Hassan Formation (Upper Bakhtiari) This formation consists of quartz, limestone, igneous and metamorphic carbonate rocks and extends in a band along the eastern flank of the Hamrin fold, while the southwestern flank is limited rocky outcrops (7) (Al-Jahari, 1988).

9. Fourth Time Deposits

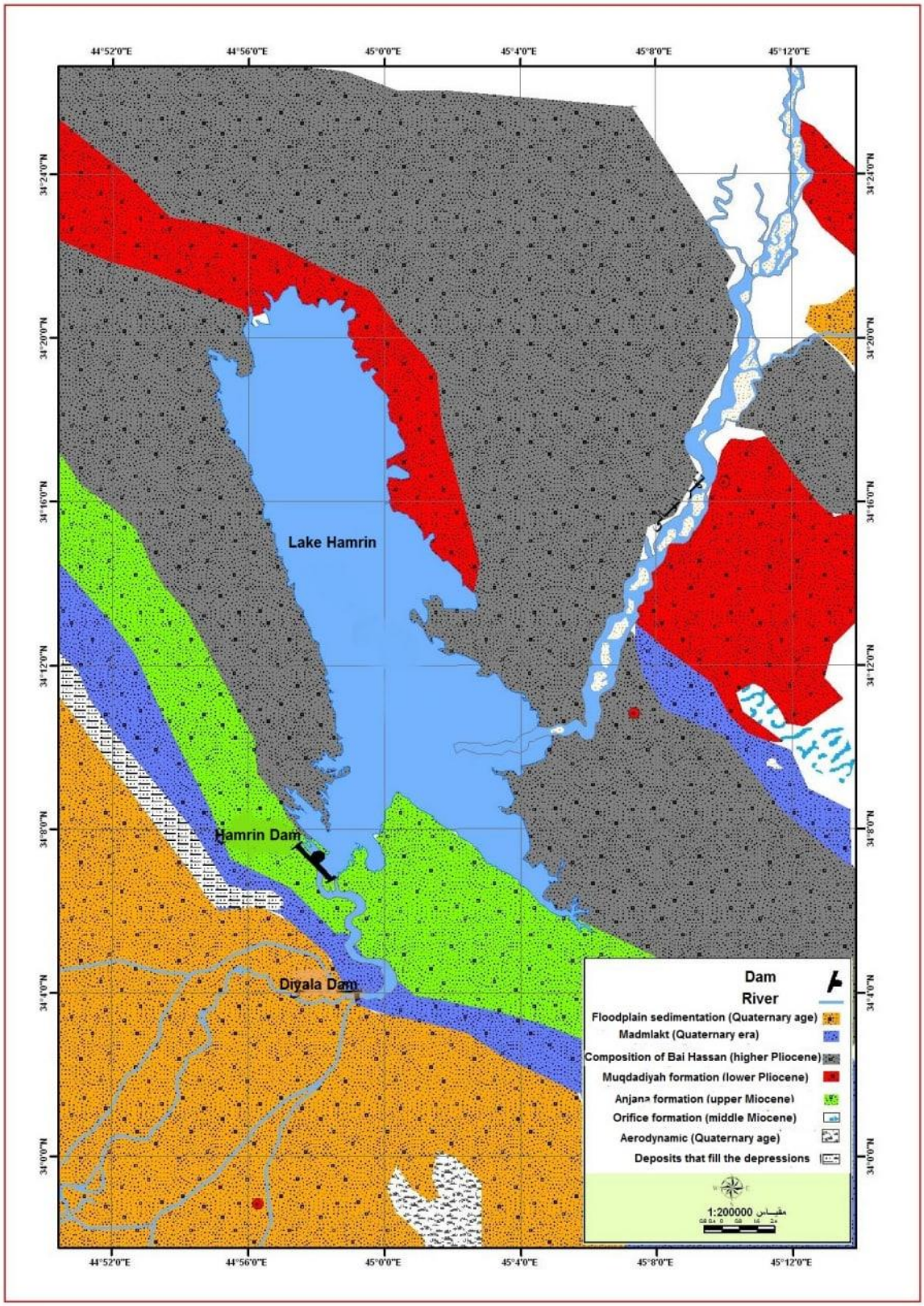
It is the sediments that are found above the Bakhtiari formations and are in the form of terraces or the river sediments transferred to the Diyala and Rawanduz Rivers consist of gravel, silt, and sand and are found along the Diyala governorate from Jalawla to Saadiya and then Mansouriya al-Jabal (8) (Al-Janabi, 2009). Or it spreads in the form of bank deposits along the banks of the Diyala River course and is in the form of alluvial sand and clay deposits. And by looking at Map No. (2) the geological formations of the area

1-The emergence of the study area dates back to geological times as a result of the ups and downs movement that occurred during the geological periods and the various sedimentation processes. The area is located within the unstable pavement units.

