MID-TERM EVALUATION REPORT

DEVELOPING RENEWABLE

GROUNDWATER RESOURCES IN ARID LANDS

PILOT CASE: THE EASTERN DESERT OF EGYPT

Submitted to

UNDP Egypt Country Office

Submitted by

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List of Acronyms

CU	:	Cairo University
CEDARE:		Center for Environment and Development for the Arab Region and Europe
ETL	:	Engineering Team Leader.
GEF	:	Global Environment Facility
GTL	:	Government Team Leader (Ministry of Water Resources and Irrigation).
IC	:	International Consultant.
IR	:	Inception Report
MIC	:	Ministry of International Cooperation.
MWRI	:	Ministry of Water Resources and Irrigation
NWRC:		National Water Research Center
PM	:	Project Manager (National Project Director).
PMC	:	Project Management Committee.
SC	:	Steering Committee.
STL	:	Science Team Leader.
TL	:	Team Leader.
TOR	:	Terms of Reference
TRP	:	Targeted Research Project
TSKL	:	Task Leader.
UNDP	:	United Nations Development program

Acknowledgement

The reviewers would like to acknowledge the sincere assistance that was received from the various partners of the project in addition to the guidance by the UNDP coordinator in facilitating the technical review and assessment of the project progress. Not to mention specific personnel, however, without the personal response received by the individuals above, this review may have not been feasible and a complete overview of the project within the short timeframe of the review task may have not been possible.

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1.0 Executive Summary

1.1 Background of Evaluation

1.1.1 Evaluated Project

The Eastern Desert Project is a Targeted Research Project (TRP), which aims to develop a replicable model for demonstrating different approaches to integrate renewable groundwater resources of watersheds into national water budget in arid regions. The project should/(should have) conducted comprehensive studies leading to the development, validation and demonstration of techniques for evaluating the extent of alternative water resources arising from sporadic precipitation over large watersheds in arid and semi-arid areas while using the Eastern Desert of Egypt as the pilot site. The comprehensive techniques should encompass the use of various geochemical and isotopic techniques, surface and ground water modeling, analysis of satellite images and digital elevation data, seismic and drilling data, field observations, and exploration of development scenarios. The project should develop procedures that can be used to accurately estimate the available groundwater water resources, its distribution, quantity, and development potential. The procedures should also be readily available to be applied in Egypt as well as countries that share similar conditions to enable planning for water management with minimum environmental, financial, and social risks. Thus, this project should be geared to assist the Government of Egypt, and similar arid countries, in achieving national goals and policies to meet increased demand of water, and to provide valuable input to the national water resources management strategies and plans.

1.1.2 Purpose of Evaluation

UNDP has initiated, as an integral part of the project implementation cycle a midterm evaluation for analyzing the achievements of the project against its original objectives and providing donors, government and project partners with an independent review of project status. Based on the review of technical and managerial aspects regarding the effectiveness, efficiency, relevance, impact and sustainability of the project, this report identifies the factors that have facilitated and impeded the achievement of the project objectives.

1.1.3 Methodology & Limitations

The review was conducted based on: 1) Interviews with various partners of the project, UNDP/GEF representative, selected trainees and steering committee members; 2) Review of project documents including Project TOR, IR, Training Courses Evaluation Forms, and Annual Progress Reports; and 3) Regional Seminar on the Project Progress conducted in Cairo, December 2005.

Due to time limitation and accessibility to the field, the review did not assess the project implementation tasks in the field. In addition, the review did not verify the quality control procedures for conducted fieldwork and data gathering.

1.2 Conclusions of Findings

GEF demonstrates through this project the potential of good management of Groundwater to release the stress on the use of surface water. The conclusions drawn from this evaluation was based on review findings conducted by the evaluation team. The findings were evident based according to the reviewed project documentation, interviews and assessment work conducted during the period of the evaluation. The findings of this review were categorized into two main sections:

- **Positive Findings**: to be encouraged and adopted in similar projects.
- **Areas for Potential Improvement**: to be studied and enhanced if time/budget allows.

Conclusions from this review were utilized as the basis for the project recommendations at this stage.

1.2.1 Positive Findings

The findings are summarized as follows:

- **Project is relevant to Egypt development priorities**
  With a rapidly growing population, Egypt is experiencing great challenges, from government subsidies being very high and unsustainable to diminishing per capita and per acre water availability (because of growth) along with deteriorating water quality (salinity, pollution, and rural sanitation). The water policy aims to evaluate the existing (includes the annual 55.5 bcm from the river Nile and potential additional 9 bcm from expected projects) and available water resources in Egypt including the potential groundwater availability in the Eastern Desert. This project assisted the government in evaluating the existing groundwater extraction potential in the eastern desert.

- **Project targeted strategic communities.**
  The project assessed the potential of water resources in areas where the farming communities have been neglected for decades and could benefit the most from this project for alleviating their poverty.

- **Good coordination by UNDP/GEF local office between project partners.**
  Due to the nature of this project (targeted research with execution and plan development phase), it was expected that the coordination between the various partners involved in this project to overcome their understanding and background differences for the project execution, obligations and expectations would be a main challenge. The coordination by UNDP/GEF local office between the various partners of the project was well done. Interviews with the various partners revealed their appreciation for the coordination efforts.

- **Training Courses are well conducted.**
  The project exceeded the number of training courses that was agreed upon during the period of the project. Some courses were repeated and additional courses were introduced.

- **Well-developed online Website for the project.**

The website constructed by the Michigan University for this project was innovative, informative and represented a valuable resource.

- **Linking target research with field implementation.**
  The project initiative is considered a good experience for linking academic sector to field work institutions. The integration of efforts between the MWRI research unit represented by NWRC together with the CU/IC to execute parts of the research work for the project was important due to the understanding by NWRC for the existing field data collected by the institutes in NWRC and the advanced enhancement of field data by CU/IC. NWRC provided in-depth expectation for the MWRI Groundwater Sector for the outcome of this project.

- **Project is relevant to UNDP/GEF priorities**
  There are 15 Operational Programs (OPs) through which the GEF provides grants. Eleven of these reflect GEF's original focal areas: four in the biodiversity focal area, four in climate change, and three more in international waters. According to the GEF international waters OP scope, OP focuses on the ecological status of transboundary water bodies, Operational Program Number 9 focuses on area-wide interventions that typically involve integrated management of land and water. This project impacts the integrated management of land and water. The output of the project can be applied in similar arid regions.

- **Project is publicized in national and international meetings**
  Six talks have been presented. Three talks with CEDARE at organized workshops. One talk has been presented in Salvador, Brazil in June 2005 during a GEF organized international waters conference. In addition, a presentation has been given during Sept 2005 in New Delhi in a conference on Aquifer Recharge management organized by UNESCO and GEF. Another talk will be presented during the 4WWF in Mexico.

- **Utilization of surface/groundwater models to estimate the groundwater potential**
  The role of surface/groundwater modeling in groundwater assessment was crucial in the project phases.

- **Good financial management**
  The overall financial management of the project seemed well controlled. The financial system applied the “payment upon delivery” approach for the conducted tasks. Such approach usually avoids un-required/unsatisfactory spending.

- **Project Partners are competent to accomplish the required tasks.**
  Scientists from CU, NWRC, MWRI and IC are well trained on surface and groundwater modeling, use of new technology of remote sensing and other relevant techniques in hydrologic systems.

- **Innovative approach for groundwater assessment**
- The project developed technical approach for groundwater water assessment in arid areas, where basic data are usually lacking or sporadic. Such procedures can be applied in other similar areas in Egypt or outside. The project has helped in ensuring transfer of new technology and know how for water resources assessment and evaluation in arid lands to Egypt and the

region. The project results will assist the government agriculture development policies to settle communities in new lands using alternatives water resources other than the traditional ones ,such as the river Nile water and non-renewable groundwater**.**

1.2.2 Areas for Potential Improvement

The areas for potential improvement can be accomplished if time and budget permits. The main areas were:

- **Lack of field data to verify modeling efforts**
  There was lack of field data resembled in non-existence of installed some rain gauges (to check/ calibrate the NASA TRMM data) in studies areas and non-drilling of additional wells.

- **Lack of integrated research between the IC, CU and Research Institutes**
  The modeling efforts conducted by IC, CU and RIGW was distributed as assigned tasks for different parts of the region, mainly Wadi El Assiuti, Wadi Dara and Wadi Kena locations. The three partners modeled the three areas. Interaction between partners to exchange modeling experience was not conducted. Thus, capacity building and exchange of experience in groundwater modeling was not achieved. This was evident from the variance in advancement level of modeling expertise in the three areas.

- **Lack of Public Awareness**
  The project did not present the results in layman terms in local news media

- **Environmental impact assessment was not accomplished**
  The project did not yet accomplish an environmental assessment and impact evaluation of the groundwater development in the eastern desert.

- **The project did not specifically address the investment potential**
  The project seemed to study various development scenarios. However, the project did not yet preset a specific investment plan based on investment potentials and even if the project was not intended to tackle this issue, but it will be very helpful for the country if such plan could be proposed by the project) . The project also needs to address the socio-economic impact of the proposed development.

- **Geophysical investigation was limited.**
  The geophysical investigation was limited to specific area of investigation and was not expanded to provide regional scope for the eastern desert project.

- **No effective role for the laboratory of hydraulic modeling in CU.**
  Although already existing in CU, there has been no evidence of considerable contribution of the laboratory of hydraulic modeling to the conducted tasks of the project.

1.3 Recommendations

The recommendations of this review are conditioned by the remaining budget and time constraints of the project. For planning purposes and suggestion of appropriate action plan(s), the recommendations are presented in three groups:

- General Recommendations;
- Recommendations for immediate implementation; and
- Recommendations to be implemented before project closure.

The recommendations are summarized as follows:

1.3.1 General Recommendations

These recommendations should be considered for the short/long term of the project and after the project completion.

