United Nations Development Program

برنامج الامم المتحدة الانمائى

Egypt

EGYPTIAN-ITALIAN ENVIRONMENTAL COOPERATION PROGRAM PHASE II

HAND-OVER CERTIFICATE

Wadi el Rayan Protected Area Project

December 2010

Government of the Arab Republic of Egypt

Egyptian Environmental Affairs Agency

National Parks of Egypt

Italian Ministry of Foreign Affairs – Directorate General of Co-operation for Development

Embassy of Italy in Egypt

THE UNITED NATIONS DEVELOPMENT PROGRAM

WHEREAS a Memorandum of Understanding (hereinafter referred to as the "MoU") for the implementation of the Egyptian Italian Environmental Cooperation Program – Phase II (hereinafter referred to as the "Program") was signed in Cairo on November 5, 2003, between the Government of Italy (GOI) - acting through the Embassy of Italy in Egypt - as the first Party, and the Government of Egypt (GOE) - acting through the Ministry of State for Environmental Affairs - as the second Party;

WHEREAS the Management Committee of the Italian-Egyptian Debt-for-Development Swap Program approved to co-finance the Program through a specific Project Implementing Agreement, which was signed on January 21, 2004, between the abovementioned Management Committee and the Egyptian Ministry of State for Environmental Affairs / Egyptian Environmental Affairs Agency;

WHEREAS a Third-Party Cost Sharing Agreement was signed on February 18, 2004, between the Government of Italy - acting through the Embassy of Italy in Egypt - as the Donor - and the United Nations Development Program (UNDP), for the provision of support services by the UNDP Egypt Country Office, in the execution and implementation of the Program within the framework of UNDP National Execution arrangement;

WHEREAS a cooperation program in the field of Environment between the GOE and the GOI had been already undertaken from 1998 to 2003 through the initiative "Institutional Support to the EEAA to improve planning capabilities for rehabilitation and protection of natural and cultural environmental resources and implementation of pilot projects within the framework of Egypt's National Environmental Action Plan (NEAP) activities";

WHEREA, in the framework of the above program, a project titled "*Wadi El Rayan Protected Area*", had been already implemented from 1999 to 2002;

WHEREAS the GOE and the GOI – considered the need to further strengthen the institutional capacity of the Nature Conservation Sector (NCS) of the MSEA/EEAA for planning and implementing a sound management of Wadi Rayan Protected Area;

WHEREAS the project "*Wadi El Rayan Protected Area*" (hereinafter referred to as "The Project"), has been implemented from April 2005 to December 2008 in the framework of the MoU, with the aim of supporting the WRPA to be managed in a sustainable manner with the participation of local stakeholders while contributing to the economic development of all Fayoum.

NOW THEREFORE,
UNDP DECLARES THAT

The Project has been substantially completed in accordance with the MoU and with the Project Document originally approved by the Parties and later amended by the Project Executive Committee (PEC), as per Annex 1 "Declaration of Achievement of Expected Results";

APPROVES

To transfer the ownership of the project to the Ministry of State for Environmental Affairs, which in turn definitely assign the ownership of all physical assets purchased, as well as intellectual assets delivered through the Project - as per Annex 2 "*Inventory List*", to the Egyptian Environmental Affairs Agency. Conditions and responsibilities of the recipient party are listed in the Annex 2 "*Declaration on Handing over*";

REQUESTS

The recipient party to guarantee scientific/technical and institutional sustainability and further development to the results achieved by the project as well as to enhance their dissemination and use among the main stakeholders as per Annex 3 "Declaration of commitment towards sustainability of Achieved Results".

•••

The Parties herewith agree to establish, within 15 days from the signature of the present Hand-Over Certificate, a Quadripartite Committee (*Program Follow-Up and Monitoring Committee*, **PFUMC**) composed by two Egyptian Members (nominated by EEAA and by UNDP) and two Italian members (nominated by Italian Embassy and DGCD-Rome) with the mandate of monitoring the results achieved by the Project as well as the implementation of the strategy for their sustainability

PFUMC shall meet regularly for its ordinary tasks or ad-hoc meetings may be called, upon request of any of the Parties and shall issue decisions and resolutions by consensus.

The following Annexes constitutes integral part of this document

Annex 1: *Declaration of Achievement of Expected Results*

Annex 2: *Declaration on Handing over / Inventory List*

Annex 3: Shared-strategy for the sustainability of Project results

Annex 4: *Wadi el Rayan Protected Area Infrastructures Maintenance Plans*

4.1 - Visitor Center of Wadi el Rayan Protected Area

4.2 - Visitor Center of Wadi el Hitan

4.3 - Unpaved Track to Wadi el Hitan

4.4 - Unpaved track between WRPA Headquarter and Madinet Madi

In witness whereof, the parties hereto have agreed the present document in four originals in the English language.

Cairo, 16th December 2010
(Place and date)

United Nations Development Program
Resident Representative

Dr. James W. Rawley

Egyptian Environmental Affairs Agency
Chief Executive Officer

Dr. Mawaheb Abdel Moneim Abou El-Azm

The Minister of State for Environmental Affairs

H.E. Maged George Elias

Annex 1

Declaration of Achievement of Expected Results

This section provides an overview of the main activities and achievement over the three years of the project pertaining to each of the seven key outputs.

- **Key Output 1: PAMU Strengthened**

Output: The Protected Area Management Unit (PAMU) is strengthened through the enhancement of its administrative and technical capacities and increased financial sustainability.

1.1 Infrastructure (see activity 7 for Hitan)

Staff accommodation: Prior to the start of the project, it had been determined that a staff accommodation would be established in Yousef Sadeek for rangers and their families. Land was secured in Yousef Sadeek and the tendering process for design and supervision was carried out. In January 2007, the tender process for the design and construction was stopped by EEAA engineering, as they were to undertake the design work and supervision of construction. Due to ongoing delays in providing designs, and subsequent budget constraints, this activity was cancelled. It was cancelled with consideration given to concerns raised by rangers that the location would not be suitable due to a lack of educational and health facilities for their families. In addition, many rangers felt they would keep their families in their home areas anyway. This suggested that the initial concept was not necessarily well suited for the cultural context. Since renovations were already made to the headquarters accommodation, this no longer seemed appropriate or necessary, in the face of the budget constraint.

Headquarters: Works at the HQ compound included a major renovation of the office, staff accommodation and guard's quarters; expanding the walled compound and parking areas; installing overhead shade in the parking area, and; constructing a storehouse for field equipment and publications. The water filtration unit to provide good water for the staff accommodation, though needed, had to be cancelled due to budget constraints. There is some potential that good water will be piped from Yousef Sadeek, suggesting that a filtration unit may not be required, however this remains uncertain.

Springs Outpost: Improvements to the Springs Outpost were made by closing in the outdoor patio for protection from blowing wind (and to make the space more useful); covering the white block wall with sand-colored plaster; extending the wall to enclose and secure the generator, and; purchasing a new generator for this

outpost. In addition, the unused garage was converted into a new Environmental Education Nature Center (described under education).

Visitor Area WC: Renovation of the old WC in the Main Visitor Area was completed. A new water pump was purchased. Ongoing repairs to the newer WC (constructed in phase I) were made. However, this building suffers serious structural problems and should be permanently closed and demolished. Attempts to have EEAA engineering confirm this were unsuccessful. In future, more WC capacity in the main visitor area is needed, particularly to deal with feasts/holidays.

1.2 Equipment, Vehicles, Office

Vehicles: Three Toyota Hilux trucks were purchased in 2005 and a microbus in 2007. The microbus was purchased to serve multiple functions, including transporting staff to and from Fayoum City and for special tours and visits by local schools. The PA's 9 vehicles, 2 boats and tractor have been maintained in good operating condition. It is noted however that the older vehicles require more maintenance, which will be a significant post-project challenge.

Field equipment: Field equipment was purchased, including 3 binoculars for patrolling and monitoring, a GPS unit, and two generators (for Springs and Hitan outposts). One binocular were given to the Monks to encourage their participation in monitoring and good collaborative relations.

Flora and fauna identification books were purchased for the outposts to improve field identification skills (birds, reptiles, mammals). A paper and electronic filing system and library has been established, per the Mid Term Review recommendations.

Office equipment: Office equipment was purchased including computers, scanners, printers and cameras (per inventory list). An internal network was established to enable common sharing of equipment and file sharing.

Inventory control: A locked room in the HQ was set aside to hold publications and equipment, with access only by security staff. All items are signed-out. An excel database for tracking publications and DVD was developed by the ICM and the security staff were trained on the system. The annual inventory and asset list was maintained and submitted to UNDP and auditors, annually.

1.3 Strengthened Organization (Training, Project Staff, Organization Chart)

Training: A Training Plan was established and implementation continued throughout, with a focus in 2007-08 (see project final report for further details). In total, 48 training programmes were offered through the project and project partners, resulting in 258 person-training opportunities (188 were for WRPA staff;

38 were for QPA staff; 32 for local community people). Some of this was through on the job training, which has inestimable value in terms of depth that can be achieved, review, ongoing coaching and mentoring.

Key highlights included the 7-day intensive course, "*Principles and Practices in PA Management*" offered to WRPA and QPA rangers, and a 4-day camping and lecture-based training for eco-guides (graduates of the Fayoum University Faculty of Tourism). Training manuals and reports were produced for these programmes.

In addition, staff pursuing extra education such as technical school, bachelors, masters and Phd, have received the cost of tuition from the project.

Organizational structure: With the participation of rangers, a new organizational chart and duty handbook (performance management system) was introduced in 2005. In 2007, these were updated, based on lessons learned, and presented to staff by Dr Fouda. Continued effort is required to ensure effective implementation of the organizational structure. Senior staff, especially assistant managers and manager, received on the job skills training related to organizational design and the functioning of a management team (performance evaluation, problem solving, resolving human and financial issues, decision making, etc.).

Project staff was maintained, including 3 drivers, 3 community guards, 1 project officer (secretarial as part of this).

Performance management: A policy and procedure for a performance management system, designed to strengthen the PAMU administrative capacities (output 1), was introduced in 2005. A key strategy in achieving enhanced effectiveness of the PAMU was to improve individual performance of all staff through a result based management (RBM) approach. A monthly assessment of individual performance (e.g., high, medium or low performance under different categories) was implemented.

1.4 Patrolling, Monitoring, Planning and Reporting

Patrolling: Patrolling schedules were established and implemented in all of the PA's sectors. The aim was to have patrolling occurring daily. This resulted in the identification of infractions. Monthly and annual patrolling reports were prepared and included details of schedules, implementation, and results.

Monitoring: (a) Monitoring design: Through the NCSCB component in 2006, a review of management effectiveness was conducted through a 5-day workshop, and a report with implementation actions completed.

As part of this, 87 surveys were conducted with stakeholders, local communities and visitors. The results contributed to the annual work plans, management plan

review. Importantly, the management effectiveness evaluation provided the framework for monitoring, which is now in line with the protected area's key values, threats, and management needs. (It appeared that the initial design from phase I was not fully rationalized or developed in terms of PA needs, and the technical protocols to ensure consistent, replicable measurements of indicators that can show trends over time.)

In 2007, a two-day monitoring workshop for rangers was held to review the current status of monitoring, the methods being used, results to date and future/evolving needs. In general, the implementation of monitoring programmes has been uneven, ranging from poor to good. There is insufficient technical capacity. Following the June monitoring workshop, work proceeded on developing a suite of indicators. The ICM prepared indicator evaluation guidelines to support the evaluation of indicators in a systematic way. This guideline goes with an excel spreadsheet that was also developed and populated with information.

It must be acknowledged that this work was delayed by the absence of the assigned senior ranger who was away from the protected area with other NCS duties (e.g., bird ringing, wetland study, West Nile monitoring, etc.).

The monitoring design will continue to require work beyond the project period, including defining clear measurement protocols and data collection forms for all aspects of monitoring (e.g., biodiversity, visitor, etc.), following implementation, and ensuring data is used and backed-up.

(b) Gazelle monitoring: In 2008, IUCN fielded an expert in Gazelle monitoring; staff were trained and carried out the monitoring and reporting program. An action plan was formulated for the protection of gazelle, and as part of this, an initial cull of feral dogs in WRPA was initiated. The entire gazelle program (monitoring, reporting and implementation of actions) needs to be implemented.

(c) Strategy: An "*Inventory, Monitoring, Research and Reporting Strategy"* was prepared and provides good strategic oversight for this program. Staff should not forget this as a useful guideline for setting priorities.

(d) Bird ringing: In 2007, the management team took a decision to cancel bird ringing at Wadi Rayan (this was shared with PEC). In the opinion of management, with the concurrence of Biomap, the ringing program was not felt to be the best (wisest) use of limited money and time for Rayan, for the following reasons:

- From an operational perspective, the program was unsustainable, as it requires 4 rangers for spring and fall seasons, each, plus vehicles and other support. This is a huge investment of time and money.
- The resulting data is more useful for research at a sub-continental scale; however it is of limited value in supporting the measurement of conservation

success at the park level. Ranger's time can be better focused on conducting annual breeding bird censuses and migration counts/surveys.
- There are many other important monitoring priorities to pursue that are of greater value (e.g., monitoring the threatened Dorcas Gazelle population).

Planning and Reporting:

(a) Business plan: Jointly with the NCSCB component, considerable time was invested in preparing the Wadi Rayan business plan.

(b) Management plan: the management plan review was reviewed and presented to NCS.

(c) Lake levels: The problem with low water levels in the Rayan Lakes continued with alarming declines in the levels in the latter half of the project. New islands have appeared in the lower lake, with vegetation taking hold. The nature of this problem of declining lake levels was communicated through meetings with the governorate, though a concerted communications effort has not yet been undertaken. The key problems of declining lake levels are:

- Eco-tourism infrastructure investments are lost or compromised (e.g., campsites) because they're too far away from the shoreline. Effective planning is not possible because of the uncertain future, and therefore plans for Mudowera were not pursued.
- Shorelines are muddy and unsightly, and therefore unpleasant for tourists.
- Vegetation has died, creating fire hazard.
- Pollution, salts and other compounds have increased in concentration.
- The volume of water coming over the waterfalls has declined, making this a less interesting tourist attraction.

1.5 Law Enforcement

Licensing: Consistent with the WRPA annual work plan, the Mid Term Evaluation recommended that the licensing system should be revised so as to ensure that EEAA has the full control over license issuance. During the project, WRPA made efforts to advance work on regulating and licensing processes. This has included the preparation of a discussion paper, assigning a staff person to work with LIF Project, and having meetings. There were no substantive results.

This is an institutional issue that affects more than WRPA and should be led by LIFP or other national level project or focal point. It is very difficult to make these interventions from the local level when decentralisation is not yet effective. Consistent with the design of EIECP, a national level focal point should take the lead and use WRPA as a demonstration site.

Work permit: A new work permit application form was developed and used with fish farmers who are building new structures. They are required to make application prior to initiating work and deliver of construction materials so that rangers can mitigate potential problems.

1.6 Sustainable Financing

Efforts continued to develop sustainable financing mechanisms, including the processes that lead to effective and sustained cooperation. Sustainable financing relies on such processes and cooperation as a means to establish a diverse source of stable funds (not just large donations which tend to be characterized by periods of high and low investment – the 'boom and bust' cycle).

In support of this, a sustainable financing strategy was presented to PEC in 2007 and the new business plan was completed, which is a key milestone on the road to sustainability. The business has four key strategies (see diagram).

The new *Friends of Hitan* NGO was approved by Ministry of Social Services in June 2008.

The Friends Hitan has excellent potential to provide a mechanism for generating and retaining revenues and developing partnerships.

The NGO can receive donations from individuals such as Hitan visitors (who have often expressed their willingness to donate) and from companies and other donors. It can also sell products (DVD, brochures) and provide educational services to generate revenues such as special events, tours, environmental education camp, etc.). The Friends should continuously work to develop new products to generate new revenues.

However, to achieve an active and prosperous programme, the Friends will need professional assistance and strong cooperation/support from NCS/EEAA. Local community members, especially from Tunis, have many professional skills to draw upon, as well as concern for the protected area.

Additional initiatives included the following:

- A cooperation agreement with the Centre for the Documentation of Culture and Nature in Egypt (CULTNAT) was signed for the printing and revenue retention of brochures, with the first project being the Birds of Wadi El Rayan and Bird Checklist. Under this agreement, CULTNAT paid to have an additional 1,000 English, 1,000 Arabic and 500 checklists printed. They will sell these and maintain a separate account for printing WR educational products.
- A policy for The Friends of Whale Valley NGO was written, and subsequently used to formulate the official papers for the NGO.

- To encourage local support, a public presentation was held in Tunis in December 2007. The new Hitan DVD was presented, along with photographs of Hitan development and a powerpoint programme about the Friends NGO. In preparation for establishing the Friends, and to test support for the new organizations, Friends memberships were sold together with some DVDs and brochures. All transactions were documented and receipts used, to enable transparency and professionalism. The revenues will be used to support the new NGO.
- The sponsorship brochure was printed and was distributed.
- The sale of the new DVD and brochures was tested at Wadi El Hitan (DVD-40 LE; Hitan guide to the open air museum-15 LE; Birds-8 LE).
- A poster to advertise these products was prepared. The testing of sales was being conducted under the project in anticipation that a mechanism will be established through the Friends of Hitan.
- Policies, Procedures and Forms were written to support the testing of selling products, and translated to Arabic, and a Consignment of Products Database was designed.
- Additional fund raising was conducted to support extra activities. For example:
    - The travel company, Egypt Uncovered, funded new garbage bins in the Main Visitor Area and some stone signs.
    - E_3OP (through US-AID) funded work at the new Oasis Nature Center.
    - A presentation and proposal was made to Shell Egypt for the sponsorship of a full sized cast Dorudon, for the new Visitor Center.

o Key Output 2: EMU Enhanced

Outcome: The enhancement of the management capacity of the local Environmental Management Unit (EMU) office in the Fayoum Governorate.

The project co-managers held exploratory meetings with DANITA & EMU in 2006, and a report was submitted to the PEC. Following PEC discussion, this activity was re-oriented given that the EMU was being supported by a Danish project.

The primary focus was on maintaining normal and ongoing cooperation and communications with the governorate office. Discussions were held with the Governorate about establishing public transportation to the local area, including WRPA. This will require more discussion, but generally, does not appear to be a priority for the governorate at this time. ARCGIS software was purchased and training provided to EMU staff.

- **Key Output 3: Collaborative Management**

Output: Key stakeholders are involved in the collaborative management (CM) of the protected area.

3.1 Technical Investigation of Springs

A study on the water resource of the springs was completed and sent to NCS, PCU, NCSCBP and the Monks. Discussion on this was had with the Monks. The PAMU has been informed in the past by the Monks that such technical studies are not needed.

The Monks were involved in gazelle monitoring in 2008. Binoculars, a bird book and publications were given to the Monks to encourage involvement and cooperation.

3.2 Eco-products for Local Benefits

Training in the land reclamation for 30 women in craft skills was undertaken. This occurred through the project, and also in a separate, but coordinated initiative through COSPE and the land reclamation project.

The project funded COSPE to undertake a needs analysis; following the final report,
the WRPA project strategy was set. The focus for WRPA is to establish selling points and relationships with local producers. The project focus was not aimed to directly undertake skills training with local communities because other projects/organizations are fulfilling this role in various ways. In addition, this requires a long term, sustained effort. The limited funds in the WRPA project were instead planned to be focused on establishing the selling points as a means to provide revenue generation opportunities for local crafts people. This strategy remains valid, however, due to budget pressures in 2008, completion of this work was not possible.

Four opportunities for selling were envisioned and could be pursued in the future:

1. On-site selling at the land reclamation where kleem carpets were being made (it is noted however that recently the kleem making has ceased);
2. The Main Visitor Area which has this included in the re-designed landscape plan (see activity 4.3);
3. The Main Gate;
4. Wadi El Hitan: the gift shop now in operation offers some local products, though there is room for an enhanced focus on local products. The operator is being encouraged to offer an “organic foods” menu with the organic products coming from the Land Reclamation area.

In addition, CISS and FTA have planned other locations in Fayoum for selling local products.

3.3 Awareness Activities & Collaborative Management Agreements

In an effort to improve collaborative management, quarterly meetings were held with the petroleum company, fishers, tourism operators, land reclamation project and cafeteria and boat owners, the Fayoum Governorate, and the prosecution. The meetings provided a means to communicate about needs and issues on both sides, and to reinforce key messages about protected area rules. Examples included oil company approvals and clearing the asphalt road of sand; rules for fishing; challenges with enforcing and prosecuting falcon hunters, monks, etc., cafeteria operations and garbage problems at the beach, and; infrastructure improvements to the main visitor area.

In 2007, WRPA hosted a USFS landscape architect to examine the Main Visitor Area. As part of this mission, WRPA staff had several on-site meetings with cafeteria and boat owners to discuss visitor area problems and solutions. Regular meetings and involvement of these stakeholders gave a spirit of cooperation between cafeteria owners and with the PAMU. The key to realizing success is to advance the work programme, with their continued involvement (see activity 4.3).

Two fishermen were contracted on a part-time basis under the project to serve as Community Guards for the bird hide and campsite. These are local individuals who work in the area of these facilities.

- **Key Output 4: Ecotourism**

Output: The ecotourism sector linked to the PA is developed and diversified.

4.1 Camping Areas, Bird Hides, Trails, Lookouts

A new bird hide on the Upper Lake and a camping site on the Lower Lake were constructed.

Mudawera: Investing time and effort in preparing a site plan for Mudawera was not warranted, beyond that which exists for the parking area to access the scenic mountain area. The bay and shoreline is affected by declining water levels and therefore muddy shorelines. The unstable water conditions makes it difficult to plan (and invest in improvements) with any degree of certainty. There are clear signs of substantial declining water levels in this bay with three new islands appearing over a two month period!

In addition, the Ministry of Agriculture constructed a drainage pipeline to this bay and in view of the scenic resource. The impacts at this time are unknown and further consideration at this time is inadvisable. Without cost, the road way should be lined with stone to prevent cars from driving up the mountain, and a proper entrance to the parking area and walking pathway should be delineated.

Camel trekking: A camel trekking opportunity in the Springs Oasis was discussed as part of business planning. However, in light of the results from the gazelle monitoring work (January 2008), this should not be pursued in the springs area to avoid unnecessary disturbance of the small and fragile gazelle population. Camel trekking could be offered around the scenic lakes.

Tracks: Tracks were maintained and the entrance to the Main Visitor Area re-aligned to increase safety. For this work, a partnership was arranged with Yousef Sadeek Town to use their grader, in return for some maintenance of the grader. The grader will be used to grade the tracks around the lakes.

The Hitan track, constructed in 2006, remained a problem as it was unfunded. Minor maintenance was carried out in mid 2007 by EEAA, however, a sustainable programme or funding has not yet been established. Maintenance on this type of road is required every three months.

4.3 Main Visitor Area & Main Gate

Main visitor area: Good progress was made in the planning and re-design of these areas (construction is still required). The USFS landscape architect was on-site for 10 days, during which time, several meetings and extensive planning was done. Input was obtained from cafeteria and boat owner stakeholders, WRPA staff, Ministry of Culture environmental design unit staff, Shaboury and Associates (visitor center consultants) and Dr Fouda. Several draft landscape plans were reviewed and a final prepared.

A detailed implementation plan was prepared to properly sequence and schedule the work, as there are many components, and to estimate the costs (estimated to be about 400,000 LE). Completing the work in the landscape plan was beyond the scope of the project budget and timetable as this is a multi-year project. It is recommended that the EPF provide a new project for the area's re-development.

The Ministry of Culture environmental design unit has expertise in landscape planning. They have offered to provide their staff services, free of charge, to support the Main Visitor Area project. This is needed support. Several on-site meetings were held with the unit.

Main gate: A new Main Gate was designed by the Ministry of Culture design unit, in cooperation with WRPA staff, after identifying needs. The detailed working drawings were prepared for tendering. The conceptual architectural

scheme has been well received by most people. The development is estimated to cost $50,000. The EPF (as part of the main visitor area project) should fund this project.

4.4 Signs

New stone signs were constructed using natural materials that are consistent with the local natural landscape. This included hand-carving the letters into the limestone rock, constructing stone monuments, mounting the signs, and finishing the base monuments. This was challenging work, given the size and weight of the stone signs.

Old metal signs have been removed and stone signs have now been installed by the Oil Company and fish farms owners.

4.5 Ecotourism Guide Training

Ecotourism guide training was designed and implemented in cooperation with CISS and the Fayoum Tourism Authority. Eight graduates of the Fayoum Faculty of Tourism were trained, which included camping and site visits to locations in WRPA and QPA. Efforts were made to find work for the eco-guides, including promoting their availability.

4.6 Visitor Security System

Discussions were held with security and tourism police, including generals from Fayoum. They indicated that the issue of having a police escort and allowing people to stay overnight at the safary camp requires high level approval from Cairo, suggesting that a national office approach was required. Writing up the history of the visitor security system by the NCM was never submitted. The conclusion is that the

4.7 Ecotourism Promotion and Marketing

Media and Publications: Associated with (and following) the Hitan inauguration in 2008, considerable media interest. An increase in visitation and awareness was noted and recorded. Publications such as the Discovery Guide were found to be effective for marketing and in providing visitor information. Several articles were written about Hitan in various national and international media. The project prepared 5 media briefs.

Marketing plan: A marketing plan was prepared. It focused on low cost but effective methods to stimulate interest and visitation to WRPA/Hitan. (see recommendations)

- **Key Output 5: Medinet Madi**

Output: The recreational & educational functions of WRPA and Medinet Madi are integrated.

Cooperation: Collaborative Committee meetings held with CISS-Fayoum Tourism Authority and SCA-Medinet Madi Project to enhance collaboration. The project and Fayoum SCA staff were very cooperative and supportive of WRPA. SCA-MM project provided training for 3 rangers on GIS.

Connecting track: An Environmental Impact Statement for new road options connecting WRPA to Medinet Madi was prepared, reviewed and finalized. However, there was insufficient funding in both the WRPA and MM projects to implement the track, at the level that is needed to realize effective tourism development. The PCU noted the following, which must be taken into consideration as the project proceeds:

> *"Concerning the "new road" connecting WRPA to Medinet Madi, the EIA has been concluded. Decisions have to be taken concerning the location (two alternatives have been proposed) and the technical specifications. Both decisions are correlated to financial availability of the budget of ISSEMM project, which is supposed to provide the financial resources but are resulting not adequate for the activity. Moreover, the effects of the road must also be evaluated from the point of view of the Medinet Madi's carrying capacity of the visitors. At this stage it is recommended that WRPA and ISSEMM projects continue to work together with the high spirit of collaboration that has been shown throughout on finalizing the technical and financial proposal, which will be agreed upon by the decision makers of SCA and NCS/EEAA."*

The SCA-Medinet Madi Project was suspended during this period. Despite this, the cultural values of Medinet Madi continue to be highlighted in WRPA publications (e.g., the Visitor Discovery Guide), including writing a display panel for the new visitor centre exhibits.

- **Key Output 6: Environmental Education**

Output: Wadi El-Rayan becomes a leading site for environmental education.

