

## The Role of Virtual Museums in Preserving Protected Areas: The Case of Wadi Degla Virtual Museum

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### Abstract

Using technology in the tourism industry has become widely used. New technologies have offered significant potential and vast advantage of preserving protected areas and cultural heritage sites. The use of virtual museums is one of the immensely growing applications in the tourism industry over the entire world. This study highlights virtual reality technology and its concept, types, objectives, and usage. It also presents virtual museums' idea and their role in preserving protected areas, focusing more on the Wadi Degla virtual museum as a case study. Besides, it sheds light on the museum's importance in making the information accessible to the public anytime and anywhere in an attractive way. The study found that Wadi Degla protectorate is facing lots of problems that will destroy it. also, it indicates that the virtual museum plays a crucial role in preserving the protected areas, supporting the sustainability concept. Moreover, the paper found out that Wadi Degla virtual museum aims to preserve and promote the protected areas in Egypt and increase awareness and educate people about the importance of protected areas. Their target is to present all protected areas in Egypt through VR technology.

### 1. Introduction

Information technology offers significant help to reach the tourism sector goal. Likewise, new technology has played a crucial role in the tourism industry, and it has pushed tourism activities for progress (Ratten et al., 2019). It also found solutions for so many problems that challenge the tourism sector development, especially moving towards sustainability (Styliani et al., 2009). Technology usage in the tourism industry has become usual since using new technology in conferences, distance meetings, bookings, and planning trips through applications (Kamel, 2003). Nowadays, tourists are more familiar with new technologies than before, as it's flexible and saves their time and money (Page and Connell, 2006). According to Loureiro et al. (2019), one of the most substantial technology applications the tourism sector uses is virtual reality and augmented reality. Virtual reality offers the tourism industry a useful application that has helped in many areas, such as management, entertainment, preservation, marketing, and promotion (Guttentag, 2010). Using these technologies enhances tourism activities and, more importantly, provides tourists with a new experience and reaches a high level of satisfaction. This paper will introduce Virtual reality technology and its usage in the

tourism industry. Also, clarify how virtual museums are integrated into the tourism sector to promote and preserve tourism activities.

Moreover, it will brief the history of Virtual reality and the different types of virtual technology. It will also identify the concept of virtual museums and how these kinds of museums become popular due to the ever-increasing progress of interactive methods. Therefore, it will discuss why museums are keen on digitizing their collection. It will show the importance of virtual museums allowing different visitors to see these protected areas separated by physical distance. Moreover, the paper presents virtual museums' role in preserving protected areas and how it has assisted an incredible educational awareness about these areas.

Virtual museums have played an essential role in conserving sites and support the carrying capacity concept, and at the same time, promoting the responsible visit and educating visitors (Worblewski et al., 2014).

Finally, the paper introduces Wadi Degla protectorate as one of Egypt's significant protected areas and how will Wadi Degla virtual museum can asset in preserving this protected area. It also discusses the contribution of Wadi Degla virtual museum in the education sector and increasing awareness regarding the environment. Finally motivates people to become more environmentally friendly and moves the tourism industry towards sustainability.

## **Literature Review**

### **2.1 Virtual Reality Definition, Etymology, and History**

Authors use different terms to refer to virtual reality as some of them use the term virtual environment, and the others identify it as a virtual world.

They use such terms have to avoid fictional Expectations that come with the virtual reality term (Sherman et al., 2003). According to Merriam- Webster (2005), Virtual reality can be defined as "an artificial environment that people can experience through sensory stimuli. Like sights and sounds provided by computers and in which one's actions partially determine what happens in the environment."

Also, it can define it as the technology that uses a computer to generate 3D images in which humans can navigate and interact (Gutierrez et al., 2008)

The first new virtual reality technology was introduced in 1950 by Morton Heilig. Who invented what is called Sensorama that contain three-dimensional videos (Burdea and Coiffet, 2003)?