1. The project should be considered as a lead example in arid zones for utilizing target research and applying scientific tools in addition to base knowledge in order to serve development purposes.
2. Target research projects should be encouraged by GEF and this project should be utilized to demonstrate the role of good management of groundwater to release the stress on the use of surface water.
3. Utilization of geo-referenced Landsat Thematic Mapper data to identify surface runoff and recharge rates should be utilized to compensate for lack of field data.
4. Utilization of geochemistry and isotopic analysis for groundwater potential in the eastern desert should be further utilized in similar arid lands.
5. The Government of Egypt should utilize the outcome of this project in agricultural, urban, tourism and industrial development planning in the Eastern desert.

1.3.2 Recommendations for Immediate Implementation

These recommendations should be considered in the very near future in order for them to be feasibly implemented before the end of the project.

1. Considering the tasks that need to be fulfilled and the positive accomplishments that have already been conducted, the project period should be extended to the first quarter of 2007 as a practical time scheme for the completion of the project objectives.
2. Interaction, communication and technical expertise exchange need to be strengthened and enhanced between the IC and the NWRC.
3. If budget permits, at least two wells need to be drilled in the eastern desert to provide additional data and verify the developed models.
4. Geophysical investigation needs to be expanded to provide regional scope for the eastern desert project.
5. The project needs to accomplish the environmental impact assessment for the studies area.
6. Relocate the laboratory for hydrologic modeling at Cairo University (CU) to the Faculty of Engineering to improve utilization and accessibility to the lab.
7. Increase the meetings/workshops between the partners working on the project to refine the conducted work and ensure the proper accomplishment

of remaining tasks. Project steering committee members may attend the meeting to give periodical evaluation and guidance.

8. Representatives of other concerned stakeholders, mainly Ministry of Agriculture, local communities should be invited to take part in the steering committee

1.3.3 Recommendations for implementation before project closure

These recommendations should be implemented before the end of the project depending on budget and time practicality.

1. The results and proved/ tested technologies of this project in the eastern desert should be largely disseminated to be further utilized in Egypt and other countries by future related projects.
2. The project should, even if it is not the target objective of the project, specifically provide an assessment for future investment potential in the area (mainly for urban/agricultural/other uses). Such issue could assist the NWRC for implementing further investigation in the area
3. The project needs to address the socio-economic impact of the proposed development (if any) as it was recommended in the workshop of December 2005.
4. The project should utilize the local media to publicize the findings and recommendations of the project.
5. A strategic plan for the exploitation of available water resources should be drafted. This plan, based on the expertise gained during the implementation of the project, could be used as a directive for further activities or investigation.
6. Finalize a development plan (e.g. preliminary master plan) with alternative scenarios for the study area focusing on the integrated management and use of surface and groundwater. The plan should take into account the economic aspect of water delivery and define the rate of extraction and quantity of available water resources.
7. Test additional techniques for optimizing use of runoff such as flood spreading, rainwater harvesting using cistern, study the relationship between surface and groundwater for artificial recharge to groundwater and remote sensing (TRMM, ASTER,SRTM) that were proved to be useful in arid lands.
8. A regional workshop should be organized with 2-3 month before the end of the project. In addition to project partners, the workshop should involve representatives from the main concerned beneficiaries of the project including local communities, Ministry of Agriculture, investors, press, neighboring countries, regional and international organizations.
9. Develop some guidelines and directives for the use of different techniques tested and validated in this project.
10. It is necessary to discuss within the remaining time of the project with the Ministry of Agriculture or other local communities on the best use of the available groundwater and socio-economic development options. Mobilization of additional external resources is probably necessary, in case it is not possible to make use of the project funds.
11. It is necessary to find in cooperation with the ministry of agriculture some alternative solution for using available brackish water in the area to alleviate the pressure on nonrenewable groundwater from the Nubian (by incorporating

new varieties of crop supporting salinity and even develop new crop pattern with high added value and consuming less water).
12. The data base developed should be maintained and updated by a partner institute.
13. A monitoring program for groundwater, surface runoff, precipitation in the study area should be performed.
14. A committee from the executing agency (Cairo University) and NWRC should be formed for planning and follow up the implementation of the recommendations.

1.4 Lessons Learnt

This project provided several lessons to be learnt and further applied in current/future similar projects. The lessons learnt from this project are classified in terms of technical approach, project management, and strategic planning.

1.4.1 Technical Approach

1. GIS and geo-referenced Landsat Thematic Mapper data can be used as initial estimates to identify surface runoff and recharge rates in the case of lack of field data.
2. The use of isotopic analysis to identify groundwater recharge source(s) and age proved to be very effective.
3. The technical procedures tested within the present project could be applied in other areas in Egypt as well as in neighboring countries with similar natural conditions to enable the planning of land reclamation with minimum environmental, financial and social impacts.
4. Integration of groundwater modeling with surface modeling can be very effective to simulate groundwater scenarios in arid areas.
5. Utilization of Geostatistics (that was not used in this project) could have enhanced the extrapolation of limited data at the region.
6. Presence of environmental, social and financial consultants in similar projects may assist in the completion of an integrated development plan during the progress of the project.

1.4.2 Project Management

1. Cooperation and coordination between different partners contributing to similar projects could become a bottle-neck and critical factor for the successful completion of the objectives.
2. Technical competence of partners and ease of exchange/enhancement of information is crucial for similar projects.
3. In terms of financial project management, the implementation of “payment upon delivery” concept between various partners avoids un-required/unsatisfactory spending.

1.4.3 Strategic Planning

1. The project proved that even in hyper arid areas, potential of water resources exists that if developed and used in rational way could help in alleviating

poverty within the local communities and help in developing new agriculture communities out side the Nile Delta and River Nile valley.

2. Target research can benefit strategic development planning especially in complicated and remote areas.
3. The Eastern desert is a potential region for future development and investment. Carefully studied planning proved to be essential for sustainable development in this region and similar locations.
4. The technical procedures tested within the present project could be applied in other areas in Egypt as well as in neighboring countries with similar natural conditions to enable planning of land reclamation with minimum environmental, financial and social risks.
5. The project proved that it is possible to develop procedures that could be used to assess and estimate accurately the available water resources with minimum field data and information, which is the main characteristic of arid areas.

2.0 Introduction

2.1 Overview

Water is scarce in the MENA region (Middle East and North Africa), one of the most arid areas in the world. The severe water–related problems in the region have been compounded in recent years by sharp increase in water demand due mainly to the fast growing population in the region. Egypt as part of this region has shown its per capita conventional water resources availability/year dropped from 2730 m3/year in the year 1950 to about 870 m3/year in the year 2000 and it is expected to be around 600 m3/y by the year 2025 (UN-ESCWA 2005). It means that it will be far under the benchmark of 1000 m3/year/per capita (accepted internationally) below which the countries are likely to experience chronic water scarcity on a scale sufficient to impede development and harm human health. Developing additional water resources would be an initiative to overcome the water shortage that would impact the development plan(s) of the country.

Over the last three decades UNDP supported several projects in the region related to water resources development, management and sustainable uses. This project under present review is one of those projects funded by UNDP/ GEF with the aim to develop a replicable model for demonstrating different approaches fo integrate renewable groundwater resources of watersheds into water budgets in arid regions. This will assist Egypt in settling communities in new lands outside the traditional ones (the Nile Delta and the river valley) using non-conventional water resources to meet increased demand of water while at the same time alleviating pressure on its surface water resources and freshwater ecosystems.

2.2 Background of Evaluation

UNDP has initiated, as an integral part of the project implementation cycle a midterm evaluation for analyzing the achievements of the project against its original objectives and providing donors, government and project partners with an independent review of project status. Based on the review of technical and managerial aspects regarding the effectiveness, efficiency, relevance, impact and sustainability of the project, this report identifies the factors that have facilitated and impeded the achievement of the project objectives.

Since the mission is considered as a midterm evaluation, the outputs and recommendations will assist in re-adjusting or re-orienting the still un-realized project activities. The evaluation should formulate the recommendations to facilitate the achievements of the project objectives. Such recommendations should also focus on the way and means for optimizing the project achievements. Lessons learnt should be derived and replicated in similar areas of the region.

2.3 Objectives of Evaluation

The objectives of this evaluation are presented as:

- General Objectives; and
- Specific Objectives.

2.3.1 General Objectives

1. Assess the effectiveness and efficiency of the project;
2. Provide recommendations that would assist in the successful completion of the project; and
3. Provide lesson learnt to be adopted in future similar projects.

2.3.2 Specific Objectives

1. Assess the project design in terms of relevance to Egypt's developed priorities, UNDP practice areas, GEF themes and needs of beneficiaries and review of project concept and design in relation to the addressed challenges and stated approach for addressing them;
2. Assess the project Impact in terms of achievements to date against the original objectives, outputs and activities using both process oriented and technical environmental indicators; and
3. Evaluate project Implementation in terms of management arrangements, quality and timeliness of output and activities, financial situation including effectiveness, partner cooperation, capacity building etc.

2.4 Methodology & Limitations of Evaluation

The evaluation was conducted based on:

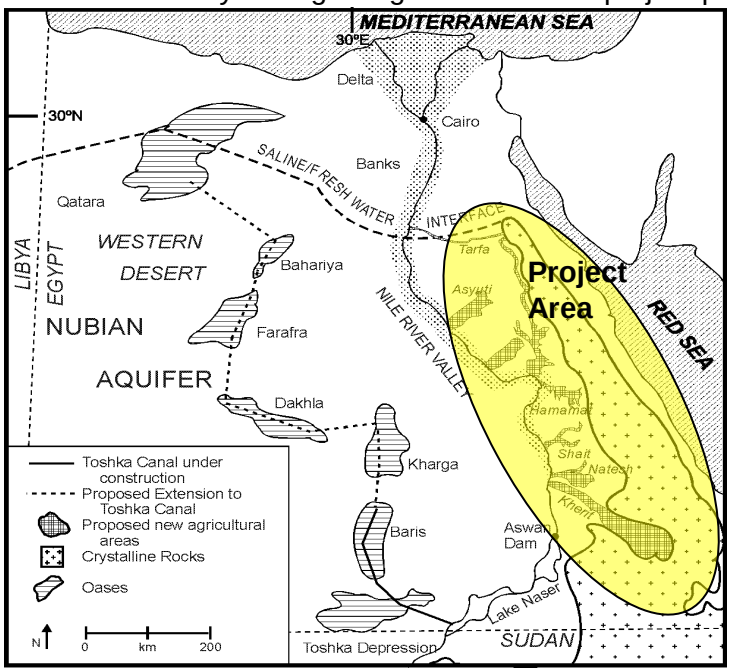
- Interviews with various partners of the project, UNDP/GEF representative, selected trainees, international consultant and steering committee members;
- Review of project documents including Project TOR, IR, Training Courses Evaluation Forms, and Annual Progress Reports; and
- Regional Seminar on the Project Progress conducted in Cairo, December 2005.

