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***Environmental & Social Impact
Assessment for 50 MWp AC PV
Power Plant [DT-ARC] in Benban,
Aswan, Egypt***

1st Draft Report

LIST OF ACRONYMS AND ABBREVIATION

CAPMAS	Central Agency for Public Mobilization and Statistics
CO	Carbon monoxide
EAP	Environmental Action Plan
EDHS	Egyptian Demographic and Health Survey 2010
EEAA	Egyptian Environmental Affairs Agency
EEHC	Egyptian Electricity Holding Company
EETC	Egyptian Electricity Transmission Company
EGP	Egyptian Pound
EHDR	Human Development Report 2010
EIA	Environmental Impact Assessment
EIB	European Investment Bank
EMU	Environmental Management Unit
ENIB	Egyptian National Investment Bank
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
EU	European Union
Eur	Euro
FGDs	Focus group discussions
GHG	Greenhouse Gas
GoE	Government of Egypt
HHH	Head of the Household
HVDC	High Voltage Direct Current
IDSC	Information and Decision Support Center
km	Kilo meter
kV	kilo Volt
LE	LivreE'gyptienne
MoEE	Ministry of Electricity and Energy
MVA	Mega Volt Ampere
MW	Mega Watt
MWA	Mega Watt Ampere
NEMA	National Electrical Manufactures Association
NO₂	Nitrogen dioxide
RE	Renewable Energy
SMP	Social Management Plan
SIA	Social Impact Assessment
SYB	Statistical Year Book 2013
WB	World Bank

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Non

Technical

Executive

Summary

1. INTRODUCTION

1.1. Background

Egypt's rapidly expanding economy and its growing population requires a reliable electricity supply which can meet the increasing demand. Residential power demand increased by 40% in 2008-2013, and overall power demand by 28%. This increase has recently led to regional blackouts as the out of date generating capacity could not cope. The existing installed generating capacity of 32,015 MW is no longer sufficient.

With demand growth expected to remain at around 7% per year over the next decades, new generating capacity in excess of 1,500 MW per year is required to replace ageing power plants and to provide additional capacity. At present electricity generation is dominated by thermal power stations.

Table 1: Total installed capacity

Total Installed Capacity		32,015	% Share
Hydro	MW	2,800	8.75
EEHC Thermal		26,480	82.75
Renewable (Wind and Solar)		687	2.10
Private Sector (Thermal)		2,048	6.40

There is a growing shift away from reliance on thermal generation using domestic natural gas and oil as these relatively low cost resources become less available. An increasing need for gas and oil imports at world market prices would put pressure on Egypt's foreign currency reserves and would expose the country to energy price volatility. In this context renewable energy sources become more and more attractive, particularly as the cost of renewable energy is falling. This makes wind-power and solar-thermal and photo-voltaic electricity generation attractive for state-owned companies as well as for private sector investors.

To stimulate the development of renewable energy Egypt has introduced an overarching regulatory framework with the aim of securing 20% of its energy generation from renewable sources by 2020; it hopes to bring 4,300 MW of renewable capacity to the national grid by 2027. As part of this Egypt has initiated a program offering feed-in tariffs for generation from wind or solar projects up to 50 MW capacity, with an initial aim of securing 2,000 MW of wind capacity, 2,000 MW of solar capacity from installations greater than 500 kW and a further 300 MW of solar capacity from installations below 500 kW (the FiT Scheme).

Under the FiT Scheme the state-owned transmission system operator, the Egyptian Electricity Transmission Company (EETC), will offer a long-term off-take of power, with a

price guaranteed for 20 years (for wind) and 25 years (for solar) from completion. While projects may be implemented on private land, the state-owned New and Renewable Energy Agency (NREA) will make available for rental multiple plots of land. Each individual plant is expected to have its own contractual arrangements and be designed, developed, financed, constructed and operated as a standalone project by a dedicated special purpose vehicle.

The key entities in developing this programme are:

- Egyptian Electricity Transmission Company (EETC),
- New and Renewable Energy Authority (NREA),
- Egyptian Electricity Regulatory Authority (EgyptERA),
- Egyptian Environmental Assessment Agency (EEAA),
- Ministry of Finance, Ministry of Electricity and Renewable Energy (MoERE), and
- Ministry of Investment.

Following an initial invitation to prequalify in November 2014 the Egyptian authorities have shortlisted approximately 80 companies as eligible to be awarded licenses and power purchase agreements within this program. The authorities are now proceeding to finalize a contractual framework for these projects.

The Egyptian government has allocated a 37.5 km² plot of land located in Benban in the Benban area of Upper Egypt (the Benban Site) to NREA for use for renewable energy generation. The NREA has in turn divided the site into 39 separate but contiguous plots which it is making available to Project Companies to implement individual projects (the Benban Projects). The NREA is granting initial access to the plots under memoranda of understanding to allow for project development. Prior to construction and operation NREA will sign long-term (25 year) usufruct agreements with the Project Companies. All 39 plots are now allocated to developers.

The 39 projects on the Benban Site will be connected to the Egyptian high voltage network through four new substations, which will be constructed on the site by EETC. These substations will in turn connect to an existing 220 kV line, which passes nearby the Benban Site at a distance of approximately 12 km. The EETC will construct the high voltage connection to this line. NREA is currently preparing site access roads.

Taken altogether this proposed development at the Benban site will consist of

- Circa 39 solar photovoltaic plants; total installed capacity 1.8 GW;
- Related infrastructure including roads, administrative buildings and four high voltage substations; and
- A high voltage interconnection.

The following map shows the location of Benban in relation to Cairo and Aswan. The distance to Cairo is approximately 650 km, to Aswan 40 km.

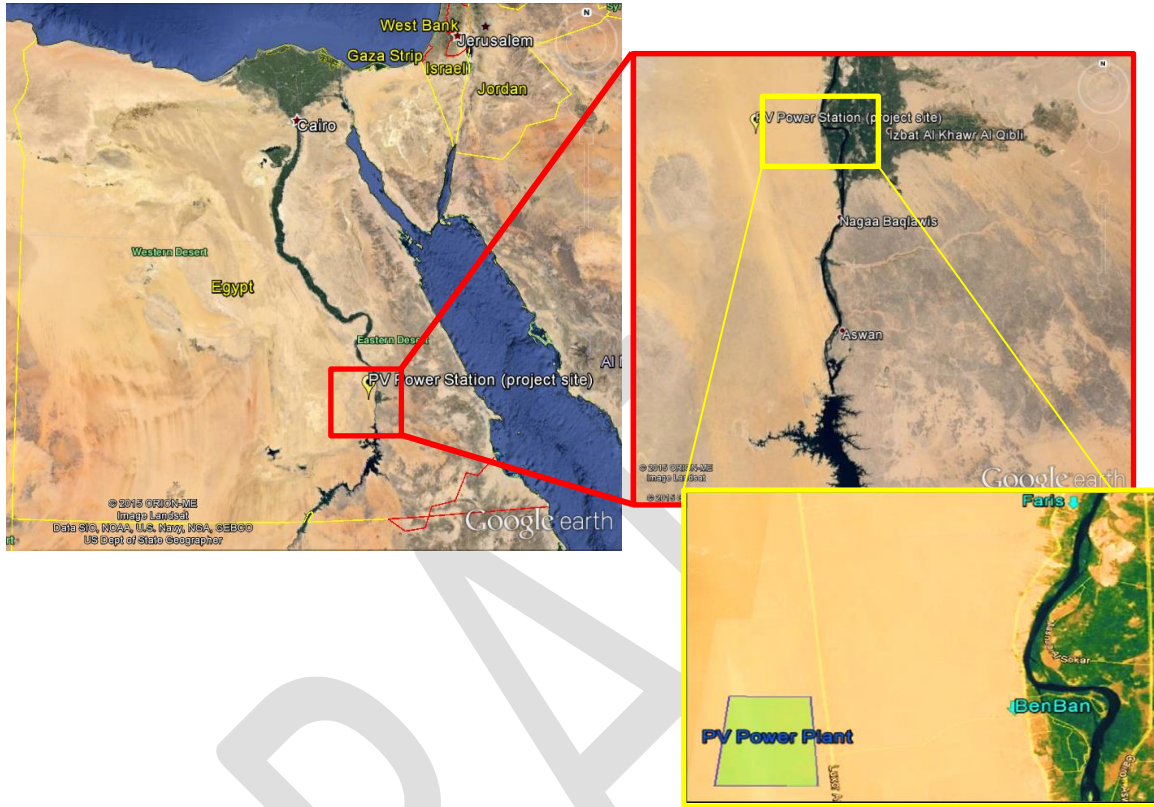


Figure 1. Location of NREA Project in Benban

NREA initiated an Environmental and Social Impact Assessment (ESIA) for a proposed concentrated solar plant (CSP) on part of the Benban site. That project is not proceeding; its ESIA, carried out in 2014 by EcoConServ in conjunction with ERM Deutschland is a reliable source of information for the site, its environment and its social context and has therefore being extensively used for this Environmental and Social Impact Assessment.

Desert Technologies has commissioned EcoConServ environmental solutions to carry out this assignment, in close co-operation with NREA and other authorities.

1.2. Project Objectives

The proposed project represents an integral component of the National energy strategy which targets reaching 20% renewables in the Egyptian power mix by 2022. The following results are envisaged from the project:

- Sustainable diversification of the national Energy mix.
- Wider electricity coverage and stable household energy supply.
- Reduced emissions and pollutant risk compared to thermal power generation.
- Reduction of Carbon dioxide & Green-House Gas emissions from power generation.
- Inviting further foreign and national investments in renewables.
- Opportunity for national manufacturers of renewable energy components.
- Social and economic opportunity at the local level and throughout the supply chain.

1.3. Objectives for the ESIA

The scope of the ESIA is to assess the environmental and social impacts of the DESERT TECHNOLOGIES [ARC] plot SBN (2-1) within the Benban Solar field. To the extent possible, this ESIA shall be aligned with the outcomes of the on-going Strategic ESIA.

- Describing project components and activities of relevance to the environmental and social impacts assessments
- Identifying and addressing relevant national and international legal and technical requirements and guidelines pertaining to project-related environmental, social, and occupational health & safety issues;
- Performing stakeholder meetings, scoping sessions, and public consultations to maximize public ownership and stakeholder engagement
- Describing baseline environmental and social conditions, obtaining key data relevant to the project, and identifying relevant governmental, administrative, and civil society institutions
- Assessing the potential environmental and social impacts of the project in the project areas;
- Developing an environmental and social management and monitoring plan for the mitigation of negative impacts and for monitoring compliance with the relevant environmental laws

1.4. Approach

This ESIA follows national and IFI ESIA requirements regarding scope and detail of assessment and procedure, and gives particular emphasis to public information and stakeholder participation. It will identify and assess significant impacts the proposed project is likely to have on the local population and on human health; on land, soil, water, air and climate; on landscape; on biodiversity; and on cultural heritage. It will identify risks and will suggest mitigation measures where appropriate.

The ESIA process consists of a defined set of steps with clear activities and outputs. This is in detail prescribed in national legislation as well as EU Directives and IFI guidelines. There are two main phases:

- The Scoping Phase: Scoping is a critical, early step in the preparation of an ESIA. The scoping process identifies the issues that are likely to be of most importance during the ESIA and eliminates what is of little concern. A key objective of this phase is to identify available information, to establish gaps that have to be addressed, and to discuss and decide what additional studies or investigation will have to be done to fill these gaps. Consultation with environmental authorities, the affected local population and any other interested parties is an important part of this stage.
- The Impact Assessment Phase: Based on the results of the Scoping Phase, all relevant potential impacts (positive as well as negative) are studied and where possible quantified. The draft ESIA document presents this assessment to affected local communities and stakeholders for comment and discussion. The final draft of the ESIA takes account of any public comments and is subsequently submitted to the authorities for project approval and permitting.

During the Scoping Phase for this ESIA, the Consultant has performed the following activities:

- Two site reconnaissance visits in August and September 2015;
- One additional site visit with NREA;
- Meetings with authorities in order to obtain detailed information about the project and the Benban location;
- Meetings with the local community of Benban;
- One public scoping session conducted on the 15 September 2015 in Cairo.
- One public scoping session conducted on the 17 September in Aswan.

During the Scoping Meetings the Consultant and representatives of authorities provided information on the project and on the planned impact assessment studies and invited the attendees to comment, raise issues, and suggest where additional studies were needed. A key objective of this meeting (and of previous meetings with community members in Benban village) was to help the local communities understand the potential environmental and socio-economic impacts in the different phases of the project (construction phase and operations phase). A second key objective was to obtain, from the developers attending the Scoping Meeting, information on the characteristics and requirements of the individual Benban Projects, both for the construction phase and the operations phase.

During the Impact Assessment Phase the Consultant assessed the impact of the project on all natural receptors and on the local population. The results of this, and the conclusions and recommendations drawn from these studies, are presented in this ESIA Report.

1.4.1. Approach to the social aspects of the ESIA

A great deal of emphasis has been placed by all stakeholders on the integration of social safeguards and collective CSR activities to develop local economy surrounding the Benban Solar Park.

The ESIA team applied the Participatory Rapid Appraisal Methodology that employs multidisciplinary sources of data. Therefore, the team has developed a cross-sectional study that uses a multi-data sources approach including:

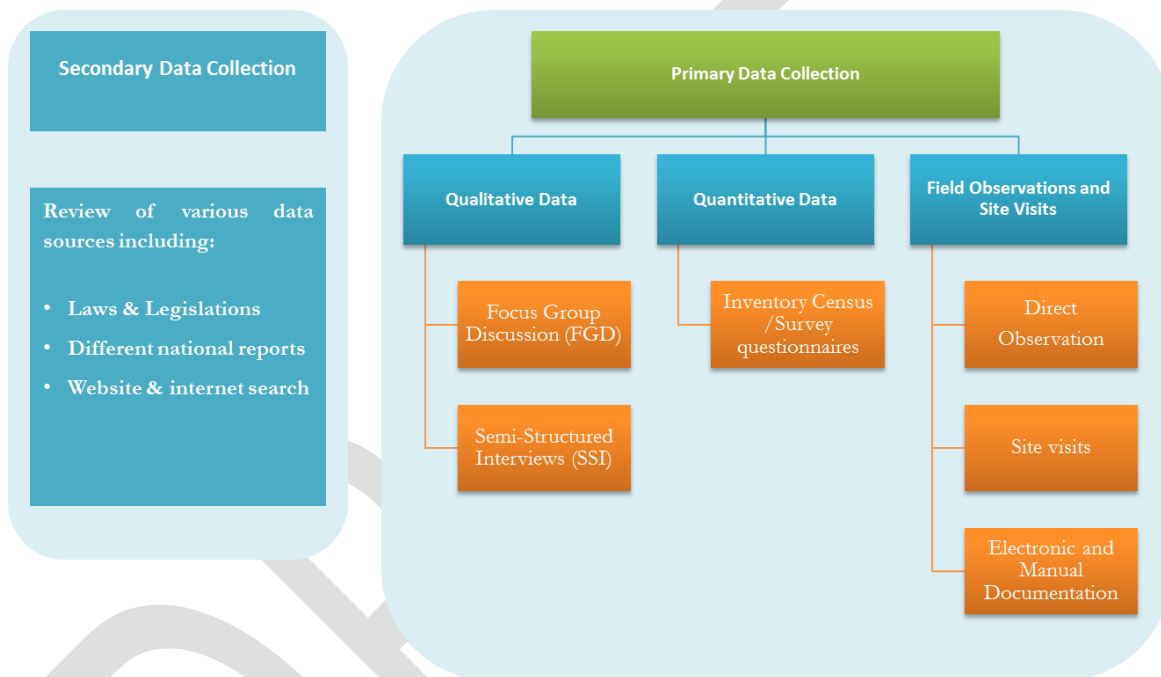


Figure 2. Data collection scheme

Secondary Data

That aims at analyzing different reports about the project site. The secondary data analysis method was used to review governmental documents. Moreover, provide a clear socioeconomic profile the communities that will host the project. Thus, the following reports have been reviewed:

1. Aswan Statistical Year Book 2013
2. Benban statistical data, Information Center 2014
3. Governorate Description by information 2012
4. Egyptian Human Development Report 2010
5. Egypt Description by Information, IDSC, 2010
6. Egypt Description by Information, IDSC, 2009
7. Egyptian Demographic and Health Survey 2009

The above mentioned reports were analyzed and summarized in a comprehensive section in order to highlight the current socioeconomic conditions of the target areas. Moreover, the comparison between the secondary and primary data allowed us to verify the quality of primary data which was to some extent consistent.

Primary Data

Primary data collection involves collecting data primarily from different potential stakeholders and project target groups. Special attention was paid to the Project Affected People within the vicinity of Benban village. Vulnerable and indigenous people were investigated using multilevel of data collection tools. Following is a brief description of data collected:

Data collection during scoping phase:

During this phase the study team has applied the following activities in order to obtain clear description of the community socioeconomic profile. Under this phase the following activities were done:

- A site visit was conducted in Benban, the mayor, environmental related groups, NGOs and community leaders. The first site visit oriented with social activities were implemented in cooperation with Environmental experts
- Preliminary meetings with NREA staff in order to highlight the organization structure, basic information about the project and their previous experience.

Various tools were developed in order to highlight the perception of each target groups. The study relied upon quantitative and qualitative data that was collected using the following tools:

Quantitative data

Structured questionnaire:

The Study team designed and tested the survey questionnaire for the potential PAPs. The applied survey covered the potential community people with emphasis on those who might benefit or get affected due to the project implementation.

The developed questionnaire covered the following topics:

- Description of socioeconomic characteristics for the community people.
- Their perception towards the project.
- Potential impacts of the project.
- Land acquisition experience.
- Ever had similar developmental projects that might have certain unfavorable or favorable impacts.

Qualitative data

The study team utilized additional qualitative research methods which aim to assist the study team in gathering an in-depth understanding of the current socioeconomic and legal conditions, livelihoods dynamics related to the hosting communities and their compensation preferences.

Qualitative methods could be also employed to investigate the conditions of direct and indirect PAPs. The qualitative methods are generally more interactive and participatory techniques that can pave the way with the local community to present the project outside prestigious places.

Females, young people and old voiceless groups were targeted using qualitative tools. Additionally, they expressed their eagerness to spell out their concerns and perceptions of the project. The suggested qualitative methods used included:

Group Meetings (GMs) were utilized and used with:

- The potential affected people
- Community people

The main indicators covered through the group meetings were:

- Characteristics of the community people
- Their perception of the project
- Their awareness about the project impacts and the needed mitigation measures, with emphasize on their own livelihood status
- Their perception of mitigation measures
- Community problems
- Community needs

Semi Structured Interviews (SSIs). That was applied with:

- NREA team
 - Information about the project
 - Basic information about NREA experience in the field of solar power
 - Institutional framework
 - Potential socioeconomic benefits and drawbacks of the project
 - Project impact on the job creation
- In- depth interview guideline with NGOs and community based organizations (parties- youth group, etc)
 - Information about the Institute/ NGO
 - Perception towards the project
 - Their contribution into the project

Maps, Photos and observation

Documentation with maps and photos was presented densely in baseline chapter. Additionally, observation checklist of different areas was used in order to facilitate the process of community mapping which is used to visualize the committee for the implementing agencies as part of the socioeconomic studies.

The key field research questions guiding the survey were:

- a) What are different socioeconomic criteria for the areas?
- b) What is the main perception of the project?
- c) What are the policies and legislations that have influence on the project?
- d) What are the potential impacts of such project?
- e) How can the project be implemented with limited disturbance for the community?
- f) How can the NGOs and community stakeholders support the project?
- g) What are the main obstacles that might face the project? And how to overcome?

Methodology of vulnerability identification

The identification of the vulnerable groups, considering their interest and setting plans to mitigate for any negative impacts lies within the core of social impact assessment. This mainly returns to the fact that vulnerable groups are more exposed to the implications of various impacts and are more likely threatened to get in more impoverishment.