In 1960 the Telesphere was created as one of Heilig's contributions to his first invention and was stereo television for personal use, and this was the first head-mounted display in the world (Ag, 2019). In 1963 Avan Sutherland developed an interactive Virtual reality using computers that could generate visual images (Craig et al., 2009). According to Mavor and Durlach (1995), the University of Chicago in 1977 created an electronic lab with a different kind of graphical demonstration, inputs, and outputs devices. In 1992, they announced a new invention called a CAVE that has a virtual display system. In 1981 NASA created a prototype virtual reality display that works as a zooming tool for images, making the Images very detailed and sightable to the eyes

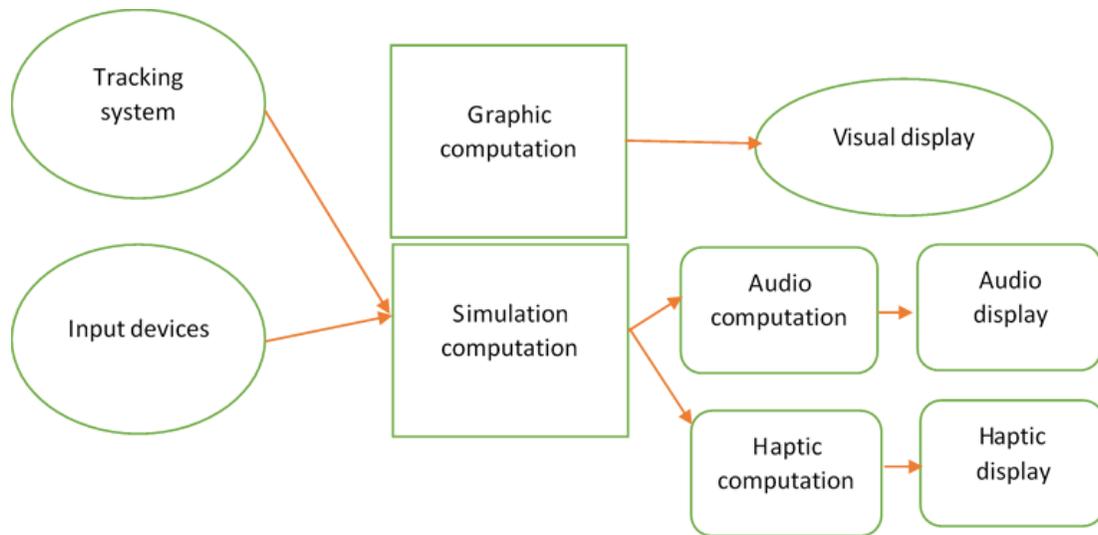
without making any effort (Earnshaw et al., 1993). In 1993, virtual reality became an industry as factories started to produce virtual reality tools, and it was costly by that time, and VR companies were small and lacking resources. Still, they kept developing until the industry peaked in the 20th and has many usages in many different fields (Bucher, 2017). VR has many uses in the tourism sector, especially in cultural tourism, which helps tourists achieve and learn what they see as VR provides extensive information in an exciting experience (Lee et al., 2019). Virtual Reality as Technology has benefits for tourists, enriches tourism experience, provides different entertainment with good quality, and increases knowledge. On the other side, virtual reality from the tourism industry perspective plays a crucial role in promoting, marketing, and raising awareness about the destination and the other attraction elements. Also, it generates revenues. There are benefits of using Virtual Reality in the tourism industry: improved experiences, full engagement, heritage conservation, training and education, accessibility. Revenue generating, marketing and promotion, competitive advantages, and gamification (Tussyadiah et al., 2018).

## **2.2 Virtual Reality Applications and Forms**

According to Kim 2005, it needs integrated multiple components to create a virtual reality system. These components represent hardware, software, the content that the user will interact with, and a computer to modalize the virtual environment. Figure one Shows the virtual reality system. It contains two main items graphic computation and simulation computation. The first one means a visual display, while the graphics computation has to have many items such: tracking system, input device, audio presentation, and haptic display. There are three types of virtual reality; fully immersive, Semi- immersive, and none- immersive (Pease, 2007). The fully-Immersive is the most famous image of VR, and the idea is to isolate the user from the real surrounding environment. At the same time, the semi-immersive is a closed room with a large screen that user can see the VR images on those screens and interact with it (Kutz, 2014). The non-immersive is the usage of computers and monitors simultaneously; the user can wear 3D glasses to improve the VR experience (Karwowski et al., 2011).