6.1 Visitor Center Improvements

Renovations + New Exhibits: The Visitor Centre project involved major renovations to the building (constructed in phase I) and a complete new set of

exhibits, including a new focus on Valley of the Whales World Heritage Site. This activity realized the following achievements, despite some setbacks along the way:

- An IUCN consultant was on-site to research and write Visitor Center display panel text. Draft text was reviewed prior to finalization and translation.
- Shaboury and Associates were awarded the contract to design/re-design the center and to design and fabricate the displays (following UNDP CAP approval). Architectural improvements and specifications were developed and approved.
- A tender for the construction works to carry out the physical modifications and additions to the existing building was undertaken. However, due to the higher than anticipated costs of construction that were over the budget, the construction works were set out in a phased approach. Subsequently, the first phase was delayed pending approval of the emergency budget, and in the meantime, the tender had to be renegotiated based on the first phase due to increasing costs of materials.
- Sponsorship of a full size Dorudon whale cast was being sought at the time of writing. An accurate and high quality Dorudon cast, which is based on a Hitan specimen, can be purchased for about $35,000 from a company recommended by Dr Gingerich. The proposal by the Italian company, Stoneage, warrants further consideration, especially concerning establishing a fossil lab. However, it is recommended that Dr Gingerich work directly with Stoneage to find suitable mutual arrangements.

Oasis Nature Center: As a result of the improvements to the Visitor Center, an opportunity arose to establish a new environmental education facility. The unused garage at the Springs Outpost was renovated to become the new Nature Center. The old VC displays were re-used, along with surplus lights, windows, doors, and bricks. Educational activities were designed for use in the new nature center. Through this project, the investments of phase I have been put to good use.

6.2 Information, Education & Communications Materials

An Information, Education, Communications Plan was prepared and translated into Arabic. Arising from this plan, several products were completed through the project, including the following:

- Printing 3,000 copies of the ***Birds of Wadi El-Rayan*** (colour) in separate English and Arabic brochures, and 500 Checklist of the Birds (B&W) (bilingual English/Arabic). An additional 1,000 copies of each of the English and Arabic birds, and 500 checklists were printed by CULTNAT, under agreement (section 1.6).

- Printing 10,000 copies of the ***Guide to Wadi El-Hitan Open Air Museum*** in separate English and Arabic. Translation into French and German has been initiated through the voluntary offer of Palm Press. Translation into Italian will also be sought, along with sponsorships to print the additional languages.
- Printing 2,000 copies of the ***Sponsorship Opportunities*** in separate English and Arabic brochures.
- ***"Whales of the Desert" DVD*** about Hitan. 1000 copies were printed. Total cost, including aerial photography was about 120,000 le. In the fourth quarter, the Minister required changes to the DVD, which were completed.
- WRPA Visitor ***Discovery Guide***: 15,000 English copies and 35,000 Arabic copies. This is given to all visitors and used for marketing and promotion. Cost was 50 piasters each.
- ***Visitor's Map for Hitan Open Air Museum***: 5000 copies were printed in English and Arabic. Distribution is free.
- ***Hitan newsletter***.
- The ***poster*** from phase I was re-designed and 1000 copies were printed along with the logo sticker.
- Design of additional new display panels for Hitan, per the Minister's request. These were written, translated and produced in clay.

Most of these materials were posted on the EIECP website.

A price list was established for selling products and was being tested at Hitan. The strategy is to have The Friends of Hitan retain funds from sales, for re-printing. This will include the Hitan DVD.

6.3 Education Inside and Outside WRPA

An IUCN consultant was engaged to research the Hitan storyline for the display panels at Hitan, and to prepare an interpretive-education plan for WRPA.

The educational programme was active during the project. Rangers made hundreds of school visits in the area, and met many thousands of students in the PA. Exact figures are not available, but it is estimated that more than 10,000 were received. The two education rangers hosted two children's festivals in WRPA (120 + 500 participants). Regular operating hours for the Visitor Centre were established and implemented.

There was strong cooperation with the US-AID project staff in Fayoum, called Egyptian Environmental Education Outreach Programme. They provided training to the rangers and cooperated in holding events.

6.4 Research Programme

Dr Philip Gingerich, University of Michigan conducted several field missions during the three years of the project, yielding many positive results in terms of important new areas and new species to science. The Bascilosaurus fossil excavated in 2004-05 was finally shipped to University of Michigan, where it is now being prepared. Michigan has also been very supportive in training rangers at Hitan and in the Michigan lab (twice). In addition, Dr Gingerich has indicated his support for assisting with the provision of fossil casts, graphics and technical reviews for the Visitor Center. This support should be acknowleged in the new VC, perhaps by establishing a "twin museum" programme (similar to the Gran Sasso twin park programme).

Informal discussions about establishing some kind of cooperative research forum and annual conference were held with Dr Sherif Baha El Din, Dr Hala Barakat and Dr Khassas. There wasn't an immediate agreement on this idea and it was noted that there is a science council. Further discussion is suggested, possibly with the national NGO, Nature Conservation Egypt.

- **Key Output 7: Wadi El-Hitan World Heritage Site**

Output: The Wadi El-Hitan area of the WRPA is effectively managed as a world heritage site.

The outputs of this activity have been significant and have consumed more than the initial project and budget plan. Prior to the project there was no infrastructure or on-site management. Today, there is a world class facility, receiving wide spread praise.

7.1 Site Specific Conservation Plan

A Project Plan was established to guide site conservation and development. It comprised five key components: management plan; site plan & development; information, education and communications; operations & business planning; monitoring, research and reporting.
In 2006, the first Hitan Workshop was held at the Panorama Hotel, with a field trip to Hitan. Positive feedback was received from many participants, which include tour operators, local businesses, governmental staff and others.

The management plan review was being written at the time of writing this report. It will include considerations for access, visitor use, restricted areas for research, monitoring, etc.

7.2 Close the Valley to Traffic

The valley was functionally closed to vehicular traffic since the end of 2006. This was done by laying down 4.5 km of large stone, spaced at about 1 meter apart. Response to this by visitors has been overwhelmingly positive. They like the silence and no disturbance in the valley; they understand the need for this action. As part of this initiative, options for closing the valley and for establishing a transportation system in the valley were drafted for discussion. A camel cart was designed, constructed and tested. It was well-received by visitors, though operational challenges were experienced with the cart. In the end, the preferred access by virtually all visitors is on foot (see below).

Tracks have been marked from Baharia and 6th October to guide visitors to the parking area, and away from the older entrances.

In 2007, a small group of Belgian embassy staff drove around the barriers and proceeded into the valley, driving beside the established track. This incident was documented through letters, and subsequently in a letter to the Ambassador from the Minister. PAMU was informed that an apology was made. The media story was picked up by Associated Press, giving the issue world wide coverage. The messages were generally positive toward protection and management efforts and unsympathetic to the individuals who broke the rules. Since then, additional signs have been added to the valley entrance. It should be noted that this kind of behavior is not the norm; most people willingly respect the rules, and are in fact very supportive of the rules.

7.3 Infrastructure

Parking area: Infrastructure for the Hitan visitor area was established, including the following:

- Parking to hold about 80 cars.
- Ticket station with two rooms.
- A visitor reception/display shelter with displays.
- A cafeteria and gift shop.
- A police station.
- Men's and women's WCs.
- Camel shed.
- Guard's quarters.
- Solar panel system.
- For the inauguration, EEAA installed an asphalt helicopter pad beside the road.
- An introductory sign at the sculptured entrance to Hitan.
- An entrance structure constructed of mud brick and tawfla was designed to resemble the abstract form of a whale.

The planned developments (with the exception of the helicopter pad) can be considered to be carbon neutral in that they use natural materials that store carbon and use solar panels that don't emit carbon, as generators do. This is an important ideal to retain in the operations because a part of the story of Wadi el Hitan is about climate change. This presents an opportunity for Italian Cooperation and NCS and its partners to demonstrate positive environmentally conscious actions.

The sewage system for the cafeteria needs to be re-considered since the initial design was under-capacity. Options are under consideration at the time of writing, and it is anticipated that a new holding tank will be installed.

Outpost improvements: In 2006, a permanent tented camp was established at Hitan for the first time, housing a team of staff to oversee the site. Six tents were set up and outfitted with beds, generator, a kitchen (refrigerator, cooking equipment), laptop computer, camera, field tools, etc. In 2007, the tents were replaced with a 'temporary' building comprising a kitchen, living area and two bedrooms, with a detached WC.

A tender process for the Hitan outpost (full size facility) was undertaken between May-July, with UNDP CAP approval in July. The contract was signed in August and the NCM determined that construction would start after Ramadan. Construction was not started, and subsequently, it was put on hold pending the anticipated visit of the First Lady in November. After that, an emergency budget was approved, requiring a delay until after March 2008. In the meantime, costs of cement and iron rose dramatically, thus requiring re-tendering. However, with the ongoing budget pressures, sufficient funding was no longer available to carry out the full project, and therefore improvements to the existing outpost were made.

Improvements to the outpost consisted of a new building with six rooms: living area, 3 bedrooms, kitchen and WC. The 'temporary' outpost will be retained for several purposes such as: research camp for Michigan, volunteers, extra staff, and storehouse.

7.4 Track Establishment

A new track connecting the asphalt road to Hitan was completed in the spring of 2006. It was located in a different area from the initial track because (a) the route had no significant sand dunes as the old one had, indicating lower construction and maintenance costs, and (b) it entered to the SE end of the valley, providing a shorter walk for visitors to the best area for the open air museum.

Maintenance of this track has been problematic as it quickly degrades. This leads to safety problems, visitor complaints, negative marketing, and fewer visitors.

In addition, track maintenance has been by grading: on its own, grading will only remove the surface materials, and in due time, result in removal of all materials. Track maintenance requires adding new material and preparing the surface. This is an ongoing requirement. There is no budget for this road.

7.5 Camping Site

New campsite locations were identified and established with the assistance of the Hitan operator, Hany Zaky, who is currently using such sites. Improvements could be considered as part of the proposed contract for the Hitan operations.

7.6 Open Air Museum

The open air museum was established and is operating effectively, including tours provided by staff. The response from visitors has been overwhelmingly positive. A visitor survey was introduced and regular visitor monitoring conducted.

The Open Air Museum developments (and project investments) included the following:

- Detailed site planning for infrastructure. Technical advice and input from Gran Sasso staff was particularly helpful in evaluating options, needs and concepts.
- IUCN consultant who researched and wrote display panels.
- Design and construction of 7 mud-brick shade structures, housing display panels at key fossil sites. Gran Sasso funded this work. Local site workers followed low impact construction, including use of donkeys to transport mud bricks to the sites.
- Planning, routing and marking (with small stones) 7 km of walking tracks, as presented in the new Open Air Museum Guide (a short and long walk route). These pathways have been tremendously successful as visitors like to follow them.
- Purchase of clay columns and ropes made from braided palm leaves, made locally in Nhazla Village for installation around the fossil sites.
- Making of baked clay number signs and direction arrows to go with the guidebook was done by local potter Ahmed AbuZeid.
- Baked clay name signs for fossil sites.

In support of these achievements, the following activities were conducted:

- An Environmental Impact Statement (mitigation plan) was prepared.
- A Visitor Management Plan was drafted to better understand how all of the components and aspects of the site would come together.
- Pricing structures for camel and cart hires were examined to understand feasibility, profitability, etc. These were later used in business planning.

7.7-7.8 Training and Research

In 2005, a four-year agreement was signed between EEAA-EGSMA-MICHIGAN UNIVERSITY to further develop, study and publicize the scientific resources of the site.

As noted previously, Dr Philip Gingerich, University of Michigan conducted several field missions during the three years of the project, yielding many positive results in terms of important new areas and new species to science. The Basilosaurus fossil excavated in 2004-05 was finally shipped to University of Michigan, where it is now being prepared.

Dr Gingerich/Michigan has also been very supportive in training rangers at Hitan during the field missions, and also in the Michigan lab (twice). Funding has come through the US-Egypt Joint Technology Fund and through this EIECP project. In addition, Dr Gingerich has indicated his support for assisting with the provision of fossil casts, graphics and technical reviews for the Visitor Center.

7.9 State of the World Heritage Report

In 2006, the 1st evaluation report to UNESCO was prepared with positive response from UNESCO and IUCN. In accordance with World Heritage guidelines, a report will be required by UNESCO every six years, according to their schedule (at this time, Hitan is not scheduled). However, to ensure effective management, an annual evaluation of management effectiveness should be conducted.

In 2007, two UNESCO advisers from the Paris office visited Wadi El Hitan and Rayan with the ICM. The team subsequently filed a very positive report, including recommendations. A response report was drafted by the ICM for the Minister to reply.

7.10 Operate Wadi El Hitan

Staff have continued to maintain the World Heritage Site in a clean and protected state.

The cafeteria, giftshop, WCs, camels and camping is presently being operated by Hani Zaky as a test case to find the problems and needs, and to get the site operating. Substantial progress has been made by Mr Zaky in getting the cafeteria and gift shop stocked with materials and operating. He has the necessary support and equipment to offer camping, 'on demand'.

A contract for Hitan operations was been drafted for consideration by NCS. It is aimed at establishing a mechanism that will assure high quality maintenance of facilities and high quality provision of services. The contract should take into consideration the following:

- Ongoing care and maintenance of the whole site, including WCs and supplying water.
- Methods to direct contract lease payments (if any) back to Hitan for ongoing facility and service improvements.
- Mechanisms to enable operation of related opportunities such as camping sites, camels, etc.

7.11 Secure WHS & Institute Entry Permits & Enforce Measures

Further discussion about a separate entrance fee to the open air museum is needed. This mechanism would be helpful (and supported by visitors) if the funds could be collected by and retained by The Friends of Hitan or another mechanism such as the training centre model.

Patrolling is conducted on an ongoing basis. Effort is made to meet all visitors.

7.12 Hitan Sponsorship and Collaboration Venture

Several steps have been taken to advance this, as noted in section 1.6. The Friends of Hitan approval is anticipated. Brochures have been printed for sale by/revenues retained by The Friends. The Hitan Sponsorship Brochure was printed.

First Lady Inauguration Event

In February 2008, the First Lady of Egypt, Mrs Suzanne Mubarek visited Hitan for the inauguration event. The project sponsored much of the event. Many dignitaries and media attended, and this led to considerable media attention and public awareness. Visits have increased over the same periods in the previous two years.

Annex 2

Declaration on Handing over

UNDP certifies that all physical assets purchased and used during project implementation, as well as all intellectual assets delivered through the above project - as per the Inventory List here below - have been delivered to the Egyptian Environmental Affairs Agency.

The recipient Party commits, at its own expense, to keep and maintain in good condition and repair the assets listed here below, as well as to make use of them for the same objectives, target area and target beneficiaries of the project and in accordance to the *Shared-strategy for the sustainability of Project results* (Annex 3)

Inventory List

Physical assets:

Asset description	Entity in charge	Location /Office
IBM Think Centre # 1,17 IBM Monitor	EEAA / WRPA MU	PAMU Headquarter
IBM Think Centre # 2,17 IBM Monitor	EEAA / WRPA MU	PAMU Headquarter
HP dx6100ut Desktop # 1	EEAA / WRPA MU	PAMU Headquarter
17 HP Monitor	EEAA / WRPA MU	PAMU Headquarter
HP dx6100ut Desktop #2	EEAA / WRPA MU	PAMU Headquarter
17 HP Monitor	EEAA / WRPA MU	PAMU Headquarter
Dell Optiplex Desktop	EEAA / WRPA MU	PAMU Headquarter
17 Dell Monitor	EEAA / WRPA MU	PAMU Headquarter
7 Motorola Cell Phone Serial Number (018TGL3389-018TGL3391- 018tgl3391-018tgl3383-018tgl3312-018tgl3390-018tgl3392)	EEAA / WRPA MU	PAMU Headquarter
2 Table	EEAA / WRPA MU	PAMU Headquarter
Office	EEAA / WRPA MU	PAMU Headquarter
1 Indian Tent (4*6)	EEAA / WRPA MU	PAMU Headquarter

Asset description	Entity in charge	Location /Office
Daly Star 9500 Satellite Receiver	EEAA / WRPA MU	PAMU Headquarter
Olympus Memory Card	EEAA / WRPA MU	PAMU Headquarter
Olympus Camera (C770)	EEAA / WRPA MU	PAMU Headquarter
Olympus Memory Card	EEAA / WRPA MU	PAMU Headquarter
WK 300	EEAA / WRPA MU	PAMU Headquarter
2 Gas Fuel Tank	EEAA / WRPA MU	PAMU Headquarter
14 Office (L-Shape,130*120)	EEAA / WRPA MU	PAMU Headquarter
2 Vertical Book Clipboard	EEAA / WRPA MU	PAMU Headquarter
22 Hydraulic Wheels	EEAA / WRPA MU	PAMU Headquarter
2 TV Holder	EEAA / WRPA MU	PAMU Headquarter
2 Refrigerator (18 Feet)	EEAA / WRPA MU	PAMU Headquarter
Food Cooker (5 Lamp ST,60*80)	EEAA / WRPA MU	PAMU Headquarter
Kitchen	EEAA / WRPA MU	PAMU Headquarter
2 Metal Bed (1 Meter)	EEAA / WRPA MU	PAMU Headquarter
5 Bed Side Table	EEAA / WRPA MU	PAMU Headquarter
25 Chair	EEAA / WRPA MU	PAMU Headquarter
2 Compass	EEAA / WRPA MU	PAMU Headquarter
1 Personal Water Tank (Coalman)	EEAA / WRPA MU	PAMU Headquarter
Solar Fuel Tank Trailer	EEAA / WRPA MU	PAMU Headquarter
1 Panasonic Data-Show Device	EEAA / WRPA MU	PAMU Headquarter
VGA Card	EEAA / WRPA MU	PAMU Headquarter
2 Wooden Bed (1 Meter)	EEAA / WRPA MU	PAMU Headquarter
1 Metal Bed (2 Meter)	EEAA / WRPA MU	PAMU Headquarter
1 Fixed Fan	EEAA / WRPA MU	PAMU Headquarter
1 Printer	EEAA / WRPA MU	PAMU Headquarter

Asset description	Entity in charge	Location /Office
1 Electrical Current Stabilizer (3 KW Japanese)	EEAA / WRPA MU	PAMU Headquarter
1 Safe	EEAA / WRPA MU	PAMU Headquarter
1 Italian Book Clipboard	EEAA / WRPA MU	PAMU Headquarter
No Frost Refrigerator (10 Feet)	EEAA / WRPA MU	PAMU Headquarter
Food Cooker (Universal)	EEAA / WRPA MU	PAMU Headquarter
Water Heater (60 Liter)	EEAA / WRPA MU	PAMU Headquarter
4 Mosquito Killer (3 Lamp,60 cm)	EEAA / WRPA MU	PAMU Headquarter
2 Mosquito Killer (2 Lamp,60 cm)	EEAA / WRPA MU	PAMU Headquarter
4 Automatic Powder Extinguisher (12 kg)	EEAA / WRPA MU	PAMU Headquarter
12 Powder Extinguisher (6 kg)	EEAA / WRPA MU	PAMU Headquarter
5 Powder Extinguisher (3 kg)	EEAA / WRPA MU	PAMU Headquarter
15 Fire Head Cap	EEAA / WRPA MU	PAMU Headquarter
Dell PC (Optiplex GX 520), Windows XP Pro	EEAA / WRPA MU	PAMU Headquarter
Dell Monitor PC 529 17 in LCD -Dell	EEAA / WRPA MU	PAMU Headquarter
Hard Disk 80 GB (Toshiba)	EEAA / WRPA MU	PAMU Headquarter
Dsc-w70 SONY Digital Camera	EEAA / WRPA MU	PAMU Headquarter
Mikalite F2L511 (12 K F) Generation	EEAA / WRPA MU	PAMU Headquarter
TV	EEAA / WRPA MU	PAMU Headquarter
Iron	EEAA / WRPA MU	PAMU Headquarter
Printer HP 1018 Laser Jet	EEAA / WRPA MU	PAMU Headquarter
Scanner Canon	EEAA / WRPA MU	PAMU Headquarter
HP 1100 Laser Jet Printer	EEAA / WRPA MU	PAMU Headquarter
DX6120 HP Compaq PC + S7540 HP 17 Monitor	EEAA / WRPA MU	PAMU Headquarter
DX6120 HP Compaq PC + S7540 HP 17 Monitor	EEAA / WRPA MU	Wadi el Hitan outpost
DX6120 HP Compaq PC + S7540 HP 17 Monitor	EEAA / WRPA MU	Lake Qarun Protected Area

Asset description	Entity in charge	Location /Office
ArcView 9.2 Single use License	EEAA / WRPA MU	PAMU Headquarter / Arafa el Said
Acer Laptop # 7	EEAA / WRPA MU	PAMU Headquarter / Hossam Kamel
Dell Latitude D510 Laptop # 2	EEAA / WRPA MU	PAMU Headquarter / Mohammed Talal
HP Laptop # 5	EEAA / WRPA MU	PAMU Headquarter Arafa EL Sayed
Dsc-w70 Digital Camera with VAT	EEAA / WRPA MU	PAMU Headquarter/ Hossam Kamel
German GPS	EEAA / WRPA MU	PAMU Headquarter/ Mohamed Ali
Chine Binoculars	EEAA / WRPA MU	PAMU Headquarter/ Mohamed Ali
Dell Latitude D510 Laptop # 3	EEAA / WRPA MU	PAMU Headquarter/ Mohamed Mayhobe
Dell Latitude 110L Laptop # 4	EEAA / WRPA MU	PAMU Headquarter/ Mohammed Ismail
Dell Latitude 505 Laptop # 6	EEAA / WRPA MU	PAMU Headquarter/ Mohammed Ismail
H Disk 120 GB Note Book	EEAA / WRPA MU	PAMU Headquarter/Hossam Kamel
ASUS Note Book Charger	EEAA / WRPA MU	PAMU Headquarter/Hossam Kamel
Ram 1 GB DDR Note Book	EEAA / WRPA MU	PAMU Headquarter/Hossam Kamel
HIACE Commuter DL 16 MID ROOF Model	EEAA / WRPA MU	PAMU Headquarter/Mohamed Abass
Zexel Switch 24 Ports	EEAA / WRPA MU	PAMU Headquarter
14 Vertical Book Clipboard	EEAA / WRPA MU	PAMU Headquarter +Springs area outpost +Wadi el Hitan outpost
Motor Calpida (Water)	EEAA / WRPA MU	PAMU Headquarter
Motor Calpida (Water)	EEAA / WRPA MU	Wadi el Hitan outpost
Dell Latitude D510 Laptop # 1	EEAA / WRPA MU	PAMU Headquarter / Wed Abd el Latif
Honda Generator EP 3800 CX	EEAA / WRPA MU	Beach outpost / Mohamed Hussein
Toshiba Fan	EEAA / WRPA MU	Beach outpost / Mohamed Hussein
Water Machinary w30 GX 160	EEAA / WRPA MU	Beach outpost /Mohamed Hussein
1 Refrigerator (10 Feet,2 Doors, No Frost)	EEAA / WRPA MU	Beach outpost

Asset description	Entity in charge	Location /Office
Motorola Cell Phone	EEAA / WRPA MU	Car # 70725
Motorola Cell Phone Serial 103TFU6367	EEAA / WRPA MU	Car # 71986
Motorola Cell Phone Serial 103TFY6530	EEAA / WRPA MU	Car # 73376
Motorola Cell Phone Serial 103TFU6366	EEAA / WRPA MU	Car # 75134
1 Electrical Current Stabilizer (1 KW Japanese)	EEAA / WRPA MU	PAMU Headquarter
2 HP Printer 1280	EEAA / WRPA MU	PAMU Headquarter
Radio-Cassette	EEAA / WRPA MU	Toyota Hilux
BenQ 5000 Color Scanner	EEAA / WRPA MU	PAMU Headquarter
HP Laser Jet Printer	EEAA / WRPA MU	PAMU Headquarter
HP Desk Jet 3520 Printer	EEAA / WRPA MU	PAMU Headquarter
Generator (Honda NAC3 110)	EEAA / WRPA MU	PAMU Headquarter
Toyota Hilux	EEAA / WRPA MU	PAMU Headquarter
Toyota Hilux	EEAA / WRPA MU	Springs area outpost
Toyota Hilux	EEAA / WRPA MU	Wadi el Hitan outpost
Battery Backups	EEAA / WRPA MU	PAMU Headquarter + Springs area outpost
Food Cooker (Ideal)	EEAA / WRPA MU	Wadi el Hitan outpost
6 Food Table Chair	EEAA / WRPA MU	Wadi el Hitan outpost
Food Table (60*120)	EEAA / WRPA MU	Wadi el Hitan outpost
Blanket	EEAA / WRPA MU	Wadi el Hitan outpost
2 Metal Bed (1 Meter)	EEAA / WRPA MU	Springs area outpost
Colored Food Cooker (5 Lamp ST,60*80)	EEAA / WRPA MU	Springs area outpost
4 Metal Bed (1 Meter)	EEAA / WRPA MU	Springs area outpost
Camel Cart	EEAA / WRPA MU	Springs area outpost
Bushnell Binoculars	EEAA / WRPA MU	Springs area outpost /Ayman Salem
8 Metal Cup Board (1 Door)	EEAA / WRPA MU	Springs area outpost +PAMU Headquarter

Asset description	Entity in charge	Location /Office
SHT 11500 Honda Generator	EEAA / WRPA MU	Spring Area outpost
4 Metal Clipboard (1 Door)	EEAA / WRPA MU	Wadi el Hitan outpost
Motorola Cell Phone Serial Number - 018TGL3383	EEAA / WRPA MU	Wadi el Hitan outpost
3 Metal Beda	EEAA / WRPA MU	Wadi el Hitan outpost
JVC 16K 11 TV (16 in)	EEAA / WRPA MU	Wadi el Hitan outpost
Olympus Camera (C707)	EEAA / WRPA MU	Wadi el Hitan outpost
2 Tent (With All Accessories)	EEAA / WRPA MU	Wadi el Hitan outpost
1 Electrical Current Stabilizer (2 KW Japanese)	EEAA / WRPA MU	Wadi el Hitan outpost
Photo Copier Machine (IR 2020)	EEAA / WRPA MU	Wadi el Hitan outpost
Shando Blanket	EEAA / WRPA MU	Wadi el Hitan outpost
Solar Panel Energy System at Wadi El Hitan	EEAA / WRPA MU	Wadi el Hitan outpost
Italian Book Clipboard	EEAA / WRPA MU	Wadi el Hitan outpost
HD-EXT-D-PASS-120 GB	EEAA / WRPA MU	Wadi el Hitan outpost / Mohamed Sameh
Bushnell Binoculars	EEAA / WRPA MU	Wadi el Hitan outpost / Mohamed Sameh

