

## **EXPLORING THE POTENTIAL FOR GEOSITES DEVELOPMENT IN EGYPT: A CASE STUDY OF WADI DEGLA PROTECTED AREA**

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### **ABSTRACT**

*The main aim of this research is to explore the potential for geosites development in Egypt, in particularly Wadi Degla Protected Area. A case study approach was applied to reach the research objectives. This research is based on a mixed approach to obtain adequate information for achieving the research aims; two stages were considered to be the most appropriate form of data collection instruments, multiple sources of data collections, including questionnaire and direct observation to gather a mix of quantitative and qualitative data. Two types of sampling used in this research including; a convenience sample for official staff and snowballing sampling for experts. The total number of distributed questionnaires was 250 copies. The final returned questionnaires were 190 copies with 76% response rate. Statistical Package for Social Sciences (SPSS, version 25) program was used for analysing data. The results showed that Wadi Degla Protected Area is characterized by geological diversity, it has a unique ecosystem. It noted that there are many activities that are practiced in the protected area as follows: mountain climbing; cycling running; bird watching; barbecue and camping. The results revealed that there is a shop and place for selling souvenirs to the visitors. This study contributed to the theory by increasing the literature review and researches related to geotourism sites in Egypt in particularly Wadi Degla Protected Area. The current study has some limitations which including; firstly, this research focused on one case study of Wadi Degla Protected Area. Secondly, the literature showed there had been clear lack of prior research studies on geotourism sites in Egypt. Future research should address more geosites in Egypt; it also should undertake to test the findings of this research.*

**KEYWORDS:** Geotourism, Geosites, Geomorphology, Resources, Egypt

## **INTRODUCTION**

Tourism industry is developing rapidly and becoming a global industry, also its growing competition creates interesting topic in tourism research (Zhang and Lu, 2012). As well, Croes and Kubickova (2013) mentioned that the destinations are faced increasing competition requiring administration to interact in prioritization of actions and deciding the allocation of resources that will benefit tourism development. According to Dupeyras and Maccallum (2013) tourism is considered one of the key sectors for development in countries and a major source of income, jobs and wealth creation. As well as, it plays an important role in promoting the image and international perception of a destination. Hence, tourism has become a global socio-economic phenomenon around the world (Cracolici and Nijkamp, 2009). The natural resources of a destination define the framework, which the visitor enjoys the destination. It includes climate, flora and fauna, scenery and other physical assets (Dimoska and Trimcev, 2012). While, Dwyer et al. (2012) have emphasized, a destination's endowment of natural resources is crucial for many forms of tourism and visitor satisfaction. However, in the tourism context natural resources have a substantial capacity to attract visitors, regardless of any 'value-added' by human providers (Dwyer and Kim, 2003; Dwyer et al., 2012).

According to the digital demand for natural resources and the decline in Egypt's natural resources, despite the existence of many natural elements, as well as the increasing demand for cultural resources (ECES, 2017). Despite the interest of officials in the pattern of ecotourism as one of the types of natural tourism, but they did not give enough attention to the geotourism as one of the types of natural tourism although the country possesses plenty of geosites could promote this branch of tourism. However, the interesting of all countries in the world for this type of tourism and they try to add these sites to UNESCO, and thus promoting the international level, so this letter seeks to known geotourism and its components and increased demand for natural resources sites and thus enhance the competitiveness of Egypt (ENCC, 2017).

The main aim of this research is to explore the potential for geosites development in Egypt, in particularly Wadi Degla Protected Area; in order to reach to this aim, there are four objectives identified; firstly, to identify the role of endowed resources in increase the demand of geotourism in Wadi Degla Protected Area. Secondly, to examine the role of created resources in increase the demand of geotourism in Wadi Degla Protected Area. Thirdly, to identify the importance of site management in increase the demand of geotourism in Wadi Degla Protected Area. Fourthly, to explore the effects of situational conditions in increase the demand of

geotourism in Wadi Degla Protected Area. The research is conducted as follows. First, there is the literature review in which we discuss the concept of geotourism and geosites. This is followed by the classification of geosites, natural resources in Egypt, importance of geotourism sites and Wadi Degla Protected Area as a geosite. The research methodology is then presented. Next, the results are discussed, and implications for further research are then reported.

## **LITERATURE REVIEW**

### **OVERVIEW OF GEOTOURISM**

Geotourism concept was developed and promoted from the early 1990s onwards (Hose, 1995). According to Heggie (2009) and National Geographic (2012) geotourism was born as a new global phenomenon since 1997. The term passed into general usage in antecedents date back to the seventeenth century (Stokes et al., 2003; Frey et al., 2006). The world has estimated the beauty of the landscape, as a consequence of different geological processes for centuries. Geotourism research began to flourish about a decade ago, and it is still in a “young” stage of development (Abdou, 2017). Geological structures present information about the past that cannot be obtained from other sources. So, this structure consists of several events such as climatic changes, volcanisms, earthquake, timing of glaciations, and sea-level fluctuations (Sallam et al., 2018). Moreover, these structures are widely spread on earth but some of them are rare or unique, and in any case, it is a part of our geological heritage (Üner et al., 2017).

Consequently, geological materials, processes and forms might be interesting for everyone such as; rare minerals, interesting rocks can be very attractive even for children or non-expert people); the various forms of quarries, abandoned mines, cliffs, crags and caves offer a good opportunity for collecting (except in the protected areas); photography and outdoor exhibition, thermal waters and hot springs also attract tourists from all over the world; snow covered mountains, ice and glaciers provide opportunities for winter sports; soil plays an important role in the shaping of the landscape. Finally, echoes, acoustic effects, the perfume, odors and legends, myths can also be attractive to tourists (Tenk, 2015; Issawi and Sallam, 2018). Geotourism was defined for the first time as “the provision of interpretive and service facilities to enable tourists to acquire knowledge and understanding of the geology and geomorphology of a site (including its contribution to the development of the Earth sciences) beyond the level of mere aesthetic appreciation” (Hose, 1995), this definition has been modified by different authors such as (Hose, 2012; Joyce, 2010; Dowling, 2011).

Summarizing, geotourism is a relatively new approach in the tourism literature. The literature has two general approaches to the concept of geotourism (Allan, 2015). Firstly, Hose (1995) and Dowling, (2011) mentioned that geotourism reflects the real value of the geological and geomorphic features. Secondly, National Geographic (2012) reported that geotourism has a purely geographic theme.

### **GEOTOURISM SITES**

Geotourism can be defined as a special for of tourism that centering on geosite (Premangshu and Rahul, 2018). According to Ilies et al., (2014) the term of "site" means location, which defined by Moroni et al. (2015) as "a part of a territory (space) of a certain size and form having a material, energetic and informational substance". On contrary, Pralong and Reynard (2005) indicated that the site is "place" which defined as "a part of a territory bearing significance". Accordingly to this definition the place is the territorial incarnation of each phenomenon in part, simple or complex, but unique and non-recurring (Ilies and Josan, 2009). From another point of view, there is an overlap between the location and site that they can replace one another (Ilies et al., 2014). Furthermore, Farsani et al. (2013: 5) considered the site as "the area around which the initial functional and structural model has transplanted itself", so there are many differences between location and sites.