Augmented reality and virtual reality always get together in textbooks and authors discussion despite that there is a significant difference between both of them; one display images, graphics, and texts with a realization of the real-time and its surroundings while the other offer a complete separation from the real world (Aukstakalnis, 2016) Augmented reality is one of the technologies that have improved a side to virtual reality. It means an enhanced image or environment shown on a screen or other display, produced by covering computer-generated images or voices in a real-world setting. Also, it means the interaction of humans with activities to engage with what users experience or doing (Craig, 2013). Augmented reality can bring a virtual object into reality. It can also reshape the design in a way that makes the usage more enjoyable (He et al., 2018). Augmented reality consists of hardware and software, the hardware represented on; computer, display screen, a camera, tracking system, network, and a real place. Softwares include application programs, web services, and a content server (Kipper and Rampolla, 2013). Another technology starts to take off

Mixed Reality; it is a combination of virtual reality and augmented reality, a mix between the real environment and an interaction object (Chen and Fragomeni, 2019).



**Figure.1.** Virtual Reality System  
**Source: Craig et al. (2009)**

### 2.3 Virtual reality in Museums

Over the decades, the definition of museums has been changed and transformed. Also, museums have invented their definitions, strategies, policies, and practices. The museum can be defined as a Non-profit. This long-life entity serves the community and works towards developing it, open to the public, which exhibits, preserves, researches, and presents humans' cultural heritage and their history for education and entertainment purposes (ICOM,2019). According to Mandrioli et al. (2003), a museum defines a place built to preserve and present different cultural heritage material with a unique feature or presents the old history of a particular location or an era. Also, it has a primary purpose, either educational or entertaining. There are many kinds of museums; art museums tend to present art pieces, and usually, these kinds of museums have a big budget compared with other types. Children's museums do not like another museum's concept as it depends on touching and interacting with pieces inside the museum. History museums are established to conserve and protect the unique contents that back to old eras. Natural history museum presents all types of living things concerning flora and fauna. Science museums are an educational museum to present a scientific process or show basic scientific facts. A particular interest museum establishes for a unique interest audience or a specific purpose. Military museums focus on military equipment and war achievements. Religion museums focus on presenting pieces that back to different religions—finally, virtual museums (VAM, 2019). The first virtual museum was presented in 1947 by Andre Malraux when he introduced a fictional museum with no walls or a particular physical place, as it is accessible for anyone interested in these kinds of museums (Styliani et al., 2009). According to (Hazan et al., 2014) virtual museum can be defined as a digital body that presents a museum's features, fulfill,

improve, or enhance the visitor experience through the digital collection, interactive, and intensive information. Virtual museums can act as a digital form of a physical museum or function separately without a real museum. The virtual museum is dedicated to the public and presents a museum without walls as the public or visitors can access it anytime and anywhere. Also, it supports the long-term preservation of the museums. Virtual museums have become a synonym for the digital collection, online museums, interactive museums, and virtual places (Tzanaki, 2002). Virtual museums can be categorized into three groups: the displayed pieces only exist virtually without their existence in a real environment. Second group: the viewed materials that already exist in a physical environment and presented in a real museum also been present virtually. Third group: the displayed pieces have been introduced in the VR with its existence in the real world but not in a physical museum (Marcus and Wang, 2018). According to the international council for museums (2018), there are three different categories of an online virtual museum; firstly, the brochure museum, this kind of museum made mainly for marketing purposes and its role in providing some information about the museum and its activity. Secondly, the content museum, opposite the brochure museum, offers extensive information about its collection, and it can be found on the website. Finally, the learning museum has been made for educational purposes as it provides scientific information not only for entertainment. Also, it gives some interaction to make the education process more exciting.

In conclusion, there are some similarities between physical museums and virtual museums. They collect, preserve, and display objects to the public and are considered a meeting point for the community. Also, there is a common purpose between virtual museums and physical museums as they are sharing the same goals and strategies (Ivarsson, 2009)

#### **2.4 Wadi Degla virtual museum**

Wadi Degla protected area is one of Egypt's most significant valleys that back to the Eocene Epoch located in the Eastern Desert 60 years ago. Wadi Degla protectorate length is 30 km from east to west. It covers a land zone of 60 square km. It has limestone rocks and also fossils. The protected area is rich with flora and fauna as it has different kinds of animals, including mammals, insects, and reptiles. Wadi Degla protectorate has different types of plants around 64.