Information Education and Communication material

Asset description	Entity in charge	Location /Office
DVD - Wales of the Desert	EEAA / WRPA MU	PAMU Headquarter
Birding in Wadi el Rayan Protected Area - English	EEAA / WRPA MU	PAMU Headquarter
Birding in Wadi el Rayan Protected Area - Arabic	EEAA / WRPA MU	PAMU Headquarter
Checklist of the birds in WRPA - English	EEAA / WRPA MU	PAMU Headquarter
Checklist of the birds in WRPA - Arabic	EEAA / WRPA MU	PAMU Headquarter
Visitor Discovery Guide, 2007 - English	EEAA / WRPA MU	PAMU Headquarter
Visitor Discovery Guide, 2007 - Arabic	EEAA / WRPA MU	PAMU Headquarter
Visitor Discovery Guide, 2008 - English	EEAA / WRPA MU	PAMU Headquarter
Visitor Discovery Guide, 2008 - Arabic	EEAA / WRPA MU	PAMU Headquarter
Wadi el Hitan, World Heritage Site (core area) - bilingual English and Arabic map	EEAA / WRPA MU	PAMU Headquarter
Wadi el Hitan, Newsletter - English	EEAA / WRPA MU	PAMU Headquarter
Wadi el Hitan, Newsletter - Arabic	EEAA / WRPA MU	PAMU Headquarter
Wadi el Hitan. Open-air Museum Map - English	EEAA / WRPA MU	PAMU Headquarter
Wadi el Hitan. Open-air Museum Map - Arabic	EEAA / WRPA MU	PAMU Headquarter
Wadi el Hitan. Guide to the Open-air Museum - English	EEAA / WRPA MU	PAMU Headquarter
Wadi el Hitan. Guide to the Open-air Museum - Arabic	EEAA / WRPA MU	PAMU Headquarter
Wadi el Rayan Protected Area poster - English	EEAA / WRPA MU	PAMU Headquarter
Wadi el Rayan Protected Area poster - Arabic	EEAA / WRPA MU	PAMU Headquarter
Sales poster - English	EEAA / WRPA MU	PAMU Headquarter
Sales poster - Arabic	EEAA / WRPA MU	PAMU Headquarter
Wadi el Hitan. Sponsorship opportunities folder - English	EEAA / WRPA MU	PAMU Headquarter
Wadi el Hitan. Sponsorship opportunities folder - Arabic	EEAA / WRPA MU	PAMU Headquarter

Asset description	Entity in charge	Location /Office
EIECP support program to the National Environmental Action Plan: Wadi el Rayan Protected Area - English flyer	EEAA / WRPA MU	PAMU Headquarter
Architecture For the Poor Book	EEAA / WRPA MU	PAMU Headquarter
Filed Guide to the Mammals of Egypt Book	EEAA / WRPA MU	PAMU Headquarter
Guide to Reptiles and Amphibains Book	EEAA / WRPA MU	PAMU Headquarter
Flora of Egypt Vol 1 Book	EEAA / WRPA MU	PAMU Headquarter
Flora of Egypt Vol 2 Book	EEAA / WRPA MU	PAMU Headquarter
Flora of Egypt Vol 3 Book	EEAA / WRPA MU	PAMU Headquarter

Infrastructure

Asset description	Entity in charge	Location /Office
Renovation of WRPA Visitor Center	EEAA / WRPA MU	WRPA Visitor Center
- pavement area outside the building, finished by marble tiles	-	-
- concrete ramp to facilitate disabled access	-	-
- internal lighting system	-	-
Setting up of the WRPA exhibition within the VC	EEAA / WRPA MU	WRPA Visitor Center
- information panels	-	-
- interactive didactic game for children	-	-
- electrical supplies, sockets, switch lights and generators	-	-
Construction and setting up of Wadi El Hitan infrastructure	EEAA / WRPA MU	Wadi el Hitan outpost
- Parking area to hold up to 80 cars		
- Ticket station with two rooms		
- A visitor reception shelter with interpretative panels		
- A cafeteria and a gift shop		
- A police station		
- Men's and women's WCs		
- Camel shed		
- Guards' quarters		
- Introductory sign at the sculptured entrance to		

Asset description	Entity in charge	Location /Office
Hitan		
- An entrance structure constructed of mud-brick and tawfla resembling the abstract shape of a whale		
- office furniture	-	-
- cafeteria furniture	-	-
Technical specifications		
- *floor of local stone for the interiors and the exterior*	-	-
- *mud brick walls and plasterwork*	-	-
- *mud brick vaults for the cover finished by plaster*	-	-
- *wooden pergola with masonry columns finished by plaster*	-	-
- *clay markers to delimit a different areas and visiting paths*	-	-
- *reservoir for potable water supply (n. two tanks)*	-	-
- *full plumbing supply, drainage, wastewater system and hydraulic equipment*	-	-
- *solar panels system (installed on the ground, following the correct exposition)*	-	-
- *electrical supplies, sockets, switch lights and emergency generator.*	-	-
- *lighting elements for the entire visitor center in the interior and the exterior*	-	-
Wadi el Hitan Open-air museum	EEAA / WRPA MU	PAMU Headquarter
- Design and construction of 7 mud-brick shade structures, housing display panels at key fossil sites		
- Planning, routing and marking (with small stones) 7 km of walking tracks		
- Clay columns and ropes made from braided palm leaves for installation around the fossil sites		
- Baked clay number signs and direction arrows to go with the guidebook		
- Baked clay name signs for fossil sites		
- 7 interpretative panels to guide the visitors along the tracks		
Headquarter renovation	EEAA / WRPA MU	PAMU Headquarter
- expanding the walled compound and parking areas;	-	-

Asset description	Entity in charge	Location /Office
- installing overhead shade in the parking area	-	-
- constructing a storehouse for field equipment and publications	-	-
Springs outpost renovation	EEAA / WRPA MU	Springs area outpost
- closing the outdoor patio	-	-
- covering the white block wall with sand-colored plaster	-	-
- enclose and secure the generator	-	-
- purchasing a new generator for this outpost	-	-
- converting the garage into a new environmental education center	-	-
Beach outpost enhancement	EEAA / WRPA MU	Beach outpost
Bird hide outpost renovation	EEAA / WRPA MU	Bird hide outpost
Wadi el Hitan staff accomodation	EEAA / WRPA MU	Wadi el Hitan outpost
Setting up of WRPA Visitor Center (VC)	EEAA / WRPA MU	WRPA Visitor Center
- Table	-	-
- Graphic Portrait Fixed on MDF Plates	-	-
- Graphic Portrait on Roll Up Stand Plates	-	-
- Vetrine Wall	-	-
- Glass case (Box Style)	-	-
- Panorama (Seafloor/Coastal Environment)	-	-
- Portrait of Children	-	-
- Hanging Shelf and 3 Equipment for Fossil Services	-	-
- Hanging Shelf for Signature Book	-	-
- Self and 6 Working Keys and Portrait For Fossil Match Game	-	-
- Box For Rock Samples	-	-
- Equipment for Sand Blast and Compressor and 5 Kilo Aluminum Ocid	-	-
- Base and Water Gun for Spongy Rocks	-	-
- Cylinder Boleikrbonet and Vaadp Cone-Shaped Wooden and Plastic Ring-Separator For Trees (Adaptation)	-	-
- Voting Machine 18 Boxes For Transparent Plastic Balls and 270 Boxes Colored Plastic Balls	-	-
- Machine to test the effect of water on the rocks	-	-
- Screen 32 inch BENQ	-	-
- Screen 22 inch Caira	-	-
- DVD player BENQ	-	-

Asset description	Entity in charge	Location /Office
- MP4 Player	-	-
- Ear Phone (Creative)	-	-
Signposts		
- Stone signposts were built and installed in the main sites using natural materials consistent with the local environment	EEAA / WRPA MU	WRPA

All abovementioned physical assets in good working conditions.

Intellectual Assets

Asset description	Entity in charge
• Training Plan: the project held 48 training sessions specialized for the development of skills to manage a Protected Area. 258 people were trained (188 for WRPA staff, 38 for QPA staff, 32 for local community people). English courses were also included and provided certificates for the staff of Wadi El Rayan. Different institutions such as the National Water Research Center, the Agriculture Department and specialized firms were involved. Training for 30 women concerning craft skills has been undertaken in collaboration with Italian NGO's. Graduates of the Fayoum Faculty of Tourism were trained to be employed as eco-guides. • Business plan: was produced for Wadi El Rayan, which was the first business plan made for a Protected Area in Egypt. In this plan are explained all the opportunities, which can generate financial sustainability for WR, • Inventory, Monitoring, Assessment, Reporting and Research Strategy was made to contribute to the protection of natural resources. In 2008 WRPA staff was trained to carry out the monitoring of the Gazelles living in the Area. • Organizational structure: with the participation of rangers, a new organizational chart and duty handbook was introduced in 2005 to ensure effective implementation of the organizational structure. • Open Air Museum of Wadi El Hitan: a management plan was drafted to better understand how all of the components and aspects of the site could jointly reach a successful result.	EEAA

Financial Assets

Asset description	Entity in charge
• A sustainable financing strategy was presented to PEC in 2007 and the new business plan was completed; • The project has supported the establishment of an agreement between the EEAA and the private firm headed by Mr. Hani Zaki, to run a gift shop and a Restaurant / Cafeteria in Wadi El Hitan, sell some local products and organic food, providing employment to the local people. The revenues are covering the regular maintenance of the infrastructures.	-

Acknowledgments and awards (if any)

Description
1. On July 17, 2005, the World Heritage Committee of United Nations Educational Scientific and Cultural Organization (UNESCO) has inscribed Wadi El Hitan (Valley of the Whales) on the World Heritage List, confirming the exceptional and universal value as cultural and natural site which requires protection for the benefit of all humanity. 2. In February 2008, the First Lady of Egypt, Mrs. Suzanne Mubarak visited Wadi El Hitan for the inauguration of the site. Many dignitaries and media attended the event, and this led to consolidate the knowledge of such a grand place to the public. 3. The Project supported the establishment of a twinning agreement between WRPA and Parco Nazionale del Gran Sasso.

Annex 3

Shared strategy for the sustainability of the Project results

The general success, and therefore, long-term sustainability of the project is deeply connected to the institutional, legal and organizational mechanisms which must be set in motion to enable the Protected Area to be managed in a sound and economically viable way, profiting of at least a percentage of the revenues.

Therefore, in order to guarantee sustainability and further development of the results achieved through the present project, MSEA/EEAA shall:

- Finalize, through the GEF project, the process of making the best performing PAs self-financing entities, and to receive benefits – at least in kind and in services, from the financial resources directly generated by NCS (e.g. entrance fees, concessions for projects within protected areas, etc).
- Update and ensure the implementation of WRPA Management Plan and Business Plan developed in the frame of the Project.

In particular, with regards to the capacity building output of the project and to the enhancement of WRPA staff management capacities, MSEA/EEAA shall:

- Keep the adequate human resources level in the PAMU and adopt adequate policies to incentive the expertise built through the project not to leave their position;
- Ensure regular update of training to PAMU staff
- Promote exchange of experience among the different Protected Areas PAMUs' staff

Moreover, MSEA/EEAA shall promote the inclusion of Madinet Madi archaeological site within the boundaries of the Protected Area as well as foster its integration in the visitors' itineraries with the aim of establishing in collaboration with SCA a sound district boosting unique natural and cultural assets.

As for the infrastructures built through the Project, MSEA/EEAA endorses the Maintenance Plans enclosed to the present Certificate as Annex 4 (4.1, 4.2, 4.3 and 4.4) for the following infrastructures:

1. Wadi el Rayan Visitor Center;
2. Wadi el Hitan Visitor Center;
3. Unpaved track to Wadi el Hitan;
4. Unpaved track between WRPA Headquarters and Madinet Madi.

Therefore MSEA/EEAA shall:

- make adequate provisions in its annual budget for the implementation of the above mentioned Maintenance Plans;
- with reference to the unpaved track connecting WRPA to the archaeological site of Madinet Madi, promote the elaboration of a legal framework at the regulatory level between EEAA and SCA for the management and the participation in the maintenance of the common asset.

MSEA/EEAA shall also make provisions in the annual budget for the maintenance of all equipment provided by the projects as well as of the signposts and interpretative panels installed by the Project.

With reference to the Information, Education and Communication material produced in the frame of the Project, MSEA/EEAA shall:

- Elaborate and adopt guidelines for the optimal use and distribution (both in paper and digital form) of all material. In particular MSEA/EEAA shall devise and apply a mechanism for a virtuous income generating use of booklets and publications such as the one established by the project with CULTNAT.

MSEA/EEAA shall also assure visibility to the activities carried out by the Project through the Ministry of Foreign Affairs/DGDC funding, by keeping the Italian Cooperation logo on all material originally produced by the Project such as signposts, interpretative panels, IEC materials even after the end of the project, as well as including it on the foreseen activities related to dissemination and divulgation.

Finally MSEA/EEAA shall take into consideration the recommendation issued by EIECP Final Evaluation mission, which will be carried out upon conclusion of the project's activities. In particular the Final Evaluation Mission will also provide the main guidelines for the sustainable management of the Protected Areas, versus the environmental pressure and the anthropic carrying capacity.

Management and administration of the Visitor Center

The present project has contributed to the enhancement of the Visitor Center established in WRPA as well as to construction and setting up of Wadi el Hitan facilities.

Wadi el Hitan infrastructures, which includes a cafeteria, a gift shop and toilets are currently operated by a private company which guarantees the regular cleaning and the ordinary maintenance of the above facilities and provides highly appreciated services to the visitors.

As for the Visitor Center, it is well placed being close to the Waterfalls, which is most popular spot in the area, and may represent an excellent departure point for the exploration of the unique natural and cultural heritage available in WRPA.

Moreover, in consideration of the kind of tourism present in the area as well as permanent exhibit with educational panels and interactive tools hosted in the Center, this may have a very positive role in the dissemination of the environmental education and awareness for visitors and in particular for school children.

At the same time, the Visitor Center represents also a potentially enjoyable service area where visitors can get general information, find good quality crafts objects for shopping, refreshment, toilet facilities, and so on. Thus, a well running VC is also an opportunity for boosting in a sustainable way the local economy in the areas of tourism and handicrafts and can be guided towards the support of the most needy sectors of the population.

A Visitor Center is basically built upon the provision of two main functions:

1. a cultural, educational and environmental-content based function, where the PAMU is both supervising and providing services;
2. a non-content based function, concerning mainly tourist services (cafeteria, crafts shop, entertainment, etc.), provided by other actors under concession (and paying a percentage of revenues after a startup period of one to three years according to local agreements).

Therefore, in consideration of all the above, within the first semester of year 2011, MSEA/EEAA shall:

- Open and assure regular operation of the Visitor Centers to the public;
- Update WRPA Management Plan for the sustainable management of the natural and cultural heritage, versus the environmental pressure and the anthropic carrying capacity;
- Update WRPA Business Plan as operational document of the Management Plan within the year 2011, including: marketing, registered logos, concession of services to private companies where applicable;
- Foster partnership agreements for the management of the non-content additional services related to the Visitor Centers activity, and assign the related concessions to local associations/NGOs or to private companies through tender procurements.

The agreements and related concessions shall be based on the following principles:

1. Promote the adoption of minimal service standards in the Visitor Center

facilities (opening hours, toilets, shops and cafeteria) and devise ways for their monitoring.

2. Provide guidelines for the selection of high-quality local handicraft products, possibly favoring women's work and sustaining their income in the crafts shop to be created or improved;
3. Orient the associations/private companies who will receive the concession towards the provision of additional services in the Visitor Center (maintenance, cleaning, etc.);
4. Encourage the continuity and improvement of education and dissemination activities possibly funded on the basis of the paying non-cultural services;
5. Support the adoption of all possible measures for an effective involvement of the local communities to spread locally a fair share of the benefits generated.

Annex 4

Wadi el Rayan Protected Area Infrastructures
Maintenance Plans

Annex 4.1 – Visitor Center of Wadi el Rayan Protected Area

Annex 4.2 – Visitor Center of Wadi el Hitan

Annex 4.3 – Unpaved track to Wadi el Hitan

Annex 4.4 - Unpaved track between WRPA Headquarters and Madinet Madi

ANNEX 4.1

VISITOR CENTER OF WADI EL RAYAN PROTECTED AREA MAINTENANCE PLAN

Embassy of Italy in Cairo

COOPERAZIONE ITALIANA
ITALIAN COOPERATION
التعاون الإيطالى

United Nations Development Program

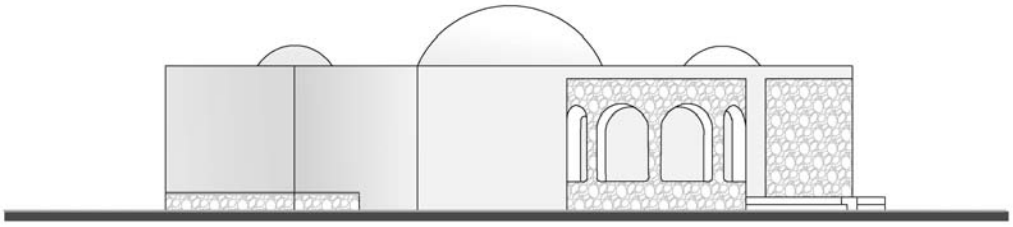
Egyptian Environmental Affairs Agency

Arabic Republic of Egypt

Egyptian Italian Environmental Cooperation Program

Wadi Rayan Protected Area

Visitor Center of Wadi Rayan Protected Area
Maintenance plan



Index

1 Project description

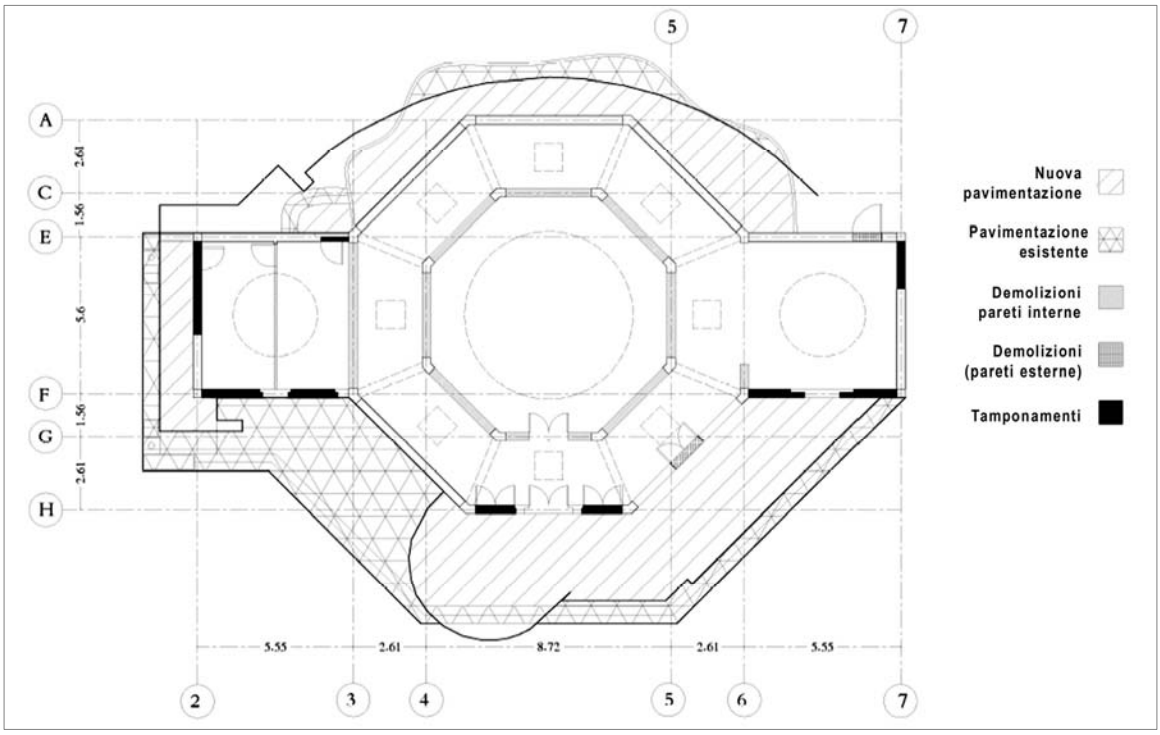
1.1 Information about the project

VISITOR CENTER OF WADI EL RAYAN	
Location	**Wadi El Rayan Protected Area**
Project	**NCSCB project (EIECP)**
Year of implementation of the building	**2000**
Year of implementation of renovation works	**2008**
Contractor	**Shabuory & Associates**
Architectural designer	**Arch. A.Abdelgawad**
Construction managers	**Shabuory & Associates**
Total cost of the work	**800.000+75.500+8500= 884.000 EGP**

1.2 Information about the building

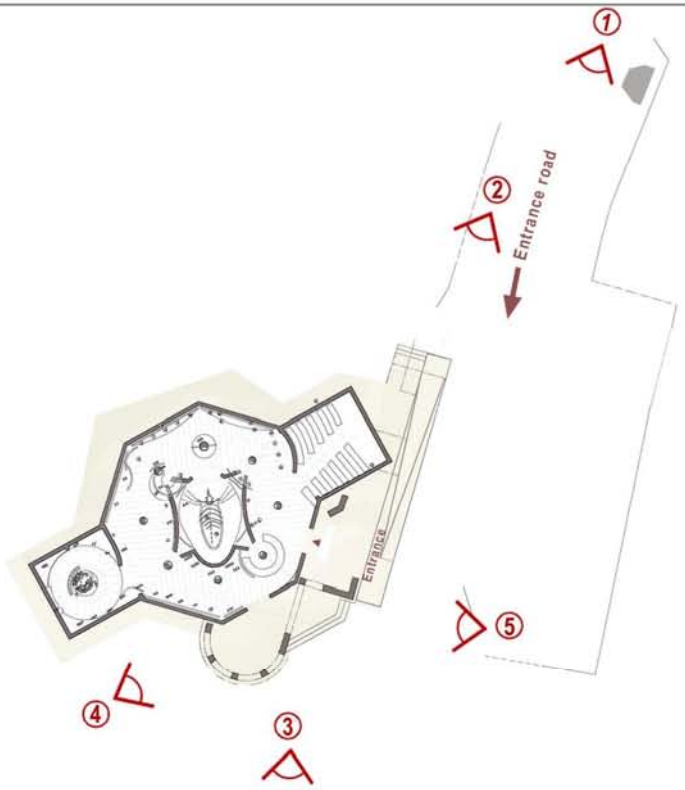
1.2.1 Brief description

The visitor center of Wadi el Rayan Protected Area is located near the water falls area, a famous attractive tourist site frequented by Egyptian and foreigner people. The building is located in a desert and not urbanized site; it enjoys a splendid panoramic view of Lake Superior.
A four steps staircase and a slip road lead to the entrance trough a wide paved surface and also to a little patio, a sort of panoramic view of the surrounding landscape.
The visitor centre covers an area of around 235m ² and it is a one-level ad building.
The current look of the building is the result of renovating works, carried out in 2008; the following picture shows the demolition and reconstruction plan, concerning the restoration project:



Currently the octagonal central room, surrounded by an external corridor marked by eight columns, contains information panels and interactive games; in the middle of the room, at a lower level there is a central area containing remains of a fossil whale skeleton.
Lateral square parts of the building contain a small video room and another exhibit space.
The main access door faces directly a reception counter; there is a second door that faces the outside patio: from this point it's possible to enjoy an excellent panoramic view of the lake.
Pre-existing windows have been closed; only small skylights on the dome are still open and placed along the exhibition corridor to enlighten the exhibit space.

