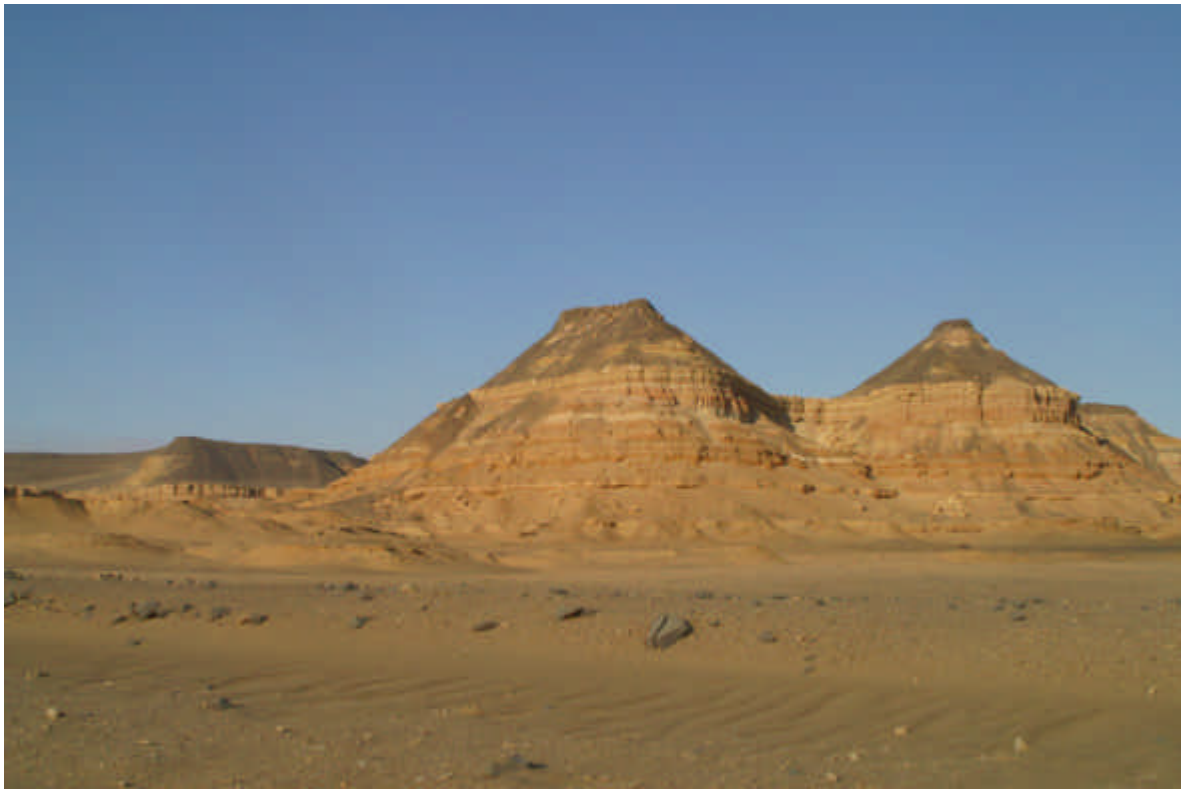
Ministry of State for Environmental Affairs
Egyptian Environmental Affairs Agency

Qaroun Protected Area Management Plan

IUCN Category II/V Protected Area
Tentative World Heritage Site



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Nature Conservation Sector
Planning Unit

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ACRONYMS

AOP	Annual Operational Plan
EEAA	Egyptian Environmental Affairs Agency
EIA	Environmental Impact Assessment
GIS	Geographic Information System
MEE	Management Effectiveness Evaluation
IBA	Important Bird Area
IUCN	The World Conservation Union
JMT	Joint Management Team
NCS	Nature Conservation Sector
PA	Protected Area
PAMU	Protected Area Management Unit
QPA	Qaroun Protected Area
TDA	General Authority for Tourism Development
WHS	World Heritage Site
WRPA	Wadi El-Rayan Protected Area

1. INTRODUCTION

Qaroun Protected Area (QPA) is part of the Egyptian national network of Protected Areas, which as of March 2007 is composed of 27 protectorates[1]. QPA was established as a natural protectorate, according to the provisions of Law 102/1983, by Prime Ministerial Decree n. 943/1989, and its boundaries were later defined in detail by Decree No. 2954/1997. As all other protected areas that are part of the national network of protectorates, the Nature Conservation Sector of the Egyptian Environmental Affairs Agency (NCS/EEAA) is the main government body responsible for the appropriate management of QPA, according in particular to Law 102 and to the other environmental legislation.

Qaroun Protected Area contains several features and areas of high value. The landscape is varied and attractive, and the area boasts stunning geological features and a diversity of natural or semi-natural habitats. Moreover, QPA includes some geological formations hosting fossil deposits of major importance from a scientific point of view, and represents one of the most important sites in the whole African continent in terms of fossil richness. The cultural heritage is also remarkable, with several archaeological sites of primary importance. Some of these features are considered of outstanding value, and have been inscribed within the tentative list of the sites to be nominated as World Heritage under the International Convention concerning the Protection of the World Cultural and Natural Heritage.

A main instrument to guide the long term management of protected areas, applied to Egyptian protected areas also in accordance with international best practice guidelines, is the preparation of a management plan. The preparation of a management plan for QPA is the responsibility of the NCS, which has developed and adopted management planning standards that are now being applied to the National PA Network.

So far, no such a document has ever been prepared for QPA. Along with other Egyptian PAs however, QPA was recently the object of a Management Effectiveness Evaluation (MEE) exercise, that represented a first attempt at assessing the current status and management situation of the area (Paleczny *et al*, in prep). One of the most critical recommendations of this exercise was the preparation of a comprehensive management plan for the area. Some preliminary results of that study have also been taken into account as much as possible during the preparation of this document.

This document is a draft management plan for the Qaroun Protected Area. Its main aim is to represent a first basis for discussion and review, internal as well as with main institutional partners, of the plan structure, management issues, objectives, proposed strategies and actions. Required components of the planning process will be consultation and participation of the main stakeholders, at the institutional and local levels, and further ground truthing of territorial planning issues. At the present stage of the management planning process, and until the plan is officially approved and endorsed, this document sets preliminary management guidelines for the Qaroun Protected Area, in order to provide interim guidance for its management by the NCS/EEAA, and in particular the local Protected Area Management Unit (PAMU), according to the legal mandate and obligations under Laws 102/1983 and 4/1994.

1.1 Purpose of the Plan

The purpose of this Plan is to establish and improve effective management of QPA in order to ensure preservation of its main natural and cultural features, in accordance with the overall mission of national protectorates as defined by the national legislation and other associated

[1] In this document, the terms "protectorate", "protected area" (or "PA") and "park" are interchangeably used. Unless it is otherwise specified, they all refer to protected areas as defined according to law 102/1983.

instruments. This Management Plan aims at providing guidance on appropriate strategies and actions for future management, and is based upon the desire to ensure that QPA is protected and remain in an essentially natural condition to the benefit of the Egyptian people and of future generations. This Plan intends therefore to represent a tool to be used to guide the management of QPA, providing clear directions for conservation, recreation and resource use based on specific management objectives and strategies.

A major purpose of the Plan is to prevent the degradation of natural cultural and heritage values by the cumulative effects of small-unplanned development decisions. Increasing use of the area also has major environmental implications and it is important that the principal features that attract visitors to the area, its outstanding scenery and natural beauty, lakeside beaches, plants and animals are protected from threats such as pollution, introduced species, and human activities which may threaten them.

1.2 Legal Framework

The management of PAs in Egypt is subject to the provisions of Law 102/1983, which outlines and identifies the basic legal framework for managing a PA. The following is a short overview of the main legal instruments applying to Protected Areas and to QPA in particular:

Law 102/1983 (Protected Areas Law) - The main PA legislative instrument, Law 102/1983 sets out the principles for the declaration of PAs and stipulates development restrictions and prohibited activities within and adjacent to the PA.

Prime Ministerial Decree 1067/1983 - Designates the EEAA as the authorized body to apply Law 102.

Prime Ministerial Decree n. 943/1989. Establishes Lake Qaroun Protected Area. Its boundaries were later defined in detail by Decree No. 2954/1997

Prime Ministerial Decree 264/1994 - Sets out conditions, rules and procedures for definition and regulation of activities in natural reserve areas and provides the NCS/EEAA with executive administrative authority over natural protectorates. It has six articles and various conditions and rules and expressly forbids construction or development of any type without the permission of the EEAA.

Law 4/1994 for the Environment - Establishes principles and procedures to address environmental issues in Egypt. This comprehensive law includes measures to address terrestrial, air, and water pollution. Law 4 notes that the EEAA has the power to administer and supervise PAs. Importantly, the law specifies that all development is required to go through an appropriate EIA process. Law 4/1994 also prohibits the hunting, possession, transport, and sale of those species of wild fauna (alive or dead) determined by Executive Statutes of the same law.

Law 2/1973 - Authorizes the Ministry of Tourism as the administrative body for the supervision and exploitation of tourism areas.

Law 117/1983 - Provides for the protection of antiquities and historical sites.

Presidential Decree 374/1991 - Establishes the General Authority for Tourism Development (TDA) to be responsible for allocation and sale of land in designated tourism areas. The local governorate approves development within recognized boundaries of urban areas.

Ministerial Decree 1611/1989 (Ministry of Justice) - Granted "police powers" to the manager of the EEAA governorate branch in which there is a PA and to the manager of the PA.

Ministerial Decree 1353/1996 (Ministry of Justice) - Vests certain employees of the EEAA, including Managers of Natural PAs with the capacity of "Judiciary Seizure Officers" relative to infringements of the Environmental Code enacted by Law 4/1994 and its Bylaws, relative to their competence.

Law 53/1966 Agriculture Law - Defines wild fauna protection regulations.

Decrees (Ministry of Agriculture) 28/1967, 5/1983, 66/1983, 1227/1998 and 90/1990 - Lists the protected species in Egypt (12 mammals, 13 reptiles, and more than 100 birds).

Law 124/1983, Fisheries Law - This law deals with all living aquatic resources, fishing grounds, vessels, fishing methods, pollution, licensing, fees, penalties, and other matters.

1.3 Planning Period

This management plan intends to define the general framework and to provide clear directions for the appropriate long term management of the protected area in accordance with national objectives and priorities for protected areas or with international obligations arising from the ratification by Egypt of international environmental treaties. This document intends also to provide operational guidance for actions and strategies that should be implemented by the NCS and other concerned stakeholders in order to improve in the short and medium term the management of the area. The operational period for this management plan is 5 years starting from the date of official approval from the Egyptian Environmental Affairs Agency.

At the end of this planning period a major update and revision of this management plan should be carried out in order to validate or amend the long term management framework defined by the plan, while regular evaluation exercises of the actual implementation of the operational indications of this plan should be carried out each year, as further specified in subsequent chapters, to overcome any unforeseen problems and to provide for optimal use of the resources applied to management.

1.4 Plan Structure

The structure of this plan follows in general the format already developed for other management plans by the Nature Conservation Sector, with technical support from IUCN and from other agencies. This plan begins with a general description of the PA and its natural resources along with an overview of its legal and socio-economic setting. The general management framework for the area is then defined on the basis of the most important values highlighted for the area, with the formulation of a long-term vision statement, the identification of the most suitable management category according to the internationally-recognized classification system proposed by Iucn, and the definition of management goals for the park.

The next section provide an appraisal of the most pressing management issues identified for the protectorate. For each of these issues, a management objective is defined along with proposed policies and actions or strategies to address it. There is then an overview of the management frramework, tools and resources that should be applied to the protected area, including the funding issues. Finally, modalities for the implementation, evaluation of effectiveness and review of the management plan are discussed.

2. SITE DESCRIPTION[2]

2.1 General Overview

Qaroun Protected Area (QPA) is located about 80 km southwest of Cairo. Encompassing and area of 1,354 km^2, the protected area is centred on 29° 30` N, and 30° 40` E, and its territory is partially included in both the Fayoum and Giza Governorates: approximately 29.5% of the PA territory falls within the Giza Governorate, while the rest (70.5%) is included within the Fayoum Governorate administrative boundaries. QPA lies in close proximity to another protectorate, the Wadi El-Rayan Protected Area (fig. 1).

The protectorare includes inland water and terrestrial components. The inland water component is represented by Lake Qaroun, the remainder of the ancient Lake Moeris, once fed by a channel branching from the Nile and now receiving agricultural drainage water from most of the land in the Fayoum Governorate through a number of drainage canals. The lake is the third largest in Egypt, its size being estimated at around 250 km^2, and is an important wetland for resident water birds and other migratory species. A small island, Gezert El Qarn El Zahbi (Qarn Island), is located in the middle of lake Qaroun covering an area of about 1.5 km^2, and it is considered as one of most attractive and important sites for nesting wetland birds in Egypt.

The terrestrial component includes part of the Fayoum depression, and a portion of the northern escarpment that bounds the depression itself. This is an area where a unique succession of past geological events, together with climatic and environmental factors, has resulted in the accumulation and later exposure of an exceptional fossil heritage with few parallels in the whole African continent, and in the world, in terms of richness and diversity. A prominent feature of the area are the Eocene sediments of Qasr el Sagha and Gebel Qattrani, which represent the most complete record of Palaeogene mammals for all Africa. The diverse fauna (40 genera, 75 species) which include two hominoid genera is critical in understanding the evolution of many mammals groups on the continents, particularly hominids.

Due to its prominent geological and paleontological features, Gebel Qatrani was included on Egypt's current Tentative List of World Heritage Sites as a potential mixed property. Furthermore Gebel Qatrani was identified by IUCN as a potential fossil World Heritage property in the IUCN contextual framework for fossil World Heritage (Wells, 1996), where it is described as: 'The most complete record of Palaeogene mammals for all Africa. The diverse fauna (40 genera, 75 species) which includes two hominoid genera is critical to understanding the evolution of many mammal groups on the continent, particularly hominids.

The area occupied an important position in the ancient world, which is reflected in a wealth of ancient monuments and archaeological sites dating from prehistoric times, through the Pharaonic and Greco – Roman period, up to the Coptic period. Such sites include Qasr El Sagha, Dime es-Seba, and the remains of what is thought to be the oldest paved road in the world.

[2] Unless otherwise specified, the information summarized in this chapter has been from Hewison (2001), (EQI) 2007, Egyptian Unesco National commission (2007).

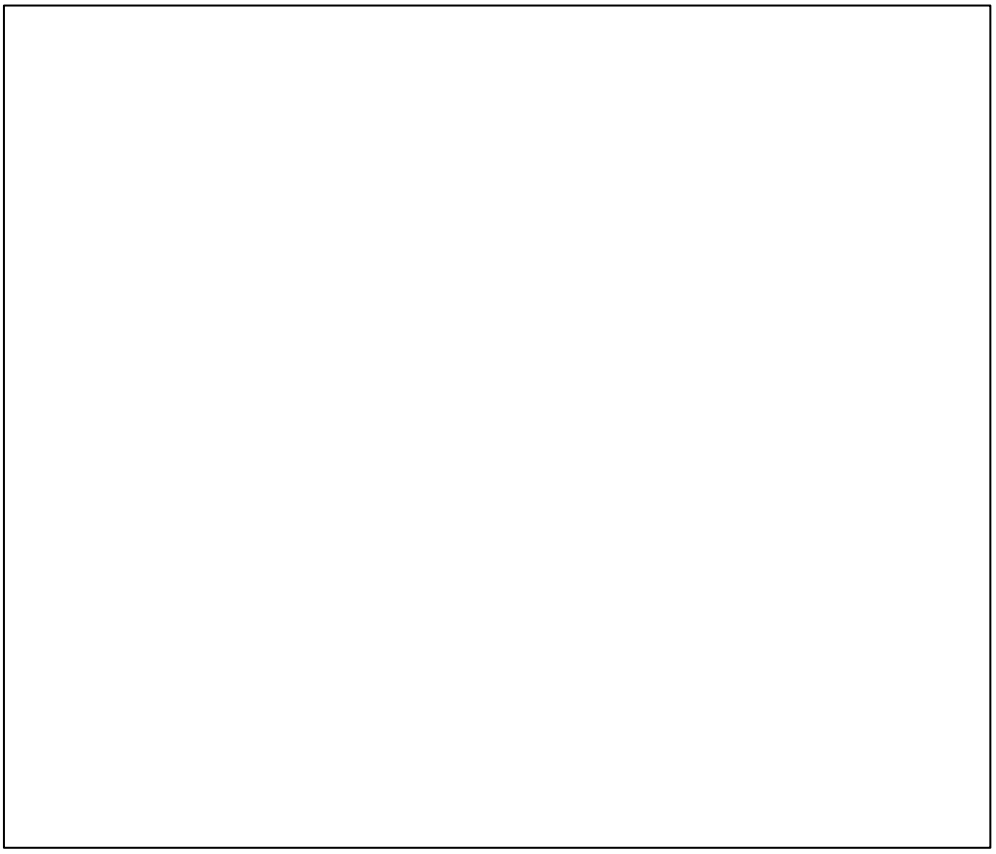

Fig. 1. Location of Qaroun Protected Area.

Human activities are also present today within the Protected Area. The southern shore of Lake Qaroun, which is included in the PA boundary, is heavily utilised for agriculture and more recently fish farming. Fishermen are active in the lake using rowing boats and nets. Some industrial and extractive activites are also carried out in the area. Most prominent among them are quarrying activities (although most of them now discontinued), and a salt extraction plant (EMISAL) that was constructed on the southern lake shore in 1984 in order to extract mineral salts from the lake water and which has the side benefits of reducing the lake's salinity levels. A few villages and tourism resorts are also present along the southern shore of the Lake.

2.2 Climate

The climatic conditions in the area are typical of a desert environment. Rainfall is sporadic and rarely occurs in winter, especially on the deserts surrounding the cultivated land. The temperature generally shows a daily variation between 45^{o} C and 9^{o} C in summer and between 20^{o} C and 2^{o} C in winter. The humidity is higher in winter, reaching about 70% during February and decreases to 58% during the summer months. The evaporation rate reach its maximum value of 13mm in June.

2.3 Topography and Geomorphology

QPA encompasses a portion of the Fayoum depression and of its northen margin. The Fayoum depression is one of the main depressions of the Western Desert of Egypt, excavated in the Eocene limestone plateau extending across this part of Egypt and characterised by the presence of Lake Qaroun. Bounded by scarps and sloping plateaux from all sides, the depression forms

an internal drainage system fed by water entering the depression through canals joining it to the Nile River. From the south, the floor of the Faiyum depression slopes downward to the Lake Qarun in a northwesterly direction, and Lake Qaroun occupies the deepest northwestern part of the basin, where the surface water that enters the depression drains is collected. Once in the Lake, water leaves only by evaporation.

The Fayoum depression is bounded, from all sides, by hills or escarpments except along the southeastern side, where the Hawara channel, through which the main irrigation canal of Bahr Yousef flows, cuts it. From the shore of the lake, sloping plains extends northward and upward, reaching sea level approximately 7 km from the shoreline. Further north the terrain is more rugged and rocky, and broken down by a series of benches and escarpments that continue up to an elevation of about 300 m. a.s.l. These escarpments include the Eocene Qasr El Sagha and Gebal Qatrani formations.

Topographically and in terms of landscape, the QPA can be divided into three major units: the cultivated land, the Lake Qaroun body and its shores, and the surrounding desert to the North of the Lake. The latter includes the slopes and escarpments that rise from the bottom of the Fayoum depression up to the surrounding plateau.

Cultivated Land. The cultivated land in the Fayoum depression covers a total area of about 2200 km^2, in those parts covered by alluvium. Narrow strips on both sides of the Hawara channel are also cultivated. Cultivated land within the PA is however restricted to a much smaller area, basically restricted to the narrow belt along the Southern shore of Lake Qaroun. Two main canals namely El Bats to the east and El Wadi to the west drain the flushed irrigation water from the Fayoum fields to the Lake. In places, these canals cut through Eocene limestones underlying a thin cover of alluvium.

Lake Qaroun (Birket Qaroun). Lake Qaroun occupies the deepest part of the Fayoum Depression. In 1992 the elevation of the lake surface was 43.5 m below sea level and mean water depth was 4.2 m. It is an enclosed, saline, inland lake that covers an area of about 234 km^2, with a length of 40 km along its east-west axis while its maximum width is less than 10 km in a north-south direction. The desert borders the lake from the north and partly eastward while cultivated land encircles it from the south, west and southeast direction. The lake has a volume of approx. 924 million cubic meters. The lake is bordered by agricultural land to the south and desert to the north. There are several lagoons and bays along the southern and northern shores of the lake, some of which hold mud or salt flats of various sizes. Qarn El Zahaby, the only sizeable island in the lake, is almost 2 km^2.

Formerly Lake Qaroun was a much larger fresh water lake with dense marsh vegetation along its shores. The lake is in fact the remnant of an ancient prehistoric lake, which covered a larger part of the floor of the Fayoum depression. In Pharonic times, Egyptians converted it into an artificially controlled sheet of the water (Lake Moeris), to be used as a regulator of excessively high and low Nile floods, and built an extensive network of canals, locks and irrigation systems designed to maintain the level of Lake Moeris. During Roman occupation, the level of the lake was dropped to make room for more irrigable land and the present Lake Qarun is only a fraction of its former size.

The main source of water for the lake is currently drainage from irrigated land, which is received through two major drains: El Batts and El Wadi. With the intensification of cultivation and irrigation since the early part of this century, the salt load of the water reaching Qaroun has increased significantly.

The Surrounding Desert. The northern shore of Qaroun lake is an uninhabited desert plain that extends from the lake north-ward and a gently sloping upward to reach sea level 7 km north of the shoreline. The most important part of the region is the area lying between Qaroun Lake and the summit of the Fayoum depression to the north, that includes the uppermost escarpment of Gabal Qatrani (tar hill), so named from a black cap rock representing an ancient lava flow which spread over the region after the deposition of the fossiliferous sediments. Its eastern extremity is perhaps the most conspicuous point in the whole region, where the two conical black basalt-capped cliff- outliers, known as Widan el Faras (horse ears) stand side by side; from their summits, the viewer commands the whole region.