Due to time limitation and accessibility to the field, the review did not assess the project implementation tasks in the field. In addition, the review did not verify the quality control procedures for conducted fieldwork and data gathering.

3.0 Project Overview

3.1 Background

The project for "Developing Renewable Groundwater Resources in Arid Lands: A Pilot Case – The Eastern Desert of Egypt" started in September 2002. The inception report was endorsed in October 2002 for a period of 36 month. However, the project started effectively at beginning of 2003. The project period was extended to August 2006. The project is a Targeted Research Project (TRP), which aims to develop a replicable model for demonstrating different approaches to integrate renewable groundwater resources of watersheds into national water budget in arid regions. The project should develop a replicable integrated model for evaluating the extent and potential of groundwater resources in arid lands. According to the project document, Egypt has been chosen as a test site for this project for several reasons. First, Egypt's landscape and its climatic and hydrologic settings are ideal for this study and it resembles these settings in neighboring countries. Hence, results obtained in Egypt can be used as a model and will be applicable to many neighboring countries. Networks of minor valleys dissect the Red Sea Hills and the surrounding Cretaceous and Tertiary outcrops and join into main valleys that ultimately drain into the Red Sea or the Nile River valley (e.g., Asyuti, Qena, and Hammamat; Figure 1). These networks of channels collect rainfall as surface runoff in the main valleys and as groundwater in the shallow alluvial and limestone aquifers flooring the main valleys. The large areal extent (e.g., 15,000 km2 for the Qena watershed) and extensive network of individual watersheds in the Eastern Desert are ideal for channeling rain precipitating over large domains into a limited number of main valleys and recharging the aquifers flooring these valleys. These topographic and climatic conditions are present along the Red Sea Hills in Egypt, Sudan, Somalia, Saudi Arabia, and Yemen. Similar conditions also exist in mountainous areas in North Africa (e.g., Tibesti in Libya, Ennedi Mountains in Chad) as well. Second, as is the case in many of the world's arid and semi-arid countries, Egypt relies almost exclusively on its surface water (Nile River) and its fossil groundwater (Nubian aquifer). Such practices have negative impacts on Egypt's freshwater ecosystems. Third, the geo-chemical and isotopic studies (Sultan et al., 2000) indicate that flash flood waters stored in shallow aquifers during the past 45 years appear to be the principal source of most of the analyzed groundwater samples in the Wadi El Tarfa and surrounding areas.



3.2 Project Objectives & Expected Outputs

The objective of the project was to develop a replicable integrated technique for evaluating the extent of renewable ground water resources in arid lands, with the Eastern Desert of Egypt as a pilot site. Specifically, a comprehensive study was conducted to investigate the distribution of alluvial aquifers and their recharge rates. The model should be replicable for similar projects elsewhere in Egypt, (e.g., Sinai), in Nile Basin countries (e.g., Red Sea hills, in Sudan, Ethiopia), in northern Africa and Middle Eastern countries (e.g., Tibesti mountains in Libya), and arid countries worldwide with topographic settings (valley networks collecting meteoric waters from mountainous areas) similar to those of the Eastern Desert.

The project should assist the government of Egypt in achieving national goals and policies to meet increased demand of water while at the same time alleviating pressure on its surface water resources and fresh water ecosystems.

The expected outputs from the project were mainly:

- Identification of source, extent, and histories of groundwater in alluvial aquifers under investigation;
- Development of Rainfall/Surface Runoff model, and evaluation of the timing of the recharge cycle is estimated, and the extent of the renewable groundwater resources recharged by rainwater precipitating over the Red Sea Hills area in the Eastern Desert;
- Construction of groundwater flow model, and investigation of groundwater flow in the alluvial aquifers flooring one of the main valleys of the Eastern Desert.
- Production of a replicable model in neighboring Middle Eastern and Saharan countries, thus contributing to the preservation of freshwater ecosystems in the area;
- Assessment of adverse ecological effects that could result from the exploitation of the investigated freshwater resources; and
- Providing in-country and out-of-country scientific, technical, and research-oriented training and outreach activities centering on the assessment of alternative water resources.

3.3 Project Shareholders

The main stakeholders of this project were mainly:

- The National Water Research Center (NWRC) including the Research Institute for Groundwater (RIGW) and Water Resources Research Institute (WRRI);
- The Groundwater Sector at the Egyptian Ministry of Water Resources and Irrigation (MWRI); and
- Cairo University (CU).

In addition to the main stakeholders, the project benefited educational and governmental institutions in neighboring third-world countries (particularly in North Africa and in the Middle East) that would utilize the project results by replicating the Egyptian model in their countries. The scientists of CU and the NWRC received training on applying the technical procedures described should have jointly implemented the project activities to achieve outputs-outcomes. After the completion of the project, CU and NWRC scientists will be capable of providing scientific,

technical, and practical guidance to their fellow citizens, as well as officials and scientists from neighboring countries, to apply the Egyptian model elsewhere. In addition, the farming community in eastern desert in Upper Egypt, a community that has been neglected for decades, should benefit the most from this pilot project.

4.0 Project Concept & Design

4.1 Review of Tasks

Reviewing the project design as stated in the Terms of Reference, the tasks can be categorized as follows:

- Training and capacity building;
- Information dissemination;
- Project operational setup;
- Research setup;
- Laboratory analysis;
- Field work;
- Research obligations; and
- Implementation obligations.

Following are the associated tasks (indicators) for the above categories and percentage of completion up-to-date of evaluation process.

- Training and capacity building should be completed subject to:
  - Organize a short course (3-5 days) on the use of isotopic and geochemical data to investigate the sources of groundwater
  - Organize training course(s) in the general area of remote sensing and image processing.
  - Acquire training on the use of surface runoff modeling.
  - Conduct training on the use of Groundwater Modeling (GMS software).

Percentage of completion is 100%.

- Information dissemination should be completed subject to:
  - Design an information system.
  - Construct a web page.
  - Organize and maintain throughout the duration of the project, a library (documentation unit).
  - Construct a digital backup system.
  - Organize three international meetings (one each year).
  - Organize meetings for the steering committee (on a semi-annual basis).
  - Conduct routine reporting (quarterly and annually) to UNDP and CU.
  - Present results in refereed international journals (at least one manuscript should be accepted prior to the beginning of the third year).
  - Publicize results by giving talks in national and international meetings (at least two talks per year).
  - Present the results in layman terms in local news media.

Percentage of completion was 90%.

- Project operational setup should be completed subject to:
  - Prepare Inception Report.
  - Assemble Steering Committee.
  - Assemble Project Management Committee.
  - Assemble the core (full-time) project administration team.

- Prepare a tender document and detailed TOR for the IC.
- Evaluate various responses to the tender document and select the IC.

Percentage of completion was 100%.

- Research setup should be completed subject to:
  - Develop a laboratory for hydrologic modeling at Cairo University (CU) Faculty of Engineering.
  - Review and compile existing studies and data.

Percentage of completion was 75%.

- Laboratory analysis should be completed subject to:
  - Identify appropriate laboratories (overseas/national) to conduct geochemical and isotopic analyses.
  - Analyze acquired and published geochemical, isotopic, field, and head information.

Percentage of completion was 100%.

- Field work should be completed subject to:
  - Organize and conduct a field trip (10 to 14 days) to collect groundwater samples, relevant hydrologic parameters, and geologic observations.
  - Organize a field trip to perform infiltration tests.
  - Collect and analyze soil samples to obtain the average chloride concentration of the soil water.
  - Set up a network of rain gauges.
  - Identify appropriate locations for stream flow gauges.
  - Collect real-time precipitation and flow data.
  - Construct a surface runoff model.
  - Collect geophysical data.

Percentage of completion was 75%

- Research obligations should be completed subject to:
  - Compute recharge rates using the chloride mass-balance approach.
  - Generate digital terrain elevation data.
  - Generate a mosaic of geo-referenced Landsat Thematic Mapper data.
  - Generate a digital mosaic from 1:500,000 geologic maps.
  - Generate a regional digital distribution map for soil and rock hydrologic characteristics.
  - Co-register the digital mosaics.
  - Define criteria for validating the model and examine the validity of the model against available field observations.
  - Estimate recharge rates during the selected storm events.
  - Examining the recurrence of large storm event (using 50 years data).
  - Select the most appropriate watershed(s) to conduct groundwater studies.
  - Develop a conceptual ground water flow model.
  - Construct and calibrate a 2-D groundwater flow model.
  - Calibrate the model.

- Conduct steady-state and transient simulations.
- Explore the utility of recently developed commercial software for coupled surface runoff/groundwater flow models.
- Explore alternative development scenarios.
- Assess any adverse ecological effects that could result from the exploitation of the investigated freshwater resources.

Percentage of completion was 80%.

- Implementation Obligations should be completed subject to:
  - Drill two to five wells.
  - Conduct a series of pumping tests.

Percentage of completion was 0%.

A detailed evaluation of accomplished tasks is presented in Section 5.1.

4.2 Review of Project Document

The following comments are based on the review of available project documentation:

- **References mentioned in documentation were not recent.**
  Some of the figures presented in the project document were not recent. For example, in 2003 year of project implementation, the actual population of Egypt was around 72 millions. However, the figure given in the document was 60 millions.

- **Reference for related on-going activities were not given.**
  No reference was given in the document to any on going activities and projects or economic activities in the study area.

- **Problem development is missing in the project document**
  The description of the social aspect ,local communities in the studied area and the economic arguments to have chosen it was missing in the project document. It is well known that the Western desert beneficiated from development efforts relative to Eastern desert. This issue was not explained in the project document.

- **Non-participation of Nile Basin Initiative and selected neighboring countries.**
  The idea that representatives from neighboring countries and from Nile Basin Initiative to joint the steering committee, as stated in the project document, was good, but was not implemented.