1.2.2 Photographic survey



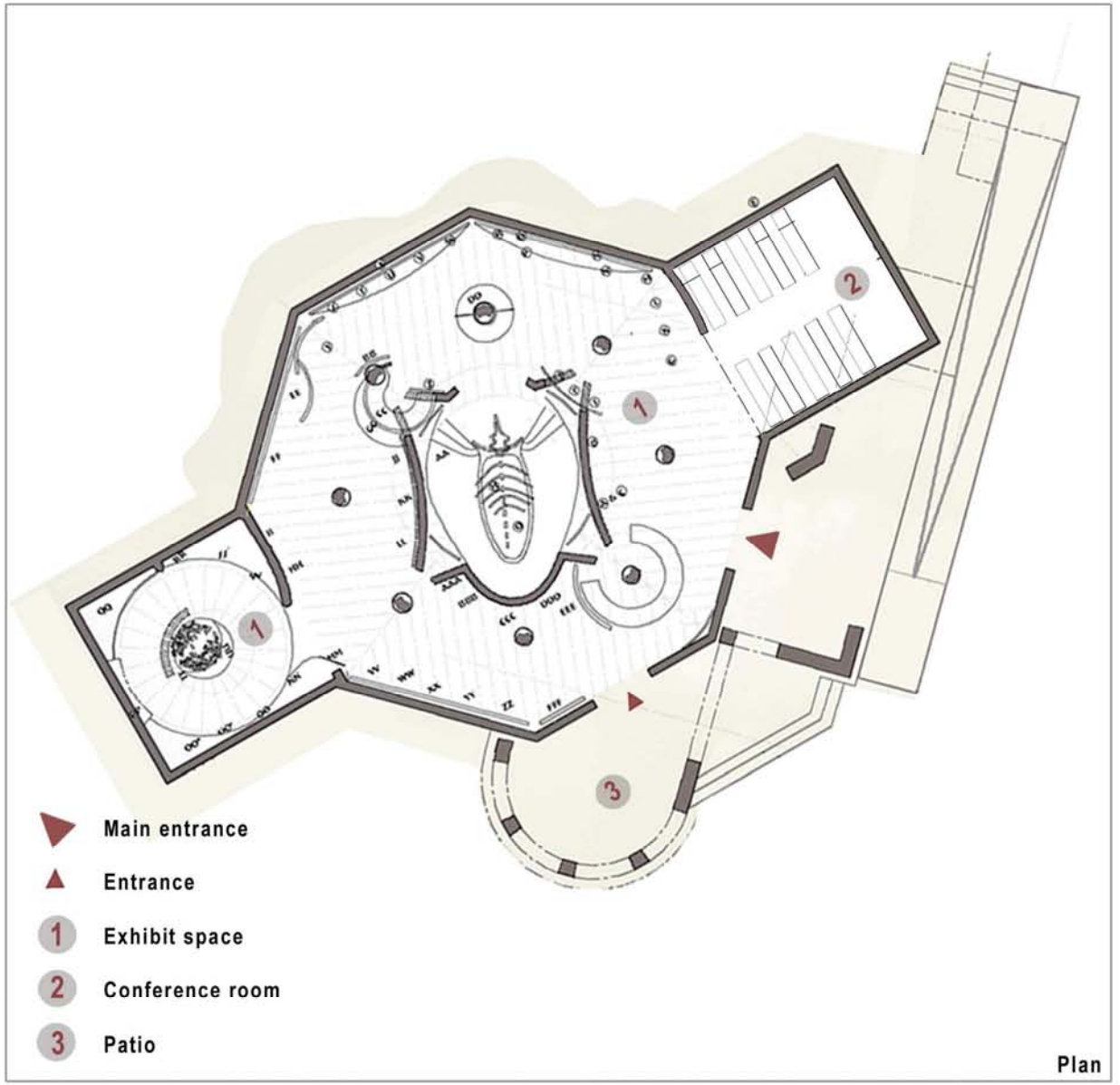
Plan with optical cones

Outdoor area: details

1.2.3 Technical drawings

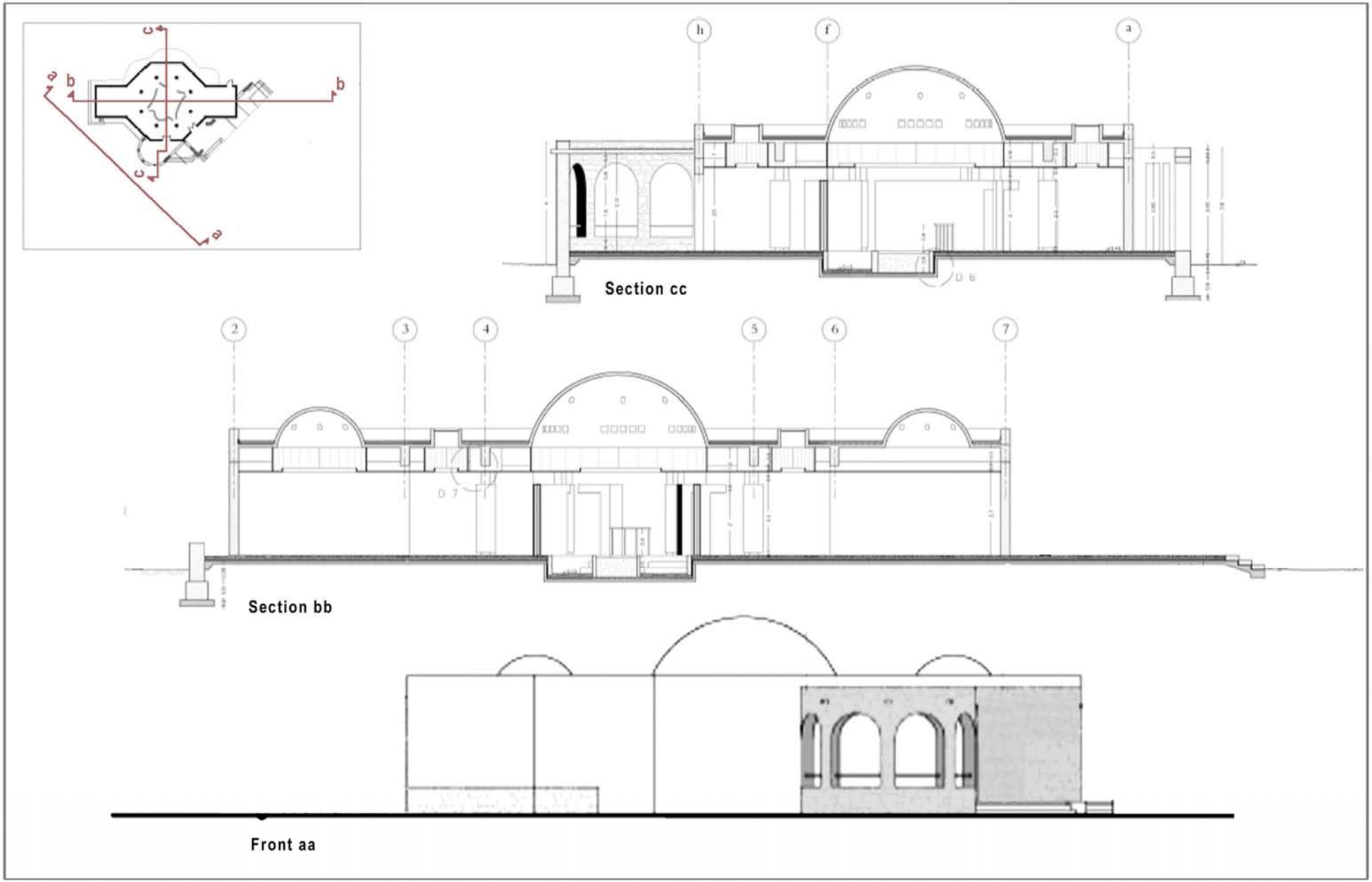
1.2.3.1 Plan

Inner views



Plan

1.2.3.2 Sections and front



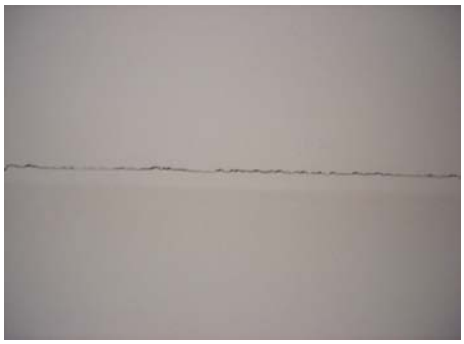
1.2.2 Project data

PROJECT DATA	
Covered surface	**~ 235 m2**
Fronts maximum height	**~ 4,60 m (height of the dome= 6 m)**
Expected visitors	**~ 15.000 visitors for years**

1.2.3 Current situation

Before to prepare an effective maintenance plan it is necessary to highlight some deficiencies of the building analysing the current situation in order to identify interventions that can lead to a full usability and functionality of the building.
The building is analyzed according to the following items:

- **Decay**: even if renovated works have been recently provided (2009), degradation phenomena affect the building, especially in finishes. Main detected disease are reported as follow:
  - cracks in the inner and outdoor plaster and in the floor;
  - detachments and lacks in the outdoor and inner plaster;
  - bad execution of flooring' laying with inserts of extraneous material,
  - some power line' wires are exposed and some sockets are unsafe.






- **Usability – liveability:** building access is facilitated by a ramp. It will be provided an air condition system inside the building in order to provide good agreeable condition for tourist staying and for the visitor center staff. Air condition is strictly necessary in the small video room, located in one of the two wings of the building, due to a quite long stay of people in this space.
  The main fault, which affects the usability of the structure, is the lack of toilets. In the past, services were placed in a close building but now they are affected by serious structural damages, so they are

inaccessible.
From the architectural point of view the outdoor semi-circular patio is an interesting element, considering as an outside extension of the building and a belvedere of surrounding landscape. A shadow system that allows the use of this space, even in the warmer months, will be provided.
Entrance glass-sliding doors don't work probably due to some anomalies in the scrolling guides or to a bad installation, so they are unusable. Anyway they are also inapt for this type of building, concerning to weather' condition and presence of sand.

- **Architectural design**: the visitor center looks poor in landscape design in the outdoor areas; its function as visitor center is not recognizable, except for the signpost at the beginning of the access path. Parking area is not well defined and main entrance is not easily recognizable.
Moreover the visitor center shows, especially in the fronts, light decay that compromises the aesthetic look of the building. The lack of essential service, like toilets, affects the usability of the building.
During next month some interventions to enhance the landscape integration of the building will be provided.

1.2.4 Construction' technologies and materials

Photographic survey: details
1. Stone wall; 2. Inner marble florring and baseborard; 3. Wooden door;
4. Dome skylights; 5. Slip road, 6. Socket; 7. Outdoor floor

2 Maintenance plan

2.1 List of the building's technological units

Class	Code	Technological units	Expected life cycle	- 40%
Structural elements	1	Foundations	80/90 years	55
	2	Beams and columns	80/90 years	55
	3	Concrete walls	80/90 years	55
	4	Stone walls	80/90 years	55
	5	Floors	30/40 years	25
	6	Connections	30/40 years	25
Outer finishings	7	Partition walls	20/25 years	15
	8	Roof	30/40 years	25
	9	Wall coating: plasterwork	8/16 years	10
	10	Outer flooring: marble tiles	15/20 years	12
Inner finishings	11	Plasterwork	8/16 years	10
	12	Gypsum board ceiling	20/25 years	15
	13	Inner flooring: marble tiles	30/40 years	25
Windows and doors	14	Skylight frames	8/16 years	10
	15	Entrance doors	8/16 years	10
	16	Glass sliding doors	8/16 years	10
System	17	Air condition system	5/10years	6
	18	Eletrical system: ductwork	20/25 years	15
	18.1	Eletrical system: equipment	8/16 years	10
Outdoor area	19	Pergola	20/25 years	15
	20	Masonry columns	80/90 years	55

2.2 Maintenance specifications

STRUCTURAL ELEMENTS

Requirements and performances:
1. Stability and resistance to the action of loads or seismic vibrations.
2. User' safety

CODE	1
Element	**Foundations**
Description	Foundations are made of reinforced concrete. This type of foundation offers resistance to high loads.
Locations	They are located 1,50 meters under the natural ground level at least
Expected life cycle (years)	**55**
Anomalies and diseases	**Movements and subsidence** **Chips and cracks (normally due to a too rapid drying of the cement)** **Corrosion of the steel** **Water penetration in the concrete layer**
Maintenace interventions	Foundation structures do not need any kind of maintenance if they are executed in the appropriate way. In case of subsidences it's advisable to contact a specialist in structures to establish the appropriate intervention to provide.
Periodicity of maintenance	If necessary
Type of reviews	Visual review. Particular attention to local subsidences
Periodicity of reviews	Once a year

CODE	2
Element	**Bearing beams and columns**
Description	Beams and columns are made of reinforced concrete (thickness = 25 cm).
Expected life cycle (years)	**55**
Anomalies and diseases	**Cracks** **Differential settlement** of the structure due to differential thermal expansion or to floors not properly connected with the bearing walls; **Detachment** of material due to the powdering of the finish. **Corrosion of the steel** **Water penetration inside the concrete**
Maintenace interventions	Structural elements do not need any kind of preventive maintenance if they are executed in the appropriate way. In case of subsidences it's advisable to contact a specialist in structures to establish the appropriate intervention to provide. Concerning external cladding see the item "outer finishes"
Type of reviews	Visual review. Particular attention to local subsidences and cracks
Periodicity of reviews	Once a year
Periodicity of maintenance	If necessary

CODE	3
Element	**Concrete walls**
Description	Walls are composed by a two layers of concrete (both 15 cm wide) divided by a fine insulating membrane (total thickness of the wall= 30 cm)
Expected life cycle (years)	**55**
Anomalies and diseases	**Cracks**: swelling of the wall to the outside **Differential settlement** of the structure due to a differential thermal expansion or to floors not properly connected with the bearing walls; **Detachment** of material due to the powdering of the finish. **Water penetration inside the concrete**
Maintenace interventions	Structures do not need any kind of preventive maintenance if they are executed in the appropriate way. In case of subsidences it's advisable to contact a specialist in structures to establish the appropriate intervention Concerning external cladding see the item "outer finishes"
Periodicity of maintenance	If necessary
Type of reviews	Visual review. Particular attention to local subsidence and cracks
Periodicity of reviews	Once a year

CODE	4
Element	**Stone walls**
Description	In the outdoor area of the building there are walls made of local limestone blocks (irregular size). Binder used is cement mortar mixed by sand in order to not contrast limestone colour to create a uniform decorative pattern on the façades.
Expected life cycle (years)	**55**
Anomalies and diseases	**Cracks**: swelling of the wall to the outside **Differential settlement** of the structure due to a differential thermal expansion or to floors not properly connected with the bearing walls; **Detachment**: detachment of stone material due to the powdering of the finish.
Maintenace interventions	Walls do not need any kind of preventive maintenance if they are executed in the appropriate way. In case of subsidence it's advisable to contact a specialist in structures to establish the appropriate intervention Concerning external cladding see the item "outer finishes".
Type of reviews	Visual review: particular attention to local subsidences and cracks. Because of dangerous deformation the lintel of the circular patio' access will be demolish and replace with a new one made of wood.
Periodicity of reviews	Once a year
Periodicity of maintenance	If necessary

CODE	5
Element	**Floors**
Description	Floor is composed by a layer of gravel (25 cm) a water proofing membrane, a concrete layer of around 10 cm, and a binder layer (5 cm) for the flooring laying.
Expected life cycle (years)	**55**
Anomalies and diseases	**Depressions or abnormal slopes of the floors** **Deformations and displacements** **Cracks** **Detachment**
Maintenace interventions	Floors do not need any kind of preventive maintenance if they are executed in the appropriate way. In case of subsidence it's advisable to contact a specialist in structures to establish the appropriate intervention. Concerning external cladding see the item "outer finishes".
Type of reviews	Visual review. Particular attention to local depression or abnormal slopes
Periodicity of reviews	Once a year
Periodicity of maintenance	If necessary

CODE	6
Element	**Connections**
Technological unit description	Technical elements connecting spaces on different levels; these structures may connect different level of a building or serve as a link if the building is on a different level than the ground level.
Description	Stairs, ramp and building basement are made of concrete lied on a layer of fine sand and stones.
Expected life cycle (years)	**25**
Anomalies and diseases	**Deformations and displacements** **Pulverization and detachment** **Chips** **Differential settlement** **Movements and subsidences**
Maintenace interventions	Stair does not need any kind of preventive maintenance if it is executed in the appropriate way. In case of subsidences it's advisable to contact a specialist in structures to establish the appropriate intervention o provide.
Type of reviews	Visual review. Particular attention to local subsidences
Periodicity of reviews	Once a year
Periodicity of maintenance	If necessary

CODE	7
Element	**Partition walls**
Description	Partition wall, constructed during building renovation, are made of gypsum board panels, applied on a steel-net fixed to a steel structure. The external finish of the panel is a painted cement plaster. Also the coating of the columns is made of the same materials.
Expected life cycle (years)	**25**
Anomalies and diseases	**Pulverization** **Detachment** **Chips** **Local subsidences** **Corrosion of the steel**
Causes of degradation	Bad execution of the artefact
Type of reviews	Visual review
Periodicity of reviews	Once a year
Periodicity of maintenance	If necessary
Maintenace interventions	This kind of structure does not need any kind of preventive maintenance if it is executed in the appropriate way. In case of subsidences it's advisable to contact a specialized staff to establish the appropriate intervention o provides.

CODE	8
Element	**Roof**
Description	Flat roof-floor is composed by a layer of reinforced concrete (15 cm) a water proofing membrane, a concrete layer (5cm) to protect the membrane, and a binder layer (5 cm) as external finish. Dome floor is composed by a layer (15cm) finished by plasterwork.
Expected life cycle (years)	**25**
Anomalies and diseases	**Moisture penetration** **Deflection** **Detachment** **Swelling** **Superficial dump**. **Superficial erosion** **Cracks** **Lack of material** **Sweeling**
Type of reviews	Visual reviews
Periodicity of reviews	Twice a year
Maintenace interventions	Concrete roof do not need any kind of preventive maintenance if they are executed in the appropriate way. In case of subsidences it's advisable to contact a specialist in structures to establish the appropriate intervention to provide.
Periodicity of maintenance	If necessary

OUTER FINISHES

Requirements and performances:

1. Functionality and usability
2. Maintain aesthetic features over the time.

CODE	9
Element	**Wall coating: plasterwork**
Description	All the rooms of the building have as external finish a layer of cement plaster covered by painting layer. The thickness is around 1,5 cm.
Expected life cycle (years)	**10**
Anomalies and diseases	**Desegregation**. **Detachment** **Superficial dump**. **Superficial erosion** **Cracks** **Lack of material** **Swelling**
Causes of degradation	Bad execution or incorrect mixture for the mortar preparation
Type of reviews	**Reviews by the user** 1. Checking fronts and visible parts. 2. Checking the condition of the finishes, verifying diseases and wear of visible parts. Checking the colour surfaces uniformity. **Reviews by qualified staff** 1. Replacement of parts affected by wear or other forms of degradation through the removal of degraded areas, cleaning underlying areas by brushing. Recovery area with appropriate or similar materials to original plaster paying particular attention to preserve the uniform appearance of the surfaces. 2. Control more weather' exposed areas: control by non-destructive methods (hammering on the plaster) in order to locate any anomaly. 3. Check plaster condition through some instruments whose use is to be defined referring to the specific type of control and type of plaster (physic-chemical analysis, stratigraphic analysis, moisture detection systems, adhesion control tests to evaluate the characteristics of homogeneity, monitoring the presence of salts etc...)
Periodicity of reviews	Twice a year
Maintenace interventions	Removal of deteriorated parts and plaster recovery, when some areas are too damaged it must be provide the total restoration in order to preserve the aesthetic requirement of uniformity of facades.
Periodicity of maintenance	If necessary (the total replacement of the plaster have to be done every ten years)

CODE	10
Element	**Outer flooring: marble tiles**
Description	Inner floorings are made of unpolished grey Trieste marble. Currently this floor has

	very low quality of finishes. It would be advisable to repairs failures and damaged tiles in order to rich a good aesthetic appearance of the outer pavement.
Expected life cycle (years)	**12**
Anomalies and diseases	**Bleaching** **Superficial dump** **Detachment** **Stains and graffiti** **Lacks**. **Depressions or abnormal slopes in the floor**
Causes of degradation	Bad execution of the laying, bad quality of the tile material.
Types of reviews	**Reviews by the user:** Control of the visible parts and finish regularity Checking finish' condition and testing the degree due to wear and erosion of visible parts, particularly in joints. Checking the uniformity of colour surfaces.
Periodicity of reviews	Once a year
Maintenace interventions	**Maintenance by qualified staff:** 1. Surface cleaning: cleaning and removal of dirt material by washing or brushing, cleaning by non aggressive products. 2. Cleaning and restoration of joints by manual brushing. Restoration of damaged joints. 3. Replacement of degraded elements: replacement of worn parts, broken or raised. Preparation of a new underlying plan.
Periodicity of maintenance	If necessary

INNER FINISHES

Requirements and performances:

1. Functionality and usability
2. Maintain aesthetic features over the time
3. To not emit harmful substances
4. Resistance to corrosive substances

CODE	11
Element	**Wall coating: plasterwork**
Description	All rooms of the building have a layer of cement plaster covered by painting as external finish. The thickness is around 1,5 cm.
Expected life cycle (years)	**10**

Anomalies and diseases	**Desegregation** **Detachment** **Superficial dump** **Superficial erosion** **Cracks** **Lack of material** **Swelling**
Causes of degradation	Bad execution or incorrect mixture in mortar preparation and laying
Type of reviews	**Reviews by the user** 1. Checking fronts and visible parts. 2. Checking condition of the finishes and verifying diseases and wear of visible parts. Checking the colour surface' uniformity. **Reviews by qualified staff** 1. Replacement of parts affected by wear or other forms of degradation through the removal of degraded areas, cleaning underlying areas by brushing. Recovery area with appropriate or similar materials to rich the original plaster, paying particular attention to preserve the uniform appearance of the surfaces. 2. Control more weather' exposed areas: control by non-destructive methods (hammering on the plaster) in order to locate any anomaly. 3. Check plaster condition through some instruments whose use is to be defined referring to the specific type of control and the type of plaster (physic-chemical analysis, stratigraphic analysis, moisture detection systems, adhesion control tests to evaluate the characteristics of homogeneity, monitoring the presence of salts etc...)
Periodicity of reviews	Twice a year
Maintenace interventions	Removal of deteriorated parts and plaster recovery, when some areas are too damaged it must be provide the total restoration in order to preserve the aesthetic requirement of uniformity of facades.
Periodicity of maintenance	If necessary (the total replacement of the plaster have to be done every ten years)

CODE	**12**
Element	**Gypsumboard cieling**
Description	Ceiling, constructed during building renovation, is made of gypsum board panels, applied on a steel-net fixed to steel vertical supports. The external finish of the panel is a painted cement plaster layer. (For plaster' maintenance see item 11).
Expected life cycle (years)	**15**
Anomalies and diseases	**Pulverization** **Detachment** **Chips** **Local subsidences** **Corrosion of the steel**
Causes of degradation	Bad execution of the artefact
Type of reviews	Visual review
Periodicity of reviews	Once a year
Periodicity of maintenance	If necessary

Maintenace interventions	Replacement of damaged steel supports and of external plaster (if necessary).

CODE	13
Element	**Inner flooring**
Description	Inner floorings are made of burnished Trieste marble tiles mixed by brown marble tiles. Brown marble is used also for baseboards.
Expected life cycle (years)	**15**
Anomalies and diseases	**Bleaching** **Superficial dump** **Detachment** **Stains and graffiti** **Lacks** **Depressions or abnormal slopes on the floor surface**
Causes of degradation	Bad execution of the laying, bad quality of the tile material
Types of reviews	**Reviews by the user** Control of the visible parts and finish regularity Checking finishes condition and testing the degree due to wear and erosion of visible parts, particularly joints.
Periodicity of reviews	Once a year
Maintenace interventions	**Maintenance by qualified staff** 1. Surface cleaning: cleaning and removal of dirt by washing or brushing, cleaning by non aggressive products. 2. Cleaning and restoration of joints by manual brushing. Restoration of damaged joints. 3. Replacement of degraded elements: replacement of worn parts, broken or raised by same or similar tiles. Preparation of the underlying plan
Periodicity of maintenance	If necessary

WINDOW FRAMES AND DOORS

Requirements and performances:

1. Thermal comfort
2. Regularity of finishes
3. Easiness of cleaning
4. Knocks resistances
5. Hard climate condition' resistance (sand storm)

CODE	13
Element	**Skylight frames**
Description	The frames are made of *sapris* wood, finished by paint; there is not a sun-protection system.
Expected life cycle (years)	**10**
Anomalies and diseases	**Chromatic alteration** **Swelling** **Deformation** **Seals degradation** **Cracks** **Lack of orthogonal structure** **Loss of gloss** **Flaking, cracking** **Rupture of the action organs (opening system)** **Loss of material**
Types of reviews	**Reviews by the user** 1. Check wood deterioration 2.Controlling finishes and protective surface coating, control flatness of the elements. 3. Hand control 4.Controlling glass uniformity and of sealing glass- frame. Check for deposits or dirt. Verifying presence of anomalies or damages parts.
Periodicity of reviews	Once a year
Maintenace interventions	**Maintenance by the user** **Lubricating hinges and locks (once a year)** Purification of locks and hinges with silicone products to ensure the correct operation. **Cleaning of the runner slides (once a year)** Cleaning and removal of stain and deposits with an appropriate detergent and non aggressive product. **Cleaning window casements (once a year)** Cleaning by aggressive detergents of residues and deposits that may affect the correct working of the window. **Cleaning gaskets (if necessary)** Cleaning by common non aggressive detergent product. **Cleaning of working elements (every 6 months)** Clean organic residues that can cause the filling of slots, holes or beats by not aggressive product. **Cleaning of frames (once a month)** Cleaning of embed and mobile frames by an appropriate detergent product. **Protection and painting of frames (once a year)** **Restoration of protective coating** after removal of the old layer by abrasive papers and filling of wood cracks by putty. To apply a primer coat by brush, to renovate the protective layer using suitable products according to the type of wood. **Woodworm and meld treatment** have to be applied on the wooden parts by brush or spray application of synthetic resin. **Replacement of waterproof layer** (every three year).
Periodicity of maintenance	(Before written)

CODE	14
Element	**Doors**
Description	Entrance doors are made of sapris wood finished by paint; handles are made of metal. Door size 2,20x1,40. Door lintels are made of reinforced concrete
Expected life cycle (years)	**10**
Anomalies and diseases	**Chromatic alteration** **Swelling** **Deformation** **Seals degradation** **Gaskets degradation** **Cracks** **Lack of orthogonal structure** **Loss of gloss** **Flaking, cracking** **Rupture of the action organs** **Loss of material**
Types of reviews	**Reviews by the user:** 1. Check wood deterioration 2.Controlling finishes and protective surface coating, control flatness of the elements. 3. Hand control 4.Controlling glass uniformity and sealing glass- frame. Checking deposits or dirt and stains.
Periodicity of reviews	Once a year
Maintenace interventions	**Maintenance by the user:** **Lubricating hinges and locks (once a year)** Lubrification of locks and hinges with silicone products, to verify the correct operation **Cleaning of the runner slides (once a year)** Cleaning and removal of dirt and deposits with an appropriate detergent product. **Cleaning window casements (once year)** Cleaning of residues and deposits that may affect the correct working, by aggressive detergents. **Cleaning gaskets (if necessary)** Cleaning by common detergent product. **Cleaning of working elements (every 6 months)** Clean organic residues that can cause the filling of slots, holes or beats by not aggressive product. **Cleaning of frames** Cleaning of embed and mobile frames by an appropriate detergent product. **Protection and painting of frames (once a year)** Restoration of protective coating after removal of the old layer by abrasive papers and filling of wood cracks by putty. To apply a primer coat by brush, to renovate the protective layer using suitable products according to the type of wood. **Restoration of protective coating** after removal of the old layer by abrasive papers and filling of wood cracks by putty. To apply a primer coat by brush, to renovate the protective layer using suitable products according to the type of wood. Woodworm and meld treatment have to be applied on the wooden parts by brush

	or spray application of synthetic resin. **(once a year)** **Replacement of waterproof layer** (every three year).
Periodicity of maintenance	(Before written)

CODE	16
Element	**Glass sliding doors**
Description	Sliding doors are composed by one shutter of security glass (10 mm), size 1,40X2.20. This type of door is not appropriate for a public building with medium-high people 'crowd. It would be suitable to demolish it.
Expected life cycle (years)	**10**
Anomalies and diseases	**Chromatic alteration** **Glass breaking** **Seals degradation** **Gaskets degradation** **Cracks** **No orthogonality** **Loss of gloss** **Flaking, cracking** **Rupture of the action organs (opening system)** **Loss of material**
Types of reviews	**Reviews by the user:** 1. Check sliding guides deterioration 2. Controlling handle 4. Controlling glass uniformity and of sealing glass- frame. Check for deposits or dirt. Verification of presence of anomalies or damages. 5. Controlling presence of sand inside the sliding guides
Periodicity of reviews	Once a year
Maintenace interventions	**Maintenance by the user:** **Lubricating hinges and locks (once a year)** Lubrification of locks and hinges with silicone products, to verify of correct operation **Cleaning of the sliding doors (once a month)** Cleaning and removal of dirt dumps with an appropriate and non aggressive detergent product or by brushing. **Cleaning glass casements (once a year)** Cleaning of residues and dumps that may affect the correct working by non aggressive detergents. **Cleaning gaskets (if necessary)**

	Cleaning by common detergent non aggressive product. **Cleaning of working elements (every 6 months)** Clean organic residues that can cause the filling of slots, holes or beats by not aggressive product. **Cleaning of frames** Cleaning of embed and mobile frames by an appropriate detergent product. **Restoration of guides (If necessary)**
Periodicity of maintenance	(Before written)

SYSTEMS

Requirements and performances:

1. Technological functionality and usability
2. Users' safety
3. Ease of inspection
4. Ease of management
5. Ease of use
5. Ease of maintenance

CODE	17
Element	**Air condition system**
Description	Split air conditioner (carrier type), one unit: Video room (5HP)
Expected life cycle (years)	**6**
Anomalies and diseases	**Slow air cooling** **Entry of dust inside the room** **Gas leakage** **Annoying noise** **Damage of the outer unit, due to presence of dust or vandalism**
Maintenance intervention	**Maintenance by the user** 1. Cleaning up of filters by using an air jet; if the filter is made of plastic material clean it by a no aggressive product; it's suitable to not use abrasive pads in order to not damage the filter pattern. Reinstall the element only after its complete drying. 2. If the unit has not been used for a long time, cleaning must be carried out before the switching on; frequent cleaning of filters over the continued use of the device (every three week) **Maintenance by the qualified staff** 3. In case of gas leakage from the internal circuit, identify and repair the hole and then fill the gas (if necessary) 4. Repairing of damaged parts (if necessary)
Frequency of maintenance	(Before written)