Additionally, Ilies and Josan (2009) stated that the site refers to the cultural and physical characteristics and to the features of the place itself. Nevertheless, Pralong and Reynard (2005) explained the features of a place (site) which are: firstly, location (absolute or mathematics and relative), secondly, size (small, large, and extended), thirdly, geographic contents. Finally, area (a certain special structure is shifting in time, space, contents and functions). The study of, Zorina and Silantiev (2014), and Serrano and Ruiz-Flaño (2018) defined geosites as geological objects that presents a particular interest for the comprehension of the Earth, climate and life history. It allows the analysis of the spatial and temporal evolution of an area and for the meaning of surface processes and the importance of rocks in the development of specific landscapes to be comprehended.

### **CLASSIFICATION OF GEOSITES**

Geosites classifications depend on their types, ranks, and categories (Ruban, 2010). Many scholars (Ruban, 2010; Zorina and Silantiev, 2014; Sallam et al., 2018) mentioned that there are 21 types of geosites as below (see Table 1):

**Table 1: Classification of geosites**

<b>Geosites type</b>	<b>Descriptions</b>
Stratigraphical geosite	represents succession of rocks, and/or it demonstrates chronology of the geologic time.
Paleontological geosite	contains fossil organisms (including those with unique preservation) or their traces
Sedimentary geosite	exhibits sedimentary rocks and bodies that can be composed of volcano
Igneous geosite	represents igneous (magmatic) rocks and bodies
Metamorphic geosite	contains rocks and bodies composed of significantly altered matter of preexisted rocks.
Mineralogical geosite	demonstrates minerals and mineral associations.
Economical geosite	represents ore, non-ore, and hydrocarbon deposits
Geochemical geosite	reflects anomalies in concentration of elements and natural and anthropogenic chemical compounds in the Earth's crust
Seismical geosite	is linked to modern and ancient earthquakes
Structural geosite	exhibits deformation structures (folds, faults, nappes, etc.).
Paleogeographical geosite	provides an information on paleoenvironments
Geothermal geosites	include hot springs and relevant phenomena
Geocryological geosite	is linked to permafrost.
Geomorphological geosite	represents landforms and surficial processes
Hydrological and hydrogeological geosites	reflect geological activity of surficial and subsurficial waters
Engineering geosite	reflects outstanding mass wasting (landslides, rockfalls, etc.) and other phenomena relevant to construction and other forms of the anthropogenic activity.
Radiogeological geosite	is linked to natural radioactive rocks, waters, or gases.
Neotectonical geosite	is a manifestation of modern tectonic activity
Pedological geosite	is linked to modern soils and paleosols
Geohistorical geosite	reflects the history of geological exploration, mining activity, and other human activities linked to the geological environment, as well as the history of geology as a science

**(Source: adapted from Zorina and Silantiev, 2014)**

Additionally, all previous classification of geosites can be divided into three categories which including; spatial appearance (point, linear, and area geosites), dynamic state (static and dynamic geosites), and origin (natural and artificial geosites) (Ruban, 2017; Zorina and Silantiev, 2014).

## **NATURAL RESOURCES IN EGYPT**

Egypt has an advanced position (22nd, up 19 places) in terms of cultural resources and business travel due to the high number of searches for cultural and recreational activities in Egypt. At the same time, an increased digital presence has led to a growth in digital demand for the country's popular cultural resources (8th). While, Egypt ranks (97th) in natural resources and the natural tourism digital demand ranks (46th), as for the natural resources Egypt is falling behind because of the severe decline in the attractiveness of the Egyptian natural sites and the limited number of natural reserves and protected areas for the entire land area (ENCC, 2017). On the other hand, Ritchie and Crouch (2003) divided resources in to two types (1) core resources and attractors which including physiography, culture and history, market ties, mix of activities, special events, and tourism superstructure; (2) supporting factors and resources such as infrastructure, accessibility, facilitating resources, and enterprise). As well, Dwyer and Kim (2003), classify the Resources category into: firstly, endowed (inherited) that can be classified as Natural (mountains, lakes, beaches, rivers, climate etc.) and Heritage or Cultural (cuisine, handicrafts, language, customs, belief systems etc.) and secondly, created resources which include tourism infrastructure, special events, the range of available activities, entertainment and shopping.

As mentioned earlier, the literature review showed that there are many variables play an important and critical role in improve the demand of geotourism sites which including;

- ***Endowed Resources*** the natural resources that constitute the primary motivation to travel for the tourists. It can be classified as natural features such as; mountains, lakes, beaches, rivers, and climate and other physical assets (Dwyer and Kim, 2003; Dwyer et al., 2012).
- ***Created Resources*** a resource exert more of secondary effect by providing a foundation upon which a successful tourism can be established. It include tourism infrastructure, comprises features such as accommodation facilities, food services, transportation facilities, attractions, fast food outlets, car rental firms, local convention and visitor bureau (Dwyer and Kim, 2003; Dwyer et al., 2012).
- ***Site Management*** which can enhance the appeal of the core resources and attractors, strengthen the quality and effectiveness of the

supporting factors and resources. Five types of activities are potentially important influences on site competitiveness: marketing management; planning and development; site management organisation; human resource development; and environmental management (Ritchie and Crouch, 2003; Dwyer et al., 2012).

- ***Situational Conditions*** are forces in the external environment that impact upon destination competitiveness. It relate to economic, social, cultural, demographic, environmental, political, legal, governmental, and technological (Ritchie and Crouch, 2003; Dwyer et al., 2012).