By conventional definition, the vulnerable groups are defined as those groups of people who are typically excluded, disadvantaged or marginalized based on their economic, environmental, social, or cultural characteristics. While various groups could fit within this description (e.g., women, youth, people with disabilities, refugees), a need for having a more specific and focused definition to identify the vulnerable groups relevant to the project raised as a necessity to the team. The ESIA analysis methodology for identifying the vulnerable groups and assessing project's impacts on them has been influenced by the Sustainable Livelihood Approach (SLA) which helped in setting the scene for describing the context, motivations and resources of the affected vulnerable households.

The SLA analysis to identify the vulnerable groups relied upon focusing on collecting information about the potential affected people, ranking them according to the severity of impact using different elements of the SLA which are:

1. Assets (social, physical, economical, human and natural assets)
2. Risks and vulnerability surrounding the targeted individuals
3. Polices and organizations that govern the implementation of mitigation measures

The level of vulnerability of certain group and the severity of the impact on these groups has been assessed by reviewing the individual's assets base using the sustainable livelihoods

analysis (SLA) approach. The less assets base the affected groups have, the less alternatives and the less coping abilities they have and the more attention should be given in designing their compensation schemes and/or mitigation measures. The dimension of the asset base that affected population possesses has been considered and integrated in the various qualitative and quantitative tools designed by the Consultant.

The analysis of the vulnerability issues has been considered as a crosscutting issue in each of the mentioned impacts, including also the pure environmental impacts. It is believed that certain groups are more vulnerable to the environmental impacts than others due to higher level of exposure to these impacts or lack of alternatives or survival methods that allow for coping with these impacts. The presentation of the vulnerable groups, in that sense, has been integrated in each of the impacts (where applicable) and was addressed in deeper approach under the social impacts assessment.

Sampling

Given the fact that all project areas are vacant desert land, the sample was targeted from the surrounding areas locating nearby project site. Hence, the sample was selected as follow:

- Group meeting with NREA staff (legal – technical – health and safety)
- In-depth interviews with the governmental organizations
 - a. EMU manager in Aswan Governorates
 - b. Head of the EMU in Benban
 - c. Urban planning in Aswan governorate
 - d. Four health related people from Aswan Governorate
 - e. Four interviews with the head of Local Councils and cities
- Seven community leaders from Benban

1.5. Limitations

This SIA is a high level assessment of the impact of the Benban individual sub-project to be implemented by DESERT TECHNOLOGIES. It relies on the data available plus the data which could be generated for this study. Where there are uncertainties about impacts, this is acknowledged and the level of uncertainty indicated where possible. The Consultant has used professional experience and available scientific literature to set limits on the maximum likely impacts and accordingly designed appropriate mitigation measures that will ensure that these limits are not exceeded.

There are limitations regarding data availability which need to be taken into account. In relation to social information this includes that due to the nature of communities (male dominant societies), the community people were reluctant to allow women to be interviewed

(regardless of having female interviewers); even if the team managed to meet a woman she often had no information to share with.

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1.6. Report Structure and Content

This ESIA consists of 8 chapters plus annexes. The chapters cover the following:

Chapter	Contents	
1	Introduction, Approach and Methodology	Contains a brief description of the proposed activity at the DESERT TECHNOLOGIES site. It defines the objectives of the ESIA and its approach and the structure of this report.
2	Legislative and Regulatory Framework	Describes the legislative, policy and administrative requirements applicable to Benban PV Projects.
3	Project Description	Includes a detailed description of the proposed activities at the Benban site.
4	Description of Baseline	Describes the environmental and social baseline conditions in the DESERT TECHNOLOGIES' Benban site and the wider project area.
5	Analysis of Alternatives	Describes and assesses alternatives to the DESERT TECHNOLOGIES Benban project.
6	Environmental and Social Impact Assessment	Describes and assesses the potential environmental and socio-economic impacts of the DESERT TECHNOLOGIES' Benban project & identifies necessary mitigation measures. This assessment covers both the construction phase and the operations phase of projects.
7	Environmental and Social Management Plan	Presents a plan to manage and control the significant impacts of the DESERT TECHNOLOGIES' Benban project, both during the construction and operations phase.
8	Stakeholder Engagement and Public Consultation	Describes the public consultation activities performed during the ESIA study.

Table 2: Structure of this ESIA

2. Legislative and Regulatory Framework

2.1 Preface

This Chapter describes the legal and administrative framework of the proposed project. It lists the national laws and international requirements pertinent to the project and describes the required permits to allow project implementation. In addition to Egyptian legislations, this chapter addresses the EBRD Performance Requirements, and World Bank operational policy regarding environmental and social issues.

2.2 National Administrative and Legal Framework

Law No. 4 of 1994 and its amendments, the Law on Protection of the Environment, and its executive regulations require Environmental Impact Assessments (ESIAs) for new projects and expansions and renovations of existing projects. The Competent Administrative Authorities (CAAs) for ESIAs in Egypt are sectorial Ministries and Governorates, given the fact that they possess the executive powers in relation to development authorization. Moreover, the CCAs are required by Law 4 to conduct the screening of projects, while the Central EIA Department of the Egyptian Environmental Affairs Agency (EEAA) is in charge of supervising the screening process, managing the review of EIA reports, taken decisions on the acceptability of EIA reports, and giving an opinion on the development and proposals for mitigating measures.

The following is a brief description of the different national authorities and institutions of relevance to this project (EEAA, EMU, and CAA).

The Egyptian Environmental Affairs Agency (EEAA) is an authorized state body regulating environmental management issues. Egyptian laws identify three main roles of the EEAA:

- It has a regulatory and coordinating role in most activities, as well as an executive role restricted to the management of natural protectorates and pilot projects.
- The agency is responsible for formulating the environmental management (EM) policy framework, setting the required action plans to protect the environment. Following-up their execution in coordination with Competent Administrative Authorities (CAAs).
- In specific to this project, EEAA is responsible for review and approve of the environmental impact assessment studies as for new projects/expansions undertaken.

- Imposing administrative fees for reviewing the environmental and social impact assessment study and issuing environmental permits.

EMU (Environmental Management Unit at Governorate and District level) is responsible for the environmental performance of all projects/facilities within the governorates premises. The governorate has established environmental management units at both the governorate and city/district level. The EMU is responsible for the protection of the environment within the governorate boundaries and thus are mandated to undertake both environmental planning and operation-oriented activities. The environmental management unit is mandated to:

- Follow-up on the environmental performance of the projects within the governorate during both construction and operations to ensure the project abides by laws and regulations as well as mitigation measures included in its EIA approval. Investigate any environmental complaint filed against projects within the governorate
- The EMU are affiliated administratively to the governorate yet technically to EEAA. The EMUs submit monthly reports to EEAA with their achievements and inspection results.
- The governorate has a solid waste management unit at the governorate and district level. The units are responsible for the supervision of solid waste management contracts.

The CAA for PV Plants is the New and Renewable Energy Authority (NREA). Law 4/1994 stipulates that applications for a license from an individual, company, organization or authority, subject to certain conditions, require an assessment of the likely environmental impacts.

The CAAs are the entities responsible for issuing licenses for project construction and operation. The EIA is considered one of the requirements of licensing. The CAAs are thus responsible for receiving the EIA forms of studies, check the information included in the documents concerning the location, suitability of the location to the project activity and ensure that the activity does not contradict with the surrounding activities and that the location does not contradict with the ministerial decrees related to the activity. The CAA forwards the documents to EEAA for review. They are the main interface with the project proponents in the EIA system. The CAA is mandated to:

- Provide technical assistance to Project Proponents
- Ensure the approval of the Project Site
- Receive EIA Documents and forward it to EEAA

- Follow-up the implementation of the EIA requirements during post construction field investigation (before the operation license)

After submission of an ESIA for review, EEAA may request revisions in the ESIA report within 30 days, including additional mitigation measures, before issuing the approval of the report. DESERT TECHNOLOGIES will have the right to issue an appeal within 30 days from its receipt of the EEAA's decision. It should be noted that once the ESIA has been approved, the ESMP as will be presented in the report, will be considered an integral part of the project; and the DESERT TECHNOLOGIES will be legally responsible for the implementation of that plan, depending on their involvement in construction or operation. It is therefore worth mentioning that the must ensure that all mitigation measures and environmental requirements described in the ESMP have been clearly referred to in the tender documents for the construction works, the construction contracts, and have been respected. DESERT TECHNOLOGIES shall follow-up construction and operation of the proposed project contractor to ensure that the ESMP is adequately implemented in the construction phase.

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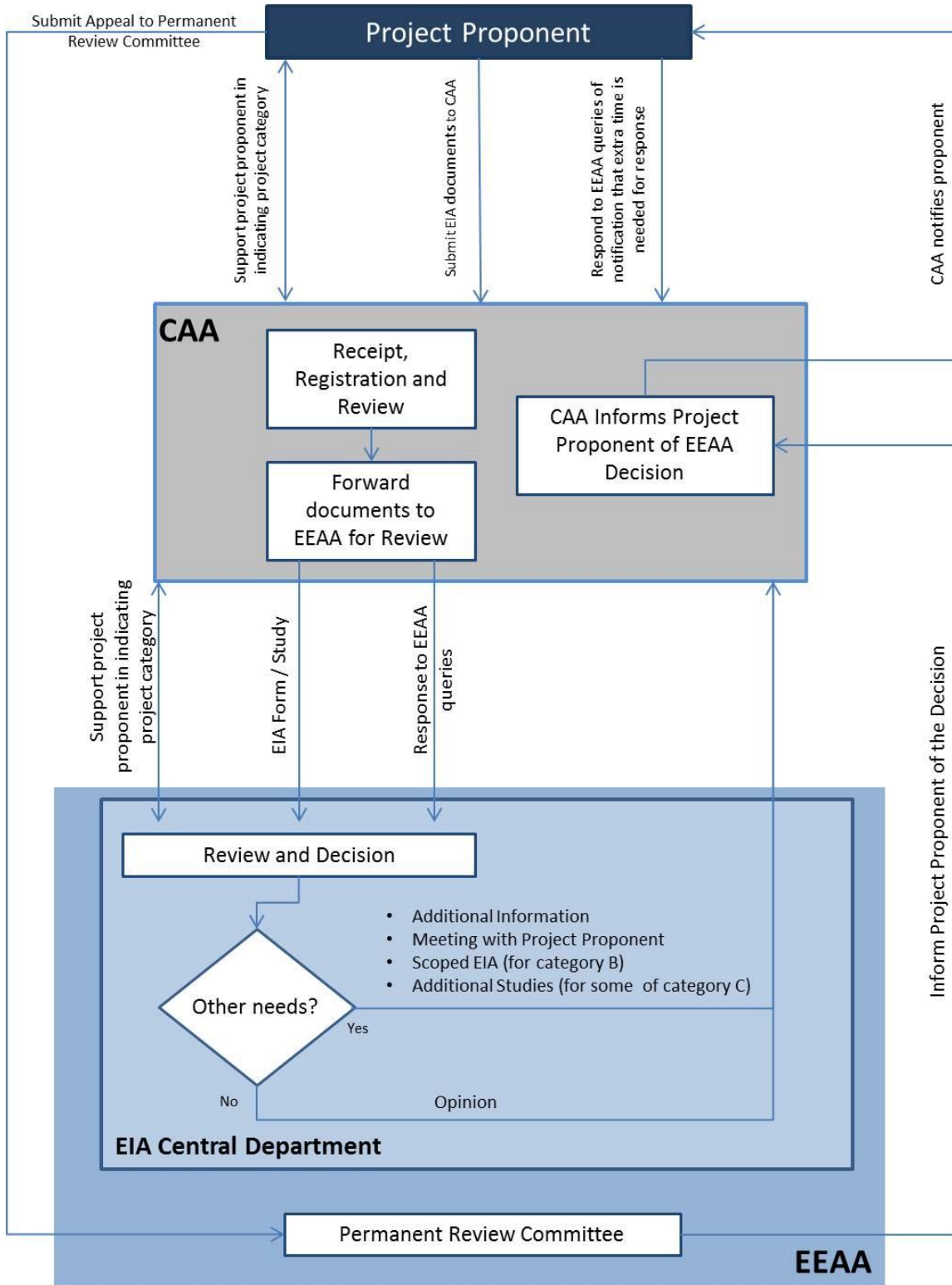


Figure 3. EIA Procedure overview

2.2.1. Permits required to construct and operate the proposed project

The key permits required for the construction and operation of the proposed project and the associated facilities are the following:

Associated facilities includes: Substations, power transmission lines, and water intake structure on the Nile river shore to provide fresh water to the project in addition to connecting pipelines.

Key required permit	Applicability of the permit Yes/ NA			
	PV PowerPlant	Associated Facilities		
		Sub-stations & Transmission lines	Water intake structure	Pipelines
Power plant construction permit: according to the presidential decree of Egypt, No 326/1997, to establish the Regulatory Body for Electric Utility and Consumer Protection. This permit is required as an authorization from the Egyptian Electric Utility and Consumer Protection Agency for the construction of PV plants	Yes	N/A	N/A	N/A
Buildings construction permit: according to the Egyptian Law for Buildings, Law 101 from 1996. The local governing unit is responsible for issuing the permit for buildings	Yes	Yes	N/A	N/A
Environmental permit: according to Egyptian Law for the Environment, Law 4/1994 amended by Law 9/2009. EEAA approval on ESIA is considered the environmental permit	Yes	Yes	Yes	Yes
Water abstraction license: according to Egyptian Law for the Environment, Law 4/1994 amended by Law 9/2009 and Egyptian Law for the Irrigation and Drainage, Law 12/1984. The Ministry of Irrigation and Water Resources has to approve any constructions or operations that result in abstraction of water from Nile River.	Possible	N/A	Yes	N/A
Operation permit: according to the presidential decree of Egypt, No 326/1997, to establish the Regulatory Body for Electric Utility and Consumer Protection. This permit is required as an authorization from Egyptian Electric Utility and Consumer Protection Agency to authorize the operation of electric utilities	Yes	Yes	Yes	N/A
Height construction permit: according to the Ministry of Defense and civil aviation authority.	Yes	Yes	N/A	N/A

Table 3. Required Permit for Construction and Operation of the proposed project and the associated facilities

NREA has coordinated with various concerned authorities with regard to the land allocation as indicated in the following table:

Concerned Authorities	Co-ordination Conclusion	Future Requirements
The National Center for Planning State Land Uses NCPSLU	Allocation of 37.2 Km ² Project Land to NREA	<ul style="list-style-type: none"> • Coordination with various concerned authorities including Ministry of Defence, EEAA, etc
Egyptian Environmental Affairs Agency EEAA	No objection for the construction of the project in the allocated land	<ul style="list-style-type: none"> • ESIA for the Project
Ministry of Civil Aviation	No objection for the construction of the project in the allocated land	<ul style="list-style-type: none"> • Building heights shall not exceed 45 m above sea level. • Wireless Towers are forbidden within the site
Egyptian Armed Forces Operations Authority, Ministry of Defense	No objection for the construction of the project in the allocated land	<ul style="list-style-type: none"> • Coordination with the Egyptian Armed Forces Operations Authority during construction of the project • Building heights shall not exceed 10 - 20 m from ground level.
The General Authority for Rehabilitation projects and Agricultural Development	No objection for the construction of the project in the allocated land	No requirements
New Urban Communities Authority	No objection for the construction of the project in the allocated land	No requirements
General Organization for Physical Planning	No objection for the construction of the project in the allocated land	No requirements
Ganoub El-Wadi Petroleum Holding Company	No objection for the construction of the project in the allocated land	No requirements
Tourism Development Authority	No objection for the construction of the project in the allocated land	No requirements
Aswan Governorate	No objection for the construction of the project in the allocated land	No requirements

Table 4. Conducted Coordination with various concerned authorities

2.3 National Legislation Pertinent to the Project

The legislations listed below and described in more details in Table 2 are the national legislation pertinent to the project:

2.3.1. Egyptian legislation related to environmental aspects

- EEAA guidelines and requirement for Environmental Impact Assessment; Articles 19 (1), 20 (2), 21, 22 (2) and 23 in law 4/1994 amended by law 9/2009
- EEAA Guidelines of Principles and Procedures for “*Environmental Impact Assessment*” 2nd Edition October 2010
- National environmental legislation law 4/1994, amended by Law 9/2009 with decree No 1095/2011, 710/2012 and 964/2015
- Labor Law number, Health and Safety Laws and Decrees 12/2003
- Traffic and Urban planning Laws.
- Electricity Law No 87 of year 2015

2.3.2. Egyptian legislation related to social aspects

EEAA guidelines related to the Public Consultation; Guidelines of Principles and Procedures for “*Environmental Impact Assessment*” 2nd Edition January 2009

- Land acquisition and involuntary resettlement;
- Protection of human rights;
- Protection of antiquities; and
- Procurement laws.

2.3.3. Egyptian legislation related to socio-economic environment

- EEAA guidelines related to the Public Consultation
- Paragraph 6.4.3 Requirements for Public Consultation
- Paragraph 6.4.3.1 Scope of Public Consultation
- Paragraph 6.4.3.2 Methodology of Public Consultation
- Paragraph 6.4.3.3 Documentation of the Consultation Results
- Paragraph 7 Requirement and Scope of the Public Disclosure

2.3.4. Land acquisition and involuntary resettlement

- Law 94/2003 on the National Council for Human Rights (NCHR)
- Law 10/1990 on property expropriation for public benefit
- Other laws governing expropriation

2.3.5. Protection of human rights

- Law no. 94/2003 on establishing the National Council for Human Rights

2.3.6. Protection of Antiquities

- Law 117 / 1983 concerning the protection of monuments is applicable.

2.3.7. Laws and regulations related to archaeology

- Law 119/2008
- Law 117/1983

Title of legislation	Summary and how this legislation applies to this project	Year
Environmental Law 4/1994 amended by Law 9/2009		
Article 19 of Law 4/1994 amended by law 9/2009 and Article 10 of the executive regulation 1095/2011	An EIA should be submitted to EEAA by CAA in accordance with local regulations before starting implementation of the projects.	2009/2011
EEAA ESIA guideline	Generation of electricity using wind or by solar energy are categorized C. It should be noted that project categorized C requires Full assessment and public consultation	October 2010
Executive regulation and Decree 1095/2011) Annex 6 Table 12	States that it is not allowed using the Asphalt mixing units at a distance less than 500 m away from a residential building.	2011
Article 42 of Law 4/1994 amended by law 9/2009 and Article 44 of ER 710/2012	Maximum allowable limits for ambient noise intensity and Maximum exposure duration	2012
Annex 8 and Annex 9 of ERs (amended by Decree 1095/2011 amended by Decree 710/2012)	Maximum allowable limits for air emissions, heat stress, ventilation rates within the work environment	2012
Article 33, 37, 39 of Law 4/1994 amended by law 9/2009 and ER 1095/2011 amended by Decree 710/2012)	Management of solid waste and hazardous waste generated from the facility during generation, handling, transportation and disposal.	2012
Ministerial Decree No. 44/2000 Decree of Law 93/1962	Controlling the discharge of wastewater into the sewage system and public network,	2000
EEAA ESIA guidelines related to the Public Consultation		
Based on Law number 4/1994 on Environmental	Consultation of the community people and concerned parties with the needed information about the project. All	1994

Title of legislation	Summary and how this legislation applies to this project	Year
Protection	<p>stakeholders should be invited. Paragraph 6.4.3 of Law 4/1994 on Environmental Protection provides detailed information on the scope of public consultation, methodology and documentation</p> <p>Paragraph 6.4.3 Requirements for Public Consultation in the EEAA ESIA Guidelines¹</p> <ul style="list-style-type: none"> • Paragraph 6.4.3.1 Scope of Public Consultation • Paragraph 6.4.3.2 Methodology of Public Consultation • Paragraph 6.4.3.3 Documentation of the Consultation Results • Paragraph 7 Requirement and Scope of the Public Disclosure 	
Electricity Law		
Law No 87 of year 2015	<p>Article 25: it stipulates the responsibility of the entities licensed to produce electricity</p> <p>Article 52: identifies the corporate related to electricity facility i.e. power plants of different kinds, transmission stations, overhead transmission lines and submarine cables of low, medium and high voltages</p> <p>Article 53: stipulates the right of proper compensation for the affected persons due to the establishment of electricity projects</p> <p>Article 55: identifies the Right of Ways that should be avoided for the OHTL and the underground cables:</p> <ol style="list-style-type: none"> 1- 25 meters from the center of the OHTL of extremely high voltage 2- 13 meters from the center for the high voltages 3- 5 meters for the medium voltage OHTL 4- 5 meters for the high and extremely high voltage cables 5- 2 meters for low and medium voltage cables 	
Land acquisition and involuntary resettlement		
Law 10/1990	<p>On Property Expropriation for Public Benefit (the KCSP project is a public benefit project). The law describes acquisition procedures as follows:</p> <ol style="list-style-type: none"> 1. The procedures start with the declaration of public interest pursuant to the presidential decree accompanied with memorandum on the required project and the complete plan for the project and its structures (Law 59/1979 & Law 3/1982 provided that the Prime Minister issues the decree); 2. The decree and the accompanying memorandum must be published in the official newspapers; a copy for the public is placed in the main offices of the concerned local Government unit. 	1990

¹ EEAA (2009) Guidelines and Foundations for the Procedures of ESIA. Arabic publication, second edition.

