FINAL EVALUATION OF THE UNDP/GEF PROJECT EGY/99/G35

Introduction of Vehicle Electric Bus Technology and Hybrid-Electric Bus Technology in Egypt – Phase 1a

FINAL VERSION

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LIST OF ABBREVIATIONS

µ	micro
AFICO	Automotive Feeding Industries Co.
APR-PIR	annual project report for UNDP/GEF projects
AVS	Advanced Vehicle Systems, Inc.
CNG	compressed natural gas
CO	carbon monoxide
CO_2	carbon dioxide
EEAA	Egyptian Environmental Affairs Agency
GEF	Global Environment Facility
km	kilometre
LE	Egyptian pound
MJ	megajoule (= million Joule)
N_2O	nitrous oxide
NGM	New Generation Motors Corporation
NO_x	nitrogen oxides
O&M	operation and maintenance
SCA	Supreme Council for Antiquities
SCAT	Southern Coalition for Advanced Transportation
SO_2	sulphur oxide
UNDP	United Nations Development Programme
USD	US dollar
US$	
W_p	peak Watt

Exchange rate:
US$ 1 = LE 5.6 (average 01/01-22/02/2008)

EXECUTIVE SUMMARY

Urban air pollution is a major environmental problem in Egypt. Among the world's largest cities with over 16 million people, Cairo belongs to the 20 most polluted cities in the world. With respect to public transportation in Cairo, more than 3.6 million commuters ride the some 13,000 buses daily. A plan for reducing the pollution levels in Egypt and effective abatement of greenhouse gases globally must therefore address transportation.

The high level of air pollution is creating various types of problems:

- Environmental impacts, such as greenhouse emissions and photochemical smog
- Health problems caused by the smog and other air pollutants
- Degradation of national monuments; high pollution causes acid rain to corrode building materials, while also the vibrations of heavy duty buses that go to and from these places can cause less stable structures to collapse.

Hybrid-electric (diesel hybrid or CNG hybrid) buses have an auxiliary power unit to generate power and have less tailpipe emissions than diesel or CNG buses. Electric vehicles have zero tailpipe emissions because no fossil fuels are burnt on-board and it derives its energy from battery storage devices. A total fuel-cycle analysis also has to take into account from energy generation and transportation to the tank. Even then, electric buses will be cleanest, followed by CNG-hybrid, diesel-hybrid, CNG and diesel buses. Unfortunately, in terms of investment cost the opposite will be true, electric buses are more expensive than CNG buses, which are more expensive then diesel buses. On the other hand, electric buses have lower operation and maintenance costs than diesel buses. In the end, the total investment and operation cost over the bus's lifetime will thus depend on the actual investment cost, price of electricity and price of diesel. In this respect it should be noted that Egypt produces diesel buses ranging from small to large deluxe buses. The investment cost of an electric bus can be lowered if (part of) the electric engine and drive system can be manufactured in Egypt. With respect to pricing, both electricity (of which some 80% generated using natural gas) and diesel fuel are subsidised in Egypt, which should be taken into account when doing a feasibility analysis.

To promote electric and hybrid-electric buses in Egypt, assistance was sought from the United Nations Development Programme (UNDP) with financial support from the Global Environment Facility (GEF). The basic concept was to have a **multi-phase programme** with an initial phase 1, in which 24 electric buses would be tested, mainly in the touristy historic sites, such as Giza, Luxor and Sakara. Electric and hybrid-drive systems of the buses would be integrated into Egyptian buses produced by local manufacturers. This phase would be followed by a Phase 2, in which more buses would be employed, not only at historic sites, but also in downtown routes (electric buses) or electric-hybrid buses on longer routes between Cairo centre and its satellite towns and its airport. Phase 2 would also encompass a more detailed study on the possibility of local manufacturing of the electric drive systems. In a subsequent third phase such completely locally manufactured electric buses would be tested at various sites throughout the country.

The overall **objective** of this programme was "to introduce to Egypt a viable electric, hybrid-electric, and eventually fuel cell technology program that would have significant benefits and sustainability in various segments of the country".

It was decided to split Phase 1 in two; in Phase1a, two buses would be tested (with GEF support) and a proposal for Phase 1b would be formulated, in which 22 more buses would be tested. The Egyptian Environmental Affairs Agency (EEAA) was the national executing agency in charge of overall coordination with the various stakeholders, while the Social Fund

for Development (SFD) responsible for project implementation. The total cash budget for the Phase 1a project originally was US$ 1.714 million, of which US$ 0.7486 million provided by GEF, US$ 0.3154 million in cash by EEAA and US$ 0.1 million by SFD.

The Project Document mentions the following **outcomes** of Phase 1a:

1. Enhanced experience on electric buses by building on the monitoring of the operation of the two test vehicles;
2. Enhanced capacity of transportation authority managers and operation and maintenance personnel to participate in the programme;
3. Creation of the basis for the launching of the next phase.

In accordance with GEF regulations, a Final Evaluation has to be carried out under the responsibility of GEF-implementing agency (i.e. UNDP) by an external evaluator. Final evaluations are intended to assess the relevance, performance and success of the project. For this purpose, an international consultant, Mr. Van den Akker, was fielded to Egypt from 3 to 7 February. This report describes the major findings, recommendations and lessons learned resulting from the final evaluation of Phase 1a.

The key **accomplishments** of the project can be described as follows:

1. After signing the Project Document in March 2000, a request for proposal was issued for the supply of two electric buses, maintenance for one year and associated training and consultancy services. The contract of US$ 979,600 was awarded to a consortium formed by New Generation Motors Co. (NGM), USA; Advanced Vehicle Systems (AVS), USA; and Automotive Feeding Co. (AFICO), Egypt. Due to institutional problems (such as Customs issues), political problems (the 9/11 attach on USA in 2001) and technical problems (e.g., the electric drive system of the first bus had to be sent for repair), the delivery of the buses got delayed. The first bus arrived late 2001 and the second one late 2002. Ownership was transferred to the Supreme Council of Antiquities that decided to transfer the place of operation from the Giza Pyramids to the Hatshepsut Temple near Luxor. A maintenance contract was signed with the consortium for the period 2003-2006.

2. Local technical staff (e.g., AFICO) was trained on the operation and maintenance of the buses, while the interest among transport officials, government agencies and private sector (bus manufacturers) was raised at a workshop in September 2002.

3. An environmental and socio-economic impact analysis was carried out in 2003 by NGM Corporation. Unfortunately, no follow-up phase was formulated as by 2002 it became clear that, due to changing priorities regarding sustainable transportation, GEF funding was no longer applicable.

The major **conclusion** resulting from the evaluation analysis can be summarized as follows. The Evaluator believes that Phase 1a has facilitated a first experience with employing electric buses in Egypt and has provided useful insights in the acquisition, operation and maintenance issues involved. However, the intended follow-up in form of the Phases 1b and 2 has never been realized. While the withdrawal of GEF funding is regrettable, this should not have been an excuse for the Egyptian entities involved (EEAA, SFD, SCA) as well as interested private sector players (such as the AFICO/Ghabbour company) not to undertake any serious effort. Given the fact that Phase 1a was intended to be a preparatory phase, but no real follow-up has materialised (so far), the Evaluator rates the project's results as '*marginally satisfactorily*'.

The Evaluator has the following **recommendations:**

GEF support for a follow-up **phase 1b** seems unlikely at this moment and in the coming years. Other ways of financing needs to be explored and these are likely to come from Egyptian sources itself. The SCA should not acquire or operate these buses itself; its task is to safeguard Egypt's national heritage, not act as bus operator. Instead a concession could be awarded to a company after a competitive bidding process. In such a scheme, the company is given the exclusive obligation to provide electric buses and passenger transport in the service area. The rationale for this approach is that concessionaires will be able to provide the most cost-effective services, because they are free to select the electric bus technology (brand, technology, size). Here, the SCA (together with local transport authorities, if required) would oversee the bidding process, negotiate the contract and monitor its compliance. Thus, such a new-style Phase 1b could try the employment of about 20-25 buses in various concession areas at various historic sites (Giza, Sakara, Luxor, etc.) A fee structure for the buses should be studied and implemented, attractive enough for bidders to participate.

In **Phase 2:**

- The operation of electric buses would be replicated and extended to other historic sites. The SCA has estimated that to implement such schemes at the major historic sites in Egypt would require some 120-150 buses.
- The larger the market for electric vehicles, the more interesting it will be for Egyptian companies to set up the necessary technology and manufacturing infrastructure. Also, environmentally speaking, electric buses will have more impact if utilized in the downtown areas of Egypt's big cities such as Cairo or Alexandria. In Cairo, demand for mobility has far outpaced the capacity of the (public) transport system to cope. Already, Cairo's traffic jams are notorious. Together with the EEAA, UNDP has presented a proposal on 'Sustainable Transport' for GEF co-funding. This project will have various components, among others, the "introduction of high-quality integrated public transport services for Cairo and its satellite cities that connect to the existing metro lines" as well as "transport demand management" measures. Although formally electric buses are not part of this new UNDP/GEF proposal, it should be explored if some of the buses to be employed (the investment will be financed as part of the non-GEF resources) in could not be electric buses, on the shorter stretches, or electric-CNG hybrid vehicles, on longer routes.
- A study should be made on the economic feasibility of manufacturing (parts of) the electric drive system in Egypt. Egypt has the infrastructure for the production of high-quality buses that range form 6 metre minibuses to large deluxe long-distance buses. Only the engine and driveline components are imported from international companies, such as GM, Scania, etc. Thus, the existing bus production know-how can be extended to incorporating electric or electric-hybrid drivelines.