4.3 Review of Stated Outputs

- **Major output should be a development plan, but not only recommendations for further studies**.
  Linkages among objectives, activities, outputs, expected outcomes, and impacts were well formulated. However, even if the project was to focus only on testing or developing procedures that could be used to accurately estimate

the available groundwater resources, MWRC and MWRI should build on these outputs with through drafting a development action plan or recommendations based on the accumulated knowledge and experience gained during the implementation of the project, as a main output. This plan would guide future interventions by the NWRC and the MWRI in the area.

- **Outputs 4 & 6 were difficult to assess during the project period.**
  Most of the objectives and outputs were properly stated, realistic and easily verifiable. However, Output 4 (Production of a replicable model in neighboring Middle Eastern and Saharan countries, thus contributing to the preservation of freshwater ecosystems in the area) and Output 6 (Providing in-country and out-of-country scientific, technical, and research-oriented training and outreach activities centering on the assessment of alternative water resources) were difficult to realize during the implementation period of the project as stated in the project document. Such outputs could be realized as a follow up to the project when all the appropriate technologies would have been tested, validated and evaluated.

- **Future of Database management of project website was not clear.**
  The collected data and information gathered and used by different stakeholders became valuable research resource. It was not clear if a database has been developed to store all the data or has been dispersed in the different institutes and groups involved in the project. It is essential that such data including geology, geophysics, hydrology, climatologic, water level, water quality, digitized maps, among other data be in an accessible database for follow up activities. The constructed website for the project may contain part of the above data, but it was not clear how it would be maintained after the project closure (i.e. would any of the institutes or CU have management control or accessibility?) It is necessary, after end up of the project, to maintain the developed data base by a partner institute.

4.4 Project Relevance

4.4.1 Project Relevance to GEF

The reviewers agree with the project document that the project complies with the strategic considerations of the GEF Operational Program 9 on Integrated Land and Water Multiple Focal Area. The land degradation component under Program 9 identifies the integrated management of both surface and groundwater resources as a priority for both transboundary basins and ecologically important multiple country dryland settings. The topographic and climatic conditions for the minor valleys that dissect hills, collecting the surface runoff from precipitation to recharge alluvial and limestone aquifers flooring these valleys are present along the Red Sea hills in Egypt, Sudan, Somalia, Saudi Arabia and Yemen. Similar conditions exist in mountainous areas in North Africa as well. Accordingly the demonstration project can be replicated in Middle Eastern Saharan and Sub-Saharan Countries.

4.4.2 Project Relevance to UNDP

The reviewers also agree that the project complies with the UNDP water strategy issued in March 1998 in consistence with the decision of UN General Assembly in 1997 and the Commission of Sustainable Development on water. Among the priority

areas of the strategy is the sustainable management of water resources, which is one of the main objectives of the present project.

In addition, the project is relevant with other programs and projects related to water resources development, uses and management that UNDP has been supporting over the last three decades in the area of water exploration. Furthermore, the United Nations Conference on Environment and Development (UNCED) held in Rio in 1992 has produced Agenda 21 as a global plan of action aimed at reclining issues of development with environmental protection. Chapter 18 of Agenda 21 focuses on water resources and identifies seven key areas for priority action. This project responds to the recommended actions stated in Chapters 18 in two areas, namely, integrated water resources development and protection of water resources.

4.4.3 Relevance to Egypt

The project is relevant to development priorities of Egypt as one of the two strategies adopted by the government of Egypt for securing water resources needed to improve economic livelihood and develop new communities outside the Nile valley, depending on increasing the utilization of groundwater for irrigation and desert reclamation. The Eastern desert is one of the target areas for urbanization and land reclamation as well. The methodology developed within the present project can also be useful for further investigations in similar areas in Egypt. Consequently any efforts for investigating and exploring additional water resources in desert areas and optimizing the use of available water resources, such as rainfall, run off and renewable groundwater stored in alluvial wadi aquifers are helpful and will be beneficiary to the economy of the country.

In addition, the development objective of the project complies with the national priorities as highlighted in Egypt's water policy for the 21st Century that focuses on development of groundwater as a non-conventional water resource

5.0 Project Implementation

5.1 Effectiveness

The outputs were directed to the needs of the Groundwater Sector in the Ministry of Water Resources and Irrigation was clear. The project results provide the sector with an overview for the potential water resources in the studied area, especially that the eastern desert was not investigated as much as western desert area. Even, if the outputs were not so precise and require further investigations, but the overall conceptualization of the aquifer was provided to perform sustainable development.

Some of the project status activities were technically infeasible. For example, the use of chloride mass balance approach to estimate recharge rate. This technique demands specific precautions that are not easy to be handled in the field. In addition, the results are often not accurate and depend on the field conditions.

The project requested that a monthly brief progress report would be completed for distribution to project partners to perform their overview functions. This would be good mean for monitoring and evaluation of the project implementation. The progress reports were prepared to UNDP every three months and they were available upon request. It is recommended that the report is distributed to all members and even put on the website of the project. Such approach would facilitate the dissemination of information.

Annual reports were also requested from the project manager to assess the achievement of the project. The progress report of June 2005 was reviewed. The indicators used in the report were appropriate and were assessed on quantitative basis. But the qualitative aspect of the achieved outputs, mainly modeling could not be specified. In spite that these models were intended to be replicated in other areas, but the results were not verified nor validated. For example, the conducted groundwater or surface water modeling were based on limited data in space and time, which is the case everywhere in arid areas (for example for groundwater modeling in Dara area the model was based on few boreholes and groundwater monitoring level). The concern was how would this model be validated. Since the model is a mean for solving mathematical equations, so in any way results will be obtained. It was necessary in this case to elaborate some guidelines showing the lessons learnt from the application of different models in the studied areas constraints and recommendations for different solutions and approaches. The same would be valuable for different remote sensing applied in the project activities.

The evaluation for the status of the conducted tasks is provided in details in the following table.

	Conducted Tasks	Comments	Overall Evaluation / Recommendations
Training & Capacity Building	Organize a short course (3-5 days) on the use of isotopic and geochemical data to investigate the sources of groundwater	☑ Done ☐ Not Done Done twice	☑ Satisfactory ☐ Unsatisfactory The conducted training courses exceed the pre-set requirements of the project according to the IR. However, because of the technical complexity of the project approach, the Ministry personnel require additional training in order to be able to replicate the same project on their own in different areas.
	Organize training course(s) in the general area of remote sensing and image processing.	☑ Done ☐ Not Done Done twice	
	Acquire training on the use of surface runoff modeling	☑ Done ☐ Not Done	
	Conduct training on the use of Groundwater Modeling (GMS software)	☑ Done ☐ Not Done Done twice	
Information Dissemination	Design an information system	☑ Done ☐ Not Done All project outputs are stored on CDs and submitted to the Ministry	☑ Satisfactory ☐ Unsatisfactory Unlike similar projects, transparency in information dissemination is remarkable for this project. However, it is highly recommended to communicate the project findings to the public and investors through appropriate media means.
	Construct a web page	☑ Done ☐ Not Done A web site has been constructed by the Western Michigan University to present project outputs.	
	Organize and maintain throughout the duration of the project, a library (documentation unit)	☑ Done ☐ Not Done Hard copies of project documents exist at the PM unit. The GW sector is actually utilizing the library as a valuable information resource	

	Conducted Tasks	Comments	Overall Evaluation / Recommendations
	Construct a digital backup system	☑ Done ☐ Not Done	
	Organize three international meetings (one each year)	☑ Done ☐ Not Done Two meetings are done. One at 2004 and the other at 2005.	
	Organize meetings for the steering committee (on a semi-annual basis)	☑ Done ☐ Not Done Done on annual basis	
	Conduct routine reporting (quarterly and annually) to UNDP and CU	☑ Done ☐ Not Done Done quarterly and annually	
	Present results in refereed international journals (at least one manuscript should be accepted prior to the beginning of the third year)	☑ Done ☐ Not Done Published 3 papers and one under publication. One master thesis done in CU. The candidate traveled to USA. Another 1 master and 1 Ph.D. students are conducted at Western Michigan University	

	Conducted Tasks	Comments	Overall Evaluation / Recommendations
	Publicize results by giving talks in national and international meetings (at least two talks per year)	☑ Done ☐ Not Done Six talks have been presented. Three talks with CEDARE at organized workshops. One talk has been presented in Salvador, Brazil during a GEF organized water conference. The project was well received and emphasized the feasibility of funding similar groundwater development project. In addition, a presentation has been given during Sept 2005 in New Delhi in a conference on Aquifer Recharge management organized by UNESCO and JEFF. Another talk will be presented during the 4WWF in Mexico.	
	Present the results in layman terms in local news media	☐ Done ☑ Not Done Not yet	
Project Operational Setup	Prepare Inception Report	☑ Done ☐ Not Done	☑ Satisfactory ☐ Unsatisfactory The overall project preparation and management is very well done. It counts for the management its
	Assemble Steering Committee	☑ Done ☐ Not Done	
	Assemble Project Management Committee	☑ Done ☐ Not Done	
	Assemble the core (full-time) project administration team	☑ Done ☐ Not Done	
	Prepare a tender document and detailed TOR for the IC	☑ Done ☐ Not Done	

	Conducted Tasks	Comments	Overall Evaluation / Recommendations
	Evaluate various responses to the tender document and select the IC	☑ Done ☐ Not Done	approach in payment upon delivery basis for the conducted tasks. Such approach should be extended in similar projects to ensure satisfactory completion of project set tasks.
Research Setup	Develop a laboratory for hydrologic modeling at Cairo University (CU) Faculty of Engineering	☑ Done ☐ Not Done Lab is available	☐ Satisfactory ☐ Unsatisfactory ☑ Can't evaluate at this time Accessibility is not satisfactory and we recommend to be moved to Faculty of Engineering.
	Review and compile existing studies and data	☑ Done ☐ Not Done	
Laboratory Analysis	Identify appropriate laboratories (overseas/national) to conduct geochemical and isotopic analyses	☑ Done ☐ Not Done All geochemistry is done	☑ Satisfactory ☐ Unsatisfactory Need to Expand on the geophysical tasks to give more regional coverage
	Analyze acquired and published geochemical, isotopic, field, and head information	☑ Done ☐ Not Done Soil sampling (infiltration and sieve analysis)	
Field Work	Organize and conduct a field trip (10 to 14 days) to collect groundwater samples, relevant hydrologic parameters, and geologic observations	☑ Done ☐ Not Done Five field trips were conducted (each was 3-5 days) to different locations.	☐ Satisfactory ☐ Unsatisfactory ☑ Can't evaluate at this time The serious lack of field data to verify and calibrate the developed models raises several concerns. Thus, if budget is available, it is highly recommended to install additional wells (at least 2 wells) to
	Organize a field trip to perform infiltration tests	☑ Done ☐ Not Done	
	Collect and analyze soil samples to obtain the average chloride concentration of the soil water.	☑ Done ☐ Not Done	

