Building in Natural Heritage Listed Areas: Evaluation of The Design of "Wadi Al-Hitan" Protected Area, Egypt

Dr. Iman O. Gawad
Associate Professor, Architecture Departement, Faculty of Fine Arts, Helwan University
iman.gawad@hq.helwan.edu.eg

Abstract

With the growth of Nature-Based Tourism and Ecotourism and the economic interest associated with these endeavours, many Protected Areas have gained popularity as tourist destinations. However, because of the particular economic focus of tourism and the complementary conservation focus of Protected Areas, the relationship between tourism and Protected Areas is considered as a multifaceted one. In fact, the design of these areas' Visitors Centres, and infrastructure development must reflect various qualitative characteristics of its unique location and History. It is therefore important that new designs and improvement projects, carried out in this regard, consider contemporary drifts in architectural design through the innovative environmental knowhow which is capable of reducing the effect on the environment while taking into consideration the Vernacular Architecture of the site.

The study investigates the relationship between 'Natural Heritage Areas' and Sustainable Design, with a special focus on the Egyptian National Protected Areas and Listed World Heritage Sites. It highlights the importance of developing a complete planning and building strategy while implementing a managerial plan to moderate negative tourism impacts and maintain the site importance and characteristics with special emphasis on the collaboration with the local society. A general analysis of successful examples of tourists' service buildings and infrastructure of Protected Areas in Egypt was conducted. The case study of the "Fossil and Climate Change Museum" and adjacent services and administrative buildings in "Wadi Al-Hitan" Protected Area was then evaluated. The Author also proposed a plan for the development of an Egyptian "National Design Guidelines" and building regulations for local Protected Areas taking in consideration the international, regional, and local design principles and benchmarks.

Keywords:

Natural Heritage Tourism, Protected Areas, Sustainable Design, World Heritage Sites

الملخص

مع السعي لانتشار السياحة القائمة على الطبيعة والسياحة البيئية، بالإضافة الى الاهتمام الاقتصادي المرتبط بهذه المساعي، اكتسبت مناطق المحميات الطبيعية أهمية كبيره بوصفها مقصدا لمثل هذه الانواع من السياحة. وبالفعل، فإن العلاقة التبادلية بين السياحة ومناطق المحميات الطبيعية، متعددة الجوانب بسبب التركيز الاقتصادي المميز للسياحة والتركيز البيئي والثقافي لهذه المناطق المحمية .كما أن تصميم المباني الخدمية التابعة للمحميات وتطوير البنية الأساسية في هذه المناطق لابد ان يعكس خصائص نوعية مختلفة لتلك المناطق والخدمات .ومن هذا المنطلق، فيجب أن يتم تصميم مراكز الزيارات في المحميات الطبيعية، بالإضافة الى مشروعات تحسينها، من قِبَل مصممين يتمتعون باحترام كبير للبيئة ويطبقون الاتجاهات الحديثة في

الهندسة المعمارية والتصميم من خلال التصميمات البيئية الإبداعية القادرة على الحد من التأثير على البيئة وتوفير الموارد بصفه عامه.

وتبحث الدراسة العلاقة بين "مناطق التراث الطبيعي" والتصميم المستدام والبيئة الاجتماعية بالمنطقة، مع التركيز بشكل خاص على مناطق المحميات الطبيعية المصرية ومواقع التراث العالمي المدرجة مما يبرز أهمية وضع إجراءات كاملة للتخطيط والبناء مع تنفيذ خطة إدارية لتخفيف الآثار السلبية للسياحة والحفاظ على أهمية الموقع وخصائصه والتركيز بوجه خاص على التعاون مع المجتمع المحلي من خلال تقييم دراسة حالة متحف الأحفورية وتغير المناخ ومبنى الزائرين في محميه وادي الحيتان العالمية .ولقد تم إجراء دراسة تحليليه لمباني الخدمات السياحية القائمة والبنية الأساسية لهذه المحمية الطبيعية في مصر، باعتبارها اول محميه يتم تسجيلها في الأمم المتحدة ضمن قائمه التراث الطبيعي العالمي، فضلاً عن دراسة التصميم المعماري لمراكز الزائرين لمحميات طبيعية مشابهه في أماكن مختلفة بمصر. واقترح المؤلف أيضاً خطة لوضع "مبادئ ولوائح إرشادية للتصميم القومي" تختص بتوجيه تصميم المباني المزمع اقامتها بالمناطق المحمية المحلية مع مراعاة مبادئ ومعايير التصميم الدولية والإقليمية لمثل هذه النوعية من المحميات الطبيعية.

الكلمات الدالة:
سياحة التراث الطبيعي، المحميات الطبيعية، التصميم المستدام، مواقع التراث العالمي

I. INTRODUCTION

The recognition of a site in the "World Heritage List" is not only focused on the acknowledgment of its exceptional universal value and veracity but also on the admission of the necessity to protect and maintain it (Borges et al., 2011). Since its adoption in 1972, the "World Natural and Cultural Heritage List" has encompassed 1121 sites of "Outstanding Universal Value". Of this list, some 23% represent Natural Sites, including 39 Mixed Sites (Cultural as well as Natural) and 213 Natural Sites. In 2005, Wadi Al-Hitan (Whales Valley), in the Western Egyptian desert, became the first "Natural World Heritage Site" in Egypt. Today, the country lists 6 Cultural World Heritage Sites with more than 33 other sites waiting on the future "Tentative List". This List is an accounting of both Natural and Cultural Sites which Egypt intends to consider for nomination due to their irreplaceable sources of life and inspiration (UNESCO and WHC, 2020).

Many suggest that Ecotourism could help subsidize the growing number of Protected Areas as there is a close relation between the environmental objectives of Protected Areas and their management (as illustrated in figure 1). Even though several possible contradictions in the Ecotourism application may affect the ways in which Nature and Culture are reduced to commodity grade in the tourist's contemplation, Ecotourism can be a useful tool in the complex negotiations and economic arguments, needed for Protected Areas, from more aggressive and destructive forms of exploitation (Weller et al., 2014).

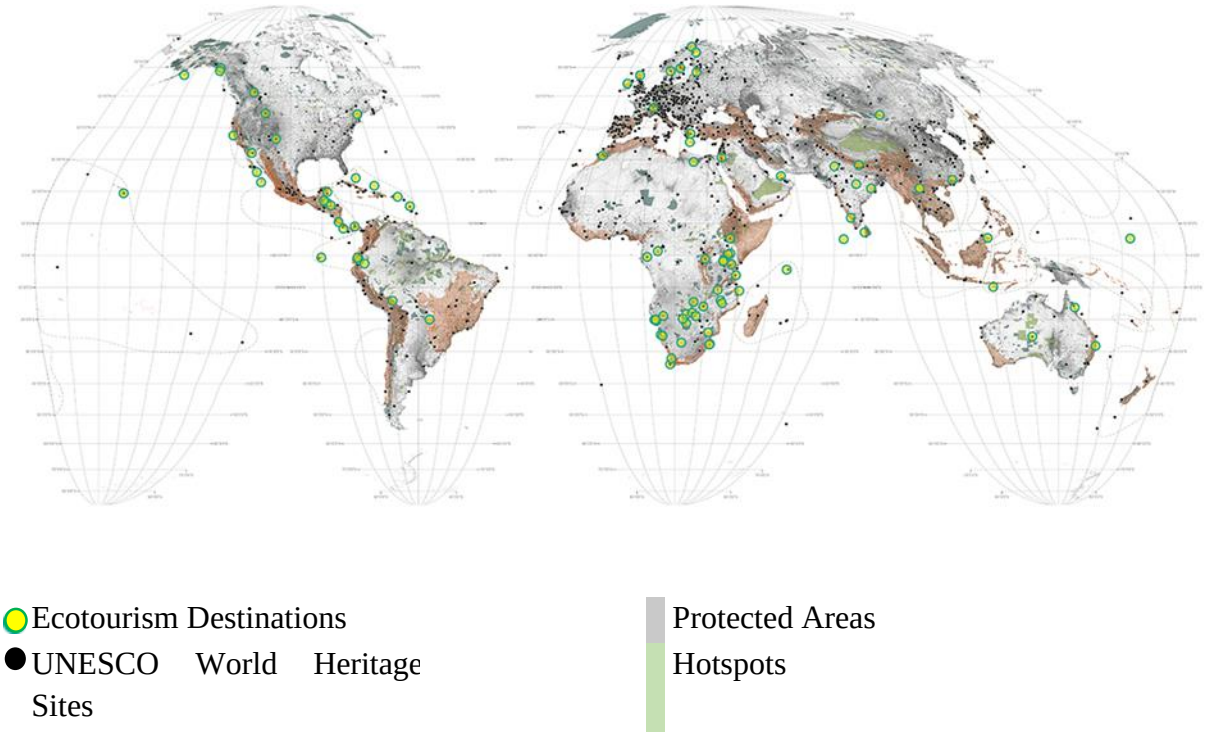


Fig. 1: World map showing UNESCO World Heritage Sites, Protected Areas, Hotspots, and its relation to Ecotourism Destinations. Source: Based on (UNESCO and WHC, 2020), (IUCN and UNEP-WCMC, 2020) and (*CEPF, 2020)*.

As the first and only World Natural Heritage Site and one of the most visited Protected Areas in Egypt, Wadi Al-Hitan consists of extremely rich fossils and stereotypes, mostly maintained in a very good condition, connected to the universal record of life. One query that has not yet been resolved is the potential inclusion of the unique "Gebel Qatrani" area (its inclusion in a boundary extension is being discussed since 2011), which would complement Wadi Al-Hitan values significantly (IUCN and UNEP-WCMC, 2020). Before 2005, there were less than 2000 visitors/year to the valley while, in 2006, the valley received more than 5,000 visitors after its designation as a World Heritage Site and the development of its access road (Mittermeier et al., 2011). A recent govermental programme was launched with the aim of promoting Wadi Al-Hitan as a national and international economic destination of the Fayoum district which increased the number of visitors to the Protected Area significantly. Therefore, more tourists are expected to come to the World Hertage Site in the future.