Moreover, it is considered a valley for residents and migrant birds. Wadi Degla was announced as a protected area in 1999 (EEAA, 2019). Wadi Degla located in Maadi, and it is considered a place to escape from the hectic daily living. The air at the protectorate is clean, and the weather is remarkably cooler than the downtown in Cairo. The area is tranquil. There are many activities people can do inside the protectorate, starting from walking, running, hiking, watching birds, riding bicycles, and camping (Oraby, 2017).

Wadi Degla virtual museum is one of the Nature Conservation Egypt (NCE) that conserves Egypt's natural heritage and supports the converting towards sustainable usage. This Non-profit Organization Established in 2005, and it collaborates with a national and international organization interested in protecting and saving the natural

heritage. In 2018 the first virtual museum was set up for the public, and it is considered the window for Wadi Degla protected area. It is in the moving museum as it doesn't have a real place. Wadi Degla virtual museums are; to bring the community closer to the environment, increasing awareness about protecting nature, and educating the community on how to become more environmentally friendly. Wadi Degla virtual museum offers three 360 videos, which show: Wadi Degla protected area geological history, Wadi Degla protectorate biodiversity and ecosystem, and finally, the activities inside the protected area. Wadi Degla Virtual Museum (WDVM) offers its services to schools, universities, conferences, and parks. Moreover, Wadi Degla virtual museum runs most of his activity full free or charges a fee for its services, and a small amount from this fee goes for the maintenance of its equipment, and the rest goes for running more events for the community to increase the awareness (WDVM, 2019)

## 2. Methodology

A descriptive-analytical approach has been used to identify the research problem. Using questionnaires, observation, and interviews. The research was conducted between October- November 2019 in Egypt applied in the Wadi Degla protectorate and Wadi Degla virtual museum. A mixed methodology was used to achieve the aims of this research; The Qualitative approach: through a visit observation to Wadi Degla protected area and an interview with the executive director, marketing manager of Wadi Degla Virtual museum.

Moreover, a Quantitative approach: Through a pre-tested questionnaire (in English/ Arabic). The questionnaires were distributed to Wadi Degla protected area visitors. To investigate their opinion about the practices inside the protected area; also, an online survey was formed to target Wadi Degla visitors. One hundred fifty questionnaires were distributed on the study sample, SPSS was used for analysis, 118 questionnaires were valid for interpretation, and 32 questionnaires were invalid. The questionnaire is the primary tool for data collecting. The form consists of two parts. **Closed Questions:** in this part, each statement (total of nineteen) has been given gradual numbers and measures according to the Likert Scale quintet, as shown in table.1. **General Information:** This part consists of four questions to collect general information about the visitor

**Table 1**  
**Likert Scale**

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1	2	3	4	5

## 3.1 Results and discussion

### Stability of the Scale

Cronbach's Alpha correlation coefficient was calculated to determine the internal consistency of the scale. The computation of Cronbach's Alpha is based on the number of items on the survey and the average inter-item covariance ratio to average item variance. A reliability coefficient of 0.60 or higher is considered "acceptable" in most social science research situations.

**Table 2**  
**Reliability Statistics**

Cronbach's Alpha	N of Items
.834	19

The table shows that all the instruments' reliability coefficients are above 0.834 (80%), which indicates that the tool is reliable for being used.

### 3.1 Visit observation and Interviews

A field visit was conducted by visiting Wadi Degla protected area; it was observed that Wadi Degla protectorate is one of the most stunning valleys. It is a place of breathtaking away from traffic and pollution. However, it was noted that there are many cases of abuse that happened inside the protectorate. The following are some of the visit observation:

- Trash is everywhere especially plastic bags and bottles
- Cars are allowed to enter
- There are no enough guidance or caution signs
- Guidance signs are broken
- No animals or birds
- Wadi Degla protected area employees aren't helpful
- There is no medical unit inside the protectorate
- There is construction work inside the protectorate
- Some people were camping inside Wadi Degla protected area with no rules

Interviews were conducted; with the founder and executive director of Wadi Degla virtual museum and the Capacity Development Officer by asking them open-ended questions as following:

- Is Wadi Degla virtual museum affiliated with any institution or organization?
- Is Wadi Degla virtual museum a private business or a government project?
- Where the idea of the virtual museum comes from?
- What is the museum offer?
- What are the goals and vision of the museum?
- What are their plans for the future?