	Conducted Tasks	Comments	Overall Evaluation / Recommendations
	Set up a network of rain gauges	☐ Done ☑ Not Done Only one rain gauge is installed in Hurgada.	verify the output of the groundwater models. In addition, several rain gauges should be installed at the various locations of the project to verify the recharge calculations conducted by the research team. Also geophysical investigation should be expanded to provide a regional scope for the eastern desert project.
	Identify appropriate locations for stream flow gauges	☑ Done ☐ Not Done	
	Collect real-time precipitation and flow data	☑ Done ☐ Not Done Done at CU but not at site	
	Construct a surface runoff model	☐ Done ☑ Not Done	
	Collect geophysical data	☑ Done ☐ Not Done Done for wadi dara and 50% done for wadi Kena	
Research Obligations	Compute recharge rates using the chloride mass-balance approach	☑ Done ☐ Not Done Not done because of lack of soil/water separating equipment	☑ Satisfactory ☐ Unsatisfactory Although the research obligations are not yet done at this time of the project, however, the research obligations seem to be satisfactory progressing towards completion. In addition to the environmental assessment and impact evaluation that will be conducted before the completion of the project, it is recommended to perform a socio-
	Generate digital terrain elevation data	☑ Done ☐ Not Done	
	Generate a mosaic of geo-referenced Landsat Thematic Mapper data	☑ Done ☐ Not Done	
	Generate a digital mosaic from 1:500,000 geologic maps	☑ Done ☐ Not Done	
	Generate a regional digital distribution map for soil and rock hydrologic characteristics	☑ Done ☐ Not Done	
	Co-register the digital mosaics	☑ Done ☐ Not Done	

	Conducted Tasks	Comments	Overall Evaluation / Recommendations
	Define criteria for validating the model and examine the validity of the model against available field observations	☑ Done ☐ Not Done The model was calibrated but not yet verified because of lack of field data	economic impact analysis for the project on the existing community and investment potential.
	Estimate recharge rates during the selected storm events	☑ Done ☐ Not Done	
	Examining the recurrence of large storm event (using 50 years data)	☑ Done ☐ Not Done	
	Select the most appropriate watershed(s) to conduct groundwater studies	☑ Done ☐ Not Done	
	Develop a conceptual ground water flow model	☑ Done ☐ Not Done (assiuti and dara)	
	Construct and calibrate a 2-D groundwater flow model	☑ Done ☐ Not Done	
	Calibrate the model	☑ Done ☐ Not Done	
	Conduct steady-state and transient simulations	☑ Done ☐ Not Done	
	Explore the utility of recently developed commercial software for coupled surface runoff/groundwater flow models	☐ Done ☑ Not Done	
	Explore alternative development scenarios (if possible)	☐ Done ☑ Not Done	
	Assess any adverse ecological effects that could result from the exploitation of the investigated freshwater resources	☐ Done ☑ Not Done	
Implementation	Drill two to five wells	☐ Done ☑ Not Done One at Wadi Dara And one at Sheikh Shazly	☐ Satisfactory ☑ Unsatisfactory ☐ Can't evaluate at this time Still recommend to drill additional

	Conducted Tasks	Comments	Overall Evaluation / Recommendations
	Conduct a series of pumping tests	☐ Done ☑ Not Done	wells according to project findings.

Comments on some of the reports prepared by the project';

1-Application of remote sensing and GIS techniques for hydro-geological investigations of wadi systems in the Eastern Desert of Egypt: This report has been prepared by the International Consultant. It focuses on the use of interdisciplinary approach in which interferences from remote sensing data are being integrated with observations extracted from other sources such as geochemistry, field geology, drilling, and geophysics. The integration of data sets is being facilitated by the use of Geographic Information System (GIS). One of the main features of this technology is the utilization of global data sets available from the world land surface digital elevation data extracted from SRTM (Shuttle Radar Topographic Mission) or ASTER (Advanced Space–born Thermal Emission and Reflection Radiometer). Such approach, using Landsat images, is well known in hydro-geological investigations, for defining lineaments in the outcropping rocks. The intersections of faults or fractures are usually considered promising sites for groundwater exploration. In the present project the approach is the same but the result is certainly more precise and the data obtained is more accurate. The main constraint is the accessibility to this technology produced by ASTER, and SRTM to all countries which is very doubtfully and most probably very costly.

2- Geochemical and Isotopic constraints on the origin of the Eastern Desert groundwater: This report has been prepared mainly by the University of Illinois, USA with the participation of the International Consultant and Project Director. This report is based on the use of isotopic technique (mainly stable isotopes) for identifying the origin of groundwater in the study area and inter-linkages between different aquifers. The main output was the identification of groundwater of different origin (shallow and Nubian aquifers). This method is well known and very cheap. For dating groundwater the report proposed the utilization of the natural radioactive tracer chlorine -36. This isotope helps for defining the age of very old water which can not be defined by C14 (the limit age for C14 is about 40000 years BP). For chlorine-36, it is possible to estimate the age for more than 100000 years. The problem with using such technique that it is very costly, not well performed and there are only very few laboratories conducting this analysis. It could be useful to utilize it for research activities, but for applied hydrogeology, there is no necessity because if we could define an age more than 40000 years, so what will change if it is more than 100000 or 200000 years (it is in any way considered as non-renewable).

3-Geophysical investigations in Wadi Dara prepared by the Research Institute for Groundwater: The geophysical investigation in this study is based on conducting geo-electrical investigation for defining the hydro-geological setting and delineation of subsurface succession. This technique is considered the cheapest and well known in the context of groundwater exploration. It is clear that the study has been well conducted and the results were helpful.

- 4-Surface and groundwater modeling: Several models on surface and groundwater have been prepared such as:
    - For Wadi Dara surface and groundwater models
    - For Wadi Qena surface and groundwater models
    - For Wadi Assuity groundwater model
    - For Wadi El Khareet surface water model

- For Wadi Abbad surface water model

- For Wadi Sannour surface water model

In total 3 groundwater models and 5 surface water models.
For surface water, all modeling work was based on using WMS (Watershed Management System) software which is well known and very reliable one. The main common characteristic of all the models done in different areas is the lack of rainfall, runoff data. All the models have been carried out on very limited rainfall data from nearby rainfall stations and never in site and it is well known that in arid areas the storm events, which generally generate floods occur most of the time very locally and at elevated areas (upper part of the catchments area) where rainfall recorders are not available. The rainfall data are also in most of the cases not in series, which could influence the results of simulation. It is not possible to check the validity of the outputs of all these models without having more measured rainfall, infiltration test in some selected areas using flood gauges even for one time if possible. Because whatever we enter in the model as input there will be an output represented by figures .The importance is to check the accuracy of the outputs by making some calibration and validation, at least in one site. Based on that it is possible to generalize the results and build on for further studies.
So, it is recommended for validating these models to install during the remaining time of the project, a flood gauge and rainfall recorders on one of the wadis for calibrating one of the models done.
For groundwater modeling based mainly on the use of GMS software, again there is a need to perform some monitoring of the groundwater level, water quality and volume extracted for calibrating the models done.
In general all the techniques and methodologies applied in this project were appropriate and valid for hydro-geological investigations. The outputs were also of good quality and very valuable for an exploration phase.

5.2 Efficiency

Even with the delay in startup, the project used its resources effectively to implement most of the activities included in the project document to produce the target outputs.

The project provided focused targets and outputs derived by the main objective to develop a replicable integrated technique for evaluating the extent of renewable groundwater (distribution of alluvial aquifers and their recharge rate) and surface runoff. The produced outputs coincided with the targeted objectives. The main factor that facilitated the production of such outputs was the good collaboration of NWRC with the project. Also the involvement of young specialists in the implementation of different activities of the project by encouraging them to get academic degrees (MS.C or PH.D) was a good factor facilitating the production of such outputs. The involvement of Cairo University in coordinating and implementing the project facilitated the training of these young specialists and providing them with scientific base for accomplishing the different tasks requested in the project and get their academic degrees.

Since the local communities were not involved in the planning and follow up of the project, the local expertise (by gender) could not be evaluated. The local community in the study area was mainly Bedouins and the use of water was mainly for human, cattle drinking and to some extent for few agriculture activities. The local expertise was poor. The application of remote sensing techniques (e.g. TRMM, SRTM…) was

advanced and required more training as well as continuous update of equipment and images.

5.3 Implementation & Management Arrangements

The modalities as defined in the project document for the execution and implementation of the project was well structured. It linked the academic sector, represented by Cairo University to applied research institutes represented by NWRC as the responsible body for performing field and investigation studies in the MWRI. Thus, the project linked the scientific researchers to field specialists, which was good concept.

The steering committee (which convene twice a year) of the project ensured that all the stakeholders were well informed about the progress of the work. The committee would setup the strategies in line with the project objectives. The Steering committee supervised project implementation progress and adjusted the policies/strategies in line with the project objectives. The idea to include representatives from neighboring countries in the steering committee was good but was not implemented.

Having a Project Management Unit (PMU) that included the team leaders and the project manager to guide technical, operational and administrative matters was also good concept. The task of this unit was to facilitate sharing and transferring technology between Cairo University and NWRC. In general the proposed structure was very appropriate, assuming that everything would be going as planned and the functions assigned would be well followed by different partners.