CODE	18
Element	**Electrical system: ductwork:**
Technological unit description	The electrical system distributes and delivers electricity. A power generator provides to the users a low voltage power through an electrical group. Inside the building the main distribution of energy runs in cables placed in special ductwork, the secondary distribution conductors is placed in special protective sheaths. **Electrical ductwork:** 1. The "channels" are the simplest elements for the passage of electric cables; they are generally made of PVC.
Description	System in question is not connected to public electrical network. In this document we report a description of a traditional electrical system because of the lack of information in the technical drawings about this aspect of the project. For electrical panels, switches and sockets we had a real feedback thanks to the site' inspection
Expected life cycle (years)	**15**
Anomalies and diseases	1. Short circuits due to defects in the underground electrical system or to power surges. 2. Failures of switches due to excessive dust inside connections or to the presence of moisture and condensation. 3. Defects of calibration in the electricity meters, failures in the connection or e failures in the protection setting system 4. Disconnection of the electricity provision: due to grounding failures, overload voltage, unexpected shot circuit. 5. Main power network failure due to an interruption of authority providing electricity. 6. Interruption of secondary electrical line due to faults in the secondary circuit of the generator. 7. Overheating which can cause defects in protection and isolation system. It could be due to oxidation of the metal masses
Types of reviews	**Reviews by qualified staff:** 1. To check the general condition and integrity of electrical containers, lids and boxes 2. Replacement of damage or degraded parts
Periodicity of reviews	Every six months
Maintenace interventions	**Maintenance by qualified staff:** Restore the expected protection level that should never be less than that one provided by law.
Periodicity of maintenance	If necessary

CODE	18.1
Element	**Electrical system: equipments**
Technological unit description	1. Electrical panels are switchboards made of thermoplastic material; they are installed inside the buildings. 2. Sockets and plugs are responsible for distributing electricity from the main

	line of adduction to equipments which are connected to the system. They are generally placed in special spaces created in the walls or floor (boxes) as well as the switches, they have the task to switching on/off of the lights inside the rooms. 3. Electrical meter is a mechanical device that operates ON / OFF and is controlled by an electromagnet. It's closed when the coil is energized and, through the poles, it creates the circuit between the power source and the receivers. The moving parts of the poles and auxiliary contacts are controlled by electromagnet moving part.
Description	System in question is connected to public electrical network. In this document we report a description of a traditional electrical system because of the lack of information in the technical drawings about this aspect of the project. For electrical panels, switches and sockets we had real feedback thanks to the site inspection
Expected life cycle (years)	**10**
Anomalies and diseases	**Electrical equipments**: <u>Switchboards:</u> 1. Bad working of contactors. 2. Bad working of fuses. 3. Bad working of the unit that manage power control 4. Bad working of the anti-condense resistance. 5. Failure in the lighting alarm and signal lamps 6. Defect in the thermostats. 7. Accumulation of dust on the contacts that causes failures <u>Sockets, plugs and switches:</u> 1. Short circuits due to defects in the grounding of the electrical system and to power surges (overloads). 2. Short circuit due to excessive dust inside connections or the presence of moisture or condensation. 3. Defects in the calibration of meters 4. Overheating which can cause defects in protection and isolation. It could be due to oxidation of the metal masses. <u>Electrical meter:</u> 1. Bad working of the winding coil. 2. Bad working of the mobile magnetic circuit 4. Bad working of the return spring. 7. Excessive noise due to dust accumulation on surfaces
Types of reviews	**Reviews by qualified staff:** <u>Electrical meter:</u> 1. Check power factor unit (every two months) 2. To verify the functionality of the power factor condenser and electrical meter (every six months) 3. Check the efficiency of the grounding of the panel' electrical system (every two months) 4. To check the correct operation of fuses(every six months) <u>Sockets, plugs and switches:</u> 1. Check the correct clamping pressure of the screws and plates, and box cover. To verify that there is a good level of insulation and protection to prevent short circuits (Every six months) <u>Electrical meter:</u> 1. Overall inspection: in case of excessive noise, remove the meter and

	check the cleanliness of surfaces, electromagnet and coil (every six months) 2. Check tension: measure the terminal voltage of arrival, using a voltmeter (Once a year)
Periodicity of reviews	(Before written)
Maintenace interventions	**Maintenance by qualified staff** <u>Switchboards:</u> 1. General cleaning using dry air at low pressure (every six months) 2. To run the tightness of all bolts, terminals and switches (ounces year) 3. Replacing the power factor unit using one of the same type (if necessary) 4. Replacing damaged parts for an adjustment according to the rules (every 15 years) <u>Sockets, plugs and switches:</u> 1. To replace them when damaged or not to be able to range law standards (if necessary) <u>Meters:</u> 1. Cleaning electromagnet surface using gasoline or trichloroethylene (if necessary) 2. To make the clamping of all cables of the contactor (every six months) 3. Replacement the meter with another one of the same type (if necessary)
Periodicity of maintenance	(Before written)

OUTDOOR AREA

Requirements and performances:

1. Users' safety
2. Functionality and usability
3. Maintain aesthetic features over the time.

CODE	19
Element	**Pergola: wooden tralllis**
Description	Pergola is composed by a structure made of gazwareena non-dimensional wood lattice trellis with 10 cm, diameter joist members 60 cm on center and masonry columns at mid space. Columns are made of limestone blocks.
Expected life cycle (years)	**15**
Anomalies and diseases	**Penetration of moisture** **Deflection** **Detachment** **Swelling** **Rot**:
Type of reviews	Visual review
Periodicity of reviews	Once a year
Maintenace interventions	The consolidation of wooden structures, following the loss of mechanical properties is generally accomplished as follow: - If wooden elements are totally damaged beams, joists or columns have to be replace with new elements. It's suitable using some ribs for ensuring safety

	measures during the works of replacement; - Woodworm and meld treatment have to be apply on the wooden parts by brush or spray application of synthetic resin; - Replacement of waterproof layer (every six year);
Periodicity of maintenancence	If necessary

CODE	20
Element	**Pergola: masonry columns**
Expected life cycle (years)	**55**
Description	Masonry columns are made of limestone blocks. (For the maintenance interventions see the item 2**).**

Overall recommendations:

- The height of the ground level outside the building was established in the project design.
  It has to be maintained over the time; for this reason it's important to clean or add sand after sand storms or any other unexpected accident which can causes the change of the projects level.
  The excess sand can causes the aggression of materials as well as their degradation; on the contrary the lack of sand can leave unprotected structural parts of the building.
- Even if it's not a technical maintenance intervention it's important to specify that the periodical cleaning up of rooms and toilets with common disinfectant products allows to maintain good hygienic standards and to preserve the building also during tourist low season.

3 Evaluation of the maintenance costs

3.1 Maintenance costs

Maintenance cost is composed by four subcomponents. A percentage value on the cost of construction is assigned for each component, referring to the whole life cycle of the building, in this case of 30 years (expected life cycle = 30 years: calculation of the average life cycle of the building-technical standards constructions- by a correction factor = 40%, determined according to the analysis of criticality factors in the context of intervention).
Then the percentages are recalculated at five years intervals updating the construction woks' cost, according to an inflation rate of 6%, from an average rate related to construction materials recorded in Egypt during the last years.

Updating the original cost of the building (884.000,00 EGP)	
Updating capital at 5th year	991.462,35
Updating capital at 10th year	1.235.542,47
Updating capital at 15th year	1.906.701,70
Updating capital at 20th year	2.551.596,98
Updating capital at 25th year	3.414.612,34
Updating capital at 30th year	4.569.521,58

Sources: data on incidence rates of individual items of maintenance on the total cost of maintenance refers to the analysis results conducted on a sample of 78 housing and public building realized at the end of 1990 with traditional technology comparable to those of the visitor center (Maintenance of buildings: design and management. Manfron, Edited by Vittorio and Enzo Siviero. Utet, 1998 Turin).

WADI RAYAN VISITOR CENTER			
Calculation of Maintenance costs (LEG)			
Construction cost (original cost)	Design expenditure	88.400	884.000,00
	Construction works	795.600	
		Expected life cycle: 30 years	
Maintenantce costs	Postnatal costs (soon after the end of the works)	1% of construction cost	45.695,22
	Preventive maintenance	60% of construction cost	2.741.712,95
	Rehabilitation of failures	9% of construction cost	411.256,94
	Contingency costs	7% of construction cost	319.866,51

TOT	3.518.531,61

		25 years of operation	
Maintenantce costs	Preventive maintenance	55% of construction cost	1.849.581,69
	Rehabilitation of failures	8% of construction cost	256.095,93
	Contingency costs	6% of construction cost	199.185,72

TOT	2.304.863,33

		20 years of operation	
Maintenantce costs	Preventive maintenance	40% of construction cost	1.020.638,79
	Rehabilitation of failures	6% of construction cost	153.095,82
	Contingency costs	5% of construction cost	119.074,53

TOT	1.292.809,14

		15 years of operation	
Maintenantce costs	Preventive maintenance	28% of construction cost	524.342,97
	Rehabilitation of failures	5% of construction cost	85.801,58
	Contingency costs	4% of construction cost	66.734,56

TOT	676.879,10

		10 years of operation	
Maintenantce costs	Preventive maintenance	17% of construction cost	218.279,17
	Rehabilitation of failures	3% of construction cost	37.066,27
	Contingency costs	2% of construction cost	28.829,32
		TOT	284.174,77
		5 years of operation	
Maintenantce costs	Preventive maintenance	8% of construction cost	82.621,86
	costi di m. straordinaria	2% of construction cost	8.262,19
	Contingency costs	1% of construction cost	11.567,06
		TOT	102.451,11

During the first five years of operation of the building the estimated expenditures, concerning the maintenance, will be of 102.450 EGP (20.490 EGP per year).
Preventive maintenance costs have to cope with building physiological aging and they have the highest incidence on the total maintenance cost. The items of higher incidence referring to preventive maintenance are:

Systems	70% of preventive maintenance cost
Doors and windows frames	20% of preventive maintenance cost
Floorings and claddings	10% of preventive maintenance cost

The schedule below shows a calculation of the costs referring to each item for Wadi Rayan Protected Area visitor center; costs are calculated during a five-year period referring to the whole life cycle of the building, of thirty years long.

Calculation of Preventive Maintenance costs (LEG)			
Construction cost	Design expenditure	88.400	884.000,00
	Construction works	795.600,00	
		Expected life cycle: 30 years	
Preventive maintenance	Systems	70% of construction cost	624.491,88
	Doors and windows frames	20% of construction cost	178.426,25

	Floorings and claddings	10% of construction cost	89.213,13
		TOTALE	892.131,26

		25 years of operation	
Preventive maintenance	Systems	70% of construction cost	2.145,36
	Doors and windows frames	20% of construction cost	591,82
	Floorings and claddings	10% of construction cost	307,01
		TOTALE	3.698,89

		20 years of operation	
Preventive maintenance	Systems	70% of construction cost	714.447,15
	Doors and windows frames	20% of construction cost	204.127,76
	Floorings and claddings	10% of construction cost	102.063,88
		TOTALE	1.020.638,79

		15 years of operation	
Preventive maintenance	Systems	70% of construction cost	367.040,08
	Doors and windows frames	20% of construction cost	104.868,59
	Floorings and claddings	10% of construction cost	52.434,30
		TOTALE	524.342,97

		10 years of operation	
Preventive maintenance	Systems	70% of construction cost	152.795,42
	Doors and windows frames	20% of construction cost	43.655,83
	Floorings and claddings	10% of construction cost	21.827,92
		TOTALE	218.279,17
		5 years of operation	
Preventive maintenance	Systems	70% of construction cost	57.835,30
	Doors and windows frames	20% of construction cost	16.524,37
	Floorings and claddings	10% of construction cost	8.262,19
		TOTALE	82.621,86

3.1.1 Thirty-year amortization schedule with annual deferred instalments at constant interest rate.

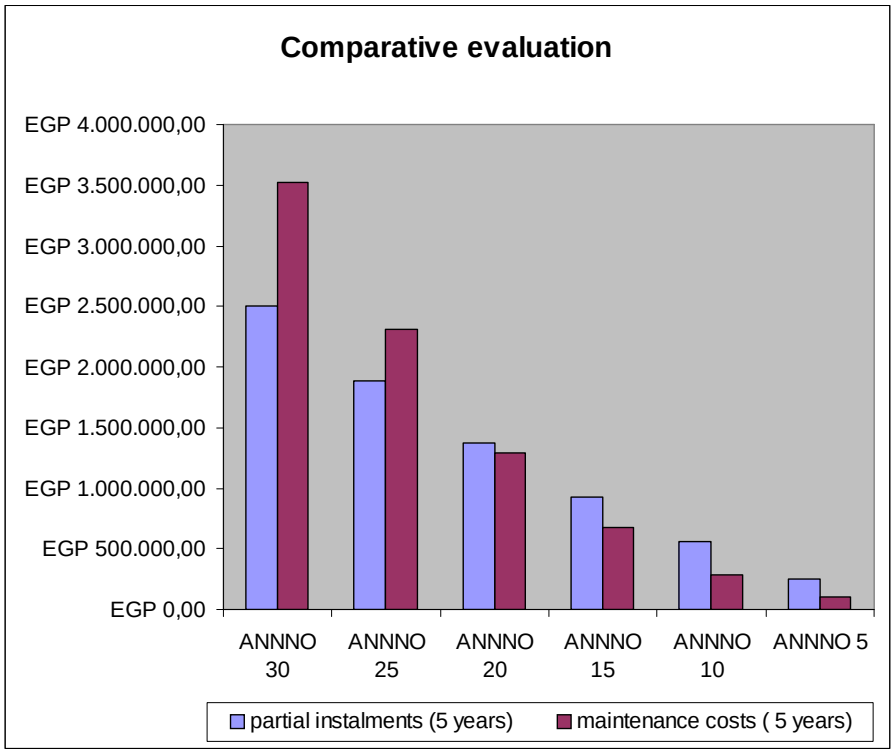
The amortization plan of the construction cost of the building is calculated on a 30 years payback period;
the interest rate chosen is 4% (Conventional interest rate for a U.S. Dollar' amount in Egypt = 3-5%) while the rate chosen for updating the capital (rate of currency inflation) is 3%, from an average rate of inflation of the currency recorded in Egypt in the last 9 years

YEAR	AMORTIZATION INSTALMENT	CAPITAL INSTALMENT	RATE INSTALMENT	DEBT PAY OFF	RESIDUAL DEBT	
0	0,00	0,00	0,00	0,00	795.600,00	original construction cost
1	46.009,62	14.185,62	31824	14.185,62	781.414,38	
2	46.009,63	14.753,05	31256,5752	28.938,67	766.661,33	
3	46.009,63	15.343,18	30.666,45	44.281,85	751.318,15	
4	46.009,63	15.956,90	30.052,73	60.238,76	735.361,24	
5	46.009,63	16.595,18	29.414,45	76.833,94	718.766,06	230.048,14
6	46.009,63	17.258,99	28.750,64	94.092,92	701.507,08	
7	46.009,63	17.949,35	28.060,28	112.042,27	683.557,73	
8	46.009,63	18.667,32	27.342,31	130.709,59	664.890,41	
9	46.009,63	19.414,01	26.595,62	150.123,60	645.476,40	
10	46.009,63	20.190,57	25.819,06	170.314,18	625.285,82	460.096,29
11	46.009,63	20.998,20	25.011,43	191.312,38	604.287,62	
12	46.009,63	21.838,13	24.171,50	213.150,50	582.449,50	
13	46.009,63	22.711,65	23.297,98	235.862,15	559.737,85	
14	46.009,63	23.620,12	22.389,51	259.482,27	536.117,73	
15	46.009,63	24.564,92	21.444,71	284.047,19	511.552,81	690.144,44
16	46.009,63	25.547,52	20.462,11	309.594,71	486.005,29	
17	46.009,63	26.569,42	19.440,21	336.164,12	459.435,88	
18	46.009,63	27.632,19	18.377,44	363.796,32	431.803,68	
19	46.009,63	28.737,48	17.272,15	392.533,80	403.066,20	
20	46.009,63	29.886,98	16.122,65	422.420,78	373.179,22	920.192,59
21	46.009,63	31.082,46	14.927,17	453.503,25	342.096,75	
22	46.009,63	32.325,76	13.683,87	485.829,00	309.771,00	
23	46.009,63	33.618,79	12.390,84	519.447,80	276.152,20	
24	46.009,63	34.963,54	11.046,09	554.411,34	241.188,66	
25	46.009,63	36.362,08	9.647,55	590.773,42	204.826,58	1.150.240,74
26	46.009,63	37.816,57	8.193,06	628.589,99	167.010,01	
27	46.009,63	39.329,23	6.680,40	667.919,22	127.680,78	
28	46.009,63	40.902,40	5.107,23	708.821,62	86.778,38	
29	46.009,63	42.538,49	3.471,14	751.360,11	44.239,89	
30	46.009,63	44.240,03	1.769,60	795.600,14	-0,14	1.380.288,89

		Updated capital
Capital updating (year 5)	230.048,14	253.991,74
Capital updating (year 10)	460.096,29	560.854,81
Capital updating (year 15)	690.144,44	928.843,55
Capital updating (year 20)	920.192,59	1.367.357,78
Capital updating (year 25)	1.150.240,74	1.887.091,85
Capital updating (year 30)	1.380.288,89	2.500.202,27

The rate chosen for updating the capital (rate of currency inflation) is 3%, from an average rate of inflation of the currency recorded in Egypt during the last years

Through the processed data it was possible to make a comparative analysis between the amortizing fund and maintenance costs by constructing a histogram where x-axis shows the years of operation of the building and the y-axis shows the maintenance costs (in red) and the amortizing instalments (in blue).
The graph allows making considerations on the convenience of maintenance over time.
The time interval selected is a five-year interval:



The graph shows that maintenance costs between the twentieth and twenty-fifth year of life of buildings equal or exceed amortizing partial instalments.
When this happens it could be inferred that the maintenance would stop to be affordable but at the same time the building, thanks to a maintenance performed as required but with a high costs, is kept in good condition ensuring its performance and its functionality.
To determine if the maintenance is affordable or if it is still preferable to replace the existing building with a new one, a revaluation of the work has to be done on the twentieth year of life. At that time it will have to be established if interventions of no-preventive maintenance (rehabilitation of failures), will reassess the value of the building.
These interventions provide the complete replacement of technological units that have completed their lifetime; primarily they concern systems that have a life cycle shorter than the structural parts one and whose replacement has costs much higher than other elements with a life span of less than 30 years.
It will be important to determine if the building has taken a significant value over the years thanks to the integration in the architectural/urban context, representing an architectural reference for the local community.
It will also be useful to evaluate if the architectural elements, that characterize the design of the building, are particularly interesting for the local architecture' style in order to determine the attractiveness of a restoration and the building conservation.

ANNEX 4.2

VISITOR CENTER OF WADI EL HITAN MAINTENANCE PLAN

Embassy of Italy in Cairo

COOPERAZIONE ITALIANA
ITALIAN COOPERATION
التعاون الإيطالي

United Nations Development Program

Egyptian Environmental Affairs Agency

Arabic Republic of Egypt

Egyptian Italian Environmental Cooperation Program

Wadi Rayan Protected Area

Visitor Center of Wadi Hitan

Maintenance plan

Index

1 Project description

1.1 Information about the project

VISITOR CENTER OF WADI EL HITAN	
Location	**Wadi El Rayan Protected Area**
Project	**NCSCB**
Year of implementation of the building	**2007**
Architectural designer	**Arch. G. Mikhail**
Built by	**Local workers**
Total cost of the work	**800.000 EGP**

1.2 Information about the building

1.2.1 Brief description

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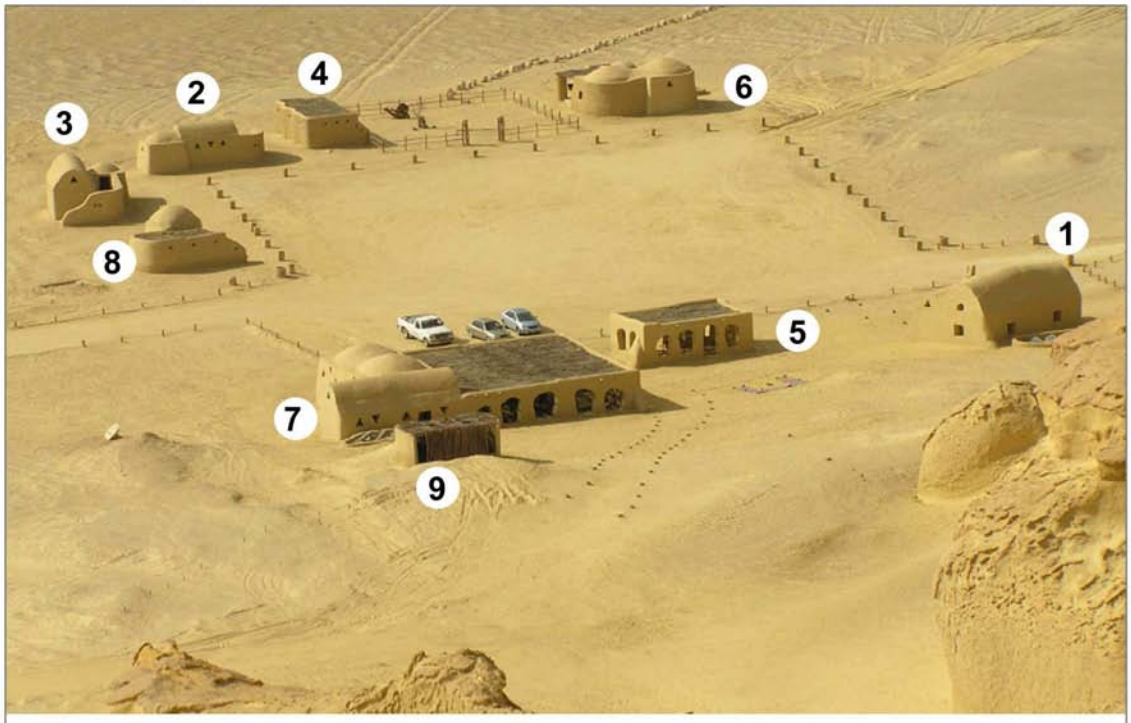
The visitor center of Wadi Hitan represents a gate for the Whale valley park.
Visitor area facilities include an orientation area, provided of informative panels, a cafeteria and a gift shop, a police station, WCs, a camel shade with a fenced area, a guard living quarters and ticket station.
Referring to the architectural design strict adherence to the surrounding area and quality of construction has been observed in order to ensure the integrity of the site and observe the intended goals of minimal impact on the protected area. Building shapes are fluid and irregular to mime the near limestone mountains and the couloirs are in harmony with the natural surroundings.
Mud brick and plaster are the materials mainly used; deeply entwined in the regions culture, utilized from ancient through modern times and readily usable by local labour. This kind of bricks is made of natural degradable material and when it disintegrates will fade back into the earth without scarring the landscape. It has high insulation properties and is certainly sustainable; it also a cheap material but it need a frequent preventive maintenance.

1.2.2 Project data

PROJECT DATA	
Covered surface	**~ 640 m2**
Fronts maximum height	**~ 4,20 m (dome height)**
Expected visitors	**~ 20.000 visitors for years**

1.2.3 Photographic survey

WADI HITAN_VISITOR CENTER



1. Ticket office, 2. Women toilets, 3. Men n toilets, 4. Camel shade, 5. Visitor orientation, 6.Police office, 7. Cafeteria, 9.Water tank

1. Ticket office

6. Police office

2.3.Toilets

7.Cafeteria

4. Camel shade

8. Guard post

5. Visitor orientation

9. Reservoir

WADI HITAN_VISITOR CENTER_ details_

Photographic survey: building details

1. Casuarina wood ceiling
2. Mud brick dome
3. Mud brick wall: plaster disease
4. Mud plaster and wooden window frame
5. Floor: limestone blocks
6. Toilets: ceramic tile cladding
7. Solar panel system
8. Cafeteria: shadow area

1.2.3 Current situation

In order to prepare an effective maintenance plan it is necessary to highlight some deficiencies of the building, analysing the current situation to identify interventions to provide that can lead to a full usability and functionality of the building and then to establish the appropriate maintenance.
The building is analyzed according to the following items:

- **Decay**: the building is in good conditions but some light decay phenomena affect the structures, probably due to natural frail materials used and to the hard weather condition.
  Main diseases detected are:
  - cracks and chips in the mud plaster
  - lack of mud plaster
  - deficiency of system protection



- **Usability and liveable spaces**: the building has a good level of usability; services are wide and well maintained, due to the good finishes used. Toilets are undersized (only two wc' units) compared to the expected tourist flow and referring to the existing camping area, that can hosts a lot of visitors.
  The system that provides electricity is composed by a solar panels system that is currently out of order, probably because of the low quality of the batteries used.
  Furthermore tourism flow is currently growing up, so it will be necessary to repaire the electrical system and also provide an alternative source of energy in case of failure of the solar panel system.