2.4 Geology and paleontology

QPA includes a relevant portion of the the Greater Fayoum Basin, which holds a rich heritage of paleontological and geological exposures. The Fayoum Basin formed initially along the Tethyan sea margin in Jurassic time, and the estuary of the Nile was once in this area. The current shape of the Fayoum basin is from subsidence that terminated in late Eocene time, and the basin is now largely below sea level. Natural breaks in the levee of the Nile River have caused repeated flooding of the basin, which were reflected in large scale variations of the size of the ancient Lake Moeris, of which Lake Qaroun represents now the vestiges.

The particular geology of the area, coupled with its topography and morphology, has always attracted the interest and curiosity of man. For example, in pharaonic times the higher part of the northern escarpment of the area were exploited for its basalt, resulting in one of the most interesting testimonies of ancient quarrying activities. Later on, the areas now within QPA attracted the interest of geologists and paleontologists. The Upper Eocene and Oligocene strata at Qasr El Sagha in the Fayoum Basin are in fact the sites of some of Egypt's oldest and most important geological expeditions. This area contains one of the most complete records of late Eocene through early Oligocene vertebrate evolution in Africa. It is especially noted for its early primates, such as *Aegiptopithecus*, one of the oldest primate fossils discovered to date.

2.4.1 Geological setting

Structurally affected by the northwestern dip of the great Arabo-Nubian massif, the Fayoum depression and surrounding areas are essentially covered by sedimentary formations of Tertiary and Qaternary eras. The area around Lake Qarun is thus occupied by sedimentary rocks of Middle Eocene, Late Eocene, Oligocene, Early Miocene, Pliocene, Pleistocene and Holocene ages. The only igneous rocks in the region are represented by basalt sheets. The constancy of many beds over wide areas is a characteristic feature. Moreover, the sediments of the Fayoum area thin out towards the south and southwest directions.

North of the Lake, following a gently rising plan a scarp rises 350 m above sea level in a series of steps above the lake Qaroun shore. The cliff is formed of limestone and clays, over lain by sand, clays and minor carbonates, while the scarp summit is covered by a thick basalt sheet of 30 m thick. This area is the most interesting for visitors in terms of geological features, as erosive phenomena and rock exposures result in many spectacular geological formations.

The age and origin of the Fayoum depression is still not completely clear, with the relative role of water and wind erosion subject in the past to some disputes. In any case, the rocks exposed in the QPA area are of sedimentary nature except for the occurrences of Oligocene basaltic

flows and range in age from Middle Eocene to recent. The chrono-stratigraphic sequence of the rock units exposed in QPA can be divided from base to top as follows:

Middle Eocene (45 Million years ago)

The Middle Eocene rocks form the oldest exposed beds, crop out at the scarps surrounding the depression and partly formed its floor. These include formations made of hard snow-white, highly fossiliferous limestone with shale and marl intercalations and the Gehannam Formation, which consists of gypsiferous shales, marls, limestones and sandstones. The maximum thickness of Gehannam Formation is 60 m, measured at Garret Gehannam.

Upper Eocene (39 M.y.a.)

The Upper Eocene rocks are exposed to the north of Lake Qaroun. The exposed Upper Eocene rocks are distinguished into two formations from base to top:

A. Birket Qaroun Formation:

It is made up of yellowish grey sandstone, fine to medium-grained, moderately hard, and highly fossiliferous at base going into yellowish to brownish grey, calcareous sandstones and is capped with grayish yellow, fossiliferous limestones. Birket Qaroun Formation is well developed in extensive areas including the desert stretch separating El-Fayoum from the Nile Valley, the area fringing the northern boundary of cultivation and Lake Qaroun, and the hill mass of Garret Gahannam on the west side of El-Fayoum area. This unit attains about 50 m thickness.

B. Qasr El-Sagha Formation:

It comprises about 200 m of cross-bedded sand, sand mud and carbonaceous shale. The rocks were deposited in a subsiding W-SW to E-NE oriented basin bounded by high lands to the north. Qasr el Sagha Formation is subdivided into 4 members which are arranged from top to bottom:

1. Dir Abu Lifa Member represents the upper 77m of Qasr El Sagha Formation. It is distinguished from the overlying Qatrani Formation in the absence of variegated beds and gravels and in its greater proportion of limestone and shale.
2. The Temple Member attains thickness of 123 m and consists primarily of thin glauconitic to limonitic arenaceous limestones and fine quartz sandstones that are inter-bedded with thicker, generally laminated sandy mudstones and carbonaceous mudstones. Gypsum is abundant in this member. the temple member.
3. Harab Member is 30-40 m thick and consists of gypsiferous and carbonaceous laminated clay stone and siltstone. Its type locality is the Minqar El Abyad section. It forms broad featureless plains and separate the Umm Rigl member below from the Temple member above.
4. Umm Rigl member is a 30-65m interval at the base of Qasr El Sagha Formation, its type locality is Garet Umm Rigl in the Qaroun lake escarpment north of the lake. This member is of special interest as it contains *Zeuglodon* and other vertebrate remains in beds.

Oligocene (35 M.*y.a.*)

Gebal Qatrani is the type locality of the Oligocene Qatrani Formation, which is composed of fluvio-marine series of variegated alluvial rocks, fine to coarse sandstone, granule and pebbly conglomerate, sandy mudstone, carbonaceous mudstone and limestone, strongly burrowed and root-bearing, fluvial, point bar and flood clastics which grade laterally and vertically into each other.

This formation is richly fossiliferous with vertebrate fauna that lived in this area in the late-Eocene and Early Oligocene ages (see below). Qatrani Formation is divided into an upper sequence (formerly termed upper fossil wood zone) and a lower sequence (formerly termed lower fossil wood zone). These two sequences are separated by a very persistent 4-10m thick layer of barite sandstone.

The upper sequence contains both a great proportion of fine sandstone, mudstone and discontinuous sand bodies and is overlain by Widan el Faras basalt. Radiometric dates on the basalt are 24.7 $\pm$ 0.4, 27.0$\pm$ 3.0 and 31.0 $\pm$ 1.0 m. y. ago (Fleagle et al., 1986). Fossil rhizoliths are common and are among some of the best preserved anywhere in the world (Bowen, 1982).

This sequence (as the lower sequence) is a host rock to important fossil vertebrate localities; it is fully continental with the exception of some thin marginal marine intervals near the top, where mangrove roots and large burrows are preserved near the base of the overlying Widan el Faras basalt. The mangrove indicates that parts of the formation were deposited at sea-level. In its upper part, this sequence has some marine intercalations, fossiliferous with marine mollusks. At frequent intervals there are limestones bearing fossils of fresh water ostracods that confirm the presence of fresh water lakes.

Significant accumulations of crocodile, turtle, fish and mammal remains occur locally in the middle red sandstone unit of the lower sequence of Qatrani Formation and concentrations of vertebrate remains of all kinds are known from the upper red sandstone unit. Rhizoliths, ichnofossils and numerous other trace fossils occur in the red sandstone sequence.

The Gebal Qatrani Formation attain a thickness 340 m and composed principally of riverine sand bars and over bank sediments deposited on a subsiding continental margin. The deposites consists mainely of sandstones and mudstones deposited as river bars and overbank sediments, often showing alterations due to paleosol formation, congolomerates and limestones are also present.

The Qatrani Formation overlies uncomformably the Qasr el Sagha Formation and underlies the Miocene basalt of Widan el Faras. The Qasr el Sagha Formation is best exposed in its type area near the Qasr el Sagha Temple. Its rocks exhibit different facies of deltaic inter-tidal, lagoonal and marine succeed or inter fingers each other. The sequence is 200m cross-bedded sand, sandy mud, limestone and carbonaceous shale that make up the lower of the three principal escarpment bounding the north margin of the Fayoum depression. Among its fossil content are the bivalve *Carolia placunoides* and other invertebrate fossils, cetaceans, fossil wood fragments, leaf prints, fossil mammals, reptiles and fish remains.

Basalt Sheets

Basalt sheets cover a large area in the northern part of the Fayoum depression, with 25 m thickness, and in Gebal Qatrani have been described as pertaining to a succession of three distinctive sheets. The three sheets overlie Gebal Qatrani Formation and uphold the uppermost escarpment in El Fayoum depression. The thickness of the basalt thins to the west and south is completely absent near Garret Gahannam. Northeastward the basalt disappears under the Miocene deposits. The variability of the thickness is due to Pre-Miocene erosion and the

irregular nature of the pre-basalt topography.

Lower miocene (25 M.y.a.)

The Gebal EL-Khashab Formation represents the Lower Miocene. It overlies the basalt sheets in Gebal Qatrani and made of a series of sands and gravels similar to those below the basalt. These red beds dip to the north and become well developed at Gebal El-Khashab to the north of El-Fayoum where they include flint gravels and silicified tree trunks. Fresh-water shells and numerous marines' remains are recorded from these beds.

Pliocene (5 M.y.a.)

Sandord and Arkell (1929) attributed the absence of marine Pliocene deposits in El-Fayoum depression to the fact that this depression was not in existence during the Pliocene, and that it then formed an upland plateau draining into the Nile Valley embayment.

Quaternary

Quaternary deposits of pebbles, gravels, sands, silt, gypsum and sand dunes. are well developed it's the Fayoum area, mostly covering the floor of the depression and its surrounding scarps. The Quaternary deposits are of particular interest as neotectonic movements have affected them.

2.4.2 Paleontological features

Fossil fauna

The Fayoum depression hosts a unique heritage in terms of fossils, especially vertebrates and above all mammals. In particular, the fossil deposits found in the area of the Gebel Qatrani escarpment are so rich that modern scholars have called it "the best known Paleogene site in Africa". Since the German geologist Schweinfurth found Eocene shark teeth and cetaceans bones in the Gezerit El Qarn island in Qaroun Lake and other specimens from Qasr El Sagha diagnosed as a new species of an archeac whale *Zeuglodon osiris*, this part of the world has been known as a repository of Paleogene vertebrates and has attracted the attention of scientists worldwide. It is also likely that much remains yet to be discovered in the area in terms of fossils.

The northern escarpment of the Fayoum depression in fact, and in particular the Gebal Qatrani area, provides by far the most complete view of the endemic African fauna before the significant faunal interchanges of the Miocene resulted in a major influx of other groups, such as the many families of rodents, artiodactyls, perissodactyls, and fissipeds that are typical of modern Africa.

The most significant fossil group know from the site is represented by the mammals. The mammal community consisted of a mixture of endemic groups that have now become extinct or greatly reduced in diversity, plus some important immigrant groups from Eurasia. The Fayoum fossils can be grouped into four successive and stratigraphically distinct faunal assemblages. Each of these mammalian assemblages may be compared with modern mammal's communities. Twenty-eight orders of placental mammals are known to exist today in the World, and twelve of them are found in Qatrani area, which is certainly best known for its remarkable primate fauna. The earliest primates from Africa have been found in three fossil

bearing layers belonging to Gebel Qatrani Formation, and several hundred specimens of anthropoideans have been collected from the upper sequence, but the most striking are the Family Parapithecidae, which includes monkey-like primates of about the size of modern squirrel monkeys.

The important discovery of *Aegyptopithecus zeuxis* by Simons and his team in 1965 was in fact a major step for understanding the evolution of primates. A nearly complete skull, many jaws, and several bones, were collected from Quarries I and M in the upper sequence (about 33 MY ago). Of all the Qatrani primates, *Aegyptopithecus* most nearly resembles later (advanced) forms. The resemblance is greatest to two species of Miocene apes, found earlier in Kenya (about 22 MY ago): *Proconsul* and *Afropithecus*. It seems reasonable to suppose that *Aegyptopithecus* was their ancestor, since they are similar in dental and cranial anatomy. *Proconsul*, in turn, is widely believed to have given rise to the earliest hominids, belonging to a variety of species of *Australopithecus*. All these evolutionary stages developed in Africa and eventually gave rise to the earliest human, *Homo habilis*. From this species apparently all later species of the genus *Homo* have descended.

Attia & Simons (2001) concluded that for the last 100 years, the Fayoum has provided the best glimpse into the evolution of Paleogene African mammals. Gebal Qatrani sequence preserves the richest Paleogene mammalian fauna in the Fayoum region of Egypt, including some of the earliest anthropoid primates. The most important site to date is quarry L-41 which has produced materials ranging from tiny Insectivores to a *Paleomastodon* humerus over one meter in length.

Like the mammals, the Qaroun reptiles also include many taxa unknown in Africa today. By contrast, the fish and birds of Qatrani do resemble, in general, those of modern tropical Africa (Simons and Rasmussen 1990). Gigantic reptiles were found in the Upper Eocene Qasr El Sagha Formation. The most common and diverse of the reptiles in the Fayoum are chelonians (turtles), represented by at least 14 genera. Oligocene crocodiles and snakes were also found in Qatrani. Fish are represented by a great abundance of siluroid catfish and lungfish similar to forms that inhabit rivers and swamps of modern sub-Saharan Africa (Bowen et al. 1982). Although fossil birds are very scanty due to their fragile nature, the bird fauna of Qatrani is very diverse and represents the best known Paleogene record of this Class in Africa. Fossil birds from the stratigraphic levels in the Gebal Qatrani include herons, jacanas, rails, storks, and fish eagles.

The above mentioned formations are also rich in invertebrate fossils. These include Mollusca (e.g. Bivalvia such as *Carolia placunoides*, a species typical of the basalt beds of the Qasr el Sagha formation, Gastropoda and Cephalopoda), Crustaceans, and Foraminifera. A prominent feature of the area is also its richness in terms of ichnofossils. Significant ichnofossils concentrations can be recognized in the area, including large communal nests and passage-ways of social insects like termites and ants, dwelling burrows of various invertebrates, pellet-filled tunnels of worms and vertebrate burrows and excavations. In fact, the ichnofossils of Qatrani are among the best preserved and most diverse that have yet been recognized in fluvial sediments from anywhere in the world (Simons et al., 1990).

Fossil Flora

The Gebal Qatrani area, considered here is as rich in fossil plants as it is in fossil animals. Fossil plants reported include: angiosperms, pteridophytes and algae. The plant remains include: stems, leaves, fruits, seeds, pollen grains, roots, rhizoliths, thalloid and unicellular

algae. As for the fossil fauna, it is worthy to mention that all discovered plant remains are only partly studied, and it is quite likely that further studies would certainly reveal more exciting information.

The Gebal Qatrani includes over 40 species of monocots, dicots and pteridophytes, in addition to over 160 species of algae. This rich, highly diversified, and well-preserved palaeoflora (besides a wealth of discovered fossil fauna), contributes to making this area one of the most important fossiliferous areas yet discovered in the world. Furthermore, the conditions of preservation that prevailed in the palaeoenvironment, judging by the good quality of the discovered plant remains, indicate that the existence of fossil fungi and fossil bryophytes (which will be the first in Egypt) is not at all unexpected. The diversified Gebal Qatrani formation assemblage of plants has many modern counterpart taxa growing in the tropics (Indomalaysia) and many others growing in monsoon climate with alternating wet and dry periods; this has supporting evidence form wood microstructure and from palaeosols.

A striking feature of the Gebel Qattrani area, that already represents a major attraction for visitors, is the richness in petrified wood. Petrified wood logs occur at random in various localities of Gebal Qatrani Formation. They form "forests" consisting of a few to about 200 logs. The logs range in diameter from 15 cm to 2 m and in length from a few meters to more than 44 m. Small pieces of silicified wood are abundantly associated with the fossil logs. Upright boles of silicified trees are sporadically found at or just above the contact between the Oligocene Gebal Qatrani Formation and the Miocene Khashab Formation. Fourteen wood species in eight angiosperm families (seven dicots and one monocot) have been reported on from the Gebal Qatrani area, dating to back to the Eocene and Oligocene periods.

2.5 Biodiversity resources

2.5.1 Habitat diversity

Qaroun PA includes a wide diversity of natural and man made habitats, some of them of significant importance for wildlife.

Wetlands

Some of the most important habitat types are found in and in proximity of Lake Qaroun. As mentioned above, the lake is saline, a factor which obviously affects the vegetation that can grow along its shores. The highest salinity recorded in the west and north of the lake, while swamp and marsh vegetation is now restricted to the vicinity of drain outlets, on the east and south shores of the lake.

Lake shore vegetation and swampy margins along the southern shoreline of the Lake are probably the most valuable habitats in the PA and the most threatened due to intensive human pressures. Mudflats are particularly well developed in the north west corner of the Lake as well as in the south east (however these flats have been largely consumed by development). Mud flats and very shallow waters are particularly important for wintering waders and flamingos (*Phaenicopterus ruber*).

Several coastal lagoons have developed along the central and western northern shoreline of the Lake forming isolated micro wetlands, which are probably of importance for wintering and breeding waterbirds.

Islands (such as the island of Qarn El Zahaby) are of prime importance for breeding waterbirds, as they provide protection from potential terrestrial predators. Some other small islands are found at the extreme western edge of the lake.

Fish farms are increasing in area constantly and are adding a new alternative wetland habitat for birds and other creatures.

Agricultural landscape

The agricultural landscape represented along the southern shores of Lake Qaroun are more or less typical of that of the Nile Valley. Although this habitat is largely man-made, it does support a considerable biodiversity, including many microhabitats, which represent relicts of the original wet savannah-like habitat that must have existed in the region. Many wetland and grassland species are represented here.

Desert habitats

Desert habitats occupy the greatest area of the PA and support the lowest biodiversity in the mean time. Several habitat types can be identified within the desert landscape, including cliffs and ridges (which fringe the northern edge of the PA), gravel and sand plains (covering the greatest part of the desert area), wadi habitats (which are restricted to very few runnels which drain the Gebal Qatrani ridge), sand dunes (which are restricted to two primary localities on at the eastern and western ends of Lake Qaroun), these dunes are often vegetated.

The few vegetated patches along the northern shore of the Lake are significant in that they represent the last such patches of wild desert vegetation in this section of the Egyptian Western Desert (other than the Springs of Wadi El Rayan). Every other such marginal land has been targeted by agricultural expansion and reclamation. And although many of the large animal species, which would have inhabited these areas in the past have been exterminated, they do represent a now relict ecosystem that undoubtedly still support representative fauna of smaller sizes.

2.5.2 Species diversity

The Fayoum Depression represents a local hot spot for biodiversity. This is indicated by the occurrence of several relict species of African origin not documented elsewhere in Egypt (such as the Egg-eating Snake *Dasypeltes scabra* and the Cape Wolf Snake *Lycophidion capanse*); and the occurrence of an endemic bird (*Sylvia melanocephala norrisae*) a subspecies of Sardinian Warbler. These cases indicate a special biogeographical history of the Fayoum Depression and to its relative isolation for extended periods of time.

Due to rapid ecological changes these species have disappeared and presumed extinct (*D. scabra* still documented only very rarely). Additionally most of the large mammals, which inhabited the region have now disappeared, with only the Jackal *Canis aureus* being the only remaining survivor.

Avian fauna

Lake Qaroun is considered to be a globally important bird area (IBA) on account of its importance for wintering and breeding waterbirds (Baha El Din 1999). In the winter Lake Qaroun holds large numbers of waterfowl. A total of 32,665 was counted in the winter of 1989/90 (Meininger & Atta 1994). Great Crested and Black-necked Grebes (*Podiceps cristatus* and *P. nigricollis*, respectively) are particularly abundant. There are also large numbers of *Anas crecca*, *Aythya fuligula* and *Fulica atra*. At least ten species of waterbirds are known to breed, the most prominent of which are *Bubulcus ibis*, *Vanellus spinosus*, *Charadrius alexandrinus*, *Sterna albifrons* and Slender-billed Gull *Larus genei.* Flamingos *Phoenicopterus ruber* winters in modest numbers and is said to breed occasionally (at least attempts to breed). *Larus genei* started breeding at Lake Qaroun in the early 1990s. Now there is an estimated 1 - 2,000 pairs nesting on El Qarn El Zahaby Island, one of the largest such colonies in the world, making it the single most important biodiversity site in the Qaroun PA.

Species inhabiting agricultural landscapes on the southern shores of Lake Qaroun, include avifauna typical of the Nile Valley, such as: Little Green Bee Eater *Merops orientalis*, Common Bulbul *Pycnonotus barbatus*, Crested Lark *Galerida cristata*, Senegal Thick-knee *Burhinus senegalensis* and Senegal Coucal *Centropus senegalensis*.

Desert and semi desert habitats support a smaller species richness including most prominently Hoopoe Lark *Alaemon alaudipes*, Brown-necked Raven *Corvus ruficollis* and small numbers of Egyptian Nightjar *Caprimulgus aegyptius* in desert margins.

A local endemic subspecies of Sardinian Warbler *Sylvia melanocephala norrisae* inhabited the dense vegetation, which existed along the shores of Lake Qaroun in the past when it was mostly fresh. Now this subspecies has become extinct as a consequence to the rapid ecological changes which have taken place over the past century, which had lead to the loss of its habitat.

Herpetofauna

In desert areas *Acanthodactylus scutellatus* is the commonest diurnal lizard, while *Stenodactylus sthenodactylus* is a common nocturnal gecko. The snake *Psammophis aegyptius* is common in rocky areas. In cultivated areas, *Bufo regularis* and *Ptychadena mascareniensis* are common amphibians, while *Psammophis sibilans* is a common diurnal snake.

Mammals

The contemporary desert mammal fauna is dominated by rodents chiefly the Lesser Gerbil *Gerbillus gerbillus* and Jerboa *Jaculus jaculus*. Dorcas Gazelle *Gazella dorcas* and White Gazelle *G. leptocerous* used to inhabit the desert habitats of this region but have both become locally extirpated during the past century.

In the cultivated areas the Red Fox *Vulpes vulpes* and Jackal *Canis aureus* are both still fairly common. Other mammalian species here are typical of the Nile Valley including the Egyptian Mongoose *Herpestes ichneomon* and Nile Rat *Arvicanthus niloticus*.