Due to the nature of this project (targeted research with execution and plan development phase), it was expected that the coordination between the various partners involved in this project to overcome their understanding and background differences for the project execution, obligations and expectations would be a main challenge. The coordination by UNDP/GEF local office between the various partners of the project was well done. Interviews with the various partners revealed their appreciation for the coordination efforts. In addition, the CO was involved in the steering committee and the Project Management Unit, the evaluation of the monthly progress report, the annual reports, and project implementation review. UNDP country office was also involved in the selection of the Project Manager and the control of effective use of UNDP-GEF resources.

One question appears regarding, the nomination of members of the steering committee, mainly from partner institutes and the groundwater sector in the ministry. This raises the concern about the continuity for follow up the project if the member is not able to attend or has been moved which was the case of the fast change in the post of the director of groundwater sector in the ministry.

There were some changes in activities and work plan from the project document; The following activities have not been implemented;

- Soil samples to obtain the average chloride concentration of the soil water.
- Compute recharge rate using the chloride mass balance
- Infiltration test to estimate recharge.
- Set up network of rain gauges (only one has been installed).
- The stream flow gauges
- Drill only two wells (the inception report suggest from 2 to 5 wells).

5.4 Areas of corrective actions

Corrective actions can be planned to improve the following areas:

- Considering the tasks that need to be fulfilled and the positive accomplishments that have already been conducted, the project period should be extended to the first quarter of 2007 as a practical time scheme for the completion of the project objectives while considering the recommended corrective actions in this report.

- Full commitments and cooperation of different partners. There was some lack of cooperation between different partners.

- Activation of the steering committee meetings and PMU. Because the project closure is approaching, the meetings should be more regular and more often (for example the steering committee should meet regularly each 4 months and the PMU more). So it is useful to accelerate the procedures for achieving the rest of the activities, mainly the drilling of wells, setup rain gauges, conducting pumping test for estimating aquifer characteristics and validating the groundwater model.

- Information circulation. Ensure that the information about the project activities and implementation arrive to all concerned parties, groups and involved personnel. It seems that there was lack in circulation of the information between different groups working within the project (and even in different studied areas: e.g. Wadi Dara, Qena Asyuti). To enhance the exchange of ideas and experiences between groups it is recommended to organize small seminars for working groups to present their findings and discuss the faced problems especially that all studied areas are similar and all are lacking data and information.

- Interaction, communication and technical expertise exchange need to be strengthened and enhanced between the IC and the NWRC.

- If budget permits, at least two wells need to be drilled in the eastern desert to provide additional data and verify the developed models.

- Geophysical investigation needs to be expanded to provide regional scope for the eastern desert project.

- The project needs to accomplish the environmental impact assessment for the studied area.

- Relocate the laboratory for hydrologic modeling at Cairo University (CU) to the Faculty of Engineering to improve utilization and accessibility to the lab.

- Increase the meetings/workshops between the partners working on the project to refine the conducted work and ensure the proper accomplishment of remaining tasks. Project steering committee members may attend the meeting to give periodical evaluation and guidance.

- Involvement of local communities and ministry of agriculture in defining alternative development scenarios by incorporating them in the steering committee.

- It is necessary to define the profile of participants in the workshops and the criteria for the selection of candidates. It is very important that they have more or less the same level of knowledge and experience .It is also important to give the participants sufficient time to perform themselves before the training workshop

5.5 Areas of Potential success

- The project progress indicates that the chosen technique(s) in evaluation of groundwater potential at the eastern desert is feasible in spite of the limited available data. Thus, the project seemed to provide a replicable technique that can be adapted in other locations with similar conditions (especially in arid and remote zones where field data are usually limited or do not exist).

- The project accomplishment(s) provide a tool for the Government of Egypt to evaluate the existing groundwater potential, thus, reduce the stress on surface water. Egypt is experiencing great challenges, from government subsidies being very high and unsustainable to diminishing per capita and per acre water availability (because of growth) along with deteriorating water quality (salinity, pollution, and rural sanitation). The water policy aims to evaluate the existing (includes the annual 55.5 bcm from the river Nile and potential additional 9 bcm from expected projects) and available water resources in Egypt including the potential groundwater availability in the Eastern Desert. This project assists the government in evaluating the existing groundwater extraction potential in the eastern desert.

- So far, the project focuses on strategic communities in the eastern desert. The project assessed the potential of water resources in areas where the limited farming communities in Upper Egypt have been neglected for decades and could benefit the most from this project for alleviating their poverty. The findings of the projects could help also in developing these farming communities.

- To date, the project exceeded the number of training courses that was agreed upon during the period of the project. Some courses were repeated and additional courses were introduced. This indicates that the project will provide a group of junior professional engineers with specific expertise in the project techniques. The potential success in the capacity building of young staff in the research institutions is considerable.

- The project is likely to provide a lead model in linking academic sector to field work institutions through target research. The project initiative is considered a good experience for linking academic sector to field work institutions. The integration of efforts between the MWRI research unit represented by NWRC together with the CU/IC to execute parts of the research work for the project was important due to the understanding by NWRC for the existing field data collected by the institutes in NWRC and the advanced enhancement of field data by CU/IC. NWRC provided in-depth expectation for the MWRI Groundwater Sector for the outcome of this project.

- According the conducted evaluation, the project is relevant to UNDP/GEF priorities. There are 15 operational programs (OPs) through which the GEF provides grants. Eleven of these reflect GEF's original focal areas: four in the biodiversity focal area, four in climate change, and three more in international waters. According to the GEF international waters OP scope, OP focuses on the ecological status of transboundary water bodies, Operational Program Number 9 focuses on area-wide interventions that typically involve integrated management of land and water. This project impacts the integrated management of land and water. The output of the project can be applied in similar arid regions.

- Both parties, Cairo University and NWRC are now more familiars and well prepared to collaborate and implement new development projects.

- The other potential success is the capacity building of young staff in both institutions (about 100 persons have been trained). They are able now to handle advanced technology such as ,remote sensing ,use of GIS, modeling isotope geochemistry.

6.0 Project Results

6.1 General

- Project contributed to Egypt development priorities in terms of rapidly growing population. Egypt is experiencing great challenges, from government subsidies being very high and unsustainable to diminishing per capita and per acre water availability (because of growth) along with deteriorating water quality (salinity, pollution, and rural sanitation). The water policy aims to evaluate the existing (includes the annual 55.5 bcm from the river Nile and potential additional 9 bcm from expected projects) and available water resources in Egypt including the potential groundwater availability in the Eastern Desert. This project assisted the government in evaluating the existing groundwater extraction potential in the eastern desert.

- The project assessed the potential of water resources in areas where the farming communities that have been neglected for decades and could benefit the most from this project for alleviating their poverty.

- The project exceeded the number of training courses that was agreed upon during the period of the project. Some courses were repeated and additional courses were introduced.

- The website constructed by the Michigan University for this project was innovative, informative and represented a valuable information resource.

- The project initiative is considered a good experience for linking academic sector to field work institutions. The integration of efforts between the MWRI research unit represented by NWRC together with the CU/IC to execute parts of the research work for the project was important due to the understanding by NWRC for the existing field data collected by the institutes in NWRC and the advanced enhancement of field data by CU/IC. NWRC provided in-depth expectation for the MWRI Groundwater Sector for the outcome of this project.

- Six talks have been presented. Three talks with CEDARE at organized workshops. One talk has been presented in Salvador, Brazil during a GEF organized water conference. In addition, a presentation has been given during Sept 2005 in New Delhi in a conference on Aquifer Recharge management organized by UNESCO and GEF-STAP. Another talk will be presented during the 4WWF in Mexico.

- The role of surface/groundwater modeling in groundwater assessment was crucial in the project phases.

- The overall financial management of the project seemed well controlled. The financial system applied the “payment upon delivery” approach for the conducted tasks. Such approach usually avoids un-required/unsatisfactory spending.

- The project developed technical approach for groundwater water assessment in arid areas, where basic data are usually lacking or sporadic. Such procedures can be applied in other similar areas in Egypt or outside.

6.2 Impacts Beyond the Direct Beneficiaries

- The potential of water resources in the Eastern Desert area is assessed and evaluated. Such issue will help to avoid any negative impacts on the environment due to overexploitation of surface and groundwater resources by different users, mainly private sector.

- More attention is given to the water resources in Wadi systems as a potential renewable water resource for developing arid areas.

- The transfer of new cost effective technologies used in assessing and evaluating water resources, such as new remote sensing technique (SRTM, TRMM)coupled with GIS ,isotopes ,modeling .The applications of these techniques is advantageous ,specially in developing countries (and more specifically in arid areas) where obtaining basic data sets that are relevant to hydrogeological investigations is most of the time very difficult or lacking .

- The involvement of partners from developed country, as a main partner, is very adequate for ensuring and accelerating transfer of know how and new technology.

- An integrated and sustainable development plan, including new water strategy for the Eastern desert is proposed.
- Water resources development in Eastern desert, neglected for long time, is now included within the water policy working plan of the ministry of water resources and irrigation This was proved in the speech given by HE Minister of water resources and irrigation in December 2005 workshop in which he mentioned very clearly that the ministry will make use of the findings of the project for developing the area.
- The Ministry of Water Resources and Irrigation is now more involved in monitoring the surface and groundwater (monitoring of groundwater level, installation of rainfall precipitation and runoff gauges. This will help in controlling the exploitation of groundwater resources in the area and prevent any degradation in quality and quantity.
- The local community in Eastern desert that has been neglected for decades will benefit the most from outputs of this project.
- The regional and International communities interested in wadi systems would benefit from the finding of this project .It is possible to make use of the Arab wadi hydrology network, sponsoring by UNESCO / The Arab Center for the studies of arid Zones and Dry Lands ACSAD / Arab League Educational Cultural Scientific Organization ,ALECSO and hosted by ACSAD Web site, for disseminate the project results in the Arab region and even at International level through the G-Wadi network sponsoring also by UNESCO .
- It is clear that the there is a commitments from the MWRI to implement the project outputs and recommendations which was clearly proved during the workshop of December 11-12 ,2005 workshop which was chaired by H.E. the minister, President of Cairo University and UNDP representative.