### **IMPORTANCE OF GEOTOURISM SITES IN EGYPT**

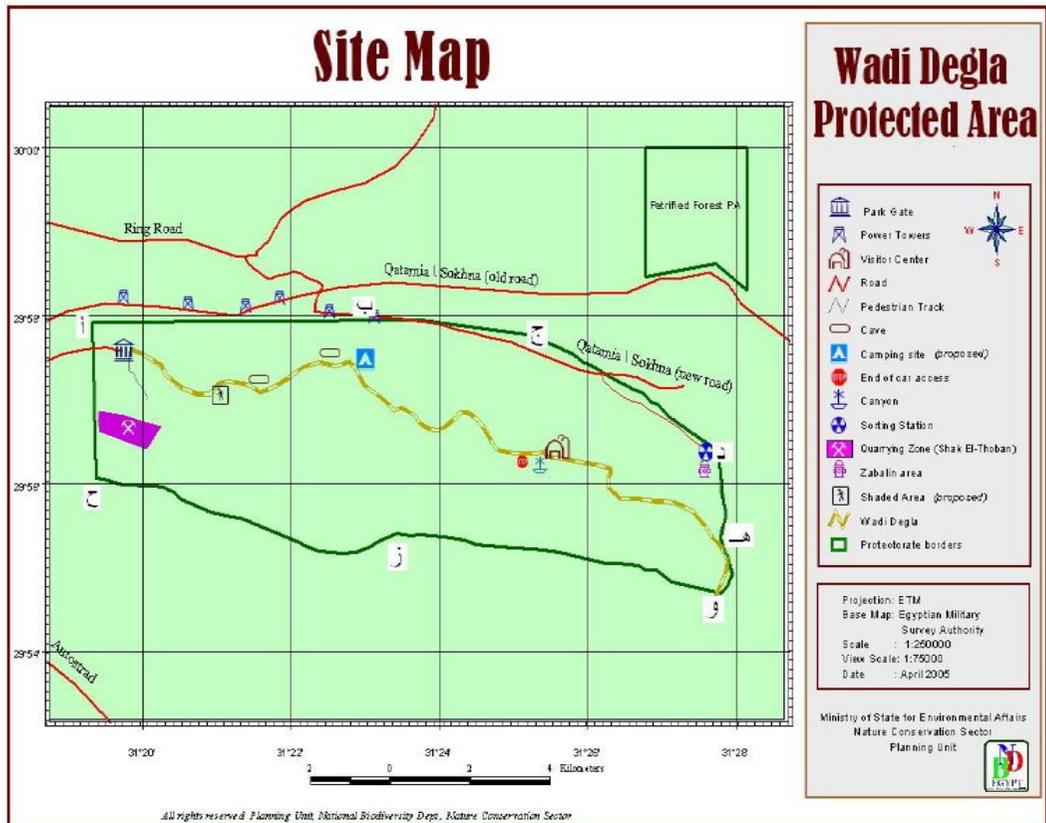
Geotourism has become important in many countries because of the great benefits, whether economic, social, or cultural benefits, along with interest in other forms of tourism (Abdel Maksoud and Hussien, 2016). Errami et al. (2015) reported that a potential geotourism development can bring many outstanding benefits to the overall tourism industry. The special importance of geological heritage for Egypt is determined by several reasons which including, firstly, establishment of geological heritage permits more balanced judgments of geological resources to avoid their extensive exploitation and natural damage. Secondly, geotourism development and geosite exploitation make possible new local budget receipts, increase in personal income of local community, and creation new job (Abdou et al., 2017). Moreover, the additional reasons are: the danger of uncontrolled or poorly planned (even illegal) urbanization is better recognized if its real negative environmental effects are evaluated. Cairo is a major tourist destination, so geotourism development there will be easier (and less risky with regard to investments) than in any remote place of the country (Abdel Maksoud and Hussien, 2016).

Vasiljević et al. (2011) explained that the technological development, economic and population growth and social changes have led to an evident and serious degradation of the natural environment. Furthermore, nature conservation is associated with the protection of biodiversity as the most vulnerable element of natural environment. While, it is quite clear that protection of both abiotic and biotic nature have to get much attention (Hose, 2012). On the other hand, enabling the local public to contribute to promotional activities, and giving them opportunity to make profit from these natural beauties for example transportation, security, and accommodation will increase awareness and help people protect these beautiful features (Bajada, 2009; Rocha and Silva, 2014). Moreover to conserve the geoheritage to next generations it should increase the awareness of these structures in terms of geological education (Üner et al., 2017).

## **WADI DEGLA PROTECTED AREA AS GEOSITE**

The Wadi Degla area in Cairo governorate was designated a protectorate in 1999 by the Egyptian Environmental Affairs Agency and covers a land area of 60 square km. It classified as desert lands protected area. This desert land easily reached from Cairo and lies just 10 km away (EEAA, 2019). Wadi Degla is one of the important valleys which extend from east to west with a length of 30 km to drain into the Nile valley of Maadi south of the Cairo governorate. It passes through the limestone rocks that had remained in the marine environment during the Eocene Epoch in the eastern desert (60 million years). Therefore, it is rich with fossils. The height of these rocks alongside the valley is around 50m. A group of valleys flew into this valley. The rain water dropping from the waterfalls affected the limestone rocks along the years and formed the so called canyon Degla, which resembles the Grand Canyon in the U.S (EEAA, 2019).

The protectorate is also one of the most important valleys that extends from east to west and rises in the mountains of the eastern desert. The Wadi runs through limestone terrain which then cuts into a deep winding canyon and a few places can be seen the floodwater which has carved the rocks into spectacular shapes (El Khateeb, 2006). There are many fossils in the rock formations and scattered patches of petrified wood. The ephemeral plants dominate the Wadi after the rainy season. Few animal species that have been found include (Dorcas Gazelle), (Gazella Dorcas), and (Nubian Ibex), (Capra Nubiana), also (Lesser Mouse-tailed Bats), (Rhinopoma Hardwickii), live in the caves in the Wadi sides (Dabes, 2006). The protectorate is a very popular destination for tourists and also people who wish to get away from the hustle-bustle of daily life, also for birdwatchers. Also, those in search of solace and relaxation can also enjoy here thoroughly (Dabes, 2006). The valley has a group of animals living here which include mammals like dear, taital, mountain rabbits, red fox, feather tailed rat, oviparous, barbed rat, little-tailed bat and others. 18 species of reptiles have been recorded as well. Apparently, Wadi Degla is a home to various species of birds, reptiles and bats, and even larger animals such as foxes and gazelles. There are also many fossils from times past when the valley was covered with water (Wagdy et al., 2008) (see Figure 1).



**Figure 1: Map of Wadi Degla Protected Area (Source: EEAA, 2019)**

The previous literature guided us to the research hypotheses, which is:

- H1: There are statistically significant effects of endowed resources in increase the demand of geotourism in Wadi Degla Protected Area
- H2: There are statistically significant effects of created resources in increase the demand of geotourism in Wadi Degla Protected Area.
- H3: There are statistically significant effects of site management in increase the demand of geotourism in Wadi Degla Protected Area.
- H4: There are statistically significant effects of situational conditions in increase the demand of geotourism in Wadi Degla Protected Area.