Nevertheless, in 2016, the "Egyptian Minister of the Environment" opened the "Fossil and Climate Change Museum" in collaboration with the Italian Government and the "United Nations Development Programme UNDP". In addition to sustaining the site's natural fossils and unique relics, the museum originates and supports Ecotourism and sustainable development as part of a collective package of international initiatives introduced to facilitate the promotion of Egyptian Protected Areas. A set of walkways between the main fossils were also laid out and small administrative and services' buildings were built. This Natural Park is now frequently visited by tourist groups, and a small camp site is available for their accommodation (IUCN, 2017). The necessity of a closer and analytical evaluation of its success practices is now more needed, especially within the possibility of the potential inclusion of the "Gebel Qatrani" site and its following developments.

Therefore, the study was based on a variety of qualitative aspects: the theoretical principles focusing on the development of tourist facilities, the organisation of activities in Protected Areas and World Heritage Sites while previous international research and granting institutions reports of the Egyptian Environment Ministry were examined. Special attention of the study was concentrated on the conceptual design and construction's strategies adopted by Egyptian Architectural Firms, assigned with the development of Visitors' Centres and/or museums in several Egyptian Protected Areas were then described with a distinct emphasis on the case study of Wadi Al-Hitan as the only Natural World Heritage Listed Site in Egypt. For a more accurate evaluation, a site visit to Wadi Al-Hitan Protectorate was organised. A proposed plan for the development of a "National Design Guidelines and Building Regulations" for local Protected Areas was then suggested, taking in consideration the international, regional, and local design principles and benchmarks, in order to be applied on new buildings' assignments and projects in future Protected Areas. Lastly, the investigation of the UNESCO's "Principles for Sustainable Tourism at World Heritage Properties" were defined in order to be employed in practice with respect to clear criteria and indicators at the national level.

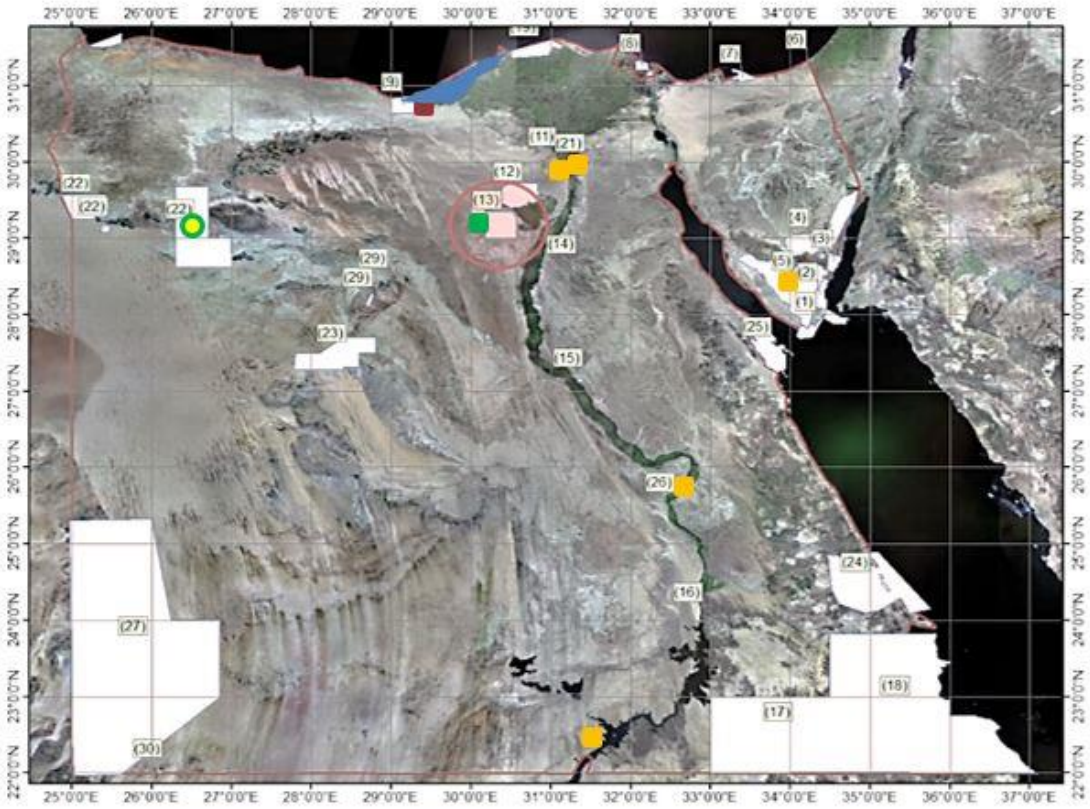
II. NATIONAL PROTECTED AREAS AND WORLD HERITAGE LISTED SITES IN EGYPT

Over the last few decades, international interdisciplinary, and cross-disciplinary research has revolved around the Global Environmental and Cultural Heritage. Local projects and cooperation between stakeholders, communities and experts have contributed as a respected common resource to the restoration, the understanding and strengthening of rural Protected Areas. This concept has been endorsed by many multinational, regional, and local governments through their legislations, policies as well as their institutional backgrounds.

II.I INSTITUTIONAL BACKGROUND OF PROTECTED AREAS IN EGYPT

Egyptian Law 102 of 1983 defines and lays down the legal basis for the creation and management of Egyptian Protected Areas as "Any area of land or coastal or inland water characterized by special flora, fauna and natural features having cultural, scientific, tourism or aesthetic value". The "Egyptian Environmental Affairs Agency EEAA" was restructured in 1992 and Law 4 of 1994 became the leading legislation for its environmental management, creating the "Nature Conservation Sector" for the management of Egypt's Protected Areas. The "Egyptian Ministry of State for Environmental Affairs MSEA" was formed in 1997 and The EEAA was placed within its scope (EEAA, 2020).

Since the passage of the law 102/1083, 24, Egyptian Protected Areas have been nationally proclaimed. The existing network encompasses approximately 10 percent of the Egyptian lands and maritime areas while covering many Ecosystems and physiological regions, as well as other important areas, such as hotspots for biodiversity, and cultural heritage (as shown in figure 2). Egyptian Protected Areas are of various sizes: they range from the largest, "Elba", at about 35,000 Km^2 to "Saluga and Ghazal Islands", at 0,5 km^2 (Fouda, 2006).



(1) Ras Mohamed	(7) Zaranik	(13) Wadi Al-Rayan	(19) Burullus	(25) Red Sea Islands
(2) Nabq	(8) Ashtum El-Gamil	(14) Wadi Sannor Cave	(20) Nile Islands	(26) Dababia
(3) Abo Galum	(9) Omayed	(15) Wadi Asiuty	(21) Wadi Degla	(27) El-Gulf El-Keber
(4) Taba	(10) Petrified Forest	(16) Saluga and Ghazal	(22) Siwa	(28) El-salum
(5) Saint Catherine	(11) Hassana Dome	(17) Wadi Alaqi	(23) White Desert	(29) Bahareya oasis
(6) Al-Ahrash	(12) Qaroun	(18) Elba	(24) Wadi El-Gemal	(30) Gabel Kamal

Cultural Site in Danger		Abu Mena	1979
Cultural Sites		Ancient Thebes with its Necropolis	1979
		Historic Cairo	1979
		Memphis and its Necropolis (The Pyramids' Fields)	1979
		Nubian Monuments from Abu Simbel to Philae	1979
		Saint Catherine Area	2002
Natural Site		Wadi Al-Hitan (Whales Valley)	2005
Ecotourism Destinations		Siwa Oasis (Adrar Amlal Ecolodge)	1994
Biodiversity Hotspot		Mediterranean Basin	2017

Fig. 2: Egyptian Natural Protectorates, Natural and Cultural Protected Areas inscribed on the World Heritage List, Official Ecotourism Destination, and Biodiversity Hotspot with a special emphasis on Wadi Al-Hitan Protected Area.

Source: Map created by the Author based on (UNESCO and WHC, 2020), (EEAA, 2020), (Global Affiliate Network, 2020) and (IUCN and UNEP-WCMC, 2020)

International and regional conventions mandate the conservation of essential Protected Areas. Egypt is a signatory to eight international and regional agreements which guarantee National Protected Areas' stipulations, and which have, under Egypt's constitution, the same jurisdiction as the Egyptian Law. The conventions expect Egypt to establish and maintain a network of Protected Areas to preserve ecosystems, representative habitats, cultural heritage sites and valuable traditional resources (Fouda, 2006).

Egypt is part of the international treaty called "the Convention concerning the Protection of the World Cultural and Natural Heritage" formed by the "United Nations Educational, Scientific and Cultural Organization UNESCO" as part of its mission to ensure the recognition, the protection and the preservation of international cultural and natural resources. As of 2016, 7 sites in Egypt are included in this list (as shown in figure 2). All the sites are in the Cultural Criteria except for Wadi Al-Hitan which is listed in the Natural Criteria. Only one site in Egypt is considered as a "Cultural Site inscribed on the List of World Heritage in Danger" which is the former ruins of a holy Christian City, including a church, baptistery, basilicas, streets, buildings, and workshops, that have been erected above the tomb of Menas of Alexandria. It is acknowledged that the sites of World Heritage are shared by all the nations of the world, regardless of their jurisdiction (UNESCO and WHC, 2019).

II.II PROMOTING GREEN ECONOMY SOLUTIONS AT PROTECTED AREAS IN EGYPT

With the negative effects often connected with Mass-Tourism to Protected Areas and the unregulated commercial benefits of touristic projects, the need for a Green Economy intervention has become a necessity. Many aspects of Green Economy have been implemented in Protected Areas worldwide for some years, others ceased due to the lack of technical and financial capital (Vavilova and Bakhareva, 2018).