They answered the questions and summarized their answers as follows: Wadi Degla virtual museum supervised by nature conservation Egypt and birdlife international. The project is funded by the Green European Foundation that supports green projects. Wadi Degla virtual museum is the museum's idea without the walls that are accessible anywhere and anytime. It uses VR technology to show three main videos about Wadi Degla protectorate. Wadi Degla geological history, biodiversity inside the territory, and the activity that can take place inside the protected area. The project operates through events at schools and universities to increase awareness about the Wadi Degla protected area. The virtual museum offers three primary different educational experiences that can happen anywhere. They charge for their services according to the organization's ability to paying. Accordingly, they run some of their activities for free. If they received any payments, a small amount of the fees goes to the project's equipment maintenance.

The rest of the costs goes towards funding a free event at another institution that cannot pay. Wadi Degla virtual museum aims to preserve and promote the protected areas in Egypt and increase awareness and educate people about the importance of protected areas. Their target is to present all protected areas in Egypt through VR technology. Finally, move Egypt towards sustainability by using new technologies.

### 3.2 Questionnaire Analysis

The following table will show Wadi Degla protectorate visitors' general information, such as gender, age, marital status, and education.

**Table 3**  
**The Profile of Respondents**

<b>Gender</b>	Male	70 (59.3%)
	Female	48 (40.7%)
<b>Age</b>	18-25	46 (39%)
	26-35	57 (48.3%)
	36- 45	10 (8.5%)
	More than 46	5 (4.2%)
<b>Marital status</b>	Single	92 (78%)
	Married	24 (20.3%)
	Divorced	2 (1.7%)
<b>Education</b>	Student	24 (20.4%)
	Bachelor	66 (55.9%)
	Masters	19 (16.1%)
	PhD	9 (7.6%)

As shown in Table 3 above, the results demonstrated that 70 respondents representing (59.3%) of the research sample were males, while 48 respondents represent (40.7%) of the research sample were females. The respondents were aged between 18 and above 46 years. Almost half of the respondents were aged between 26 and 35 years, with a total number of 57 (48.3%), while one-third of the respondents were aged between 18 and 25 with a total number of 46 (39%). The majority of respondents -92- were single (77.1%), and (20.3%) were married with a total number of 24 respondents. Two-thirds of the respondents with a total number of 66 (55.9%) had their bachelor's degrees, and 24 (20.4%) were students.

**Table 4**  
**Test of normality**

	Kolmogorov-Smirnova		
	Statistic	df	Sig.
There are safety and security measures in the protectorate	.285	118	.000
No cars are allowed to enter	.317	118	.000
There are guidance signs in the protectorate	.292	118	.000
There are caution signs in the protectorate	.293	118	.000
Protectorate workers abide by the protectorate rules	.202	118	.000
I am aware of the rules that I should follow during my visit	.236	118	.000

There are many violations inside the protectorate	.229	118	.000
Wadi Degla protected area is accessible	.221	118	.000
Wadi Degla protected area is clean	.290	118	.000
There are available guides in the protectorate	.333	118	.000
I would visit the protectorate again	.170	118	.000
I would recommend the protectorate to friends and family	.178	118	.000
Protectorate workers are helpful and knowledgeable	.309	118	.000
I am concerned about protecting the environment	.284	118	.000
I am aware of the importance of the protected areas	.290	118	.000
I would report any abuse for the environment or the species inside the protectorate	.189	118	.000
There is a medical support unit at the protectorate	.294	118	.000
I have heard about virtual museums	.308	118	.000
I have heard about Wadi Degla virtual museum	.303	118	.000

Table 4 shows the normal distribution test (Sample KS), and the significance level for each statement is less than 0.05, which means that the sample follows the normal distribution.

**Table 5**

There are safety and security measures in the protectorate

		Frequency	Percent
Valid	Strongly disagree	31	26.3
	Disagree	48	40.7
	Neutral	14	11.9
	Agree	15	12.7
	Strongly agree	10	8.5
	Total	118	100.0

Table 5 shows that most of the WadiDeglaprotectorate visitors disagreed with the statement with a total percentage of 67%, which indicates the shortage of safety and security measures in the protected area.