In terms of **lessons learned** one can conclude that with introduction of a new technology in a country, such as electric vehicles, unexpected issues will occur. Testing the buses at various sites (Giza, Luxor) under different conditions encountered several delays, but enabled to determine the required specifications adjusted to suit the Egyptian environment. This is a learning process also, in which Egyptian technicians gained a first experience by fixing problems on-site. The Evaluator suggests that such invaluable lessons learned are taking into account should the programme move to a follow-up phase.

Source: United Nations Cartography Section

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1. INTRODUCTION

The final Evaluation Report is divided into three sections. This first section provides general background of the project 'Introduction of Viable Electric and Hybrid-Electric Bus Technology in Egypt", purpose of evaluation, project implementation setup, partners and major stakeholders and evaluation methodology. The next section dwells on findings from the reports and from interactions with stakeholders. In the third section, conclusions from the observations and findings are discussed in the context of project objectives. These also pertain to sustainability and replicability of project and lessons learned. The section ends with providing generic recommendations for the dissemination of electric buses in Egypt.

1.1 Background

Urban air pollution is a major environmental problem in Egypt. Among the world's largest cities with over 16 million people, Cairo belongs to the 20 most polluted cities in the world (see Table 1 below).

Table 1 Concentrations of air pollutants in Cairo

Pollutant	*Concentration (µg/m^3)*	*U.S. standard (µg/m^3)*
Sulphur dioxide (SO_2)	40-156 annual mean	80 annual mean
Particulates	349-857 annual mean	75 annual mean
Nitrogen oxides (NO_x)	90-750 hourly mean	100 annual mean
Carbon monoxide (CO)	1,000-18,000 hourly mean	40,000 1-hour; 10,000 8-hour mean
Lead	0.5-10 annual mean	1.5 quarterly mean
Ozone (O_3)	100-200+ hourly maximum	235 hourly maximum

Source: NGM (2003)

The high level of air pollution is creating various types of problems:

- *Environmental effects.* The main negative effects are the *greenhouse effect* (caused by the release of greenhouse gases in the combustion of fossil fuels in the vehicles' engines, such as carbon dioxide CO_2 and nitrous oxide N_2O), *acid rain* (occurring when water vapour reacts with sulphur and nitrogen dioxides, producing sulphuric and nitric acid) and *photochemical smog* (consisting of ozone and chemical compounds formed under the influence of sunlight from NO_x and volatile organic compounds released in fossil fuel combustion)

- *Health impacts.* The photochemical smog and pollutants such as CO, NO_x, NO_2, particulates and other compounds directly affect the lungs-respiratory system and increase the chances of cardio-vascular diseases. According to the Egyptian Environmental Affairs Agency (EEAA), approximately 15,000 to 25,000 people die every year in Cairo related to air pollution and between and 90 million to 270 million sick days per year are lost. Lead maybe causing a lowering of children's IQ by four to five points.

- *Degradation of national monuments.* Acid precipitation and other toxins can corrode building materials. Combined with the vibrations from large diesel buses, high pollution can lead to the collapse of some of the ancient structures. With the high pollution level

and traffic congestion in Cairo in the short run and the possible decay of monuments in the longer run, Egypt will be less attractive as a tourist destination.

Recent developments in Egypt, such as phasing out of leaded gasoline and the introduction of CNG in the transport sector, have led to dramatic decreases in lead and particulate concentrations. With respect to public transportation in Cairo, more than 3.6 million commuters ride the 3,300 buses and 700 minibuses of the Public Transport Authority daily, and another 800,000 ride the 700 buses of the Cairo Bus Company[1]. A plan for reducing the pollution levels in Egypt and effective abatement of greenhouse gases globally must address transportation.

Box 1 Alternative vehicle technologies for public transportation

An *electric bus* has zero tailpipe emissions by nature because it burns no fossil fuels on- board and derives its electric energy from battery storage devices. Battery options include lead-acid, nickel-cadmium, nickel-metal-hydride, and lithium-ion. While the limited range of electric buses may be perceived as a problem for long-distance travel, these types of buses are in fact the easiest to implement in existing transport systems because they do not require a new fuelling infrastructure, because depots can be equipped with charging stations. Batteries are charged off-board and are placed in the buses in a swap-out operation in approximately 10 minutes. Recycling of batteries is not a major issue because currently lead-acid batteries are recycled as part of the normal system for automotive batteries. Investment cost may be viewed as being high up front (see Section 2.2). However, with higher volume, leasing options, and operational life cycle accounting, electric vehicles will eventually have a lower cost per km travelled.

Hybrid-electric buses have an auxiliary power unit (APU) which is placed on the bus to generate electricity. The APU could take on any form ranging from compressed natural gas or diesel turbine, to small gasoline internal combustion engine, or any combination. The primary purpose of the APU is to extend the range of an electric bus, and in some instances, provide load balancing. To go from fossil-fuels to hybrid-electric is literally the addition of an APU engine and plugging a wire to the bus power system. The drive train does not change. One advantage is that the technology is well-known and being used in passenger vehicles. While hybrid-electric buses can be classified as “low emission” (less than gasoline or diesel), but a larger investment is required in comparison with diesel-fuelled buses.

A *fuel-cell bus* is similar in concept to the hybrid-electric, in that the fuel cell is mounted in the bus and plugged into the power system. The difference is that batteries could be eliminated completely when using a fuel cell. The advantage of the fuel cell / electric bus (without on-board reformer) is that it is ‘zero-emission’ since electricity is generated by combining hydrogen stored on-board in a tank with oxygen from the air. A reformer-based fuel cell bus is similar to a hybrid-electric in that some form of fuel, such as methanol, is utilized to extract the hydrogen. The disadvantage, today, is that the fuel cell cost is on the order of $20,000 per kWatt (because of the platinum parts); it requires hydrogen which has to be generated off-board and transferred to the bus tank. The cost of new infrastructure might however not be to prohibitive if used for urban transport and if vehicles can be refuelled at a depot on the transport corridor. The technology is in the pre-commercialization stage. Due to lack of practical experience with the technology, maintenance (lack of skilled labour) can be an issue as well.

[1] Source: Project Document

1.2 Project description, objectives and project partners

The main **objective** of the project is "to introduce to Egypt a viable electric, hybrid-electric, and eventually fuel cell technology program". The proposed project consists of a multi-year, plan, consisting of three **phases**:

- *Phase 1*a, is the phase evaluated in this evaluation report. It encompasses the following main tasks:
  - Obtaining practical experience with the acquisition and operation of electric buses;
  - Enhancing capacity of transport and technical staff on operation and maintenance;
  - Preparation of the follow-up phase(s)
- *Phase 1b,* the follow-on stage was planned to involve the completion of the pilot phase 1, in which 22 more electric and electric-hybrid buses would be brought into Egypt. By the end of phase 1, a technology transfer and commercialization plan would exist, based on real demonstration bus routes, for production of viable electric and hybrid-electric buses in Egypt. This would enable the expansion of the bus routes and the addition of new routes in other historic sites, in Greater Cairo, and in other major cities such as Alexandria.
- In *Phase 2,* the imported electric and hybrid electric drive systems would be integrated into Egyptian-made buses with a local manufacturer. Thus, local manufacturing would enhance the economic benefits and reducing the overall cost of the buses. Several buses would be locally produced and placed in service at historic sites and at various downtown city locations. A more comprehensive study on the economic feasibility of full manufacturing of the entire drive system, and future economic impact would be performed.
- In *Phase 3* of the programme, the complete bus and electric drive-trains would be completely manufactured in Egypt by establishing a manufacturing facility in Egypt to produce the components of the electric drive system for integration in Egyptian built buses and for worldwide export. Motors, controllers, battery management systems, and other critical components would be produced through this new venture. With Egypt's high tariffs on imported goods, the net cost of the electric driveline could be much lower when produced in Egypt. Again, a number of locally manufactured electric or hybrid buses would be produced and placed in service at various sites throughout the country, for performing shakedown testing. Upon implementation of the third phase of the program, Egypt would have become a major producer and possibly exporter of advanced electric and hybrid electric vehicles to neighbouring countries and for the worldwide market.

To implement such a multi-phased programme, assistance was sought from the United Nations Development Programme (UNDP) with financial support from the Global Environment Facility (GEF). Phase 1a started with the signature of the Project Document in March 2000 and ended operationally in June 2006. For reasons that will be explained in the next chapter, the subsequent follow-up phases (as outlined above) were never implemented.

The total budget for the Phase 1a Project was US$ 1.714 million, of which US$ 0.7486 million provided by GEF and US$ 0.4154 million by the Egyptian counterparts in cash and US$ 0.55 in-kind[2].

The Egyptian Environmental Affairs Agency (EEAA) has been the principal national executing agency for the bus pilot project and been responsible for the overall local

[2] Social Fund for Development: US$ 315,430; Egyptian Environmental Protection Agency, US$ 100,000 and US$ 550,000 as in-kind contribution from the Southern Coalition for Advanced Transportation (SCAT), a non-profit technology transportation consortium, based in Atlanta, USA.

coordination between the stakeholders until the completion of Phase I. EEAA has managed the Project in close cooperation with the Social Fund for Development (SFD).

The SFD, as the national implementing agency for the project, set up a Steering Committee in 2000 that will assist with directing the project and insure that it meets the objectives of the main stakeholders, including the Ministry of Culture and the Supreme Council for Antiquities (SCA). The Steering Committee first met in May 2001 and has met about 5 times during 2001-2003. Member of the Steering Committee included SFD, SCA, EEAA, Giza Governate and the Project Manager[3].

1.3 Evaluation methodology and structure of the report

According to standard UNDP/GEF regulations, an independent evaluation is needed at the end of project. Final evaluations are intended to assess the relevance, performance and success of the project. It looks at early signs of potential impact and sustainability of results, including the contribution to capacity development and the achievement of global environmental goals. It will also identify/document lessons learned and make recommendations that might improve design and implementation of follow-up phases or of other UNDP/GEF projects.