This is a new approach in Egypt, which relies on the involvement of native communities in the management of conservation. A pioneer project was launched in St. Catherine's Protected Area in Sinai based on the "Global Environment Facility's GEF" and UNDP's "Medicinal Plant Conservation Project MPCP" and carried out through the "Egyptian Environmental Affairs Agency EEAA". The project's goal was to motivate local communities to conserve, use and benefit from their place/habitat according to a sustainable foundation. The development of a "Community Based Natural Resources Management CBNRM" system in St. Catherine Protected Area marks a new approach by the EEAA towards collaborative conservation. This new EEAA approach to cooperative conservation is being established with the aim of incorporating the approach of CBNRM in the St. Catherine Protected Area. The main aim of this process is to obtain access to MPCP resources to ensure that benefits are paid to resource-close citizens who bear the expense of environmental management.

The following is a brief on some of the main activities related to Green Economy in Protected Areas in Egypt (Talaat et al., 2007):

1. Organic Farming practices in Wadi El-Rayan Protected Area, with the financial and technical support given by the Italian Government to both the Egyptian Ministry of Agriculture and the Ministry of Environment.

2. The Integrated Solid Waste Management Project and the Medicinal Plants Cultivation Program at Saint Catherine Protected Area, Sinai Peninsula.

3. Sustainable buildings constructions at Wadi El-Gemal Protected Area, were made of local materials and the design was based on Roman ruins where rocks were brought from different places to give the impression of the same landscape of these sites.

III. ARCHITECTURAL DESIGN CRITERIA OF PROTECTED AREAS

The adequate design of Protected Areas is one of the most powerful tools for conserving biodiversity which can also provide other benefits, such as protecting local water supply and cultural values while preserving indigenous peoples' livelihoods. Protected Areas vary from those explicitly protected and exempted from extractive use to multi-use areas that permit sustainable constructions and natural resources' use (Possingham et al., 2006). Several international and national design considerations and criteria define and regulate the design and construction procedures of Protected Areas and World Heritage Sites as follows:

III.I. INTERNATIONAL DESIGN CRITERIA OF PROTECTED AREAS AND WORLD HERITAGE SITES

Many Protected Areas, which suffer from the lack of funding, do not accomplish the design and conservation purposes they have been created for. Furthermore, many face major threats and challenges from improper growth within and outside their borders. Therefore, inadequate design can lead to the creation of Protected Areas which can fail to meet the international requirements. The "International Union for Conservation of Nature IUCN" created a comprehensive design and effectiveness' management measuring system, which includes the conceptual design questions, management appropriateness, and whether the Protected Areas' goals were being met or not. Generally talking, the mentioned conceptual design restrictions and limitations include the size and influence of the site's requirements, buffer zones and links to other regions. The assessment of the extent at which Protected Areas achieve their specified goals requires evaluating natural, biological as well as social effects. These three requirements are used for the evaluation of the effectiveness of Protected Areas worldwide in order to enhance its management and mobilise resources for the creation of successful Protected Areas (Hockings, 2003).

Nevertheless, the International Design Criteria for a World Heritage Listed Site follows the "Criteria for the Assessment of Outstanding Universal Value" taken from Chapter II.D of the "Operational Guidelines for the Implementation of the World Heritage Convention" which states the following (UNESCO and WHC, 2020): *"To be deemed of outstanding universal value, a property must also meet the conditions of integrity and/or authenticity and must have an adequate protection and management system to ensure its safeguarding."*

The UNESCO/World Heritage Centre also proposed two important principles which are more related to the design, construction, and management of its "Listed Properties" among several other "Principles for Sustainable Tourism" (UNESCO and WHC, 2020) as follows:

1. **Principle 6**: "*Tourism infrastructure and visitor facilities associated with World Heritage Properties should be carefully planned, sited, designed, constructed, and periodically upgraded as required to maximize the quality of visitor appreciation and experiences while minimizing adverse impacts on heritage values and the surrounding environmental and cultural context".*
2. **Principle 9:** "*Tourism infrastructure development and visitor activity associated with World Heritage Properties should also contribute to local community development in an effective and equitable manner".*

On another level, the "International Council on Monuments and Sites ICOMOS" and the "International Federation of Library Associations and Institutions IFLA" coordinated their efforts in the production of the "ICOMOS-IFLA Principles Concerning Rural Landscapes as Heritage" by adopting the dissemination and use of a set of principles to foster the awareness, successful protection, environmental transformation and dissemination and appreciation of "Rural Landscape Heritage" throughout the world, as part of what is called "the International Human Culture". Its purpose is to foster an adequate balance between its social, environmental, economic, and cultural aspects (Ashrafi and Shokrani, 2019).

III.II. THE DESIGN OF PROTECTED AREAS' FACILITIES AND INFRASTRUCTURE IN EGYPT

Several infrastructures and building facilities have been recently constructed to sustain contemporary governance in the Egyptian Protected Areas. Instead of old buildings, already existing in some of the older Protected Areas (as seen in figure 3), new offices, staff accommodation and workshops have been built in many new ones. Most of the current Protected Areas have now basic offices and field facilities, labs, supplies for public education, etc. In recognition of the uniqueness of every Protected Area, the national authorities have strongly promoted general sustainable design criteria that conserve the natural environment, vernacular architecture practices, and the local culture of these areas. In addition, local building materials should be used while employing native people in their construction and maintenance. Yet, there is no defined National Design Guidelines and Building Regulations for Egyptian Protected Areas.

Fig. 3: Wadi Al-Rayan Protected Area's old Headquarter (photo on the left side) and old Visitors' Center on the shore of Karoun Lake (photo on the right side) (Marchetti, 2005)

Some of the best examples of this design strategy are the numerous Park Rangers Stations, Information Centers, and Park Entrances designed for the following studied Egyptian Protected Areas. These examples are anticipated to serve as a model for sustainable construction techniques and increase awareness of environmental sensitive design elsewhere in Egypt:

III.II.I Wadi El-Gemal National Park

Wadi El-Gemal Protected Area has been declared to be the 24th Protectorate in Egypt in 2003 mainly because of its striking landscape and significant cultural resources. Located 50 km to the south of the Egyptian Red Sea's coastal town of "Marsa Alam", its buildings were designed by an Egyptian architectural firm called the "Egyptian Earth Construction Association". They applied the "Dry-Stone" technique with limited use of cement: a construction technique that can be traced back to thousands of years. The structures have a minimal physical footprint on their

premises and are mixed with the landscape while using natural heat exchangers strategies (Whitelaw et al., 2014). Conceptually, the architecture design of the Park's main building was influenced by the Acacia tree which is the only tree species abundant in this Hot Arid desert (as illustrated in figure 4). For the local inhabitants, the "Ababda" tribes, the Acacia tree is regarded as a point of reference as it offers the requisite landmark, a shade for social gathering, and building branches for firewood and construction material. Similarly, the Park's Visitor's Center was built to provide shade and shelter for different activities. The remoteness of the site from any utility advocated the need to design the building to support itself. It also presented a major challenge due to the lack of access to electricity or running water supplies during its construction (EECA, 2011).

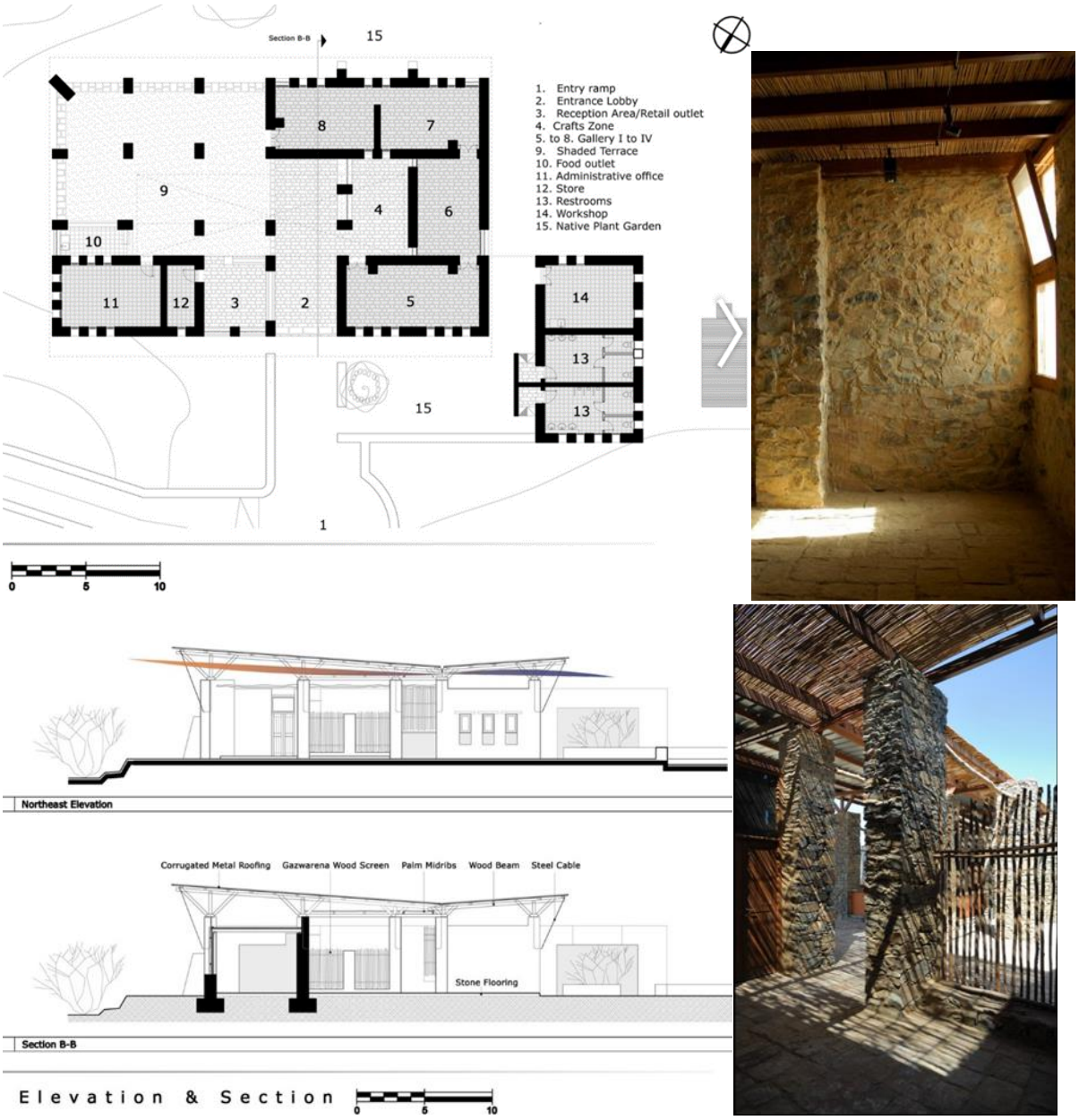


Fig. 4: Wadi El-Gemal National Park's conceptual design, plans, elevation, and section. External and Internal photos show the influence of the Acacia tree on the building form Source: (EECA, 2011)