2 Maintenance plan

1. List of the building's technological units

Class	Code	Technological units	Expected life cycle	- 40%
Structural elements	1	Foundations	80/90 years	55
	2	Walls	30/40 years	20
	3	Floors	80/90 years	55
	4	Partitions walls	30/40 years	20
	5	Cielinng	30/40 years	20
Outer finishings	6	Plaster work	6/8 years	5
	7	Outer flooring and inner flooring	30/40 years	25
	8	Roof cladding	6/8 years	5
Inner finishings	9	Wall cladding: plasterwork	6/8 years	5
	10	Wall cladding: ceramic tiles	15/20 years	12
	11	Inner flooring: ceramic tiles	15/20 years	12
Windows and doors	12	Window frames	8/16 years	10
	13	Doors	8/16 years	10
Systems	14	Wastewater system	20/25 years	15
	15	Water distribution system: pipeline	8/16 years	10
	15.1	Water distribution system: equipment	8/10 years	6
	16	Eletrical system: ductwork	20/25 years	15
	16.1	Eletrical system: solar panels	20/25 years	15
	16.2	Eletrical system: equipement	8/14 years	10
Oudoor area	17	Wooden pergola	20/25 years	15
	18	Masonry columns	80/90 years	55

STRUCTURAL ELEMENTS

Requirements and performances:

1. Stability and resistance to the action of loads or seismic vibrations.
2. User' safety

CODE	1
Element	**Foundations**
Description	Foundation is made of granitic stone blocks. This type of foundation offers resistance to high loads.
Locations	~ 1,50 meters from the natural ground level at least
Expected life cycle (years)	**55**
Anomalies and diseases	**Movements and subsidences**
Maintenace interventions	Foundations do not need any kind of maintenance if they are executed in the appropriate way. In case of subsidences it's advisable to contact a specialist in structures to establish the appropriate intervention to provide.
Type of reviews	Visual review. Particular attention to local subsidence's
Periodicity of reviews	Once a year
Periodicity of maintenance	If necessary
Periodicity of maintenance	If necessary

CODE	2
Element	**Walls**
Description	Bearing walls are made of mud bricks (bricks made buy a mix of mud and straw drying up to the sun before start the construction) Binder used is a mortar composed by a mixture of mud, straw and little stone. The same mixture is used as plaster for the façades.
Expected life cycle (years)	**55**
Anomalies and diseases	**Cracks**: swelling of the wall toward the outside **Differential settlement** of the structure due to differential thermal expansion or to floors not properly connected with bearing walls; **Detachment**: detachment of material due to the powdering of the finishes. **Dissolution** of the mud due to weather accident or water ascent from the soil that can cause penetration of humidity inside the walls and so the dissolution of bricks.
Maintenace interventions	Replacement of damaged bricks. If it's not possible to replace a few bricks because the damaged area is too compromised it's possible to reinforce the wall by introducing a wood beam in horizontal way. This action allows reinforcing and reconnecting the entire wall. In case of dangerous subsidences it's advisable to contact a specialist in structures to establish the appropriate intervention to provide.
Type of reviews	Visual review. Particular attention to local subsidences, cracks or dissolution of mud brick portions.
Periodicity of reviews	Every three months
Periodicity of maintenance	If necessary

CODE	3
Element	**Floor**
Description	Floor is composed by a layer of compacted sand. The upper level of finish is composed by limestone block banding together by a mortar composed by clay and sand. (The mortar is a mixture composed by clay, sand and water. In the appropriate doses these materials form a plastic mixture that hardens during the time through chemical reactions.)
Expected life cycle (years)	**55**
Anomalies and diseases	**Depressions or abnormal slopes of the floors** **Deformations and displacements** **Cracks** **Detachment**
Maintenace interventions	Floors do not need any kind of maintenance if they are executed in the appropriate way. In case of subsidences it's advisable to contact a specialist in structures to establish the appropriate intervention to provide.
Type of reviews	Visual review. Particular attention to local subsidences and cracks
Periodicity of reviews	Once a year
Periodicity of maintenance	If necessary

CODE	4
Element	**Partition walls and decorative walls**
Description	Partition walls have the same characteristics of bearing walls. Due to project designer decision some walls (not bearing) have irregular shape and a bigger thickness than the other walls in order to mime close natural limestone mountain shapes. Building system used is mud bricks technique.
Expected life cycle (years)	**25**
Anomalies and diseases	**Penetration of humidity** **Pulverization** **Detachment** **Chips** **Dissolution**
Causes of degradation	Bad execution of the artefact, presence of external moisture.
Type of reviews	Visual review. Particular attention to local subsidences, cracks or dissolution of mud brick portions.
Periodicity of reviews	Every three months
Maintenace interventions	Replacement of damaged bricks. If it's not possible to replace bricks because the damaged area is too compromised it's possible to reinforce the wall by introducing a wood beam in horizontal way. This action allows reinforcing and reconnecting the entire wall. In case of subsidences it's advisable to contact a specialist in structures to establish the appropriate intervention.

Periodicity of maintenance	If necessary

CODE	5
Element	**Ceiling**
Description	Ceilings are vaults made of mud bricks (made of mud and drying up to the sun before laying) Binder used is a mortar composed by a mixture of mud, straw and sand. The same mixture is used as plaster for the façades. Ceiling use the same construction system of the walls
Expected life cycle (years)	
Anomalies and diseases	**Cracks**: swelling of the wall to the outside **Differential settlement** of the structure due to a differential thermal expansion; floors not properly connected with the bearing walls. **Detachment** of material due to the powdering of the finishes. **Dissolution** of the mud due to weather accident or water ascent from the soil that causes penetration of moisture inside the walls and the dissolution of bricks
Maintenace interventions	Replacement of damaged bricks. If it's not possible to replace single bricks because the damaged area is too compromised it's possible to reinforce the wall by introducing a wood beam in horizontal way. This action allows reinforcing and reconnecting the entire wall. In case of subsidences it's advisable to contact a specialist in structures to establish the appropriate intervention to provide.
Type of reviews	Visual review. Particular attention to local subsidences or cracks or dissolution of mud brick portions.
Periodicity of reviews	Every three months
Periodicity of maintenance	If necessary

OUTER FINISHES

Requirements and performances:

1. Functionality and usability
2. To maintain aesthetic features over the time.

CODE	7
Element	**Plaster work**
Description	The plaster in question is a mixture composed by mud, sand, straw. The thickness is around 3 cm.
Expected life cycle (years)	**5**

Anomalies and diseases	**Disaggregation**. **Detachment** **Superficial dump**. **Superficial erosion** **Cracks** **Lack of material** **Swelling**
Causes of degradation	Bad execution or incorrect mixture in the mortar preparation
Type of reviews	**Reviews by the user** 1. Checking fronts and visible parts. 2. Checking the condition of the finishes and verifying diseases and wear of visible parts. Checking the colour surfaces uniformity. **Reviews by qualified staff** 1. Replacement of parts affected by wear or other forms of degradation through the removal of degraded areas, cleaning underlying areas by brushing. Recovery area with appropriate or similar materials to original plaster paying particular attention to preserve the uniform appearance of the surfaces. 2.Control more weather' exposed areas: control by non-destructive methods (hammering on the plaster) in order to locate any anomalies 3. Check plaster functionality of the through some instruments whose use is to be defined referring to the specific type of control and the type of plaster (physic-chemical analysis, stratigraphic analysis, moisture detection systems, adhesion control tests to evaluate the characteristics of homogeneity, monitoring the presence of salts etc...
Periodicity of reviews	Twice a year
Maintenace interventions	Removal of deteriorated parts and plaster recovery; when some area are too damaged it must be provide the total restoration in order to preserve the aesthetic requirement of uniformity of facades.
Periodicity of maintenance	If necessary (total replacement every 5 year)

CODE	**8**
Element	**Outer flooring and inner flooring**
Description	Ground floor is composed by limestone block banding together by a mortar composed by clay and sand. In some areas, particularly shadow area and cafeteria limestone floor is cover by a fine layer of sand
Expected life cycle (years)	**25**
Anomalies and diseases	**Bleaching** **Superficial dump** **Disintegration** **Detachment** **Stains and graffiti** **Lacks** **Depressions or abnormal slopes of the floors** **Formation of sand drifts**

Types of reviews	**Reviews by the user** Overall control of the visible parts about regularity of finishes. Check finishes condition and verify the decay due to wear and joints erosion.
Periodicity of reviews	Once a year
Maintenace interventions	**Maintenance by qualified staff** 1. Surface cleaning: cleaning and removal of dirt dump by washing or brushing, cleaning of damaged elements with an appropriate and no aggressive cleaning product. 2. Cleaning and restoration of joints by brushing manual cleaning. 3. Replacement of degraded elements: replacement of worn parts. Restoration of degraded joints with suitable material. 4. Cleaning and levelling sand drifts inside the shadow areas
Periodicity of maintenance	If necessary

CODE	**9**
Element	**Roof cladding**
Description	The roof is cover by mud plaster. The plaster in question is a mixture composed by mud, sand, straw. The thickness is around 3 cm.
Expected life cycle (years)	**5**
Anomalies and diseases	**Disaggregation**. **Detachment** **Superficial dump**. **Superficial erosion** **Cracks** **Lack of material** **Swelling**
Causes of degradation	Bad execution or incorrect mixture in the mortar preparation
Types of reviews	**Reviews by the user** 1. Checking fronts and visible parts 2. Checking the condition of the finishes and verifying diseases and wear of visible parts. Checking the colour surfaces uniformity. **Reviews by qualified staff** 1. Replacement of parts affected by wear or other forms of degradation through the removal of degraded areas, cleaning underlying areas by brushing. Recovery area with appropriate or similar materials to original plaster paying particular attention to preserve the uniform appearance of the surfaces. 2. Control more weather' exposed areas: control by non-destructive methods (hammering on the plaster) in order to locate any anomalies 3. Check plaster functionality of the through some instruments whose use is to be defined referring to the specific type of control and the type of plaster (physic-chemical analysis, stratigraphic analysis, moisture detection systems, adhesion control tests to evaluate the characteristics of homogeneity, monitoring the presence of salts etc...
Periodicity of reviews	Once a year
Maintenace interventions	Removal of deteriorated parts and plaster recovery, when some areas are too damaged it must be provide the total restoration in order to preserve the aesthetic

	requirement of uniformity of facades.
Periodicity of maintenance	If necessary (total replacement every 5 year)

INNER FINISHES

Requirements and performances:

1. Functionality and usability
2. To maintain aesthetic features over the time
3. To not emit harmful substances
4. Resistance to corrosive substances

CODE	10
Element	**Wall cladding: plaster work**
Description	All the rooms of the building have as external finish a layer of plaster, a mixture composed by mud, sand, and straw. The thickness is around 3 cm.
Expected life cycle (years)	**5**
Anomalies and diseases	**Disaggregation**. **Detachment** **Superficial dump**. **Superficial erosion** **Cracks** **Lack of material** **Swelling**
Causes of degradation	Bad execution or incorrect mixture for the mortar preparation
Type of reviews	**Reviews by the user:** 1. Checking fronts and visible parts. 2. Checking the condition of the finishes and verifying diseases and wear of visible parts. Checking the colour surfaces uniformity. **Reviews by qualified staff** 1. Replacement of parts affected by wear or other forms of degradation through the removal of degraded areas, cleaning underlying areas by brushing. Recovery area with appropriate or similar materials to original plaster paying particular attention to preserve the uniform appearance of the surfaces. 2. Control more weather' exposed areas: control by non-destructive methods (hammering on the plaster) in order to locate any anomalies 3. Check plaster functionality of the through some instruments whose use is to be defined referring to the specific type of control and the type of plaster (physic-chemical analysis, stratigraphic analysis, moisture detection systems, adhesion control tests to evaluate the characteristics of homogeneity, monitoring the presence of salts etc..
Periodicity of reviews	Twice a year
Maintenace interventions	Removal of deteriorated parts and plaster recovery, when some areas are too damaged it must be provide the total restoration in order to preserve the aesthetic requirement of uniformity of facades.

Periodicity of maintenance	If necessary (the total replacement of the plaster have to be done every five years)

CODE	11
Element	**Toilet cladding: stone tiles**
Description	The inner coating of toilets is a ceramic cladding tile. Tile dimensions are 30x30 cm; they are polished and unglazed. Mortar used is white cement lime.
Expected life cycle (years)	**12**
Anomalies and diseases	**Bleaching** **Superficial dump** **Detachment** **Stains and graffiti** **Lacks**. **Depressions or abnormal slopes on the wall**
Causes of degradation	Bad execution of the laying, bad quality of the tile material
Types of reviews	**Reviews by the user:** Control of the visible parts and finishes regularity Checking finishes condition and testing the degree due to wear and erosion of visible parts, particularly joints. Checking the uniformity of colour surfaces. Acknowledgement of faults
Periodicity of reviews	Once a year
Maintenace interventions	**Maintenance by qualified staff:** 1. Surface cleaning: cleaning and removal of dirt by washing or brushing, cleaning with appropriate product 2. Cleaning and restoration of joints by manual brushing. Restoration of damaged joints. 3. Replacement of degraded elements: replacement of worn parts, broken or raised. Preparation of the underlying plan.
Periodicity of maintenance	If necessary

CODE	12
Element	**Inner flooring of toilets: stone tiles**
Description	The inner coating of toilets is a ceramic cladding tile. The tile dimensions are 30x30 cm. Tiles are polished and unglazed. Mortar used is white cement lime.
Expected life cycle (years)	**12**
Anomalies and diseases	**Bleaching** **Superficial dump** **Detachment** **Stains and graffiti** **Lacks**. **Depressions or abnormal slopes on the wall**
Causes of degradation	Bad execution of the laying, bad quality of the tile material

Types of reviews	**Reviews by the user:** Control of the visible parts and finish regularity Checking finishes condition and testing the decay due to wear and erosion of visible parts, particularly joints. Checking the uniformity of colour surfaces. Acknowledgement of faults
Periodicity of reviews	Once a year
Maintenace interventions	**Maintenance by qualified staff:** 1. Surface cleaning: cleaning and removal of dirt by washing or brushing, cleaning with appropriate and non aggressive product. 2. Cleaning and restoration of joints by manual brushing. Restoration of damaged joints. 3. Replacement of degraded elements: replacement of worn parts, broken or raised. Preparation of the underlying plan.
Periodicity of maintenance	If necessary

WINDOW FRAMES AND DOORS

Requirements and performances:

1. Thermal comfort
2. Regularity of finishes
3. Easiness of cleaning
4. Knocks resistances
5. Weather accident' resistance

CODE	13
Element	**Window frames**
Description	Frames are made of wood, finished by natural colour. In order to guarantee its preservation wood is treated by a water proof product and sprayed by insecticide.
Expected life cycle (years)	**10**
Anomalies and diseases	**Chromatic alteration** **Swelling** **Deformation** **Seals degradation** **Cracks** **Lack of orthogonal structure** **Loss of gloss** **Flaking, cracking** **Rupture of the action organs** **Loss of material**
Types of reviews	**Reviews by the user:** 1. Check wood deterioration 2.Controlling finishes and protective surface coating, control flatness of the elements.

	3. Hand control 4.Controlling glass uniformity and of sealing glass- frame. Check for deposits or dirt. Verification of presence of anomalies or damages.
Periodicity of reviews	Once a year
Maintenace interventions	**Maintenance by the user:** **Lubricating hinges and locks (once a year)** Purification of locks and hinges with silicone products to ensure the correct operation **Cleaning of the runner slides (once a year)** Cleaning and removal of dirt and deposits with an appropriate detergent product. **Cleaning window casements (once a year)** Cleaning by aggressive detergents of residues and deposits that may affect the correct working **Cleaning gaskets (if necessary)** Cleaning by common detergent product. **Cleaning of working elements (every 6 months)** Clean organic residues that can cause the filling of slots, holes or beats by not aggressive product. **Cleaning of frames** Cleaning of embed and mobile frames by an appropriate detergent product. **Protection and painting of frames (once a year)** Restoration of protective coating after removal of the old layer by abrasive papers and filling of wood cracks by putty. To apply a primer coat by brush, to renovate the protective layer using suitable products according to the type of wood. **Maintenance by qualified staff (if necessary)** Replacement of broken frames or glasses using the same material following project specification
Periodicity of maintenance	(Before written)

CODE	**14**
Element	**Doors**
Description	The entrance door and the inner doors are made of wood; in order to guarantee its preservation, wood is treated by a water proof product.
Expected life cycle (years)	**10**
Anomalies and diseases	**Chromatic alteration** **Swelling** **Deformation** **Seals degradation** **Gaskets degradation** **Cracks** **Lack of orthogonal structure** **Loss of gloss** **Flaking, cracking** **Rupture of the action organs** **Loss of material**
Types of reviews	**Reviews by the user:**

	1. Check wood deterioration 2.Controlling finishes and protective surface coating, particular attention to swelling of the coating or of the wood. 3. Hand control 4.Controlling glass uniformity and sealing glass- frame. Checking deposits or dirt.
Periodicity of reviews	Once a year
Maintenace interventions	**Maintenance by the user:** **Lubricating of hinges and locks (once a year)** Lubrification of locks and hinges with silicone products, to verify the correct operation **Cleaning of the runner slides (once a year)** Cleaning and removal of dirt and deposits with an appropriate detergent product. **Cleaning of casements (once year)** Cleaning of residues and deposits that may affect the correct working, by aggressive detergents. **Cleaning gaskets (if necessary)** Cleaning by common detergent product. **Cleaning of working elements (every 6 months)** Clean organic residues that can cause the filling of slots, holes or beats by not aggressive product. **Cleaning of frames** Cleaning of embed and mobile frames by an appropriate detergent product **Protection and painting of frames (once a year)** Restoration of protective coating after removal of the old layer by abrasive papers and filling of wood cracks by putty. To apply a primer coat by brush, to renovate the protective layer using suitable products according to the type of wood. Spraying of insecticide (once a year)
Periodicity of maintenance	(Before written)

SYSTEMS

Requirements and performances:

1. Technological functionality and usability
2. Users' safety
3. Ease of inspection
4. Ease of management
5. Ease of use
5. Ease of maintenance

CODE	**15**
Element	**Wastewater system**

Technological unit description	**Pipes of drainage** provide to the spillage of water from a reservoir placed on the upper level of the site. **Sewage wells** must convey, in the sewer wastewater. They are generally circular, and they are composed by precast pieces of concrete. Coarse material is retained by an appropriate drilled basket, leaving only water flow and if it is necessary to retain sand and mud, which would pass easily through the holes of the basket, it's preferable to ensure a settling in a tank located on the bottom of the well. When connecting drainage to the existing sewerage system become difficult it's important to realize **septic tanks**; these elements can be a temporary store for wastewater coming from sewage well. Generally septic tanks are prefabricated and can be easily installed; they must be waterproof in order to prevent leakage that may cause pollution.
Expected life cycle (years)	**15**
Anomalies and diseases	**Pipelines:** **Accumulation of grease**: grease accumulation on the walls of the ducts. **Corrosion**: corrosion of pipes with obvious signs of decay showed the same changes of colour and presence of rust. **Defects in joints and connections**: fluid leakage near the joints due to bad executions of connections or disconnections of joints. **Erosion**: Soil erosion outside the pipes which is usually caused by ground infiltration. **Encrustation** accumulation of mineral deposits on the walls of the ducts. **Penetration of roots**: root vegetables penetrating inside ducts that cause the obstruction of the system **Sedimentation**: accumulation of mineral deposits on the bottom of the duct can cause obstruction of the ducts. **Sewage wells:** **Corrosion** of the walls of the wells due to hard particles in wastewater and on the superficial flowing water **Defects in joints and connections**: fluid leakage near the joints due to errors or disconnections of joints. **Grids' diseases**: grids' breaking can cause leakage of materials such as coarse sand and rubble. **Deposits**: fouling or obstruction of the grid of wells due to accumulation of material which is foliage, vegetation, etc... **Septic tanks:** **Abrasion**: Abrasion of the septic tank walls due to the effects of hard particles used in the water and surface runoff. **Corrosion** of the walls and of the bottom of the basins due to chemical action of fluids. **Deposits**: excessive accumulation of sand and solids elements on the bottom of the tank. **Obstruction**: obstruction of the well grids due to accumulation of material (foliage, vegetation, etc.) **For all the components:** Stench: septic sewage could be produce unpleasant odours, lethal or explosive gas producing chemical effects dangerous for people.
Types of reviews	**Reviews by qualified staff:** 1. Test for detected leaks inside the pipes (once a year) 2. To verify overall status and integrity of grids and cover plates of the

	wells (twice a year) 3. Checking along the walls of the septic tanks in order to pull out accumulation of mineral material and to verify that there is no loss of materials. (Twice a year)
Periodicity of reviews	(Before written)
Maintenace interventions	**Maintenance by qualified staff:** 1. Cleaning from sediments, causing obstructions and reducing the carrying capacity of fluids. (Twice a year) 2. Cleaning of the wells by removing sludge' storage and washing with pressure water. (Twice a year) 3. Cleaning of tanks removing any material accumulation, ensuring a water pressure cleaning up (Twice year_ if tourist crowd will increase the maintenance will be performed three times a year.)
Periodicity of maintenance	(Before written)

CODE	**16**
Element	**Water distribution system: pipeline**
Technological unit description	Water pipes provide the spillage of water from a reservoir, water tanks, placed on the uppest level of the site. These tanks provide of potable water all the site and they have a life cycle of 25 years. The distribution system of the hot and cold water allows the facility of water use in the indoor and outdoor areas of a building. Water system is generally composed by the following technical elements: - Connection line , which connects the main water network to user secondary network; - Hydraulic machines, which control physical-chemical microbiological characteristics of water and control also the correct pressure to provide water distribution in the network; - Deposits, which provide to the users an adequate water supply - Heaters that must raise the temperature of cold water to satisfy the user' needs; - Cold/hot water distribution network has the function of transporting water to supply terminals; - Networks of hot water circulation, which have the function of keeping in constant circulation hot water to ensure distribution to the desired temperature; - Sanitary equipment and fittings that allow users to use hot / cold water **Polypropylene pipes** transporting thermo-vector fluids to the taps of sanitary equipments trough an underground network.
Expected life cycle (years)	**10**
Anomalies and diseases	**Insulation defects:** leaks detected in the insulation layer. **Defects in the control system**: defects of calibration for safety and control device, like pressure gauges or thermometers. **Leaks**: loss or leakage of fluid circulating in the pipes. **Deformation**: change of initial shape, warping of elements and irregularities

	Gradient slope' errors: errors in the calculation of the slope can cause a backflow of stagnant water **Deposits**: accumulation of storage material inside the pipes and inside the filters; it can cause fluid loss or pipe breaks
Types of reviews	**Reviews by qualified staff:** Check by view: to verify the main characteristics of pipes, particularly referring to: - leaks in joints: to check lesions or disconnection; stability of pipe supports; vibrations; - Presence of condense; insulation of pipes.
Periodicity of reviews	Once a year
Maintenace interventions	**Maintenance by qualified staff:** Cleaning of the water tanks (every two year) Refill of water tanks (if necessary) Renovate insulation of pipes when some signs of deterioration are visible (every three years)
Periodicity of maintenance	Every 10 years (after a review by specialized staff)

CODE	16.1
Element	**Water distribution system: hydraulic equipment**
Technological unit description	**Sanitary equipment**: elements for water distribution that allow users to carry out operations related to provision of sanitary water, hot water and / or cold water. **Water closet (WC)**: installed on the floor and made of glazed sanitary porcelain; it includes flush tank and toilet seat and chrome plated connection valves. **Wastewater wall box** made of glazed sanitary porcelain; the glaze is opacified by zirconium silicate, the material obtained has a good resistance to impacts and it allows very low water absorption. **Service sink** for cafeteria service, complete with chrome plated water faucet, chrome plated basket. **Kitchen sink** for resident rooms complete with chrome plated water faucet, siphon and all necessary accessories.
Expected life cycle (years)	**6**

Anomalies and diseases	**Failures:** failure of support structures for sanitary devices due to incorrect installation or to vandalism. **Corrosion**: corrosion of pipes in the strong decay parts and presence of rust **Defects in joints or connections**: fluid leakage close to the joints due to errors in the placement phase and / or disconnections of joints. **Defected valves**: bad working due to incorrect installation or poor dimensions design of the valves **Deposits**: accumulations of storage material inside the pipes and in the filters that cause leaks or breaks of the pipes. **Limestone deposit**: especially for chrome plated sink **Chips**: chips in the coating glaze of sanitary devices causing lacks. **Faults in the control** (wastewater wall box) malfunctions of devices controlling the wastewater box due to fouling or deposit of various materials (dust, limestone, etc.).. **Abnormalities of the float** (wastewater wall box) malfunction of the float that controls the water flow.
Types of reviews	**Reviews by qualified staff:** 1. Control by view: to verify and arrangement of the anchor of equipments and wall box with any silicone sealing (every two months). 2. Control by view: to verify the functionality of waste devices and arrangement of devices not fully working and replacement of damage parts (every two months). 3. Checking and replacement of seals (if necessary). 4. Verification required for all discharges of sealing or replacing seals (every two months). 5. Checking, fixing, fitting and replacement (if necessary) of toilet seat with other similar and same quality seat (every six months) 6. Checking of taps: to check taps work by making some openings and closings actions (every two months).
Periodicity of reviews	(Before written)
Maintenace interventions	**Maintenance by qualified staff:** 1. Mechanical unblocking of drains without removal of equipment by the use of pressurized air or flexible probes. (If necessary) 2. Remove lime deposit using chemical products. (Every 4 months) 3. Replacement of damage wastewater wall box (Every 15 years).
Periodicity of maintenance	(Before written)

CODE	17
Element	**Electrical system: ductwork:**
Technological unit description	The electrical system distributes and delivers electricity. The electrical urban authority provides to the users a low voltage power through an electrical group. Inside the building the main distribution of energy runs in cables placed in special ductwork, the secondary distribution conductors is placed in special protective sheaths. **Electrical ductwork:** 1. The "channels" are the simplest elements for the passage of electric cables; they are generally made of PVC.
Description	System in question is connected to public electrical network. In this document we report a description of a traditional electrical system because of the lack of information in the technical drawings about this aspect of the project. For electrical panels, switches and sockets we had a real feedback thanks to the site' inspection
Expected life cycle (years)	**15**
Anomalies and diseases	1. Short circuits due to defects in the underground electrical system or to power surges. 2. Failures of switches due to excessive dust inside connections or to the presence of moisture and condensation. 3. Defects of calibration in the electricity meters, failures in the connection or e failures in the protection setting system 4. Disconnection of the electricity provision: due to grounding failures, overload voltage, unexpected shot circuit. 5. Main power network failure due to an interruption of authority providing electricity. 6. Interruption of secondary electrical line due to faults in the secondary circuit of the generator. 7. Overheating which can cause defects in protection and isolation system. It could be due to oxidation of the metal masses
Types of reviews	**Reviews by qualified staff:** 1. To check the general condition and integrity of electrical containers, lids and boxes 2. Replacement of damage or degraded parts
Periodicity of reviews	Every six months
Maintenace interventions	**Maintenance by qualified staff:** Restore the expected protection level that should never be less than that one provided by law.
Periodicity of maintenance	If necessary

CODE	17.1
Element	**Electrical system: solar panels**
Description	A photovoltaic system consists of a set of equipment converting solar energy directly into electricity. The appropriate slope to obtain a good panel

	performance is calculated according to system location in relation to the building, system size and presence of obstacles to direct sun exposure. The support is a steel chain link structure resistant to weight and made of stainless steel or anodized aluminium. In this case the panels are placed in special enclosures on the ground; to prevent the formation of birds nests near the structure is advisable to protect the upper edges of the panels. The production of electricity using photovoltaic technology has several advantages; the most significant are: the absence of any polluting emission, fossil fuel savings, reduced maintenance costs; modularity of the system (to increase the size of the system to increase the number of modules).
Expected life cycle (years)	**15**
Anomalies and diseases	1. Loss of transparency of protective coating placed on the panel surface due to the accumulation of dust and dirt causes a consequent loss of efficiency (around 15%) of normal performance. 2. Biological waste coating and animal faeces can create shadow areas on solar panels and affect their performance. 3. Possible glass breakage. 4. Oxidation of circuits and soldering of solar cells 5. Formation of moisture inside the panel because of breakage during and transport installation 6. Rust
Types of reviews	**Reviews by users:** 1. To check the general condition and integrity of battery, stell support system and screen panels. 2. Checking the status of fixing and cable connecting the modules. 3. Checking the watertight of the terminal box 4. Visual inspection of any internal deterioration 5. State control of the electrical connections and wiring system. 6. Control of the electrical characteristics of the module
Periodicity of reviews	Every six months
Maintenace interventions	**Maintenance by users:** 1. Regular cleaning of the module. Dirt accumulated on the transparent cover module reduces productivity and can cause bad effects similar to those produced by shadows. This aspect becomes dangerous in case of industrial waste and birds waste material; even if it's not very appreciable also the presence of powder reduces the sunrises capacity of capture. To prevent the standing of birds on the panel it's possible installing small antennas on the top of the module. The cleaning operation can be performed by users, it's consists in washing photovoltaic modules with non-abrasive detergent and water, avoiding water accumulation on solar modules. These actions must be done when photovoltaic modules are cold, so early in the morning or late in the evening (ounces months). 2. To provide anti-rust coating of the steel chain-link structure during installation and to provide preventive maintenance over the time to steel supports (every six months).
Periodicity of maintenance	If necessary