Flora

Vegetation is very sparse in the desert habitats, being restricted largely to some runnels from the Qatrani range or to dune formations near the Lake shores. Vegetation near the Lake is

composed of *Tamarix* sp. *Sueda aegyptiaca* and *Alhagi graecorum*. In higher altitude runnels the dominant vegetation is *Calligonum commosum*.

In the cultivated landscape, besides feral species there is a considerable diversity of weed flora and thickets of wetland vegetation such as *Phragmites australis, Typha domingensis* and *Cyperus rigidus*. On adjacent lands *Tamarix niloticus, Desmostachya bipinata* and *Alhagi graecorum* dominate.

Aquatic life

The fish species assemblage of Lake Qaroun has been deeply altered with the introduction of several species typical of marine or brackish waters. Nilotic aquatic fauna has mostly disappeared, being replaced by many marine species that have been introduced from the Mediterranean to restock the ecologically modified lake. The aquatic fauna is in any case a significant resource in terms of fishery. To give an example, between 1980 and 1990 Lake Qaroun produced an average of 956 tons of fish and shrimps annually, of which 40% was *Tilapia* sp. and 36% shrimps (Euroconsult 1992b).

2.6 Archeological sites

The region where the QPA lies has had a long history of human occupation, which dates at least from the Neolithic era, and which is testified by numerous prehistoric and archeological remains. The early occupation of the area was clearly linked to the presence of a large lake and to its climate conditions. Ancient Lake Moeris was much more extensive than the current Lake Qarun. Egypt's climate 8500-4000 years ago was significantly wetter, and this large natural lake with its abundant wildlife and surrounding fertile soils, attracted very early human occupation.

An outline of the human occupation history of the area as well as of the main ancient sites of the region can be found in many sources, for example in Hewison (2001). The main archaeological sites found within the QPA are described below, and their location within the PA is shown in map 3 along with other minor sites. Only 3 sites are currently classified as SCA properties.

Qasr el-Sagha

This site, located north to Lake Qaroun right on the desert edge towards Gebal Qatrani, has an uninscribed temple and a settlement area. The temple lies on a levelled platform. The paved floor of the temple lies 35 m above the Qaroun Lake's level. The site is dated to the Middle Kingdom based on its plan as well as the settlement area that lies south of the temple. Across the temple to the south, there are several prehistoric remains. The building is made of sandy limestone with unique mortaring and jointing. Inside the temple is divided into rooms that held statues to various Egyptian gods.

Dime es-Seba

The ruins of the Ptolemaic city of Dimeh es-Seba and its temple are located on the north edge of Qaroun's Lake. They lie not far from Qasr al-Sagha, on the old caravan route leading to the western desert oases. The ruins include a huge enclosure wall of mud brick, up to 10 meters high and 5 meters wide. In the center of the enclosure lies the temple, built of rough stone and dedicated to Soknopaios and Isis.

Ancient basalt quarries at Widan el faras

The ancient basalt quarries of Widan El Faras are located at the top of Gebal Qatrani, and represent the site where extraction of doloritic basalt, which was commonly used for construction on the floor mortuary temples in front of pyramids, took place. From the third through sixth Dynasties, basalt was used for interior pavements, and occasionally for walls and cause ways, in the pyramids temples of Zoser, Userkaf and Pepi I at Saqqara, and Khufu at Giza. Large manmade caves are present at the quarries, suggesting shelters for workers. The eight ancient basalt quarries at Widan El Faras remain another unprotected historical landmark in Egypt, which is currently threatened by renewed quarrying of the basalt for modern road material and railways.

Oldest paved road

The area includes the remains of what is thought to be the oldest paved road in the world, that connected the basalt quarries at Widan El-Faras with the ship quay at the old shore of the ancient Lake Moeris at Qasr El-Sagha, south of the quarries. This might have been the oldest inland port in Egypt, used by ships transporting basalt blocks from Faiyum to Giza along the Lake, then Bahr Youssef, downstream the Nile to the site of the Pyramids. The road is about 11 km in length, and terminates at the shores of the ancient Lake Moeris at long narrow ridge capped by jumbled blocks of basalt about 800 m southwest of Qasr El Sagha. The ancient road stands elevated partially above the desert due to relative wind erosion. Near the basalt quarry the road branches into number of segments leading to the eight individual quarrying sites.

Dir Abou Lifa Monastery

This site is located 2 km north east of Qasr el Sagha temple and contains the remains of a coptic Christian monastery built about 686 A.D. Vivian (2000) refers that the Dir Abou Lifa monastery was funded by st. Panoukhius and was in use from the 7th through the9th centuries, serving as a haven for Christians during times of persecution.

2.7 Socio-economic setting

2.7.1 General socio-economic context

As already mentioned, QPA lies within the administrative boundaries of two Governorates, Fayoum and Giza. To provide an overview of the socio-economic context in the two governorates selected indicators are summarised in table 1. Most of the PA, and in particular the sectors where human presence and activities are concentrated, fall within the Fayoum Governorate, and the short description that follows is therefore restricted to this governorate. More detailed background information on the socio-economic situation of this Governorate can be found in various sources, including EQI (2006), and Hewson (2001).

The inahbited area of the Fayoum Governorate is sub-divided into five smaller administrative units. The 1996 census reported a population of approx 1989881, ie. about 3% of the total population of Egypt. At that time, most of the population lived in rural areas or villages, while approximately 28.5% of the population was living in the major urban centers. Due to the proximity to Cairo, a large proportion of the population is formed by commuters, that work in

the capital and periodically return to Fayoum. These include also a large number of university students, although opportunities for higher education have increased in Fayoum with the opening of several faculties.

Indicator	Year	Egypt	Giza	Fayoum
Life expectancy at birth (years)	2001	67.1	65.6	65.6
Adult literacy rate 15+ (%)	2001	65.6	71.1	47.7
Human development index	2001	0.68	0.69	0.599
Literacy rate (15+)	2001	65.6	71.1	47.7
Rural population (as % of total)	2001	57.1	45.5	77.7
Households with access to piped water (%)	2001	91.3	94.2	79.6
Urban	2001	97.5	98.6	92.6
Rural	2001	82.1	87	79.6
Labor force 15+ (as % of total population)	2001	28.7	27.9	30.6
Unemployment rate % Total	2001	9	5.4	8.5
Urban	2001	8.9	6.1	10.3
Rural	2001	9.2	4.4	7.8
GDP per capita (LE)	2000/2001	5537.6	6153.4	3612.8
Urban population (as % of total)	2001	42.9	54.5	22.3
Annual population growth rates %	1996-2001	2.1	2.1	2.6
Population density (per km2)	2001	63.7	61.8	368.4

Tab. 1: Selected socio-economic indicators for Giza and Fayoum Governorates (source: UNDP Human Development Report of Egypt 2006).

Agriculture is the most important activity in the Fayoum Governorate, benefitting from the availability of fertile land and abundant water from the Nile. The main cash crop of the area is cotton, but coltivation of many other crops, including fruits and vegetables, date palm and olive is widespread. Medicinal and aromatic plants are also cultivated. Other rural occupations, such as livestock rearing or bee-keeping, are also commonly practiced. Fishing is also practiced, particularly in the waters of the Qaroun and Wadi Rayan lakes.

Industry still plays a less important part in the economy of the governorate. There are several small industrial establishments devoted to various productions, including cotton milling, food canning, and tiling. Several industrial activities are now concentrated in the new industrial area of Kom Oshim.

Commercial extraction of minerals and other non-renewable natural resources is also practiced in several areas. Quarries and mines are operated to extract materials such as clay, sand, gravel, limestone, basalt. Oil drilling is also carried out in a few areas.

2.7.2 Existing and planned land uses in and around the PA

Although mostly uninhabited, human use of QPA and its surroundings is intense at specific locations, and particularly to the east and south of the area (see map 1). A more recent phenomenon is also the increasing encroachment of human presence on the PA surroundings, in particular to the north and north west of its boundaries.

There are several villages adjacent to QPA, which are situated along the southern, eastern and western shores of the lake and have a population of 20,000 inhabitants. The inhabitants around and within QPA are mainly working on agriculture and fishery. Most of the villagers around Qaroun Lake are working on agriculture of the economical crops (olive, maze, wheat, onion, tomato, etc). Livestock grazing is scarcely practiced, and restricted to areas bordering the Lake, where poor quality fodder is found. These areas support small numbers of goats, sheep, cattle or camels.

Recreational activities and tourism are also part of the local economy. Some hotels and holiday resorts are present along the southern Lake Qaroun shore. Here, tourism services such as fish restaurants, cafeterias and hotels provide employment opportunities for many residents of the area. A further zone within QPA has been recently designated as "ecotourism development area". This area is located at the northern shore of the Lake Qaroun. New industrial development was also recently proposed for areas along the northeast of the lake.

Quarrying represents the most important extractive activity in the area. Several quarries exist in and around QPA for basalt, clays, sand and gravel for industrial uses and building materials. Due to the geological characteristics of the area, quarrying has in fact been an important activity since pharaonic times: archaeological sites at Gebal Qatrani for example have clarified the role of basalt quarrying during the pharaos time. In addition to the ancient quarries, modern basalt quarries are also found in this area, and represent one of the main threats to its natural and cultural heritage. Clay quarrying is widely distributed at the eastern margins of the PA, although the clay inside the QPA are now inactive and closed. Sand and gravels are extracted especially outside the PA along the track from the Bahariya - 6th October road to Gebal Qatrani.

2.7.3 Water resources management issues

As mentioned above, the Fayoum depression represents a typical closed drainage system. Water for agricultural, industrial and domestic consumption in the area comes mainly from the Nile River. Nile water used for irrigation purposes reaches the Fayoum depression through the Bahr Yusuf and Bahr Hassan Wassef canals, and is then distributed through a network of canals and ditches to agricultural fields. Drainage water flows into a network of drainage canals, that eventually discharge into Lake Qaroun or alternatively into the Wadi El-Rayan lakes. In addition seeping water reaches the lake by gravity agricultural drainage water reaches Lake Qaroun through a complicated system on a well-organized drainage net, which ends by three major drainage canals reaching the lake. Drainage water however is often recycled up to several times before final discharge by mixing it with fresh water. As a result, the water that reaches the deepest parts of the depression or that is discharged into the Lake is often of very poor quality, and known to be loaded with high levels of pollutants. Water eventually leaves the Lake essentially by evaporation.

The water resources of Lake Qaroun are therefore affected both quantitatively and qualitatively by a variety of vactors. Large amounts of agrochemicals, including pesticides and fertilizers, are used in the agricultural fields of the region. A substantial portion of these chemicals, along with other pollutants such as heavy metals and anions, are carried by the agricultural wastewater that is drained to the Lake.

Recent studies demonstrate that water quality in the Lake is poor, and samples show a high load of various pollutants. In parts of the lake dissolved oxygen is low, and the water is generally alkaline, with low pH levels. Phosphorous and nitrogen contents are also high, especially in the western part of the lake.

It was recently noted that an increase of the levels of residuals of pesticides and quantity of domestic waste dumped in the lake have increased levels of nitrates until it reached about 46 mg/l. There are heavy metals noticed as (Zn, Cu, Cd, Pb and Hg). The concentration of Zn and Cu exceed those of the other trace metal (Co, Ni and Pb) by factors of 3-37 and 1.3-15.6 respectively.

Water pollution is also exacerbated by organic and microbial pollution resulting from sewage. Most of the sewage resulting from the inhabited areas of the Governorate is discharged untreated into the canals that eventually feed Lake Qaroun. Domestic and agricultural solid waste too is often dumped into these canals, and its degradation contributes to the pollution of the water. Pollution from industrial activities can also be observed.

In addition to high inorganic and organic pollutant loads, a major problem is that the run off from the irrigated fields has also led to a continuous increase in salinity of the lake. The salinity of the lake has in fact been increasing for several decades. This has presented a series threats to the biodiversity and species population of fishes and birds, and it has also threatened the socioeconomic systems in the governorate. A recent study showed that Nile irrigation water supply to Fayoum depression amounts to 2.3 billion m^3/y, 20% of which ends up to lake Qaroun with its salt load. The salinity increased from less than 10 gm/l up to 36 gm/l by the year 1998 and expected to increase to 40-45 gm/l by 2000-2010. The salt content of the lake was sodium sulfates 11.8 % calcium sulfate 3.4 % and magnesium sulfate 16.8 % and sodium chloride 64.9 %. The characteristic of the lake are unique and non-comparable neither to seawater nor with natural alkaline spring, even if the total TDS looks identical. The lake water is higher in magnesium and sulfur content, but its lower in chlorides and sodium ions. Consequently, the lake water is exceptionally rich in sodium sulfate and magnesium salts, but slightly poor in sodium chloride.

Most of the studies refer to the fact that salt extractions will lead to enhance its biodiversity and in the same time, this process is high economic value. During 1984, the Egyptian Salts and Minerals Company (EMISAL) were constructed to extract the different dissolved slats from Lake Qaroun. The lake water is withdrawn to a series of four ponds connected to each other the first one at the lake while the forth on is connected to the factory of salt extraction. The new project proposed for extraction of salts from the lake by the EMAC Company, still under studies and will establish in the northern shore of the lake. The project aims to extract salts (Mg – Na – Cl – K) frpm the lake to over come the high salinity of the water.

The pollution and degradation problems affecting the Lake have widespread impacts on the value of its water resources, negatively and severely influencing economic activities such as fishery as well as the recreational and natural values of the area.

For example, water quality deterioration has led to many problems to the ecology of the lake and to its fauna, with side effects also on the socio-economic value of its resources:

- *Fishing problems*: At the beginning of the present century, the lake was known for its high fish production of numerous species. In 1920 the total catch reached 4100 tons, but in 1998 it was 1025 tons only. All the fresh water fish gradually disappeared, and only few fish

species were able to acclimatize in saline conditions (salinity increased during year 1920 to 1998 from 17.4% to 35.1%). We can not forget to mention that the yield/fadan of lake Qaroun was 77 Kg in 1920 and 19.3 Kg in 1998.

- *Plankton*: The high salinity, low oxygen content, low amounts of phosphate and nitrates elevation act to drop nourishment of phytoplankton organisms, and accordingly the feeding of fish species such as mullet (xxx) is less. Also zooplankton plays a, critical role in the ecology of the aquatic system by serving as the link between various trophic levels. It suffers from continuous increase of salinity in the lake.
- *Birds*: Lake Qaroun is an important wetland for water bird. Its an important wintering area for Great Crested and Black-necked Grebes, although the number counted in winter 1998/99 were considerably smaller than those ten years earlier. The habitats in and around Lake Qaroun are rapidly changing. The continuous increase in salinity will limit the life of the Lake, including bird populations.

3. MANAGEMENT GOALS AND OBJECTIVES

3.1 Protected area values

One of the basics steps in defining the long term framework and objectives for the management of any protected area is the clear identification of the most important values that the protectorate maintains. These are the features that need to be preserved if the protected area is to effectively fulfill its role of conserving the country's natural and cultural heritage for which it has been established. Based on the resources , the following main values have been identified as those to be considered as the main basis for the long term management of the area:

- The QPA is of high recreational, scientific and educational importance. Outstanding scenic beauty, landscape variety and easy access to unspoilt parts of the Lake Qaroun shoreline as well as to the upper part of G. Qatrani make it one of the most beautiful spots in the Fayoum governorate. Main different habitat types are found in the area, which hosts a unique representation of geological features and paleontological deposits, a wide variety of migratory bird species, and other natural and landscape features uniquely mixed with archaeological and prehistoric sites.

- QPA has an important scientific and cultural role at the international level in preserving one of the most important fossil deposits known for Africa, containing the most complete record of palaeogene mammals for all Africa, which is critical in understanding the evolution of many mammal groups on the continent, particularly hominids. QPA is also highly important for the archaeological and prehistoric remains found within its boundaries, some of which represent unique examples of past human endeavours.

- With reference to the national system of protected areas, QPA has an important role in contributing to the conservation of significant portions of wetland habitats of particular importance for migratory and breeding water birds, as well as of small but representative examples of western desert habitats which are only partially represented in other PAs. By ensuring adequate protection of these resources, QPA can significantly contribute to fulfilling the role of the PA system in preserving the diversity of species, habitats and land features of Egypt.

3.2 Vision statement

The following statement is proposed as a long-term vision to be adopted for the Qaroun PA:

- "QPA, where the continuity of life on earth is represented from its earliest beginnings to the present, is widely recognized and cherished as a place of outstanding universal value to science and humanity and where biodiversity and geodiversity continue to be conserved and sustained for the benefit of all".

3.3 Management category according to the IUCN categories system

With reference to the Iucn framework of PA management categories, QPA will be broadly classified and managed according to a two-category system as follows:

CATEGORY II area (definition: a protected area managed mainly for ecosystem protection and integrity, environmental education and eco-tourism) for the northern sector of the PA, from the new asphalt road and tracks running north of Lake Qaroun up to the northern boundary of the PA, along with the whole Qarn El Zahaby Island.

CATEGORY V area (definition: protected area managed mainly for landscape/seascape conservation and recreation) for the southern sector of the PA, including the northern shore of the Lake, the southern shore, and the Lake basin.

3.4 Management objectives for the QPA.

The long-term management objectives for the Qaroun PA are defined as follows:

- Conservation of the unique fossil deposits and geological formations of the Jebel Qatrani area as a legacy for future generations, and as a crucial site for geology and paleontological research;
- Conservation of the wetland habitats of Lake Qaroun as key habitat for water bird breeding, wintering and migration;
- Contribute to the conservation of the biodiversity and geodiversity of Egypt and of the Western Desert in particular by securing portions of habitats, species range and landscape features representative of the ecosystems of the region;
- Promotion of public understanding and appreciation of Egypt's natural heritage;
- Preservation of the archaeological resources and cultural heritage of the Fayoum region by contributing to the conservation of important sites and features within its boundaries;
- Promotion of the area as a focal point for ecologically sensitive tourism, thus expanding and diversifying the economic activity base in the region;
- Facilitate and manage compatible educational and scientific uses of the area.

4. MANAGEMENT ISSUES

Several management issues have been identified as of particular concern for the management of the PA, and they are reviewed in this section identifying specific proposed management objectives and policies. For each issue, strategies and required actions are also identified. In doing this, for some issues an effort has been made at highlighting those specific actions that should be implemented as a priority by the PAMU over the planning period, and at distinguishing them from more general best practice guidelines to be adopted regularly during the management of the area. In general terms, these actions should represent minimal targets to be achieved over the planning period, if sufficient financial resources are available.

4.1 Quarrying and mining

Quarrying and mining generally have negative impacts on the environment, as they can cause aesthetic impacts, damage to geological formations as well as vegetation, soil erosion and flooding, and reduction of habitat complexity. Quarrying and mining are in general a consumptive industry, which is most often incompatible with both conservation and tourism development. Especially in the case of Qaroun Protected Area, they represent one of the main threats to PA values, in particular to fossil deposits, archaeological and prehistoric sites, geological formations and landscape. The open landscape that is characteristic of the area makes also the impact of quarrying of particular concern for the maintenance of the aesthetic values of the landscape and therefore for the appeal of the area to visitors.

Due to its geological characteristics, the area north of Lake Qaroun has been the object of quarrying and mining activities, with extensive exploitation of basalt, clay, and other materials. Although an effort has been put towards stopping basalt extraction activities, active quarries are still present within PA boundaries. It must be remembered that Law 102/1983 expressly forbids damaging or removing rocks or soil and the spoiling or destruction of geological structures in Protectorates. Therefore, and in consideration of the fact that most of the valuable natural and cultural heritage of the PA are particularly at risk from quarrying and mining, the PAMU will seek to limit and phase out mining and quarrying fron the PA as soon as possible.

Main objective: to avoid any further damage to the natural and cultural resources of the area, in particular to the fossil deposits and ancient basalt quarries, and to the aesthetic qualities of the landscape in general.

Policy: Closure and eventual exclusion of all commercial quarrying and mining activities inside the Protectorate within 3 years will be sought. For areas adjacent to the PA, quarrying and mining will only be allowed if it is demonstrated that it has no impact on PA values and it does not affect currently undiscovered features. Mining and quarrying activities in these areas will only be licensed for highly economic mineral resources, and in areas away from viewers (sheltered areas) and with no other significant natural or cultural resources.

Strategies and actions:

- All quarrying and mining activities inside the QPA shall be terminated as soon as possible, and no further quarrying shall be authorized.
- The PAMU will immediately survey and identify mining and quarrying areas in QPA, and in the adjacent areas, and the operational / contractual condition at each.

- The PAMU will immediately notify senior personnel at all existing quarry sites of the fact that prohibition of quarrying within QPA boundaries will be strictly enforced and of the new regulations adopted. After sufficient notice or grace period where applicable have elapsed, legal action against offenders will be taken.
- For adjacent areas, quarrying shall only be carried out within existing active quarries which will not be extended, and no new sites shall be authorized unless and until areas potentially suitable for quarrying and mining are identified by the PAMU.
- Where active quarrying is authorised in the vicinity of the PA and conducted close to known or potentially fossiliferous layers, action will be taken in order to ensure that if fossils are discovered, they can be properly preserved or recovered and the site preserved
- On the basis of environmental and aesthetic considerations, the PAMU, in consultation with the Giza and Fayoum governorates and the Egyptian Geological Survey, will define areas where quarrying and mining activities may be allowed within areas adjacent to QPA. Once these areas are identified, licenses will only be given after full EIA and field evaluation and inspection of potential sites by PAMU staff.
- EEAA will liaise with all Governorates and concerned Ministries requiring them to notify concessionaires of regulations and required procedure for quarrying in areas around PAs, and to consult with EEAA prior to approval of new or renewing quarrying requests.

Additional guidelines:

- PAMU will regularly monitor the situation to ensure that no new quarries are opened, and that existing ones are not extended. The PAMU will also ensure that operators are kept fully aware of quarry regulations.
- EEAA will regularly inform all concerned authorities of new policies adopted and provide adequate legal and administrative backstopping to PAMU.
- EEAA shall also be responsible for evaluating and approving EIAs in consultation with QPA.
- The PAMU may seek to plan, coordinate or implement the restoration of the landscape at stopped quarry and mine sites in exposed localities.