III.II.II Abu Galum (Blue Hole) National Park

One of the pioneer examples in Egypt is the Abu Galum Protected Area, designed by a group of young Egyptian architects who founded a design and build firm called "Hand Over" which specializes in delivering cost-effective and environment-friendly building solutions using natural and local materials. The Blue Hole diving site in Abu Galum Protected Area is one of 5 most prominent Blue Hole diving sites in the world. The Protected Area is owned by the Egyptian Ministry of Environmental Affairs while being funded and managed by the UNDP's "Egypt's Strengthening Protected Areas Financing and Management Systems Project". The Area was left with no visitors' facilities until recently and the only buildings in the site were small touristic services built by the locals as a main source of income (as seen in figure 5). The seats were in the shape of a wooden shakes or cafes in the Arabian style. Kotb et al. (2004) reported substantial indirect threats to tourism in the area by landfills, dredging and sedimentation, sewage, and desalination plant effluent, all of which are linked to ongoing coastal development. The problem was also exacerbated by the contamination from boats used for tourism purposes in the form of garbage, waste, plastic bags, and water bottles.

The new buildings and facilities in the Blue Hole Protected Area was completed in February 2020 by the Cairo based architectural firm. It designed the administration facilities, visitor's toilet, ticket rooms, an entrance, as well as the outdoor urban furniture, including seating, sheds for the divers and interpretative signage along the site for wayfinding. Commissioned to design and build all aspects of the project, "Hand Over" applied Rammed Earth techniques with stone footing, and used natural stones and wood for the structures, all of which were locally sourced (as shown in figure 6). A finishing layer of Acacia and oil was applied to the walls to preserve their surfaces. According to Hand Over: "these techniques are durable and have been tested in ancient and modern buildings alike". The project site is divided into 3 main building zones: the entrance facility, dry toilets, and the administration building. However, integral to the project was the enhancement of the visitor experience, throughout information and instruction boards as well as shaded structures and resting spaces (Hand Over, 2020). Through the use of natural materials, Rammed Earth technique and solar panels, the architecture firm was nominated for the "Agha Khan Award" and won the "Qatar Sustainability Award" (Hany, 2020).

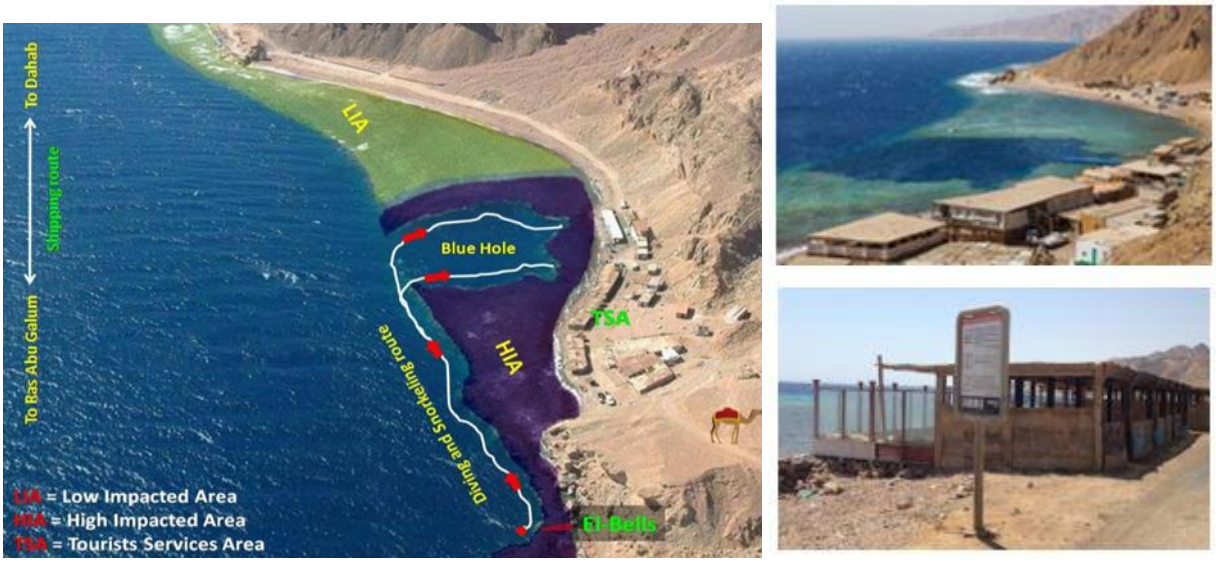
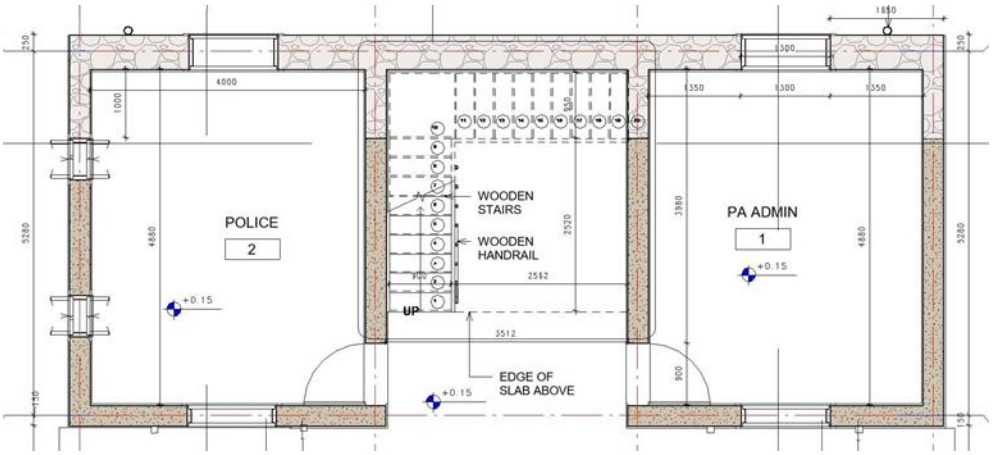


Figure (5): A Landsat Image showing the Blue Hole Diving Site and the compared areas, in addition to the main tourism practices in the site. (El-Naggar et al., 2017)

Photos of the small touristic services built by the local (Budget Wayfares, 2020)



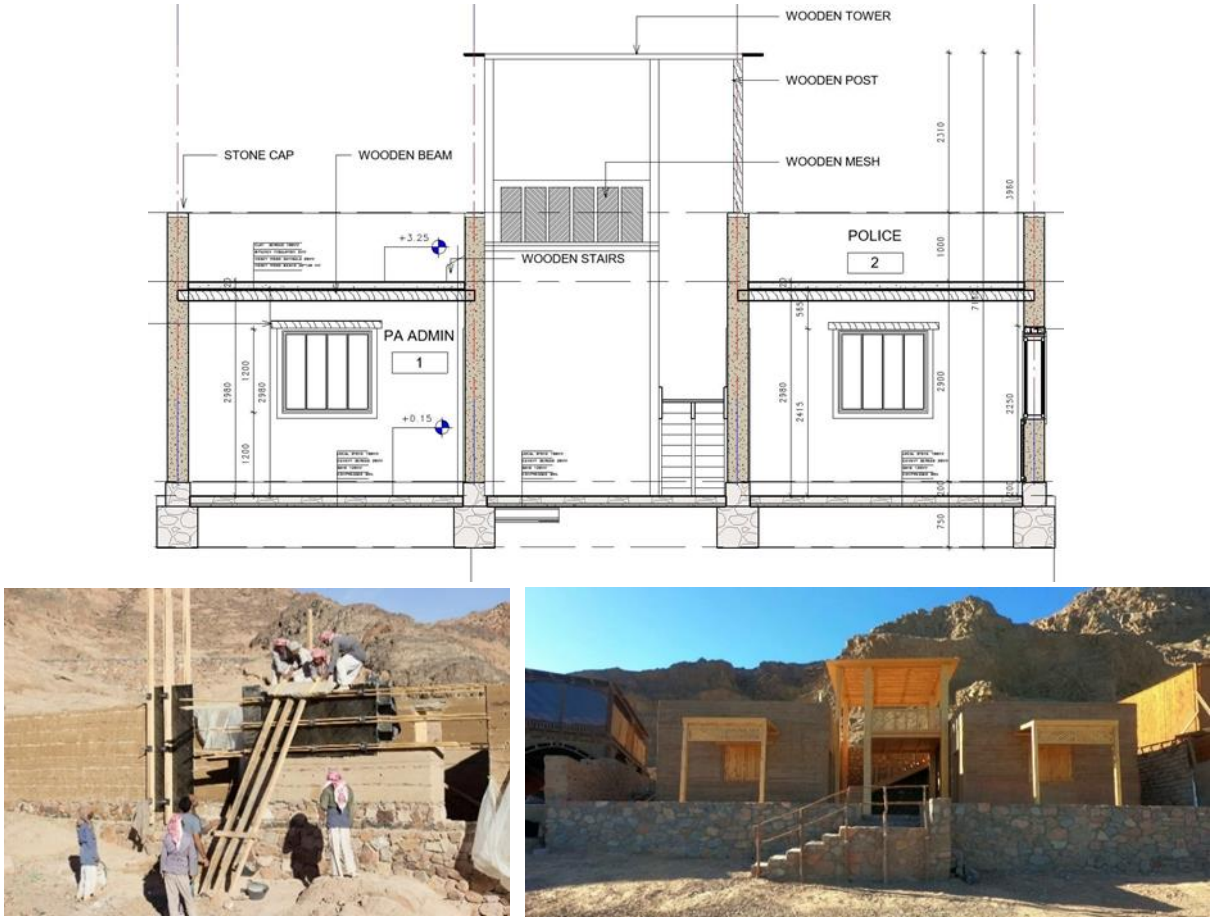


Fig. 6: Abu Galoum Protectorate construction plan and section as designed by the Egyptian design and build company "Hand Over".
Source: (Hand Over, 2020) and (Alsamarae, 2020)