**Table 6**

No cars are allowed to enter

		Frequency	Percent
Valid	Strongly disagree	39	33.1
	Disagree	52	44.1
	Neutral	8	6.8
	Agree	8.5	8.5
	Strongly agree	7.6	7.6
	Total	118	100.0

Table 6 shows that most of the respondents disagreed with the statement with a total percentage of 77.2%, which indicates that cars are allowed to enter the protected area.

**Table 7**

There are guidance signs in the protectorate

		Frequency	Percent
Valid	Strongly disagree	28	23.7
	Disagree	54	45.8
	Neutral	18	15.3
	Agree	13	11.0
	Strongly agree	5	4.2
	Total	118	100.0

Table 7 shows the respondents' percentage of the statement; 82 % disagreed with the statement, while 18% are neutral. It is evidence of guidance sign lacking in the protectorate

**Table 8**

There are caution signs in the protectorate

		Frequency	Percent
Valid	Strongly disagree	26	22.0
	Disagree	54	45.8
	Neutral	20	16.9
	Agree	9	7.6
	Strongly agree	9	7.6
	Total	118	100.0

Table 8 shows that 77.8% of the respondents disagreed with the statement, while 20% are neutral; this an indication of caution sign shortage in the protectorate

**Table 9**

Protectorate works abide by the protectorate rules

		Frequency	Percent
Valid	Strongly disagree	20	16.9
	Disagree	39	33.1
	Neutral	36	30.5
	Agree	17	14.4
	Strongly agree	6	5.1
	Total	118	100.0

Table 9 shows that 59% of the respondents disagreed with the statement, while 36% are neutral, which indicates the inefficient employees who work in the protected area.

**Table 10**

I am aware of the rules that I should follow during my visit

		Frequency	Percent
Valid	Strongly disagree	5	4.2
	Disagree	15	12.7
	Neutral	36	30.5
	Agree	47	39.8
	Strongly agree	15	12.7
	Total	118	100.0

Table 10 shows that more than half of the respondents know the protectorate rules, with a total percentage of 52.5%, while 30.5% are neutral. It proves that most of the protectorate visitor is responsible visitors.

**Table 11**

There are many violations inside the protectorate

		Frequency	Percent
Valid	Strongly disagree	20	16.9
	Disagree	26	22.0
	Neutral	17	14.4
	Agree	39	33.1
	Strongly agree	16	13.6
	Total	118	100.0

Table 11 shows that 46.7% of the respondents agreed with the statement, while 38.9% disagreed. It is an indication that there are violations happens in the protectorate

**Table 12**

Wadi Degla protected area is accessible

		Frequency	Percent
Valid	Strongly disagree	5	4.2
	Disagree	31	26.3
	Neutral	43	36.4
	Agree	20	16.9
	Strongly agree	19	16.1
	Total	118	100.0

Table 12 shows that 36.4% of the respondents are neutral with the statement, while 33% agreed, which means that Wadi Degla protectorate is moderate regarding the accessibility

**Table 13**

Wadi Degla protected area is clean

		Frequency	Percent
Valid	Strongly disagree	25	21.2
	Disagree	50	42.4
	Neutral	15	12.7
	Agree	14	11.9
	Strongly agree	14	11.9
	Total	118	100.0

Table 13 shows that 63.6 % of the respondents disagreed with the statement, while 23% agreed. It is an indication of WadiDeglaprotectorate uncleanliness

**Table 14**

There are available guides in the protectorate

		Frequency	Percent
Valid	Strongly disagree	26	22.0
	Disagree	64	54.2
	Neutral	12	10.2
	Agree	14	11.9
	Strongly agree	2	1.7
	Total	118	100.0

Table 14 shows that 76.2% of the respondents disagreed with the statement, while 13.6% agreed. It is an indication of the protectorate guides unavailability

**Table 15**

I would visit the protectorate again

		Frequency	Percent
Valid	Strongly disagree	8	6.8
	Disagree	27	22.9
	Neutral	33	28.0
	Agree	22	18.6
	Strongly agree	28	23.7
	Total	118	100.0

Table 15 shows that 42.3% of Wadi Degla protectorate visitors would revisit it. While 29.7% wouldn't visit the protectorate.