2-The area includes sedimentary layers dating back to the formations of the third geological time. It consists of limestone rocks that were deposited during the Cretaceous era and represent the rocky foundation.

3-The formations of the third geological time, which are represented in the Miocene deposits, which appear on the axis of the convex Hamrin fold, in addition to the Pliocene deposits, which appear on the Hamrin Dam and Diyala Dam area.

4-The fourth time formations, which cover most of the previous formations and are represented in:



Map 2. The Structural geology features in the study area

Source: 1- Anwar Mustafa, Khanaqin Plate, Measures 1: 250,000, General Establishment for Geological Survey and Mining, Geological Survey Department, Geological Survey Department, Baghdad, 1993.

2- Sabah Yaqoub and Duraid Bahjat Dekern, Baghdad Painting, scale 1: 250,000, General Establishment for Geological Survey and Mining, Geological Survey Department, Aeronautical Survey Department, Baghdad, 1996.

3- The geological structure of the region can be summarized as follows: -

A- Aerobic sediments represented by sand dunes and eruptions on the southwestern flank of the Hamrin fold (9) (Sabah Yaqoub, 1996a).

B- Flood sediments, which are the sediments resulting from the run-off of water during the flood, and they consist of gravel, sand and silt. These sediments originate from the Diyala River Basin and the Alwand River (10) (Sabah Yaqoub, 1996b).

10. Geomorphological Features in the Study Area

There are many geomorphological features in the study area, including:

1-The plain area: This area is located in the lower part of the Diyala River. It is a relatively flat area and constitutes an area of (85%) of the governorate's area, which amounts to (17,685 km2). These plains lie between the Hamrin Heights in the north, the governorates of Baghdad and Wasit in the south, the Iraqi-Iranian border in the east, and the Tigris River in the west (11) (Al-Saadi, 1986).

The highest part of the region is south of Hamrin and the lowest parts are in the southwest of Mansourieh. When tracing the study area to find out the topographical phenomena, we find to the east of the sedimentary plain, the plains known as the eastern edge of the sedimentary plain, which were formed by the sedimentation of valleys and torrents descending from the eastern heights, and its slope is to the southwest. And to the east of the eastern edges are the fan functions, which extend from the south of Khanaqin to Mandali, including the Mandali fan, which formed the Kanakir River. As for its western sections, they are low, and this helped the presence of some depressions in which water collects, such as the Al-Shabaija depression (12) (Al-Tamimi, 2002).

Within the study area there are some areas covered by sand dunes, which appear due to the activity of external factors, especially weathering and winds, in dry and semi-arid areas such as the lands of Muqdadiyah, which is known as (Al-Aith) and small dunes that are located near Khan Bani Saad and in the Baladrouz region, in addition to the presence of some small hills in Above Al-Khalis Al-Ala Project (13) (Al-Azzawi, 2000).

2- The undulating area: it represents the central part of the Diyala River Basin, and its height is (100-300) m. It extends from the north of the Hamrin Hills to its northern borders, forming the southeastern part of the undulating region in Iraq, and this region is transitional between mountainous and semi-mountainous (15) (Khasbak, 1973).

This region includes a group of plains and hills, which are: - The group of hills are:

-Hamrin Heights, which represent the boundary between the plain region and the semi-mountainous region, and its extension is northwest-southeast.

The Qizil Ribat Heights, which are parallel to the Hamrin Hills from the east, between the Diyala River in the west and Wadi Ibb Naft in the east.

-The heights of Waraishka, which extends from the southwest of Khanaqin towards the northwest and includes Mount Jesdagh and Kulaiban.

-The heights of Jubbah Dagh and Qara Bagh, which are convex curves formed by the ground movements that formed the northeastern highlands of Iraq at the end of the third and early fourth period Pleistocene (16) (Hested, 1948).

Plains group: They are low lands found along valleys, the edges of mountains, coastal plains, plateaus or heights, and the plains are formed either through flowing lava, which was deposited by water, snow, wind or waves, and also formed by erosion processes, and the fertility of the plains and their economic importance depend on These types include: abyssal plains, glacial plains, lacustrine plains, lava plains, and alluvial plains, which include floodplains, which are the lowlands adjacent to rivers, which are formed by the deposition of organic nutrients and silt by rivers after the heavy flood season caused by storms and rains. Or melting and receding snow, floodplains are usually flat and very fertile lands because they receive nutritious sediments as a result of repeated floods over thousands of years., led to a decline in its levels even during the flood seasons, which left many people behind flood plains. The floodplains in the study area consisted of flat plain lands covered by thick layers of sediment and silt that were transported by rivers and torrents descending from the eastern sides. The plain area begins after the Diyala River exits the Hamrin Mountain range. The region is characterized by the presence of geomorphological phenomena such as river islands.