III.II.III Other Examples of National Protected Areas

Another Architecture Design firm, "Image House", known for its building design character which reflects the Egyptian vernacular architecture as well as the cultural identity of the area, while at the same time optimizing the use of local materials and skilled local workers, was assigned for the design of other National Protected Areas (as shown in figure 7). The founder of the architectural firm and its main designer, Gabriel Mikhail, had several previous experiences working with various conservation and development organizations such as the UNDP, USAID, the European Union. With the funding of the EEAA, the Government of Italy and UNDP, the building of these National Protected Areas was made possible. Following are descriptions of some of the Protected Areas which were designed and constructed by "Image House" firm (Image House, 2019):

1) The Waterfalls Park, Wadi Al-Rayan National Protected Area:

This site was also built with interpretation centers, restaurants, cafes, visitors centers and other facilities that lead to an enhanced visitor's experience along with the satisfaction of different stakeholders. The design introduced an area, which is big enough to accommodate tens of thousands of tourists who come to see the natural landscape every year. A pigeon house was traditionally constructed of pottery and clay plasters, as part of the original design of the visitors' services, that also accommodated several bazaars on its ground level.

2) Wadi Al-Rayan Protected Area's entry facilities and landmark:

This 1760 km^2 National Park is controlled by the main access facility, as well as serving as a functional monument for marking the entry to the park. Ticket rooms, shaded areas, workers' kitchenette and toilets are also included. The designed structure was built to comprise between the natural and cultural heritage of the Park and the surrounding area.

3) **Ras Mohamed National Park's Visitor Center Revival**:

This project aimed at the renovation of the current Visitors Center where guests are informed about the unique resources and biodiversity of the famous Protected Area of Egypt. The whole building has been renovated from the interior to the outside. The exhibit house was extended and redesigned with the aim of enhancing the indirect low levels of natural lighting and the flow of visitors' circulation. A distinctive geodesic dome has been erected to provide shadow, natural ventilation, and thermal comfort for the building users. The Visitors Center has also become a place to experience local cultures and interact during various events in and around the Visitor Center with the local community. The Protected Area's gift shop has local souvenirs crafted by the community artisans.

4) White Desert National Park infrastructure:

In the desert city of Farafra, 13 km from the south frontier of the Park, a former visitor center was originally constructed in an unsustainable style and had to be renovated and rebuilt. The designer improved the building's facades using the oasis' vernacular architectural style of the region as can be seen in the nearby old village of Qasr. The project also included exhibitions design and building facilities as well as the enhancement of its Visitors Center, ticket office, guard outpost and entry point. The landscape imitated the natural scenery of the area and its climate with palm trees over mountains which are supposed to be "vegetative mounds". Local germination is enabled by common Tamarix, Halfa, and other wild species. The exhibits demonstrate the geology, the flora, the fauna, and the beautiful natural sceneries of the park.

5) **Ras Hankorab Eco-Beach**

South of the Wadi El-Gemal National Park, this pristine project included the design and development of a sightseeing facility. The Eco-Beach has been saved from the unsustainable activities of Mass-tourism by creating several tourist facilities which control the use of the beach and enabled the Park officers to manage its conservation. The work included directional signs, designated tracks, shading areas, toilets, benches, garbage separation bins and local handicrafts' selling areas.

Wadi Al-Rayan National Park,	**Waterfalls Park**		

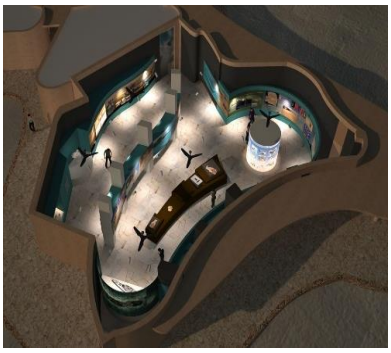
	Entry Facilities and Landmark		
Sinai Peninsula	Ras Mohamed National Park's Visitor Center		
Egyptian Western Desert	White Desert National Park infrastructure		
Wadi El-Gemal National Park, Red Sea	Ras Hankorab Eco-beach		

Fig. 7: Egyptian Protected Areas were redesigned and constructed by "Image House" firm at different parts of the country. Source: (Image House, 2019)

IV. WADI AL-HITAN PROTECTED AREA

A region of Wadi Al-Rayan Protected Area in Egypt's West Wilderness, known as Wadi El-Hitan, contains invaluable, early, and now extinguished, fossil remnants: The Archaeoceti whales' sub-order. These fossils reflect one of the greatest evolutionary records: the emergence of whale as a marine mammal from a deformation as a land-based species (Fouda and Sarhan, 2013). In this region, some 40 km west of the Wadi Al-Rayan Lakes, one species the whale fossils reaching a length of 21 meters can be found beside another species with reminiscent hinder limbs (Antar, 2020). First discovered in 1902, the importance of these fossils has actually been rediscovered only since 1983 while in 2005 it was transformed into a World Heritage Site

and has been accessible to visitor since then (as illustrated in Figure 8). The construction of the Protected Area's facilities has been achieved through a twinning agreement between Wadi Al-Rayan Protected Area, the National Park of Wadi Al-Hitan and Italy's Gran Sasso National Park and sponsored using Italy's technical and financial support (UNESCO and WHC, 2008).

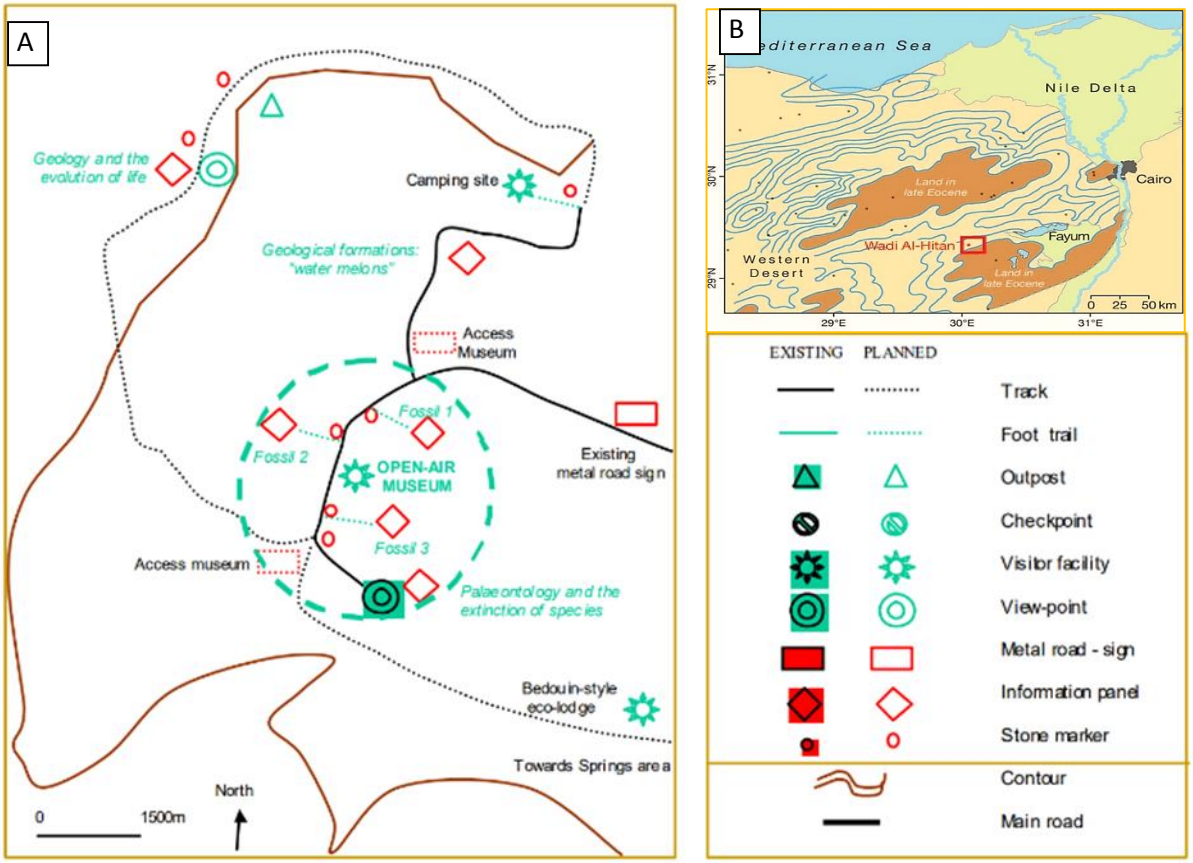


Fig. 8: A) Wadi Al-Hitan Area's Schematic Site Plan (Marchetti, 2005) and (Peters et al., 2009) B) Map showing the modern geography and Late Eocene paleogeography in the scope of Wadi Al-Hitan (red rectangle) while Late Eocene sediment thickness is illustrated in Blue color contour lines (Fouda, 2006).

The Italian Government has been a leading contributor to the establishment of many Protected Areas in Egypt by means of the "Italian Development Cooperation Agency IDC" and IUCN's technical assistance. Wadi Al-Hitan's project has produced a range of ambitious sub-projects which are of great interest to other Protected Areas. Local people in Fayum Governorate's Lake Qarun are being helped to develop expertise to lead visitors in the area and encouraged to establish small-scaled tourist facilities such as Eco lodges (Whitelaw et al., 2014).

As a strictly Protected Area, within the broader Wadi Al-Rayan Protected Area, this intermediate segment comprises a buffer zone which was created to protect it against wider risks, including uncontrolled visits and traffic casualties (Fouda and Sarhan, 2013). It was funded by the "Egyptian Italian Environmental Cooperation EIECP" and is considered as one of the most modern and organized sights in Egypt as it includes a separate car park, a café, toilets for tourists and a fossil museum. All these outbuildings are built in an adobe style to blend in with the landscape (Ramzy, 2013).