CODE	17.1
Element	**Electrical system: equipments**
Technological unit description	1. Electrical panels are switchboards made of thermoplastic material; they are installed inside the buildings. 2. Sockets and plugs are responsible for distributing electricity from the main line of adduction to equipments which are connected to the system. They are generally placed in special spaces created in the walls or floor (boxes) as well as the switches, they have the task to switching on/off of the lights inside the rooms. 3. Electrical meter is a mechanical device that operates ON / OFF and is controlled by an electromagnet. It's closed when the coil is energized and, through the poles, it creates the circuit between the power source and the receivers. The moving parts of the poles and auxiliary contacts are controlled by electromagnet moving part.
Description	System in question is not connected to public electrical network. Main energy source is provided by the solar panels and by an emergency generator.
Expected life cycle (years)	**10**
Anomalies and diseases	**Electrical equipments**: <u>Switchboards:</u> 1. Bad working of contactors. 2. Bad working of fuses. 3. Bad working of the unit that manage power control 4. Bad working of the anti-condense resistance. 5. Failure in the lighting alarm and signal lamps 6. Defect in the thermostats. 7. Accumulation of dust on the contacts that causes failures <u>Sockets, plugs and switches:</u> 1. Short circuits due to defects in the grounding of the electrical system and to power surges (overloads). 2. Short circuit due to excessive dust inside connections or the presence of moisture or condensation. 3. Defects in the calibration of meters 4. Overheating which can cause defects in protection and isolation. It could be due to oxidation of the metal masses. <u>Electrical meter:</u> 1. Bad working of the winding coil. 2. Bad working of the mobile magnetic circuit 4. Bad working of the return spring. 7. Excessive noise due to dust accumulation on surfaces
Types of reviews	**Reviews by qualified staff:** <u>Electrical meter:</u> 1. Check power factor unit (every two months) 2. To verify the functionality of the power factor condenser and electrical meter (every six months) 3. Check the efficiency of the grounding of the panel' electrical system (every two months) 4. To check the correct operation of fuses(every six months) <u>Sockets, plugs and switches:</u>

	1. Check the correct clamping pressure of the screws and plates, and box cover. To verify that there is a good level of insulation and protection to prevent short circuits (Every six months) Electrical meter: 1. Overall inspection: in case of excessive noise, remove the meter and check the cleanliness of surfaces, electromagnet and coil (every six months) 2. Check tension: measure the terminal voltage of arrival, using a voltmeter (Once a year)
Periodicity of reviews	(Before written)
Maintenace interventions	**Maintenance by qualified staff:** Switchboards: 1. General cleaning using dry air at low pressure (every six months) 2. To run the tightness of all bolts, terminals and switches (ounces year) 3. Replacing the power factor unit using one of the same type (if necessary) 4. Replacing damaged parts for an adjustment according to the rules (every 15 years) Sockets, plugs and switches: 1. To replace them when damaged or not to be able to range law standards (if necessary) Meters: 1. Cleaning electromagnet surface using gasoline or trichloroethylene (if necessary) 2. To make the clamping of all cables of the contactor (every six months) 3. Replacement the meter with another one of the same type (if necessary)
Periodicity of maintenance	(Before written)

OUTDOOR AREA

Requirements and performances:

1. Users' safety
2. Functionality and usability
3. Maintain aesthetic features over the time.

CODE	18
Element	**Pergola: wooden tralllis**
Description	Pergola is composed by a structure made of gazwareena non-dimensional wood lattice trellis with 10 cm, diameter joist members 60 cm on center and masonry columns at mid space. Columns are made of limestone blocks and covered by plaster. (For the maintenance interventions on plasterwork see the item 7).
Expected life cycle (years)	**15**
Anomalies and diseases	**Penetration of moisture** **Deflection** **Detachment** **Swelling** **Rot**:
Type of reviews	Visual review
Periodicity of reviews	Once a year

Maintenace interventions	The consolidation of wooden structures, following the loss of mechanical properties is generally accomplished as follow: - If wooden elements are totally damaged beams, joists or columns have to be replace with new elements. It's suitable using some ribs for ensuring safety measures during the works of replacement; - Woodworm and meld treatment have to be apply on the wooden parts by brush or spray application of synthetic resin; - Replacement of waterproof layer (every six year); - Replacement of damages joists with new element of the same quality and of the same shape and dimension
Periodicity of maintenancence	If necessary

CODE	19
Element	**Pergola: masonry columns**
Description	Masonry columns are made of limestone blocks and covered by plaster. (For the maintenance interventions on plasterwork see the item 7).

Overall recommendations:

- The height of the ground level outside the building was established in the project design.
  It has to be maintained over the time; for this reason it's important to clean or add sand after sand storms or any other unexpected accident which can causes the change of the projects level.
  The excess sand can causes the aggression of materials as well as their degradation; on the contrary the lack of sand can leave unprotected structural parts of the building.
- Even if it's not a technical maintenance intervention it's important to specify that the periodical cleaning up of rooms and toilets with common disinfectant products allows to maintain good hygienic standards and to preserve the building also during tourist low season.

3 Evaluation of the maintenance costs

3.1 Maintenance costs

Maintenance cost is composed by four subcomponents. A percentage value on the cost of construction is assigned for each component, referring to the whole life cycle of the building, in this case of 30 years (expected life cycle = 30 years: calculation of the average life cycle of the building-technical standards constructions- by a correction factor = 40%, determined according to the analysis of criticality factors in the context of intervention).
Then the percentages are recalculated at five years intervals updating the construction woks' cost, according to an inflation rate of 6%, from an average rate related to construction materials recorded in Egypt during the last years.

Updating the original cost of the building (1.000.000 EGP)	
Updating capital at 5th year	918.922,73
Updating capital at 10th year	1.172.804,13
Updating capital at 15th year	1.725.521,90
Updating capital at 20th year	2.309.137,54
Updating capital at 25th year	3.090.146,92
Updating capital at 30th year	4.135.313,64

Sources: data on incidence rates of individual items of maintenance on the total cost of maintenance refers to the analysis results conducted on a sample of 78 housing and public building realized at the end of 1990 with traditional technology comparable to those of the visitor center (Maintenance of buildings: design and management. Manfron, Edited by Vittorio and Enzo Siviero. Utet, 1998 Turin).

WADI HITAN VISITOR CENTER			
Calculation of Maintenance costs (LEG)			
Construction cost (original cost)	Design expenditure	80.000	720.000,00
	Construction works	720.000	
		Expected life cycle: 30 years	
Maintenantce costs	Postnatal costs (soon after the end of the works)	1% of construction cost	41.353,14
	Preventive maintenance	60% of construction cost	2.481.188,19
	Rehabilitation of failures	9% of construction cost	372.178,23
	Contingency costs	7% of construction cost	289.471,96

		TOT	3.184.191,51
		25 years of operation	
Maintenantce costs	Preventive maintenance	55% of construction cost	1.673.829,58
	Rehabilitation of failures	8% of construction cost	231.761,02
	Contingency costs	6% of construction cost	180.258,57

		TOT	2.085.849,17

		20 years of operation	
Maintenantce costs	Preventive maintenance	40% of construction cost	923.655,02

	Rehabilitation of failures	6% of construction cost	138.548,25
	Contingency costs	5% of construction cost	107.759,75

TOT	1.169.963,02

		15 years of operation	
Maintenantce costs	Preventive maintenance	28% of construction cost	474.518,52
	Rehabilitation of failures	5% of construction cost	77.648,49
	Contingency costs	4% of construction cost	60.393,27

TOT	612.560,27

		10 years of operation	
Maintenantce costs	Preventive maintenance	17% of construction cost	207.195,40
	Rehabilitation of failures	3% of construction cost	35.184,12
	Contingency costs	2% of construction cost	27.365,43
		TOT	269.744,95
		5 years of operation	
Maintenantce costs	Preventive maintenance	8% of construction cost	76.576,89
	costi di m. straordinaria	2% of construction cost	7.657,69
	Contingency costs	1% of construction cost	10.720,77
		TOT	94.955,35

During the first five years of operation of the building the estimated expenditures, concerning the maintenance, will be of 94.955 EGP (18.990 EGP per year).
Preventive maintenance costs have to cope with building physiological aging and they have the highest incidence on the total maintenance cost. The items of higher incidence referring to preventive maintenance are:

Systems	70% of preventive maintenance cost
Doors and windows frames	20% of preventive maintenance cost
Floorings and claddings	10% of preventive maintenance cost

The schedule below shows a calculation of the costs referring to each item for Wadi Hitan visitor center; costs are calculated during a five-year period referring to the whole life cycle of the building, of thirty years long.

Calculation of Preventive Maintenance costs (LEG)			
Construction cost	Design expenditure	80.000	800.000,00
	Construction works	720.000,00	
		Expected life cycle: 30 years	
Preventive maintenance	Systems	70% of construction cost	565.151,02
	Doors and windows frames	20% of construction cost	161.471,72
	Floorings and claddings	10% of construction cost	80.735,86
		TOTALE	807.358,61

		25 years of operation	
Preventive maintenance	Systems	58% of construction cost	-4.707,42
	Doors and windows frames	16% of construction cost	-1.298,60
	Floorings and claddings	8% of construction cost	-673,65
		TOTALE	-8.116,25

		20 years of operation	
Preventive maintenance	Systems	47% of construction cost	646.558,51
	Doors and windows frames	13% of construction cost	184.731,00
	Floorings and claddings	7% of construction cost	92.365,50
		TOTALE	923.655,02

		15 years of operation	
Preventive maintenance	Systems	35% of construction cost	332.162,97
	Doors and windows frames	10% of construction cost	94.903,70
	Floorings and claddings	5% of construction cost	47.451,85
		TOTALE	474.518,52

		10 years of operation	
Preventive maintenance	Systems	23% of construction cost	145.036,78
	Doors and windows frames	7% of construction cost	41.439,08
	Floorings and claddings	3% of construction cost	20.719,54
		TOTALE	207.195,40
		5 years of operation	
Preventive maintenance	Systems	70% of construction cost	53.603,83
	Doors and windows frames	20% of construction cost	15.315,38
	Floorings and claddings	10% of construction cost	7.657,69
		TOTALE	76.576,89

3.1.1 Thirty-year amortization schedule with annual deferred instalments at constant interest rate.

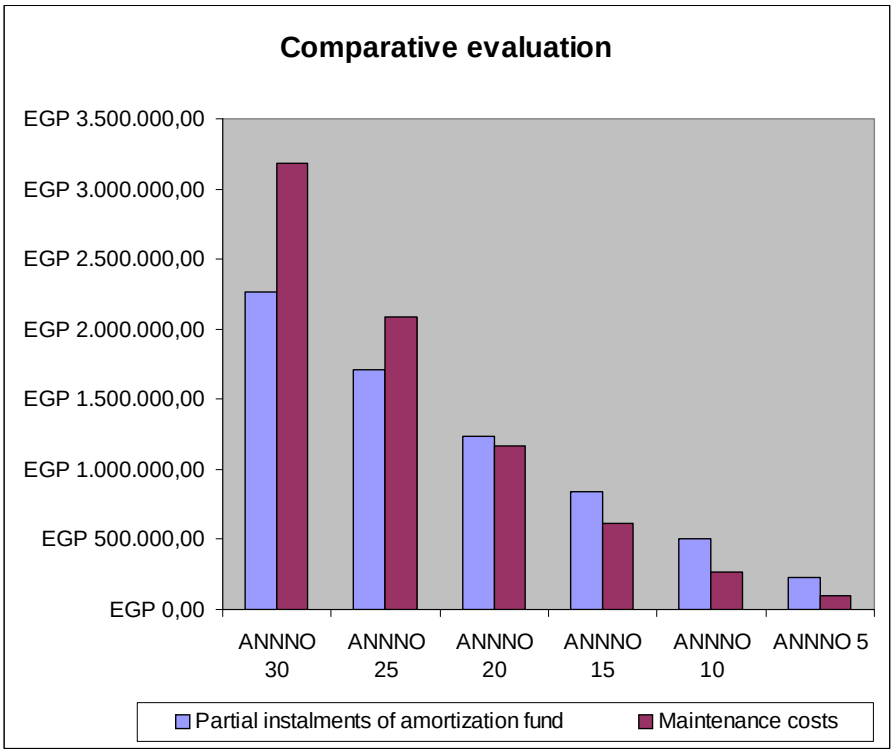
The amortization plan of the construction cost of the building is calculated on a 30 years payback period; the interest rate chosen is 4% (Conventional interest rate for a U.S. Dollar' amount in Egypt = 3-5%) while the rate chosen for updating the capital (rate of currency inflation) is 3%, from an average rate of inflation of the currency recorded in Egypt in the last 9 years

YEAR	AMORTIZATION INSTALMENT	CAPITAL INSTALMENT	RATE INSTALMENT	DEBT PAY OFF	RESIDUAL DEBT	
0	0,00	0,00	0,00	0,00	720.000,00	original construction cost
1	41.637,68	12.837,68	28800	12.837,68	707.162,32	
2	41.637,68	13.351,19	28286,4928	26.188,87	693.811,13	
3	41.637,68	13.885,23	27752,44531	40.074,10	679.925,90	
4	41.637,68	14.440,64	27197,03592	54.514,75	665.485,25	
5	41.637,68	15.018,27	26619,41016	69.533,02	650.466,98	208.188,40
6	41.637,68	15.619,00	26018,67937	85.152,02	634.847,98	
7	41.637,68	16.243,76	25393,91934	101.395,78	618.604,22	
8	41.637,68	16.893,51	24744,16892	118.289,29	601.710,71	
9	41.637,68	17.569,25	24068,42847	135.858,54	584.141,46	
10	41.637,68	18.272,02	23365,65841	154.130,56	565.869,44	416.376,80
11	41.637,68	19.002,90	22634,77755	173.133,46	546.866,54	
12	41.637,68	19.763,02	21874,66145	192.896,48	527.103,52	
13	41.637,68	20.553,54	21084,14071	213.450,02	506.549,98	
14	41.637,68	21.375,68	20261,99914	234.825,70	485.174,30	
15	41.637,68	22.230,71	19406,9719	257.056,41	462.943,59	624.565,20
16	41.637,68	23.119,94	18517,74358	280.176,35	439.823,65	
17	41.637,68	24.044,73	17592,94612	304.221,08	415.778,92	
18	41.637,68	25.006,52	16631,15677	329.227,60	390.772,40	
19	41.637,68	26.006,78	15630,89584	355.234,39	364.765,61	
20	41.637,68	27.047,06	14590,62447	382.281,44	337.718,56	832.753,60
21	41.637,68	28.128,94	13508,74225	410.410,38	309.589,62	
22	41.637,68	29.254,10	12383,58474	439.664,48	280.335,52	
23	41.637,68	30.424,26	11213,42093	470.088,74	249.911,26	
24	41.637,68	31.641,23	9996,450566	501.729,97	218.270,03	
25	41.637,68	32.906,88	8730,801388	534.636,84	185.363,16	1.040.942,00
26	41.637,68	34.223,15	7414,526244	568.860,00	151.140,00	
27	41.637,68	35.592,08	6045,600094	604.452,08	115.547,92	
28	41.637,68	37.015,76	4621,916898	641.467,84	78.532,16	
29	41.637,68	38.496,39	3141,286373	679.964,23	40.035,77	
30	41.637,68	40.036,25	1601,430628	720.000,48	-0,48	1.249.130,40

		Updated capital
Capital updating (year 5)	208.188,40	229.856,82
Capital updating (year 10)	416.376,80	507.561,00
Capital updating (year 15)	624.565,20	840.582,53
Capital updating (year 20)	832.753,60	1.237.428,04
Capital updating (year 25)	1.040.942,00	1.707.775,69
Capital updating (year 30)	1.249.130,40	2.262.626,82

The rate chosen for updating the capital (rate of currency inflation) is 4%, from an average rate of inflation of the currency recorded in Egypt during the last years

Through the processed data it was possible to make a comparative analysis between the amortizing fund and maintenance costs by constructing a histogram where x-axis shows the years of operation of the building and the y-axis shows the maintenance costs (in red) and the amortizing instalments (in blue).
The graph allows to make considerations on the convenience of maintenance over time.
The time interval selected is a five-year interval:



The graphs of the comparative evaluation of maintenance costs and amortizing instalments show that maintenance costs between the twenty-fifth and twentieth year of life of buildings equal or exceed amortizing partial instalments.
When this happens it could be inferred that the maintenance would stop to be affordable but at the same time the building, thanks to a maintenance performed as required but with a high costs, is kept in good condition ensuring its performance and its functionality.
To determine if the maintenance is affordable or if it is still preferable to replace the existing building with a new one, a revaluation of the work has to be done on the twentieth year of life. At that time it will have to be established if interventions of no-preventive maintenance (rehabilitation of failures), will reassess the value of the building.
These interventions provide the complete replacement of technological units that have completed their lifetime; primarily they concern systems that have a life cycle shorter than the structural parts one and whose replacement has costs much higher than other elements with a life span of less than 30 years.
It will be important to determine if the building has taken a significant value over the years thanks to the integration in the architectural/urban context, representing an architectural reference for the local community.
It will also be useful to evaluate if the architectural elements, that characterize the design of the building, are particularly interesting for the local architecture' style in order to determine the attractiveness of a restoration and the building conservation.

ANNEX 4.3

UNPAVED TRACK TO WADI EL HITAN MAINTENANCE PLAN

Embassy of Italy in Cairo

COOPERAZIONE ITALIANA
ITALIAN COOPERATION
التعاون الإيطالي

United Nations Development Program

Egyptian Environmental Affairs Agency

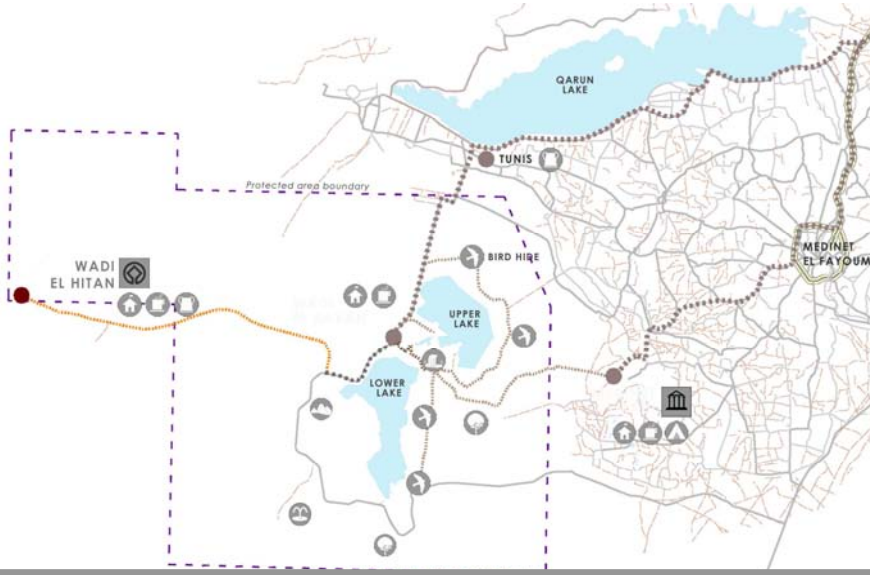
Arabic Republic of Egypt

Egyptian Italian Environmental Cooperation Program

Wadi Rayan Protected Area

Unpaved track to Wadi Hitan

Maintenance plan



Index

1. Overall information about the project

2. Maintenance plan

3. Conclusions

1 Overall information about the project

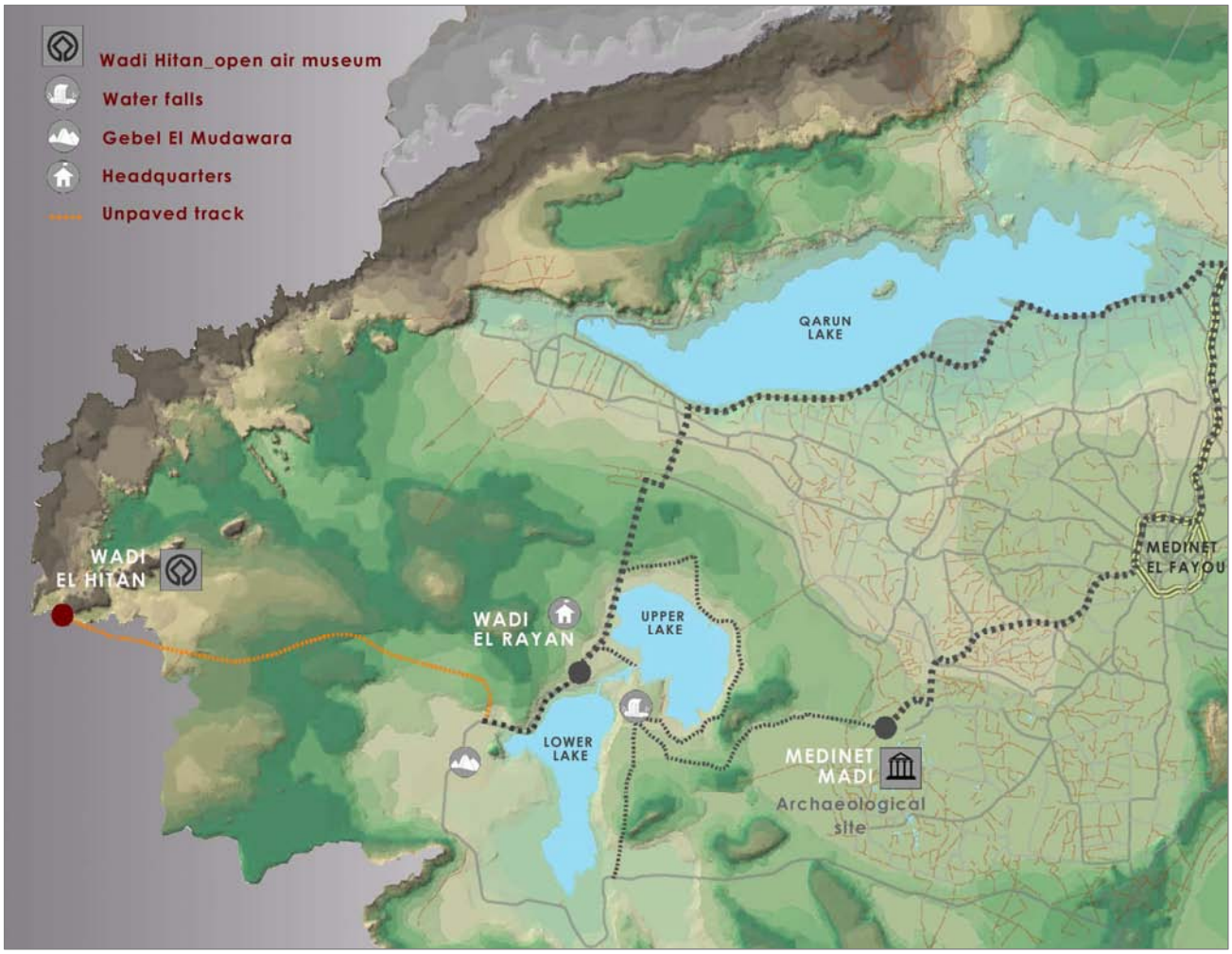
TRACK LINKING MEDINET MADI AND WADI RAYAN PROTECTED AREA	
Location	**Wadi Rayan Protected Area**
Project	**Agreement between CEO-EEAA and Army Engeneering Departement**
Construction manager	**Army Engeneering Departement**
Project managers	**General Mahmoud Magawre**
Total cost of the work	**4.500.000 EGP**
Implementation of works	**Four months (Genuary-April 2006)**

1.2. Project data

PROJECT DATA	
Track	
Total length of the track	**34 km**
Width section	**6÷7 m**
Expected visitors for years	**15.000**

1.1. Brief description

According to the contract signed between Dr Kheleil, CEO-EEAA and the Army Engineering Department, in the person of General Mahmoud Magawre, an unpaved track has been constructed to link the Wadi Rayan Headquarters and Wadi Hitan Site, including a parking area for the "Valley of Whales open air museum".
The work began in January 2006 and finished within 4 months, in April 2006, and the total cost of the work is 4.5 million LE.
The road is the most direct route between the protected area Headquarters and the Wadi El Hitan site, facilitating more efficient transfer of supplies and personnel and more effective management in general.
However, visitors to Wadi El Hitan, travelling through WRPA by this track, have greater opportunities to explore WRPA sites, including the main visitor area (beach and waterfalls), visitor centre, hiking and sight seeing at Gebel Murawera, visiting springs and dune field to the south of Lower Rayan Lake, and eventually, linking to the Medinet Maadi track (see picture 1).



Picture1. Map of Wadi Rayan Protected Area

1.3 Technical information

- Road layout: the road begins leaving the existing asfalt road in correspondence with Gebel Mudawara and it ends at the south-west end of the valley, including a parking area. It covers 34 Km in length.
- Dimension: it is 6 m wide (included 1 m shoulder on either side per normal approach) and 7 m width on high areas and curves.
- Materrial: his dust/clay road was constructed using the same approach as if it would be surfaced with asphalt but leaving it unpaved. Through an earlier general agreement with Ministry of Transportation, the road is 50 cm in height. There are some places along the recommended road where the limestone bedrock reaches the surface and there is no need for a thick base. According to the Army, there are other higher areas in order to maintain a level base.
- Maintenance: ss a unpaved track, maintenance interventions have to be provided frequently in order to prevente corrugations dameges.
- Vehicles allowed: standard of vehicle includes buses and small cars.

1.3.1 Specifications

- Construction of a base fine layer; fine well graded soil material.
- Construction of wearing layer; fine well graded crushed stone material (mix composed by stone, clay and water) to implement the road ballast.
- Treatment of existing soil on track path; complete work of scraping watering and compaction
- Construction of stone masonry design for traffic signage according to project manager and protected area dispositions.

1.4 Photographic survey

1.Gebel el mudawara
2.Asfalt road
3.Unpaved track
4.Track borders
5.Send remouval
6.Unpaved track

2 Maintenance plan

2.1 Introduction

Due to hard weather conditions and referring to the wearing of this type of infrastructure the unpaved track need a periodical maintenance in order to ensure its sustainability and its technological and functional performances, maintaining the characteristics of quality and efficiency of artefacts over time.

2.1.2 Anthropic load during the operating period

A theoretical number of vehicles crossing the track every day has been calculated in order to establish the anthropic load that involved the infrastructure in question.
The calculation refers to a nine-period months: this period starts from September and finishes in May and it corresponds to medium-high season of tourism; in fact during hot season touristic flow is very low and car traffic is markedly reduced.

Operating period: nine months	
Theoretical users / year	**15.000**
Theoretical users / month	**1.700**
Theoretical users / day	**55**
Car (pick-up) / day	**~ 15**

2.2 Maintenance plan

2.2.1 Types of works and equipment needed

Periodical maintenance

This intervention provides the whole track crossing by a tractor towing a rectangular metal frame with heavy tires tied under (wide ~ 3 meters); the dimension of the tires depends to the dimension of the frame (it is possible to use 3 medium tires or 4 small tires).
These activities ensure the sand removal and levelling the track to the desired level; the tractor must travel 4 times up and down to cover the entire width of the track; this type of periodical maintenance is frequent because it doesn't include watering activity and compaction of road surface.