Mr. Jan van den Akker, owner of the consultancy bureau Advisory Services on Climate, Energy and Development Issues (ASCENDIS), hereafter referred to as 'the Evaluator', was selected to undertake the final evaluation of the Phase 1a Project.

The Evaluator adopted the following methodology:

- Review of the relevant project documentation, such as the Project Document, the final Report of Phase 1a, Contract for the Supply of Two Buses (between SDF and NGM Corporation), as well as annual project expenditure sheets
- A mission was undertaken to Egypt from 3-7 February 2008 to meet the key stakeholders in Cairo and visit Luxor, the site of operation of the two electric buses

During the mission, discussions were held with the former Project Manager and former Minister of State of Environment as well as representatives from the EEAA, SDF and SCA (see Annex B for more details on the schedule of meetings).

[3] Issues discussed at the Steering Committee meetings were, for example, approval of the selection of the bus supplier, reports of the bus tests and the technical problems faced in the operations and negotiations with NGM, approval of holding the NGM workshop, the problem of releasing of the first bus from customs and proposed means to solve the problem, moving the bus operation from Giza to Luxor and handover of the buses to SCA

2. FINDINGS

2.1 Implementation: outputs, activities and accomplishments

For each of the three outcomes, as mentioned in paragraph 1.2, this chapter assesses the progress in the implementation of the project's outcomes and outputs, following the format for reporting outcomes as given in the annual project implementation review reports (APR-PIRs) and list of activities as given in the Project Document (ProDoc).

Objective

"Introducing a viable programme for replacing diesel buses with electric, hybrid-electric, and, as applicable, fuel-cell buses"

Indicators for the Development Objective	*Baseline and target value*	*Actual value 2006*
• Demonstration component of Phase 1a completed • Proposal for next phase 1b is agreed and its implementation secured by the commitments of the key stakeholders (including financing)	*Baseline:* • No electric buses *Target:* • Two buses have been delivered tested and handed over the end user • Proposal and agreements for follow-up phase has been agreed upon	• Two electric buses are operational at Luxor • The plan to proceed with the follow-up Phase 1b (let alone, a Phase 2) was discontinued (due to changes in GEF priorities)

Outcomes, outputs and activities

Outcome 1:
"Enhanced experience on electric buses by building on the monitoring of the operation of the two test vehicles"

Outcome indicator	*Baseline and target value*	*Actual value 2006*
• The two test vehicles are in regular use and the results are presented in a 'final report' Activity (as given in ProDoc) 1. Identifying and designing potential bus service routes 3. Testing of electric buses in various routes;	*Baseline:* • No electric buses *Target:* • Ownership and responsibility for the continuing operation of the buses transferred to SCA	• SCA is running the two test buses; ownership transferred in 2003 with maintenance contract with AFICO until 2006; • Final report prepared by the supplier NGM (2003)

Achievements:

After signing the Project Document in March 2000, a 'request for proposal' was issued (limited tendering) in August 2000 by the SFD for international bus manufacturers to submit proposals jointly with Egyptian private sector partners. A contract was awarded to he New Generation Motors (NGM) Corporation, working together with the Advanced Vehicle Systems (AVS)[4] and the Egyptian bus manufacturer Automotive Feeding Industries (AFICO)[5], for the delivery of two electric buses. The contract was signed in April 2001.

Regarding the selection of the bus routes, various options were contemplated, such as location in densely populated areas (downtown city centres) or near monuments frequently visited by tourists; maximum length of possible route (80-100 km) and the strategy for battery charging. In the end, it was decided to employ the buses near the Giza Pyramids (see picture below), within the limits of Cairo and at one of the most recognisable places in the world. The idea was coinciding with plans of the Supreme Council of Antiquities to ban diesel buses and other polluting private cars in the immediate area surrounding the Great Pyramids[6], to be replaced with zero-emission (electric) shuttle buses to operate within the closed area to transport visitors to the sightseeing and rest area stops.

The first bus arrived late 2001, prepared at the facility in the USA and shipped to Egypt. Noting some problems (more details are given in section 2.2), the motor was sent back and only installed again in May 2002. Important first activity was to collect vehicle operational and performance data. The second bus did not arrive until late 2002. The two buses measure 6.7 metres and are of similar model, although differing in drive system and accessories, while the second bus was also equipped with an electrically-driven air conditioning unit.

Various tests were applied to the busses (operational tests on normal and other roads; routes on flat and grading terrain, including making trips up to the Giza plateau). Also, various routes in Cairo were tried and it was seen to have suitable range for basic benign conditions of transportation. While the bus was able to surmount the incline to the Giza Plateau (which turned out to be greater than the maximum 11% as stated in the original requirements), it was discovered that the 13% grade nonetheless meant a considerable energy draw on the batteries (equating 2-4 loops of use; equivalent to about 6 hours of shuttle services).

In 2003, it was decided to employ the two buses to transport tourist to and fro the periphery of the Hatshepsut Temple in the Deir al-Bahri area in Luxor (see picture on next page).

[4] Based in Virgina and Tennessee, USA, respectively

[5] AFICO assembles diesel buses in Egypt

[6] Some 100 buses reportedly go up the ramp to the Pyramids

Outcome 2
"Enhanced capacity of transportation authority managers and O&M personnel to participate in the programme"

Outcome indicator	*Baseline and target value*	*Actual value 2006*
• Local stakeholders are capable of operating and maintaining the electric buses and related infrastructure Activity (as given in ProDoc) 2. Training, maintenance and operation	*Baseline:* • None *Target:* • All stakeholder are trained	• Training of two AFICO engineers by NGM started in 2004; engineers are currently performing the maintenance of the buses

Achievements:

A 3-day conference/workshop was held in September 2002 at the Mena House Hotel near the Giza pyramids. The conference brought in various leading experts on electric vehicle technology (e.g., from USA and India), discussing manufacturing issues, state of technology, environmental impacts. A demonstration was held of the electric bus, giving workshop participants a first-hand experience.

Regarding maintenance and operation, ownership was transferred to SCA. Under a 3-year contract, AFICO-NGM provided maintenance service and two AFICO engineers were trained in 2004. This contract expired in 2006 and since then SCA itself has been responsible for operation and maintenance (O&M). The Evaluator spoke with some of the O&M staff when visiting Luxor. Apparently, one of the buses (see picture on the next page on the left) has been causing quite some technical problems, while the other (see picture on the right) has been doing quite well. Maybe this has to do with the fact that, although similar in model, the buses differ with respect to the drive systems and accessories.

The O&M team reported some small adaptations. For example, the compressor, placed under the bus, easily filled with the fine desert sand and has now been placed in the back. Other stakeholder interviewed mentioned that, in fact, SCA should do the maintenance itself, but subcontract to a company that has more specialised knowledge in this matter. In 2007 it was decided to award such a contract and a tender procedure was started. At the moment of writing this report, this procedure was about to be finalised.

Outcome 3:
"Creation of the basis for the launching of the next phase"

Outcome indicator	*Baseline and target value*	*Actual value 2006*
• Final project report and project proposal for next phase are finalised, presenting and incorporating results of the Phase 1a activities Activity (as given in ProDoc) 4.Computer simulation of various bus configurations/routes 5. Impact studies 6.Developing detailed plan and proposal for Phase1b	*Baseline:* • No impact study *Target:* • Impact studies (social, economic, environmental) finalised • Potential bus service route identified and computer simulation of various buys configuration and routes completed	• Impact studies finalised and presented in final report, but the other activities have been shelved, as the plan for a joint GEF/Egyptian phase 1b have been discontinued due to changing GEF priorities • Final evaluation done in February 2008

Achievements:

An environmental and socio-economic impact analysis was carried out in 2003 by NGM Corporation. The next Section 2.2 discusses impacts of electric buses in more detail. The other activities (design of several bus configurations and routes as well as the formulation of a proposal for the successor phase 1b) have not been carried out after it became that GEF would not financially support such a follow-up phase.

2.2 Impacts of the electric buses project

Being a preparatory phase, that was supposed to be followed by subsequent phases 1b and 2, it is difficult to talk about real impacts, as only two buses were put in operation. Nonetheless, the APR-PIRs of the project as well as the report NGM (2003) provide some insight in the potential impacts of the introduction of electric buses in Egypt.

Energy savings and emission reductions

Electric buses are sometimes referred to as 'zero-emission' vehicles, because the tailpipe emissions are zero. This can be misleading. If the electricity fuelling the vehicle's batteries has been generated by means of fossil fuels this leads to emissions elsewhere. A fuel-cycle analysis (from 'well to wheel') gives more appropriate estimates of emissions as indicated in Table 2 below.

Table 2 Emissions for electric, hybrid and fossil fuel buses in Cairo

Emission in grams per km travelled	SO_2	NO_x	Particulate matter (PM)	CO	CO_2-equivalent	Energy consumption per vehicle (MJ/km)
Diesel bus	13.0	16	3.329	12	2,236	24.9
CNG bus	0.044	14	0.028	15	1,165	22.2
Diesel-hybrid	6.0	21	0.389	5	1,069	11.8
CNG-hybrid	0.02	6	0.033	11	712	17.7
Electric bus	0.006	2	0.067	1	483	5.5

Source: NGM (2003)

Assumptions:

- *Electric vehicles:* Natural gas provides 81.6% of power supply in Cairo (remaining 18.4% are hydro and renewables); power generation plant: capacity factor 67%, efficiency: 38.8%; T&D losses: 7%. Losses during battery charging and AC/DC conversion: 28%
- *Fuel vehicles:* Diesel is refined at nearby refinery (91% operating efficiency)

Assuming that there are some 13,500 diesel buses in Cairo alone in operation[7] and an annual distance travelled of 90,000 km, this implies an annual CO_2 reduction of 2.13 million tonnes if all buses would be electric in comparison with the baseline of having diesel-fuelled buses only.

