



The impact of geomorphological characteristics on the development of ecotourism in the Najaf Sea region

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Abstract

Ecotourism can be viewed as one of the modern kinds of tourism that have attracted much attention in the recent past because of its significance in promoting sustainable development and conservation of natural resources. Ecotourism mainly relies on the use of natural resources in different regions where geomorphological features act as one of the main elements in these regions since it gives rise to diverse landforms and landscapes both for tourists and researchers.

According to the definition, geomorphology is the science that deals with the study of surface forms of the Earth, their development, and causes influencing their development. Thus, these features help determine the character of tourism resources and opportunities for development. Therefore, studying the relationship between geomorphological features and tourism development is becoming a relevant issue for geographical and tourist sciences.

The Najaf Sea region is a unique geographical region of Iraq because of the presence of different geomorphological forms such as sand dunes, depressions, and desert plains. Such diversity makes it possible for the region to have natural resources for developing ecotourism. Although the region holds promising natural potentials for tourism, there are still limited efforts in this regard which calls for research in order to investigate the importance of developing tourism here.

Therefore, the current paper is aimed at investigating the effects of geomorphological features on tourism development in the Najaf Sea region. It will be done through exploring the main geomorphological features in the region in order to reveal their contribution to tourism development and sustainability of tourism.

Keywords: (Geomorphology, ecotourism, Najaf Sea, Tarat area)

Section One: Basic Concepts in Geomorphology:

Geomorphology is defined as the science that studies the topography of the Earth's surface and the natural processes that shaped it, such as weathering, erosion, deposition, volcanoes, and earthquakes, as well as the process of these landforms' evolution. Before delving into the study of geomorphology, we must shed light on the basic concepts it contains. These concepts or ideas are considered the foundations of this science and the essential facts that must be understood by anyone studying the subject. Professor W.D. Thornbury summarized these concepts in ten points as follows:

- 1. The first point:** A geomorphological process refers to the force that has changed and continues to change the features of the Earth's surface in the past and present. Geomorphological processes encompass all physical and chemical changes that play a fundamental role in the development of landforms. These processes are either internal (or internal) or external (or external). Internal processes encompass several forces: 1- Epirogenic processes (continental building), 2- Orogenic



processes (mountain-building), 3- Volcanic processes, and 4- Earthquake-causing processes. The forces driving these processes appear to be closely linked to the internal tectonic activity of the Earth's crust. They have played a significant role in shaping the Earth's major landforms, distinguishing themselves from external processes by their constructive nature.

External processes comprise a diverse range of forces that play a crucial role in landform formation, primarily on continents. These can be categorized as: 1- Weathering, 2- Surface water flow, 3- Ice and glaciers, 4- Wind, 5- Waves, and 6- Groundwater. The overall effect of this group is destructive, aiming primarily to flatten landforms and bring them to the base of erosion. Therefore, their action typically conflicts with that of the first group of geomorphological processes. Were it not for the continuous activity of subterranean processes, the landforms on the Earth's surface would have vanished and ceased to exist at present.

- 2. The second idea:** Geological structure is a dominant factor in the development of landforms and is reflected in them.

Structure, in our understanding, refers to two fundamental aspects: 1- The type of rocks, and 2- The position of the rocks within the Earth's crust. Each structure has a set of associated landforms, and studying these landforms allows us to understand the nature of the underlying structure. The landforms within a folded structure differ entirely from the landforms found on a coastal plain, even though both resulted from the same geomorphic process and are both at the same stage of the geomorphic cycle. This close relationship between structure and associated landforms helps reveal the type of structure and predict the mineral and other important economic resources contained within its rocks.

- 3. The third idea:** Geomorphic processes operate at varying rates, which is why the Earth has its diverse landforms. The influence of these varying geomorphic processes can be attributed to the type and structure of the rocks in the Earth's crust. This leads to variations in resistance to erosion. Some of these variations are very pronounced at times, while at others they are subtle.

It can be said that, except in some areas subject to tectonic movements, high topography is associated with areas of hard, resistant rock, while low topography is associated with areas of weak rock. However, we should not equate the formation of topography solely with variations in rock resistance. Erosion processes are influenced by other local conditions that increase or decrease their intensity, such as temperature, altitude, degree of exposure, ruggedness, and the presence and density of vegetation cover.

- 4. The fourth idea:** Geomorphological processes leave their distinctive marks on landforms, and each geomorphic process develops its own set of landforms. We explained earlier that a geomorphic process refers to the physical and chemical methods by which the Earth's surface is transformed. Some processes, such as earth movements and volcanic activity, originate from forces within the Earth's crust, and these are known as internal processes, while others are produced by external forces and are known as external processes.