4.2 Access and off-road driving

Unregulated access and use of off road vehicles damages the landscape, fragile top soil and potentially sensitive archaeological and palaeontological resources. Off road driving is common within the QPA boundaries, and represents one of the main threats to the resources of the area in terms of damage to fossils and visual impacts. No adequate measures to prevent, regulate and discourage off road driving have been implemented so far, apart from limited interventions in a few sites. The practice of off-road driving is facilitated by the lack of clearly marked tracks, as well as by lack of control, enforcement of regulations and awareness by visitors.

The risks of deterioration of the natural and cultural resources is also increased by the scarce control on access to the area that can be exerted at the moment. This is facilitated by the lack of clearly identified routes and points of entry to the PA from which access by visitors can be monitored and controlled. The risk of substantial damage to the protected area is also likely to increase with the opening of a new asphalt road running along the northern coast of Lake Qaroun, whose construction is already planned, and which is expected will increase access to the northern sector of the PA.

Main objective: To avoid damage by off-road driving to the natural and cultural resources of the area by restricting vehicle use to a network of marked tracks. To minimize impact and disturbance (noise, pollution, visual) caused by use of motorized vehicles, while allowing the reasonable development of nature-friendly recreational activities, other sustainable uses and effective PA management.

Policy: Lands within the PA will be considered as closed to vehicles. Visitors and users of the PA will be allowed to drive only on defined, marked tracks, which are to be designated on management maps and marked on the ground. Off-road vehicle driving will be formally prohibited and actively inhibited. This will involve the development of an adequate network of clearly identifiable tracks. Off-road driving by PAMU staff will be minimized and restricted only to unavoidable needs related to management purposes.

Public access to PA will be controlled and limited to a restricted number (2-3) of entry points. Other access points will be physically closed if feasible, and access from unauthorised entry-points will be actively discouraged.

Strategies and Actions

- A network of unpaved tracks connecting main points of interest is to be clearly marked, developed, and adequately maintained, making as far as possible best use of already existing tracks.

- Appropriate signage is to be provided, in particular at key points (junctions, etc.). PAMU is to actively identify and evaluate existing tracks, adequately mark tracks open to public use, plan and develop signage system. PAMU is to identify also areas that need to be sealed off completely.

- Opening of new tracks is restricted to unavoidable needs related to management. Development of new tracks shall be consistent with conservation requirements, and shall be accurately planned and preceded by preparation of statements of impact to be reviewed by EEAA.

- Notice on off-road prohibition is adequately provided in multiple languages (at least Arabic and English) with signposts, on information materials, and at entry points.

- A restricted set (maximum 3) of official entry points, to be promoted as access routes for visitor entry is identified. It is envisaged that this may include: i) main entry point at western tip of lake; ii) entry point at eastern boundary; iii) access point from north, along Baharyia road. (option: consider relocating and promoting access from east starting from Fayoum desert road

- Patrolling efforts are to be increased, and adequate patrolling shall be carried out to ensure compliance with regulations. PAMU is to actively discourage and suppress unauthorized off-road driving.

- EEAA is to make an effort to inform all concerned stakeholders, and in particular tourist companies of new policies and regulations adopted, and is to provide adequate legal and administrative backstopping to PAMU in dealing with violations.

Additional guidelines

- Tracks can be improved at particularly bad patches where drivers tend to try better alternatives. Obstacles (large rocks etc.) can be placed at critical points in order to force drivers to follow a particular route.

- Easy-to-read instructions with codes of off-road driving should be posted at the entrances to important and heavily used tracks, indicating clearly the penalties for misconduct.

- PAMU staff is to restrict off-road driving to unavoidable needs. Routine patrolling to be conducted only following tracks open to public, unless otherwise and unavoidably requested by management needs. Special vehicles (dune buggy type) with low inflation tyres should be acquired for patrolling purposes.

- Public access tracks are to be marked with non-intrusive means, e.g. stones coming from surrounding areas. Use of valuable materials (i.e. pieces of fossilised wood) from PA should be avoided, as this can send misleading "signal" to visitors (e.g. related to removal of fossils). Fossilised wood used to mark tracks could be removed, and placed in suitable location.

4.3 Visitor management and ecotourism development

QPA has substantial potentialities to attract visitors interested in nature, desert landscapes, and natural and cultural heritage. Unregulated visitor use of the area however poses a risk for the long term conservation of the resources of the area, as some of its valuable features are of such a high sensitivity that they can be deteriorated even by the less intrusive modalities of visitor use (such as walking), if these are not properly controlled. Visitation to the QPA is currently unregulated or facilitated, which leads to excessive impact by visitors and reduced quality of visitor experience. On the other hand, appreciation and use of the area by visitors can provide substantial benefits to the area, in terms of enhancing public support as well as providing direct and indirect economic benefits to conservation.

Main objective: To avoid damage to the PA resources by unregulated visitor use, while guaranteeing that the rich cultural and natural features of the area are appreciated and enjoyed by visitors and that QPA is promoted as a leading ecotourism site within the Fayoum region.

Policy: Visitor access is actively encouraged in designated areas, but regulated according to carrying capacity and sensitivity of sites. Highly valuable areas will be closed to public access or made accessible to visitors only through escorted visits or other modalities that ensure proper control of visitor behaviour. A visitor fee system will be established, based on modalities already applied in other PAs .

Strategies and Actions

- The PAMU will immediately and continuously seek to reduce and prevent negative visitor impacts by regular patrolling of primary attractions and sensitive sites.

- Appropriate facilities and infrastructure needed to promote well managed visitor use of the PA, in addition to the design and set up of a network of designated tracks and signage system, should be identified.

- Interpretation facilities needed to enhance the visitor experience and appreciation of the PA values shall be planned and realized. It is anticipated that visitor facilities may include interpretation facilities, such as field interpretive stations and panels, a visitor information point, preferably located within the PAMU office, and possibly a Visitor Centre, strategically located in an accessible locality (i.e. along the southern lake Qaroun shore).

- A set of information tools, such as publications and other media, shall be produced to spread knowledge of the PA values and sites of interest. To facilitate their distribution, space within the existing headquarters could be transformed into a front office/information point open to visitors.

- A suitable logo should be designed and adopted as the symbol of the PA, and used together with the NCS logo on all signposts as well as on materials used to promote the PA to outside audiences and potential visitors.

- Needs, opportunities and requirements for developing a program to train and certify local residents as official guides for the PA shall be evaluated, and in doing this appropriate consideration should be given to the need of establishing a system allowing only guided visits to the most sensitive areas, such as the Gebal Qattrani escarpment.

- The PAMU shall monitor visitor impacts and responses through a comprehensive monitoring program.

- The PAMU shall coordinate with Tourist Police to seek simplification of arrangements for non-Egyptians security, so that security concerns do not affect opportunities for the enhancement of visitor use of the area.

- Detailed zoning and site planning of core protection zones shall be developed to define closed and permitted sites (these will be marked accordingly).

- A visitor safety plan and emergency response plan should be developed, and necessary materials should be acquired or training implemented.

Additional guidelines

- PAMU shall ensure that QPA visitor regulations are widely disseminated and understood.

- Tourism resources of QPA shall be reviewed and assessed as a basis for defining the appropriate types of tourism, routes and carrying capacity for different management zones.

- In evaluating the feasibility of establishing a Visitor Centre, the needs and opportunity to pursue an approach coordinated and integrated with WRPA and Wadi El-Hitan World Heritage Site should be taken into consideration.

- Particular attention should be devoted to improving access to the region, by encouraging relevant authorities to improve conditions of the main road leading to QPA and WRPA along the southern shore ot the Lake, and by devising more efficient and less burdensome security procedures for tourist parties visiting the region.

4.4 Fossil collection and removal

Fossil collection, improper handling or removal by unauthorised people (visitors, etc.) represents one of the greatest dangers that can jeopardize the outstanding richness and scientific value of the PA in terms of paleontological deposits. The area is well known to many outsiders for its fossil treasures, and fossil hunting might still be proposed to visitors as an activity to be done in the area by uncaring tourist guides. The unauthorised collection of fossil specimens is likely to result in the diminution of the scientific and cultural value of the area, as removed specimens are no longer available to the scientific community for research and to the public for appreciation. Even if fossils are not eventually taken away from the area, their simple relocation by unaware visitors can be substantially harmful, as they can be damaged or the information that can be gained from the context in which they are found is lost.

At present, only limited efforts can be put into place by the PAMU in order to prevent such activities, and resources are not adequate to counteract current risks of unauthorised collection. While removal of fossilised specimens might be needed in order to ensure adequate preservation of important specimens or materials of scientific importance, improper collection can have deep negative consequences, as it can permanently ruin the scientific value of deposits as well as deplete the potential for appreciation and enjoyment of the area by visitors.

Main objective: promote *in situ* maintenance of fossil specimens, while allowing for meaningful scientific investigation to continue and ensuring proper preservation of specimens.

Policy: Fossil collection and removal will only be authorized for scientific purposes, and as part of approved research activities. Whenever possible, retention of fossil specimens in the area, or alternatively in public museum collections, preferably within the country, will be pursued, provided that they can be properly preserved and made available to the research community and the public at large. The unauthorized collection and removal of fossils shall be stringently enforced.

<u>Strategies and Actions</u>

- Notice on fossil removal prohibition should be adequately provided with signposts, on information materials, and at entry points.

- Adequate patrolling shall be carried out to ensure compliance with regulations.

- Fossil specimens at particular risk shall be identified and specific measures shall be taken in order to prevent their removal or damage (e.g. replacement with casts, etc.).

- Adequate awareness and information programs shall be activated and directed in particular at tour operators, guides, etc.

Additional guidelines

- Innovative, long-term approaches should be explored to relieve pressures from collectors (e.g. communication campaigns, responsible fossil hunting in designated areas or in disused quarries, etc.)

4.5 Research activities and palentological studies

The Gebal Qatrani area is worldwide known for its fossil records, and regarded as a primary site for scientific investigation on paleontology. Studies conducted so far in Qatrani have significantly added to the understanding of the evolution of fauna and flora, and have contributed to highlighting the value of the QPA. Paleontogical research activities however can lead to the degradation of important fossil resources if not well managed and coordinated.

Objective: To retain the area as a prime scientific research site available to the scientific community, especially for palaenthological research, while preventing damage to key natural and cultural values. To avoid that research activities impair options for future research. To enhance the contribution of research to public awareness and appreciation and enjoyment of the geological history of the area.

Policy: Further research activities in the PA will be allowed, but in a strictly controlled manner, especially in the case of manipulative research activities (e.g. fossil excavations). Procedures and detailed research policies shall be established to ensure that only research activities of crucial interest are conducted, that their impact on the natural and cultural heritage is kept to a minimum, that research activities do not harm key values, that activities are conducted in ways that minimize impacts and optimize returns, that sites targeted by research are returned to their original state as much and as soon as possible, and that research activities serve the overall conservation and educational goals of the PA. Alternative sites for research if available outside PA should be preferred.

Strategies and Actions

- Research activities shall be reviewed, and close control of research activities shall be exerted by the PAMU, in order to ensure that they do not cause irremediable damage to features and values within the PA.

- A comprehensive policy and detailed regulations on research shall be produced, preferably in consultation with research institutions and scientists already active in the area, and shall be the basis for the release of any future authorization of research within the PA.

- Training and information of concerned PAMU personnel on research techniques should be ensured by researchers carrying out projects in the PA.

- A paleontological research plan for QPA, identifying priorities which might serve the PA conservation objectives, shall be developed.

4.6 Development in ecotourism development and multiple use zones

A large area along the Northern coast of the Lake Qaroun has been targeted for "ecotourism development", while development of new industrial and extractive activities, including a new salt extraction plant, was recently proposed for some areas along the northeastern coast of Lake Qaroun. The opening of a new asphalt road running north of the lake and linking it to the Cairo-Fayoum highway is also foreseen to boost the development of this area. A first segment of this road, of about 20 kms of length and starting from the western end of the lake, has already been completed. Massive development of tourism and other activities along the north coast of the lake may however diminish the long term potential of the area, and would preclude future opportunities for real ecotourism opportunities based on its natural assets.

The northern zone of the QPA had been under the TDA jurisdiction, but with the declaration of the PA these area now fall under the management of the Nature Conservation Sector (NCS). A co-operation protocol between the ministry of state for environment and ministry of tourism delineated the zone of ecoturism and the regulation of establishment of infrastructure. Tourism development activities within this zone could have a significant impact on the overall QPA image and status. Thus, activities within them will have to be carefully evaluated and their operations closely monitored to ensure protection of habitats and in general to guarantee that they are consistent with the long-term vision and management objectives of the PA.

Objectives: To enhance the value of the PA as a prime site for ecotourism and sustainable tourism initiatives, while ensuring that tourism development is compatible with its overall conservation objectives, and that impacts from the development of tourism initiatives are kept to a minimum preserving the potential of the area. To ensure that development of new productive facilities does not harm the natural assets of the area.

Policy: Ecotourism and sustainable tourism initiatives will be allowed only in designated zones of the PA (see zoning system), which will be left in a natural state as much as possible. Only low-impact ecolodge development, adhering to TDA's ecolodge guidelines, will be permitted. For the development of higher impact tourism facilities and services, investments will privilege the re-development and improvement of the existing infrastructures along the south shore of the lake, including improvement of quality of infrastructure and standards of service. Development on the north shore of the lake will be kept to a minimum by avoiding high impact development and by applying mitigation measures where relocation outside of PA boundaries is not feasible. Productive activities will be allowed only in the multiple use zone and only if compatible with the conservation objectives of the PA.

<u>Strategies and Actions</u>

- PAMU shall implement and supervise compliance to the approved zoning system with respect to tourism development and other economic activities.

- Only low impact activities would be allowed in zones targeted for development of environment friendly tourism, such as: camping, picnicking, swimming, and sunning on beaches. General public use of these areas for recreation will be assured. Important natural habitats and landscape will be maintained as much as possible.

- A line of communication between PAMU, EEAA and FTA should be established in order to coordinate the management and planning of the ecotourism zone.

- EIAs will be required for any development initiatives, and they shall thoroughly consider landscape impact as well as solid waste and wastewater disposal procedures. The PAMU shall review and verify all EIAs on the ground to ensure that they meet the guidelines and regulations for environmental management, particularly solid and liquid waste management. Mitigation plans should be developed to minimize also the impacts on landscape.

- The PAMU will ensure that TDA's ecolodge guidelines are adhered to during construction and future operation.

- PAMU shall monitor development of tourist schemes, construction and operation of all facilities in order to ensure compliance with PA regulations and management plan policies, EIA requirements, etc.

- The PAMU will exert its surveillance on waste disposal procedures, ensuring that all solid waste generated be disposed outside QPA in designated landfill sites.

- Use of pesticides, introduction of exotic species, disposal of solid waste around facilities, disposal of untreated liquid waste will be prohibited in areas where development of tourism facilities is allowed.

- The opening of new roads will not be allowed within the PA. For roads whose construction is already planned, careful consideration should be given to their impact and real necessity. Full EIA will be mandatory, and careful planning will be required in order for the road to have minimal impact on the landscape, for example by adapting as much as possible to the terrain morphology. Material to be used for or resulting from road construction shall not be extracted from or disposed of inside the PA.

Additional guidelines

- PAMU shall make an effort at establishing effective mechanisms for positively involving tourism sector operators in management of the PA.

- In order to facilitate access to areas devoted to low impact tourism developement, opportunities for taking advantage of already existing infrastructures, e.g. by improving conditions of the main road leading to QPA and WRPA along the southern shore ot the Lake, and for devising more efficient and less burdensome security procedures for tourist parties visiting the region, shall be explored as opposed to the opening of new roads.

4.7 Antiquities and cultural heritage preservation

Tampering with antiquities is a problem in most of the remote cultural heritage sites in Egypt. Uninformed tourists contribute significantly to the degradation of archaeological resources through trampling sensitive sites or graffiti writing, and collecting artefacts. The rather indistinct nature of some archaeological sites (particularly prehistoric sites) might render them

susceptible to damage as they can be easily overlooked and consequently overrun. Intentional theft of artefacts is also widespread. Vandalism and haphazard quarrying and mining are other major threats.

The main responsibility for the conservation and protection of archaeological sites lies with the Supreme Council of Antiquities. Nevertheless the NCS, as the organization mandated by the Egyptian Government to establish and manage protected areas, has the responsibility to ensure protection of archaeological sites located inside the PA.

Main Objective: To stop and prevent the deterioration and loss of archaeological resources in QPA and adjacent areas, preserving the archaeological sites within the QPA as heritage for the future as well as an attraction for visitors.

Policy: All tampering, excavation or collection of any material from or near known or potential archaeological sites (including old paved road and basalt quarries) will be strictly prohibited. Only excavations sanctioned by the Higher Council of Antiquities will be permitted, provide they comply with general PA regulations. Sensitive sites will have controlled visitor access, while less sensitive sites will be open to visitors with appropriate precautionary measures taken.

Strategies and Actions

- A line of communication and effective contact and coordination mechanisms should be establish by the PAMU with the local and central representatives of the Supreme Council of Antiquities, in order to define adequate procedures for reporting issues related to the protection of archaeological sites to relevant authorities.
- The PAMU shall include the main archaeological sites in the patrol plan and concerned S.C.A. should brief rangers on what type of damaged activity they should look out for and how to report.
- Sensitivity of sites shall be evaluated and visitor management recommendation provided by experienced archaeologists. Highly sensitive sites may need to be closed off, provided with instructional signs or closely controlled as necessary.
- The PAMU and S.C.A. shall establish a code of conduct for tour operators and tourists and inform them of restricted sites.
- Individual site and visitor management plans should be prepared. Monitoring of primary sites should be established to assess visitor impacts.
- Restoration of critically damaged resources by sanctioned professionals should be encouraged.

4.8 Fossil heritage preservation

As already mentioned in previous paragraphs, the area north of Lake Qaroun is rich in fossil deposits, and the Gebal Qattrani escarpment is considered as one of the most important sites in Egypt, and also in the African continent, for scientific research. The importance of the area is also recognized at the international level. In its 2005 session, the World Heritage Committee, with its decision 29COM 8B.5 endorsed the nomination of the nearby Wadi El-Hitan area as World Heritage Site. With the same decision, the Committee urged Egypt to consider any future nomination of the Gebel Qatrani Formation for natural fossil values as an extension of the Wadi Al-Hitan site.

The rich heritage of the area, its proximity to Cairo and other major cities, and the relatively easy access represent good opportunities for enhancing the public appreciation and enjoyment of this heritage for scientific and educational purposes. At the same time, these same factors, along with the sensitivity of the resources, call for great attention on the urgency of adopting appropriate measures to ensure the preservation of this unique heritage.

Main Objectives: To ensure the preservation of the fossil deposits of Gebal Qattrani, as a resource for education and public appreciation of the history of life on Earth, as a prime site for scientific research, and as a legacy for future generations.

Policy: The fossil deposits of the Gebal Qattrani area and associated geological formations will be considered as a major asset in the management of the PA, and their conservation will be given a high priority. To enhance the prospects for the appropriate valorization and preservation of the paleontological heritage of the area, recognition of its importance as a site of national and possibly international value will be sought.

Strategies and Actions

- A line of communication and effective coordination should be maintained by the PAMU and EEAA with the representatives of concerned authorities and organizations (e.g. Ministry of Education, Unesco, GeoParks networks), in order to facilitate the recognition of Gebal Qattrani as a geological site of national or possibly international value.
- The nomination of the Gebal Qattrani area as an extension of the Wadi El Hitan World Heritage Site should be considered as one of the primary options to ensure quick recognition of the international value of the area, according to the relevant World Heritage Committee recommendation from its July 2005 session.
- Strong coordination and exchange of best practice should be enhanced and maintained with the team in charge of the management of the Wadi el-Hitan World Heritage Site, also through the establishment of a Joint Management Team (see par. 5.1.2)
- The PAMU shall increase the patrolling and monitorin efforts in the fossil rich areas, and maintain regular patrolling of the Gebal Qattrani area at levels appropriate to discourage actions harmful to fossil deposits.
- The PAMU shall make any effort to implement all other actions and strategies aimed at enhancing the conservation of the fossil heritage of the area (see par. 4.2, 4.4, 4.5). This will include as a matter of priority the delimitation with appropriate means of a core protection zone encompassing the main fossil rich formations (see zoning system).
- Prior to opening any fossil rich area to public visitation, individual site and visitor management plans should be prepared, and appropriate mechanisms should be put into place to deter removal of fossils. Monitoring of primary sites should also be established to assess visitor impacts.

4.9 Water quality and management

Qaroun Lakes is fed mainly by the drainage water from the Fayoum depression. As a consequence, the quantity and quality of its waters are affected by a variety of factors and influenced by large scale processes that are mostly taking place well beyond the boundaries of

QPA. Therefore, any strategy or action targeting should be based on a holistic approach that takes into account the complex nature of the issues at stake.

Two main issues are currently of high concern. The first is the level of pollutants in the lake waters, which is greatly affected by the chemicals and heavy metals from the agricultural run off. This can have deep implications not only in ecological terms, posing a threat to the biodiversity of the area, but also in terms of human health and economic value of the lake resources. The other main issue is related to the increasing salinity of the lake, which is constantly changing its ecology. According to available data, the salinity of the lake is likely to become too high for many life forms to continue to exist, and this will ultimately reduce its importance as a habitat for most wetland species.

The problems caused by the deterioration of water in Lake Qaroun can be summarizes as follows:

- The bio-diversity of fish, plankton and birds is highly threatened by increasing the salinity of the lake. The accumulation of salts and lack of proper storage space exacerbates this problem even further.
- Part of the socio-economic system in this area is largely dependent on the lake. High levels of pollutants and increased salinity risk to severely affect the economic values, such as those linked to fishery and recreational activities, associated to the lake water resources.

Main objective: To seek the improvement of water quality and the stabilization of water salinity levels in Lake Qaroun.

Policy: All competent and concerned authorities will be encouraged to take a more active role and to increase efforts for reducing the pollutant loads of the water reaching Lake Qaroun. Water management actions and extractive activities that may contribute to the stabilization of salinity levels in the Lake will be facilitated, provided they are compatible with the PA objectives and management framework established by this plan.