11. The Role of Geomorphological Features and Their Impact on Tourism Activity and the Possibility of Exploiting Them in Sustainable Development Using RS and GIS Technologies

The concept of tourism activity: Tourism is one of the human phenomena that arose a long time ago. Global unified tourism. By the researchers, each researcher focused on a specific aspect, some of them considered it an economic phenomenon and others social, and some of them were cultural and psychological. And the word "tourism" means "to move around" and "circulate". The World Tourism Organization defined tourism as the movement of individuals from one place to another and for different periods of time for a period of more than 24 hours and less than a year with the provision of services related to this activity. To other social or recreational reasons, or to spend vacations. Recreation, rest and treatment, which leads to an increase in the income of the individuals residing in the place of the visit through the expenditure of the visiting person.

Tourism depends on two main pillars: - Infrastructure, which is the primary services that must be provided to carry out any project or tourist area, such as water networks, electricity, gas, communications, health services, roads and

banks; As for the tourism infrastructure, it includes hotel accommodation facilities, camps, tourist reception projects, and tourist information offices. These services vary between countries according to the development of each country.

The concept of sustainable development: In the report of the World Resources Institute for the year 1997, 24 definitions were counted, and these definitions were classified into four groups, namely:

1-Economic for the developed countries, it is a reduction in the consumption of energy and resources. As for the developing countries, it is the employment of resources in order to raise the standard of living and reduce poverty.

2-Socially, it means striving for the stability of population growth and raising the level of health and educational services, especially in the countryside.

3-Environmentally means the protection of natural resources and the optimal use of agricultural land and water resources.

4-Technology is the development that moves society to the era of clean industries and technologies that use the least number of resources and produce the minimum number of gases polluting and harmful to ozone.

One of the most comprehensive and widespread definitions is the definition of the World Commission on Environment and Development. It defines sustainable development as a development that allows meeting the needs and requirements of the present generations without compromising the ability of future generations to meet their needs (17) (Said, 2010).

sustainable development goals: -

Sustainable development seeks to achieve many goals, including:

1-Environmental goals: include: -

- Protecting natural resources and reducing environmental degradation
- Optimum use of energy and natural resources

2-Economic objectives: include: -

- Achieving industrial and agricultural growth
- Balanced management of natural resources
- Achieving sustainable tourism

12. The Components of Sustainable Development and Its Impact on Tourism Activity in Diyala Governorate

Natural and human geographic components affect tourism activity, which in turn is reflected in sustainable development in Diyala Governorate, including the geographical location, which plays an important role in tourism activity through the type of prevailing climate, which affects the movement and human activity, as the climate affects the timing of tourism activity and thus affects the Extensive growth rates in the economic, social and cultural aspects (18) (Omar, 2010). RS and GIS Technologies RS technology defines remote sensing as the science of obtaining data on the Earth's surface without actually communicating with it, and then processing and analyzing this data to obtain useful information. As for GIS

technology, it is an applied pattern of computer technology that is concerned with accomplishing special functions in the field of geographic information processing, presentation and analysis, in accordance with its applied objective based on distinct human and electronic competence (19) (Aziz, 2000).

13. Conclusions

1-The study area is characterized by the availability of many natural qualifications that can be exploited in the establishment of sustainable tourism development.

2-Implementation of tourism projects leads to the development of economic sectors and the achievement of economic and social well-being for the population of the region.

3-Diversity of topographic features in the study area, which is dominated by the presence of plains and hills, which are represented by the Hamrin Hills series.

4-The presence of other natural potentials that could be a factor in attracting tourists, such as archaeological sites and sand, which contribute to achieving sustainable development in the region.

5-The lack of development of infrastructure services, road maintenance and expansion, and these activities contribute to reviving the tourism activity in the region.

14. Recommendations

1-Using modern RS and GIS technologies in studying the selection of sites with tourist attractions and using them in planning and sustainable development.

2-Improving the tourism services in the governorate in terms of tourist accommodation and tourist transport related to tourist attractions.

3-Supporting small local industries, such as the manufacture of dairy products, bee honey and artistic works, which have a role in the tourism marketing operations of the region.

4-It is necessary to develop mechanisms to preserve the elements of the environment from pollution and attention to the cleanliness of the tourist areas in order to promote sustainable tourism development for the province.

5-Creating the appropriate conditions for the development of tourism activity and following strategic planning by setting a precise legal framework with the use of the media for publicity and promotion of tourism resources.

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