Each landform possesses its own distinctive characteristics, which depend on the type of process that formed it. Floodplains and fan-shaped plains (deltas) are the result of river activity. Sinkholes and caves are formed by the action of groundwater. The presence of various mounds and drum-like hills indicates the previous presence of glaciers above the area. This connection between the process and the landform facilitates a classification of landforms based on their origin.



5. **The Fifth Idea:** This idea means that landforms develop within what is known as the geomorphological cycle proposed by Davis, beginning with the nascent stage, then youth, maturity, and old age. It is clear that the nascent stage is not readily apparent in many landforms because the formation process is so slow that erosion can alter the basic contours of the landform before its external form is fully realized. However, some landforms are formed rapidly, such as certain volcanic hills resulting from rapid eruptions. The concept of a stage is crucial to Davis's geomorphological thinking. For him, a geomorphic feature is an interaction of the following factors: (landform = structure + process + stage). Any change in any component of this equation must lead to a change in the other constituent factors.
6. **Sixth Idea:** Complexity is more common than simplicity in geomorphological development. Simple geomorphic development means that a particular landform is affected by a single geomorphological process and passes through a single geomorphological cycle. For example, flowing rivers may be responsible for developing the surface features above it, thus moving it from the nascent stage to the youth stage, then to the mature stage, and finally to the senescent stage. Or a coastal plain may be affected by rivers, and a mountainous region with a complex structure may be affected by glaciers, which continuously alter its features, moving it from one stage to another sequentially within the geomorphological cycle. However, such development is not found in nature except to a very limited extent, as there are only a few areas affected by a single geomorphological process. A kind of overlap occurs between the effects of several geomorphological processes, even though the impact of one primary process may be discernible. In a glacial valley, which is a primary product of glacial action, weathering and surface water also play their part. The same is true for river valleys, coastal cliffs formed by waves, and glacial valleys, which are primarily caused by groundwater.
7. **Seventh Idea:** Geomorphological research and studies indicate the existence of eroded surfaces dating back to distant geological eras, such as the Cretaceous, and some even further, to the Precambrian period. However, these phenomena are very rare due to continuous exposure to erosion processes over long geological periods. Most of the landforms currently found on Earth's surface, however, date back to a relatively recent geological period. In 1931, Professor Ashley estimated that 90% of the current landforms originated in the period following the Tertiary period, and that 99% of the Earth's current landforms date back to the middle of the Middle Miocene epoch.
8. **Eighth Idea:** The existence of our current landforms cannot be explained without a precise understanding of the impact of the geological and climatic changes that occurred during the Pleistocene. The climatic changes that took place during the Pleistocene had a very significant impact on the landforms that exist on Earth today. During the glacial periods, glacial erosion affected vast areas of the Earth's surface, estimated at 25,000,000 km². The impact of these periods was not limited to the areas actually covered by ice, but extended to other vast areas where there were secondary effects resulting from the decrease in temperatures across the entire globe during the glacial period. Rainfall increased in desert regions, and thus traces of river activity appeared, which are still visible today as dry valleys. The drop in sea level during the Ice Age also led to the formation of elevated coastlines. Rivers that once flowed into the oceans underwent a process of rejuvenation, accompanied by specific geomorphological changes. Conversely, during



the warm periods between ice ages, deserts expand, wind activity intensifies, sea levels rise above their current level, and submerged coastlines form, among other things.

In addition to the effects of the Pleistocene Ice Age, many regions experienced tectonic plate movements during this period. Some of these movements originated in earlier epochs but reached their peak during the Pleistocene. For example, these movements intensified around the Pacific Ocean and are partly responsible for the landforms found there today.

9. **Ninth Idea:** Existing geomorphological processes cannot be separated from climatic factors, as climate has a significant impact on these processes. Weathering is a process that affects rocks using climatic factors such as temperature, humidity, and rainfall. Wind is also a climatic factor. The action of surface water is closely linked to the nature of the prevailing climate, as is the case with glaciers, groundwater, and waves. Therefore, it is essential for the geomorphological researcher to have a specific climatic background that enables them to understand the nature of the geomorphological processes prevalent in the region they are studying.
10. **Tenth Idea:** The value of this idea has become apparent through the current interest in studying what are known as ancient geomorphological features. These are defined as features or forms that are no longer affected by the geomorphic process that created them. These are divided into remnant, exposed, and buried features. Studying such features, especially buried ones, requires specialized technical expertise and advanced scientific methods for their detection and identification. The importance of making efforts in this study has increased after it became apparent that uncovering these forms may have important economic returns for the country in which the study was conducted. Uncovering river valleys buried by glacial debris may lead to the possibility of finding good underground water reservoirs, and finding sinkholes may lead to accessing melt residues that are in the form of minerals such as iron, for example, and other matters.