**Table 16**

I would recommend the protectorate to others

		Frequency	Percent
Valid	Strongly disagree	9	7.6
	Disagree	24	20.3
	Neutral	37	31.4
	Agree	23	19.5
	Strongly agree	25	21.2
	Total	118	100.0

Table 17 shows that 40.7% of the Wadi Degla protectorate visitors recommend it to others for a visit. While 31.4% are neutral, and 27.9% would not recommend the protectorate to others.

**Table 17**

Protectorate workers are helpful and knowledgeable

		Frequency	Percent
Valid	Strongly disagree	18	15.3
	Disagree	59	50.0
	Neutral	19	16.1
	Agree	18	15.3
	Strongly agree	4	3.4
	Total	118	100.0

Table 17 shows that 65.3% of the respondents disagreed with the statement, while 18.7% agreed. It is an indication of the staff's unwillingness to offer help or give information.

**Table 18**

I am concerned about protecting the environment

		Frequency	Percent
Valid	Strongly disagree	8	6.8
	Disagree	9	7.6
	Neutral	19	16.1
	Agree	51	43.2
	Strongly agree	31	26.3
	Total	118	100.0

Table 18 shows that 69.5% of Wadi Degla protectorate visitors are concerned about protecting the environment.

**Table 19**

I am aware of the importance of the protected areas

		Frequency	Percent
Valid	Strongly disagree	3.4	3.4
	Disagree	8.5	8.5
	Neutral	12.7	12.7
	Agree	53	44.9
	Strongly agree	36	30.5
	Total	118	100.0

Table 19 shows that 75.4% of Wadi Degla protectorate visitors know the importance of protected areas. It is an indication of the increasing awareness about protected areas.

**Table 20**

I would report any abuse for the environment or the species inside the protectorate

		Frequency	Percent
Valid	Strongly disagree	6	5.1
	Disagree	13	11.0
	Neutral	39	33.1
	Agree	37	31.4
	Strongly agree	23	19.5
	Total	118	100.0

Table 20 shows that 50.9% of the respondents would report any abuse that might happen to the environment or the species, while 33.1 are Neutral, and 16.1 disagreed with the statement.

**Table 21**

There is a medical support unit at the protectorate

		Frequency	Percent
Valid	Strongly disagree	34	28.8
	Disagree	54	45.8
	Neutral	16	13.6
	Agree	9	7.6
	Strongly agree	5	4.2
	Total	118	100.0

Table 21 shows that 74.6% of the respondents agreed that there is no medical support unit.

**Table 22**

I have heard about virtual museums

		Frequency	Percent
Valid	Strongly disagree	22	18.6
	Disagree	55	46.6
	Neutral	13	11.0
	Agree	18	15.3
	Strongly agree	10	8.5
	Total	118	100.0

Table 22 shows that 65.2% of the respondents never heard about virtual museums, while 11% are neutral, and 23.8% have heard about virtual museums.

**Table 23**

I have heard about Wadi Deglavirtual museum

		Frequency	Percent
Valid	Strongly disagree	30	25.4
	Disagree	57	48.3
	Neutral	17	14.4
	Agree	9	7.6
	Strongly agree	5	4.2
	Total	118	100.0

Table 23 shows that 73.7% never heard about Wadi Degla virtual museum while 14.4% are neutral, and 11.8% have known about the virtual museum of Wadi Degla.

### 3. Conclusion and Recommendations

As a result of the increased knowledge of tourists and the community using a different form of technology, new technology has emerged in the tourism activity. Virtual reality is one of the most significant new technology used in the tourism industry since the first introduction in 1966. It continues to be developed till it has its new advanced VR glass. There are three kinds of virtual reality; Fully immersive, Semi-immersive, and none-immersive. There are differences between virtual reality, Augmented reality, and mixed reality as the first one separates the audience from their real-life and takes them