Strategies and Actions

- Approval of projects for the extraction of salts from the Lake, which will help reduce the salt load in the Lake, will be granted after appropriate EIA process and evaluation of the compliance with PA regulations, zoning system and objectives.

- The PAMU will initiate a water quality monitoring program, based on the regular collection and analysis of water samples from the lake and if possible on the analysis of complimentary data from other sources. The water monitoring protocol will include the collection of water samples at the point of discharge of channels feeding into the Lake.

- Reports on water quality in the lake, based on the results of the water quality monitoring program, will be produced regularly (at least yearly) and distributed to concerned authorities and stakeholders.

- Regular meetings will be called with the main institutions, at which results of the monitoring activities carried out by the PAMU will be presented and discussed.

- The PAMU will follow up with concerned parties with regards to water management issues of the Lake. Concerned institutions will be required to take action whenever results from the monitoring activities show high levels of pollutants in the water of the lakes or of the channels.

- The Fayoum governorate and other concerned authorities will be urged to consider the establishment of treatment plants at the main channels draining agricultural wastewater into the lake.

- The PAMU will seek to increase awareness on the water management issues through *ad hoc* campaigns specifically targeting concerned authorities and stakeholders.

Additional guidelines

- Opportunities for applying innovative environmental management approaches to industries and tourist resorts along the shouthern shore of the lake, as well as to new facilities to be established along the northern shore, shall be explored as a longer term strategy to ensure the maintanenance of acceptable levels of pollutants in the lake.

- Concerned authorities shall also be encouraged to take actions in order to keep under control the amounts of pesticides and fertilizers used in agriculture.

4.10 Biodiversity values and conservation of habitats and species

Many development activities in the PA are leading to destruction and degradation of habitats. Unregulated tourist developments particularly along the south western shores of the lake are destroying the best waterbird habitats, particularly mudflats and salt marshes and will lead to increased disturbance to birds. The opening of a new road, and the proposed development of new tourism facilities along the northern shore of the lake can lead to the degradation of lakeshore habitats also in this areas. Quarrying and unregulated access by vehicles can lead to substantial damage to the desert habitats found in the northern part of the PA.

Another threat to habitat and biodiversity values may be represented by invasive species. Many invasive species have invaded the Egyptian agricultural landscape, including the Fayoum Depression. The impact of these invasive species is not well known on the Egyptian biodiversity, but is likely to be detrimental to some sensitive species. Most of the impact is however restricted to the southern agricultural and wetland zones. As already mentioned, much of the existing fauna in Lake Qaroun has in fact been imported from the Mediterranean.

Main objective: Maintain habitats in natural condition, maintain semi-natural habitats in ecologically functional conditions, and ensure preservation of species of conservation concern.

Policy: Preservation of high value habitats and species of conservation interest will represent a priority in the management of the area. High value habitat patches will be maintained, even when falling within zones where human activities are to be allowed. Areas important for species of high conservation interest (e.g. nesting areas for endangered birds) will be strictly protected. Efforts will be directed at understanding the impact of invasive species on biodiversity and at their control it if deemed feasible or necessary.

Strategies and Actions

- Development of human activities will be restricted to specified zones according to a zoning plan (see chapter 5).

- The PAMU will conduct an inventory of high value habitat patches in the zones where compatible human activities are to be allowed, and will prepare a detailed land use plan in these zones to ensure that important habitats are maintained.

- The PAMU will intensify patrolling and legal action in areas of high biodiversity value to prevent illegal development (particularly infringements on the Lake shore line).

- PAMU to list and survey invasive species and investigate from stakeholders major negative impacts on local biodiversity.

4.11 Hunting, fishing, persecution of wildlife

Fayoum has been traditionally a popular site for European hunting parties visiting Egypt in winter, who chiefly target water birds. Although there have continuous efforts to control hunting around the Lake, evidence indicates that there are many violations, both by foreign hunting parties and by natives, who kill many protected species and cause much disturbance to both wintering and breeding birds. Falcon catching is also widespread in the desert sections of the PA.

In light of the increasing human presence in the region, conflicts between man and wildlife are also bound to appear. This is particularly true with the fisheries industry. In the summer of 1998 some 3,000 fledgling *L. genei* were found dead on El Qarn Island. Despite statements by Ministry of Agriculture experts that starvation and parasites caused the mass death, it is almost certain that the birds were poisoned (because of the scale and suddenness of the incident), probably by local fish farmers. This illustrates the type and scale of conflicts that are arising between man and wildlife in many of Egypt's wetlands.

Main objectives: To stop all hunting activities with the PA boundaries. To retain Lake Qaroun as an area for sustainable use of fishing resources. To identify potential conflict between wildlife and man and minimize the negative impacts of any management actions taken.

Policy: Hunting will be strictly forbidden and actively prosecuted within the PA. Professional fishing will continue to be allowed to residents in neighbouring villages. Sport fishing will be allowed in multiple use zones, and in other areas.

Strategies and Actions

- The PAMU will intensify patrolling and legal action particularly in areas of high biodiversity value to prevent illegal hunting activities.

- The PAMU will establish a signage system, which indicates the PA regulations to be placed at entrance points and strategic localities of the PA.

- Traditional fishery will be allowed to continue, but the PAMU will actively contribute to ensuring that fishermen abide to existing regulations, that fishing efforts are

appropriate for achieving a sustainable yield, and that fishing activities do not have impacts on other biodiversity values.

- The PAMU shall liaise constantly with local authorities and law enforcement agencies to educate and reinforce the no hunting message.

- The PAMU is to survey areas of potential conflict (primaraly fish farms) and assess any damages that might be reported.

- The PAMU is to evaluate and monitor any actions taken by users to reduce damages caused by wildlife and stop any destructive practices.

- The PAMU shall provide technical advice on methods to control or reduce damage caused by wildlife.

4.12 Public awareness and information

Raising awareness at the local and national level on the importance of conservation of QPA is essential for achieving its long-term management objectives. Public awareness in PAs aims to elicit the support and goodwill of stakeholders as a means of meeting conservation management goals.

Objective: To ensure public support for long-term PA objectives and management actions, through the promotion of understanding and valuation of PA role and function.

Policy: Information, education and communication activities targeting the various stakeholders and the public at large will be carried out regularly by the PAMU. Public awareness will be a complementary to other management tools and strategies such as law enforcement.

Strategies and Actions

- Design and implement a public awareness campaign targeting primarily local communities as well as authorities at the local level (councils, police, tourism offices, etc.), and aimed at promoting public understanding of the value of paleontological resources of the area and of the damage to by unauthorised activities (e.g. quarrying or fossil collection).

- Carry out an information and awareness initiative targeting desert tourism operators to inform them on the regulations of the protected area, and in particular on the strict control that will be applied to prevent unauthorised fossil collection and off road driving.

- Design and implement an information campaign, targeting primarily concerned government authorities (e.g. Ministry of Agriculture, Ministry of Water Resources and Irrigation, etc.) and their officials, aimed at increasing understanding of the water management issues concerning Lake Qaroun, of their environmental, health and economic implications, and of the need of a concerted effort to prevent excessive build up of pollutant loads and degradation of water quality.

- A suitable logo should be designed and adopted as the symbol of the PA, and used on materials used for information and communication activities.

Additional guidelines

- Direct communications between PAMU and local stakeholders should be intensified, and PAMU should respond promptly to all inquiries from the public.

- Public communication tools (signs, newsletter, brochures, posters etc.) should be developed and continuously updated.

- A detailed Information, Education and Communication Strategy identifying priorities, tools and resources needed to increase awareness among all stakeholders should be developed.

4.13 Stakeholders and local community involvement

Although most of QPA is basically void of permanent human presence, human use of the PA is intense in particular sectors (i.e. the shouthern shore of Lake Qaroun and the lake itself), and dense rural communities are settled along the sourthern part of the PA. Given the intensity of human presence and use in the areas adjoining QPA, involvement of the local community and stakeholders is to be considered as fundamental for the long term success of any management strategy to be pursued in the PA. Specific efforts will therefore be directed at enhancing the opportunities for actively engaging local communities in the PA activities. Efforts should also be continuosly directed at maintaining adequate exchange of information, views and concerns between the PAMU and local stakeholders.

Objective: To enhance support at the local level for the PA objectives and management.

Policy: Efforts will be directed at enhancing the opportunities for local communities to derive benefits from activities related to the management of the PA, and in particular at employing local residents in PA activities and services. Communication activities targeting the local communities and concerned stakeholders will be carried out regularly by the PAMU, and efforts will be made at integrating views and concerns of the local communities in the management of the area.

Strategies and actions.

- The PAMU will seek to employ primarily locals to work as community guards, drivers or in other roles. Whenever a vacancy arises in the PAMU staff and new employees need to be selected, the PAMU will duly advertise this in all villages of the area. Provided that they are suitably qualified, locals will also be encouraged to apply for any ranger position to be filled in the PAMU.

- The PAMU will seek to employ local labour force for all temporary work to be carried out in the PA. The PAMU will also seek to outsource services and lease facilities inside the park to locally based cooperatives, businesses or other suitable organizations.

- The PAMU will seek to train local inhabitants as tour guides for excursions in the PA. For visits to areas within the PA where only accompanied visits will be allowed, the

PAMU will seek to facilitate the organisation of a suitably recognized system of local trained guides authorised to lead visitors.

- The PAMU will held periodic meetings and regular consultations with local authorities, community representatives, NGOs or other concerned organizations. Preferably once a year, suitable events open to the public should be organised in each major centre to inform interested stakeholders of plans and actions being undertaken by the PAMU and to gather views, comments and concerns of local communities.

4.14 Solid waste

Uncontrolled disposal of garbage is currently a problem mainly along the south coast of Lake Qaroun, in particular near villages. However, the intensity of human activities in the region, the encroachment of human presence on the PA surroundings from its southern, eastern and northern sides, and the foreseen increase in tourism activities in the area are likely to lead to an increase of the amount of solid waste produced, that may result in increased solid waste pollution affecting also the northern sector of the PA, if adequate procedures for waste disposal are not put into place. On the other hand, the attractiveness of the area to visitors, and its potential for sustaining a regular income of benefits from tourism, can only maintained if solid waste presence within and around the area is kept to a minimum. Therefore, efforts shall be directed at ensuring that all solid waste produced in and around the area is appropriately disposed of, and that solid waste presence within the area is avoided.

Objective: To ensure that the presence of solid waste inside the PA is kept to a minimum.

Policy: Disposal of all waste will be strictly prohibited, and landfills will not be allowed inside the PA. Tourism facilities (including hotels, ecolodges and boats) operating within QPA and its Buffer Zone should take full responsibility for disposing of their waste appropriately outside the PA, and violators will be actively prosecuted. The PAMU will ensure that facilities are available at selected sites within the PA to collect visitors' waste, which should eventually be properly disposed of outside the PA.

Strategies and Actions

- The PAMU will seek to coordinate with local City Councils and other authorities to ensure that waste management within the PA and its Buffer Zone is carried out properly, and that no waste is disposed of within the PA.

- Competent authorities shall ensure that all waste is disposed of at designated landfill sites outside the PA, and that burning of waste and fly dumping is avoided. This will include the dumping of all building debris and spoil in borrow pits in designated localities outside the PA.

- Waste management will be included as a major prerequisite before approving any future investments in the PA Buffer Zone, or in the Ecotourism or Multiple Use Zones.

- PAMU will install garbage bins at commonly used recreational sites and ensure regular disposal of garbage. No bins will be placed in the core and premium wilderness areas, from where visitors will be expected to take back their own garbage.

Additional guidelines

- Awareness should be raised among tour operators and visitors of the importance of disposing of garbage responsibly. Strict instructions not to dump waste in the PA should be given to tour operators and guides operating in the area at any opportunity, and they should also encouraged to report offenders.

- Cleaning campaigns with the assistance of local businesses and indigenous communities should be periodically organised.

- Enforcement of waste disposal prohibition and immediate prosecution of offenders should always be ensured by the PAMU.

4.15 Natural hazards (climate change, etc.)

Large-scale or long-term environmental changes or natural catastrophes, either human-induced or natural, can possibly pose a threat to the PA resources. At present it is however difficult to estimate what could be the likelihood and potential extent of such phenomena, even though some data are available, for example on tectonics and the risk of earthquakes. Moreover, it should be noted that potential impacts of such phenomena could be substantially different in the various sectors of the PA.

In any case, as widespread scientific consensus exists or is building up on the potential occurrence of phenomena such as climate change, for resources found within the PA that are of outstanding value or are found nowhere else, perspectives and actions needed for preservation in the face of such threats should be taken into consideration. As these threats can be considered unavoidable or beyond the range of action of actors concerned by this plan, measures to be considered will basically refer to adaptation or mitigation approaches.

Objective: To avoid damage to the natural and cultural resources of the area by non-preventable long-term or large-scale natural or human induced phenomena such as climate change, earthquakes, etc..

Policy: A proactive approach is adopted to preventing damage to resources, by making an attempt at identifying natural and human induced long-term or large-scale phenomena that can threaten resources and at evaluating relevant mitigation or adaptation measures to be applied.

Strategies and Actions

- Estimated long term trends and expected changes in climate should be considered, based on available, scientifically sound state-of the-art-climatic models, and an attempt should be made at identifying what changes in the local climate could be expected on the long term.

- Potential damage of expected changes in local climate to resources should be assessed, and prevention and mitigation measures should be identified and their feasibility evaluated.

- The state of archaeological sites and other points of interest, and their sensitivity should be assessed, and potential damage by earthquakes or other natural hazards should be evaluated.

5. MANAGEMENT FRAMEWORK, TOOLS AND RESOURCES

5.1 Management framework and responsibility

5.1.1 Management responsibility and institutional stakeholders

According to the existing legislation, the EEAA is the competent authority with the overall responsibility and mandate for the management of the QPA and of its resources, in particular with reference to the prescriptions of Laws 102 and 4. As for other protected areas in Egypt, a local unit of EEAA, the Protected Area Management Unit (PAMU), is currently and will continue to be in charge of the direct management and administration at the field level of QPA. The PAMU operates under the direction and supervision of the Nature Conservation Sector of EEAA, and it is directed by a PA manager. The PAMU should normally report directly to NCS head offices in Cairo, and in particular to the Manager for the Central Protectorates.

The PAMU has the overall responsibility for the day to day management and administration of the PA resources, for the implementation of management programmes, plans and prescriptions. The PAMU is also responsible for ensuring and regularly monitor the application of existing regulations and laws, and should report any violations to police and judiciary authorities for the necessary actions. The QPA is included in the territory of the Fayoum and Giza Governorates, and the PAMU shall also operate in close contact with and under the supervision of the authorities of these two Governorates.

The EEAA through its PAMU will not be the only authority with responsibility over the area, as responsibility for specific issues, features and resources will continue to be vested in other authorities, according to the existing legislation. For example, all the antiquities and archaeological heritage fall under the direct responsibility of the Supreme Council of Antiquities. Moreover, several factors originating outside of the PA boundaries can potentially affect the PA resources. Strong coordination with, or/and direct involvement by the PAMU of the other government agencies and local administrative authorities with responsibilities over the resources of the area will be therefore necessary for several management issues. The PAMU will make constant efforts to assume a coordinating role in this respect, while also ensuring that actions and policies adopted by any other agencies comply with the protected area regulations and existing legislation. The following is a list of the main institutional stakeholders:

- Ministry of Tourism (TDA)
- Ministry of Transport
- Ministry of Interior
- Ministry of Defence
- Ministry of Agriculture
- Ministry of Irrigation
- Ministry of Health
- Supreme Council of Antiquities, Ministry of Culture
- Governorate of Faiyum
- Governorate of Giza
- Egyptian Minerals Resources Authority

- The General Organization for Roads and Bridges
- Universities both national and international

5.1.2 Joint management team for Wadi El-Hitan World Heritage Site and Gebel Qatrani Site

Due to its reachness in terms of fossils, the area of Gebal Qattrani has been identified as a possible World Heritage Site. The decision (29COM 8B.5) of the World Heritage Committee that endorsed the nomination of Wadi Hitan as a WHS urged "the State Party to consider any future nomination of the Gebel Qatrani Formation for natural fossil values as an extension of Wadi Al-Hitan". The technical evaluation by IUCN supporting the nomination of Wadi Hitan highlighted that "the values of the nominated property and the Gebel Qatrani Formation represent different aspects of an intimately related story" and that Gebel Qatrani "has important values which cannot be logically separated from the interests within Wadi Al-Hitan in relation to a claim for World Heritage status".

Regardless of its nomination, the Gebal Qattrani site shares several values and management issues with the Wadi El-Hitan World Heritage Site. For example, both areas have similar natural values in terms of geology and palaeontology. Similar inventory, monitoring, research, assessment and reporting initiatives are required for both, and potentially could be coordinated.

A joint management team (JMT) has therefore been proposed to guide the management of Wadi El-Hitan World Heritage Site, located within Wadi El-Rayan Protected Area, and Gebel Qatrani Site, located within Qaroun Protected Area. The purpose of having a JMT is to enhance the benefits of sharing staff resources, increase efficiencies and improve the overall effectiveness of management. More detailed TORs for the JMT, as drafted within the framework of the Italian-funded project supporting the management of WRPA, are reported in annex 1.

5.2 Zoning

As for many other protected areas, one of the main management tools to be applied to QPA will be the establishment of a zoning system. This will mean that, although the whole QPA will continue to be legally protected, different levels of management or protection will in fact be applied to different parts of the PA. The zoning system identified by this plan represents a general zoning framework, that identifies the main approach that will be applied to macro areas within the PA. For each zone, and in particular for the zones where more intrusive development is to take place, finer scale zoning and land use planning shall be carried out during the planning period. Until more detailed planning of each zone is implemented, approval of land use changes in areas within the PA boundaries shall always be subject to careful site evaluation and approval by the PAMU.

Zoning is a basic step in the management of most protected areas, as it divides the assets of the protected area and schematically outlines the type of management regime and development activities appropriate for particular areas. Zoning is a tool used to assist management in applying specific policies and objectives to particular sectors. It allows for existing uses and future permitted ones to be located in areas where they are compatible with conservation goals. Basing management programmes and activities within a zoning system will help to clarify and locate the planning process and greatly facilitates the implementation of this management plan.

The Qaroun Protected Area zoning system is based on a resource-based approach, by which the area is zoned/classified according to its need for protection, level or intensity of management and capacity to sustain traditional, public or commercial use. Different specific management objectives are then set for each zone. The zoning system necessarily takes into account the existing uses of the area, and aims at integrating also some recent high level decisions that concern the Northern shore of Lake Qaroun.

The zoning system to be applied includes several zoning categories to be established according to different specific objectives, and with different levels of regulatory and management provisions. They are summarized in the following table, while the boundaries of the corresponding zones are shown in map 4. Following is a more detailed description of the zones.

Code	Zone	Approximate location	Protection level	Permissible impact
A	**Core heritage protection zone**	The area surrounding the fossil deposits of Qatrani, fossilized forest, ancient basalt quarries and ancient paved road, and other outstanding features.	Very high	Zero or very low
B	**Biodiversity strict protection zone**	Qarn El Zahaby Island	Very high	Zero or very low
C	**Premium wilderness and landscape preservation zone**	Western half of Northern shore of Lake Qaroun, up to the new asphalt road; Northern shore of Lake Qaroun, west of zone E; Mud flats in the easter tip of Lake Qaroun All areas surrounding zone A not included in other zones.	High	Very low
D	**Archaeological protection zone**	Restricted areas surrounding main archaeological sites or aggregation of sites not in core zone	High	Low
E	**Sustainable tourism development zone**	Central part of the Northern shore of Lake Qaroun	Moderate	Low
F	**Multiple Use Zone**	Qaroun Lake basin; Southern shore of Lake Qaroun; Eastern quarter of northern shore of Lake Qaroun	Low	Moderate to high

Table 2. Summary description of management zones.

5.2.1 Zone Descriptions

A. Core heritage protection zone

Very high value areas set aside primarily for preservation of natural and cultural heritage, with access only allowed to limited numbers of visitors following strictly controlled modalities or for special purposes such as research or management activities.

General description, location and extent: This zone will include a relevant portion of the escarpment that bounds the Fayoum depression from the north, including the uppermost Gebal Qattrani escarpment and the two conical black basalt-capped cliff- outliers known as Widan el Faras, extending over the most important areas for the preservation of the rich fossil deposits and of some of the most valuable archaeological remains found in the area. The boundary of the zone zone will be set wherever possible along recognizable features, such as the major escarpments, and will include a series of know fossil sites, the ancient basalt quarry of Widan Faras and part of associated ancient paved road. The zone will include approx. 315 km^2.

Protection Level: High with zero impact.

Objectives: To ensure the preservation of the rich geological, paleontological and archaeological heritage of the Gebal Qattrani area, for the benefit of present and future generation and as a prime site for research and public appreciation of past natural events and early human history.

General management strategy: No active management other than protection or limited intervention for interpretation purposes, visitor management, preservation of features agains decay; only non-manipulative scientific research and monitoring allowed. Open to public access only in strictly controlled manner, otherwise accessed only for management, research and monitoring purposes or for other justified reasons (e.g. documentation), after permission is issued by the PAMU director, except for PAMU staff while on duty.

Development: None permitted, except for limited and sensitive development of infrastructures for visitor management or other purposes. Scientific facilities to be removable.

Public Use: Only open to visitors in a strictly regulated manner to limit absolute numbers, group size and number of groups, and ensure appropriate behaviour of visitors. In general terms, visits will only be allowed to escorted parties guided by PAMU staff or other authorized guides (sub-zone A1), although for some areas also non escorted visits may be allowed after appropriate measure are taken to prevent damage to sensitive features (sub-zone A1).

B. Biodiversity strict protection zone/Bird Sanctuary

Basically pristine natural area set aside for the conservation of free interaction of ecological factors, and worthy of total protection with minimal access by people and no forms of construction or development.