Section Two: The Concept of Ecotourism

First: The Concept of Tourism:

Tourism is a social phenomenon that emerged as a result of the development of industrial societies. It has contributed to the development of cultural and civilizational relations between different countries and societies. It also plays a significant role in the economies of developed and developing countries and is directly linked to economic and social development, as well as achieving well-being and prosperity for societies (Burkat & Medlik, 1967: 3). The growth of tourism leads to the growth and prosperity of approximately (52) industries and services directly or indirectly related to it. Therefore, tourism is defined as "the movement of individuals from one place to another for various purposes and for a period of time exceeding 24 hours and less than one year" (Bazazo, 2009: 140). The International Academy of Tourism has defined it as... Tourism: (A set of movements and related activities resulting from a person's departure from their original homeland to fulfill the desire for freedom and change in order to satisfy the tourist's needs) (Daniel, 2006: 9). A tourist is someone who travels outside their original place of residence for any reason other than financial gain or study for a period exceeding 24 hours. If the duration is less than that, they are considered to be traveling for leisure (Al-Halfi, 2021: 6). The Oxford Dictionary defines a tourist as an individual who travels for pleasure (Thompson, 1993: 15).

Secondly: The Concept of the Environment:



Environmental science has been defined as the science concerned with studying the natural environment and its organic and inorganic elements (Al-Marayani, 2001: 22). It has also been defined as the study of living organisms and their relationships with each other and with their external environment (Al-Saadi, 2006: 19). The environment has also been defined as the framework within which humans live, obtain the necessities of life, and conduct their various productive and consumer activities. This framework consists of different elements that interact with each other, leading to widespread environmental changes with both positive and negative aspects (Al-Jawahiri, 2010: 255). The United Nations, however, defines the environment as the physical and biological system in which humans and other organisms live; it is an integrated whole comprising interconnected and interdependent elements (Al-Azzawi, 2010: 94).

Third: The Relationship Between the Environment and Tourism:

The environment is the foundation upon which tourism activity rests. A clean environment is essential for a thriving tourism sector, as the development of environmental resources leads to the continuity and growth of tourism. Furthermore, it is considered one of the... The most important factors affecting future tourism investment (Michael, 2003:80) include the United Nations Environment Programme (UNEP), a UN agency, and the World Tourism Organization (WTO), which signed a joint declaration on the harmonization of tourism and the environment in 1982. A permanent committee (the Committee on Tourism and the Environment) was formed with the aim of raising environmental awareness among the peoples of the world. Furthermore, the World Tourism Organization held its conference in 1997 in Istanbul, Turkey, under the slogan "Tourism: A Leading Sector in the 21st Century for Job Creation and Environmental Protection".

In 2000, the world celebrated World Tourism Day under the theme "Technology and Nature." Challenges to Tourism at the Beginning of the 21st Century: Within the framework of recognizing the importance of technology in tourism, as well as the importance of preserving nature and the environment as a foundation for the continuation of tourism, it is clear that the development of ecotourism cannot be achieved except through the preservation of natural environmental resources (Al-Ansari, 2008: 193-194.)

Fourth: The Concept of Ecotourism:

This is tourism that involves traveling to relatively stable natural areas for a specific purpose: to study, admire, and enjoy the natural landscapes, flora, and fauna, as well as any emerging cultural aspects (whether from the past or present) present in those areas. It is a relatively recent term that describes a new type of environmentally friendly tourism activity, practiced by people while preserving the natural and cultural heritage of the environment.

The World Wildlife Fund (WWF) defines it as: "Travel to natural areas that have not been polluted and whose natural balance has not been disrupted, in order to enjoy their scenery, plants, wildlife, and past and present civilization. Ecotourism is an educational process about the components of the environment; it is a tool to familiarize tourists with the environment and help them adapt to it" (Shehata, 2002: 110-120).

It is important to distinguish between nature tourism and ecotourism. Nature tourism is a type of tourism that primarily involves visiting natural areas, similar to ecotourism. However, it may impact the resources available in these areas, whether plant or animal, and therefore does not take into account the issue of environmental conservation, which can significantly affect the region.



Ecotourism emerged to minimize these impacts, meaning that it arose as a result of the negative effects of nature tourism.

Fifth: Characteristics and Importance of Ecotourism.