7.0 Recommendations

The recommendations of this review are conditioned by the remaining budget and time constraints of the project. For planning purposes and suggestion of appropriate action plan(s), the recommendations are presented in three groups:

- **General Recommendations**
  The general recommendations should be considered for the short/long term of the project and after the project completion.

- **Recommendations for immediate implementation**
  The recommendations for immediate implementation should be considered in the very near future in order for them to be feasibly implemented before the end of the project.

- **Recommendations to be implemented before project closure**
  These recommendations should be implemented before the end of the project depending on budget and time practicality.

7.1 General Recommendations

1. Publicize the project as a lead example
   The project should be considered as a lead example in arid zones for utilizing target research and applying scientific tools in addition to base knowledge in order to serve development purposes.

2. Encourage similar/future target research
   Target research projects should be encouraged by GEF and this project should be utilized to demonstrate the role of good management of groundwater to release the stress on the use of surface water.

3. Utilize geo-referenced Landsat and similar techniques
   Utilization of geo-referenced Landsat Thematic Mapper data to identify surface runoff and recharge rates should be utilized to compensate for lack of field data.

4. Utilize geochemistry and isotope analysis
   Utilization of geochemistry and isotopic analysis for groundwater potential in the eastern desert should be further utilized in similar arid lands.

5. Government of Egypt should utilize the project output
   The Government of Egypt should utilize the outcome of this project in agricultural, urban, tourism and industrial development planning in the Eastern desert.
6. Follow up the implementation of project results
   The steering committee should be invited to follow-up and monitor the implementation of the project results and recommendations, even after the end up of the project. This committee could, for example, be considered as consultative committee. GEF/UNDP can provide some financial support to this committee, even after phase out of the GEF fund or take the initiative to invite the committee to meet each 4 months for follow –up and ensure sustainability.

7.2 Recommendations for Immediate Implementation

1. Extend the project to first quarter of 2007
   Considering the tasks that need to be fulfilled and the positive accomplishments that have already been conducted, the project period should be extended to the first quarter of 2007 as a practical time scheme for the completion of the project objectives.

2. Strengthen interaction and communication between IC, CU and NWRC
   Interaction, communication and technical expertise exchange need to be strengthened and enhanced between the IC, the CU and the NWRC.

3. If possible, drill 2 wells
   If budget permits, at least two wells need to be drilled in the eastern desert to provide additional data and verify the developed models.

4. Expand Geophysical investigation
   Geophysical investigation needs to be expanded to provide regional scope for the eastern desert project.

5. Accomplish environmental impact assessment
   The project needs to accomplish the environmental impact assessment for the studied area.

6. Facilitate access to activate the utilization of the laboratory for hydrologic modeling
   Relocate the laboratory for hydrologic modeling at Cairo University (CU) to the Faculty of Engineering to improve utilization and accessibility to the lab.

7. Increase briefing meetings/workshops
   Increase the meetings/workshops between the partners working on the project to refine the conducted work and ensure the proper accomplishment of remaining tasks. Project steering committee members may attend the meeting to give periodical evaluation and guidance.
8. During the coming training workshops it is necessary to include more participants from the ministry (groundwater sector) or NWRC since they are the main beneficiaries from the project and they will be requested to implement the recommendations and results of the project.
9. Since the renewable groundwater in the studied area (mainly aquifers in Wadi systems) is brackish, and the groundwater from the Nubian is non-renewable, it is recommended that, for alleviating pressure on the Nubian fresh groundwater, to perform some studies regarding the use of brackish water in agriculture by including new varieties of crop supporting salinity and with high productive value. For this reason it is necessary to invite the ministry of agriculture to joint the project steering committee.
10. It is also necessary to organize monthly or every two months a seminar where the involved groups working on different watersheds present their findings and exchange ideas and experiences .Such approach can help in circulating the information.

7.3 Recommendations for implementation before project closure

1. Propagate the results of the project
   The results of this project in the eastern desert should be further utilized in Egypt and other countries by future related projects.

2. Assess potential investment in the studies area
   The project should specifically provide an assessment for investment potential in the area (mainly for urban/agricultural/other uses).

3. Address socio-economic impact
   The project needs to address the socio-economic impact of the proposed development (if any). However, this recommendation may not be feasible if not supported under GEF eligible funding.

4. Publicize the finding in local media
   The project should utilize the local media to publicize the findings and recommendations of the project.

5. Draft strategic water plan for the area
   A strategic plan for the exploitation of available water resources should be drafted.

6. Document scenarios and alternatives for development
   Finalize a development plan (e.g. preliminary master plan) with alternative scenarios for the study area focusing on the integrated management and use of surface and groundwater. The plan should take into account the economic aspect of water delivery and define the rate of extraction and quantity of available water resources.

7. Organize de-briefing workshop
   A regional workshop should be organized within 2-3 month before the end of the project. In addition to project partners, the workshop should involve representatives from the main concerned beneficiaries of the project including local communities, Ministry of Agriculture, investors, press, neighboring countries, regional and international organizations.

8. Develop some guidelines and directives for the use of different techniques
   Compile the used techniques and provide systematic guidelines and directives to be implemented in future similar projects.

9. Conduct a socioeconomic assessment in the study area.

10. Organize one or two workshops in modeling or any other domain (a short investigation could be undertaken with all the participants attended the previous workshops to explore in which domain they need more training for performing their capacity).

11. A follow up arrangement for the implementation of the project recommendations should be settled

8.0 Lessons Learnt

This project provided several lessons to be learnt and further applied in current/future similar projects. The lessons learnt from this project are classified in terms of:

- **Technical approach**
  Lessons learnt from technical approach should benefit researchers working on similar projects.

- **Project management**
  Lessons learnt from project management should benefit UNDP, GEF, governments and project managers working on similar projects.

- **Strategic planning**
  Lessons learnt from strategic planning should benefit governments and implementing agencies.

8.1 Technical Approach

1. GIS and geo-referenced Landsat Thematic Mapper data can be used as initial estimates to identify surface runoff and recharge rates in the case of lack of field data.

2. The use of isotopic analysis to identify groundwater recharge source(s) and age proved to be very effective.

3. The technical procedures tested within the present project could be applied in other areas in Egypt as well as in neighboring countries with similar natural conditions to enable the planning of land reclamation with minimum environmental, financial and social impacts.

4. Integration of groundwater modeling with surface modeling if tested and proven to be accurate can be very effective to simulate groundwater scenarios in arid areas.

5. Utilization of Geostatistics (that was not used in this project) could have enhanced the extrapolation of limited data at the region.

6. Presence of environmental, social and financial consultants in similar projects may assist in the completion of an integrated development plan during the progress of the project.

8.2 Project Management

1. Cooperation and coordination between different partners contributing to similar projects could become a bottle-neck and critical factor for the successful completion of the objectives.
2. Technical competence of partners and ease of exchange/enhancement of information is crucial for similar projects.

3. In terms of financial project management, the implementation of “payment upon delivery” concept between various partners avoids un-required/unsatisfactory spending.

4. It is preferable to arrange a type of questionnaire which can be distributed to partner institutes requesting proposals regarding the training program contents, duration ,the way of handling it .Since these institutions are more involved in practical works ,so they can better define the needs of their personnel ,in term of training .The out put of these assessment can help to define better the training programme and make it more profitable .

5. A consultation with main stakeholders and end users should be undertaken prior the launching any project of development ,even before the design .Some type of mutual agreements must be set up in which the role and tasks of different partners are defined .Such approach will accelerate the implementation of the project activities and avoid losing time in consultation with all partners .It also help that each partner consider that he is owner of the project.

6. Building a possible partnership between scientific and researcher from academic sector (Cairo University) and applied sector representing here by the ministry and NWRC) which is not all the time a simple task .Such approach could be generic for further cooperation between other partners or the same ones involved in the present project but in other areas with similar conditions, inside or outside Egypt.

7. There is no unique mechanism for distilling and incorporating lessons learnt, but the most effective one is the participatory approach.

8.3 Strategic Planning

1. The project proved that even in hyper arid areas, potential of water resources exists that if developed and used in rational way could help in alleviating poverty within the local communities and help in developing new agriculture communities out side the Nile Delta and Nile River valley.

2. Target research can benefit strategic development planning especially in complicated and remote areas.

3. The Eastern desert is a potential region for future development and investment. Carefully studied planning proved to be essential for sustainable development in this region and similar locations.

Appendix 1 – TOR

Terms of Reference
For
Developing Renewable Groundwater Resources in Arid Lands, A Pilot Case- the Eastern Desert of Egypt (EGY/01/G35 – 00012358)

1. Introduction

The Eastern Desert project is a targeted research project that is funded through the Global Environmental Facility (GEF), implemented through the United Nations Development Programme and executed by Cairo University in Egypt. It aims to develop a replicable model for demonstrating different approaches for the integration of renewable groundwater resources of watersheds into national water budget in arid regions.

The project conducts comprehensive studies to evaluate the potential and extent of alternative water resources arising from sporadic precipitation over large watersheds in arid and semi-arid areas using the Eastern Desert of Egypt as the pilot site. Various comprehensive techniques are investigated including the analysis of satellite images and digital elevation data, use of geochemical and isotopic techniques, surface and groundwater modeling, seismic and drilling data, and field observations. Tasks inferred by the project include rainfall analysis and prediction of design storms, geo-chemical and isotopic analysis of GW samples to determine its renewability, soil sampling, infiltration tests, remote sensing tasks to develop co registered mosaics for geology, land use, soil, and elevations of the entire Eastern Desert of Egypt, surface water modeling for all major *wadies* (narrow valleys), computation of recharge to quaternary basins, geophysical tests, groundwater modeling, and exploration of development scenarios.

The project will develop procedures that could be used to accurately estimate the available groundwater water resources, its distribution, quantity, and development potential. They could be applied in Egypt as well as in neighboring countries to enable planning for water management with minimum environmental, financial, and social risks. Thus, this project is geared to assist the Government of Egypt in achieving national goals and policies to meet increased demand of water, and provides valuable input to the national water resources management strategies and plans.