Technology cost and cost reduction options

One question here is the assessment of costs of electric buses vis-à-vis a comparable diesel (or CNG) bus. Table 3 provides a short analysis of their economics. The initial investment in an electric bus is higher than of a diesel bus. In case of the Phase 1a project, the cost of the bus was US$ 192,500, plus US$ 8,800 of shipping cost. On the other hand, electric buses offer lower fuel and maintenance cost. Assuming that a bus runs for 90,000 km annually over its 10-year lifetime, this would make the project buses more expensive to purchase and operate over the overall life of the bus. However, substantial cost reduction can be achieved if more parts of the bus could be manufactured locally and this may lower investment cost to

[7] The NGM (2003) study mentions that some 3,300 buses and 700 mini buses of the Public Transport Authority and 700 buses of the Cairo Bus Company are in operation. Emission reduction of using an electric bus in comparison with a diesel bus is about 1.75 kgCO_2 per km travelled.

Table 3 Cost breakdown of electric and diesel buses

	Electric (imported)	Electric bus (local man.)	Diesel bus
Initial investment			
Investment cost bus	201,300	150,000	100,000
Lifetime	10	10	10
Interest rate	10%	10%	10%
Annualised cost (US$)	**32,761**	**24,412**	**16,275**
Fuel cost			
kWh per km	0.7		
Litres per km			0.4
Cost (US$) / kWh	0.035		
Cost (US$) / litre of diesel			0.13
Cost (US$) / km	0.026		0.05
Maintenance cost			
Tyres	0.025		0.025
Other maintenance	0.075		0.099
Battery cost	0.064		
Overhaul cost			0.103
Total fuel & maintenance cost	0.190		0.281
Annual distance travelled (km)	90,000		90,000
Annual fuel & maintenance cost	**17,096**	**17,096**	**25,251**
Total annual cost per bus (US$)	***49,856***	***41,508***	***41,526***

Compiled from NGM (2003) and data on cost of buses acquired during the evaluation mission.
Duties in Egypt are quite high could add up to 100% of investment cost of imported parts, depending on their classification by Customs. Cost of an electric bus could then be as high as US$ 240,000-300,000. The energy costs are based on actual prices, using the exchange rate of US$ 1 = LE 6. The power tariff varies between LE 0.05 for the first 50 kWh and LE 3.8 for over 1000 kWh; a power tariff of LE 0.21/kWh has been assumed here. Diesel price is about LE 0.75 per litre.

about US$ 150,000[8]. If so, this would make the cost of a diesel and electric bus compatible, while the latter would offer substantial environmental benefits.

The two buses are currently operating on a commercial basis. The project has demonstrated the beneficial environmental impacts and the technical viability of operating electric buses under certain conditions. Regarding economic viability, the impact study NGM (2003) is less useful. A table similar to Table 3 is presented in NGM (2003) and presents an analysis of operating and maintenance cost of an electric and a diesel bus. Unfortunately, the analysis does not take into account the investment cost itself of the buses. Furthermore, the energy prices are based on US data, rather than Egyptian. Maybe such limited analysis in NGM (2003) is done on purpose. It should be noted that international energy prices vary, fuels are heavily subsidised in Egypt[9] and duties on imported goods are quite high; therefore, it may be difficult to compare the real cost of diesel and electric buses over their useful lifetime.

In the end feasibility not only depends on the cost, but on revenues as well. The electric buses operating in the Hatshepsut Temple near Luxor reportedly can generate up some US$ 1000 (LE 5,000-6,000) a day or more, so running the bus should be economically viable.

[8] Talaat Ghabbour, p.c.

[9] The UNDP Bioenergy project document (UNDP, 2008) mentions that the price of LE 0.55 per litre, but unsubsidized would cost LE 1.44 per litre.

Other impacts

Unfortunately, the project has not yet led to any significant follow-up activity to expand the electric buses fleet in Egypt. One reason is the fundamental change in GEF funding priorities for sustainable transport, shifting from technology-oriented[10] to a more planning-oriented focus[11]. Therefore, GEF funding for a follow-up phase is not considered applicable anymore.

While informal discussions between SFD, Supreme Council of Antiquities (SCA) and private bus manufacturers have continued, this has not resulted in specific follow-up actions.

2.3 Assessment of the design and implementation of the project

2.3.1 Country ownership and relevance

Given certain circumstances, electric buses compare favourably to conventional diesel-fuelled buses. Some of the potential benefits are:

- Health problems resulting from air pollution cost Egypt about US$ 2 billion a year, according to USAID estimates (NGM, 2003). Taking into account that transport contributes to about 45% of pollution, this implies that the cost of health problem attributable to transport is about US$ 900 million a year. Even if only 10% of Egypt's could be turned into electric (or at least electric-hybrid) vehicles this could imply savings of about US$ 90 million a year.
- In the touristy antiquities areas, reducing the amount of pollution and vibrations caused by heavy duty buses will help stopping the degradation of the national monuments.

In addition, the Government of Egypt aims at enhancing its energy security by reducing its national consumption of oil products and take advantage of the domestically available resource of natural gas. With the shift towards natural gas (used directly or for power generation), Egypt has the ability to export more oil and improve its trade balance accordingly; hence the interest of the Government to promote CNG, electric and hybrid vehicles in transportation.

The Social Fund for Development (SFD) supports programmes in the areas of education, health care, employment, increased income and improvement in the quality of life. This includes reduction of pollution (by improving the efficiency of the mass transport system) and creation of sustainable jobs. With respect to the latter, the SFD signed an agreement with the US Small Business Administration (SBA) to create a mechanism for assisting small enterprises and to bridge the gap between US and Egyptian small businesses. This also has provided an umbrella for the electric buses project, which entails technology transfer as part of a partnership between a US (NGM Corporation) and an Egyptian company (Ghabbour/AFICO).

[10] Electric, hybrid or fuel-cell vehicles for public transportation as well as advanced technologies for converting biomass feedstock into liquid fuels

[11] Modal shifts to more efficient and less polluting forms of public transport and non-motorised transport, through measures such as improved traffic management, better urban and transport planning and associated training, capacity building and dissemination of results.

2.3.2 Implementation approach

The original idea of the electric and hybrid buses project consisted of a multi-year, multi-phase plan. The current phase 1a encompasses testing two buses, conducting economic, environmental and social studies, and training. By the end of phase 1a, a technology transfer and commercialization plan would exist for the further employment of 22 more buses in historic sites and downtown city locations before 2005.

While sounding nice in theory, this original idea and timeframe were too ambitious:

(1) The first phase 1a was intended to be implemented over a 6-month period in 2000. However, the project started in 2000 and was not operationally closed until 2006.

(2) The follow-up phases have never materialised as very soon after project initiation that no phases would be eligible for GEF funding.

Delays in project implementation

The project's first phase 1a was intended to be implemented in 2000 during a 6-monh period. It has taken much longer. The reasons for this delay are as follows:

- *Delay in starting up the project.* The electric buses project (phase 1a) was formalised until the signature of the project document (March 2000) and the appointment of the technical committee supervise the preparation of the request for proposals for bus procurement[12]. In August 2000, the tender documentation was prepared, while the contract with NGM, AVS and AFICO was signed in April 2001. In other words, the tendering already took longer than the envisaged 6-month duration of Phase 1a;
- *Customs.* Shortly after arrival of the first bus, it had to be stored in the free trade area for a couple months, as it was not clear if this imported equipment should be exempted from duties, or if not eligible for exemption, how much should be paid. The bus got in by mid 2001. In fact, the second bus (arriving in July 2002) had to go through the same process and issues, not only causing delays but additional storage charges[13];
- *Technical problems (1).* Even before going through customs, the first bus was held in storage in USA en Egypt, pending the finalization of the contracting and settling of the customs issues. Due to the lack of maintenance for such a long period, the battery pack got damaged, while dust got settled in the filters and inside the motor. During test runs the accumulated dust caused localised overheating and failures in the windings. It appears that this was also a design problem of the first bus prototype and similar problems were not observed in the second bus, which actually was of better quality than the first one;
- *Political problem.* By this time, the 9/11 terror attack in the USA, caused a temporary breakdown in communications of up to 8 months between SFD and the NGM support team in Egypt with NGM USA, made worse by delay in payments to NGM. The 9/11 event also delayed the dispatch until May-June 2002 of a team comprised of two specialists from to Egypt to train Egyptian technicians on the maintenance of the bus;
- *Technical problems (2).* Lack of communication implicated that the minor damage was not repaired, but the decision was taken to continue running the bus. This however caused further damage and the entire electric drive had to be sent back to NGM for rebuilding, implying further delay and additional cost. The electric engine was reinstalled again in May 2002.

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12 The original Request for Proposal (RFP) included excessive details for the specifications that discouraged bidders to participate and led to receipt of only one proposal. Consequently the RFP was revised and re-issued to allow for more companies to apply and accordingly several proposals were received for evaluation but this process consumed several months to finalize

13 The NGM (2003) report mentions some US$ 40,000 in storage charges for the first and US $ 12,000 for the second bus . The first bus was supposed to be in custody of the supplier until it was delivered to the site and there was some disagreement between NGM and its Egyptian partner that delayed the release of the first bus. Thus, these payments included some settling of payments between NGM and its Egyptian partner company which was not the responsibility of the Egyptian government

The two buses were handed over to Supreme Council of Antiquities (SCA) by mid 2003. The executing agency, SDF, requested an extension of the project for three more years at no additional cost to the project for a maintenance contract with the bus provider, in order to ensure that a sustainable basis for operation and maintenance of the buses. The project was operationally closed with the last payment to the contractor (NGM/AFICO) in June 2006.