IV.I WADI AL-HITAN'S CONSERVATION CHALLENGES AND THREATS

The fossils were discovered on the surface of a desert landscape now totally dry, which was 40 million years ago part of the vast Tethys Ocean. The fragile and vulnerable skeletons of the Wadi are exposed to wind erosion by the surrounding sand. As the region's Ecotourism expands, visitors will need constant monitoring to prevent damage from being caused by vehicles driven by privileged visitors over the skeletons similar to what happened in 2007 (Peters et al., 2009). The following are unique threats to the protection of the geological value of the Wadi Al-Hitan site (UNESCO and WHC, 2019):

A) Destruction caused by visitors: Fossils and whale skeletons, are physically fragile and vulnerable to trampling, especially to vehicle crushing damages. In the 3-years period after its inscription on the World Heritage List, there was a rise in the number of tourists to this site, thereby raising the potential losses and damages caused by visitors. Cases of off-road accessibility for 4x4 vehicles and the construction of unofficial access routes through northern fossil-rich areas were recorded and posed a considerable risk.

B) Natural erosion and theft: The slow and natural process of wind and water erosion is part of the dynamics of the site. It contributes to the exposure and discovery of *new* fossils, while others are lost or taken. In previous cases, there was a need for a special preservation of exposed sections of the valuable fossils using "Polymer Embedding" to protect the fossils against natural erosion. The threat of fossils' theft is surprisingly very real since many of them lie on the surface and can be easily retrieved.

D) Quarrying: Incomplete efforts to create illegal quarries for the construction of buildings on the site have been documented. This could continue to pose a possible threat to the Protected Area.

IV.II WADI AL-HITAN PROTECTED AREA'S DESIGN

In November 2013, the UNDP launched a "Request for Proposals" regarding the establishment of "Wadi Al-Hitan Fossil and Climate Change Museum" in Wadi Al-Rayan Protected Area. The design of the project was also assigned to "Image House" which is a well-known multi-disciplinary architectural design firm since 1997 with several previous experiences working with National Parks in Egypt and with various conservation and development organizations as previously discussed. The firm oversaw the design and construction of the Park's facilities such as the Visitors' Center and interpretative resources (Fouda, 2006). According to the Image House firm, considerable research has been undertaken to explore natural and cultural contexts that could provide the basis for the development of appropriate architecture and interpretative facilities for this unique and global site. The design of the Protected Area's facilities and buildings presented several challenges and were based on the following criteria and considerations (Image House, 2019):

A. The layout must be submissive and allow the landscape to dominate, not the other way around. Therefore, the main attraction of such an irreplaceable natural environment should never be the architecture itself.

B. The architecture needs to respond to this region's rich cultural heritage. The valley's architectural and natural context is quite diverse. Therefore, the design must be liberal while being rooted in the past.

C. The building must serve local residents and benefit from their local expertise and skills. This region supports farmers' communities that cultivate land while fishing in the neighboring two Fayoum lakes. They have created their own vernacular architecture, using a restricted model of organic and renewable materials, whereas using passive means to control the environment.

D. The architectural designs have been influenced by the aesthetic elements of Ecomimicry through imitating the colors and landscape textures of the earth. Each structure has been designed to show minimal interference and visual impact on the fossils and the landscape.

E. Mud brick and plaster have been selected as building materials (as shown in figure 9). They are intertwined with the area's history and are readily used by local labor from ancient to modern times. Nevertheless, they are made of land and can fade back into the earth beside being high insulated and durable.

F. Construction took place with great care, and any mud mixing was carried out on plastic sheets and trails that are clearly marked for work and material mobility. The site was not permitted to acquire lorries for the transportation of building materials. Only donkeys were used to carry on the required materials.

Fig. 9: Vernacular construction techniques of the Wadi Al-Hitan Protected Area.
Source: (Antar, 2016)

It was also possible to raise awareness of the significance of Wadi-Al-Hitan and the importance of preserving it through Ecotourism while using effective interpretation tools. This work began before the site was inscribed and as part of the improved managerial procedures of several Protected Areas in Egypt. Another result of well-planned Ecotourism at Wadi Al-Hitan was the economic growth of local communities. The management of the Protected Area has worked with local communities to improve their ability to provide visitors with certain touristic and accomodation services (UNESCO and WHC, 2020).

The Protected Area is about 200 km^2 (not including buffer zone). Because of its distant nature, visitors can camp overnight, thus reducing the need for permanently construct infrastructures that would violate its natural and prehistoric landscape. Vehicles are prohibited and only guided tours by foot or on camel on a set trail are allowed to visit Wadi Al-Hitan through previously arranged guided tours (EEAA, 2020).

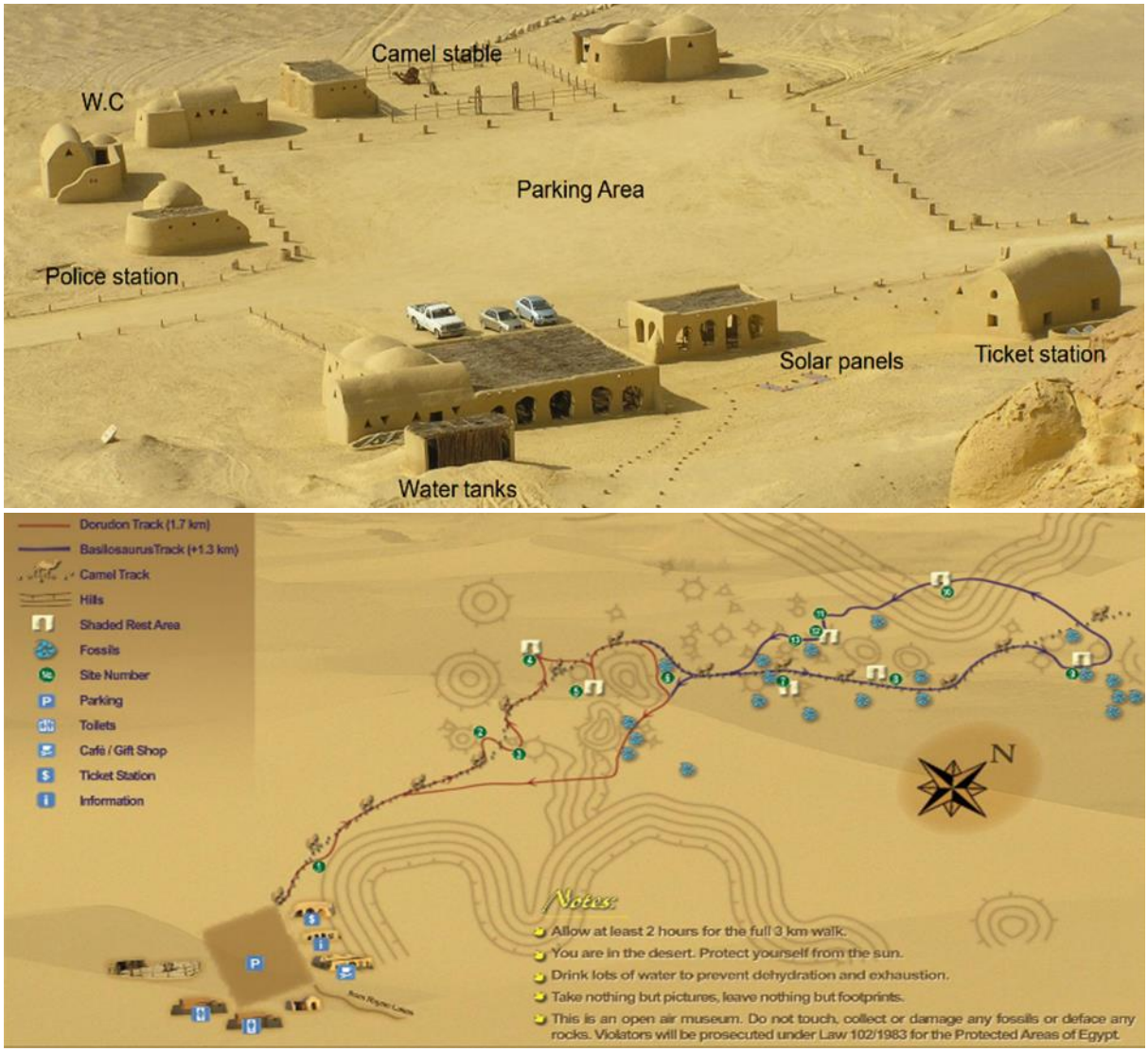


Fig. 10: A) The architectural design of Wadi Al-Hitan in harmony with the natural landscape.
B) Essential Infrastructure of the Wadi Al-Hitan Protected Area.
C) Available tracks and facilities to the visitors of Wadi Al-Hitan
Source (EEAA, 2020) and the Photo is taken by the Author.

IV.II.I Wadi Al-Hitan Visitors' Centre and Facilities

Comprehensive interpretation and visitors' guidance facilities (Visitor Centre, signage, information panels, brochures, and video) have been developed in 2010. **The architectural design of the Visitors' Centre and its amenities aims at reducing its effect on the landscape through functional and aesthetic aspects of Ecomimicry as illustrated in figure 11.** A complex articulation system of vaults and sculpted mud-bricks walls is used for the ticket station and the information post (IUCN and UNEP-WCMC, 2020).

As for the energy and water supplies in the buildings, a water tank is filled on a regular basis although it is not adequate to fulfil the needs of a large number of tourists and staff. The Centre relies primarily on the use of the complex's solar energy system. Nevertheless, more attention must be paid to energy resources as the use of solar panels is not enough, and rangers and coffee shop operators need to use a diesel engine which, unfortunately, disrupts the sense of peace and quiet that the tourist needs (Howard, 2020).