General description, location and extent: This zone will include the whole Qarn El Zahabi island in Qaroun Lake, extending over the most important areas for breeding of species of high conservation value, particularly birds. In order to provide for sufficient protection and prevention of unauthorized access, the boundary of the zone zone will be set along a 500 mt. buffer from the island coastline. This zone will include approx. 6 km^2.

Protection Level: High with zero impact.

Objectives: To ensure the representation and continued existence of resident flora and fauna elements, and in particular of breeding waterbirds, in a natural state, and to serve as monitoring and research site.

General management strategy: No active management other than protection, e.g. removal of feral species; only non-manipulative scientific research and monitoring allowed. Closed to public access and accessed only for management, research and monitoring purposes or for other justified reasons (e.g. documentation), after permission is issued by the PAMU director, except for PAMU staff while on duty.

Development: None permitted and all scientific facilities to be removable.

Public Use: None permitted.

C. Premium wilderness and landscape preservation zone

Relatively pristine natural area with high scenic and recreational value and of high to moderate importance for biodiversity conservation.

General description, location and extent: This zone will include the western portion of the Northern shore of Lake Qaroun and the belt between this and the new asphalt road, a portion of the northern shore of the Lake to the east of the sustainable development zone (zone E), part of the eastern tip of Lake Qaroun, as well all desert areas surrounding the core heritage protection zone (A) and not included in other zones. This zone will include areas mainly targeted to biodiversity conservation (marked as zone C2), and areas mainly devoted to landscape and wilderness preservation (zone C1). This zone will include approx. 740 km^2.

Protection Level: Medium level, minimal impact.

Objectives: To ensure the conservation of landscape and natural values of the area. To provide opportunities for easily accessible desert tourism or other recreational opportunities that provides visitors with a rewarding natural experience.

General management strategy: Limited active management other than protection or limited intervention for interpretation purposes, visitor management, preservation of features agains decay, research and monitoring. Active management mainly directed at maintaining natural areas, minimising impacts and enhancing opportunities for visitor enjoyment of natural and cultural values within limits of acceptable change. Open to public access following general PA regulations (e.g. no off road driving), but specific limits may be set to maintain visitor expectations and entrance fees will be levied on visitors.

Development: None permitted, except for limited and sensitive development of infrastructures for visitor management or other management purposes. Scientific facilities to be removable.

Public Use: Generally open to visitors within established rules. No overnight stay except for authorised visitors in designated camping areas.

D. Archaeological protection zone

Restricted areas surrounding main archaeological sites or aggregations of sites not included in the core heritage protection zone.

General description, location and extent: Normally relatively small areas that contain important archaeological, religious or cultural sites that require different levels of protection and management. This zone will include for example archaeological sites such as Qasr el Sagha, and a surrounding buffer.

Protection Level: High protection, Minimal impact.

Objectives: To effectively protect in partnership with relevant stakeholders and Government authorities significant sites within the Protected Area, some of which may be accessible to visitors.

General management strategy: Management strategies will depend on the particular site and partner agency but for accessible sites the general approach will be to ensure adequate safeguards and interpretative facilities to minimise visitor impact. Archaeological sites will be protected and managed in association with the Supreme Council of Antiquities. Some of the smaller sites will be physically protected by barriers to prevent vehicular access. Identifications signs will be placed at each archaeological site giving restrictions on access.

Development: None except for the installation of appropriate protective measures and interpretative facilities, all of which should be designed to be sensitive of landscape and environmental considerations.

Public Use: Variable according to sensitivity with some sites permanently or seasonally closed to the public while others may be accessible on a controlled basis.

E. Sustainable tourism development zone

Restricted areas targeted for development of sustainable tourism facilities and services according to specific guidelines.

General description, location and extent: A narrow belt along the middle sector of the northern shore of Lake Qaroun, this zone will include approx. 12 km^2.

Protection Level: Medium protection: Medium impact.

Objectives: To allow for the development of sustainable tourism activities within the PA that are compatible with the overall conservation objectives of the PA.

General management strategy: The general approach will be based on monitoring of compliance with approved guidelines and regulations.

Development: Only development of infrastructures and facilities associated to tourism use allowed.

Public Use: Variable according to sensitivity with some sites permanently or seasonally closed to the public while others may be accessible on a controlled basis.

F. Multiple and intensive use management zone

These areas are generally already developed (urban areas) or utilised (extractive activities, agriculture and fishery) areas, or areas set aside for services essential to the protected area or for the provision of facilities and deleterious activities required for visitors.

General description, location and extent: Areas of lower conservation value, traditionally subject to human use or that are already developed or scheduled as urban areas or development sites, have already been highly impacted or are likely to be in the near future. This zone will include approx. 285 km^2.

Protection Level: Low protection: High impact

Objectives: Sacrificial areas used for multiple purposes to concentrate urban development, traditional activities such as agriculture and fish farming, commercial activities such as quarrying or high impact tourism activities.

General management strategy: Passive with activities monitored to ensure compliance with regulations.

Development: As required, according to Protected Area regulations and EIAs.

Public Use: Generally open access within prescribed limits.

5.2.2 Other zoning categories and systems

In addition to the categories envisaged in the main zoning system, other zoning regulations are envisaged that apply to specific areas for specific purposes.

World Heritage Site zone.

Several features within the QPA have been tentatively identified as being of such a unique and outstanding value to possibly warrant the nomination as World Heritage under the Convention concerning the Protection of the World Cultural and Natural Heritage (commonly referred to as the "World Heritage Convention"). The Qattrani areas is in fact inscribed into the tentative list of World Heritage Sites, and once the criteria on which the nomination is to be pursued have been clearly identified, specific areas within the QPA could be nomitated as World Heritage Site. In this case, a special management zoning category, the World Heritage special management zone, will be applied to areas pertaining to the WHS, and will overlap with the PA general zoning system.

The exact boundaries of the World Heritage special management zone will necessarily depend on the features and criteria on whose basis the nomination is to be sought. Should the nomination as World Heritage Site be sought for the Gebal Qatrani site as a natural heritage property for its geological and paleontological resources, it can however be anticipated that the boundaries of the World Heritage Site might correspond to the boundaries of the core zone envisaged in the above mentioned zoning scheme (see table). This zone will therefore have special management status as World Heritage Management Zone. Further coordination with the concerned authorities, and in particular with the Unesco National Committee will in any case be necessary for a detailed definition of the boundary of the site.

5.3 PA Boundaries and Buffer Zone

Apart from the southern part of the PA, the current boundaries are defined with straight lines, that do not follow features or landmarks that can be recognized in the field. Moreover, some significant sites might still be excluded from the PA. There is therefore the need to re-evaluate the current boundaries, and possibly suggest amendments that could contribute to improving management. In the short term in particular, options for boundary refinements should be considered in order to adjust and extend the northern boundary at the PA north-eastern corner to follow the upper escarpment and provide for boundaries placed along more easily recognizable features. In parallel with more detailed land use planning in some of the zones, the PAMU shall conduct a thorough survey of the area to evaluate the feasibility of such adjustments.

Buffer zone. Some areas currently outside the boundaries of the PA can be considered of considerable importance for the preservation of the natural and cultural heritage of the region, as they are in continuity with features found within the PA. For example, the same geological formations that contain the fossiliferous deposits found within the PA are also found to the west of the existing boundaries. Moreover, some archaeological sites and features that are part of the heritage of the region lie to the north and northeast of QPA boundaries (e.g. Abu Ballas site and pharaonic gypsum quarries, see map. 3). Uncontrollled activities in some of these areas, such as quarrying, may also have a negative impact on the resources inside the PA. It may therefore be advisable that such areas are included in a buffer area, where a certain level of control on activities may be exerted by the PAMU or other relevant authorities. In addition to the management zones defined within the PA boundaries, an external zone category may be applied to accommodate these areas: the Adjacent Area defined according to art. 4 of Law 102.

For two main areas the opportunity and feasibility of inclusion in an adjacent area will be explored in the short-term:

- The area between the northern boundary of the PA and the Cairo-Baharyia road, that will provide for improved protection and prevention of human encroachment on the sensitive areas in the northern portion of the PA;
- A narrow belt ecompassing the continuation of the Qattrani formation to the west and connecting the western boundary of the protected area to the boundary of Wadi El-Rayan Protected Area, that will provide for improved landscape protection and preservation of the rich geological and paleontological heritage of the Gebal Qattrani escarpment.

5.4 Management tools

In addition to the strategies and actions identified in chapter 4 for each specific issue, and to the zoning framework described in the previous paragraph, the long-term conservation of the PA resources and features will be based on a set of general management tools, programs and procedures, whose implementation and application will be under the direct responsibility of the PAMU.

5.4.1 Site and micro-scale planning

In addition to the zoning system described in the first paragraph, more detailed site planning or micro-scale planning will be required for several key areas and sites of high value or particular concern within the PA. In fact, while the zoning system described in the previous paragraph defines the general regulatory framework and management approach to be applied to "macro-zones" within the PA, this detailed site planning will identify for more restricted areas the precise arrangement of any infrastructural element to be set up (i.e. tracks, buildings, etc.) and the management actions to be applied to specific sites in order to ensure that development is orderly and consistent with general management objectives.

Site planning will be another fundamental tool that should be adopted by the PAMU itself or under its supervision to insure the orderly development of facilities and services. Site plans will need to be developed especially for sites of particular interest to visitors, where visitation modalities must be organised so as to minimize impacts while at the same time enhancing visitors' experience, and where infrastructures and facilities must blend with the landscape and be respectful of natural features. As a priority for the planning period, detailed site plans should be prepared for several important sites, that include:

- Qasr El Sagha
- Petrified forest area
- A section of the Ancient paved road leading to Widan el Faras
- Dimeh el-Sibah
- A selected set of fossil sites or sites with outstanding geological features

Micro-scale planning will be required for portions of those zones where a certain level of human activities can be accomodated, for example the multiple use and ecotourism development zone, so as to control the impact of such activities and ensure the preservation of areas or habitats of high conservation value within them. Areas of particular concern, and for which such micro-level planning should be pursued as a priority during the 5-year planning period are the ecotourism development zone on the Northern shore of Lake Qaroun, the area targeted for the development of salt extraction plants and the southern shore of Lake Qaroun. For these areas, comprehensive surveys and identification of important habitat patches should be completed prior to the release of licences.

5.4.3 Patrolling

Patrolling will be one of the basic management tool to be applied continuously and regularly by the PAMU. Patrolling consists of regular or irregular inspection of the PA and its resources, either on land or on water. The main objectives of patrolling are to enforce PA regulations, discover and stop violations to PA regulations by PA users, detect any notable, broad changes in the PA's natural conditions, which might require further detailed investigation and monitoring, regularly verify the condition of infrastructures, services and facilities that serve other management purposes (such as signposting, tracks, etc.).

ALL PAMU staff with operational field tasks (senior staff, rangers, community guards, drivers) regardless of specialization will be obliged to participate in patrolling activities. It is expected that all PAMU staff (with exception of the PA Manager) will spend between 25-50% of their working time on field patrols, spending the remaining time balance on their particular

area of specialty. Patrolling will be normally conducted by teams of PAMU staff (rangers and community guards), who must be in full uniform, to affirm their authority and identity. Safety considerations must be paramount for patrolling teams to avoid endangering PAMU staff. Patrolling teams will have multidisciplinary tasks: while the main objective is regulation enforcement, rangers on patrol could also collect data for use in monitoring programs; communicate with local inhabitants and community guards; maintain PA facilities.

The MEE recently conducted has highlighted that currently patrolling efforts are at a minimum, with patrolling done mostly in case of notice of presence of visitors (Palecny *et al.*,). During the planning period, patrolling efforts should therefore be increased to attain at least the average frequency of one patrolling trip per day. Patrolling efforts should reasonably cover all parts of the PA, although they will be adaptively directed to the most pressing issues/resources. To this end, patrolling schedules will be regularly issued and updated in order to ensure optimal control over the PA. The patrolling schedule will identify specific routes, localities, times and teams to carry out the patrolling missions. Patrolling intensity and frequency should be higher in PA zones of particular conservation value or where increased human activities are allowed (as in the Multiple Use Zone). Specific patrolling schedules and routes will be developed when PAMU staff is more familiar with visitor use patterns and issues.

5.4.4 Law Enforcement

Enforcement of the provisions of Law 102 for 1983 and Law 4 for 1994 is an important obligation for the PAMU, and law enforcement is one of the primary tasks of all rangers (regardless of specialization). PAMU have police power enabling them to take action against violators of the law. Law enforcement is an important component in particular of the patrolling activity, and patrolling teams should be prepared at all times to carry out their obligation in enforcing the law.

All rangers and staff operating in the field should get basic training in enforcement procedures and professional behavior expected when dealing with violators, and the PA manager will be responsible of ensuring that such training is provided. The legal officer (ranger) will be responsible for follow up of prosecution procedures and will keep track of record of details and relevant paper work. Close contact and coordination with police and other authorities will be important to have effective law enforcement.

5.4.5 PAMU Monitoring and Research

Monitoring and research will be important tools to guide and enhance the management of the protected area. Monitoring is the primary source to direct and adjust management, and is thus an essential part of the management process. According to a commonly accepted definition, monitoring is "the collection and analysis of repeated observations or measurements to evaluate changes in condition and progress toward meeting a management objective" (Elzinga, 2001). Monitoring is a powerful tool for identifying problems at an early stage, when cost-effective solutions are more likely to be available. But monitoring is also critical for measuring management success, as effective monitoring can demonstrate whether a management approach is working or not. In this case, monitoring should be designed to determine if the management objectives are met.

Research too can be a powerful tool to guide management, as improved knowledge on specific issues can help in formulating strategies and identifying solutions to emerging problems. Targeted and management issues oriented research will be an important tool to be applied by the PAMU to achieve more effective management. Thus, the PAMU will encourage, facilitate and where possible support applied research by outside researchers that is consistent with management objectives and requirements, and may also initiate specific projects to be implemented by its staff according to planned priorities. Unplanned research lacking clear scientific objectives and not relevant to management priorities could be counterproductive, and shall be avoided by the PAMU.

All external researchers willing to undertake research projects within the PA will be required to submit a detailed proposal to the PAMU/EEAA for approval. The approval of research projects may be conditional to or facilitated by the adoption of modifications of the research project to reflect management needs and priorities. Researchers will also be required to provide copies of reports, theses and publications resulting from their work in the PA, and whenever possible will be encouraged or required to provide data to be stored in the PAMU's IT/GIS unit.

Research that can be damaging to important natural resources, especially if research design calls for the collection of large numbers of specimens of fauna and flora or other samples, will be forbidden unless strongly justified by management needs.

During the 5-year planning period, the PAMU will be expected to start at least some regular monitoring programmes targeting a few priority issues. The PAMU staff will be responsible for identifying suitable methodologies and for devising appropriate protocols. It is advisable that periodical reports be produced at least annually to summarize and disseminate the results of these monitoring activities. The following are issues which should at least be considered during the planning period:

- Wintering and breeding birds. A simple program should be initiated to obtain improved baseline data and monitor the main trends in terms of species diversity, numbers, phenology, and spatial distribution (e.g. breeding sites, wintering areas, important habitat patches) of water birds in Qaroun lake. This program should be initiated soon if possible, in order to provide improved knowledge to be applied to more specific planning and zoning of human activities and development (e.g. tourism development).

- Condition of fossil sites. In coordination with research institutions carrying out palaeontological studies in the PA monitoring activities on the condition and degradation of fossil deposits should be planned and initiated, at least at key sites.

- Water quality. The regular collection of data on the qualitative properties of the water in Lake Qaroun, and the compilation of regular reports on water quality, will be an important component of the strategy adopted by the PAMU to . The monitoring scheme should also take advantage of any other sampling activities carried out by other organizations.

- Visitor numbers. The regular collection of data on the number and type of visitors entering the PA will be crucial in directing strategies for the effective implementation of a visitor fee system. The PAMU will therefore implement a monitoring program aimed at measuring with reasonable levels of accuracy the actual numbers of visitors entering the northern sector of QPA for recreational purposes. Periodical reports should be produced to summarise the information on numbers of visitors.

For the implementation by the PAMU of the monitoring activities, and in order to take advantage of expertise already available in particular within the EEAA/NCS, strong interactions and coordination will be established and maintained with other protected areas of the national system or with other concerned institutions, and chiefly with the WRPA PAMU, which has acquired and developed over the past 10 years considerable experience in many of the issues to be considered as priorities. For the implementation of targeted research programs the involvement of specialised research institutions, such as Universities within and outside the country, may also be sought.

5.4.6 EIAs

EIAs are one of the primary management tools for the PAMU. EIAs should be undertaken prior to the construction of any facility inside the park. The EIAs should follow the Environmental Impact Assessment Guidelines (EEAA 1996), the Environmental Guidelines for the Development of Coastal Areas (EEAA 1996) and any relevant TDA guidelines for tourism-related facilities. The final EIA should be reviewed, verified by and approved by the PAMU to ensure that information presented is accurate and that the project complies with the PA's regulations and management objectives.

5.4.7 Licensing / Permits

Licenses are used to regulate certain long term and stable activities, where regulations do not need to be adjusted such as quarries and ecolodges. Permits are given for shorter periods where seasonal adjustments might need to be made on a short term basis, such as for fishing, research, entering closed zones, etc. Permits and licenses are also to be used as a method to inform users of the PA regulations and to educate them about its values.

A comprehensive, consistent and stable licensing and permit system needs to be developed identifying activities which need to be licensed, prerequisites for licensing, and arrangements with other stakeholders who should participate in the licensing process. The possibility of collecting fees for concession licenses should be investigated within the framework of revenue generation for NCS/EEAA.

5.4.8 Visitor fee system and entry points

According to Prime Min. Decree of 2006, the establishment of a visitor fee system, similar to those already applied to other protectorates such as Wadi Rayan, needs to be pursued as a matter of priority. However, the system will be adapted to the characteristics of QPA, that make it impractical to have a fee system applied to the protected area as whole. In fact, given the intensive use of sectors of the PA by large numbers of people, both for the utilization of resources in the area (e.g. fishery) as well as for recreational activities, the entrance fee system will not be applied to the southern sector of the PA.

Visitors fees will therefore be collected only from visitors accessing the nothern part of the PA, and will be associated to and justified by the maintenance of this part of the PA as a premium site for nature based-recreational activities. In practical terms, fees will not be charged from visitors accessing the multiple use zone (zone F). Visitors fees will be collected from all

visitors accessing the rest of the PA, except for residents of the villages adjacent to the PA, workers and officials. Entrance fees could be the same as charged for WRPA, i.e. currently 3 L.E. for Egyptian nationals and 3 US$ for foreigners. Groups may be entitled to reduced fees or exempted (e.g. schools and students).

Multiple methods would need to be applied for fee collection, in parallel with the establishment of facilities and infrastructures, such as entry check points. The first method to be applied would be to advertise and put notice on signposts of fee requirements, requesting users to buy tickets at administration offices prior to entry into the area. At specific sites ticket collectors might then have to be present on the spot, and checkpoints may need to be established. Ticket could also be sold at other facilities, such as the Fayoum Governorate Tourist information center. The PAMU staff will be (when the fee system is installed and fully functional) responsible for conducting random ticket checks, as part of their regular patrolling duties, to ensure that visitors have valid tickets.

The establishment of the fee collection system will be implemented in parallel with the establishment of official entry points, and a phased approach will be adopted. This approach will envisage, in addition to the recommended restriction of access points to the PA, the sequential establishment over the 5 year planning period of official entry points at different locations, depending on the observed flow of visitors. At start, a first official entry point will be designated at the western end of Lake Qaroun. Clear signs will notify visitors of the fee requirements, inviting them to purchase tickets prior to entry. Visitors entering the protected area will be required to purchase their tickets from the PAMU office in Shakshouk, or permanent or semi-permanent ticket collecting points may be established on the spot. A second entry points may be designated immediately or as a further step along the eastern boundary of the PA. Also in this case clear signs will notify visitors of the fee requirements, inviting them to purchase tickets prior to entry. Depending on number of visitors, fees may need to be collected from the PAMU office, from other facilities (e.g. other offices such as Tourist information offices), or permanent/semi-permanent ticket collection facilities may be established on the spot.

A third official entry point may also be established along the northern boundary of the PA, allowing for direct connection with the Cairo-Baharyia road. In this case however, at least until effective measures for the control of the core heritage protection zone are in place, considering that entry from the north allows easy access to the core heritage protection zone, visitors will only be allowed to enter or exit the PA if accompanied by PAMU staff or other authorised guide. Should an entry point be designated along the northern boundary therefore, visitors entering from this side will be required to obtain permission for their entrance prior to their visit, and clear notice of prohibition of unauthorised entry will be posted on the PA boundary. Considering the distance from the PAMU headquarters, placement of ticket collection facilities in this case is not likely to be practical, unless sustantial flow of visiting parties from this side is observed.

5.4.9 GIS

A basic GIS unit will be established witihin the PAMU, to serve as a tool for improving the management and planning of activities within the PA. IT and GIS can be important, efficient modern management decision-making support tools. However the efficiency and usefulness of GIS depends greatly on the overall design of its role in the management of the resources at hand, and on the actual use that is made of the available tools and data.

The GIS unit at WRPA has already accumulated an extensive database on the distribution of the major resources and human activities in the western Fayoum region. The GIS unit to be established in QPA will interact closely with the WRPA GIS unit, to enhance sinergies and avoid duplication. The local unit will serve PAMU management needs and benefit from the already existing capacities at WRPA. It is recommended that a coordinated database, holding baseline data of the two PAs and mirrored at both units, is build and maintained, in order to provide for analyses and planning that could involve the two protected areas as an integrated system (e.g. planning of thematic visitor itineraries).

At the PAMU level the IT/GIS unit will collect data from monitoring programs, patrolling, the spatial distribution of human development, economic activities in and around the PA, and the distribution of sites and natural resources of conservation interest. The unit will ensure that data is retained for future use and analysis by the PAMU. The GIS unit will be involved from early stages in the design and formulation of monitoring programs to ensure adaptability of collected data. It is also recommended that the GIS regularly produces a series of maps depicting background information on the distribution of main features in the PA. These maps should be for example produced at least annually as part of the annual reporting.