Stakeholder participation and partnership strategy

Main stakeholders have been the implementing/executing agencies SDF and EEAA as well as the SCA. Bus supply, testing and operation is based on partnership between a US company (NGM) and the Egyptian bus maker AFICO (Automotive Feeding Industries Co.), whose Managing Director is Taalat Ghabbour, a member of a well-known Egyptian family of businesspeople. AFICO is manufacturing company, producing a range of products from automotive filters, to public transport buses and electric golf carts. This US-Egypt private partnership has apparently worked well and has had good relations with the implementing and executing agencies of the project (i.e. UNDP, SFD and EEAA).

2.3.3 Financial planning and delivery of counterpart inputs

Table 4 provides an overview of the budget allocation per budget line as given in the UNDP/GEF Project Document and Budget Revision sheets and based on actual spending in the period up to December 2006 as given in the UNDP Combined Delivery Reports for that period. The Evaluator notes that, not including the US$ 10,000 for the final evaluation, most of the GEF cash funding (as well as that of EEAA and SDF) had been spent by the end of 2006.

It is the Evaluator's task not to only to check if the budget has been spent, but how it was spent on which budget items and activities. Table 4 shows that the budget on 'administrative

Table 4 Planned budget of Phase 1a and actual expenditures

Planned budget (see Project Document) *(all amounts are in US$)*	GEF	SFD+EEAA	Subtotal, cash	In-kind SCAT	TOTAL
Personnel and travel	245,000	209,000	454,000	225,000	679,000
Training and studies	45,000	50,000	95,000		95,000
Oversight and support	15,000	74,430	89,430	52,000	141,430
Equipment (buses and 3-yr maintenance)	443,600	82,000	525,600	273,000	798,600
Total	**748,600**	**415,430**	**1,164,030**	**550,000**	**1,714,030**

Expenditures *(UNDP-managed; in US$)*	Planned	Actual	2001	2002	2003	2004	2005	2006	2008 (est.)
Admin support	31,889	32,966	6,853	16,490	9,615		9		
NGM subcontract	700,100	637,153	243,370		244,900	127,348	21,535		
Miscellaneous	116,611	136,214	24,607	43,437	50,885	4,907	- 19,736	32,114	
Evaluation		10,000							10,000
Subtotal	*848,600*	*816,334*	*274,830*	*59,927*	*305,400*	*132,255*	*1,808*	*32,114*	*10,000*
GEF budget	748,600	748,488	246,230	59,927	245,400	128,692	56,775	2,465	9,000
Cost sharing (EEAA)	100,000	67,846	28,600	-	60,000	3,563	- 54,967	29,650	1,000
Cash co-financing (SFD managed)	315,430	315,430							
In-kind co-financing	550,000	-							
TOTAL	**1,714,030**	**1,131,764**							

support', the 'NGM/AFICO subcontract' and 'miscellaneous' was spent over 2000-2008 more or less as planned.

The biggest budget item has been the delivery of the two buses and associated management, support and maintenance cost as well as the cost of spare parts, of which a breakdown is given in Table 5. It should be noted that the in-kind co-financing by SCAT has not been realised as this American-based not-for-profit consortium never participated in the project.

Table 5 Price of contract between SFD and NGM

Description	US$
- Project oversight and management in US & Egypt	65,000
- Engineers, technicians, logistics	184,632
- Local support by NGM US and NGM Egypt in Phase1a	78,368
- Training	15,000
- Workshop	10,000
- Environmental and social impact study	20,000
- Travel	45,000
- Cost of bus 1	192,500
- Cost of bus 2	192,500
- Shipping of both buses	17,600
- Operational equipment (extra battery packs; external charge; pallet jack)	37,500
- A/C system	21,000
- Spare parts	52,645
- Maintenance equipment (software; tool sets; air compressor; air hose)	16,846
- Shipping of spare parts and maintenance equipment	21,000
- Design/paint; miscellaneous	19,500
Total cost	989,091
Special discount	- 9,491
Total contract price	979,600

Source: MGM-SFD (2001)

Effectiveness of the agencies in backstopping the project; monitoring and evaluation

With the Minutes of Meeting of the Steering Committee in Arabic language only and lack of progress reports, the Evaluator has basically relied on the APR-PIRs and interviews during the mission to make a judgement on the effectiveness of the entities involved in backstopping the project. The main conclusion is that the Project Manager and entities involved, UNDP, SFD, EEAA and SCA have facilitated the implementation of all the planned activities of Phase 1a during 2000-2006.

One concern, however, is that no sustainability strategy has been formulated in terms of Phases 1b, 2 and 3, as originally planned. Even without GEF support, some type of follow-up activities could have been formulated, assuming that the Egyptian stakeholders really have an interest in employing environmentally friendly buses.

In terms of oversight, the project's Steering Committee has met several times during 2001-2003 to discuss the project's progress and actions to be taken.[14]

[14] Given the fact, that only a few group of activities have been undertaken (namely, the delivery and operation of the two demonstration buses and associated training and impact analysis activities), no formal monitoring has taken place based on using the logical framework as a management tool.

2.3.4 Project formulation

Project design

As such, the project document provides a clear, logical structure for Phase 1a:

- Acquisition, testing and operation of two test buses;
- Training on maintenance and operation;
- Impact analysis of operation of the buses;
- Formulation of the follow-up phase

As regards to the period of duration as mentioned in the Project Document, it is clear that the initial duration of six months for successfully completing of Phase 1a, including the tendering, procurement, operationalisation and monitoring the results was drastically underestimated.

Follow-up phases

The SFD and SCA have expressed interest in a second phase for the project, but have been focusing too much on GEF provide the necessary co-financing. The second phase would aim at assembling 22 buses in Egypt to be operated in historical sites. The total demand of these buses is estimated at 100-150 buses for all historical sites. However, the GEF priorities in sustainable transportation have changed away from promoting alternative technology to more sustainable transport planning and non-motorised transport. Instead of pursuing the illusion of GEF co-funding, the partners involved (UNDP, SCA, SFD and private sector) should (and could) have explored other ways of funding the envisaged follow-up phases.

3. CONCLUSIONS, LESSONS LEARNED AND RECOMMENDATIONS

3.1 Conclusions on project results and design

3.1.1 Project conceptualization and implementation

The 'electric buses, Phase1a' was meant as a preparatory phase for a larger initiative on employing electric and electric-hybrid vehicles, first at the antiquities sites and later expanding into the public transport of downtown cities, such as Cairo. As such, the project document for Phase 1a describes a coherent set of objectives and outputs and has embarked on doing first some test runs of the electric buses at a well-known historic site (Giza, later Luxor). The project is implemented by the United Nations Development Programme (UNDP), Egyptian Environmental Affairs Agency (EEAA) and the Social Fund for Development (SFD). Two buses were employed as testing and demonstration units and ownership was later transferred to the Supreme Council for Antiquities (SCA), who currently operates them in Luxor area.

Phase 1 itself has been split up in two sub-phases, namely Phase 1a and Phase 1b, in which trials are undertaken with 2 and 22 electric buses respectively. As the investment cost in 24 buses would be quite considerable (some US$ 4.8 million, not including management and support cost, spare parts and cost of operation and maintenance), it is understandable that instead of implementing the whole Phase 1 in one go, the Phase 1 was split up in a and b. From the Global Environment Facility (GEF) perspective this has reduced technology risks (e.g., technology may not work well in Egyptian circumstances; high cost of technology) as well as institutional-organizational risks (e.g., commitment of Egyptian bus companies to local manufacture and provide suitable support as well as commitment of key stakeholders in Government). It is ironic therefore that GEF became a major risk factor itself, by changing its funding priorities in the area of sustainable transport, thus effectively torpedoing the follow-up Phases 1b it was envisaged to co-finance.

Phase 1a has enhanced the experience on employing electric buses in Egypt by giving useful insights in acquisition, operation and maintenance issues involved (outcome 1). Local technical staff is capable of operating and maintaining the buses (outcome 2) and interest among managers, such as in SCA or Egyptian bus manufacturers, has been raised. Here, the project has performed *satisfactorily*.

Regarding outcome 3 'creation the basis for the launching of the next phase', the Evaluator rates the results as *unsatisfactorily*, as clearly no follow-up phase has materialized and no serious intent has been undertaken (so far) to have any follow up. The study on environmental, economic and social impacts (NGM, 2003), describes the environmental benefits and technical issues well, but from the study it is not clear what financial costs and benefits of employing electric buses vis-à-vis conventional buses are, nor what would be needed in terms of manufacturing infrastructure. Maybe this lack of analysis is partly justifiable, because further research on these topics was envisaged to be done in Phase 1b.

The argument that GEF has pulled out is not altogether convincing as justification for the lack of any follow-up activities. Apparently, at least one of the buses is running quite well. Both SCA expresses interest (they claim some 100 buses are needed in other antiquities areas) and

the private sector has expressed interest in locally manufacturing electric buses (the electric drive would still need to be imported). It sounds a bit like a 'chicken and the egg' situation. Government entities interested in employing electric buses (such as SCA) seem not to be able to take a decision on where and how to acquire and operate the buses, while Egyptian private sector will not do any investment if not sure of what the demand for electric buses will be.

Combining the rating of the three outcomes, the Evaluator's overall rating of project implementation is '*marginally satisfactorily*'.

3.1.2 Project impacts; sustainability and replication

Normally in the evaluation of UNDP/GEF climate change projects, the Evaluator asks some final questions on project sustainability, "how effective has the project been in contributing to market transformation?" and on project replication, "what has been the contribution to replication and scaling up of RET utilization in the Pacific region?"

The *de facto* objective of the project has been, not only to have some first experience with the operation of electric buses, but to formulate follow-up phases, as proposed in the original Project Document. As these phases have not materialized, it is not possible to have any say about the impact of the electric buses initiatives in terms of transformation of the market for electric vehicles. But, at least, some awareness has been raised and local capacity has been created by the project

3.2 Lessons learned and recommendations

3.2.1 Recommendations

For Phase 1b (extending the electric buses pilot programme to the historic sites)

Currently no dedicated (sustainable) transportation system exists within the antiquities sites and protectorates in Egypt. Tourists are transported directly by their heavy duty tour buses and private vehicles right up to the entrance of the historic sites.