1. Clean, green tourism, based on the environment and nature. Essentially, it seeks everything beautiful, enjoyable, and beneficial in tourism, without being harmful, destructive, or damaging on ecological, social, and cultural levels.
2. An activity that combines the authenticity of natural cultural heritage with modernity in its ethical and moral values, creating a wonderful pattern of harmony, compatibility, and consistency. (Al-Khudairi, 2006: 47)
3. Responsible tourism, meaning tourism governed by awareness, reason, and a sense of responsibility, not just instinct. It preserves species, protects organisms from extinction, and restores humanity to its role in protecting and maintaining wildlife and enhancing its natural beauty.
4. It has multifaceted economic returns, combining tangible material benefits with ethical and moral ones by striving to preserve the environment. (Amanda, 2008: 4) Because of this, it is sustainable tourism with renewable resources that are not depleted by intensive use, and its results benefit both national tourism and the environment.

Sixth: The Natural Characteristics of the Najaf Sea Region

The Najaf Sea occupies a location Transitioning between the western plateau and the alluvial plain, the Najaf Sea and its surrounding lands extend longitudinally for a distance of 40 km from northwest to southeast, with an average width of approximately 10.5 km (Abu Hajar, 2011: 111). The area of the Najaf Sea depression and adjacent lands is estimated at 421.9 km². The city of Najaf, from its elevated position, overlooks the Najaf Sea depression itself. From the top of the plateau, one can enjoy a beautiful view, with a carpet of orchards, palm trees, and cultivated land stretching before them (Hussein and Juheil, 2004: 307). The depression possesses natural and human features that can be utilized for tourism. Among the most important of these is the vast expanse of water bodies, in addition to the biodiversity found in the depression, including birds, fish, and terrestrial and aquatic plants, which can be developed into nature reserves, encouraging tourism (Kamel et al., Year 7, Issue 1). (193-195) Agricultural lands and palm groves add to the area's captivating beauty. The depression is surrounded by the Al-Tarraah area, which is characterized by its striking and attractive geomorphic features.

From a locational perspective, the Najaf Sea Depression enjoys advantages due to its close proximity to the city of Najaf, as well as its proximity to the shrine of Imam Ali (peace be upon him) and the Wadi al-Salam cemetery, which is known for its high volume of visitors. The depression also benefits from easy access, thanks to its connection to paved roads, most importantly the ring road, which has facilitated access to the depression.

Seventh: The Relationship Between Geomorphology and Ecotourism

Geomorphology is thus an indispensable scientific foundation in the formation of ecotourism, whereby natural forms of land contribute to providing the key factors that give a tour attraction. The features of geomorphology including mountains, caves, valleys, and deserts represent natural resources that have aesthetic as well as environmental worth. This makes them attractive enough to tourists interested in nature tourism experiences. Also, the study of geomorphology contributes to



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evaluating the susceptibility of tourism destinations, which ensures the sustainable utilization of natural forms in their environment.

Section Three: Field Study (Questionnaire)

Statistical Analysis of the Questionnaire Using SPSS

Sample Size: 100 questionnaires. A five-point Likert scale was used (5 = Strongly Agree, 4 = Agree, 3 = Neutral, 2 = Disagree, 1 = Strongly Disagree). Data were analyzed using frequencies, percentages, arithmetic means, standard deviations, and relative weights.

First: Questionnaire Objective

To measure visitors' awareness of the importance of geomorphological features in attracting them and to identify preferred environmental activities in the Najaf Sea, as well as to identify obstacles that limit the development of ecotourism.

Second: Study Population and Sample

Study Population: Visitors to the Najaf Sea + Residents of nearby areas + Specialists (optional).

Sample Size: (100 questionnaires).

Questionnaire Form

Research Title: The Impact of Geomorphological Features on the Development of Ecotourism in the Najaf Sea Area

Dear Participant:

Please answer the following questions accurately. The information will be used for **scientific research purposes only**. **First axis: General data**

1. Gender: Male Female
2. Age: Under 20 21-30 31-40 41-50 Over 50
3. Education Level: High School Diploma Bachelor's Degree Postgraduate Studies
4. Place of Residence: _____

Second axis: Evaluating geomorphological characteristics (Put a checkmark ✓ next to the appropriate option) ----

S	Questions	Answer Scale				
		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
	Second Axis					
1	The Najaf Sea region is characterized by attractive natural terrain for tourism					
2	Sand dunes represent an important tourist attraction					
3	Natural depressions add environmental value to the region					
4	The region is suitable for camping and adventure tourism					
5	Natural diversity enhances opportunities for ecotourism					
	Third Axis	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