5.5 Management resources

This paragraph identifies a set of critical resources should be developed or allocated specifically to the management of QPA to enhance and implement effective management of the protectorate over the planning period. They can be identified under three main categories, which are infrastructures (buildings and other man-made features, such as tracks,), equipment and staffing.

5.5.1 PA management infrastructures

A set of infrastructural elements will be required to support management efforts and to ensure that resource within the QPA are effectively monitored and controlled. Infrastructural needs will be described under two main headings: PA management infrastructures, described in this paragraph, and infrastructures for visitor management, described in the following paragraph. The former refers to all infrastructures that will serve general management activities to be carried out by the PAMU, while the latter refers to infrastructures that will be specifically required to enhance visitor management and improve opportunities for visitation by the public. It is however obvious that some infrastructural elements will serve both purposes: for example some tracks to be developed to improve visitor management will also serve general management purposes such as patrolling.

At present, the infrastructures available to the PAMU are limited to a building serving as headquarters/administrative office and located in the village of Shakshouk. In terms of roads and tracks, apart from the portion along the southern shore of Lake Qaroun, where the road network is fairly developed, unpaved tracks exist within the PA. A 20 kms. segment of a new paved road was recently constructed along the northern shore of Lake Qaroun, and a further segment that should eventually link this road to the main road running east of the PA is envisaged for construction.

In terms of facilities for the general PA management, the main infrastructural needs identified are the following:

- **Headquarters and administrative offices.** These will continue to be located in the currently available building in Shakshouk, which appears of sufficient size and to be strategically located in a suitable position that combines reasonable possibilities of access to most of the area, sufficient proximity to other services and offices, and close contact with stakeholders and public. In addition to ensuring regular maintenance, only limited interventions will be needed in order to upgrade the existing structure. This will include trasforming part of the structure into a front office for visitors, where basic information materials could be made available to the public.

- **Permanent Outpost.** The need to have an operational outpost in the Gebal Qattrani sector of the PA is to be considered as a priority. This will serve as a base to ensure permanent or semi-permanent presence of rangers and community guards in one of the most vulnerable parts of the PA, where valuable natural and cultural assets are found. The location identified for the outpost is shown in map 5. The outpost will need to have sufficient residential space, including at least one or two bedrooms, toilets and kitchenette, a small store room.

5.5.2 Visitor management infrastructure and interpretation facilities

The development of facilities and infrastructures for visitors can greatly enhance the appreciation and understanding of visitors, therefore contributing to increasing the chances of effective long-term preservation of QPA main values. However, different strategic approaches will be applied to the different parts of the protected area.

In the PA zones where visitors' access will be allowed without particular restrictions, a more traditional approach will be pursued, that will envisage the positioning of interpretation structures such as panels, signs, etc. associated to features or particular points of interests, thus allowing visitors to enjoy the PA natural and cultural richness of the area and to appreciate also by themselves. A completely different philosophy will on the contrary be adopted in the core sectors of the PA, and in particular in the Gebal Qatrani core protection zone, which will be based on avoiding as much as possible any kind of installation or structure that may alter the natural and unspoilt character of the area. Within this zone, the use of interpretation facilities and visitor infrastructures will be preferentially kept to a minimum, highlighting the idea of the area as a high conservation value and in line with the general management approach to be applied that envisages only guided visits under the supervision of staff.

In more specific terms of facilities and infrastructures related to visitor management, it can be anticipated that the following main elements will be required, although for each of them there will be the need of more detailed feasibility studies and plans prior to construction (tentative location for some of this elements is shown in map. 5):

- **Tracks and trails.** A network of unpaved tracks connecting the most important sites for visitors will be developed. Most of this network is already existing, although it needs to be further developed and clearly marked. Short trails could also be established, starting from selected sites reachable by car.

- **Signposts.** Signs and signposting will be important tools to guide visitors and residents through the area, making them aware of the PA's existence and particular places and facilities.
- **Interpretation facilities.** Interpretive panels and displays should be placed at key sites to provide information on the spot.
- **Entry points**. The implementation of a fee system for visitors will require the establishment of appropriate systems and facilities to control the inflow of visitors and to collect entrance fees. However, the lack of sufficient and reliable information and realistic projections on the numbers of visitors likely to enter the protected area from different entry points leads to recommending that a phased and adaptive approach is adopted to this issue in order to ensure appropriate and efficient allocation of resources. Gates or checkpoints would be established only after their real need is warranted by observed increase in visitor numbers and logistics consideration. In any case, gates or ticket collection stations will have to consist of simple facilities, well integrated into the surrounding landscape.
- **Designated campsites**. Simple campsites will be designated and arranged with basic facilities (fire pit, compost toilets, etc.) in suitable spots, and will represent the only areas where camping will be allowed outside the ecotourism development zone.
- **Information and Visitor center**. A visitor center, possibly including a small museum holding a representative sample of selected fossil specimens from the area, could be established in a suitable location. The locality where to establish the center should be easily accessible, and strategically positioned to attract most of the visitors coming to the area. A possibility could be represented by a suitable location along the southern shore of Qaroun lake, so that the center may attract visitors to other localities of the region, such as Wadi Rayan. In the short term, part of the PAMU office in Shakshouk can be transformed into a front office open to the public, where basic information and publications can be made available to visitors. In evaluating the feasibility of establishing a Visitor Centre however, the needs and opportunity to pursue an approach coordinated and integrated with WRPA and Wadi El-Hitan World Heritage Site should be taken into account, especially considering the links between the naturalistic values of the areas.

A more comprehensive and detailed plan for interpretation facilities shall be realised prior to the establishment of the main facilities.

5.5.3 Equipment

To ensure that management of the QPA is effective and the PAMU in particular is capable of carrying out management duties, basic field, scientific and technical equipment will also be needed, and sufficient financial sources will have to be made available to develop the PAMU resources over the next five years.

A list of major items of equipment that should be available to the PAMU is provided in table 3. Provision of such equipment should be a priority to be pursued within the first two years of the planning period. Over the rest of the planning period, it is expected that equipment availability will be maintained at least at the same levels, unless otherwise required by specific factors. Financial requirements for the provision of a first set of equipment to be allocated to the PAMU as matter of priority are reflected in the provisional budget for a specific targeted management program (see ch. 6).

The PA manager will be ultimately responsible for the maintanance and good use of the equipment allocated to the PAMU, and for ensuring that equipment is maintained functional and at the target levels.

5.5.4 Staffing

The PAMU is going to carry the responsibility for maintaining the resources of the PA and ensuring that its objectives are met, and must have sufficient staff to fulfil all planned activities. EEAA/NCS will therefore have to recruit sufficient suitable staff for the management of QPA. As for other PAs, careful selection of future staff, clear job descriptions, training and well-defined career development lines will be important elements in developing a successful and effective team.

Some important issues to be considered with respect to staffing needs are that:

- The current number of rangers is not extremely low, although insufficient to effectively ensure adequate levels of patrolling and to implement monitoring activities and other programs, especially considering that normally rangers are on duty on average for 60% of their time. What is more remarkable is the current composition in terms of technical background. Rangers are in fact the most specialized staff members, and a balanced composition is to be sought in terms of background and specialization. Considering the lack of rangers with background on scientific background, in particular ecology, life sciences and geology, and the importance that , it is recommended that priority is given to integrating the existing ranger force with personnel having background in related subjects.
- The number of community guards is rather low, and insufficient to ensure good control over many parts of the protected area.
- The number of ticket collectors is insufficient to effectively apply a visitor fee system.

The present PAMU staff complement is summarized in the first column of table 4. The additional staff to be recruited or allocated to the PAMU complement and maintained over the planning period considered by this document is shown in column 2 of the same table. The following additional considerations should however be applied:

- Recruitment of at least one ranger with life sciences/ecology background, two community guards and one additional driver should be a priority to be achieved within the first two years of the planning period.
- The completion of the full complement of ticket collectors shown as target is conditional to the effective implementation of a viable visitor fee system

Staff training: Training for PAMU staff should take place on a variety of levels from induction of new staff, through junior, mid-level and senior grades. It should combine formal courses as well as in-service and on-the-job training and should continue throughout the staff members' careers. All staff, from new recruits to experienced Rangers, should benefit from ongoing training programmes to enhance their job performance and improve career and promotion opportunities. A proposed integrated PAMU training programme for all staff, from new recruits to senior rangers, should be developed and presented to the Director of the NCS on the basis of a thourough review of training needs, and subsequently implemented. Estimated financial requirements for a baseline training program have been included in the provisional budget.

Item	Target complement- notes
4 x 4 vehicles	3
Patrol boat	1
Motorbikes	2
Computers, printers and other hardware	4 desktop, 1 laptop, 1 desktop with A3 colour printer to be allocated to GIS unit
Office and data analysis software	1 GIS software package Standard packages of office utilities
Binoculars	8
Telescopes	1
Cameras	2
Camping equipment	1 complete set
GPS	3
Satellite phones	1
Radio-communication equipment	On all vehicles and 2 handheld
Monitoring and technical equipment (hammers, etc.)	To be further specified

Table 3. Equipment needs for PAMU

Position	2006 staff complement	Target Staff complement to be added
Protected Area Manager	1	---
Rangers	5 (Geologist, Engineer, Vet. Social affairs)	2 (Geologists, biologist)
Office management staff (accountants, administrators, secretary)	5	------
Legal affairs	2	-----
Community guards	2	4
Driver	2	1----
Boat driver	1	1
Translator (English)	1	---
Technician (agriculture)	2	---
Ticket collectors	2	4
Total	**23**	**11**

Table 4. Existing human resources and projected increase in staff according to management needs currently identified.

6. IMPLEMENTATION OF THE MANAGEMENT PLAN

This management plan is both a planning tool and a programming document for the PA, including a series of long-term strategic directions and prescriptions, such as zoning and regulatory prescriptions, along with a more operational part, that refers to actions and activities that should be put into place in the 5 years planning period.

Overall responsibility for the proper implementation of the MP will be a major responsibility for EEAA and in particular NCS, as the main government agency in charge of the management of QPA. At the field level, the effective implementation of the plan prescriptions will be charged onto the PAMU, and in particular will be assigned to the PA manager. Implementation of the operational part of this management plan will be the major responsibility of the PA manager. Even though for several issues and actions the main responsibility will pertain to other agencies, the PAMU, led by its manager, will have the main coordinating and monitoring role.

The main tool to be applied for the effective implementation of the management plan will be represented by the Annual Operational Plan. In addition to the AOP, several other additional instruments can be applied to ensure the effective implementation of this plan: these will include targeted management programs as well as specific plans focusing on issues of main concern for the management of the PA.

6.1 Annual Operational Plan

In order to ensure that the day to day day management of the PA, in addition to ensuring effective implementation of routine tasks and tackling of contingencies and emergencies, comply with the longer term objectives of this management plan, and that short term actions actually contribute towards achieving the PA longer term objectives, an Annual Operational Plan (AOP) will be prepared each year. The AOP will be the main document translating the broader indications of this management plan into operational targets and short term plans, and will also represent the main tool that will allow to establish expected results and to track and monitor the progress in achieving these results. The AOP will also be the main document to be prepared in order to justify the Protectorate's annual budget request.

It will be the responsibility of the Area Manager to prepare the AOP, submit it to the Director of the NCS and get his approval for it. The AOP will then be the Protectorate's official annual work plan. The first draft of the AOP must be drawn up before the preparation of the annual budget for the Protectorate, as the budget will be based on the AOP. The budget and justifying draft AOP will be presented to the NCS Director and when the approved budget is received, a final AOP will be prepared.

The AOP should include an appraisal of the results already achieved with reference to the indications of this management plan, and an assessment of the progress made during the previous year towards meeting its targets. The AOP should also include an assessment of the priorities to be confronted during the year.

6.2 Targeted management programs

Strategies, actions, and resources required to face priority issues and to enhance the management of QPA have been discussed in the previous chapters. In order to facilitate their implementation as well as the identification of financial needs and potential funding sources, another programming tool to be applied in the day to day management of the PA and in the enhancement of the PA will be represented by targeted management programs. These will be specific plans that will group in a coordinated fashion strategies and actions aimed at certain issues and priorities. While AOP will extend over a single year, targeted programs may extend over several years, depending on the scale of the issue and of the complexity of the envisaged intervention, and will be reflected into AOPs.

Some specific programs that need to be implemented, such as those on monitoring, have already been discussed in the relevant chapters. A series of targeted programs, identified as priorities for the 5-year planning period and which therefore should be developed and implemented as a matter of priority, is briefly presented in the following pages. The financial requirements for their implementation have been roughly estimated and included in the estimated provisional budget summarized in table 5. Each plan should be further developed into a detailed operational plan, specifying the resources required, expected outputs and time schedule.

Strengthening of PAMU and development of basic management facilities

The aim of this program will be to enhance the capacity of the PAMU to carry out adequate surveillance and ensure proper management of the PA. The program will be targeting the main weaknesses of the PAMU in terms of equipment, staff, capacity and infrastructures. The activities to be carried out will include:

- Provision of two 4wd vehicles
- Renewal and upgrading of office and technical equipment (computers, GPS)
- Provision of field equipment (camping gear, uniforms, etc.)
- Minor upgrading of the PAMU office
- Establishment of a permanent or semi-permanent outpost at the base of the Gebal Qatrani escarpment

Estimated financial requirements: 600,000 L.E.
Estimated time frame for implementation: 18 months

Baseline resources assessment and monitoring programs

The aim of this program will be to expand and update the information base available on the resources in the area, in order to support improved decision making and more detailed planning of sensitive sites and areas. The activities will include baseline assessments of the distribution and extent of important natural habitats and surveys of the most important areas for wildlife conservation, as well as the initiation of selected monitoring programs on priority issues (see par.).

Estimated financial requirements: 100,000 L.E.
Estimated time frame for implementation: 24 months

Development of signpost system

The development of an integrated and coordinated system of signposts will be fundamental to improve the effectiveness of the management and conservation efforts in the area by informing and educating visitors. Signposts will have the purpose of guiding visitors and residents through the area, highlighting the entrance to the PA and informing or reminding visitors and users of PA regulations, inform visitors and users of specific features, guide visitors along defined routes or point them to particular sites, support the enforcement of specific rules (e.g. zoning). Signs to be used will be of three major types: signs marking the boundaries of the PA or of specific management zones, signs with instructions and prohibitions, and signs which inform visitors about points or features of interest.

Several major sets of signpost will be envisaged: i) a set of signposts at the main entrance points of the PA, with a summary of the main regulations applying to the PA, ii) a set of simple signposts marking the boundaries of the the PA, to be placed at least at strategic points where access may be more likely iii) signposts marking, at least on tracks and at strategic points, the entry to managament zones with restricted access, with clear indication of the prohibition of unauthorised entry, iv) directional signs posted at major junctions and key points along roads and demarcated tracks to guide visitors, v) information signposts, giving particular places and facilities (e.g. nomes of particular features, viewpoints, etc.).

Prior to the development of signposts, a comprehensive signposting plan will be needed to ensure the entire system would be integrated and stylistically harmonious. All PA signposting within the PA will be consistent in style, should show NCS and QPA logos, and whenever possible use natural, but long-lasting materials.

Estimated financial requirements: 100,000 L.E.
Estimated time frame for implementation: 2 years

Development of demarcated track system and prevention of off-road driving in QPA

The main objective of the program will be to reduce and avoid damage by off-road driving to the natural and cultural resources of the area, mainly by restricting vehicle use to a network of marked tracks. Actions and strategies will be implemented in order to minimize impact and disturbance (noise, pollution, visual and physical damage) caused by use of motorized vehicles, while allowing the reasonable development of nature-friendly recreational activities, other sustainable uses and effective PA management. This will involve the development of an adequate network of clearly identifiable tracks. Moreover the plan will seek to effectively control and limit public access to the PA only through a restricted number (2-3) of entry points.
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Activities to be implemented include:

- Surveying all minor tracks and identifying spots where cars tend to abandon main routes
- Developing and clearly marking with non-intrusive means, e.g. stones, a network of unpaved tracks connecting main points of interest, making as far as possible use of already existing tracks.
- Placing appropriate means (e.g. large boulders) in more sensitive spots to prevent exit from main track

- Marking and a restricted set (maximum 3) of official entry points, to be promoted as access routes for visitor entry.

A first phase will be directed at taking actions urgently needed in order to reduce the impact on the very important fossil deposits and cultural heritage sites found in the area. The total cost of such phase is evaluated at approximately 25.000 L.E. This priority program envisages basically:

· The improvement of the already marked tracks leading to Gebal Qattrani and the petrified forest. These tracks have already been demarcated with stones for about 18 kms, but they need to be improved in some tracts;

· The demarcation with more visible means (such as sticks and wires) of the tracks close to some high value sites, such as the petrified forest and 4 fossil quarries where important specimens have been discovered. About 5 km of track are to be demarcated this way;

· The preparation of some signposts and directional signs to be put at key points;

· The closure (for example by large stone placement) of some access points that allow visitors to enter the PA from the upper escarpment of Gebal Qattrani.

In the second phase all the other parts of the PA will be targeted with the same activities, after a comprehensive survey of minor tracks has been carried out in order to develop a coordinated plan for the tracks system.

Estimated financial requirements: 200,000 (25.000 L.E. phase 1)
Estimated time frame for implementation: 2 years

Activation of visitor fee system

The aim of this program will be to initiate the establishment of an effective mechanism of visitor fees collection. The activities will include the designation of official entry points, with adequate notice to visitors (in parallel with activities related to signposting), and the establishment of adequate ticket collection procedures. This will represent the first step of a phased approach for the implementation of an effective visitor fee system (see chapter 5). The actitivies will also include the activation of the regular collection of data on visitors entering the PA, so as to provide baseline information for the further development of the fee collection system and of visitors' facilities in general.

Estimated financial requirements: 30,000 L.E.
Estimated time frame for implementation: 18 months

Development and implementation of a comprehensive interpretive plan

The development of intepretation facilities will be of great importance to enhance the quality of visitors' experience, to raise awareness on the values of the PA, and therefore to increase the chances for effective protection of sensitive features. However, the development of intepretation needs to be carefully planned and executed, in order to achieve high quality standards, accuracy of scientific contents, and attractive look. The objective of this targeted program will be to devise a comprehensive plan for interpretive facilities, to establish a first set of lighter facilities in key sites (e.g. panels), and to further analyse opportunities and constraints for establishing facilities of greater size, such a visitor centre/small museum.

- Development of a comprehensive interpretive plan, identifying modalities and means of interpretation, main themes, overall plan of facilities, etc.
- Design, preparation and installation of interpretive panels in key sites
- Preparation of a feasibility study and preliminary project for a visitor/information centre

Estimated financial requirements: 600,000 L.E.
Estimated time frame for implementation: 3 years

Development of site plans for key localities and features

The objective of this targeted program will be to prepare and implement site plans for sites of major interests to visitors, and for which an increase of visitor flow can be expected. For these sites, detailed plans should be developed to ensure the preservation of both the natural or cultural features as well as the orderly development of facilities and services, such as shades, parking areas, trails, resting areas, etc.. Starting from a thorough sensitivity analysis of the site, each plan will include detailed maps and layouts, as well as financial requirements.

The development of site plans will have to be closely linked to and coordinated with the development of interpretation facilities and of other infrastructures, such as tracks. It should be noted also that a site plan for the Widan Faras quarries and ancient paved road is already being prepared. This program will target at least three additional areas: i) the area encompassing Qasr El-Sagha and Dir Abu Lifa, and ii) the petrified forest area, iii) the Dimeh el Sibah area.

Estimated financial requirements: 200,000 L.E.
Estimated time frame for implementation: 18 months

Production of a first generation of IEC materials on QPA and Public Awareness activities

The objective of this program will be to a first generation of information tools to be used to illustrate the most important features of the PA to visitors, as well as to promote the PA to the outside world. The materials will also represent to remind visitors of the regulations applying to the PA. Specific public awareness activities may also be organized focusing on some sensititive issues (see chapter 4.11).

In terms of information materials, main items to be produced will include:

- An A4 leaflet, with layout and design consistent with leaflets produced for the other Egyptian PAs
- A foldable colour brochure, describing the main features of the park, with schematic map (A4 size)
- Simple leaflets on specific topics to support public awareness initiatives
- A foldable map of the PAs of the Fayoum, covering both WRPA and QPA and highlighting possible itineraries connecting the two protected areas as well as other sites of interest in the region (to be produced in conjunction with WRPA).

Estimated financial requirements: 200,000 L.E.
Estimated time frame for implementation: 2 years

6.3 Financing

The implementation of this management plan will require financial resources additional to those already allocated each year to the PA. These resources will be required for both the envisaged investments in durable assets, such as development of infrastructures and procurement of equipment, as well as for the implementation of activities or of programs targeting specific issues. Under the current institutional framework, the main sources of financial resources for the implementation of the plan could be represented by a) the allocation from the and the Environmental Fund, b) external projects funded by organizations, such as donor agencies or other institutions.

Table 5 below summarizes the estimated financial requirements, not considering recurring costs such as running costs and salaries for permanent staff, for the implementation of the targeted management programs listed in the previous chapter, which can be considered as priority activities to be implemented in the 5 year planning period. The overall requirements in terms of financial resources required for the full implementation of this plan however shall be estimated once full feasibility studies and detailed planning for major elements are carried out, and shall be the object of a detailed financial and business plan, which should also include a full analysis of recurrent costs.

Program	**Estimated fin. Requirements (L.E.)**
Strengthening of PAMU and development of basic management facilities	600,000
Baseline resources assessment and monitoring programs	100,000
Development of signpost system	100,000
Activation of visitor fee system	30,000
Development of demarcated track system for the prevention of off-road driving in QPA	200,000
Development and implementation of a comprehensive interpretive plan	600,000
Development of site plans for key localities and features	200,000
Production of a first generation of IEC materials on QPA and public awareness activities	200,000
Total	**2,030,000**

Table 5. Summary of estimated financial requirements for targeted management programs.

6.4 Monitoring of implementation and revisions of the plan

Annual Operational Plans will form the basis for the monitoring of plan implementation. Each year the status of implementation of the various activities shall be revised against the targets set in the AOPs. A major review of the overall implementation of the management plan is recommended after three 3 years.