In India, for example, the authorities have banned vehicles from entering the precincts of the famous Taj Mahal monument and restricted parking within a 500 m radius of the building[15]. Similarly, the SCA has been planning for some on banning the approach of these large diesel coach buses in the immediate surroundings. Pollution and vibration-free electric buses of various sizes can then be employed to transport tourists with in the exclusions area.

Given the current priorities on co-financing, GEF support seems unlikely at this moment and in the coming years. Other ways of financing needs to be explored and these are likely to come from Egyptian sources itself. The SCA should not acquire or operate these buses itself; its task is to safeguard Egypt's national heritage, not act as bus operator. Instead a concession could be awarded to a company after a competitive bidding process. In such a scheme, the company is given the exclusive obligation to provide electric buses and passenger transport in the service area. The rationale for this approach is that concessionaires will be able to provide

[15] The sulphur dioxide settles on the mausoleum as sulphuric acid, causing the marble to discolour and flake. But transport measures alone are not enough. The authorities have banned the development of new industries with a 10,000 km^2 exclusion zone and ordered existing industries to change from coal cokes to natural gas (source: Lonely Planet guide, India, 1999).

the most cost-effective services, because they are free to select the electric (brand, technology, size). Here, the SCA (together with local transport authorities, if required) would oversee the bidding process, negotiate the contract and monitor its compliance.

The company involved in Phase 1, AFICO, would probably participate in the bidding for such a concession scheme. However, given the fact that there are few such bus producers in Egypt it might be difficult to find enough other interested and qualified bidders.

Thus such a new-style Phase 1b could try the employment of about 20-25 buses in various concession areas at various historic sites (Giza, Sakara, Luxor, etc.) A fee structure for the buses should be studied and implemented, attractive enough for bidders to participate. The entrance fee at the antiquities site could be augmented slightly in accordance with the 'polluter-pays' principle.

For Phase 2:

In Phase 2, the operation of electric buses would be replicated and extended to other historic sites. The SCA has estimated that to implement such schemes at the major historic sites in Egypt would require some 120-150 buses.

Electric buses will even have more impact if utilized in the downtown areas of Egypt's big cities such as Cairo or Alexandria. In Cairo demand for mobility has far outpaced the capacity of the (public) transport system to cope. Already, Cairo's traffic jams are notorious (the Evaluator had the privilege of experiencing this himself). According to a recent study, the average speed of a trip in Cairo on a normal day is about 19 km/hr and this will drop to 11 km/hr by the end of the next decade. Together with the EEAA, UNDP has presented a proposal on 'Sustainable Transport' for GEF co-funding (US$ 6.9 million). This project will have the following components (see UNDP, 2006):

1. Introduction of high-quality integrated public transport services for Cairo and its satellite cities that connect to the existing metro lines
    a. Connection of Cairo with satellite towns, starting with the lines Tahrir Square (Cairo) via Lebanon Square to Sheikh-Zayed, 6th of October and Media Production City
    b. Improved services within the satellite cities, starting with 6th of October
    c. Feeder bus station with integrating ticketing for pilot stations of the existing metro lines;
2. Increase of non-motorised transport in the modal share in provincial cities;
3. Introduction of Transport Demand Management (TDM), including micro-pedestrian areas, parking policies and facilities, introduction of public transport priority treatment and priority bus lanes;
4. Improved energy efficiency of freight transport.

Although formally electric buses are not part of this UNDP/GEF proposal, it should be explored if some of the buses to be employed (the investment will be financed as part of the non-GEF resources) in component 1 could not be electric, on the shorter stretches, or electric-CNG hybrid vehicles, on longer routes.

A study should be made on the economic feasibility of manufacturing (parts of) the electric drive system in Egypt. Egypt has the infrastructure for the production of high-quality buses that range form 6 metre minibuses to large deluxe long-distance buses. Only the engine and driveline components are imported from international companies, such as GM, Scania, etc. Thus, the existing bus production know-how can be extended to incorporating electric or electric-hybrid drivelines. The larger the market for electric vehicles, the more interesting it will be for Egyptian companies to set up the necessary technology and manufacturing infrastructure.

3.2.2 Lessons learned

1) Through the course of the project there have been many *delays*, of which some could have been avoided and others not. For example, the issue with customs could have been avoided with proper planning and communications, as it does not make sense that SFD, a government agency, has to pay money to Customs, another government agency, for a government-funded programme.

2) Especially the first bus has been hit by system failures. According to the impact study (NGM, 2003), the long waiting storage period (in which apparently dust settled in the filters and electric engine) caused failure of proper operation of the engine. Continuation of operation implied further damage and in the end the engine had to be sent back to NGM to re-build. According to the operators of the buses in Luxor, the vehicles were designed for operation in USA rather than in Egypt, but the ambient conditions of high dust and heat (reaching over 40^{o}C in the summer period) affect the buses performances. The operators mentioned that small modifications had to be made (e.g. changing the position of the compressor in the bus, so that less dust enters) in both buses. The first bus continues to be causing problems apparently. One reason also is that the second bus's design is a bit different and seems to be sturdier built.

3) The lesson learnt here is that with introducing new technology in a country, such as electric vehicles, unexpected issues will occur. Testing the buses at various sites (Giza, Luxor) under different conditions enabled to determine the required specifications adjusted to suit the Egyptian environment. This is a learning process also, in which Egyptian technicians gained a first experience by fixing problems on-site. The Evaluator suggests that such invaluable lessons learned are taking into account should the programme move to a follow-up phase.

ANNEX A. TERMS OF REFERENCE

UNDP/GEF Project
"Introduction of Viable Electric and Hybrid-Electric Bus Technology in Egypt-Phase I"

1. Introduction:

The Monitoring and Evaluation Policy (M&E Policy) at the project level in UNDP/GEF has four objectives:
a) to monitor and evaluate results and impacts; b) to provide a basis for decision making on necessary amendments and improvements; c) to promote accountability for resource use; d) to document, provide feedback on, and disseminate lessons learned. A mix of tools is used to ensure effective Project monitoring and evaluation. These might be applied continuously throughout the lifetime of the project e.g. periodic monitoring of indicators – or as specific time-bound exercise such as mid-term reviews, audit reports and final evaluations.

In accordance with UNDP/GEF Monitoring and Evaluation policies and procedures, all regular and medium-sized projects supported by the GEF should undergo a final evaluation upon completion of implementation. A final evaluation of a GEF-funded project (or previous phase) is required before a concept proposal for additional funding (or subsequent phases of the same project) can be considered for inclusion in a GEF work program. However, a final evaluation is not an appraisal of the follow-up phase.

Final evaluations are intended to assess the relevance, performance and success of the projects. It looks at early signs of potential impact and sustainability of results, including the contribution to capacity development and the achievement of global environmental goals. It will also identify/document lessons learned and make recommendations that might improve the design and implementation of other UNPD/GEF projects.

2. Project Objectives

The overall objective of the project is to introduce to Egypt a viable electric, hybrid-electric, and eventually fuel cell technology program, that would have significant benefits and sustainability in various segments of the country. The project will contribute to the long-term reduction of low emission bus system, to the enhancement of Egypt's technological competitiveness and to job creation. This will be applied to antiquity sites starting with the Giza plateau as well as the Cairo public ground transport sector. The project was proposed to be a multi-year, multi-phase plan reducing the pollution in Egypt and meeting some of the objectives of Egypt Vision 2017. The current phase I(a) encompasses six tasks aimed at addressing specific operational technology questions, testing a bus in various sites in Egypt, conducting economic, environmental and societal studies, providing training to managers, engineers, and technicians. Two electric buses will be used to perform the six tasks outlined here. By the end of Phase I(a), a technology transfer and commercialization plan will exist, based on real demonstration routes.

3. Project Description

This final evaluation covers only the Phase I(a) which encompasses six tasks aimed at addressing specific operational technology questions, testing a bus in various sites in Egypt, conducting economic, environmental, and societal studies, providing training to managers, engineers, and technicians, and developing the scope and proposal for stage (b) of Phase I. Two electric buses

were used to perform the six tasks in Egypt outlined in the project document. The follow-on stage, Phase I (b), should have involved the completion of the pilot project demonstration whereby the remaining 22 buses with various hybrid configurations will be brought to Egypt and placed at various sites. By the end of Phase I, a technology transfer and commercialization plan will exist, based on real demonstration bus routes, for production of viable electric and hybrid-electric buses in Egypt. This will enable the expansion of the bus routes and the addition of new routes in other historic sites, in Greater Cairo, and in other major cities.

4. Objectives of the evaluation

The evaluation of UNDP/GEF project "Introduction of Viable Electric and Hybird Electric Bus Technology in Egypt" is initiated by the UNDP Egypt and it is being undertaken in accordance with the UNDP/GEF Project Monitoring and Evaluation Policy)[16]. The principal purpose of the project evaluation is to assess the project results and impacts as required by the UNDP/GEF Monitoring and Evaluation Policy.

The Final Evaluation Report should include the following dimensions:

- Assessment of the achieved progress since project formulation and project implementation compliance to project objectives.
- Recommendations to the Egyptian Government on how to ensure sustainability of the initiative, modality of execution and extension of the service to all areas of antiquities;
- Extracting lessons learned that could be valuable in other countries and finding best practices that could be applied in similar projects or project approaches;
- Recommendations on developing further project proposals to international institutions in the field of clean buses technology in Egypt.

Main stakeholders in the evaluation process are UNDP Egypt, Ministry of Environment and the project implementing institution Social Fund for Development as well as the Supreme Council of Antiquities as the end user.