Title of legislation	Summary and how this legislation applies to this project	Year
	<p>This law has specified, through Article 6, the members of the Compensation Assessment Commission. The commission is made at the Governorate level, and consists of a delegate from the concerned Ministry's Surveying Body (as President), a delegate from the Agricultural Directorate, a delegate from the Housing and Utilities Directorate, and a delegate from the Real Estate Taxes Directorate in the Governorate. The compensation shall be estimated according to the prevailing market prices at the time of the issuance of the Decree for Expropriation.</p> <p>The project will not entail any land acquisition activities due to the following:</p> <ol style="list-style-type: none"> 1- The PV main site is located on state-owned a land which, according to law no. 10/1990, does not trigger any expropriation activities. 2- The lands that will be used for the water intake pipelines are located within the public street network. 3- The water intake pump station will be located adjacent to the existing Bin Ban Water station (this plot of land is owned by the Local Governmental Unit) 	
Law 577/1954	Law 577/54 , which was later amended by Law 252/60 and Law 13/162, and establishes the provisions pertaining to the expropriation of real estate property for public benefit and improvement.	1954
Civil code 131/1948	<p>Articles 802-805 recognize private ownership right.</p> <ul style="list-style-type: none"> • Article 802 states that the owner, pursuant to the Law, has the sole right of using and/or disposing his property. • Article 803 defines what is meant by land property • Article 805 states that no one may be deprived of his property except in cases prescribed by Law and would take place with an equitable compensation. 	1948
Protection of communities Human Rights Laws		
Law no. 94/2003	The Law on Establishing the National Council for Human Rights (NCHR) aims to promote, ensure respect, set values, raise awareness and ensure observance of human rights. At the forefront of these rights and freedoms are the right to life and security of individuals, freedom of belief and expression, the right to private property, the right to resort to courts of law, and the right to fair investigation and trial when charged with an offence. This Constitution came into force after a public referendum on 11 September 1971 and was amended on 22 May 1980 to introduce the Shoura Council and the press.	2003
Building Laws		
Unified Building Law No. 119 of year 2008	<i>Chapter one- Article 2:</i> It is banned to construct any buildings or structures outside the urbanized area endorsed for villages and	2008

Title of legislation	Summary and how this legislation applies to this project	Year
	<p>cities that did not develop strategic planning.</p> <p>The lands allocated for agriculture products or livestock are prohibited under the condition of having a ministerial decree and approval from the Ministry of Agriculture.</p> <p>The agriculture lands outside the villages and cities, and the lands allocated for constructing private building or services building; They should obtain approval from the Ministry of Agriculture.</p> <p><i>Chapter 2: Article 10:</i> The General Organization for Physical Planning (GOPP) is responsible for the development of any urban plans on the national or regional levels in accordance with the interested organization plans and the military perspectives for the safety of the State.</p> <p>The GOPP is responsible for adopting techniques, standards and measurement of monitoring of the plans</p> <p>Due to having the KCSP outside the inhabited area of the nearby villages, in accordance with this law, it will necessitate approvals from the military, Ministry of Agriculture and the Urban Planning Unit within the governorate.</p>	
Laws and regulations related to Archaeology		
Law 117/1983	<p><i>Definition of monuments</i></p> <p>Article 1 defines a monument as a building or movable property produced by different civilizations or by art, sciences and literature and religions from prehistoric era and during successive historical eras until a hundred years ago or historical buildings.</p> <p>Article 2 states that any building or movable property that has an historical, scientific, religious, artistic or literary value could be considered as a monument whenever the national interest of the country impose its conservation and maintenance without adherence to the time limit contained in the preceding Article no.1</p> <p>Article 5 of the law states that the Supreme Council of Antiquities (SCA) is the competent authority responsible for antiquities in Egypt</p> <p><i>Construction license</i></p> <p>Article 20 states that licenses of construction in archaeological sites or land are not permitted, and it is prohibited to make any installations or landfills or digging channels or constructing roads or agricultural land or for public benefits in the</p>	1983

Title of legislation	Summary and how this legislation applies to this project	Year
	<p>archaeological sites or land within its approved border lines.</p> <p>Also, Article 20 states that a buffer zone around the monument or the site is defined as three kilometers in the uninhabited areas or any distance determined by the SCA to achieve environmental protection of the other parts of the monument in the surroundings (article 20-Ch.1).The provisions of this article (20) apply on land which appears to the SCA - based on conducted studies – that there is a probable existence of monuments in the subsoil. The provisions of this article are also applied on desert and areas where quarrying work is licensed.</p> <p>Article 22 states that: licenses of construction in the immediate vicinity of archaeological sites within populated areas could be delivered by the competent authority, after the approval of SCA. The competent authority must state in the license; the conditions which the SCA emphasizes to guarantee that the building does not have a negative visual impact on the monument and its direct buffer zone that protects the archaeological and historical surroundings. The SCA has to pronounce its verdict on the license demand within 60 days of the date of submission. Otherwise, the elapsing of this period is regarded as a decision of refusal.</p> <p><i>During Construction</i></p> <p>Article 23 states that the SCA should take the necessary steps to expropriate land that is found in or kept in place and registered according to the roles of this Law. (Article 23- Ch.1). [These roles are defined in the second chapter of the Law 117 – articles 26-30].</p> <p>Article 24 states that everyone who finds by chance the part or parts of a fixed monument in its place must promptly inform the nearest administrative authority within forty-eight hours</p>	

2.3.8. Law 4/1994 for the Environmental (amended by Law 9/2000)

Ambient Air Quality and Gaseous Emissions

Articles 35 and 34 of Law 4 of its Executive Regulations amended by Decree 1741/2005 provide the maximum load of the ambient air and the permissible levels of air pollutants in emissions in Annex 5 and Annex 6 respectively. Annex 5, and Annex 6 of Law 4/1994 have been modified by ministerial decree 1095/2011 modified by 710/2012. Tables 1, 2, 3, and 4 present the maximum load of the ambient air and the permissible levels of air pollutant pertinent to the project accordingly.

Noise Pollution

Article 42 of the Law 4/1994 requires all organizations and individuals to maintain emanating sounds from different operating machinery or other sources below the permissible limits. Licensing authorities are to ensure that in a given area, the overall emanated sounds from fixed sources are within the allowable limits. In addition, licensing authorities are to ensure that machinery and equipment used by establishments fulfill the law's requirements.

Maximum permissible limits of sound intensity according to Annex 7- Table 1 of the Executive Regulations (1095/2011 modified by 710/2012) specify that noise intensity during an eight-hour work shift shall not exceed 85 decibels.

Waste management

Article 37 of Law 4/1994, articles 38 and 39 of its Executive Regulations, and Law 38 of 1967, amended by Law number 31 of 1976, deal with the collection, transportation, and safe disposal of solid wastes.

Article 39 of Law 4/1994 and Article 41 of its Executive Regulations requires precautions to be taken during any digging, construction, demolition activities, or transport of resulting waste, in order to avoid air pollution.

Articles 29 to 32 of Law 4/1994 provide regulations for the handling and storage of hazardous materials, including hazardous waste. Article 33 of Law 4/1994 specifies that all precautions must be taken when handling or storing hazardous material in any form (i.e.: gaseous, liquid, or solid).

Articles 34 to 36 address the responsibility of companies in ensuring safety of workers against chemical risks.

Articles 26, 31, and Decree 211/2003, specify conditions for the storage of flammable material, fuel, raw material, products and equipment.

Article 36 specifies that the workers should be made aware through written or oral instructions of the hazards related to the chemicals they are handling; they should also be trained on proper handling procedures.

Petroleum and Mineral Resource minister decree number 1352/2007 defines hazardous waste materials generated from petroleum industry. In addition ministerial decree number 1352/2007 prohibits handling of hazardous waste, except for entities authorized by EGPC.

Biodiversity

The main law concerned with natural protectorates is Law 102/1983. The Prime Ministerial Decree 1067/1983 designates the EEAA as the authorized administrative body charged with the implementation of law 102/1983.

At this stage, it is not expected that natural protectorates will come within the area of influence of the project. However, HP pipelines

The protection granted to the animal species listed in Annex 4 of Law 4 extends to:

- Animal species listed by Ministerial Decree 28/1967 for Article 117 of Law 53/1966, amended by Law 116/1983.
- Other animal species determined by international conventions to be ratified by Egypt.

Any other group of animals for which a decree shall be issued by the Minister of Agriculture with the agreement of the EEAA.

2.3.9. Law 38/1967 for General Cleanliness

Article 15 of the Executive Regulations stipulates that vehicles hauling construction waste should have a tight cover to prevent dispersion or falling of its contents.

2.3.10. Law 93/1962 for Wastewater

Law 93/1962 regulates the disposal of wastewater, and liquids in general, to the sewerage network. The Executive Regulations (Decree 44/2000) in Article 14 details the physical/chemical standards that should be complied with. The articles of this Law apply to the project in two main aspects:

- In case damage is caused to the sewerage network during excavation; and
- In case dewatered water from excavated trenches is discharged to the sewerage network.

2.3.11. Law 117/1983 for Protection of Antiquities

Law 117 of 1983 concerning the protection of antiquities gives the Supreme Council for Antiquities (SCA) the responsibility of management and protection and management of antiquities and archaeological sites. The law requires prior approval by that authority of plans for construction work on archaeological sites. Any legal person encountering any evidence of archaeological presence is required by law to report his finding to the General Authority for antiquities.

2.3.12. Traffic planning and diversions

Traffic Law 66/1973, amended by Law 121/2008 deals with traffic planning during construction of projects. Law 140/1956 on the utilization and blockage of public roads and Law 84/1968 concerning public roads govern the utilization or temporary obstruction of public roads. The Executive Regulations of Law 140 contain specifications for the management of construction and demolition debris. The law also allows the competent administrative authority to charge a fee for occupation of public ways.

2.3.13. Work environment and operational health and safety

Several laws and decrees tackle occupational health and safety provisions at the work place, in addition to Articles 43 – 45 of Law 4/1994, which address air quality, noise, heat stress, and the provision of protective measures to workers. These laws and decrees apply to the work crew that will be involved in construction activities.

Law 12/2003 on Labor and Workforce Safety and Book V on Occupational Safety and Health (OSH) and assurance of the adequacy of the working environment. The law also deals with the provision of protective equipment to workers and fire-fighting/emergency response plans. Moreover, the following laws and decrees should be considered:

- Minister of Labor Decree 48/1967.
- Minister of Labor Decree 55/1983.
- Minister of Industry Decree 91/1985
- Minister of Labor Decree 116/1991.

The environmental aspects that have to be taken in consideration for the workplace are noise, ventilation, temperature, and health and safety. Noise regulations and standards for the work environment are described previously.

Table 5. Limits of heat exposure permissible in the work environment

Type of Work	Low Air Speed (° C)	High Air Speed (° C)
Light work	30	32.2
Moderate Work	27.8	30.5
Heavy Work	26.1	28.9

Table 6. Limit of exposure to temperature permissible in work environment

System of Work and Rest per Hour	Low Work (°C)	Moderate Work (°C)	Heavy Work (°C)
Continuous work	30	26.7	25
75% Work, 25% Rest	30.6	28	25.9
50% Work, 50% Rest	31.4	29.4	27.9
25% Work, 75% Rest	32.2	31.1	30

2.3.14. EEAA ESIA guidelines related to the Public Consultation

Consultation with the community and concerned parties, where all the stakeholders are invited, should clearly provide attendees with the necessary information about the project. Paragraph 6.4.3 of EEAA EIA guidelines provides detailed information about the scope of public consultation, methodology and documentation thereof

- Paragraph 6.4.3.1 Scope of Public Consultation
- Paragraph 6.4.3.2 Methodology of Public Consultation
- Paragraph 6.4.3.3 Documentation of the Consultation Results
- Paragraph 7 Requirement and Scope of the Public Disclosure

2.3.15. Land Acquisition and Involuntary Resettlement

Law No. 10 of year 1990 on Property Expropriation for Public Benefit identifies infrastructure projects as public benefit activities. It describes acquisition procedures as follows:

- The procedures start with declaring the project for public interest pursuant to the presidential decree accompanied with a memorandum on the required project and the complete plan for the project and its structures (Law 59/1979 & Law 3/1982 provided that the Prime Minister issues the decree for Expropriation);
- The decree and the accompanying memorandum must be published in the official newspapers; a copy for the public is placed in the main offices of the concerned local Government unit.

This law has specified, through Article 6, the members of the Compensation Assessment Commission”. This Article states that the commission is made at the Governorate level and consists of a delegate from the concerned Ministry’s Surveying Body (as President), a delegate from the Agricultural Directorate, a delegate from the Housing and Utilities Directorate, and a delegate from the Real Estate Taxes Directorate in the Governorate. The compensation shall be estimated according to the prevailing market prices at the time of the issuance of the Decree for Expropriation.

This project will not require land acquisition or involuntary resettlement given that the project land area has been allocated by the Egyptian Government and has no inhabitants.

2.4 International Standards

In addition to the national regulations, the project should comply with typical or common international requirements. World Bank (and IFC) Environmental and Social requirements typically cover those of most other financing institutions. EBRD has similar procedures and policies and may seek to cooperate with World Bank (and IFC) to agree on common environmental and social requirements.

2.4.1 European Bank for Reconstruction and Development (EBRD) Performance Requirements

European Bank for Reconstruction and Development (EBRD) Environmental and Social Policy (EBRD Performance Requirements); EBRD has adopted a set of specific Performance Requirement (PRs) covering key areas of environmental and social impacts. These reflect EBRD’s commitment to promote EU environmental standards as well as the European Principles for the Environment. The PRs of relevance to the proposed project are shown in the table below:

Table 7. EBRD Performance Requirements (PRs) and potential applicability

EBDR Performance Requirements (PRs)	PR Triggered (Y/N)	Objective of PR
PR1 Assessment and Management of Environmental and Social Impacts and Issues	(Y)	The objectives of this PR are to: <ul style="list-style-type: none"> • identify and evaluate environmental and social impacts and issues of the project • adopt a mitigation hierarchy₂ approach to address adverse environmental or social impacts and issues to workers, affected communities, and the environment from project activities

			<ul style="list-style-type: none"> • promote improved environmental and social performance of clients through the effective use of management systems • develop an ESMS tailored to the nature of the project, for assessing and managing environmental and social issues and impacts in a manner consistent with relevant PRs.
PR2	Labour and Working Conditions	(Y)	<p>The objectives of this PR are to:</p> <ul style="list-style-type: none"> • respect and protect the fundamental principles and rights of workers <p>promote the decent work agenda, including fair treatment, non-discrimination and equal opportunities of workers</p> <p>establish, maintain and improve a sound worker-management relationship</p> <p>promote compliance with any collective agreements to which the client is a party, national labour and employment laws</p> <p>protect and promote the safety and health of workers, especially by promoting safe and healthy working conditions</p>
PR3	Resource Efficiency and Pollution Prevention and Control	(Y)	<p>The objectives of this PR are to:</p> <ul style="list-style-type: none"> • identify project-related opportunities for energy, water and resource efficiency improvements and waste minimization • adopt the mitigation hierarchy approach to addressing adverse impacts on human health and the environment arising from the resource use and pollution released from the project • promote the reduction of project-related greenhouse gas emissions.
PR4	Health and Safety	(Y)	<p>The objectives of this PR are to:</p> <ul style="list-style-type: none"> • protect and promote the safety and health of workers by ensuring safe and healthy working conditions and implementing a health and safety management system, appropriate to the relevant issues and risks associated with the project. • anticipate, assess, and prevent or minimise adverse impacts on the health and safety of project-affected communities and consumers during the project life cycle from both routine and non-routine circumstances.

PR5	Land Acquisition, Involuntary Resettlement and Economic Displacement (not triggered for this project but relevant for associated projects)	(N) ²	<p>The objectives of this PR are to:</p> <ul style="list-style-type: none"> • avoid or, when unavoidable, minimise, involuntary resettlement by exploring alternative project designs • mitigate adverse social and economic impacts from land acquisition or restrictions on affected persons' use of and access to assets and land by: (i) providing compensation for loss of assets at replacement cost; and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation and the informed participation of those affected • restore or, where possible, improve the livelihoods and standards of living of displaced persons to pre-displacement levels • improve living conditions among physically displaced persons through the provision of adequate housing, including security of tenure at resettlement sites.
PR6	Biodiversity Conservation and Sustainable Management of Living Natural Resources	(N) ³	<p>The objectives of this PO are to:</p> <ul style="list-style-type: none"> • protect and conserve biodiversity using a precautionary approach • adopt the mitigation hierarchy approach, with the aim of achieving no net loss of biodiversity, and where appropriate, a net gain of biodiversity • promote good international practice (GIP) in the sustainable management and use of living natural resources.
PR7	Indigenous Peoples	(N)	There are no Indigenous Peoples in the project area.
PR8	Cultural Heritage	(N)	<p>The objectives of this PR are to:</p> <ul style="list-style-type: none"> • support the protection and conservation of cultural heritage • adopt the mitigation hierarchy approach to protecting cultural heritage from adverse impacts arising from the project • promote the equitable sharing of benefits

² PR5 will not be triggered for the PV power plant, but it might be triggered for the associated facilities such as pipelines and transmission OHTLs depending on the routes.

³ The Site is assessed as arid areas, with scarce plant cover and low density of wildlife.

			from the use of cultural heritage in business activities <ul style="list-style-type: none"> • promote the awareness and appreciation of cultural heritage where possible.
PR9	Financial Intermediaries	(N)	This project does not involve Financial Intermediaries
PR10	Information Disclosure and Stakeholder Engagement	(Y)	The objectives of this PR are to: <ul style="list-style-type: none"> • outline a systematic approach to stakeholder engagement that will help clients build and maintain a constructive relationship with their stakeholders, in particular the directly affected communities • promote improved environmental and social performance of clients through effective engagement with the project's stakeholders • promote and provide means for adequate engagement with affected communities throughout the project cycle on issues that could potentially affect them and to ensure that meaningful environmental and social information is disclosed to the project's stakeholders • ensure that grievances from affected communities and other stakeholders are responded to and managed appropriately.

2.4.2. World Bank Safeguard Policies

The World Bank (WB) has identified 10 environmental and social safeguard policies that should be considered in its financed projects.

World Bank Safeguard Operational Policies and their applicability to the proposed project:

Table 8. Triggered OPs according to World Bank

Safeguard Policy	Triggered (Y/N)	Justifications
Environmental Assessment (OP/BP 4.01)	Y	A comprehensive analysis of the negative impacts and mitigation measures are described in the following chapters.
Natural Habitats (OP/BP 4.04)	N	The Site is assessed as arid areas, with scarce plant cover and low density of wildlife.
Forests (OP/BP 4.36)	N	Site is described as arid areas, with scarce plant cover and low density of wildlife with no forests.