2. Objectives of the Evaluation

UNDP has initiated, as an integral part of the project implementation cycle, a midterm evaluation that will analyse the achievements of the project against its original objectives while providing donors, government and project partners with an independent review of project status. The evaluation will review technical and managerial aspects and consider issues of effectiveness, efficiency, relevance,

impact and sustainability. The evaluation will identify factors that have facilitated and/or impeded the achievement of objectives and should result in recommendations and lessons learned that will help in re-orienting and re-prioritizing project activities and managerial arrangements as needed.

The evaluations will specifically asses:

- Project Design: Relevance of project to Egypt's develop priorities, UNDP practice areas, GEF themes and needs of beneficiaries and review of project concept and design in relation to the addressed challenges and stated approach for addressing them.
- Project Impact: assessment of project achievements to date against the original objectives, outputs and activities using both process oriented and technical environmental indicators.
- Project Implementation: project management arrangements, quality and timeliness of output and activities, financial situation including effectiveness, partner cooperation, capacity building etc.

The assessment should also be extended to cover the logical framework matrix using appropriate indicators for the project.

3. Products Expected from the Evaluation

Based on the above points on project design, impact and implementation, the evaluation mission should prepare a comprehensive report according to the attached outline in Annex I. The report should:

- Assess the extent to which the project objectives have been met and where gaps are evident identifying causes of slow progress, if any, and suggesting remedial measures);
- Document lessons learned from the project thus far discussing elements that have and/or have not worked well and discussing re-prioritization of scheduled activities (if needed);
- Provide recommendations to strengthen project performance in terms of effectiveness, efficiency, impact, implementation, execution and sustainability of the project.

4. Methodology for Evaluation

The evaluation will be based on information obtained from reviewing documents such as the project document, project brief, quarterly progress reports, Annual Project Report (APR) and minutes from Tripartite Review and minutes from relevant meetings. The mission should also rely on information gathered through field visits and interviews with target beneficiaries and project staff including government officials, University professors and/or consultants. Interviews should include Cairo University, Ministry of Water Resources and Irrigation (National Water Research Centre and Groundwater Institute).

5. Implementation Arrangements

The consultant(s) will be contracted by UNDP country office in consultation with UNDP-GEF. The Project Management Unit shall arrange for the consultant all necessary site visits and meetings in Egypt according to the ToR. UNDP country

office in coordination with the project management unit shall arrange logistics for the mission including hotel reservation and transportation during the mission. The mission will maintain close liaison with UNDP Resident Representative, concerned agencies of the government, any members of the international or national team of experts as well as the Project Management Unit.

The findings of the mission will be presented in a seminar including all stakeholders. Three hard copies and one electronic copy of a draft final report should be submitted for review to UNDP-Cairo Office, UNDP-GEF Coordinator for the Arab States and the UNDP-GEF Principal Technical Advisor on International Waters, two weeks after the end of the mission. The consultant(s) will be allowed two weeks from receiving feedback to respond to the comments from Cairo and New York and submit a final report. Three copies of the final report and one electronic copy are required.

6. REQUIREMENTS OF THE EVALUATION TEAM:

The Consultant shall be a water quality specialist with technical expertise recognized at international level. S/He must have an advanced university degree preferably in engineering/ water science fields with 10-15 years of relevant experience preferably in the groundwater sector and technical issues related to water in developing countries. Previous involvement and understanding of UNDP's procedures is an advantage and extensive international experience in the fields of project formulation, execution, and evaluation is required. The consultant should also possess strong technical writing and analytical skills coupled with relevant experience in results-based monitoring and evaluation techniques. The consultant should be well acquainted with general water resources development related information in Egypt and in particular groundwater and have strong linkages with the water sector. The consultant should be fluent in English and Arabic and possess strong technical, writing and analytical skills

7. DURATION:

The total duration of the consultancy will be 10 days of which the consultant will spend 4 days in Cairo for meeting and interviewing the key partners in the project and will be allowed six days to read the supporting documents and prepare the evaluation report.

ANNEX 1

REPORT OUTLINE

ACRONYMS AND TERMS
EXECUTIVE SUMMARY :

- What are the context and purpose of the evaluation?
- What are the main conclusions, recommendations and lessons learnt?

INTRODUCTION:

- Whose decision was it to evaluate the project?
- What is the purpose of the evaluation?
- What products are expected from the evaluation?
- How will the evaluation results be used?
- What are the key issues addressed by the evaluation?
- What was the methodology used for the evaluation?
- What is the structure of the content of the evaluation report?

THE PROJECT

- When did the project start and what is its duration? What are the problems the project seeks to address?
- What are the immediate and development objectives of the project?
- Who are the main stakeholders?
- What results are expected?

PROJECT CONCEPT AND DESIGN

- Did the project document clearly define: problem to be addressed- project approach and strategy- implementation and management arrangements - linkages among objectives, inputs, activities, outputs and expected outcomes and impact?
- Are the immediate objectives and outputs properly stated, significant, realistic and verifiable?
- How relevant is the project to: development priorities of Egypt and UNDP thematic areas (i.e., poverty eradication and sustainable development - environmental and natural resource sustainability, millennium development goals)
- Was the project prepared in a participatory manner?

PROJECT IMPLEMENTATION:

- ***Efficiency***
  - How well did the project use its resources to produce target outputs?
  - To what extent are local expertise (by gender) and indigenous technologies and resources used?
- ***Effectiveness:***
  - What is the project status with respect to target outputs in terms of quantity, quality and timeliness? What factors impeded or facilitated the production of such outputs?
  - How useful are the outputs to the needs of the direct beneficiaries? Is there a general acceptance of the outputs by these beneficiaries?
  - Do the outputs contribute to the achievement of the immediate objectives of the project? What signs indicate this? Are monitoring

and evaluation indicators appropriate or is there a need to develop or improve indicators?
- Is the project expected to induce an impact on legislations, regulations and national policies in the water sector in Egypt?
- Is the proposed technology cost-effective for Egyptian conditions?

- ***Implementation and Management Arrangements of the project:***
  - How appropriate are the execution and implementation modalities?
  - How well is the project management, its organizational setup, rules and procedures for its functioning, decision-making process, compliance with decisions adopted for implementation?
  - How adequate are monitoring and reporting mechanisms?
  - How adequate is the support provided by the UNDP country office?
  - Do stakeholders, particularly the direct beneficiaries, participate in the management of the project? If yes, what are the nature and extent of their participation, by gender?
  - What is the relevance of the quantity and quality of purchased equipment to the project needs?
  - Are there any major changes in activities or workplan from the project document occurred? If yes, what are the reasons for the changes?

- ***Areas of corrective action:***
  - What problems in project implementation need to be resolved?
  - What are the flaws, if any, in design, implementation, monitoring and evaluation?
- ***Areas of potential success:***
  - Are there any early indications of potential success?

PROJECT RESULTS

- ***Given the indicators established by the project and/or recommended by the evaluation team***:
  - How has the project contributed to the development of the capacity of the direct beneficiaries to carry out their tasks in an environment of change in terms, a). individual learning and b). improving organizational structures and interrelationships?
  - What are the likely impacts of the project beyond the direct beneficiaries?
  - Are there any signs of potential contribution to enabling environment or to a broader development context (ie. Institutional, socio-political, economic and environmental)?
  - Are the project results systematically disseminated?
- ***What factors affect the implementation of the project?***
  - Is there adequate government commitment to the project?
  - Do the stakeholders have a sense of ownership to the project?
  - Have a mechanism been put in place to ensure the sustainability of the project results?

RECOMMENDATIONS

- What corrective actions are recommended for the design, implementation, monitoring and evaluation of the project?
- What actions are recommended to follow-up or reinforce initial benefits from the project and ensure replicability?

- Are there any necessary modifications to the project document to be considered?
- What are actions needed to ensure sustainability of the project after phase out of the GEF funds?

LESSONS LEARNT

- What are the main lessons that can be drawn from the project experience that may have generic application?
- What are the best and worst practices in formulating, implementing, monitoring, and evaluating a capacity development project?
- What is the mechanism for distilling and incorporating lessons learnt?

LIST OF ANNEXES

- ToR,
- Persons interviewed
- List of documents reviewed
- Any other relevant materials.

Appendix II – List of Interviewee

- Dr. Ahmad Wagdi, PM, Cairo University
- Dr. Mohamed Bayoumi, Programme Specialist, UNDP/GEF Egypt.
- Dr. Mohamed Sultan, IC, Head of Geosciences Department Western Michigan University
- Dr. Fatma Abdel–Rahman Attiah, Professor, Ex-Head of Water Sector, MWRI
- Dr. Ahmed Rashad Khater, Director Groundwater Research Institute (RIGW)
- Dr. Mohamed Abdel–Motaleb, Director Water Resources Research Institute (WRRI)
- Dr. Khaled Abu-Zeid, Professor, Steering Committee Member (CEDARE)
- Nahed Mohamed Khalil, Head , Groundwater Sector, MWRI
- Dr. Akram Fekry, Head of Technical Office, RIGW
- Dr. Abdo Ismail, Hydrogeology, RIGW
- Dr. Mohamed Sonbol, Associate Professor, WRRI
- Dr.Taher Mohamed Hassan, Professor, RIGW
- Eng. Shayma El Sayed, Engineer, Groundwater Sector

Appendix IV – References

1- Project document for the GEF/UNDP –Funded Project ,Entitled;
Developing Renewable Groundwater Resources in Arid lands; A Pilot Case Study the Eastern Desert.

2- Inception Report, October 2002 of the Project

3- Evaluation Form, Groundwater modeling using GMS

4- Application of Remote Sensing and GIS Techniques for Hydrological Investigation of Wade Systems in the Eastern Desert of Egypt, December 2005.

5- Surface Water Modeling for Wade Dara the Eastern Desert Project

6- Geochemical and Isotopic Constraints on the Origin of the Eastern Desert Groundwater.

7- Geophysical Investigations in Wade Dara Area Assessment of Hydrogeological Setting in View of the Interpreted Measures Receptivity Data

8- Surface Water Modeling Tasks (2) 29-32 Wadi Sannour

9- Hydrological Modeling Tasks (3) 29- 32 Wadi Qena

10- Surface Water Modeling Tasks (2) 29-32 Wade Qena

11- Geophysical Investigations in Wadi Dara Area .Previous Studies on Wade dara Area.

12- Surface Water Modeling Tasks (2) 29-32 ,Wade Abbad .