## **RESEARCH METHODOLOGY**

The case study research approach represents a proper methodology to answer the research questions (Yin, 2009). A single case study was used to achieve the research aim, and research question. This research is based on a quantitative and qualitative approach (mixed methods) since its main aim is to understand the context better from practitioners (Saunders, 2011). To obtain adequate information for achieving the research aim and objectives,

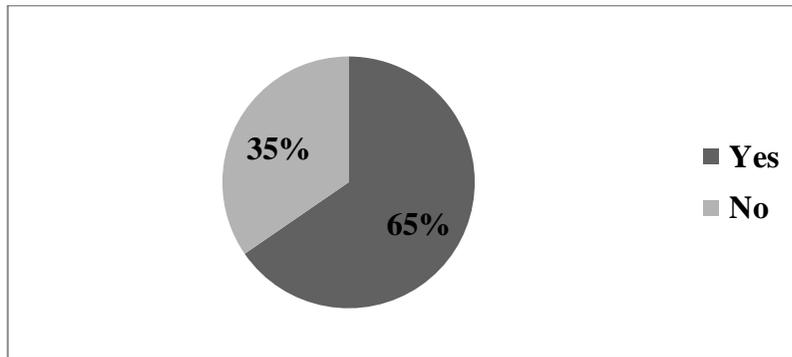
two stages were considered to be the most appropriate form of data collection instruments, multiple sources of data collections, including questionnaire and direct observation to gather a mix of quantitative and qualitative data. This research started with quantitative research in phase one which depends on the questionnaire, in order to attain extending understanding the research topic. The questionnaire in this research is broken into five sections including; geotourism sites demand and attractions (consists of questions relating to the demand of geotourism sites and the attraction of geotourism sites), endowed resources (5 items), created resources (8 items), site management (9 items), and situational conditions (4 items). The study variables are modified from Dwyer and Kim (2003). A Likert scale was used (1) strongly disagree, (2) disagree, (3) neutral, (4) agree, (5) strongly agree. Finally, the qualitative researches employed in phase two via using the direct observation of study areas. The research sampling was used two types of sampling including; firstly, a convenience sample for official staff (General Authority for Tourism Development and Egyptian Tourist Authority in Ministry of Tourism, Egyptian Environmental Affair Agency and Manger of Wadi Degla Protected Area). Secondly, snowballing sampling for experts (who have experience, knowledge and research in geotourism sites). The total number of distributed questionnaires was 250 copies. The final returned questionnaires were 190 copies with 76% response rate. Statistical Package for Social Sciences (SPSS, version 25) program was used for analysing data.

## **RESULTS AND DISCUSSIONS**

### **PHASE ONE: QUESTIONNAIRE ANALYSIS**

#### **GEOTOURISM DEMAND AT WADI DEGLA PROTECTED AREA**

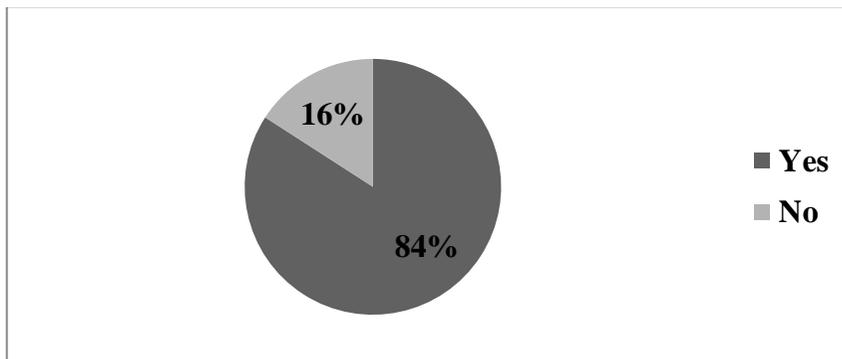
This section of the questionnaire was aimed to collect information related to the demand of visiting Wadi Degla Protected Area. The respondents were asked *is there demand for visiting Wadi Degla Protected Area?* The participants were answering with *yes* or *no*, depending on their view. 123 (65%) of the respondents were said *yes*, 88 (35%) of the respondents were said *no* (see Figure 2).



**Figure 2: Demand for visit Wadi Degla Protected Area**

### **Geotourism attraction at Wadi Degla Protected Area**

The respondents were asked, *does Wadi Degla Protected Area have an attraction to be considered a geotourism site?* 159 (84%) of the respondents were answer yes, that Wadi Degla Protected Area have attractions such as fossils, rocks, mountains, and fossilized trees, that help it to be considered as a geotourism site. While 30 (16%) of the participants were answer *no* (see Figure 3).



**Figure 3: Geotourism attraction at Wadi Degla Protected Area**

### **Endowed resources in Wadi Degla Protected Area**

The results in table (2) showed that the mean scores for the natural and geological resources in Wadi Degla Protected Area range from 3.94 to 4.19. The standard deviations for the responses to the items measuring it ranged between 0.61 to 0.99 displays a reasonable level of variability. The results reported that the grand mean of the natural and geological resources variables were 4.06, comparing that mean with the 5-point of Likert scale strongly disagree (1), disagree (2), neutral (3), agree (4), strongly agree (5), this mean is situated between the choice number (4) agree and (5) strongly agree and it closed by the choice number (4). These mean statistics show

the agreement of the participants for the natural and geological resources in Wadi Degla Protected Area. This result matched with the literature review the geotourism play a vital role in enhancing the economic development in the potentials geosites and contributing to the sustainable development within these geosites (McKeever, 2010).

**Table 2: Mean and Standard Deviation of the endowed resources in Wadi Degla Protected Area**

<b>Endowed resources in Wadi Degla Protected Area</b>	<b>Mean</b>	<b>Std. Deviation</b>	<b>Number of responses (n=190)</b>
1. Wadi Degla Protected Area is characterized by unique diversity in geological and geomorphological aspects.	4.10	0.75	190
2. Wadi Degla Protected Area has a history and geological importance.	4.19	0.61	190
3. Wadi Degla Protected Area has an interest to scientists and researchers.	4.14	0.74	190
4. Wadi Degla Protected Area has an aesthetic value that targets tourists.	3.94	0.93	190
5. Wadi Degla Protected Area has economic value.	3.96	0.99	190
<b>Statistics for all Variables</b>	<b>4.06</b>	<b>0.80</b>	<b>190</b>

**CREATED RESOURCES IN WADI DEGLA PROTECTED AREA**

Results in the following table (3) showed that, the mean scores for geotourism competitiveness indicators "created resources" in Wadi Degla Protected Area range from 2.33 to 4.70. The standard deviations for the responses to the items measuring it ranged between 1.02 to 1.31, which displays a reasonable level of variability. The results reported that the grand mean of the created resources in Wadi Degla Protected Area were 3.52, comparing that mean with the 5-point of Likert scale strongly disagree (1), disagree (2), neutral (3), agree (4), strongly agree (5), this means is situated between the choice number (3) neutral and (4) agree and it closed by the choice number (4). These mean showed the agreement of the participants for the created resources in Wadi Degla Protected Area. The results matched with the literature review reported that infrastructure play an important role in site management. However, the geoheritage and geosites have confronted many challenges, such as the accessibility and

infrastructure issues, and the lack of sustainability of geoheritage (Errami et al., 2015).