5. Products expected from the evaluation

The key product expected from this outcome evaluation is a comprehensive analytical report in English that should, at least, include the following contents:

- Executive summary
- Introduction
- The Project and its development context;
- Key findings and conclusions
- Recommendations
- Lessons Learnt
- Annexes: TOR, field visits, people interviewed, documents reviewed, etc.

Annex B includes detailed description of the Table of Content

Other specifications:

The length of the report shall not exceed 50 pages in total

Timeframe for submission of first draft of the report: 2 weeks from the end of the mission.

[16] See http://thegef.org/MonitoringandEvaluation/MEPoliciesProcedures/mepoliciesprocedures.html

6. Methodology or evaluation approach

The methodology that will be used by the evaluation team should be presented in the report in detail. It shall include scrupulous information on:

- Documentation review, (the list of documentation to be reviewed is included in the Annex C to the Terms of Reference);
- Interviews held;
- Field visits;
- Participatory techniques and other approaches for the gathering and analysis of data;

7. Qualifications:

An independent international expert will conduct the evaluation that should not have participated in the project preparation and/or implementation and should not have conflict or interest with project related activities. The expert will be responsible for conducting a mission to Egypt to meet with the stakeholders, visit the site and will be responsible drafting the report

The consultant should possess the following qualifications:

- Advanced degree in climate change related studies including mechanical/industrial engineering, energy, etc
- At least 10 years of work experience in related field, including project evaluation experience
- Familiar with Hybrid Electric Buses technology
- Familiar with GEF-UNDP rules and regulation and prior evaluation experience with GEF projects will be an asset
- Strong analytical skills Fluent in English language

8. Implementation arrangements

The UNDP Egypt will be responsible for liaising with the project team to set up stakeholder interviews, arrange field visits, coordinate with the Government and ensure the timely provision of per diems and travel arrangements.

The activity and timeframe are broken down as follows:

Activity	Timeframe and responsible party
desk review	3working days by the international expert,
Mission to Egypt including field visits interviews to the stakeholder	5 working days
Writing draft report	6 working days
Finalization of the evaluation report (incorporating comments received on first draft)	3 working days

9. Scope of the evaluation – specific issues to be addressed

The scope of evaluation includes 2 principal components:

- Analysis of the attainment of global environment objectives, outcomes, impacts, project objectives and delivery and completion of project outputs (based on indicators);
- Evaluation of project achievements according to GEF Project Review Criteria:
  - Implementation approach;
  - Country ownership/driveness;
  - Stakeholder participation/Public involvement;
  - Sustainability;
  - Replication approach;
  - Financial planning;

- Cost-effectiveness;
- Monitoring and evaluation.

Below a detailed description of categories of the evaluation report is given, particularly specifying the issues that are addressed under each broad category of minimum requirements set by the UNDP/GEF M&E policy.

An annex providing more detailed guidance on terminology and the GEF Project review Criteria is an integral part of this ToRs and are provided in Annex A. Annex B gives more detailed specification on the Scope of the Evaluation Report.

10. Terms of Reference Annexes

Annex A:	*Terminology in the GEF guidelines to Terminal Evaluation*
Annex B:	*The Scope of the Evaluation Report*
Annex C:	*List of Documents to be reviewed by the Evaluators*

Annex A. Explanation on Terminology Provided in the GEF Guidelines to Terminal Evaluations

Implementation Approach includes an analysis of the project's logical framework, adaptation to changing conditions (adaptive management), partnerships in implementation arrangements, changes in project design, and overall project management.

Some elements of an effective implementation approach may include:
- The logical framework used during implementation as a management and M&E tool
- Effective partnerships arrangements established for implementation of the project with relevant stakeholders involved in the country/region
- Lessons from other relevant projects (e.g., same focal area) incorporated into project implementation
- Feedback from M&E activities used for adaptive management.

Country Ownership/Driveness is the relevance of the project to national development and environmental agendas, recipient country commitment, and regional and international agreements where applicable. Project Concept has its origin within the national sectoral and development plans

Some elements of effective country ownership/driveness may include:
- Project Concept has its origin within the national sectoral and development plans
- Outcomes (or potential outcomes) from the project have been incorporated into the national sectoral and development plans
- Relevant country representatives (e.g., governmental official, civil society, etc.) are actively involved in project identification, planning and/or implementation
- The recipient government has maintained financial commitment to the project
- The government has approved policies and/or modified regulatory frameworks in line with the project's objectives

For projects whose main focus and actors are in the private-sector rather than public-sector (e.g., IFC projects), elements of effective country ownership/driveness that demonstrate the interest and commitment of the local private sector to the project may include:
- The number of companies that participated in the project by: receiving technical assistance, applying for financing, attending dissemination events, adopting environmental standards promoted by the project, etc.

- Amount contributed by participating companies to achieve the environmental benefits promoted by the project, including: equity invested, guarantees provided, co-funding of project activities, in-kind contributions, etc.
- Project's collaboration with industry associations

Stakeholder Participation/Public Involvement consist of three related, and often overlapping processes: information dissemination, consultation, and "stakeholder" participation. Stakeholders are the individuals, groups, institutions, or other bodies that have an interest or stake in the outcome of the GEF-financed project. The term also applies to those potentially adversely affected by a project.

Examples of effective public involvement include:

Information dissemination

- Implementation of appropriate outreach/public awareness campaigns

Consultation and stakeholder participation

- Consulting and making use of the skills, experiences and knowledge of NGOs, community and local groups, the private and public sectors, and academic institutions in the design, implementation, and evaluation of project activities

Stakeholder participation

- Project institutional networks well placed within the overall national or community organizational structures, for example, by building on the local decision making structures, incorporating local knowledge, and devolving project management responsibilities to the local organizations or communities as the project approaches closure
- Building partnerships among different project stakeholders
- Fulfillment of commitments to local stakeholders and stakeholders considered to be adequately involved.

Sustainability measures the extent to which benefits continue, within or outside the project domain, from a particular project or program after GEF assistance/external assistance has come to an end. Relevant factors to improve the sustainability of project outcomes include:

- Development and implementation of a sustainability strategy**.**
- Establishment of the financial and economic instruments and mechanisms to ensure the ongoing flow of benefits once the GEF assistance ends (from the public and private sectors, income generating activities, and market transformations to promote the project's objectives).
- Development of suitable organizational arrangements by public and/or private sector**.**
- Development of policy and regulatory frameworks that further the project objectives**.**
- Incorporation of environmental and ecological factors affecting future flow of benefits.
- Development of appropriate institutional capacity (systems, structures, staff, expertise, etc.) **.**
- Identification and involvement of champions (i.e. individuals in government and civil society who can promote sustainability of project outcomes)**.**
- Achieving social sustainability, for example, by mainstreaming project activities into the economy or community production activities**.**
- Achieving stakeholders consensus regarding courses of action on project activities.

Replication approach, in the context of GEF projects, is defined as lessons and experiences coming out of the project that are replicated or scaled up in the design and implementation of other projects. Replication can have two aspects, replication proper (lessons and experiences are replicated in different geographic area) or scaling up (lessons and experiences are replicated within the same geographic area but funded by other sources). Examples of replication approaches include:

- Knowledge transfer (i.e., dissemination of lessons through project result documents, training workshops, information exchange, a national and regional forum, etc).
- Expansion of demonstration projects.
- Capacity building and training of individuals, and institutions to expand the project's achievements in the country or other regions.
- Use of project-trained individuals, institutions or companies to replicate the project's outcomes in other regions.

Financial Planning includes actual project cost by activity, financial management (including disbursement issues), and co-financing. If a financial audit has been conducted the major findings should be presented in the TE.

Effective financial plans include:
- Identification of potential sources of co-financing as well as leveraged and associated financing[17].
- Strong financial controls, including reporting, and planning that allow the project management to make informed decisions regarding the budget at any time, allows for a proper and timely flow of funds, and for the payment of satisfactory project deliverables
- Due diligence due diligence in the management of funds and financial audits.

Co financing includes: Grants, Loans/Concessional (compared to market rate), Credits, Equity investments, In-kind support, Other contributions mobilized for the project from other multilateral agencies, bilateral development cooperation agencies, NGOs, the private sector and beneficiaries. Please refer to Council documents on co-financing for definitions, such as GEF/C.20/6.

Leveraged resources are additional resources—beyond those committed to the project itself at the time of approval—that are mobilized later as a direct result of the project. Leveraged resources can be financial or in-kind and they may be from other donors, NGO's, foundations, governments, communities or the private sector. Please briefly describe the resources the project has leveraged since inception and indicate how these resources are contributing to the project's ultimate objective.

Cost-effectiveness assesses the achievement of the environmental and developmental objectives as well as the project's outputs in relation to the inputs, costs, and implementing time. It also examines the project's compliance with the application of the incremental cost concept. Cost-effective factors include:
- Compliance with the incremental cost criteria (e.g. GEF funds are used to finance a component of a project that would not have taken place without GEF funding.) and securing co-funding and associated funding.
- The project completed the planned activities and met or exceeded the expected outcomes in terms of achievement of Global Environmental and Development Objectives according to schedule, and as cost-effective as initially planned.
- The project used either a benchmark approach or a comparison approach (did not exceed the costs levels of similar projects in similar contexts)

Monitoring & Evaluation. Monitoring is the periodic oversight of a process, or the implementation of an activity, which seeks to establish the extent to which inputs, work schedules, other required actions and outputs are proceeding according to plan, so that timely action can be taken to correct the deficiencies detected. Evaluation is a process by which program inputs, activities and results are analyzed and judged explicitly against benchmarks or baseline conditions using performance indicators. This will allow project managers and planners to make decisions based on the evidence of information on the project implementation stage, performance indicators, level of funding still available, etc, building on the project's logical framework.

[17] Please refer to Council documents on co-financing for definitions, such as GEF/C.20/6. The following page presents a table to be used for reporting co-financing.