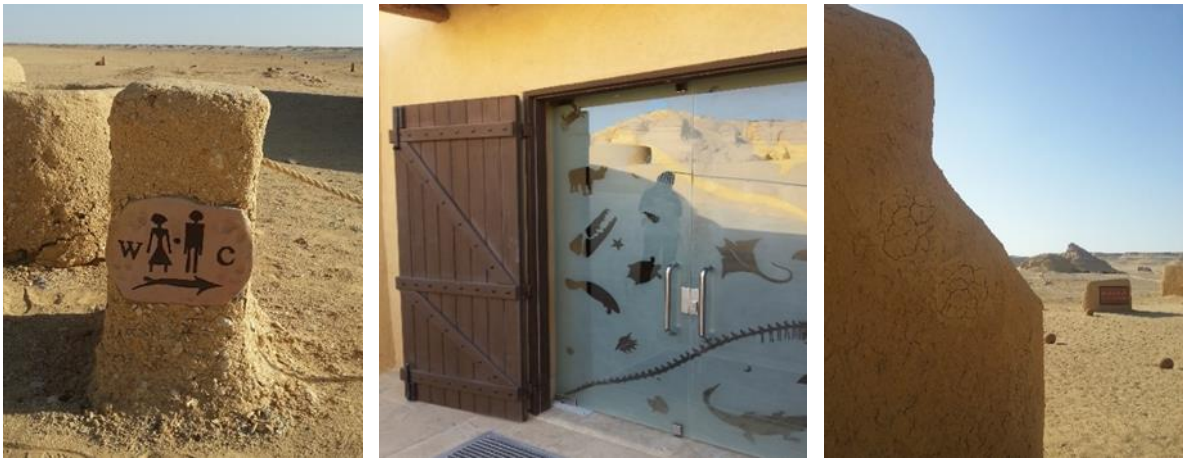


Fig. 11: Using design items and signs from the natural surrounding and cultural context in Wadi Al-Hitan. Photos taken by the Author.

Fig. 12: The cafeteria, Visitors Centre and gift shop at the Wadi Al-Hitan National Park. Mud brick, reed, and plaster as building materials deeply entwins in the regions culture. Photos taken by the Author.

Because the valley is a Protected Area, there are hardly any of the amenities one normally finds at any tourist attractions. Nevertheless, the single cafeteria on the site serves traditional Egyptian food to the site visitors boosting the already homely atmosphere provided by the campsite.

IV.II.II The Museum of Wadi Al-Hitan "Fossil and Climate Change"

The museum, open only in 2016, illustrates the significance of the site while its design follows the same architecture theme of the first phase of the project, including the open-air museum and visitor facilities. In addition to other fossils, the museum focuses on a complete skeleton of the largest whale species discovered on the site that is the extinct 'Basilosaurus' (UNESCO, 2020). **The structure is half buried under the ground in order to have less visual impact on the landscape. Only the principal dome and vaults above the ground are seen, which reflects the landscape in line with the current architecture** (as shown in figure 13). This also gives tourists a feeling of suspense, as the original remains of ancient whale are buried underground.

The museum’s design additionally helps to maintain the users’ thermal comfort while increasing the rigidity of the building to the outside. The use of natural design strategies is maximized in terms of energy consumption, daylighting and natural ventilation needs. High openings and roof slots ensure natural ventilation and illumination, while niche displays are fitted with lighting shafts. In the middle of the museum’s gallery, beneath the biggest dome, the circular museum building features the largest Basilosaurus skeleton. Visitors who circulate around this main area witness the universal climate change, taking them on a trip through the past of the evolving climate on our planet from the beginnings to the shifting aeons of 40 000 000 years ago to the environment of wales and humans, ending by today's specific climate change problems and the future ones. The entrance lobby is designed in a traditional vernacular theme with local construction materials but with an advanced architecture that seeks to incorporate design technologies combined with the talents of local workers and artisans (Mikhail, 2017).

Fig. 13: The dome of the Museum during its construction phase and after its completion. Photos taken by the Autor and (Image House, 2019)

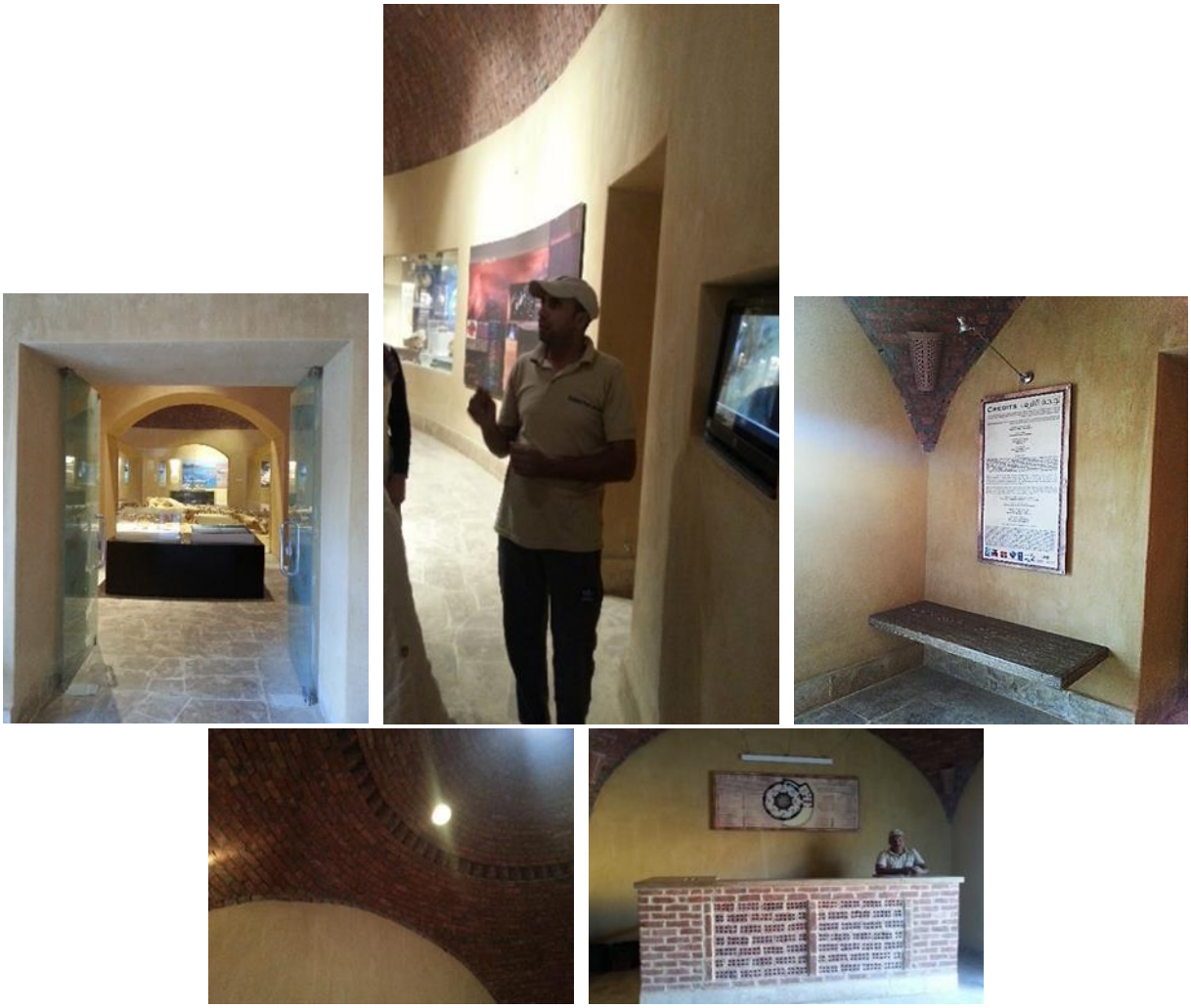


Fig. 14: Internal design of the Fossil and Climate Change Museum at Wadi Al-Hitan Protected Area. Photos taken by the Author.

IV.II.III Wadi Al-Hitan Protected Area's Social and Cultural Impact

The community around Wadi Al-Hitan area are primarily farmers who cultivate the land using ancient methods while producing traditional crops such as oranges, lemons, apricots, dates, and olives. Fishing is also a major source of income that capitalises on Lake Karoun and many irrigation canals, using artificial fishing farms. Quarries and mining are supplementary occupations in the northern shore of the lake. In view of the overcrowded and polluted conditions in and around Cairo, tourism in the region is undoubtedly on the rise. Both Wadi Al-Rayan and Wadi Al-Hitan offer opportunities and challenges in the management of Ecolodges (Hewison, 1984).

The tourism growth in Wadi Al-Hitan has taken place primarily at a small level with the local communities providing tourists most of their services. The management of the Protected Area has worked with the local communities to improve their capacity in order to be able to provide touristic services to the visitors while also building their professional skills. Another result of Wadi Al-Hitan's well-planned Ecotourism was the economic growth of local communities. Residents of the local area were also trained on restoring and maintaining the fossils of the site and are hired in the Protected Area as Guards (IUCN, 2017). Several forms of collaboration with the local community are introduced below (Abulhawa et al., 2014):

1. Hiring camel owners near the Protected Area as working members.
2. Training the local people on the handmade products to raise their standard of living and selling them to the museum visitors.
3. Training the locals on giving lectures on the importance of the environment all over Fayoum District.
4. Asking aid from local people through vernacular build workers and competent artisans and training them on using old ways of building like using raw bricks.

However, given the constantly evolving environment in which Protected Areas function, the responsible managerial authorities are generally aware of the need for further creativity in that context. A flexible, adaptable integrated management model which does not need extensive and/or intensive human and financial resources is therefore needed (Vavilova and Bakhareva, 2018). The preservation of revenues in the Wadi Al-Hitan Protected Area is proposed to be maintained in two mechanisms. The first is to establish the Non-Governmental Organisation "The Friends of the Whales Valley". The second mechanism is to set up a special services unit, similar to the Sharm El-Sheik Protected Area example, under the name of "Nature Conservation Training Centre". This could help Wadi Al-Hitan Protected Area's management to raise money from the rent of its facilities and offering training courses and other managerial services. The two mechanisms can be further developed in collaboration with the "Nature Conservation Sector Capacity Building NCSCB" and the "Legal and Institutional Framework Project LIFP" self-funding scheme (Mittermeier et al., 2011).