Pest Management (OP 4.09)	N	The proposed project will not involve purchasing or using Pesticides.
Physical Cultural Resources (OP/BP 4.11)	N	The ESIA for the proposed project identifies no sites of cultural or religious significance to local communities. In addition, chance finds procedures will be included
Indigenous Peoples (OP/BP 4.10)	N	No indigenous people are present in project areas.
Involuntary Resettlement (OP/BP 4.12)	N ⁴	The project will not result in resettlement activities.
Safety of Dams (OP/BP 4.37)	N	Not relevant to the proposed project
Projects on International Waterways (OP/BP 7.50)	Not Applicable	
Projects in Disputed Areas (OP/BP 7.60)	N	Not relevant to the proposed project

2.4.3. EIB Environmental and Social Standards

Standard One: Assessment and Management of Environmental and Social Impacts and Risks

The overall objective of this Standard is to outline the promoter's responsibilities in the process of assessing, managing and monitoring environmental and social impacts and risks associated with the operations.

Standard One: Assessment and Management of Environmental and Social Impacts and Risks

Triggered

Standard Two: Pollution Prevention and Abatement

The objectives of this Standard are:

- Avoidance of any deterioration in the quality of human health or the environment, and any loss of biodiversity, by avoiding, reducing and, if possible, compensating/remediating significant adverse effects of projects supported by the EIB;
- Support to the EU aims of reducing greenhouse gas emissions and enhancing resource efficiency, that will ease pressures on the environment and bring increased

⁴ PR5 will not be triggered for the PV power plant, but it might be triggered for the associated facilities such as pipelines and transmission OHTLs depending on the routes.

- competitiveness through cost savings from improved efficiency, commercialization of innovations and better management of resources over their whole life cycle; and,
- Promotion of an integrated approach to prevention and control of emissions into air, water and soil, to waste management, to energy efficiency and to accident prevention for the protection of the environment as a whole and therefore, avoiding the shift of pollution from one environmental medium to another.

Standard Two: Pollution Prevention and Abatement

Triggered

Standard Five: Cultural Heritage

The objective of this Standard is to outline the promoter's responsibilities in terms of cultural heritage management, involving the actions taken to identify, assess, decide and enact decisions regarding the impact on cultural heritage associated with operations supported by the EIB

Standard Five Cultural Heritage

Not triggered as there is no cultural heritage within the project site

Standard Six: Involuntary Resettlement

- Avoid or, at least minimize, project-induced resettlement whenever feasible by exploring alternative project designs;
- Avoid and/or prevent forced evictions and provide effective remedy to minimize their negative impacts should prevention fail;
- Ensure that any eviction which may be exceptionally required is carried out lawfully, respects the rights to life, dignity, liberty and security of those affected who must have access to an effective remedy against arbitrary evictions;
- Respect individuals', groups' and communities' right to adequate housing and to an adequate standard of living, as well as other rights that may be impacted by resettlement;
- Respect right to property of all affected people and communities and mitigate any adverse impacts arising from their loss of assets, or access to assets and/or restrictions of land use, whether temporary or permanent, direct or indirect, partial or in their totality. Assist all displaced persons to improve, or at least restore, their former livelihoods and living standards and adequately compensate for incurred losses, regardless of the character of existing land tenure arrangements (including title holders and those without the title) or income-earning and subsistence strategies;

- Uphold the right to adequate housing, promoting security of tenure at resettlement sites;
- Ensure that resettlement measures are designed and implemented through the informed and meaningful consultation and participation of the project-affected people throughout the resettlement process; and
- Give particular attention to vulnerable groups, including women and minorities, who may require special assistance and whose participation should be vigilantly promoted.

Standard Six: Involuntary Resettlement

Applicable to overhead transmission line (outside the scope of this ESIA)

Standard Six: Rights and Interests of Vulnerable Groups

Standard sets out to avoid or minimize, or otherwise mitigate and remedy potential harmful effects of EIB operations to vulnerable individuals and groups whilst seeking that these populations duly benefit from such operations. As a means to foster those project outcomes, Standard 7 proposes a framework and tools to address inequalities and other factors contributing to vulnerability, and, as appropriate, to allow for equal access to and enjoyment of project benefits for those individuals and groups.

Standard Six: Rights and Interests of Vulnerable Groups

It will be triggered as there might be a minor chance finding of vulnerable groups among daily wage workers

Standard Eight: Labor Standards

With the present standards, the responsibilities of the promoter are defined to ensure that the project embraces the principles of International Labor Standards

Standard Eight: Labor Standards

Triggered

Standard Nine: Occupational And Public Health, Safety And Security

In compliance with ILO's Guidelines on occupational safety and health management systems the EU's decent work agenda the OSH Framework Directive as well as the UN Guidelines on Business and Human Rights, the EIB stresses the employers' duty of care towards project workers and society, in safeguarding occupational and public health, safety and wellbeing within the area of influence of their operations and at associated facilities

Standard Nine: Occupational And Public Health, Safety And Security

Triggered

Standard Ten: Stakeholder Engagement

As a public institution, the EIB actively promotes the right to access to information, as well as public consultation and participation; the right to access to remedy, including through grievance resolution, is equally acknowledged and actively promoted by the EIB. Standard 10 affirms the EIB's expectation that promoters uphold an open, transparent and accountable dialogue with all relevant stakeholders at the local level targeted by its EIB operations. This Standard stresses the value of public participation in the decision-making process throughout the preparation, implementation and monitoring phases of a project.

Standard Ten: Stakeholder Engagement

Triggered

EIB Financing Outside the EU:

1. For all other countries, projects financed by the EIB are expected to follow the relevant EU environmental and social principles, standards and practices, and international good practice, unless the promoter identifies in the ESIA why an exemption to this requirement is justified on the basis of affordability, local environmental considerations, cost of application or other factors.
2. For intermediated financing, Ops should confirm the use of contractual obligations on the intermediaries to verify compliance by the final beneficiaries with the relevant environmental and social standards (EU or national, with EU standards as the benchmark).

3. In all cases, the Note to the Commission should also refer to the acceptability – or subsequent verification of the acceptability - of the project to the EIB in terms of likely environmental impacts and proposed mitigation and compensation measures.

2.4.4. European Union Standards

The following is a listing of key European Union (UN) Commission Directives which apply because they are requirements of both EBRD and EIB:

Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment applies to the assessment of the environmental effects of those projects which are likely to have significant effects on the environment.

Directive 2012/18/EU on the control of major-accident hazards involving dangerous substances (amending and subsequently repealing Council Directive 96/82/EC), obliges Member States to ensure that operators have a policy in place to prevent major accidents.

Directive 2002/49/EC defines a common approach intended to avoid, prevent or reduce on a prioritized basis the harmful effects, including annoyance, due to exposure to environmental noise, including, among other, assessment methods for the noise indicators.

2.4.5. Other international guidelines

The following guidelines will be used aiming at fulfilling the requirements of World Bank, and IFC regarding the triggered safeguard policies:

- IFC EHS General guideline
- IFC EHS Guideline for Electric Power Transmission And Distribution

These Guidelines contain the performance levels and measures that are normally acceptable to World Bank and are generally considered to be achievable in new facilities at reasonable costs by existing technology. Also the General EHS Guidelines cover four areas of international good practice, these are:

- Environmental;
- Occupational Health & Safety (OHS);

- Community Health & Safety (CHS); and
- Construction and Decommissioning.

The proposed Project is assessed in accordance with the IFC guidelines, performance standards and their related guidance notes, and manuals related to environmental, social, health and safety issues.

2.5 International Conventions and Agreements

Egypt has signed and ratified a number of international conventions that commit the country to conservation of environmental resources. The following Table is showing a list of pertinent conventions to this project:

Table 9. Relevant international conventions and agreements to which Egypt is a signatory

Environmental Category	Name of Multilateral Environmental Agreement
Biodiversity and Natural Resources	Convention on Wetlands of International Importance Especially as Water Fowl Habitat (RAMSAR)
	Convention Relative to the Preservation of Fauna and Flora in their Natural State
	International Plant Protection Convention
	African Convention on the Conservation of Nature and Natural Resources
	Protocol to Amend the Convention on Wetlands of International Importance Especially as Water Fowl Habitat
	Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES)
	Convention on the Conservation of Migratory Species of Wild Animals (Bonn)
	Convention on Biological Diversity (CBD)
	Agreement for the Establishment of the Near East Plant Protection Organization
Convention Concerning the Protection of the World Cultural and Natural Heritage	

	<p>United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa</p>
	<p>Agreement for the Establishment of a Commission for Controlling the Desert Locust in the Near East</p>
	<p>International Tropical Timber Agreement</p>
	<p>International Tropical Timber Agreement, 1994</p>
	<p>Protocol Concerning Mediterranean Specially Protected Areas</p>
	<p>Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean</p>
<p>Hazardous Materials and Chemicals</p>	<p>Convention on Early Notification of a Nuclear Accident</p>
	<p>Convention Concerning Prevention and Control of Occupational Hazards Caused by Carcinogenic Substances and Agents</p>
	<p>Convention on the Prohibition of the Development, Production and Stock-Piling of Bacteriological (Biological) and Toxin Weapons, and on their Destruction</p>
	<p>Protocol on the Prevention of Pollution of the Mediterranean Sea by Transboundary Movements of Hazardous Wastes and their Disposal</p>
	<p>Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal</p>
	<p>Amendment to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal</p>
	<p>Bamako Convention on the Ban of the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa</p>
	<p>Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency</p>
	<p>Joint Protocol Relating to the Application of the Vienna Convention (on Civil Liability for Nuclear Damage) and the Paris Convention (on Third Party Liability in the Field of Nuclear Energy)</p>
	<p>Convention on Nuclear Safety</p>
<p>Vienna Convention on Civil Liability for Nuclear Damage</p>	
<p>Convention on the Prohibition of Military or any other Hostile Use</p>	

	of Environmental Modification Techniques
	Stockholm Convention on Persistent Organic Pollutants (POPs)
Atmosphere and Air Pollution	United Nations Framework Convention on Climate Change
	Kyoto Protocol
	Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water
	Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space Including the Moon and Other Celestial Bodies
	Vienna Convention for the Protection of the Ozone Layer
	Montreal Protocol on Substances that Deplete the Ozone Layer
	(London) Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer
Health and Worker Safety	(Copenhagen) Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer
	Convention Concerning the Protection of Workers Against Occupational Hazards in the Working Environment due to Air Pollution, Noise and Vibration
Institutional and Other Topics	Convention Concerning the Protection of Workers Against Ionizing Radiation
	Treaty Establishing the African Economic Community

2.6.1 OP 4.01 – Environmental Assessment

According to the World Bank Operational Policy OP 4.01, the Natural Gas Connection Project is classified among Category A projects. Projects under this Category are likely to have significant adverse environmental impacts that are sensitive⁵, diverse, or unprecedented.

The environmental impacts that are likely to be caused by the project shall be analyzed in this study. Mitigation measures shall be identified for all expected negative impacts, along

⁵ A potential impact is considered “sensitive” if it may be irreversible (e.g., lead to loss of a major natural habitat) or raise issues covered by OP 4.10, *Indigenous Peoples*; [OP 4.04, Natural Habitats](#); [OP 4.11, Physical Cultural Resources](#); or [OP 4.12, Involuntary Resettlement](#).

with an Environmental Management and Monitoring Framework presenting mechanisms for implementation of these mitigation measures.

2.6.2. OP 4.11 – Physical Cultural Resources

Project areas may include sites, buildings and monuments that fall under the definition of Physical Cultural Resources⁶. Because the project will include significant excavations in many, which may be near sites of cultural value, there has been specific attention in this study to identify the locations of such sites, and to develop mitigation measures for controlling the effects on such sites. These mitigation measures are also reflected in the Environmental Management and Monitoring Framework.

⁶ Physical Cultural Resources are defined as movable or immovable objects, sites, structures, groups of structures, and natural features, and landscapes that have archeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance.

2.6 Gap analysis for key environmental concerns: Egyptian Laws and WB Policies.

As stated in IFC general EHS guideline, when host country regulations differ from the levels and measures presented in the EHS Guidelines, projects are expected to achieve whichever is more stringent. Therefore the following tables are presenting comparisons between Egyptian Threshold, and IFC threshold for pertinent impacts.

Table 10. Maximum Permissible Limit for noise intensity according to Egyptian and World Bank requirements

	Egyptian Law 4 Requirements			Requirements of WB		
	Permissible limit for noise intensity decibel			Receptor	One hour L _{Aeq} (dBA)	
		DAY 07–22 hrs	NIGHT 22- 07 hrs		DAY 07–22 hrs	NIGHT 22- 07 hrs
Noise	TYPE OF AREA					
	Sensitive Areas (schools-hospitals- public parks- rural areas)	50	40	Residential	55	45
	Residential areas with limited traffic and where public services are available	55	45	Industrial	70	70
	Residential areas in the city where commercial activities are available.	60	50			
	Residential areas located adjacent to roads which width is less than 12m, and workshops or commercial or entertainments activities are found.	65	55			
	Areas located adjacent to roads which width is 12m or more, or light industrial areas.	70	60			
	Industrial areas (heavy industries)	70	70			

Table 11. Standards and Limits for Noise Levels in the Work Environment

Egyptian Law 4 Requirements		Requirements of WB			
Noise	TYPE OF PLACE AND ACTIVITY	MAXIMUM PERMISSIBLE NOISE [level equivalent to decibel (A)] at the beginning of 2014	Location /activity	Equivalent level LAeq,8h	Maximum LAmax,fast
	Work place with up to 8 hour shifts and aiming to limit noise hazards on sense of hearing*	85	Heavy Industry (no demand for oral communication)	85 dB(A)	110 dB(A)
	Hospitals, clinics, public offices, etc	80	Light industry (decreasing demand for oral communication)	50-65 dB(A)	110 dB(A)
	Administrative offices – control rooms	65	Open offices, control rooms, service counters or similar	45-50 dB(A)	N/A
	Work rooms for computers, typewriters or similar equipment	70	Individual offices (no disturbing noise)	40-45 dB(A)	N/A
	Work rooms for activities requiring routine mental concentration	60	Hospitals	30-35 dB(A)	40 dB(A)

*: If the measured noise at the workplace increased over the maximum allowable limit by 3 dBA, the exposure period shall be reduced to half of the exposure period. In addition, wearing proper ear muffs is a must. Noise level at any time at the work place shall not exceed 135 dBA. Noise shall be measured inside working environment in LAeq unit in accordance with ISO 9612/ ISO 1996 or Egyptian standards

Table 12. Standards for ambient air and air emissions

Issue	Requirements of Egyptian legislations ($\mu\text{g}/\text{m}^3$)				Requirements of WB ($\mu\text{g}/\text{m}^3$)			
	Ambient air pollutants threshold (Egyptian)				Ambient air pollutants threshold According to WHO			
Ambient air parameters	1 hr	8 hr	24 hr	1 Year	1 hr	8 hr	24 hr	1 year
Exposure period								
Carbon monoxide $\mu\text{g}/\text{m}^3$	30	10	N/A	N/A	N/A	N/A	N/A	N/A
Sulfur dioxide $\mu\text{g}/\text{m}^3$	350	N/A	150	60	N/A	N/A	125	N/A
Nitrogen oxides $\mu\text{g}/\text{m}^3$	300	N/A	150	60	200	N/A	N/A	40
Particulates PM ₁₀ $\mu\text{g}/\text{m}^3$	N/A	N/A	150	70	N/A	N/A	150	70
Particulates PM _{2.5} $\mu\text{g}/\text{m}^3$	N/A	N/A	80	50	N/A	N/A	N/A	N/A
TSP $\mu\text{g}/\text{m}^3$	N/A	N/A	230	125	N/A	N/A	230	80
Ozone	180	120	N/A	N/A	N/A	160	100	N/A

All parameters (are mg/m^3) unless otherwise noted. Nm3 is at one atmospheric pressure, 0 degree Celsius;

- N/A = not applicable; NDA = Non-degraded airshed; DA = Degraded airshed (poor air quality); Airshed should be considered as being degraded if nationally legislated air quality standards are exceeded or, in their absence, if WHO Air Quality Guidelines are exceeded significantly;

***: Egyptian requirements are compulsory for all types, and capacities of boilers which are different than the world bank requirements. According to IFC General EHS guidelines the mentioned limits are for boilers with capacity (3 to 50) MWth.

Table 13. Max. Emission allowable limit for mix Asphalt units according to the Egyptian Regulations

Max. Emission allowable limit for mix Asphalt units (mg/m ³)		
Total VOCs	CO	Total particulate matters
50	500	50

Table 14. Maximum allowable limits for discharge of wastewater into the sewage system and public network

Parameter	Limit PPM unless otherwise stated
Temperature	Not more than 40 C
pH	6-10 (unit-less)
BOD	400
COD	700
Phenol	0.005
Lubricants, oils & resins	100
Mercury compounds	10
Iron	10
Manganese	10
Copper	10
Zinc	10
Arsenic	10
Cadmium	10
Chromium	10
Cyanure	10
Lead	10

3. Project Description

3.1 Background

The project is to utilize solar energy to generate electric power with a capacity of 50MW to be connected to the national grid. The proposed photovoltaic plant consists of the following main components:

- **Solar field:** Main components of photovoltaic power plant or “solar field” consists of a large group of semiconductor technology based silicon solar cells arranged in what is known as solar PV panel or solar module. Solar panels convert impinging sun rays (photons) to electrons. The electrons’ flow generates direct current (DC) electricity which gets collected and channeled into an electronic device “inverter” to invert the DC current into Alternating Current (AC); the form of electricity used to power homes, neighborhoods, factories, cities, etc.
- **Racking:** Structural components which support the PV panels. These structures could be stationary (fixed) or movable thru utilizing a “tracking system” to track sun movement during the day, thru out the entire year.
- **Tracking:** This is a mechanical system attached to the racking system to enable it to track sun movement. This could be a one axis tracking system (similar to the system used in this project) and it could also be a two axis tracking system, as another alternative.
- **Other** electric and/or electromechanical system components, such as cables, inverters, transformers, switchgear and controls are used to control and condition the power output of the solar field. An inverter is used to convert the electricity which is produced as direct current in to alternating current for the purpose of grid connection. in order to connect a large solar facility to the national grid , numerous inverters will be arranged in several arrays to collect , and convert the produced power.
- **Connection to the grid:** Routing energy generated from solar field to the national electricity grid.

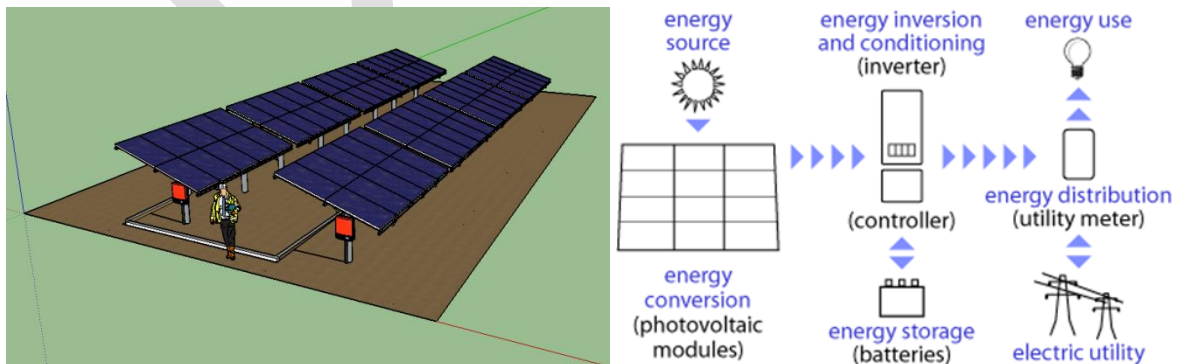


Figure 4. Main Components of a PV Power Plant

3.2 Project Location

The proposed 60 PV Power plant with 0.98 km² total area would be located in the western desert, which is one of the driest areas in Egypt, approximately 40 km northwest of Aswan city. The area designated for the project is approximately 37 km² owned by NREA within Aswan governorate administrative jurisdictions. The Nile River is approximately 15 km east of the site. Settlements in the vicinity of the project area includes Benban Al Gdeeda (approximately 12 km to the east) and Faris Village (approximately 20 Km to the northeast).