**Table 3: Mean and Standard Deviation of created resources Wadi Degla Protected Area**

<b>Created resources in Wadi Degla Protected Area</b>	<b>Mean</b>	<b>Std. Deviation</b>	<b>Number of responses (n=190)</b>
1. Transportations are available for visitors in Wadi Degla Protected Area.	3.60	1.31	190
2. Pamphlet, brochures and maps are available to visitors in different languages.	4.65	1.24	190
3. There are recreational activities in Wadi Degla Protected Area such as camping.	4.70	1.14	190
4. There are places to sell souvenirs in Wadi Degla Protected Area.	4.55	1.05	190
5. There are medical services within or near Wadi Degla Protected Area.	2.95	1.11	190
6. There is a communication network within Wadi Degla Protected Area.	2.33	1.07	190
7. There is food and beverage service within or near Wadi Degla Protected Area.	2.45	1.02	190
8. There are festivals and special events are carried out Wadi Degla Protected Area.	2.99	1.21	190
<b>Statistics for all Variables</b>	<b>3.52</b>	<b>1.03</b>	<b>190</b>

**GEOTOURISM SITE MANAGEMENT IN WADI DEGLA PROTECTED AREA**

The results in the following table 4 showed that, the mean scores for geotourism site management in Wadi Degla Protected Area range from 2.00 to 3.20. The standard deviations for the responses to the items measuring it ranged between 0.89 to 1.15, which displays a reasonable level of variability. The results reported that the grand mean of geotourism site management in Wadi Degla Protected Area were 2.44, comparing that mean with the 5-point of Likert scale strongly disagree (1), disagree (2), neutral (3), agree (4), strongly agree (5), this means is situated between the choice number (3) natural (2) disagree, and it closed by the choice number (2). These mean statistics show the disagreement of the participants for the geotourism site management in Wadi Degla Protected Area. The literature

review reported that site management focuses on activities which implement the policy and planning framework in order to enhance the appeal of the core resources and attractors, strengthen the quality and effectiveness of the supporting factors and resources, and best adapt to the constraints imposed by qualifying and amplifying determinants (Dimoska and Trimcev, 2012).

**Table 4: Mean and Standard Deviation of geotourism site management Wadi Degla Protected Area**

<b>Geotourism site management in Wadi Degla Protected Area</b>	<b>Mean</b>	<b>Std. Deviation</b>	<b>Number of responses (n=190)</b>
1. There is a marketing plan for the promotion of Wadi Degla Protected Area.	2.39	1.13	190
2. There is cooperation between the Tourism Promotion Authority, the EEAA and the tourism companies for the marketing of Wadi Degla Protected Area.	2.35	1.12	190
3. There is a plan for development of Wadi Degla Protected Area.	2.40	1.13	190
4. The local community will be involved in the development and marketing plans of the Wadi Degla Protected Area.	2.48	1.11	190
5. Environmental protection laws and the application of the concept of sustainability within the Wadi Degla Protected Area shall be applied.	2.46	1.10	190
6. The employees are trained to carry out the guidance process within Wadi Degla Protected Area.	2.45	1.09	190
7. There is a budget to be set up to manage Wadi Degla Protected Area.	3.20	1.07	190
8. Development and marketing of new tourism products such as geotourism.	2.30	1.15	190
9. There are suitable programs to promote tourism awareness of the importance of geotourism sites.	2.00	0.89	190
<b>Statistics for all Variables</b>	<b>2.44</b>	<b>1.05</b>	<b>190</b>

**SITUATIONAL CONDITIONS IN WADI DEGLA PROTECTED AREA**

The results in table (5) indicated that the mean scores for the indicator of situational condition in Wadi Degla Protected Area range from 2.65 to 4.10. The standard deviations for the responses to the items measuring it ranged between 0.96 to 1.15, which displays a reasonable level of variability. The gran mean of this indicator is 3.52, comparing that mean with the 5-point of Likert scale strongly disagree (1), disagree (2), neutral (3), agree (4), strongly agree (5), The results reported that the mean of situational condition in Wadi Degla Protected Area were situated between the choice number (3) neutral and (4) agree and it closed by the choice number (4). These mean showed the agreement of the participants for the indicator of situational condition in Wadi Degla Protected Area. These results matched with the study of According to Leung et al. (2018).

**Table 5: Mean and Standard Deviation of situational conditions in Wadi Degla Protected Area**

Situational conditions in Wadi Degla Protected Area	Mean	Std. Deviation	Number of responses (n=190)
1. There are cameras within Wadi Degla Protected Area.	3.35	1.01	190
2. Visitors are accompanied by staff in Wadi Degla Protected Area.	2.65	0.96	190
3. Visitors are presented their ID, accounted and registered before entering Wadi Degla Protected Area.	4.10	1.15	190
4. Security procedures are available to protect visitors in Wadi Degla Protected Area.	3.99	1.09	190
<b>Statistics for all Variables</b>	<b>3.52</b>	<b>1.04</b>	<b>190</b>

**PHASE TWO: DIRECT OBSERVATIONS**

Direct observation aimed to identify the natural and geological features in Wadi Degla Protected Area and to explore the actual situation to use Wadi Degla Protected Area as geotourism site. Observation check list was depended on the literature review, all these issues will be discussed as below;

**ENDOWED RESOURCES IN WADI DEGLA PROTECTED AREA**

The observation reported that Wadi Degla Protected Area is characterized by all issues in the check list (see Table 6), that discussed as below;

**Table 6: Endowed resources observation**

Observation list	Yes	No
1. There is a unique diversity in geological and geomorphological forms.	√	
2. There is an ideal geological features (cracks and folds).	√	
3. It has features for all geological ages.	√	
4. There are many rocks and mountain.	√	
5. There are different fossils and fossilized trees.	√	

According to Newsome (2006) there are many geological interesting places and features have become tourism attraction places such as landscape, landforms, mountains, fossils (Errami et al., 2015), soils, rocks ,and the use of stone and minerals by humans. Also, Johnson et al. (2010) classified geotourism in to: Geological (craters, lava caves, islets, mountains, waterfalls, coastlines, coral reefs, beaches, cliffs) and Geomorphological sites, Anthropological (in caves and mines) sites, Geothermal and volcano destinations, and geological heritage.

**DIVERSITY OF GEOLOGICAL FORMS IN WADI DEGLA PROTECTED AREA**

In term the geological diversity, the observation reported that Wadi Degla Protected Area is characterized by geological diversity, which contains rocks from the Eurasian gypsum rocks with medium topography (El Khateeb, 2006). The reserve contains geological formations and Limestone Mountains that contribute to the creation of a rich and diverse ecosystem in some vertebrate fossils (Dabes, 2006) (see Figure 4). Additionally, the observation found that Wadi Degla Protected Area the Wadi has a unique ecosystem may be subdivided into a number of habitats with respect to grounds of sediment thickness and plant cover which including; Rocky habitat, Cliffs and Terraces.