This plan is intended to be a dynamic instrument. Continuous updates are expected and necessary to keep it accurate and up to date. It is envisaged that the plan should be completely reviewed and reassessed after five years, in light of achievements and shortcomings on the ground.

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Annex I. Joint Management Team for Wadi El-Hitan and Gebel Qattrani Site

Terms of Reference
October 16, 2006

Introduction

A joint management team (JMT) has been proposed to guide the management of Wadi El-Hitan World Heritage Site, located within Wadi El-Rayan Protected Area, and Gebel Quatrani candidate World Heritage Site, located within Quarun Protected Area.

The purpose of having a JMT is to enhance the benefits of sharing staff resources, increase efficiencies and improve the overall effectiveness of management.

The rationale for this approach includes the following:

- Both areas have similar natural values in terms of geology and palaeontology. Similar inventory, monitoring, research, assessment and reporting initiatives are required for both, and potentially could be coordinated.
- The areas are in close geographical proximity, enabling operational opportunities.
- Visitor use is anticipated to include both areas (some exists now). Protection and visitor management activities (particularly for the future) would be more effective if considered in a holistic context.
- Presently one NCS manager is responsible for both areas, though staff resources are managed separately.
- Staff capacity for Quarun is limited and would benefit from the added support.
- Some equipment is expensive and may be better to share.

Geographic Area of Responsibilities

The JMT responsibilities would include three main areas:

1. Hitan WHS as defined in the designation (approximately 20,000 hectares);
2. The proposed Gebel Quatrani WHS boundary, and;
3. the intervening area between the two. Though parts of the intervening are outside of the two protected areas, the JMT should monitor land use proposals and activities to ensure they are not conflicting with or adversely affecting World Heritage values.

Team Members

- National Co-manager, WRPA/Quarun PA
- International Co-manager, WRPA
- Assistant Manager-Operations, WRPA
- Assistant Manager-Technical Unit, WRPA
- Assistant Manager, QPA
- Sr Ranger-Geologist, WRPA
- Sr Ranger-Geologist, QPA
- Sr Ranger-Planning & Management Effectiveness, WRPA

Roles and Responsibilities

- Each area will operate as separate sectors as their distance is far enough without roads to warrant two locations.
- Overall priority setting and management will be by the Joint Management Team.
- In the long term, it is anticipated that more staff will be needed at Quatrani than at Hitan due to it size and proximity to urban areas such as 6th October City and Cairo.

Role	**Responsibility**
Day to day operations at each site (scheduling work, patrolling, monitoring)	• Respective Sr Ranger, Assistant Managers
Establishing priorities for both sites	• JMT
Establishing annual work plans	• Respective Sr Ranger, Assistant Managers and Co-Managers • Review meeting by JMT to look for cooperation and efficiencies and effectiveness.
Patrolling, including opportunities to cooperate	Respective Sr Rangers
Establishing monitoring, assessment and reporting on effectiveness and status of resources (including reporting to UNESCO)	JMT
Planning visitor facilities, roads, signs	JMT
Coordinating research	JMT
Providing technical advice	JMT
Coordinated approach to management planning	Sr Ranger-Planning and ME (WRPA) through JMT
Developing information, education and communications plans	JMT
Large financial purchases	JMT
Training	JMT
Projects/work parties (sharing workers to get projects done)	JMT
Equipment sharing (e.g., when Hitan outpost is completed, can move tents to Quatrani for a field camp)	JMT
Strategic planning	JMT

Protocols for Joint Management

The purpose of the JMT can only be achieved through the willing participation of the members. Cooperation requires 'give and take', and this can take many forms. Overall, team members are urged to remember that through this mechanism we're aiming to better protect globally important resources.

Scheduled meetings will likely be the primary means of identifying needs and finding solutions. This is due to the limited communications facilities at this time (e.g., no telephone land lines and limited mobile connections). Two-way radios should be installed at Quarun Office and in the Quarun vehicle to enable radio communications between the field camps.

Meetings should be held quarterly as follows:

- June 1: Review proposed annual work plans (NCS fiscal year July-June)
- September 1: Coordinate implementation of NCS annual work plans
- December 1: Review progress on NCS annual work plan implementation; review proposed WRPA project work plan (Italian project fiscal year is January-December)
- March 1: Review progress and plan activities

DRAFT

Lake Qaroun

بركة قارون

QPA Boundaries

Main Land Cover categories

- Bare Rock or rock with sand layer
- Shallow stony soil
- Irrigated Herbaceous Crops
- Irrigated Tree Crops - Olive
- Loose and shifting sands
- Dunes
- Sparse low forbs on waterlogged soil - sabkha
- Artificial water bodies (salt extraction or fish farming)
- Airport
- Urban Areas and villages

Roads and tracks

- Highway
- Main roads
- New road (North of Qaroun Lake)
- Tracks

Mining and quarrying

- Main active quarry areas
- Main areas with inactive quarries

Quarry sites

- Sand quarries
- Active Basalt quarries
- Other quarries
- Old mining or quarry sites

N

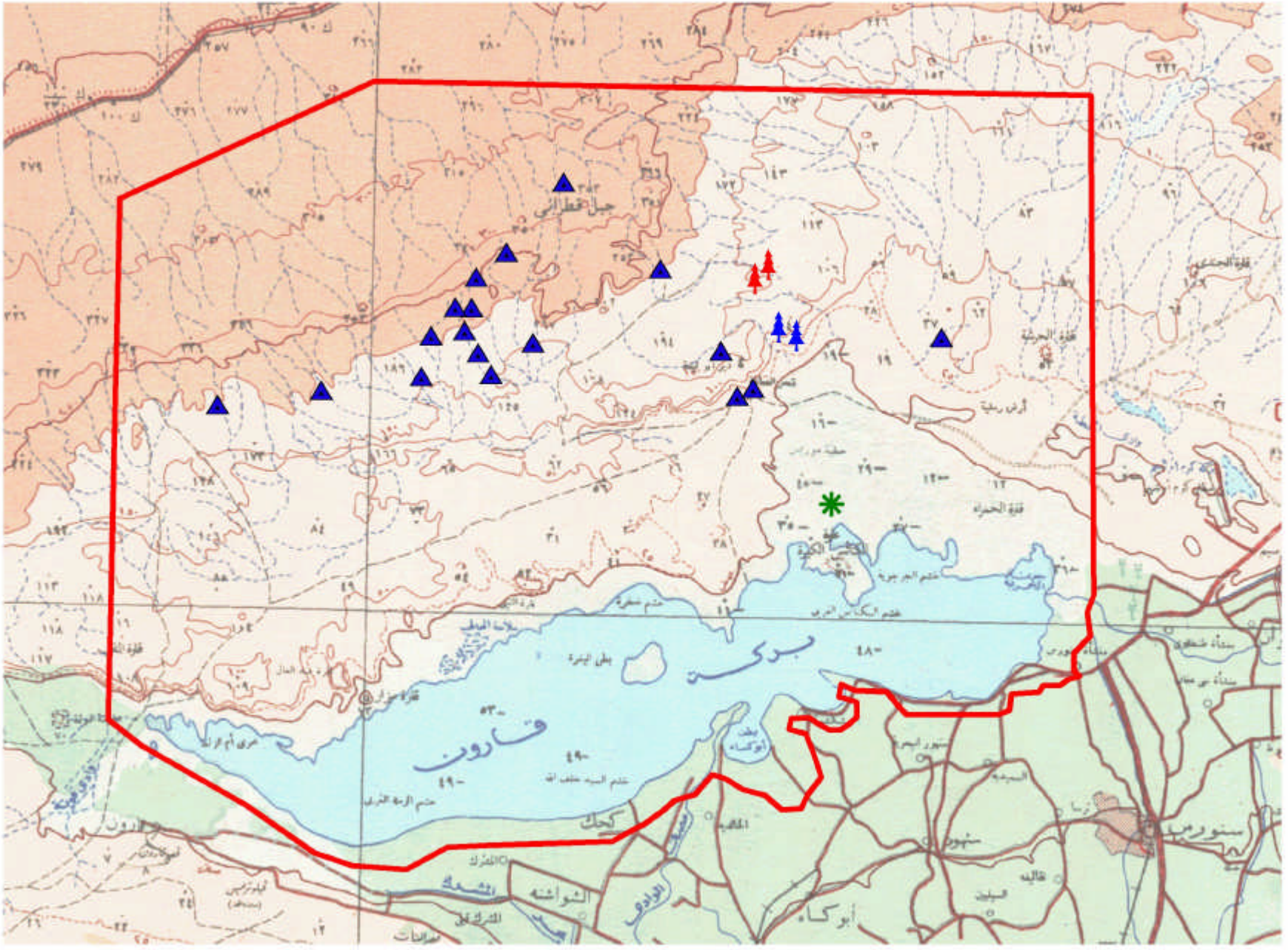
5 Kilometers

Projection UTM 36 N
WGS 1984

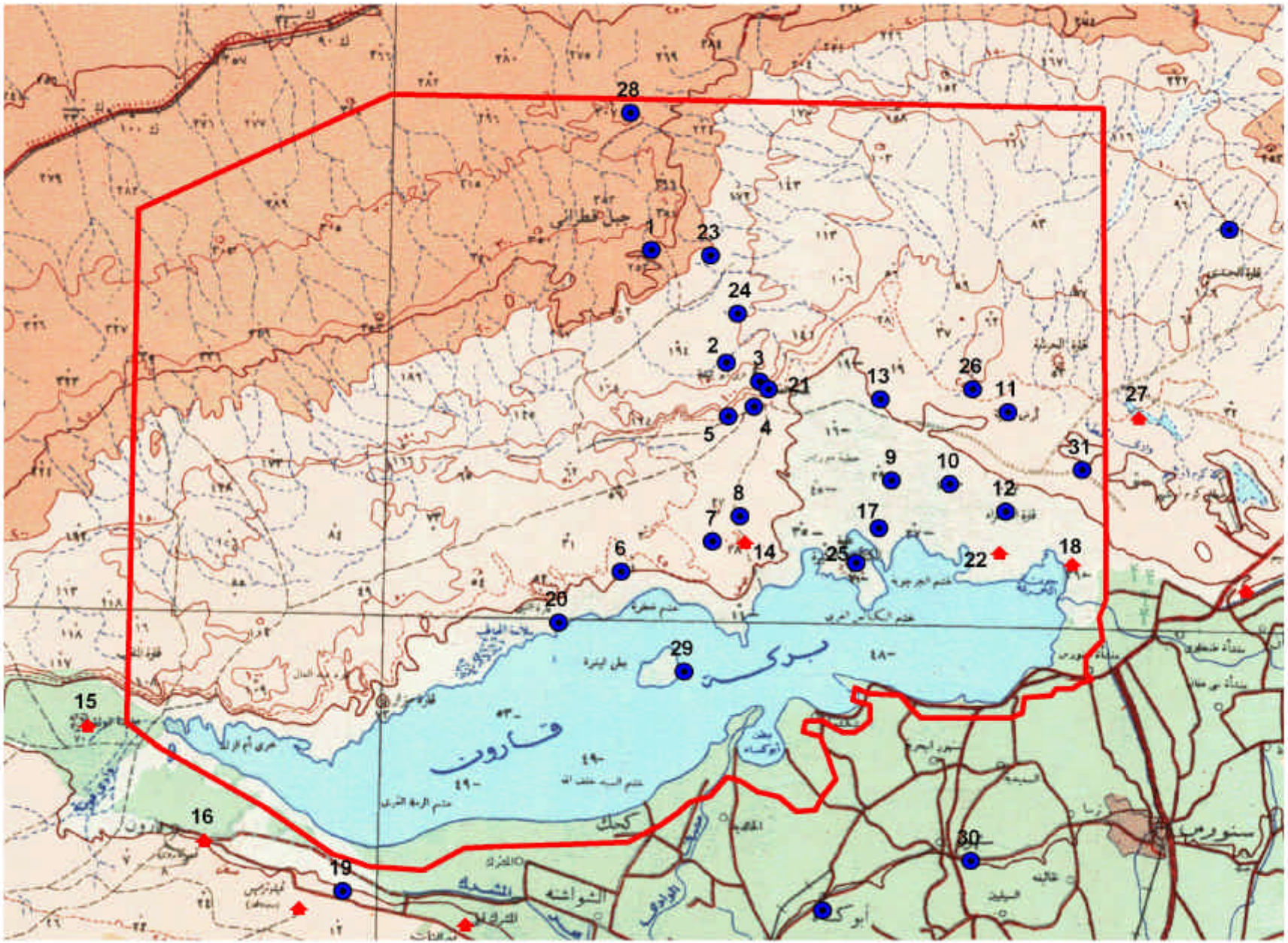
Landcover data produced by FAO/Africover.

Additional baseline data courtesy of ISSEM Project with scientific and techical direction of Pisa University.

Map 1. Qaroun PA: main land cover and land use units



Map 2: Main known paleontological sites within QPA



QPA Boundaries

Known archaeological sites

- Recorded as S.C.A. property
- Not recorded as S.C.A. property

1 Pharaonic basalt quarries
2/24 Old paved road
3 Dir Abu Lifa Monast.
4 Pharaonic fishing village
5 Pharaonic pier
6 Neolithic arrowhead field
7 Cemetery hill
8 Unexplored Greco-Roman
9-12 Neardenthal neolithic site
13 Epipaleolithic site
14 Dimai as-sibah
15 Medinet Quta
16 Qasr Qarun
17 Tell Shaggas
18 Qaret el-Rusa
19 Ruins
20 Tell el-Bouni
21 Qaser el - Sagha
22 Qara el- Hmra
23 Widan el-Faras
25 Illuet el-Kanais el-Kebir
26 Kom W
27 Kom K
28 Abu Ballas
29 Geziret el-Qarn
30 Kom el-Manqul
31 Roman Gebel

N

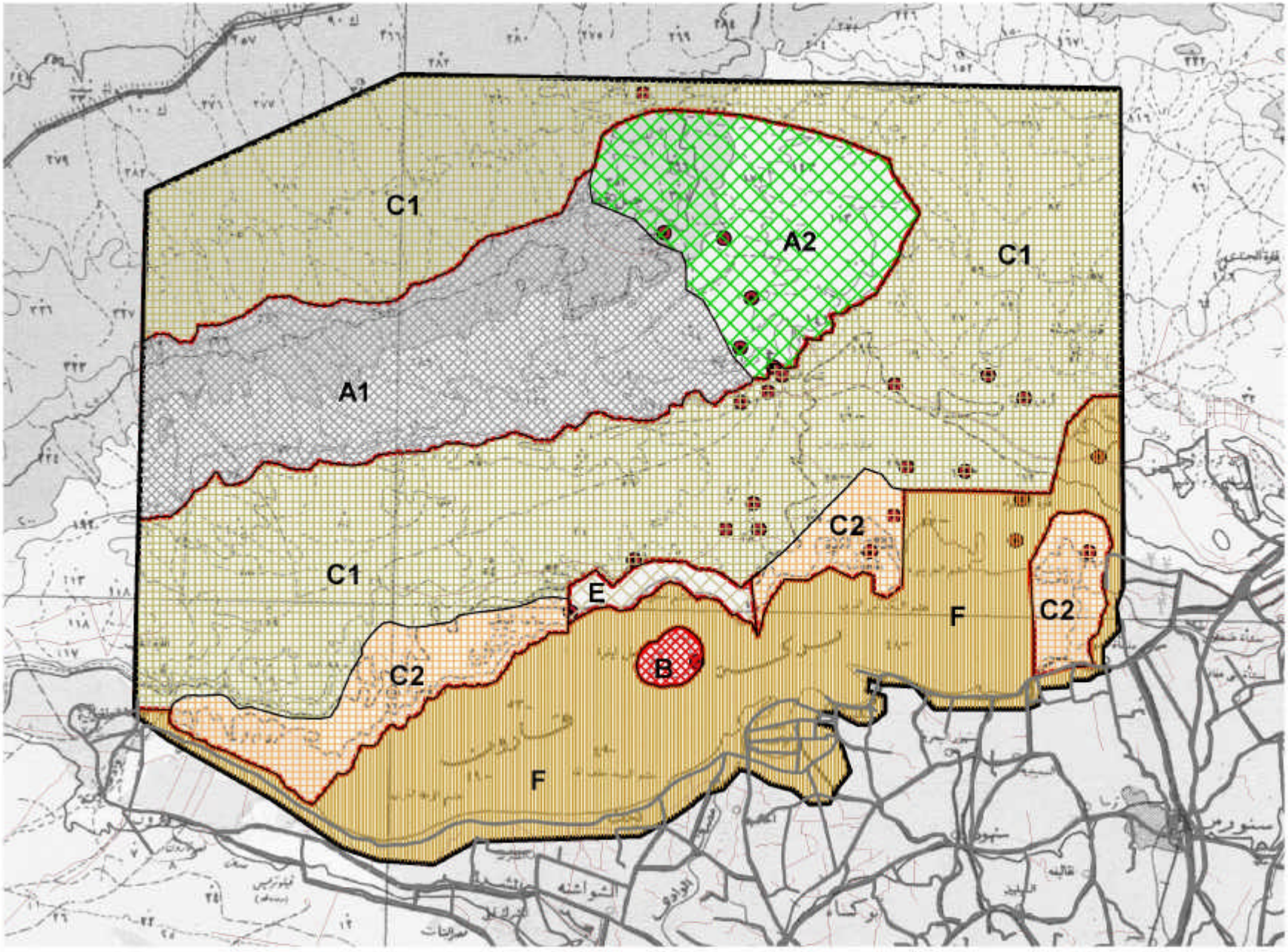
5 kms

Projection UTM 36 N
WGS 1984

Data courtesy of ISSEM Project with scientific and techical direction of Pisa University.

Additional data from Unesco Nat. Commission.

Map 3: Main known archaeological sites within and around QPA



QPA Boundaries

Management zones

A1 Core heritage prot. zone

A2

B Biodiversity strict prot. zone

C1 Wilderness-wildlife prot. zone

C2

E Ecotourism development zone

F Multiple use zone

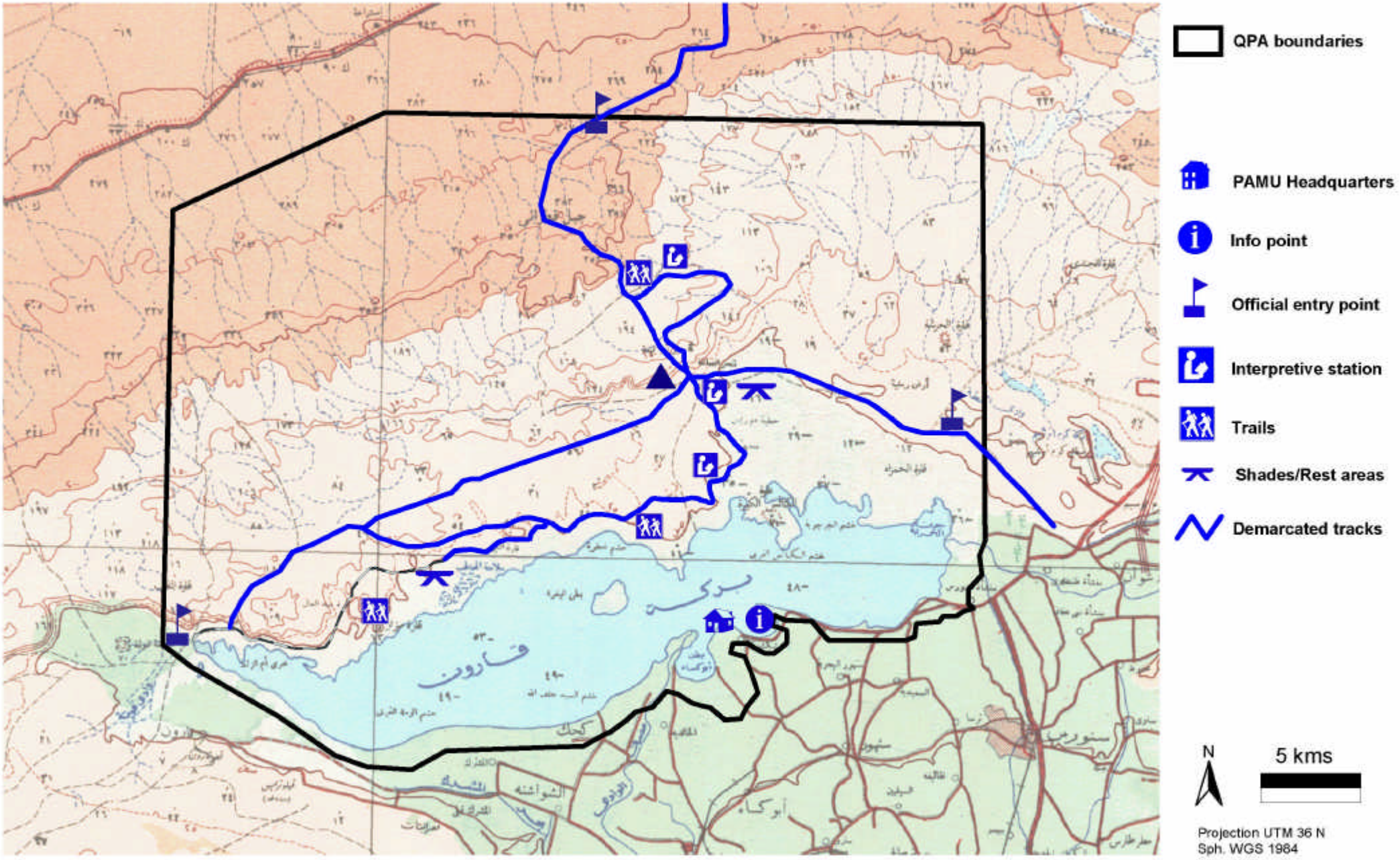
Arch. sites (possibly zone D)

N

5 kms

Projection UTM 36 N
Sph. WGS 1984

Map 4: Approximate boundaries for QPA management zones



Map 5: Approximate foreseen location of selected infrastructures and visitor facilities