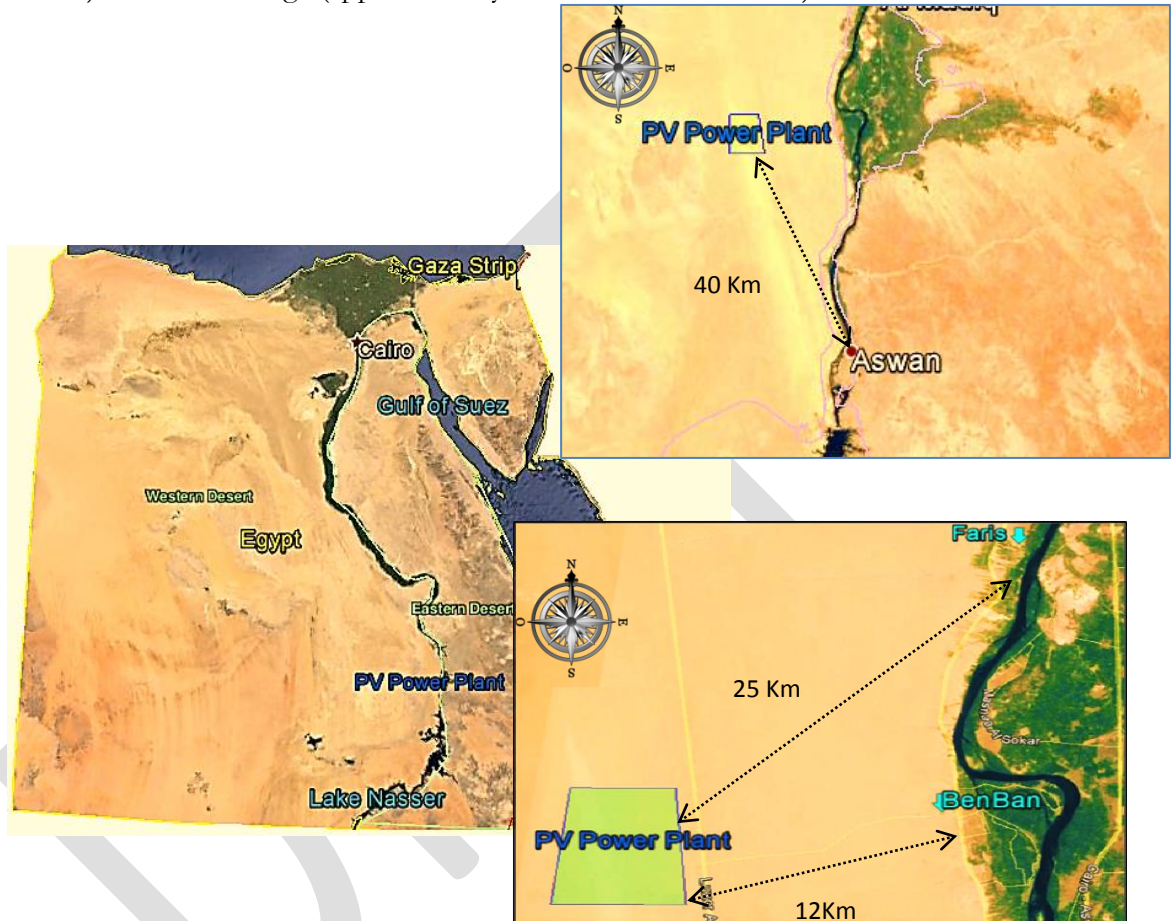


Figure 5. Satellite images for the project location

The NREA project eastern boundaries flows roughly parallel 500 m west to the existing 500 KV high voltage line as shown in the following figure. The closest existing building to the site is an under rehabilitation ambulance station shown in the figure, and the uncompleted constructions nearby. Close to the other boundaries of the location there is no evidence of existing activities or constructions.

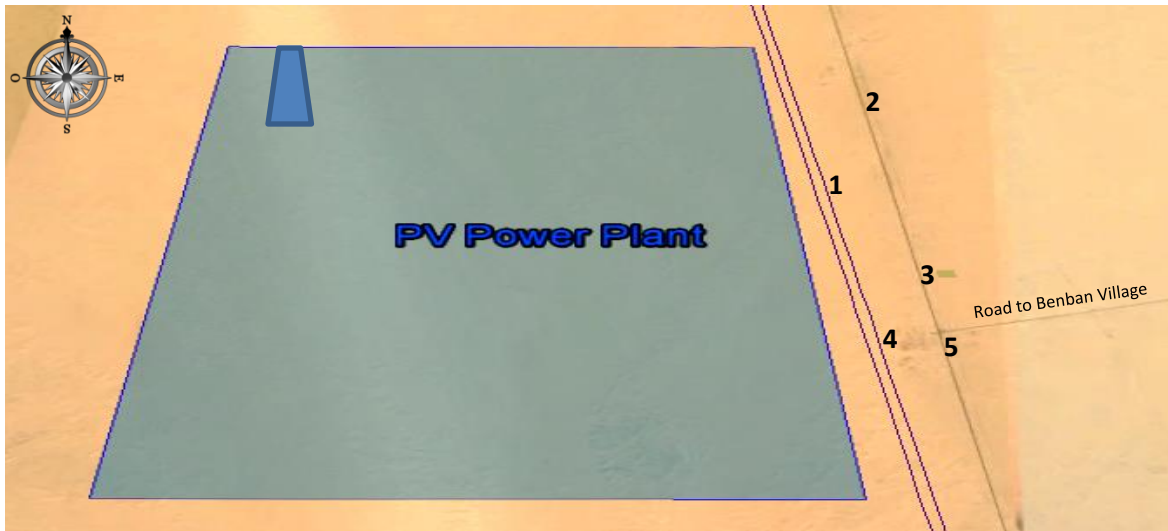


Figure 6. Surroundings of the area designated for the PV power plant

The coordinates of the PV power plant four corners are indicated in following table.

Table 15. Coordinates of owned land by NREA

Point	Latitude N	Longitude E
1	24° 27' 19.874''	32° 42' 5.838''
2	24° 26' 26.387''	32° 42' 5.844''
3	24° 26' 26.385''	32° 41' 44.895''
4	24° 27' 19.870''	32° 41' 44.887''

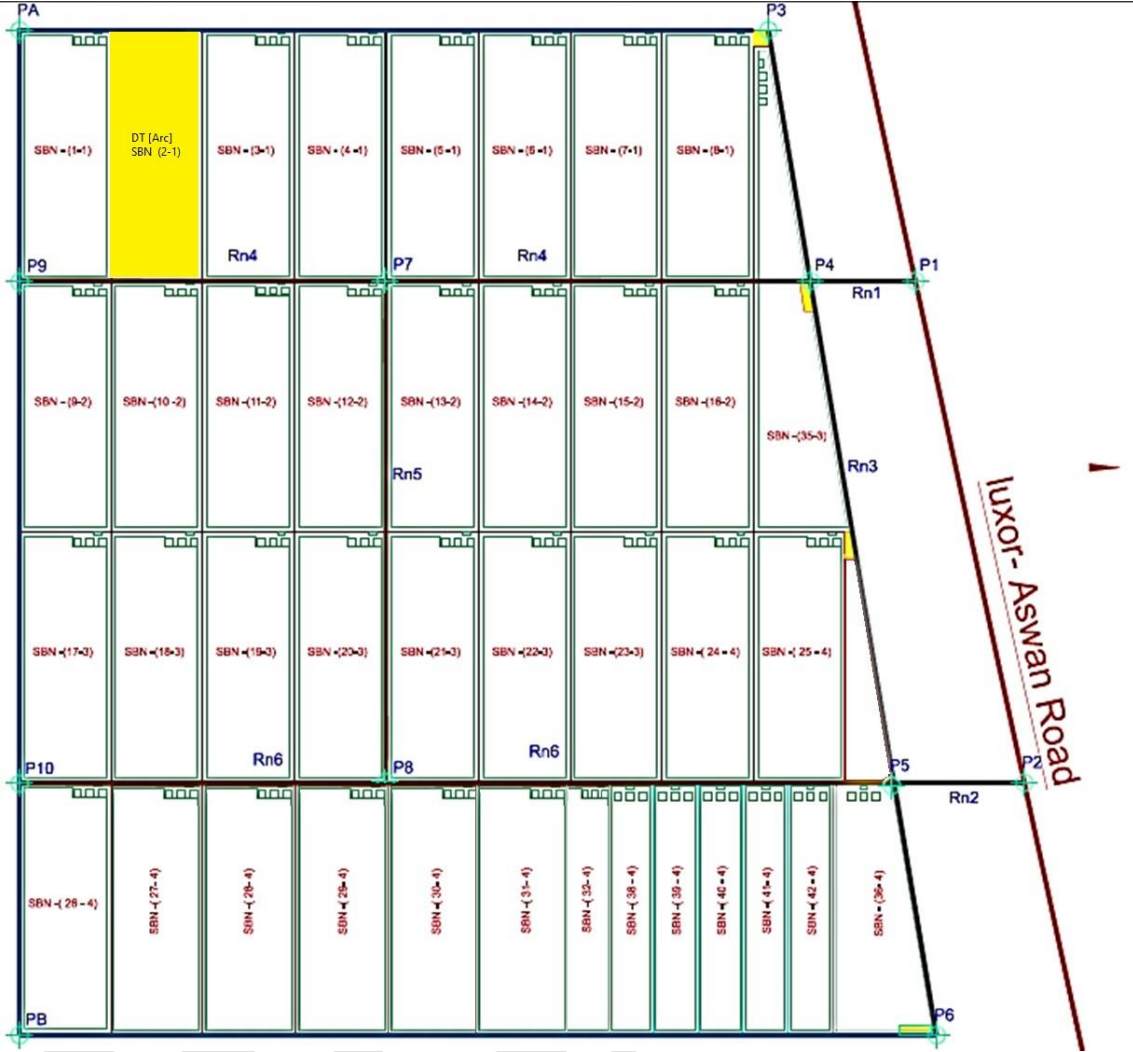


Figure 7. Area and plots designated for DESERT TECHNOLOGIES PV power plant



photos

Figure 8. Area designated for DESERT TECHNOLOGIES PV Plant

3.3 Proposed Technology / design

Photovoltaic (PV) is a method of generating electrical power by converting solar radiation into direct current electricity using semiconductors that exhibit the photovoltaic effect. Photovoltaic power generation employs solar panels composed of a number of cells containing a photovoltaic material. Materials presently used for photovoltaic include monocrystalline silicon, polycrystalline silicon, amorphous silicon, cadmium telluride, and copper indium selenide/sulfide. Photovoltaic is the direct conversion of light into electricity at the atomic level. Some materials exhibit a property known as the photoelectric effect that causes them to absorb photons of light and release electrons. When these free electrons are captured, an electric current results that can be used as electricity.

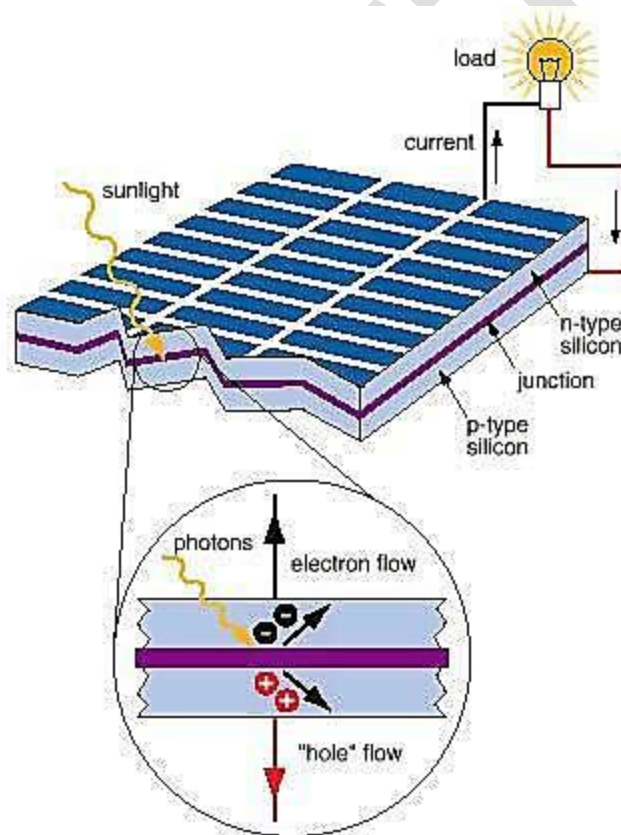


Figure 9. Solar cell's energy exchange

3.3.1. General components

The key components of the Project are the power arrays which are composed of several Photovoltaic (PV) panels which convert solar energy into electricity. The Project includes a group of power arrays distributed throughout the Project site where each array will have the PV panels that receive and transform the solar energy. Typical PV power arrays are shown in Figure below.



Figure 10. Typical PV Power Arrays Composed of PV Panels

The Project will also include underground cables which connect the power arrays with a collector station. The collector station collects all the electricity from the underground cables and then connects with a substation, which will connect to the National Grid. Other buildings and infrastructure needed onsite include:

- 2x20 container for security
- 1 substation
- 23 inverters (SMA PVPS 2200)
- 23 transformers
- Building for Operation & Maintenance

The plant should be a combination of Polycrystalline PV modules of 315Wp units, totaling 9,522 strings, including 190,440 PV modules, providing a total capacity of 59.9 MW DC/50 MW AC .

The PV modules will have a Tracking system which consists of ground mounted steel profiles suspending torsion beams that support rows of PV modules at a row-to-row distance of 4m, thereby providing a minimum aisle width of more than 2m. The Module Rows will track the daily path of the sun from east to west based upon long-term passive algorithms that determine the sun's precise position throughout the day and throughout the year.

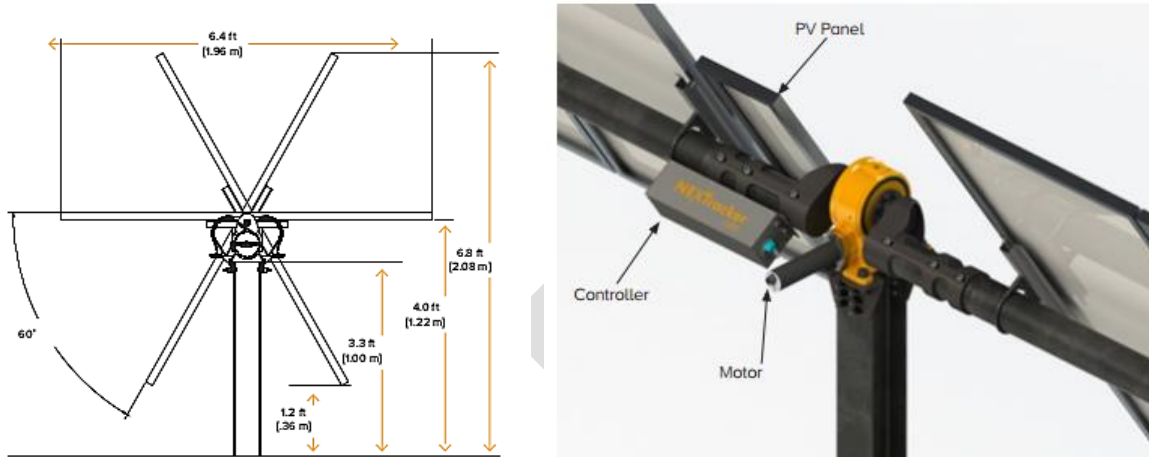


Figure 11. Sun tracking system

Central inverters technology; the plant will be connected to a Substation. The system will be connected to 23 Inverter stations.

Power from PV power plant is proposed to be evacuated to the 220 kV substation which will be about 1 km distance from the power plant.

3.4 Activities of the Construction Phase

Planning and Construction Phase: This phase includes preparation of a detailed design for the Project, planning and transportation of the project components to the site (e.g. PV modules), and onsite preparation activities for installation of the PV arrays and various other components. Site preparation activities could include excavations, grading, levelling, and land clearing activities.

- DESERT TECHNOLOGIES [ARC] is one of 39 investors planning to complete construction of their PV power plant within a 7-11 month period this may lead to

traffic impacts on the main highway and on the internal roads of the Benban solar park.

- The NREA is currently evaluating the water intake for the Benban solar park. Some options are taken into consideration.
- With similar projects it is expected there will be around 150 workers during construction phase where the water requirement on a per capita basis is expected to not surpass 50 liters/day. Thus the projected water estimate per month is approximately 225,000 liters/month (225 m³/month). However additional margin of water should consider to account for dust fugitive emissions of site nature.
- Additionally the same periods may exhibit a large influx of workers for all 39 projects. H&S and housing (whether on-site in temporary accommodation or off-site) issues may arise.

3.5 Activities of the Operation Phase

Operations Phase: This phase involves power production and maintenance of the PV Power Arrays and all the various electrical equipment. This includes, notably, regular PV module cleaning to prevent dust build-up which could affect their performance.

- The DESERT TECHNOLOGIES Plant is planned to be cleaned monthly, every month with dry cleaning techniques and each two months, it will applied wet cleaning.
It is estimated that 3 liters/PV modules is required, hence having 190,440 PV modules will required 571.32 cubic meters per wet cleaning operation, that means 3427.92 m³/year
- Module cleaning is always according to PV module manufacturer specification. The water should be demineralized and low salt.
- Up to the time of completion of this ESIA, the water supply issue is being addressed collectively by the Benban investors (currently forming an association). The investors have signed a collective request for NREA to support them in addressing the water supply issue. The options are:
 - **OPTION 1. Groundwater:** Aquifer around 200-250m deep according to hydrogeological studies. However, there are no reliable references on the size, quality, or discharge/recharge of the aquifer at the project site. A site-specific ground water resources assessment should be carried out in collaboration with Ministry of Irrigation and Water Resources before drawing the water required for the 39 projects from the aquifer.
 - **OPTION 2. Intake (plus pipeline)** from the Nile river (ca. 17km) directly to a site local distribution network. Impacts of such an intake have been studied

thoroughly in the Kom Ombo CSP ESIA and information is available to NREA for assessing options.

- *OPTION 3.* Arrange for **shipments of water** with tank trucks and on-site storage deposits.

3.6 Decommissioning Phase

It is unclear whether NREA would take ownership of the Project after 25 years and continue operating it, or whether the Project will be completely decommissioned. In the case of decommissioning of the Project, decommissioning activities could include the disconnection of the various Project components for final disposal.

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4. Description of Baseline

4.1 Introduction

This chapter includes the environmental and social baseline conditions at the project’s area of influence. The Consultant has reviewed available literature and public sources and visited the site and its surrounding area. This chapter makes extensive and direct use of information on the physical environment; biological environment; and heritage as presented in the Kom Ombo CSP ESIA as these data and survey findings are still valid and cover the same area. This was confirmed in site visits in October-November 2015. Socio-economic information as used for the Kom Ombo study was checked for validity; updated and extensively extended.

4.2 Physical Environment

4.2.1. Climatic Conditions

The Aswan region is part of the arid belt of Egypt where rainfall is negligible; the exception is the occasional heavy torrential rainfall on the eastern highlands. The average maximum temperature varies from 21.6 C° in winter to 37.9 C° in summer, and the average minimum temperature varies from 6.7 C° in winter to 21.7 C° in summer. The maximum relative humidity is 51 % in winter and 27% in summer. Prevailing winds are NW to SE with an average maximum monthly speed of 10 knots/hr (August) and an average minimum speed of 6 knots/h (January). The climate in Aswan is called a desert climate. There is virtually no rainfall during the year. This climate is considered to be **BWh** according to the Köppen-Geiger climate classification.