**Figure 4: Diversity of geological forms in Wadi Degla Protected Area**  
(Source: the researcher's own photo taking during the observation process)

## **GEOLOGICAL FEATURES (CRACKS AND FOLDS) IN WADI DEGLA PROTECTED AREA**

Structurally, the area of Wadi Degla Protected is affected by a number of fractures and normal faults, striking in. on the other hand, the observation reported that Wadi Degla Protected Area was affected mainly by the faulting and folding patterns (Dabes, 2006). As well as, that there are many caves on the edge of Wadi Degla Protected, whose length ranges between 10-50m, formed by the water known as the karst. The importance of the caves is that it is a place for harbouring some animals, as it is considered an important place to study the climatic changes that prevailed in the region during the ancient times (Wagdy et al., 2008) (see Figure 5). Additionally, the observation noted that there are more than 6 caves discovered and surrounded in Wadi Degla Protected Area, but there are hundreds of other caves that have not been discovered till now.



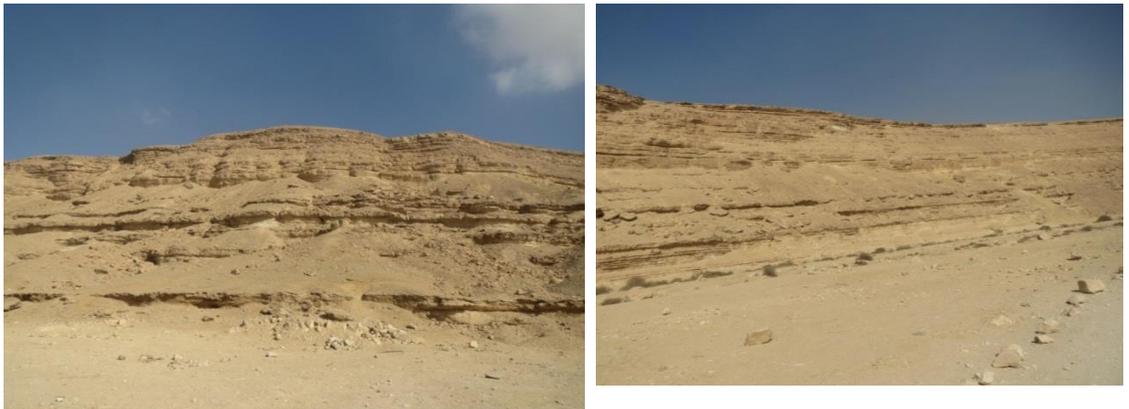


**Figure 5: Cracks and Folds in Wadi Degla Protected Area**

**(Source: the researcher's own photo taking during the observation process)**

#### **GEOLOGICAL AGES IN WADI DEGLA PROTECTED AREA**

Wadi Degla Protected Area is formed in the Eocene limestone pavement that had remained in the marine environment during the Eocene Epoch in the eastern desert (60 million years ago). The exposed outcrops of the Eocene rocks are characterized by fossils of *Nummulites gizehensis* and the vertical crevices of the exposed bed-rock are filled with blown sand (Wagdy et al, 2008). The observation confirmed that (see Figure 6).





**Figure 6: Geological Ages in Wadi Degla Protected Area**

**(Source: the researcher's own photo taking during the observation process)**

### **ROCKS AND MOUNTAIN IN WADI DEGLA PROTECTED AREA**

Wadi Degla Protected Area is characterized by the presence of limestone rocks as a result of the downward movement of the Egyptian lands. This sea deposited sediments in the sea which led to the formation of the limestone rocks rich in fossils (Dabes, 2006) (see Figure 7). As well as, the observation found that Wadi Degla Protected Area passes through the limestone rocks. The rain water dropping from the waterfalls affected the limestone rocks along the years. It also contains high mountain heights with beautiful aesthetic views.





**Figure 7: Rocks and Mountain in Wadi Degla Protected Area**  
(Source: the researcher's own photo taking during the observation process)

#### **FOSSILS IN WADI DEGLA PROTECTED AREA**

Fossils are the remains of animal or plant organisms that lived in ancient times and were buried in sedimentary rocks. The observation noted that Wadi Degla Protected contains fossilized coral reefs and fossils, also, there are several fossilized snails as the place was in ancient times part of the seabed and then receded into a rocky place. It also has fossils of species of *Oster* and *Nolite* as well as the remains of worms (Dabes, 2006).

#### **CREATED RESOURCES IN WADI DEGLA PROTECTED AREA**

According to the direct observation, Wadi Degla Protected Area is located in the east of Maadi. It is bordered on the west by the Wadi Degla Club and Shaq Al Thaaban area. The eastern side is the Qattamiya Cement quarries. On the northern side are the Zahraa El Maadi factories and the Qattamiya Ain Sokhna road. It has two outlets; one in Maadi and the other in the Ain Sokhna road (see Figure 8). As well as, the observation found that Wadi Degla Protected Area divided into a number of including; gate area; visitor center; ancient waterfalls; Wadi floor and trail.



**Figure 8: Wadi Degla Protected Area**

**(Source: the researcher's own photo taking during the observation process)**

In term the transportation facilities and accessibility, the observation noticed that Wadi Degla Protected Area is accessible and easy to visit it, but it need private transportation and Four-wheel drive cars (see Table 7).

**Table 7: Created resources observation**

Observation list	Yes	No
1. There are transportation facilities available to visitors to Wadi Degla Protected Area.	√	
2. There are maps, pamphlets and brochures for Wadi Degla Protected Area.	√	
3. There are recreational activities in Wadi Degla Protected Area such as camping.	√	
4. There are places to sell souvenirs in Wadi Degla Protected Area.	√	
5. There are medical services within or near Wadi Degla Protected Area.	√	
6. There is a communication network within Wadi Degla Protected Area.		√
7. There is food and beverage service within or near Wadi Degla Protected Area.		√
8. Accommodation services are available near Wadi Degla Protected Area.	√	

9. There are signs in the roads and tracks to Wadi Degla Protected Area.		√
10. Level of cleanliness of Wadi Degla Protected Area.	√	
11. There are bathrooms in Wadi Degla Protected Area.	√	

As well as, it noticed that there is pamphlet and brochures for visitors. In addition, there is a visitor center that provides visitors with information. The center consists of a lecture hall, a museum, a laboratory, a library, a store, administrative offices, and toilets (see Figure 9).



**Figure 9: Visitor center in Wadi Degla Protected Area**

**(Source: the researcher's own photo taking during the observation process)**

With regard to a recreational activity in Wadi Degla Protected Area, it noted that there are many activities that are practiced in the protected area as follows: mountain climbing; cycling (see Figure 10); running; bird watching; barbecue and camping (see Figure 11).



**Figure 10: Recreational activity in Wadi Degla Protected Area**

**(Source: the researcher's own photo taking during the observation process)**

This matched with the literature review that the entertainment industry can be a major supplier to the tourism sector. It is play a major role in marketing sites and competitive strategy (Dwyer and Kim, 2003). It is noteworthy that through involving local communities in innovative strategies and geomarketing, such as creating products (geoproducts, geomenu in restaurant), new jobs (geotours, georestaurants), and new recreational activities (geosports, geomuseums, geomonuments) (Johnson et al., 2010).