Renovation works

The complete maintenance of the track must be provided every two years to ensure the renovation and of the sandy road surface, including watering and compaction of the soil.
The works to provide for renovation are:

- Cleaning road including removal of earth and other materials
- Earth excavation for road and ancillary works in all types of soil
- Supply grading and compacting of crushed stone

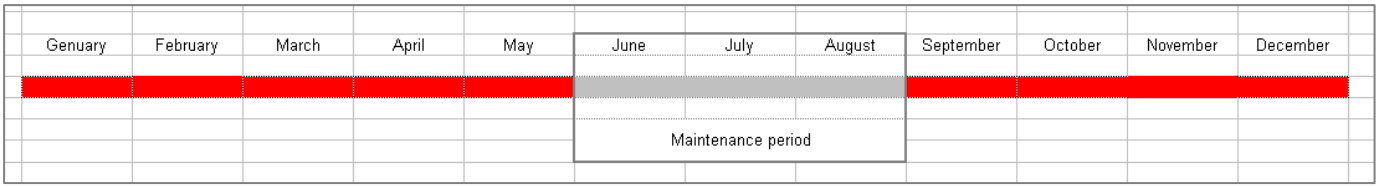
The equipment required is:

- One motor grader
- Dump tractor
- One vibratory roller
- Tanks of water as per required
- Any other equipment or labours needed will be available

The maintenance will be provide as follow:

- **Periodical maintenance** for track and intersections will be provided around every two month. It's important to specify that the plan provides 6 maintenance interventions per year but periods to perform maintenance will be decided according to the recorded car traffic (during high touristic season periodical maintenance could be more intensive).
- **Renovation works**: every two years

Renovation works must be performed during the following period of the year that is during truism low season.



2.2.2 Maintenance costs:

The schedule below reports activity' items and costs:

Periodical maintenance (every two months)		
Activities	**Frequency**	**Estimated costs**
The removal sand and levelling the track to the desired level; Equipment needed: one tractor trailing two tires;	every two months	300 EGP/day
Labour: two workers	every two months	400 EGP/day
Estimate works duration		4 days
Cost of the intervention (every two months)		2.800 EGP
Total cost of the interventions per year		**16.800 EGP**

Renovation works (every two years)	
Activities	**Estimated costs**
The removal sand and levelling the track to the desired level; wheel loader and dump tractor are needed for removal of sand and the motor grader for scraping and levelling.	1000 EGP/day
Watering the track material and final levelling requiring water tanks and motor grader	2000 EGP/day
Compaction of track using the vibratory roller machine	500 EGP/day

Estimate works duration	~ 26 days
Total cost of the interventions	**91.000 EGP**

3 Conclusions

The type of periodical maintenance' method, described above, should be performed frequently and this aspect allows a constant monitoring of the conservation status of the whole track and intersections, referring to car traffic and weather events and it can provide a good level of effectiveness for maintenance, even if executed with no specialized equipment and no qualified staff. Anyway the complete maintenance of the track, including renovation works, must be performed every two years to ensure watering and compaction of the sandy road surface.

In the case under consideration the total cost of maintenance is estimated to be 62.300 LE per year.

ANNEX 4.4

UNPAVED TRACK BETWEEN WRPA HEADQUARTERS AND MADINET MADI MAINTENANCE PLAN

Embassy of Italy in Cairo

COOPERAZIONE ITALIANA
ITALIAN COOPERATION
التعاون الإيطالي

Supreme Council of Antiquities

United Nations Development Program

Egyptian Environmental Affairs Agency

Arabic Republic of Egypt

Egyptian Italian Environmental Cooperation Program

Unpaved track between Wadi Rayan Protected Area Headquarters and Medinet Madi

Maintenance plan

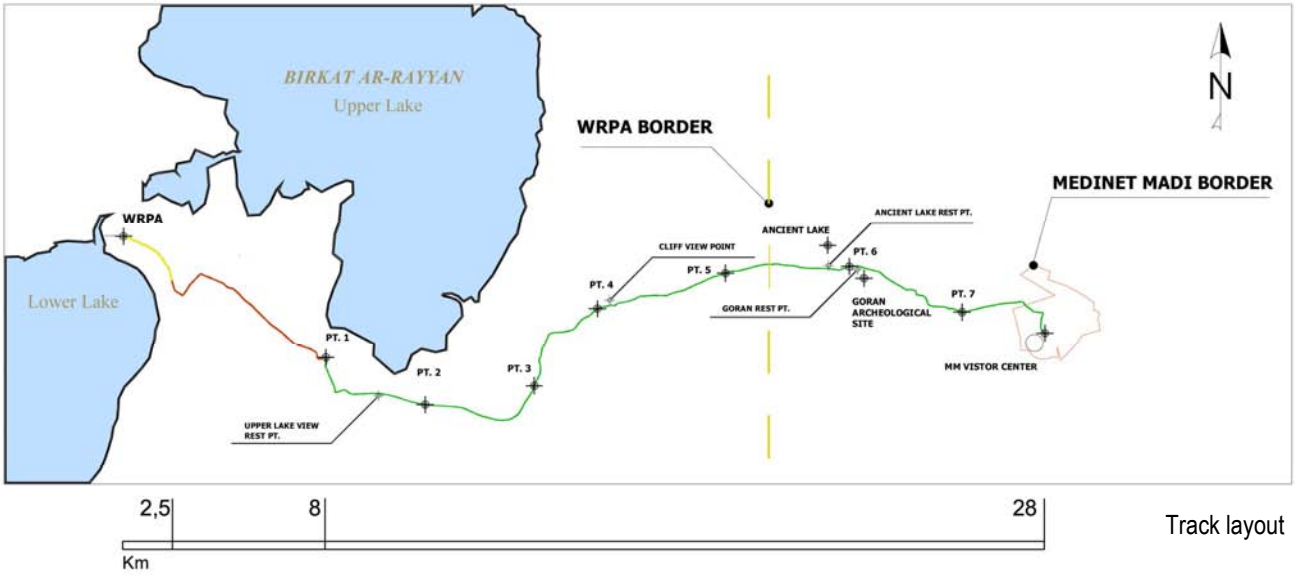
Index

1 Overall information about the project

TRACK LINKING MEDINET MADI AND WADI RAYAN PROTECTED AREA	
Location	**Fayoum Oasis**
Project	**ISSEM project / EEPA project**
Contractor	**Toshka company**
Construction manager	**Engineer Shady Salam**
Project managers	**Arch. A. Giammarusti, Arch. A. De Vita**
Project designer	**Arch. F.V. Rubattu**
Total cost of the work	**900.000 EGP (ISSEM project) +160.300 EGP (EEPA project)**
Procedure followed by	**Tender**
Period of implementation	**2009-2010**

1.1. Brief description

The unpaved track linking Medinet Madi Archaeological Site and Wadi Rayan Headquarters crosses the desert of Fayoum, experiencing beautiful sights of the Rayan lakes, mountains, bird watching and interesting natural sites. The design of the unpaved track aims to create a panoramic road respecting natural and environmental features in order to create a link between important touristic sites, regulating the car traffic into the protected area and allowing the preservation of the area maintaining natural outcome.
The Fayoum Governorate in general, particularly Wady Rayan Protectorate, is characterized by hot dry weather; sand storms are recorded in this area 35 times a year (concentrated in the winter and spring seasons, from September till May). Sand storms form a heavy layer of sand over the roads; such occurrences could cause accident, road blocks or transportation delay.
The total length of the track is 28 km and it has three intersections; these crosscuts would decrease the irregular crossing traffic that could destroy track borders and damages the road surface. The total length of each intersection is 200 meters (100m +100m).
25,5 kilometres of the unpaved track cross a desert area until the Lower Lake where the type of soil changes because of the presence of the accumulation of waste water from the nearby fish farms that often are responsible of the road flooding.
This part of the track (to Wadi Rayan headquarters direction) has recently undergone to a complete rehabilitation work, within the EEPA (Enhancement of Egyptian Protected Areas) project in order to ensure a normal and safe traffic flow; furthermore this road stretch represents one of the most panoramic point of view to the lower lake.
As the desert track and the fish farm' track has different characteristics referring to the material of the road surface and to the technologies of implementation, maintenance interventions to provide will be different.
For this reason this maintenance plan document is divided into two parts: the first one refers to the maintenance of the desert track area and the second one is dedicated to the fish farm'track maintenance.



Track layout

1.2. Project data

PROJECT DATA	
Track	
Total length of the track	**28 km**
Unpaved desert track length **(ISSEM project)**	**20 km**
Unpaved desert track length **(EEPA project)**	**5,5 km**
Fish farm area' track **(EEPA project)**	**2.5 km**
Width section	**6÷11 m** (changeable according to the sections)
Expected visitors for years	**15.000**
Intersections	
Number of intersections along the track	**3**
Length of each intersection	**100m +100m**
Total length	**600 m**
Width section	**9÷11 m**

2 Desert track stretch

2.1 Technical information

Description of works provided

Works required covered an area of about 25,5 km.
The track has been designed after an accurate GIS survey in order to evaluate the most suitable layout; all the works have been be provided after soil survey and laboratory tests and they have been provided as follow:

Soil treatment

1. Construction of a base course layer of well graded material; founded on 2 layers of 15 cm each, each compacted and laboratory tested.
2. Wearing layer; founded from well graded crushed stones, on 1 layer, compacted and tested.
3. Treatment of existing soil on track path; complete works of scraping watering and compaction.

Signage

1. Construction of stone masonry for information signage according to design and position provided in technical drawing.

Track borders

1. Placing of standard size stones: average diameter of 15 cm (50 cm in case of slope) for the stone bordering
2. Placement on both sides of the track every 7 m; every 1,5 m in case of slopes.

2.1.1 Photographic survey

2.2. Maintenance plan

Introduction

Due to hard weather conditions and referring to the wearing of this type of infrastructure the unpaved track need a periodical maintenance in order to ensure its sustainability and its technological and functional performances, maintaining the characteristics of quality and efficiency over time.

Anthropic load during the operating period

A theoretical number of vehicles crossing the track every day has been calculated in order to establish the anthropic load that involved the infrastructure in question.
The calculation refers to a nine-period months: this period starts from September and finishes in May and it corresponds to medium-high season of tourism; in fact during hot season touristic flow is very low and car traffic is markedly reduced.

Operating period: nine months	
Theoretical users / year	**15.000**
Theoretical users / month	**1.700**
Theoretical users / day	**55**
Car (pick-up) / day	**~ 15**

Maintenance iterventions: types of works and equipment needed

Periodical maintenance
This intervention provides the whole track crossing by a tractor towing a rectangular metal frame with heavy tires tied under (wide ~ 3 meters); the dimension of the tires depends on the dimension of the frame (it is possible to use 3 medium tires or 4 small tires).
These activities ensure the sand removal and levelling the track to the desired level; the tractor must travel 4 times up and down to cover the whole width of the track.
Renovation works
This type of periodical maintenance is frequent because it doesn't include watering activity and compaction of road surface on the whole track length and on intersections; for this reason the complete maintenance of the track (renovation works) must be provided every two years to ensure the renovation and compaction of the sandy road surface.
The works to provide for renovation are:

- Cleaning road including removal of earth, debris and other extraneous materials
- Earth excavation for road and ancillary works in all types of soil
- Supply and grading and compacting crushed stone

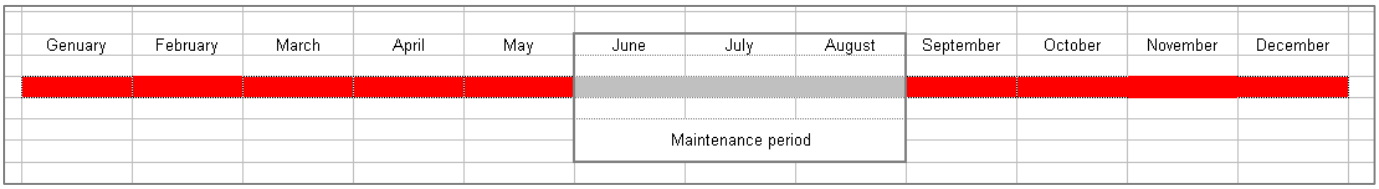
The equipment required is:

- One motor grader
- Dump tractor
- One vibratory roller
- Tanks of water as per required
- Manpower

The maintenance will be provided as follow:

- **Periodical maintenance** for track and intersections will be provided around every two month. It's important to specify that the plan provides six maintenance interventions per year but periods to perform maintenance will be decided according to the recorded car traffic (during high tourist season periodical maintenance could be more intensive).
- **Renovation works**: every two years

Renovation works must be performed during the following period of the year.



2.2.1 Evaluation of cost

The table below reports activity' items and costs:

Periodical maintenance		
Activities	**Frequency**	**Estimated costs**
The removal sand and levelling the track to the desired level. Equipment needed: one tractor trailing two tires;	Every two months (three days)	300 EGP/day
Labour: two workers	Every two months (three days)	400 EGP/day
Re positioning the stone border requiring one tractor	Every two months (one day)	300 EGP/day
Estimate works duration		2 days
Total cost of the interventions per year		**14.400 EGP**

Renovation works (every two years)	
Activities	**Estimated costs**
The removal sand and levelling the track to the desired level; wheel loader and dump tractor are needed for removal of sand and the motor grader for scraping and levelling.	1000 EGP/day

Watering the track material and final levelling requiring water tanks and motor grader	2000 EGP/day
Compaction of track using the vibratory roller machine	500 EGP/day
Manpower (4 workers)	800 EGP/day
Estimate works duration	~ 20 days
Total cost of the interventions	**86.000 EGP**

The total amount of maintenance costs is ~ 114.800 EGP during a two-year period.

The periodical maintenance' method, described above, has been tested in similar contexts achieving positive results.
It should be performed frequently and this aspect allows a constant monitoring of the conservation status of the whole track and intersections, referring to car traffic and weather events and it can provide a good level of effectiveness for maintenance, even if executed with no specialized equipment and no qualified staff. Anyway the complete maintenance of the track, including renovation works, must be performed every two years to ensure watering and compaction of the road surface.
In the case under consideration the cost of maintenance for this stretch of the track is estimated to be 57.400 LE per year.

3 Fish farm area stretch

3.1 Brief description

The work has been carried out recently providing an operation of draining and channelling wastewaters coming from the fish farms located between the Upper and Lower lakes as well as resettlement of the track surface. The works provided also the construction of three additional pipelines, using concrete pipes, and three PVC pipelines to ensure a better flow of water towards the lake.

Renovation works

3.1.1 Project data

PROJECT DATA	
Track	
Fish farm area' track	**2,5 km**
Width section	**~ 6 m**
Implementation of the work	**November 2010**

3.1.2 Technical information

Description of works

Works required covered an area of about 2,5 km; they have been provided as follow:

Draining and channelling wastewaters from fish farms

1. Clearance of existing drainage canals
2. Re-levelling of the drainage canals
3. Excavation for the n.6 pipelines, diameter dimension as per in the technical drawings
4. N.6 Pipelines fixation, in adequate slope (to ease the drainage)
5. Covering the pipelines sections with compacted sand and soil for a minimum of 20 cm.

Type of pipes

1. Three concrete pipelines have been installed orthogonally to the track direction (see cross section)
2. Three PVC pipelines have been installed orthogonally to the track direction

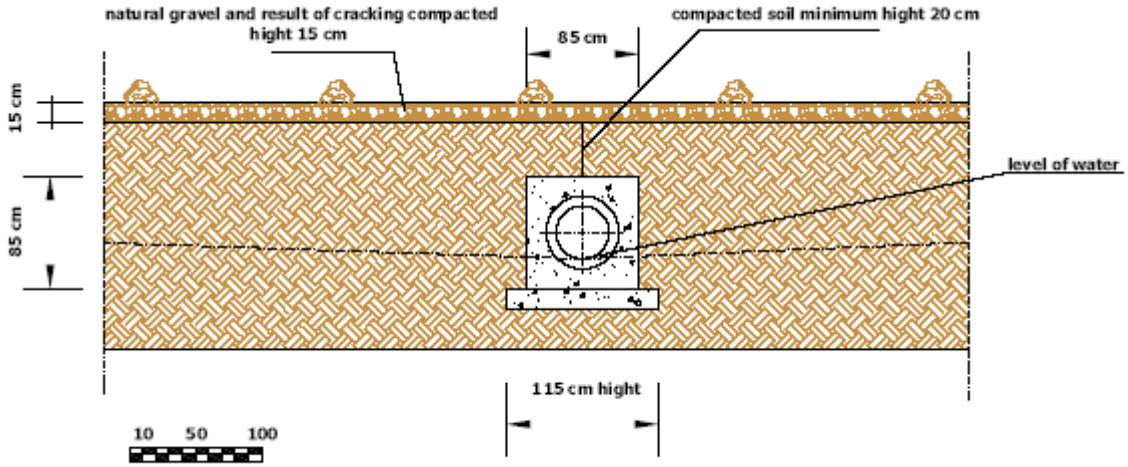
Construction of the track surface

1. Construction of a n.1 layer material gradient gravel natural or the result of cracking, coarse-fine gravels and clays (material collected on site)
2. Compaction and smoothing the upper layer surface of 15 cm of thickness

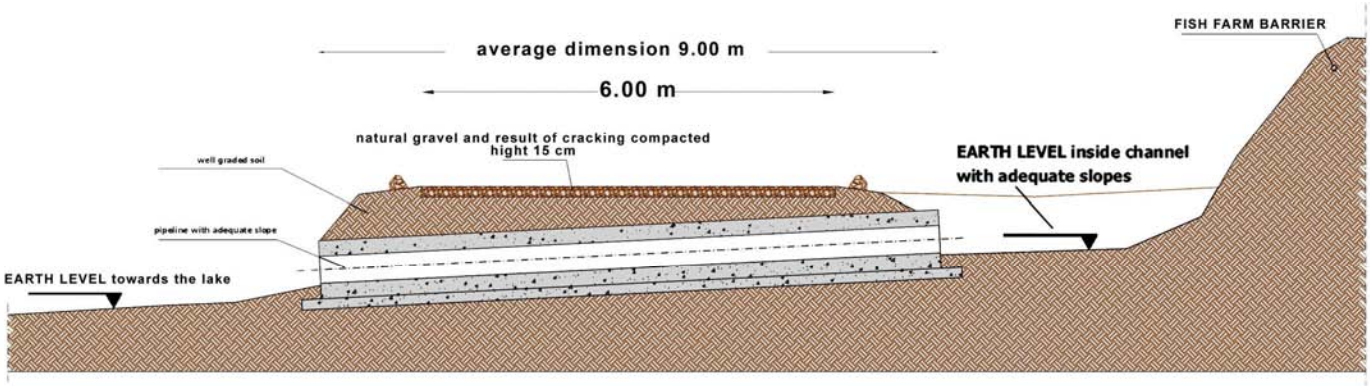
Track borders

3. Placing of standard size stones (50 cm)
4. Placement every 5 m run

Longitudinal section



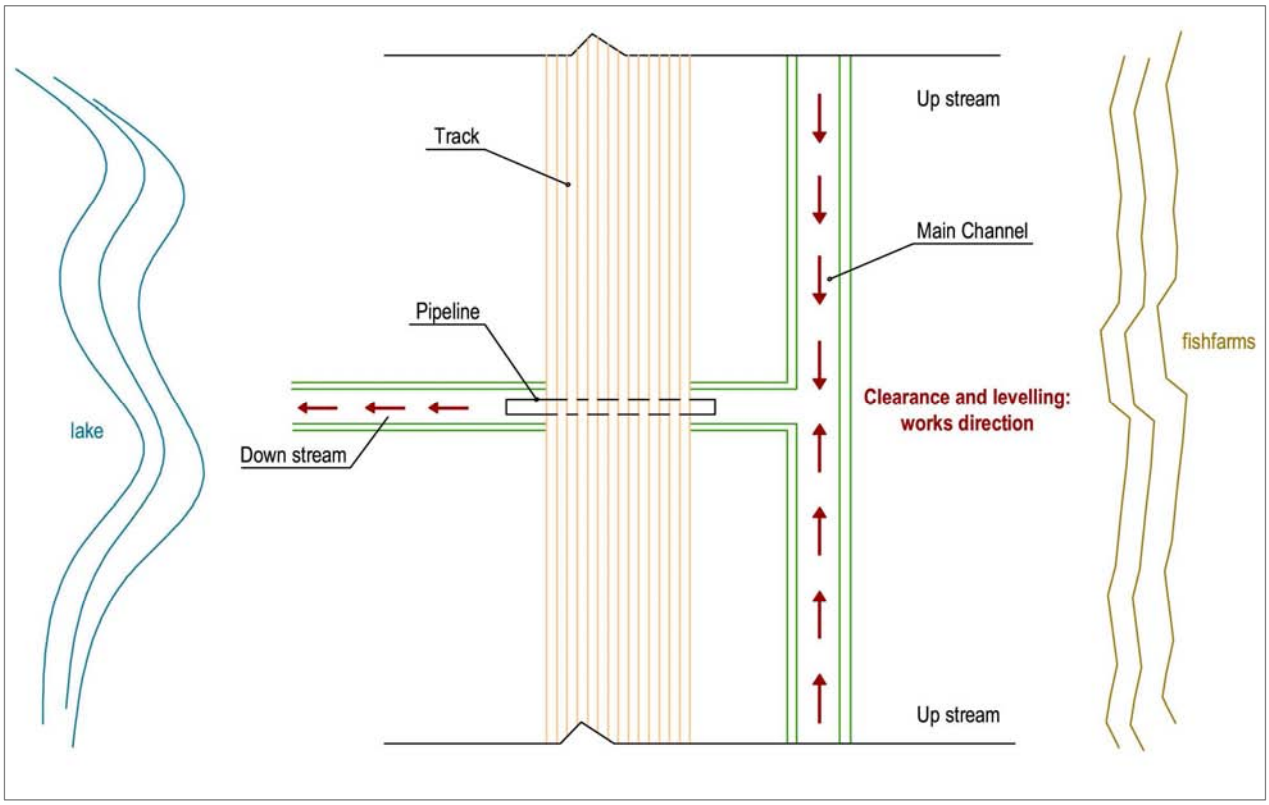
Cross section type



3.2 Maintenance plan

Types of works

The maintenance of these 2.5 km focuses on the cleaning of all the channels along the track from debris and vegetation that may obstruct the water flow toward the lake.
The channel parallel to the track collects the waste water coming from the fish farm, thanks to the appropriate gradient, and it distributes the flow in the orthogonal channels toward the lake thanks to the gradient levelling.
During the cleaning operation it will be respected the sketch plan of intervention below in order to maintain the appropriate gradient of the channels.



The cleaning of the main channel could be provided by the fish farmers, as concessioners of the area in cooperation with the protected area staff and under their supervision.
Maintenance will be performed also for the track surface, referring to compaction and leveling of the soil.

It's important to underline that periodical maintenance of this stretch of track is strictly necessary to ensure the safety and traffic flow; so it has to be performed continuously as indicated in the plan.

3.2.1 Evaluation of costs

The table below reports activity' items and costs.

Periodical maintenance		
Activities	**Frequency**	**Estimated costs**
Works of clearance of channels	Every four months	(Carried up by the fish farmers, as concessioners,

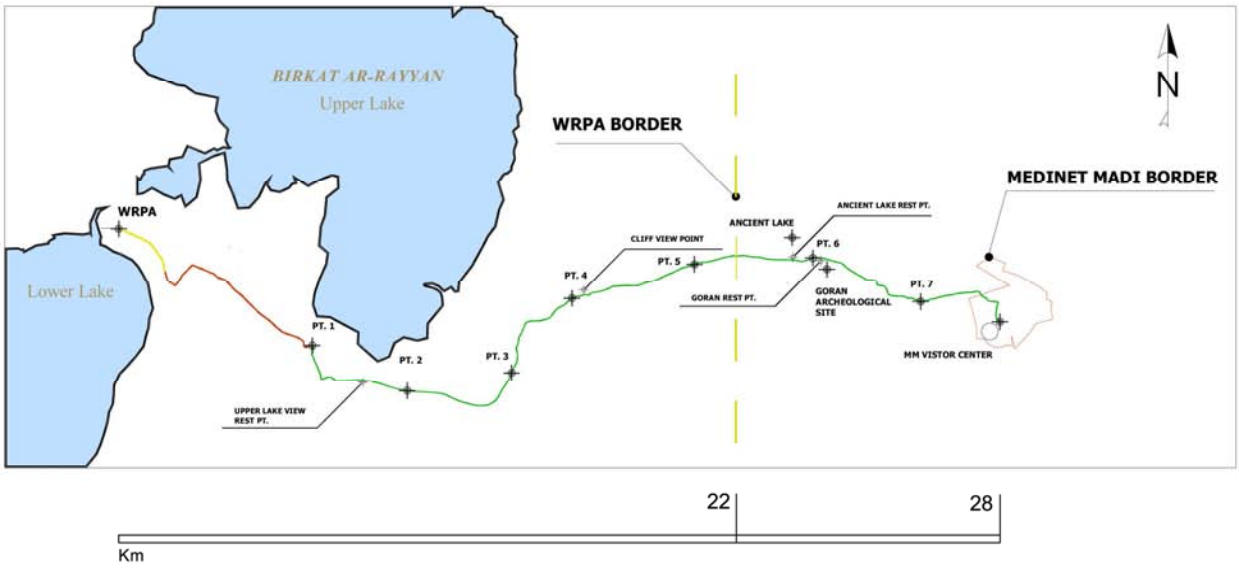
		under the supervision of the rangers)
Levelling of channels (equipment needed: excavator)	Every four months	5.660,00 EGP
Works of maintaining the track surface in order to ensure the traffic flow (loader and motor grader)	Every four months	7.670,00 EGP
Manpower required: 5 workers	Every four months	(included in the previous costs)
Estimate works duration		15 days
Cost per period		13.300,00 EGP
Total cost of the interventions per year		**40.000 EGP**

In the case under consideration the cost of maintenance for this stretch of the track is estimated to be 40.000 LE per year.

4 Conclusions

The cost for the maintenance of the whole track is 97.400 EGP per year, considering maintenance costs for desert track and for fish farm area stretch.

As reported in the project data schedule, the total length of the track is 28 km, included the fish farm area stretch. Around 22 km fall within the borders of the Protected Area of Wadi Rayan, as showed in the picture below.



Nevertheless all the relevant parties - Wadi Rayan Protected Area, Fayoum Governorate and Supreme Council of Antiquities - will have to ensure the complete maintenance of the whole track.
It's important to underline that the fish farm track (2,5 km) need a special maintenance, which interventions have high costs.
Since the protected area staff will ensure the periodical maintenance of this stretch of track, they shall take advantage of the operative contribute of the fish farm concessioners for the channel cleaning, reducing notably

the costs. Works of compaction and leveling of the track surface will have to be provided, charging a private company or using protected area resources.
In any case, modality, frequency and equipments reported in the plan should be respected for every type of maintenance intervention.
Frequency of periodical maintenance is the main aspect to consider referring to the condition of this stretch of the track: a missed intervention could cause serious damages in the infrastructure and make necessary rehabilitation works that could be markedly expensive.