V. ANALYSIS AND DISCUSSIONS

It is important to analyse the site context of any Protected Area in relation to its architectural design potentials, social, environmental, economic (market), geographical, and ecological characteristics in order to predict how a site will expand in terms of tourism development. The relationship is often considered inexistent or at least emergent in most of the Listed World Heritage Sites as the site management authority stops at the site boundaries, and little can be done to control what happens immediately outside it. However, the design and interpretation facilities of the Visitor Centre, the Fossil Museum in Wadi Al-Hitan Protected Area contributed greatly to the reduction of unregulated access with potential negative impacts on the sight. Such facilities and the underlying concepts and plans are a relatively good example of practise for other similar sites in national Protected Areas. Local stakeholders' early participation in site conservation also contributed to preserving its values.

Therefore, the study of the relationship between the site's natural surroundings, human societies and cultural background, and economical aspect, was a priority in order to consider potential positive tourism's impact on the Protected Area. The Author applied this form of analysis on Wadi Al-Hitan Protected Area (as shown in Table 1) with the aim of defining essential design features which may have a direct influence on Wadi Al-Hitan's management's strategies, preservation of its natural assets, and Ecotourism potentials. The Author also identified some of the "Proposed Future Interventions" which were the outcomes of previous international and national studies and presented reports on the site to the Egyptian Government as a result of multinational cooperation.

Yet, the "International Union for the Conservation of nature IUCN " described three elements as having a beneficial effect on current management policies and Ecotourism at Wadi Al-Hitan.

They can be summarised in the enhanced conservation, increased value recognition and community growth. The restriction of tourists' numbers policy adopted by the Wadi Al-Hitan's management meant that the built facilities could be kept to a minimum, thus reducing future negative impacts from Mass-Tourism. Guided tours and extensive controls have been carried out to prevent unauthorised access to fragile fossil remains scattered across the site while limiting any negative impact in form of damages or theft (Hockings et al., 2008). In addition to strict visitors control policy, Wadi al-Hitan encourages community engagement. In fact, capacity building and visibility of the site were among the key goals for local communities, with positive impacts on the enhancement of local comprehension and financial benefits for local tourism companies.

		The Natural Surrounding	**Human Societies and Cultural Background**	**Economical Aspect**
Tourism Related Concerns	**Positive Impact on the Protected Area**	The Egyptian Government has developed needed infrastructure, outdoor and indoor exhibits, and interpretation facilities due to the increase number of tourists which helped in the preservation of the fossils and decreased the number of vehicle casualties.	• The architectural design features and guiding signs entwins the natural surrounding and cultural context. • Public and local inhabitants' engagement in tourism and site awareness. • The use of local labor and skilled workers and artisan in the construction process.	• The establishment of "Friends of Wadi Al-Hitan" NGO to generate the needed funding for the development and maintenance of the Protected Area through the private sector investment. • The development of small-scaled community tourism facilities and tourists' accommodation services.

	Proposed Future Interventions	• The 34 km road from Wadi Al-Rayan Protected Area must be maintained. • The inclusion of guiding signs written in multiple languages, and not only Arabic, to prevent any future casualties. • Multiple access points to the Protected Area may present a potential threat to the fossils but the authorities are working towards limiting these accesses.	• The establishment of a collaborative management forums, including community leaders, in order to hold regular meetings with different local stakeholders. • The extension of the site related values and science studies including the sponsorship of formal and informal training of local human capital.	• The improvement of the Protected Area's infrastructure such as the provision of an additional water tank in the visitors centre as well as a supplementary diesel generator powering. • The upgrading of the Gift and Souvenir Shop in the visitors' centre. • A plan for a long-term funding should be drawn up as well as further diversified sources of funds and alternative strategies for sustainability should be established.

Table 1: Tourism driven impacts on Wadi Al-Hitan Natural World Heritage Site. Based on (Eagles et al., 2008), (Hockings et al., 2008) and (Kholy, 2010)

VI. CONCLUSIONS AND RECOMMENDATIONS

This research can be used as a preliminary study of the strategic value of the sustainable design of the buildings and infrastructure's facilities of Protected Areas as an important asset for the development of tourism in these areas. It also provides an overview of the relationship between Ecotourism and one of the Natural World Heritage Sites in Egypt, as an example of a developing country with limited financial resources. It is noted that several international and regional organisations (such as the UNESCO, WTO, IUCN, EU and others) have dealt with Sustainable Tourism and its impact on World Heritage Sites with a special prominence on the tourism and development and not from the urban and architectural design. Nevertheless, emphasis can be placed on ensuring that Egyptian Protected Areas and future World Heritage Sites in Egypt, should have a comprehensive set of regulations and design guidelines to be used with new buildings' assignment and projects in Protected Areas similar to the "Green Star" and the "Green Pyramid" national initiatives (as proposed in figure 15).

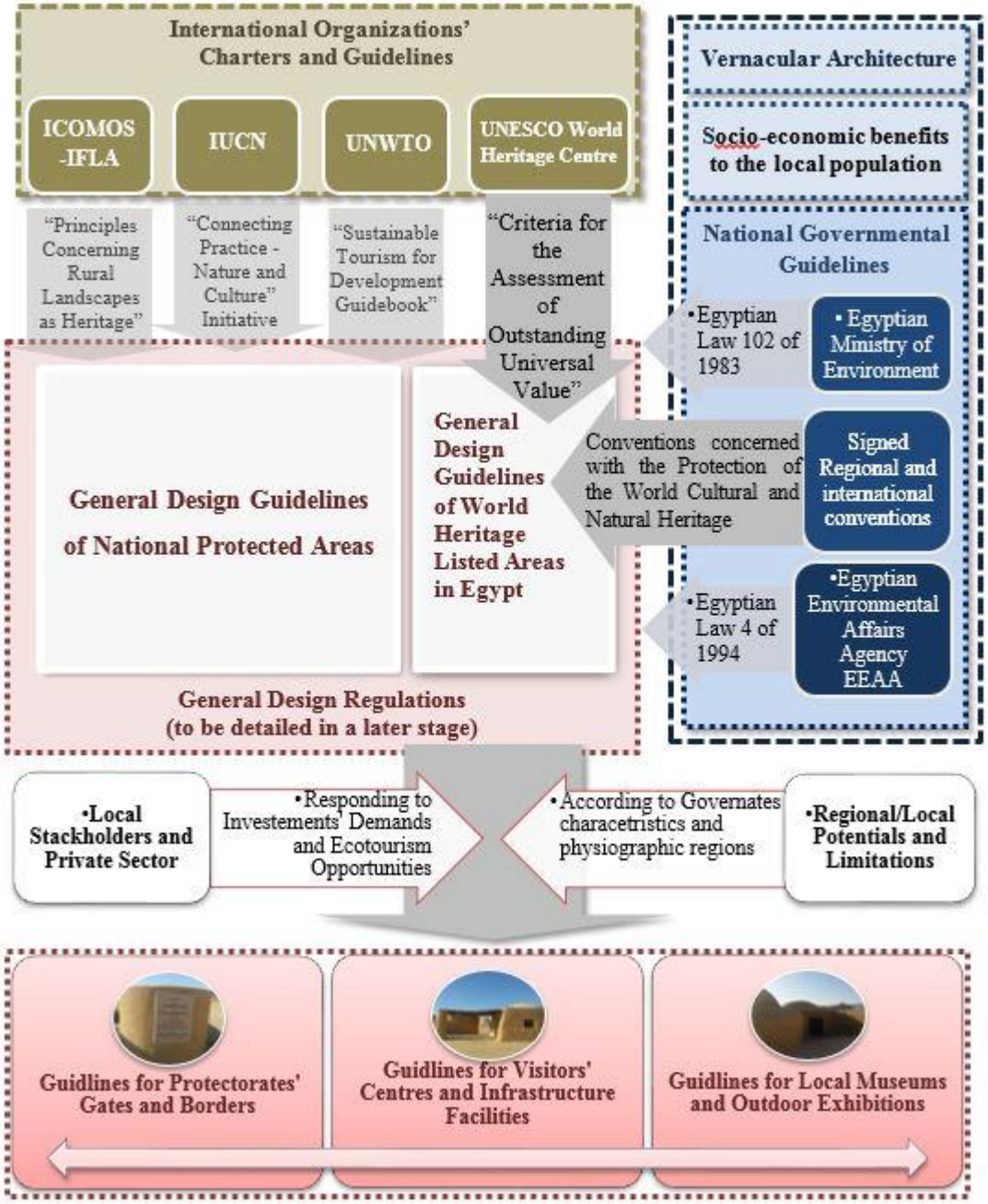


Fig 15: A Proposed plan for the development of a "National Design Guidelines and Building Regulations" for local Protected Areas taking in consideration the international, regional, and local design principles and benchmarks.

The aim of the proposed National Design Guidelines is to examine in practical terms the complementary use and implementation of the international Organizations' Charters and Guidelines (in particular the UNESCO's "Principles for Sustainable Tourism in World Heritage Properties") in respect of clear national governmental criteria and indicators while assuring a potential socio-economic benefit to the local population and respecting the values of local Vernacular Architecture of the site. The proposed guidelines also differentiate between the needed requirements for a World Heritage Listed Area in Egypt and other National Protected Areas. It is also recommended to produce three types of guidelines: the first for Protectorates

gates and borders, the second for Visitors' Centres and infrastructure facilities while the third can be dedicated to local museums and outdoor exhibitions within the Protected Area.

The development of Green Economy's best practices, as a new approach for sustainable development, also provides supportable solutions at Wadi Al-Hitan Protected Area which is expected to result in better environmental management, biodiversity conservation together with economic and social development. Yet, the rich advantages of the site are generally based on its natural values, mainly in the area of Ecotourism, knowledge building and education. In addition, it also provides significant economic benefits to the local population in view of Wadi Al- Hitan's distant and desert environment. This relationship needs to be monitored in order to promote the site's inclusiveness and participatory approach. It is also worth mentioning that Ecotourism provides a fast-growing form of tourism which matches the needs of Fayoum District.

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