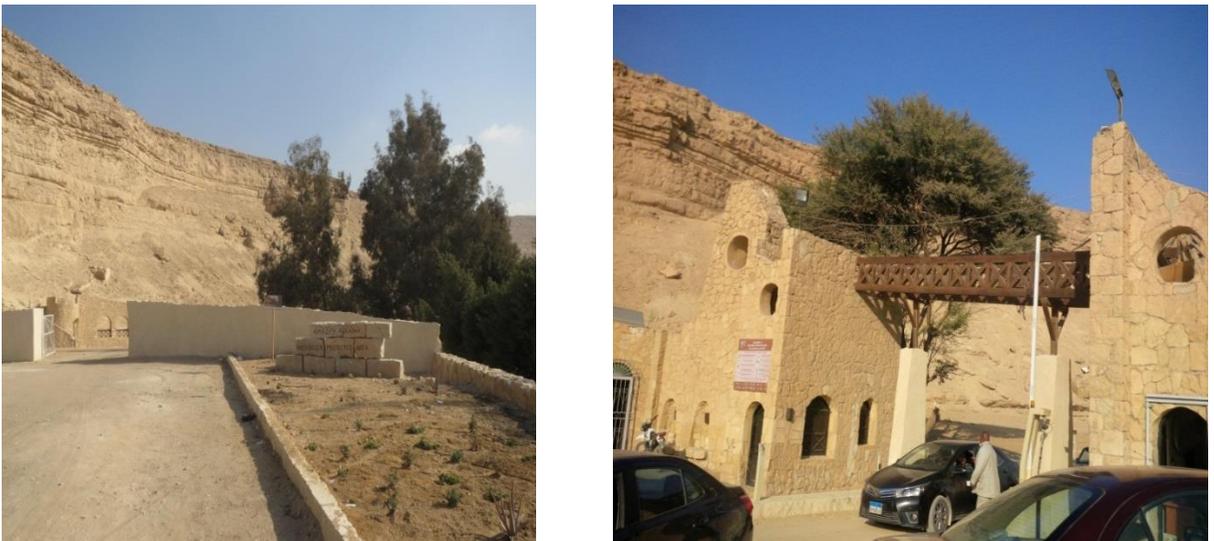


**Figure 11: Camping in Wadi Degla Protected Area**

**(Source: the researcher's own photo taking during the observation process)**

According to Crouch (2007) medical services considered one of the main facilitating resources that must be within or near the sites. As well as Leung et al. (2018) reported that healthcare must be found inside the protected area to serve the visitor. On the other hand, the observation found that there is a shop and place for selling souvenirs to the visitors such as; handmade products. The observations showed that there is no medical service or ambulance point within or near Wadi Degla Protected Area. It observed that there is no telephone network in place. Although, Wadi Degla Protected Area is located on the border of the capital and while constantly being frequented by visitors, there is no means of communication within it and this is considered a necessary need in cases of visitor's injury and emergency situations.

Furthermore, the study of Mulec and Wise (2012) revealed that geotourism sites should have shops or outlets to promote its products to the visitors through making of local handicrafts such as the production of fossil casts and souvenirs by local enterprises. Also to reduce the poverty, it must be generate a sufficient revenues and employment for local community around the protected area (Leung et al., 2018)



**Figure 12: The main entrance-Wadi Degla Protected Area**  
(Source: the researcher's own photo taking during the observation process)

The observation found that there is not outlet for serving food and beverage to the visitors and there is no accommodation service in Wadi Degla Protected Area, but during the observation there are hotels and restaurants provided food and beverage and accommodation services in Zahraa El Maadi. Additionally, the observation results found that there is a

lack of road signs in the way to Wadi Degla Protected Area; it is found only the main entrance of Wadi Degla Protected Area (see Figure 12).

Additionally, the area of Wadi Degla Protected is cleanliness and pure, there is garbage cans in the place (see Figure 13). The observation found that the bathrooms only found in the main entrance of Wadi Degla Protected and visitor center (see Figure 14).



**Figure13:Waste cans in Wadi Degla Protected Area**

**Figure 14: Bathroom in Wadi Degla Protected Area**

**(Source: the researcher's own photo taking during the observation process)**

#### **SITE MANAGEMENT IN WADI DEGLA PROTECTED AREA**

The observation noted that there are regulations to protect the environment within Wadi Degla Protected Area. Also, all the environmental elements of the Wadi Degla are monitored by identifying the sensitive areas of Wadi Degla Protected Area and monitoring are carried out on a regular basis. The reserve is divided into three observation areas: the cave area, the waterfall area and the Wadi Degla area (in the beginning, middle and north). The observation reported that the area of Wadi Degla Protected did not have any promotion activities (see Table 8).

**Table 8: Site management observation**

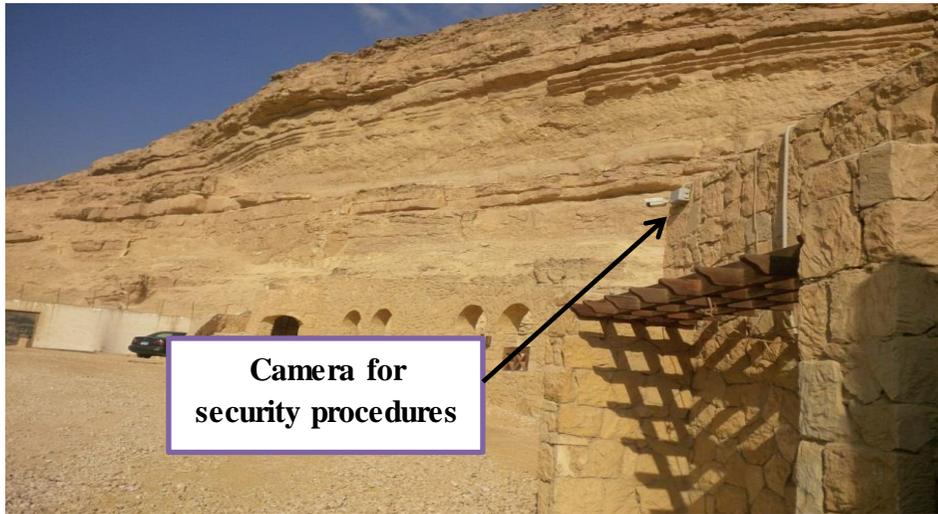
Observation list	Yes	No
1. There are regulations to protect the environment within Wadi Degla Protected Area.	√	
2. There is a variety of marketing activities used for Wadi Degla Protected Area.		√

**SITUATIONAL CONDITIONS IN WADI DEGLA PROTECTED AREA**

During the observation the researcher found that Wadi Degla is protected from the protected areas where visitors are an essential element, so the number of visitors and their nationality are recorded. It also the observation found that there is accurate count to the number of visitors to the site. It also observed that there is ticket for entering Wadi Degla Protected Area. Also, Security staff collected the ID card for visitors and they are delivered to them when they departure. The observation noticed that visitors are not accompanied by staff in Wadi Degla Protected Area (see Table 9). In term of the security procedures, the observation found that there are procedures to protect the visitors in place. It also, noted that there is camera located at the main gate of Wadi Degla Protected Area to monitor visitors (see Figure 15). The literature review mentioned that Safety and security concerns can affect the choice of geotourism sites and effects on the demand of geosites. As well as, Leung et al. (2018) reported that it should increase safety and security for visitor and local community around the protected area.