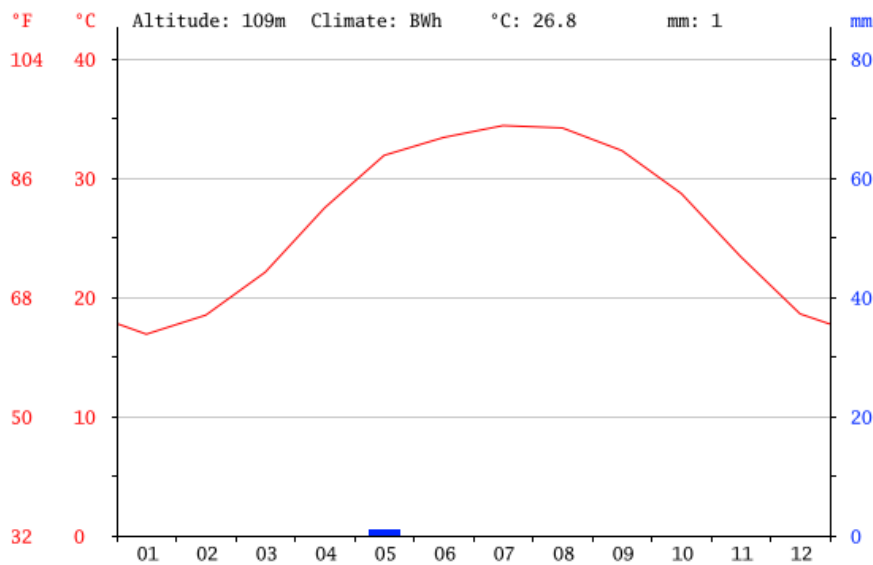


Figure 12. Climate Graph of Aswan Governorate

Table 16: Main climatic parameters at Lake Nasser

Month	Air Temperature		Relative Humidity %	Wind Speed (knots)	Rainfall (mm)	Evaporation rate Nasser Lake (mm/day)
	Mean (max)	Mean (min)				
Jan	23.7	9.9	35	5.6	0.1	2.9
Feb	25.9	11.0	24	6.5	0.1	5.4
Mar	30.4	14.3	16	7.0	0.1	7.4
Apr	35.5	16.9	15	7.4	0.3	8.9
May	39.6	23.4	15	7.2	0.0	10.0
Jun	41.7	25.6	13	7.7	0.0	11.2
Jul	41.5	26.3	19	7.1	0.0	10.7
Aug	41.9	26.4	19	7.1	0.0	10.6
Sep	39.6	24.0	21	7.1	0.0	9.5
Oct	36.9	24.0	23	7.3	0.0	8.0
Nov	30.8	21.6	32	6.2	0.0	6.5
Dec	25.5	16.4	37	6.6	0.0	4.5

4.2.2 Geomorphology

The Nile Valley occupies the alluvial tract along the River Nile. Along this course no tributary joins the Nile. After entering Egypt at Wadi Halfa it passes for more than 300 km through a narrow valley surrounded by cliffs of sandstone and granite on both its eastern and western sides until it reaches the First Cataract 7 km south of Aswan. The construction of the Aswan Dam at the beginning of 20th century inundated part of the agricultural land along this stretch and the Aswan High Dam turned parts of the Nubian Desert into a vast reservoir forming one of the largest man-made lakes, extending to almost 4½° of latitude from Aswan to the Dal Cataract in Sudan.

The natural gradient of the River Nile in Nubia (1 m/11 km) is slightly higher than in the remaining 1,100 km of its course to the sea. North of Aswan, the Nile Valley broadens and the agricultural areas between the river and the cliffs either side of its valley increase in width. Near Esna, about 160 km north of Aswan, the cliffs change from sandstone to limestone.

In the Benban, three geomorphic units are present:

- The alluvial plains with their cultivable land.
- Cliffs of sandstone surrounding the alluvial plains of the Nile Valley.
- The Basement Complex (Igneous and metamorphic rocks).

The following includes a description of the first two (of the three mentioned) units:

The Alluvial Plains.

In the Nile trough the alluvial plains are differentiated into the young alluvial plain and the old alluvial plain. The young alluvial plain comprises essentially the present Nile flood plain which occupies the central portion of the Nile Valley, with underlying silty clay deposits. The area is extensively cultivated. The surface is almost flat, slopes very gently northward and the ground elevation is about 700 m above sea level. The surface is characterized by the present channel of the Nile and the complex of irrigation canals and drains.

The old alluvial plains occupy the outer portions of the Nile and rise more than 50m above the young alluvial plain. The surface is on top of mixed sand and gravels, structured into conspicuous terraces. Portions of the alluvial plains are under cultivation with irrigation either by groundwater or river water.

The Sandstone cliffs

These cliffs surround the alluvial plain on both sides of the Nile valley. They consist mainly of colored sandstone and shale beds. Shallow depressions are distributed in the sandstone plain. The Benban project site lies in this area.

4.2.3 Topography

The entire project site is nearly flat hard sandy and gravel ground with a general slope downward in the northeasterly direction. Ground levels vary from 140 m to 150 m and rarely exceed 150m. Away from the project site, on the south western side occur high mountains (Gabal El-Barqa) of about 500m high.

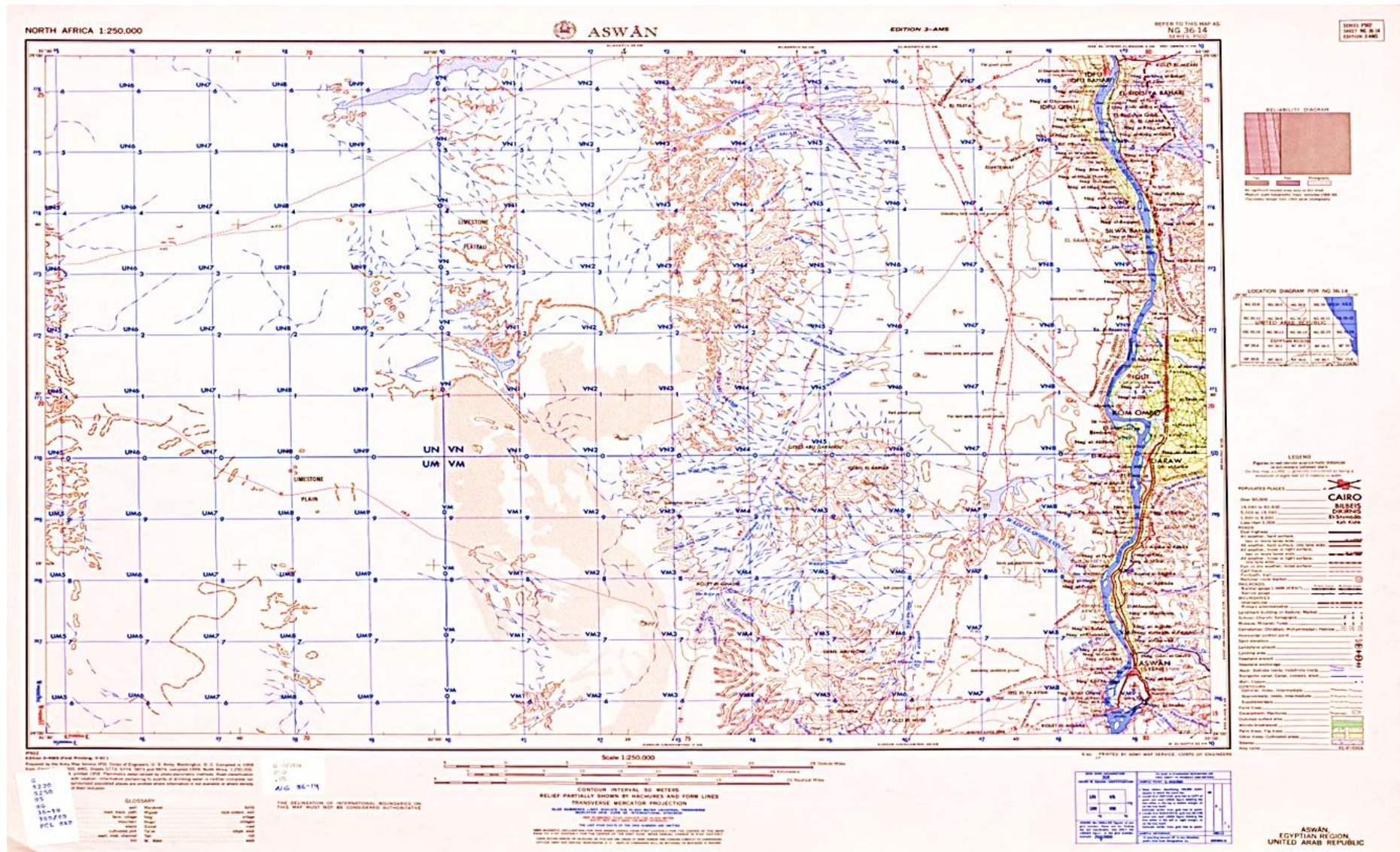


Figure 13: Topographic Map of Aswan (Scale 1:1.250.000)

4.2.4 Geology of the Aswan region

In the Aswan region, the sedimentary succession can be differentiated into the lithostratigraphic units described below (from the younger (top) to the older unit), this also applies to the KCSP project site located approximately 47km north of Aswan :-

The Quaternary- Pliocene Rock unit, differentiated into the following subunits:

The Aeolian sand deposits, sand sheets and sand dunes, (thickness < 10 m). The silty clay deposits of the present Nile flood plain, the outwash deposits of the desert wadis, the playa deposits of the desert depressions, the travertine deposits, the inverted wadi deposits and the paleosols mainly in the form of Terrarose (Holocene - Pleistocene), (thickness < 50 m). The graded sand and gravel (Prenile); forming the main aquifer (thickness < 200 m). The mixed clay sand and gravel (Protonile) forming a secondary aquifer (thickness < 100 m). The main clay layer with interbeds of sand (Paleonile), assigned to the Pliocene and forming an aquiclude, (thickness >50m).

The Upper Cretaceous-Paleozoic Sandstone Rock Unit composed of sandstone with shale interbeds and having an exposed thickness of about 300 m. In the subsurface the thickness is expected to increase to more than 1000 m.

Precambrian Rock Unit; composed of highly fractured igneous and metamorphic rocks and having a limited geographical distribution on the surface. In the subsurface these extend almost all over the area and exist at varying depths below the surface.

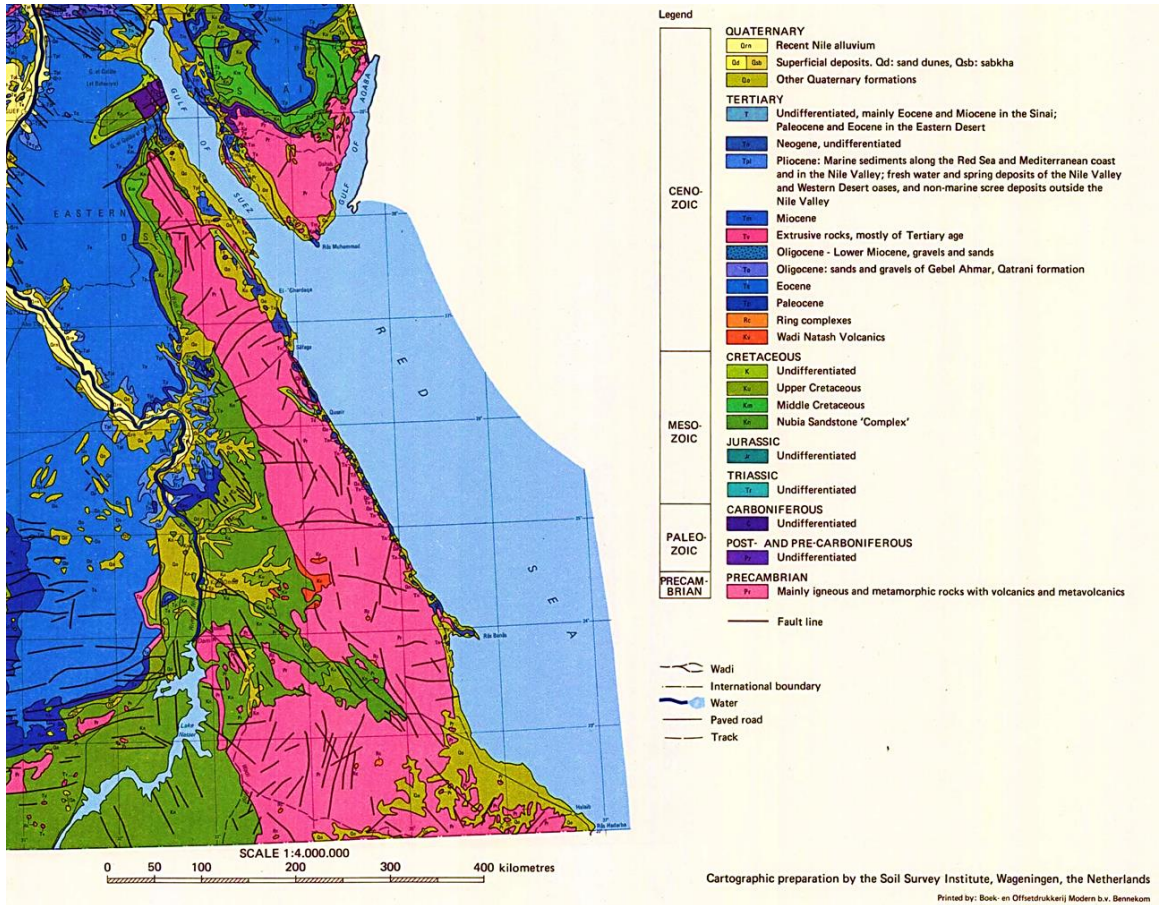


Figure 14. Geology of the Region

4.2.5 Soil Characteristics

Yellow sand and gravel sheets cover most of the area, plus darker coloured sheets at the eastern side. These dark sheets (old alluvial plain) are of a brownish yellow layer (about 1m thick) of coarse and medium gravel (mainly quartz) over a dark gray sandy mud layer of about 1m thickness. Yellow sand and gravel sheets lie directly over the Nubian Sandstone.

Local villagers at the project site sieve these sand sheets to collect coarse and very coarse sand fractions for use in filters for fresh water treatment. The fine sands that of these sand sheets will at times of wind cover the PV panels and consequently decrease their efficiency, necessitating regular cleaning.

The surface at the site is probably stable enough for the construction of the panel arrays without additional concrete foundations, but geotechnical investigations at each plot will be needed to confirm this.



Figure 15. Panoramic view of the area



Figure 16. Sandstone and gravel sheets

4.2.6 Seismic activity

Some areas such as Kalabsha (60 km southwest of Aswan, approximately 100 km distance to the Benban site) are known to be seismically active. An earthquake in November of 1981 had a magnitude of 5.5 (Helwan station) or 5.1- Richter Scale (NOAA). It was strongly felt in Aswan and in areas to the north up to Assiut and to the south up to Khartoum. The intensity near the epicenter was between VII and VIII on the Mercalli earthquake intensity scale (ranging from I-‘not felt’ to X-‘extreme’). Several cracks on the west bank of the lake and several rock-falls and minor cracks on the east bank were reported. The largest of these cracks is about 1 m in width and 20 km in length (Kebeasy et al. 1982). This earthquake was preceded by three main foreshocks and followed by a large number of aftershocks. The focal depth of this earthquake seems to be very shallow (Kebeasy et al. 1982). The ISC (International Seismological Center) and NOAA estimate the depth to be 0 and 10 km respectively; Savage (1984), using both P- and S-waves, estimates the depth to be 19 to 20 km. This depth is consistent with the depth range of the well-located aftershocks (Simpson et al. 1984, Topozada et al. 1984).

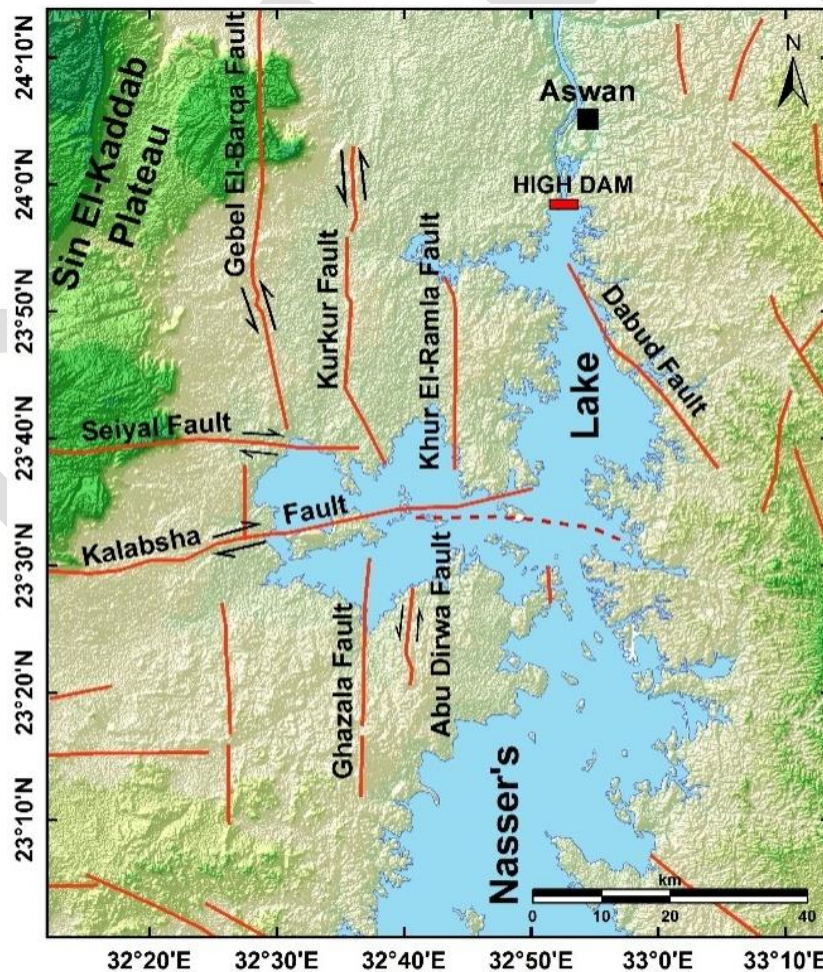


Figure 17. Geological and tectonic features around Nasser's Lake (Sawires, et al. 2015)

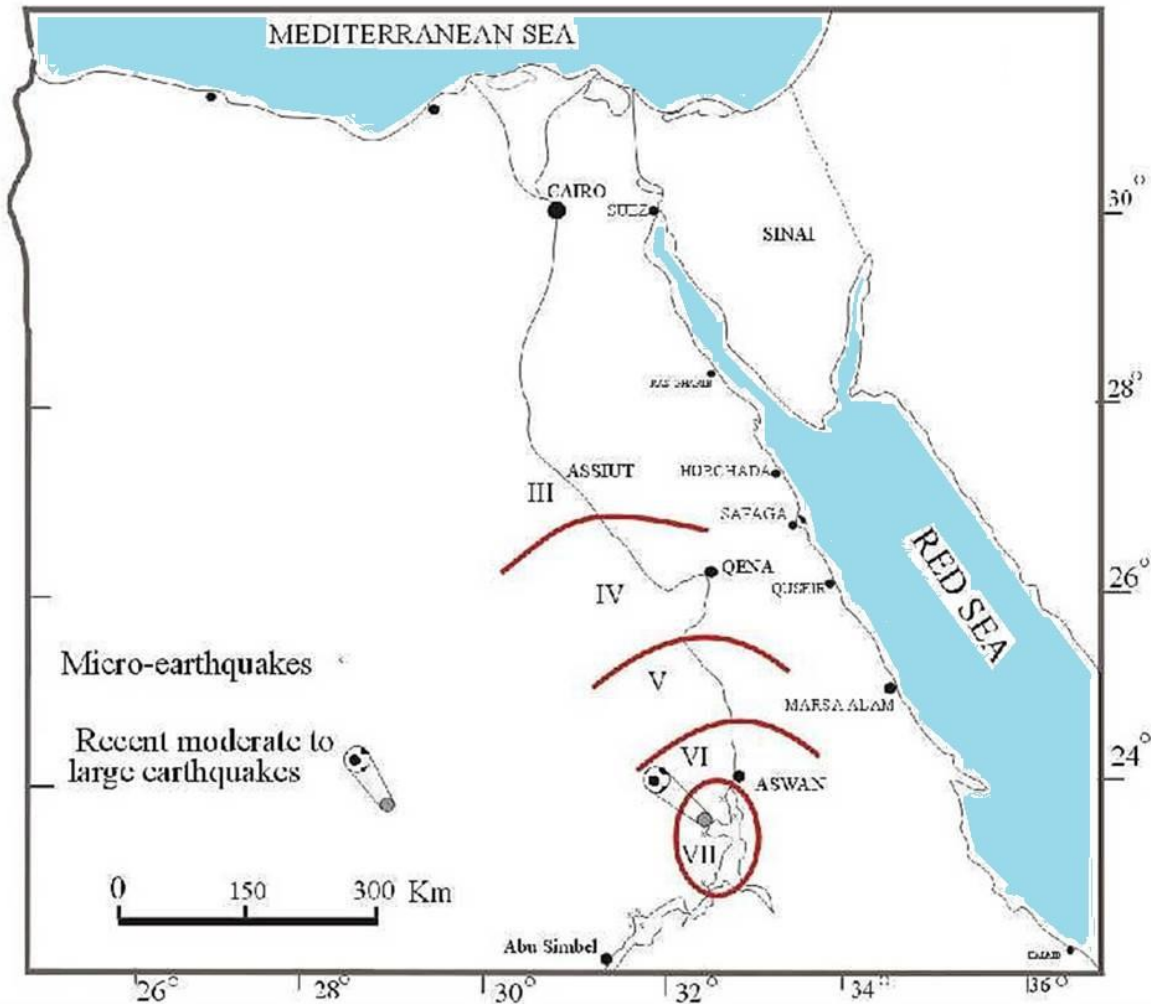


Figure 18. Epicentral distribution of earthquakes in the Lake Nasser are (III-VII on Mercalli Scale)

Frequency of Earthquakes

The number of earthquakes is a basic characteristic of the seismic activity of any given locality during a specific period of time. Savage (1984) investigated the activity around Aswan during the interval from 27 BC to 1984 and estimated the occurrence of earthquakes of a magnitude of 5.5 or more as once in approximately 300 years. The rate of seismicity and tectonic activity in the wider project area is therefore low although earthquakes of a higher magnitude can occur.