Monitoring and Evaluation includes activities to measure the project's achievements such as identification of performance indicators, measurement procedures, and determination of baseline conditions. Projects are required to implement plans for monitoring and evaluation with adequate funding and appropriate staff and include activities such as description of data sources and methods for data collection, collection of baseline data, and stakeholder participation. Given the long-term nature of many GEF projects, projects are also encouraged to include long-term monitoring plans that are sustainable after project completion.

Financial Planning and Co-financing

Co financing (Type/Source)	IA own Financing (mill US$)		Government (mill US$)		Other* (mill US$)		Total (mill US$)		Total Disbursement (mill US$)	
		Actual	Planned	Actual	Planned	Actual	Planned	Actual	Planned	
– Grants										
– Loans/Concessional (compared to market rate)										
– Credits										
– Equity investments										
– In-kind support										
– Other (*)										
Totals										

* Other is referred to contributions mobilized for the project from other multilateral agencies, bilateral development cooperation agencies, NGOs, the private sector and beneficiaries.

Leveraged Resources

Leveraged resources are additional resources—beyond those committed to the project itself at the time of approval—that are mobilized later as a direct result of the project. Leveraged resources can be financial or in-kind and they may be from other donors, NGO's, foundations, governments, communities or the private sector. Please briefly describe the resources the project has leveraged since inception and indicate how these resources are contributing to the project's ultimate objective.

Annex B: The Scope of the Evaluation Report.

1. *Executive summary*

- Brief description of the project
- Context and purpose of the evaluation
- Concise summary of the findings and conclusions

2. *Introduction*

- Purpose of the evaluation
- Key issues addressed
- Methodology and evaluation
- Structure of the evaluation

3. *The project and its development context*

- Project start and duration
- Problems that the project seeks to address
- Immediate and development objectives of the project
- Main stakeholders
- Results expected

4. *Findings and Conclusions*

In addition to a descriptive assessment, all **criteria marked with (R) should be rated** using the following divisions: Highly satisfactory, Satisfactory, Marginally Satisfactory, Unsatisfactory

4.1 Project formulation

- Conceptualization/Design (R). This should assess the approach used in design and an appreciation of the appropriateness of problem conceptualization and where the selected intervention strategy addressed the root causes and principal threats in the project area. It should also include an assessment of the logical framework and whether the different project components and activities proposed to achieve the objective were appropriate, viable and corresponded to contextual, institutional, legal and regulatory settings of the project. It should also assess the indicators defined for guiding implementation and measurement of achievement and whether lessons from other relevant projects (e.g. same focal area) were incorporated into project design.

- Country-ownership/Driveness. Assess the extent to which the project idea/conceptualization had its origin within national, sectoral, and the development plans and focuses on national environment and development interests

- Stakeholder participation (R). Assess information dissemination, consultation and "stakeholder" participation in design stages.

- Replication approach. Determine the ways in which lessons and experiences coming out of the project were/are to be replicated or scaled up in the design and implementation of other projects (this also relates to actual practices undertaken during implementation)

- Other aspects to assess in the review of Project formulation approaches would be UNDP comparative advantage as Implementing Agency for this project; the consideration of

linkages between projects and other interventions within the sector and the definition of clear and appropriate management arrangements at the design state.

Project implementation

Implementation Approach (R). This should include assessments of the following aspects:

(i) The use of the logical framework as a management tool during implementation and any changes made to this as a response to changing conditions and/or feedback from Monitoring and Evaluation activities if required.
(ii) Other elements that indicate adaptive management such as comprehensive and realistic work plans routinely developed that reflect adaptive management and/or; changes in management arrangements to enhance implementation.
(iii) The project's use/establishment of electronic information technologies to support implementation, participation and monitoring, as well as other project activities.
(iv) The general operational relationships between institutions involved and others and how these relationships have contributed to effective implementation and achievement of project objectives.
(v) Technical capacities associated with the project and their role in project development, management and achievements.

Monitoring and evaluation (R). Including an assessment as to whether there has been adequate periodic oversight of activities during implementation to establish the extent to which inputs, work schedules other required actions and outputs are proceeding according to the plan; whether formal evaluations have been held and whether action has been taken on the results of this monitoring oversight and evaluation reports.

Stakeholder participation (R). This should include assessments of the mechanisms for information dissemination in project implementation and the extent of stakeholder participation in management, emphasizing the following:

a) the production and dissemination of the information generated by the project;
b) local resource users and NGO participation in project implementation and decision making and an analysis of the strengths and weaknesses of the approach adopted by the project in this arena;
c) the establishment of partnership and collaborative relationships developed by the project with local, national and international entities and the effects they have had on project implementation.
d) Involvement of government institutions in project implementation, the extent of government support for the project.

Financial planning: There have been annual financial audits conducted during the project. These have been in the years 2003, 2004.Although the evaluation is not expected to conduct a financial audit of the project, there should be an assessment of:

a) the actual project cost by objectives, outputs, activities;
b) the cost-effectiveness of achievements;
c) financial management (including disbursement issues);
d) co-financing.

Sustainability: Extent to which the benefits of the project will continue, within or outside the project domain, after it has come to an end. Relevant factors include, for example, development of sustainability strategy, establishment of financial and economic instruments and economic instruments and mechanisms, mainstreaming project objectives into the economy or community production activities.

Execution and implementation modalities: This should consider the effectiveness of the UNDP counterpart and Project coordination Unit participation in selection, recruitment,

assignment of experts, consultants and national counterpart staff members and in the definition of tasks and responsibilities; quantity, quality and timelines of inputs for the project with respect to execution responsibilities, enactment of necessary legislation and budgetary provisions and extent to which these may have affected implementation and sustainability of the project; quality and timeliness of inputs by UNDP and Government and other parties responsible for providing inputs to the project, and the extent to which this may have affected the smooth implementation of the project.

Results

- Attained of Outcomes/Achievement of objectives (R): including a description and rating of the extent to which the project's objectives (environmental and developmental) were achieved using Highly Satisfactory, Satisfactory, Marginally Satisfactory, and Unsatisfactory ratings. If the project did not establish a baseline (initial conditions), the evaluators seek to determine it through the use of special methodologies so that achievements, results and impacts can be properly established.

- The section should also include reviews of the following:

  a) Sustainability: including and appreciation of the extent to which benefits continue, within or outside the project domain after GEF assistance/external assistance in this phase has come to and end.
  b) Contribution to upgrading skills of the national staff.

5. *Recommendations*

   - Corrective actions for the design, implementation, monitoring and evaluation of the project.
   - Actions to follow-up or reinforce initial benefits from the project, taking into account that UNDP, except for Environment and Energy Programme is due to phase out in the end of 2005; thus recommendations should be oriented to project stakeholders like municipalities, government institutions, NGOs and other target audiences.
   - Proposals for future directions underlining main objectives and facilities regarding sustainability, resource allocation, management and other issues on Environmental and Energy project implementation in the country.

6. *Lessons learned*

   - This chapter should highlight the best and worst practices in addressing issues relating to relevance, performance, sustainability and success in order to be useful for other RBEC countries.

7. *Evaluation report Annexes*

   - Evaluation TORs
   - Itinerary
   - List of persons interviewed
   - Summary of field visits
   - List of documents reviewed
   - Questionnaire used and summary of results
   - Comments by stakeholders (only in case of discrepancies with evaluation findings and conclusions)

ANNEX B. ITINERARY OF THE EVALUATION MISSION

B.1 Mission schedule

Sun 03/02/08	• Meeting with Mr. Mohamed Bayoumi, ARR, UNDP • Meeting with Ms. Nadia Makram Ebeid (former Minister of State for Environment; currently Executive Director of the Centre for Environment and Development for the Arab Region and Europe) • Meeting with Dr. Ashraf Zaki (former Project Manager; currently Vice Chairman of Egypt Post)
Mon 04/02	• Meeting with Ms. Mawaheb Abou El-Azm (Chief Executive Officer) and Yasmine Abdel Aziz (Project UNDP/GEF NCSA) at Egyptian Environmental Affairs Agency) • Meeting at Social Development Fund with Dr. Azzat Dia El Din (Assistant General manager; International Cooperation Group), Dr. Ayman Khoudeir (Senior Manager), Dr. Ayman Abdel Wahab (Senior Manager) and Mr. Walid Shafey Farghaly (Associate) • Meeting with Mr. Mounir Tabet (Country Director, UNDP)
Tue 05/02	• Meeting with Mr. Zahi Hawass (Secretary General, Supreme Council of Antiquities) • Meeting with Mr. Talaat Ghabbour (Managing Director, AFICO)
Wed 06/02	• Report writing
Thu 07/02	• Field visit to Luxor (site of operation of the two electric buses); meeting with Mr. Mostafa Wazery (Supreme Council of Antiquities) and Mr. Ahmad Atef (Social Development Fund)

B.2 Documents consulted

UNDP (2002, 2004, 2005, 2006
Annual Project Reports (APR-PIR), of the Electric Buses Phase 1a project

NGM (2003)
Final Report for Phase I(a), Introduction of Viable Electric and Hybrid-Electric Bus Technology in Egypt, including *Impact of EV and HEV Applications in the Reduction of Greenhouse Gas Emissions in Egypt and Socio-Economic Analysis;* New Generation Motors (NGM) Corporation, Virginia, USA

NGM-SFD (2001)
Contract for the Supply of Two Electric Buses, Related Training and Consultancy Services between Social Fund for Development and New Generation Motors Corporation

UNDP (2000)
Project Document, project EGY/99/G35, *Introduction of Vehcile Electric and Hybrid-Electric Bus Technology in Egypt – Phase 1;* United Nations Development Programme

UNDP (2006)
Project Document, Sustainable Transport

UNDP (2008)
Project Document, Bioenergy for Sustainable Development