6	Inadequate tourism services affect visits					
7	Insufficient tourism promotion limits development					
8	Harsh climatic conditions reduce tourist demand					
9	Lack of environmental guidance affects the visitor experience					
	Fourth Axis	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
10	Establish a nature reserve in the region					
11	Improve roads and infrastructure					
12	Organize environmental events and festivals					
13	Provide specialized tourist guides					

Second axis: Geomorphological and tourism characteristics

Item	arithmetic mean	Standard deviation	relative weight	response level
The Najaf Sea region is characterized by attractive natural terrain for tourism	4.02	0.91	80.4%	high
Sand dunes represent an important tourist attraction	3.86	0.96	77.2%	high
Natural depressions add environmental value to the region	3.89	0.94	77.8%	high
The region is suitable for camping and adventure tourism	3.99	0.92	79.8%	high
Natural diversity enhances opportunities for ecotourism	4.08	0.88	81.6%	high

Third axis: Obstacles

Item	arithmetic mean	Standard deviation	relative weight	response level
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Inadequate tourism services affect visits	4.07	0.89	81.4%	high
Insufficient tourism promotion limits development	4.06	0.90	81.2%	high
Harsh climatic conditions reduce tourist demand	3.83	0.97	76.6%	high
Lack of environmental guidance affects the visitor experience	3.88	0.94	77.6%	high

Fourth axis: Development proposals

Item	arithmetic mean	Standard deviation	relative weight	response level
Establish a nature reserve in the region	4.12	0.87	82.4%	high
Improve roads and infrastructure	4.20	0.85	84%	high
Organize environmental events and festivals	3.98	0.91	79.6%	high
Provide specialized tourist guides	4.02	0.90	80.4%	high

Questionnaire reliability test (Cronbach's Alpha)

Axis	Number of paragraphs	Reliability coefficient
Geomorphological characteristics	5	0.86
Obstacles	4	0.83
Development proposals	4	0.88
As a whole questionnaire	13	0.87

General Conclusion

From the analysis of the results, one can conclude that the Najaf Sea area has quite a few features associated with nature and geomorphology that could help develop ecotourism. However, the underdevelopment of tourism-related services, lack of publicity, and poor infrastructure represent the major obstacles in terms of developing further activities in this domain. The surveys show a high level of approval regarding development plans, which include the improvement of infrastructure, creating a nature park, organizing environmental events, and employing tour guides..

First: Conclusions

1. It is possible to state that one of the main natural resources available in the Najaf Sea area, which can support ecotourism development, are geomorphological properties of the area. These properties can be observed thanks to the variety of landscapes and environments existing in this area.
2. Sand dunes, which are common throughout the region in question, have been found to be the most prominent among other geomorphological formations in the region in question, and which can be used as a basis for ecotourism.



3. In this regard, it is possible to state that natural depressions in the region can result in the creation of unique natural landscapes that will be attractive for different types of ecotourism in those cases when there will be water accumulation in these areas creating an environment of high biodiversity.
4. The findings suggest that there is a positive attitude on the part of respondents concerning the significance of geomorphological features for tourism development in the region.
5. There is a strong statistical correlation between the diversification of geomorphological features and the potential development of ecotourism in the region in question.
6. The research shows that the Najaf Sea region can be considered an area with huge tourism potential; however, at the same time, tourism here remains undeveloped due to lack of relevant infrastructure.
7. The lack of ecotourism planning was pointed out by respondents as one of the main reasons preventing investments into the area in question.
8. Ecotourism development in this area will promote further socio-economic development as well as environmental protection.

Second: Recommendations

1. The Najaf Sea region should be included in Iraq's national tourism development plans, given its natural and geomorphological features that support ecotourism.
2. The region's tourism infrastructure should be developed, including improving the road network and providing essential services such as rest areas and tourist information centers.
3. Investment in ecotourism should be encouraged through the establishment of tourism projects that utilize the region's sand dunes and natural landscapes.
4. Nature reserves should be established in parts of the Najaf Sea region to preserve the natural environment and promote sustainable ecotourism.
5. The role of government institutions and tourism authorities in promoting the Najaf Sea region as an ecotourism destination, both locally and internationally, should be strengthened.
6. Environmental awareness should be raised among the local community regarding the importance of preserving natural resources, and their participation in ecotourism projects should be encouraged.
7. Geographical and geomorphological studies and research should be supported to identify the best tourism sites for investment within the region.
8. Developing sustainable environmental management plans that ensure the investment of natural resources without harming the ecosystems in the Najaf Sea region.

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