4.2.7 Hydrogeology

Data about the hydrogeology of the Aswan area are available from observation wells drilled by RIGW in the Nile Valley, in the east and west of Lake Nasser; wells drilled by the Lake Nasser Development Authority; wells drilled by farmers in the area of the project site; and from detailed maps (1:100,000). Information available includes the groundwater levels, the amount of groundwater extraction, and groundwater quality. A well at a short distance east of the project site showed that the groundwater level might be at 245m below surface, producing slightly brackish water.

Hydrogeological Units

The classification of rock formations with regards to groundwater occurrence is based on the description of UNESCO (1983), ACSAD (1985) as well as RIGW and IWACO (1989 and 1991). The following describes the main hydrogeological units arranged from top to bottom:-

Hydrogeological Unit No. 1: represented in the Nile Valley, composed of graded sand and gravel with thin interbeds of clay. It is extensive and is also highly productive. This unit occupies much of the Nile Valley, and it is capped by silty clay layer which acts as an aquitard. The groundwater in this unit is under semi- confined condition. In the outer portion of the valley, where the silty clay layer is missing the groundwater is locally under phreatic condition.

Hydrogeological Unit No.2: represented in the Nile Valley, composed mainly of mixed, sand and gravels. The geographical distribution of this unit is not extensive and moderate productivity. The groundwater in this unit is generally under phreatic conditions. In the subsurface it underlies the unit described before, but no details are available.

Hydrogeological Unit No.3: composed of porous sandstone with shale interbeds belonging to Mesozoic-Paleozoic. In the subsurface it underlies the unit No. 2. It is highly to moderately productive. This unit extends underneath the Kom Ombo CSP main site (SE corner of the Benban site).

In addition to the above three units, the following hydrological units also exist:

Hydrogeological Unit No.4: It is composed of sand and clay and is recorded in the downstream portions of the desert wadis. It has a limited geographical distribution and is of local value. The productivity of this unit is low.

Hydrogeological Unit No.5: It includes the fissured and weathered zones of the basalt flow. This is expected to hold limited quantities of water (unexplored).

Aquifer Systems

There are two main aquifer systems in the Aswan area which contribute to the supply of groundwater:

The Aquifer in the Quaternary Rock: Mainly restricted to the valley of the Nile and depending on its recharge on the surface water of the Nile itself. The local villagers close to the Nile mainly depend on this aquifer.

The Aquifer in the Upper Cretaceous-Paleozoic Rocks: The Upper Cretaceous sandstone beds and the older sandstone beds have a wide geographical distribution in the subsurface (Nubian Sandstone Complex), and form a portion of the regional aquifer system. The productivity is expected to be highly to moderately productive. The reclaimed areas just east of the project site depend on this aquifer.

Groundwater Flow

The regional flow pattern in the Quaternary Fluvial Aquifer System of the Nile Valley is from south to the north, i.e. in the downstream direction of the river. In addition to this, local flow patterns are mainly influenced by the irrigation system, the intensity of groundwater extraction and the inflow from other aquifer systems.

The highest water level is recorded in West Tahta project which is located in the western side of the Nile Valley. This high water level is essentially due to the intense irrigation by the lifted surface water. This leads to a waterlogging problem in the adjacent low flood plain area. The lowest water level is recorded on both sides of the River Nile.

Nubian Sandstone Aquifer System: In reference to the isopiezometric map of the Nubian Sandstone aquifer (modified by RIGW from different sources) for this area there is a flow pattern from east to west, eastward from the valley of the Nile. The rainfall in the eastern high land principally controls this pattern. The western flow pattern is controlled by the regional dynamics in the Nubian Sandstone basin in NE Africa, including the Egyptian Western Desert. This pattern is locally interrupted by the over- extraction of water in some areas. In the Kom Ombo CSP area (SE part of the Benban project area) the depth to the aquifer (Nubian Sandstone aquifer) can be expected to be between **200-250 meters**, with a flow direction to the Northwest.

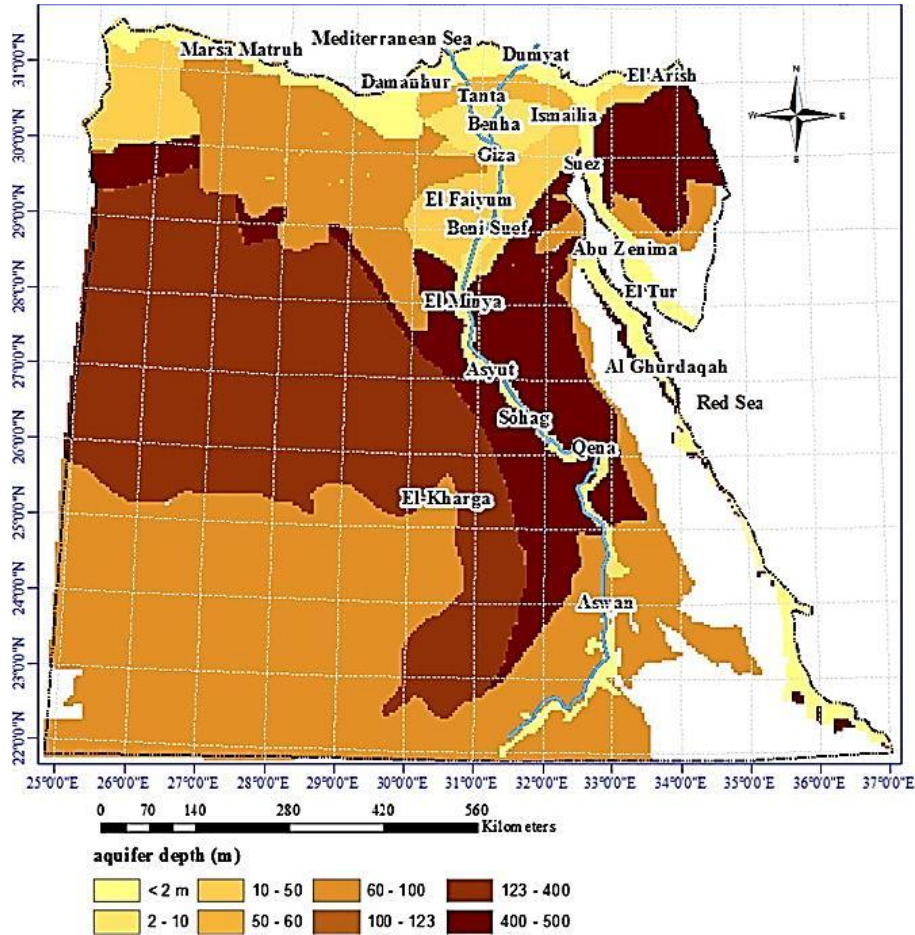


Figure 19. Classification of aquifer depth in Egypt (Salim, M. 2012)

Recharge and Discharge of Groundwater

For the Quaternary Fluvatile Aquifer system: The groundwater is continuously recharged by the infiltration of the excess irrigation water in the main canals through the top silty clay layer. It is also recharged from the occasional rainfall during sudden rain storms, and locally from the other aquifers in contact with it. This aquifer is possibly recharged by vertical upward leakage from the deeper aquifer system having high-pressure water (Nubian Sandstone Complex). The discharge of water from the Quaternary aquifer system takes place, naturally, as outflow into the Nile itself and the irrigation drains, as well as outflow into the other aquifer systems in contact with it. It takes place artificially as extraction of groundwater from the existing wells both for irrigation and for drinking purposes.

For the Nubian Sandstone Aquifer system: The groundwater is essentially paleowater and has been formed during one or more of the pluvial interval. This aquifer is slightly recharged from the present rainfalls both on eastern highland in Egypt as well as outside Egypt to the

southwest. The ground-water discharge of the Nubian Sandstone aquifer system takes place essentially as natural outflow into the depression areas including the Nile Valley area.

Groundwater Quality

Data of the water samples collected in (1996) from the different aquifer systems shows the following:

The water of the Quaternary aquifer system: In the Nile Valley it is generally fresh in the central parts of the valley, with TDS value less than 1000 ppm. This water becomes brackish in the outer parts of the valley, with TDS values greater than 1000 ppm. Similar water qualities are recorded in the downstream portion of Wadi Qena.

The water of the Nubian: The sandstone aquifer system is fresh, warm, and has a sulfide odour.

4.2.8 Hydrology

Two hydrologic systems exist in the Project area: the man-made and the natural. The man-made system includes the irrigation canals. The natural system includes the River Nile and the wadis. The wadis are complex series of dry channels which dissect both the eastern escarpment and the western escarpment. Such channels are well defined on the sandstone plain and occasionally become active after rain storms and may cause a lot of damage. The project site lies in a nearly flat hard area and does not include any significant wadis.



Figure 20. Hydrologic natural system (river and wadis) in the zone

4.2.9 Ambient Noise

The main sources of noise in the project vicinity are:

- Traffic on the Aswan - Luxor Highway
- Prevailing wind

For the Kom Ombo ESIA, a certified laboratory conducted noise measurements on 12th June 2013 for a period of 8 hours at three different locations as shown in Table 2 and Figure 5; i.e. the Kom Ombo CSP location; BenBan village; and the water intake structure on the Nile. The intensity of noise at all three locations was within the legally permitted limits.

Table 17: Monitoring Sites locations

Measurements Location	Latitude	Longitude	The intensity of noise in dB
MS1 Kom Ombo CSP main site	24°23'42"N	32°45'53"E	62
MS2 Ben Ban village	24°26'29.33"N	32°52'11.25"E	55.7
MS3 Water intake	24°27'45.30"N	32°52'28.22"E	55.3



Figure 21: Location of noise and ambient air quality monitoring sites

4.2.10 Ambient Air Quality

Air quality monitoring has been undertaken for the pollutants of primary concerns (NO_2 , SO_2 , T.S.P and PM_{10}) in order to better characterize the baseline air quality as part of the environmental impact assessment required. In other words, this report presents the analyses results for a field visit for the “Hot Spot” for installing the solar powered station in Benban village (1 Km from Luxor-Aswan Road) where a one-hour average measurements were conducted for carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), Total Suspended Particulates (T.S.P) and particulate matter (PM_{10}) for Five specific locations where the air quality complies with the national guidelines for all the analyzed parameters. The site specific air quality measurements were conducted using a Standard ambient air quality monitoring instruments under the supervision of experienced specialists.

Table 18. Daily average results ($\mu\text{g}/\text{m}^3$)

Day	TSP	PM ₁₀	NO ₂	SO ₂	CO (mg/m ³)
AA1	65	44	19.64	28.7	0.23
AA2	57	35	23.34	36.31	0.234
AA3	79	49	11.46	18.88	0.453
AA4	68	41	25.44	30.86	0.28
AA5	78	39	20.23	32.37	0.314
Guideline	230	150	150	150	30

For more detailed results kindly refer to the Lab report attached as annex to this ESIA

All parameters were below the normal detection limits of the used equipment, and were thus fully in compliance with the ambient air quality regulations.

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4.3 Biological Environment

4.3.1. Methodology

The Consultant initially surveyed the Kom Ombo CSP project sites in 2013 to identify potential sensitive locations with regards to existing species and habitats. The wider site (as Kom Ombo only covers part of the Benban site) was re-visited in 2015 to check whether the situation had changed noticeably, requiring another detailed survey (which was not the case).

The species identification in 2013 was based on the Consultant's knowledge and experience about the flora and fauna of the studied area and used standard scientific identification guides. All recorded species have been documented.

4.3.2. Natural Habitats

The project area consists of sand dunes and gravel sheets. This represents extreme natural habitats characterized by lack of water, vegetation and wildlife.



Figure 22. View of the wider Benban area

The nearest areas with vegetation and wildlife are the agricultural area around Benban water banks of the River Nile and of the irrigation canals, at a distance of 12+ km from the eastern border of the Benban site.

4.3.3. Flora

Benban site

The project site is located on an arid/extremely arid area without vegetation or natural habitats. The nearest vegetation (13 km from the site) can be found near the highway; it consists of a strip of planted shrubs with irrigation.

The nearest area with a diverse flora is the cultivated land east of Benban village and the banks of the River Nile.



Figure 23: Agricultural land near Benban



Figure 24: River Nile

Agricultural crops grown in this area are listed in the following table.

Table 19: Crops grown in the Benban area

Scientific name	Family
Triticum pyramidale	Gramineae
Saccharum officinarum	
Medicago sativa	Leguminosae
Trifolium alexandrinum	
Faba vulgaris	
Allium ampeloprasum	Amaryllidaceae
Mangifera indica	Anacardiaceae
Phoenix dactylifera	Arecaceae

Natural flora and weeds such as *Hyphaena thebaica*, *Calotropis procera*, *Alhagi graecorum*, *Tamarix amplexicaulis*, *Tamarix passeroides*, *Tamarix nilocita*, *Cynodon dactylon* and *Polypogon monspeliensis* also exist near farmlands, sides of village roads, canal banks, pasture areas, and the settlements themselves.



Figure 25: Tamarix passeroides



Figure 26: *Tamarix amplexicaulis*



Figure 27: *Hyphaene thebaica*



Figure 28: *Calotropis procera*



Figure 29: *Alhagi graecorum*

4.3.3. Fauna

No terrestrial animals or birds were seen during the site visits in 2015, but there are records of a limited number of species occurring on sites with similar physical and climate conditions.

- **Mammals**

Potential and recorded mammals

Mammalian species which represent these habitats are *Dorcas Gazelle*, *Gazella dorcas*, Red fox, *Vulpes* and *Ruepple Fox Vulpes rueppelii* and other small mammals which were recorded before in such western desert habitats.

Tracks found during the Kom Ombo study suggest the presence of one or more of the fox species likely to live in similar habitats, e.g. *Vulpes vulpes* and *Vulpes rueppelii*.

- **Birds**

There are no birds nesting on the Benban site itself but many species nest in the agricultural land near Benban and at the riverbank.

Potential species according to literature

Key avian species which represent these habitats include wheatears, larks, shrikes and warblers, also raptors and some species of Corvidae. The species found during the Kom Ombo study are listed in Table below. Migratory birds pass the area. This includes the white stork which has its main north- south migration route along the Nile valley.

No.	Scientific name	English name	Number
1	<i>Corvus ruficollis</i>	Brown necked raven	4
2	<i>Oenanthe isabellina</i>	Isabelline wheatear	2
3	<i>Mihus migrans</i>	Black Kite	2
4	<i>Otus scops</i>	Eurasian Scops Owl	3



Figure 30: White stork

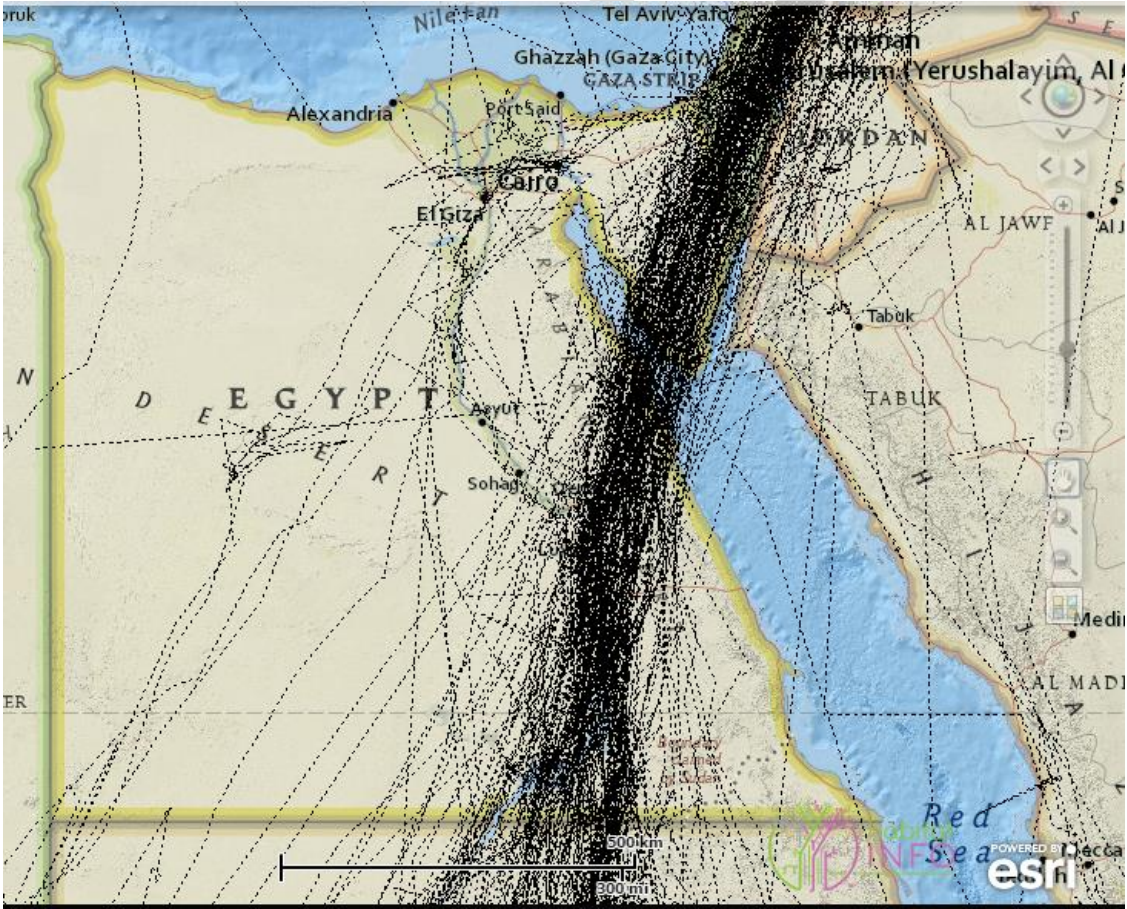


Figure 31. Main migration routes in Egypt, source: BirdLife International (2015)

- **Herpetofauna**

Potential species

These include *Acanthodactyllus* spp. and *Mesalina* spp

Recorded species

No reptilian species were found during the Kom Ombo study or later site visits in 2015.