to an imaginary experience. In contrast, augmented reality brings the virtual environment to the real-life. The latest is mixed reality, which is a combination of virtual reality and Augmented reality with some interaction as it makes the experience more exciting. The museum concept has been changed and redefined over the years until it has its recent definition. The first virtual museum was found in 1947. Both the physical museum and virtual museum collect, preserve, display, and educate the public about the unique item they have. There are many kinds of physical museums as there are many types of virtual museums, but they commonly have a similar goal of preservation or increasing awareness. Wadi Degla protectorate is one of Egypt's most significant protected areas that back to 60 million years ago. Wadi Degla protectorate was announced as a protected area in 1999 by the Ministry of environmental affairs in Egypt. Visitors have abused Wadi Degla protectorate as many violations happened inside the territory. The staff of Wadi Degla are unfriendly and not knowledgeable. The protectorate lacks signboards and a medical unit. There are no roles for camping. Wadi Degla virtual museum is the first virtual museum in Egypt to preserve the natural heritage. Wadi Degla virtual museum is one of Nature Conservation Egypt's projects. Wadi Degla virtual museum uses 360 videos through the VR glass to increase the awareness among the Egyptian community about Wadi Degla protected area. It plays a crucial role in preserving Wadi Degla protected areas and promoting it by being a responsible visitor and moving towards sustainability.

Wadi Degla protectorate needs to obtain regular maintenance for its signboards and clean the territory and collect the plastic from its land. The staff of Wadi Degla needs to be more educated and collaborative with the visitor. There is a need to establish a medical unit in case of an emergency. Wadi Degla protectorate management should provide a guide for visitors. Also, rationing the violation activities inside the protected area. They should also create a brochure that includes all the rules the visitors should follow during their visit and even camping regulations.

Moreover, the protectorate management should collaborate and support the Wadi Degla virtual museum as it will help them on both sides, preserving and promoting the protectorate. It's highly recommended to establish an office for Wadi Degla virtual museum inside the protectorate, which will make it more beneficial for visitors. The Egyptian environmental affairs agency should regularly audit the protected areas, especially Wadi Degla protectorate. Also, it should obtain regular training for the workers inside the protected areas. Moreover, the Ministry of Environment and Ministry of tourism should have regular meetings to discuss cooperation to promote and preserve protected areas. Both ministries should also support the innovation to preserve and promote the protectorate, such Wadi Degla virtual museum. For further research measuring the impact of the virtual museum: visitor's perspective and expectations. Also, how to use virtual reality in tourism higher education in Egypt.

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## دور المتاحف الافتراضية في حماية المحميات الطبيعية: دراسة حالة متحف وادي دجلة الافتراضي

كريم رشوان

معهد الإلسن

### الملخص

أصبح استخدام التكنولوجيا في صناعة السياحة أمر هام حيث يتم استخدامها على نطاق واسع. لقد وفرت تلك التقنيات الحديثة إمكانيات كبيرة مميزات لاحتصر لها في الحفاظ ليس فقط على المحميات الطبيعية ولكن أيضاً على مواقع التراث الثقافي. كما يعد استخدام المتاحف الافتراضية أحد التطبيقات المتطورة والتي يتم استخدامها بشكل كبير في صناعة السياحة في جميع أنحاء العالم. تهدف هذه الدراسة إلى تسليط الضوء على تقنية الواقع الافتراضي ومفهومها وأنواعها وأهدافها واستخداماتها. كما تعرض الدراسة فكرة المتاحف الافتراضية ودورها في الحفاظ على المحميات الطبيعية، مع التركيز أكثر على متحف وادي دجلة الافتراضي كدراسة حالة. علاوة على ذلك، يلقي الضوء على أهمية المتحف في جعل المعلومات في متناول الجمهور في أي وقت وفي أي مكان بطريقة جذابة. وقد نوصلت الدراسة أن محمية وادي دجلة تواجه الكثير من المشكلات والعديد من التجاوزات والتي سيكون لها أكبر الأثر على تدميرها. كما توصلت أيضاً أن متحف وادي دجلة الافتراضي يلعب دوراً حاسماً في الحفاظ على المحمية، ويدعم مفهوم الاستدامة. ليس ذلك فقط بل يعمل على زيادة الوعي لدى الجمهور من خلال الفيديوهات التعليمية التي يعرضها وذلك سوف يلعب دوراً أساسياً في الترويج للمحمية وأيضاً تشجيع مفهوم السياحة المسؤولة..

### معلومات المقالة

#### الكلمات المفتاحية

المتاحف الافتراضية؛  
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