**Table 9: Situational conditions observation**

Observation list	Yes	No
1. Visitors are presented their ID before entering Wadi Degla Protected Area.	√	
2. Visitors are accounted and registered before entering Wadi Degla Protected Area.	√	
3. Visitors are accompanied by staff in Wadi Degla Protected area.		√
4. Security procedures are available to protect visitors in Wadi Degla Protected Area.	√	



**Figure 15: Security procedures in Wadi Degla Protected Area**  
 (Source: the researcher's own photo taking during the observation process)

**TESTING RESEARCH HYPOTHESES**

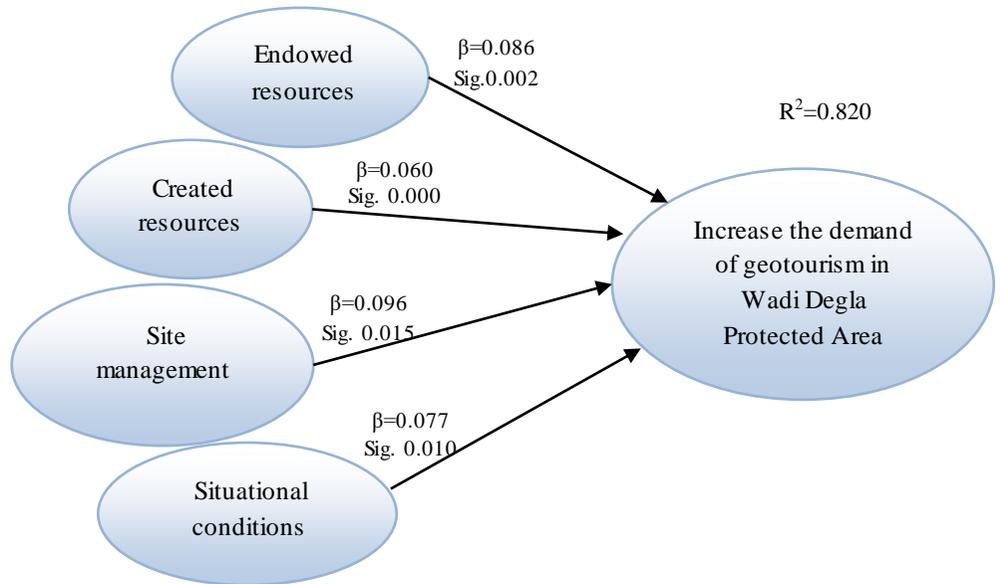
This research includes several independent and dependent variables. The independent variables are endowed resources, created resources, site management and situational conditions. The dependent variable is in increase the demand of geotourism in Wadi Degla Protected Area. Regression Analysis (see Table 10 and Figure 16) showed that the constant coefficient  $B = 0.086$ ,  $Sig. = 0.002$  for endowed resources,  $B = 0.060$ ,  $Sig. = 0.000$  for created resources,  $B = 0.096$ ,  $Sig. = 0.015$  for site management and  $B = 0.077$ ,  $Sig. = 0.010$  for situational conditions. Also, the percentage of the determination coefficient ( $R^2$ ) was (82%) for the study variables, these refer to there was an effect of endowed resources (H1), created resources (H2), site management (H3) and situational conditions (H4) in increase the demand of geotourism in Wadi Degla Protected Area. Therefore, the current study refused the null hypothesis and accepted the alternative one (H1, H2, H3 and H4), which declared that there are significant effects of the independent variables on the dependent variable.

**Table 10: Multiple regression analysis**

Model		Unstandardized Coefficients		t	* Sig.	R <sup>2</sup>	Dependent Variable
		B	Std. Error				
1	(Constant)	1.353	0.191	6.090	0.000	0.820	Increase the demand of geotourism
	Endowed resources	0.086	0.122	2.430	0.002		
	Created resources	0.060	0.029	2.574	0.000		

Site management	0.096	0.122	2.630	0.015	in Wadi Degla Protected Area
Situational conditions	0.077	0.212	1.330	0.010	

\* Significant level at 0.05 (P<0.05)



**Figure 16: Study hypotheses testing model**

## CONCLUSION AND FURTHER RESEARCH

The results showed that there are attractions such as fossils, rocks, mountains, and fossilized trees, that help Wadi Degla Protected Area to be considered as a geotourism site and there was demand for visiting it. The finding revealed that the participants were completely agreed with the created resources variables in Wadi Degla Protected Area. The results found that Wadi Degla Protected Area is accessible and easy to visit it, but it needs private transportation and Four-wheel drive cars. It showed that it noticed that there is pamphlet and brochures for visitors. In addition, there is a visitor center that provides visitors with information. With regard to a recreational activity in Wadi Degla Protected Area, it noted that there are many activities that are practiced in the protected area as follows: mountain climbing; cycling running; bird watching; barbecue and camping. The results revealed that there is a shop and place for selling souvenirs to the visitors, also, there is no food and beverage or medical services within Wadi Degla Protected Area. But, during the observation

there are medical center, hotels and restaurants provided food and beverage, accommodation and medical services in Zahraa El Maadi. In terms of the geotourism sites management, participants were disagreed with the geotourism site management variables in Wadi Degla Protected Area. It also reported that there are regulations to protect the environment within Wadi Degla Protected Area and it did not have any promotion activities. The results revealed that the participants were completely disagreed with situational conditions variables in Wadi Degla Protected Area. It also, revealed that Wadi Degla is protected where visitors are an essential element, so the number of visitors and their nationality are recorded and there is accurate count to the number of visitors to the site. In term of the security procedures, the results showed that there are procedures to protect the visitors in place. It also, noted that there is camera located at the main gate of Wadi Degla Protected Area to monitor visitors.

Additionally, the results reported that the participants were completely agreed with endowed resources variables in Wadi Degla Protected Area. The results indicated that reported that Wadi Degla Protected Area is characterized by geological diversity, which contains rocks from the Eurasian gypsum rocks with medium topography, it has a unique ecosystem may be subdivided into a number of habitats with respect to grounds of sediment thickness and plant cover which including; Rocky habitat, Cliffs and Terraces. Additionally, the results revealed that Wadi Degla Protected is contains fossilized coral reefs and fossils, but places where there are a number of fossilized snails as the place was in ancient times part of the seabed and then receded into a rocky place. This research has number of limitations were, firstly, this research focused on one case study of Wadi Degla Protected Area. Secondly, the literature showed there had been clear lack of prior research studies on geotourism sites in Egypt, in particularly Wadi Degla Protected. Future research should address more geosites in Egypt; it also should undertake to test the findings of this research.

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