- **Insects**

The project's area lacks the vegetation cover required by most species. The following species were found during the Kom Ombo ESIA.

Table 20: Insect species found during the Kom Ombo ESIA

No.	Scientific Name	English Name	Arabic Name
1	<i>Eremiaphila zetterstedti</i>	Desert Pebble Mantis	فرس النبي
2	<i>Schistocerca gregaria</i>	Desert Locust	جراد صحراوي
3	<i>Sturmia bella</i>	Sturmia Fly	ذبابة ستورميا
4	<i>Cleoptera</i> sp.	Beetles	خنافس أرضية



Figure 32: Dessert locust



Figure 33: Desert pebble mantis

4.4 Archaeology and Cultural Heritage

The Benban site as such has no man-made structures. However, an important ancient Egyptian temple exists in the wider area, at Kom Ombo, on the River Nile.

In ancient times, Kom Ombo stood on an important crossroads between the caravan route from Nubia and trails from the gold mines in the eastern desert. During the reign of Ptolemy VI Philometor (180-145 BC), it became a training area for African war elephants. The temple at Kom Ombo was also built on the eastern bank of the river Nile at this time, under Ptolemy VI. Since this bend in the Nile was a favoured spot for crocodiles to bask in the sun and threaten locals, it is natural that the temple would be dedicated to Sobek, the crocodile god. But it is unusual in having a double dedication: it also honors Haroeris, a form of the falcon-headed god Horus. Much of the temple has since been destroyed by Nile floods, earthquakes and builders who used its stones to construct other temples and sanctuaries.



Figure 34. Felouque and Kom Ombo Temple



Figure 35. Estimated distance

4.5 Social Baseline

This section of the ESIA contains a description of the baseline socio-cultural characteristics at the proposed project areas. Description of the existing baseline environment was assessed through a combination of a desk-based study, site visits, and consultation with relevant authorities and stakeholders.

4.5.1. Socio-economics characteristics

Depending on a combination of both primary data collected from the field and secondary resources reviewed including statistical data, this section will highlight the following: Basic information about the project areas, administrative areas, demographic characteristics and human development profile, access to basic services, health profile, and level of awareness, economic characteristics, supplies and ration service, industrial activities, roads and transports, tourism, police and security service, and deceptions of the project and predicted impacts.

Basic information about project site

The proposed PV Power plant will be located in the western desert, which is one of the driest areas in Egypt, approximately 40 km northwest of Aswan city and within the Aswan governorate. The area designated for the project comprises approximately 37.5 km² of desert owned by NREA. The following table shows the site coordinates and the maps show the location of the site. The plot SBN-(2-1) allocated for DESERT TECHNOLOGIES [ARC] project is aprox. 1,000,000 m²

The project will be implemented in Aswan Governorate. It is one of the governorates of the South Upper Egypt Region that includes Souhag, Aswan, Qena, Red Sea, and Luxor City.

It is the south gate of Egypt and the liaison between northern and southern parts of the Nile Valley and between Egypt and Africa as well. The area of the governorate covers 62.7 thousand km², representing 6.2% of Egypt's total area. It encompasses 5 Markaz, 10 cities, 33 rural local units annexed by 79 villages, and 342 hamlets

According to the 2006 census, the population is about 1.323.315 million people; 42.5 % of them live in urban areas and 57.5% in rural areas. The population natural growth rate is 22.8 per thousand.

The description of project areas will present basic information about the governorate, Daraw Markaz and Benban village. In case of the availability of information on the level of Benban sub-villages, it will be presented.

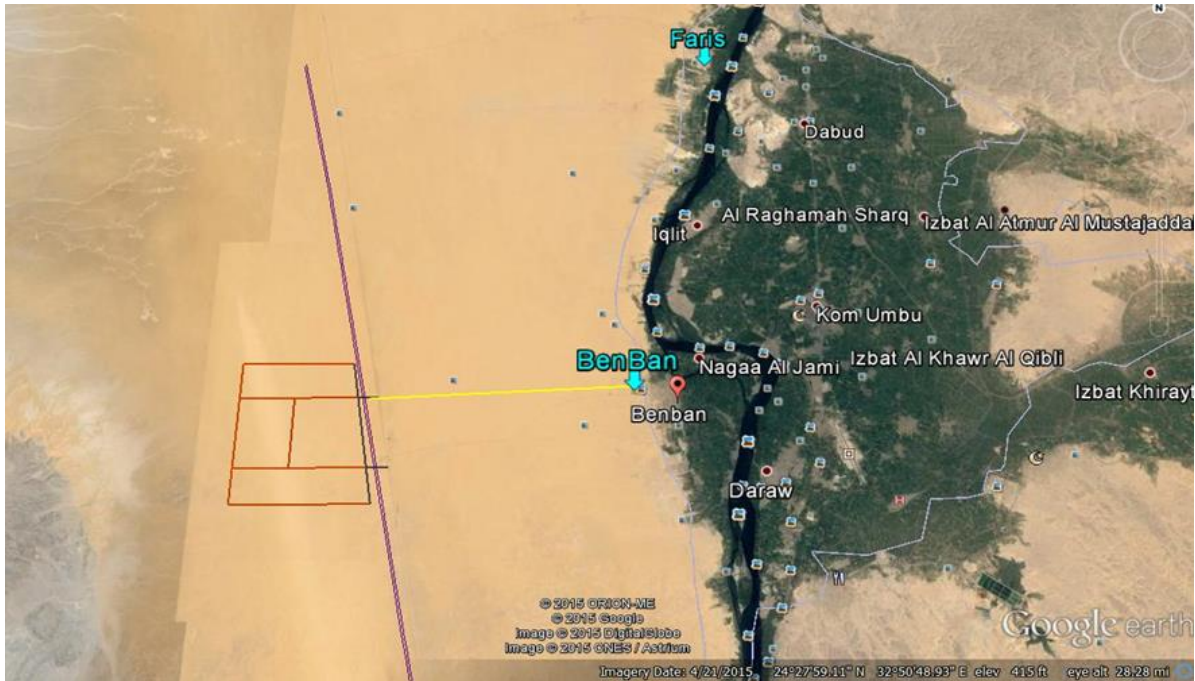


Figure 36. NREA Site in relation to Benban and Fares villages

Administrative divisions

The proposed Power Plant is located in the Western Desert of Egypt. It is located at the west side of the River Nile; and characterized by low precipitation rate. The proposed project area of 1 km² at North Aswan is a part of a 37 km² large area owned by NREA, that is located 40 km North of Aswan, and approximately 1 Km West of the Desert Aswan – Luxor Highway.

The project eastern boundaries flows roughly parallel 500 m west away to the existing 500 KV high voltage transmission line. The nearest settlements to the boundaries of the proposed power plant is the New Benban village which is located in the jurisdiction of Daraw Markaz⁷ is about 12 Km East of the site, also Benban Village is located 13 Km east of the project boundaries, both settlements represent the closest existing sensitive receptor.

Information available about Aswan Governorate was sufficient to provide clear idea about the governorate that will host the project. However, the information available about Benban was relatively limited.

With regards to Benban village, it encompasses three main villages namely, Benban Qebly, Benban Bahary and El Raqaba.

⁷ The governorate is divided into regions which is named after Markaz

Table 21. Administrative division of Aswan Governorate, Daraw Markaz and Benban

Administrative Division	Aswan	Daraw	Benban
No. of Markaz	5		
No. of cities	10	1	
No. of districts (<i>Hai</i>)	0	0	
No. of rural local units	37	4	
Affiliated villages	0	3	3
Villages outside local units	79	0	
Hamlets	342	46	20

Source: Statistical Year Book of Aswan Governorate 2015

Table 22: Sub-villages and hamlets affiliated to Benban

Sub-village	Hamlets total number	Hamlets names
Benban Qebly	5	El Sabakhaya- El Khebra El Foqania- El khebra El Tahtania- Naga Abu Shawareb- El Sheikh Mousa
Benban Bahary	6	El Sheikh Abd Allah- El Nagaa El Sharqy- El Sheikh Bastawy- Nagaa El Omda- Naga El Ababda – New Benban
El Raqaba	9	El Raqaba El Fokania- El Raqaba El Tahtania- Nagaa El Omda- El Hegazia- El Sheikh Fadl- El Oliqat- El Sheikh Zeid- El Bashab- Nagaa El Arab

The total area of the Aswan Governorate is up to 62,726Km^{2,8}. The total populated area represents about 5.2% of the total area. While housing and scattering areas represent 2.25%. The agriculture land is about 47.34 km². Daraw area is estimated with 50.54 km² while Benban area is 22 km²

Table 23. Distribution of area and land use in Aswan Governorate, Benban and Daraw Markaz

Area	Aswan Governorate	Daraw	Benban
Total area	62,726.00 km²	50.54 km²	22 km²
Total populated area	1,004.77 km ²		
Housing and scattering areas	69.7 km ²		
Facilities and cemeteries	254.42 km ²		
Ponds and fallow	34.61 km ²		

⁸ Description of Egyptian Governorate, 2012, IDSC

Area	Aswan Governorate	Daraw	Benban
Agricultural land within agricultural borders	523.73km ²		
Agricultural land outside agricultural borders	122.31km ²		
Population density in the populated area	1.4 thousand person/km ²		
Population density in the total area	0.02 thousand person/km ²		
Total populated area (% to total area)	1.6%		

Source: Governorate Description by information 2012- Information and Decision Support Centre (Information about Benban is based on SYB 2015)

Urbanization trends

Aswan Governorate has a wide range of desert lands that encourage illegal encroachers to seize lands illegally. As well, the most dominant type of land ownership is Customary (*Wad'a Yad*). That resulted in squatter problems. Aswan has 10 unsafe areas that are distributed as follow 7 areas in Aswan city, 2 in Bousilia Bahary and one in Benban. With regards to the new cities, there is one new city in Aswan Governorate which is the New Aswan City.

Based on the Egyptian Human Development report 2010, the urban population of Aswan Governorate represents 42.5% of the total population. The urban population grows annually with the percentage of 1.9

History and Cultural Heritage

Aswan is the ancient city of Swenet, which in antiquity was the frontier town of Ancient Egypt facing the south. Swenet is supposed to have derived its name from an Egyptian goddess with the same name¹. This goddess later was identified as Eileithyia by the Greeks and Lucina by the Romans during their occupation of Ancient Egypt because of the similar association of their goddesses with childbirth, and of which the import is "the opener". The ancient name of the city also is said to be derived from the Egyptian symbol for *trade*⁹. Because the Ancient Egyptians oriented toward the origin of the life-giving waters of the Nile in the south, Swenet was the first town in the country, and Egypt always was conceived to "open" or begin at Swenet. The city stood upon a peninsula on the right (east) bank of the Nile, immediately below (and north of) the first cataract of the flowing waters, which extend

⁹ <http://en.wikipedia.org/wiki/Aswan>

to it from Philae. Navigation to the delta was possible from this location without encountering a barrier.

The stone quarries of ancient Egypt located here were celebrated for their stone, and especially for the granitic rock called Syenite. They furnished the colossal statues, obelisks, and monolithal shrines that are found throughout Egypt, including the pyramids; and the traces of the quarrymen who wrought in these 3,000 years ago are still visible in the native rock. They lie on either bank of the Nile, and a road, four miles (6 km) in length, was cut beside them from Syene to Philae. Due to the nature of Aswan Governorate as a witness of old history, Aswan is privileged of wide range of monuments i.e. Abu Simbel temple, Philae Temple, etc.

Benban is considered one of the oldest areas in Aswan that was targeted by Arab tribes 1000 years ago. Arab tribes have a wide range of norms and traditions that should be fully abided to. Respecting woman, honesty, integrity, hospitality and knight attitudes are the main aspects to be respected.

Benban village is inhabited by Arab tribes that came to these areas along time ago (over 1000 years) they are the descendants of El Husein (Grandson of Prophet Muhammad. Thus, they feel that they are honored. The main tribes in these areas are El Ansar and El Ababda. Nubian people living in this village are only three households. Almost all the village are Muslims. About 3.0% are Christians. They value traditions and norms. They managed to form a committee that might settle disputes among people (*Shoura Council*)¹⁰

Each year Benban village holds a big carnival for horse and camel riding competitions. More than 10,000 people visit the village from all over Egypt. They are seen and treated as *guests*, thus, each household pays 150 -250 EGP in order to provide guests with free of charge accommodation.



Figure 37. Equestrian Festival in Benban and Fares

¹⁰ Based on a meeting with the Mayor of Benban Bahary

The Arab tribes tend to respect the central authority in Egypt. They also feel proud of any communication with those authorities. They don't like any liberal or revolutionary approaches. They also have an active contribution to the elections through nominating parliament candidates.



Figure 38. Community leaders meeting with authorities

Demographic characteristics and human development profile

Getting a clear description for the population is essential for any socioeconomic study. The characteristics of population might affect the willingness of community to host any developmental projects. As well as, such description might give an idea about how to introduce the project to the communities and how to gain acceptance for the project in the areas.

Total Population

The total population of Aswan Governorate is estimated with 1,323,315¹¹. The total number of households is 310,679 HH. Females represent 48.12% of the total population.

Daraw Markaz's population is estimated with 109,346 people. The total population is segregated into 24,488 households. Benban population is estimated with 26220 people (SYB 2015). The new Benban total houses are estimated with 100 units.

¹¹ www.aswan.gov.eg Census guideline 2012

Table 24. Population of Aswan Governorate, Benban and Daraw Markaz

District/Markaz	Urban/Rural	Estimating Population			
		Males	Females	Total	No. of Families
Aswan Governorate	Urban	305553	292394	597947	149486
	Rural	360112	365256	725368	161193
Total of Aswan Governorate		665665	657650	1323315	310679
Daraw Markaz	Urban	20863	21967	42830	10707
	Rural	32291	34225	66516	14781
Total of Daraw Markaz		53154	56192	109346	25488
Benban village	Rural	12728	13492	26220	5797
Total of Benban Markaz		12728	13492	26220	5797

The total population in Benban is estimated with 26,220 people. They are segregated in three main sub- villages. 36.0% of the total population reside Benban Bahary, 34.9% live in El Raqaba and 29.0% of the total Benban population live in Benban Qebly. The total households are estimated with 5,797. The average household size varies between 4.4 in El Raqaba to 4.6 in Benban Bahary.

Population of Benban by sub-village

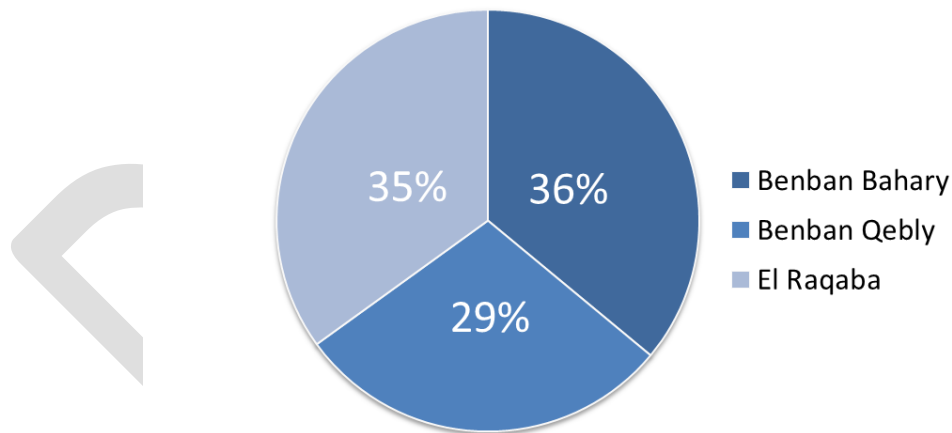


Figure 39. Percentage of Population distributed by sub-village

Table 25. Population distribution in Benban

Sub-village	Male	Female	Total	Households	HH size
Benban Bahary	4,645	4,797	9,442	2,054	4.6
Benban Qebly	3,746	3,868	7,614	1,720	4.4
El Raqaba	4,337	4,827	9,164	2,023	4.5
Total	12,746	13,492	26,220	5,797	4.5

Distribution of population by gender in Benban sub-villages

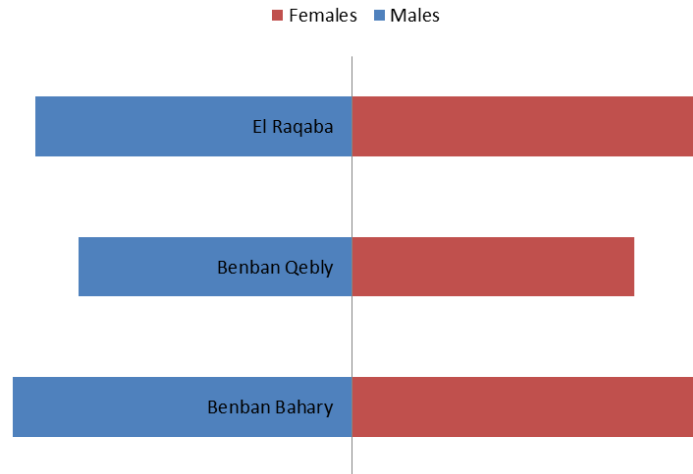


Figure 40. Distribution of population by gender

Age structure

Age-distribution of the population in the Aswan Governorate ensures that the community there is a growing young community as almost 30.0% of the population are categorized as less than 15 years old. Those who are 15- less than 45 years old represent about 50.0% of the population.

Age distribution in Benban is almost identical with Aswan Governorate. The population between 15- less than 45 represents 50.34% of the total population of Benban. Those who are less than 15 constitute 29.9% of the total population.

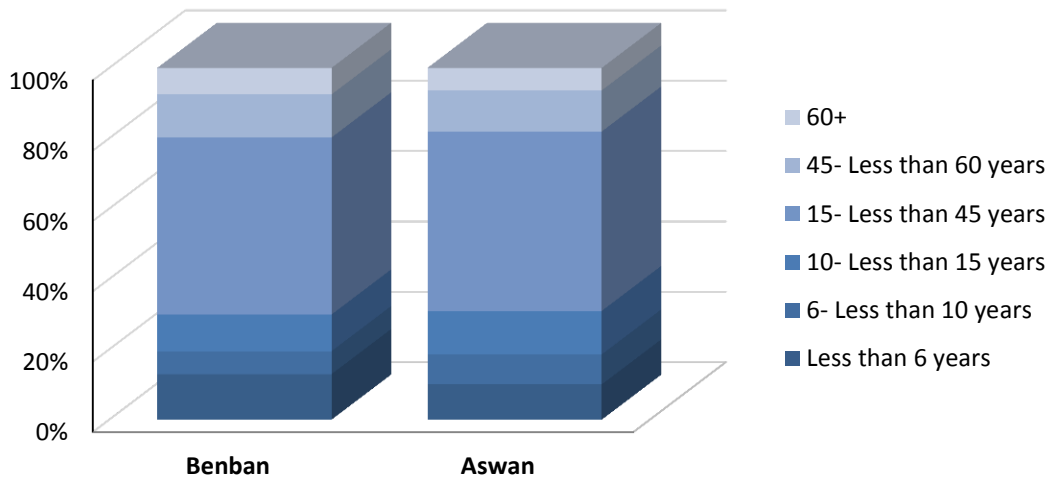


Figure 41. Distribution of the total Aswan Governorate population by age (Source: CAPMAS Census 2006)

Rate of Natural Increase

The crude birth rate in Aswan governorate is 28.9¹², while it reaches 31.7 in Daraw. Mortality rate is relatively identical among the three communities. In Aswan Governorate and Daraw Markaz the mortality rate is 5.6 per 1000 live births. Natural growth rate which is estimated of 23.5 per thousand persons in Aswan Governorate, 26.2 per thousand persons in Daraw.

Table 26. Natural growth of Aswan Governorate, Benban and Daraw Markaz

Markaz	Birth rate			Mortality rate			Population natural growth rate		
	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
Daraw	33.8	30.4	31.7	7.5	4.3	5.6	26.3	26	26.2
Aswan Governorate	21.2	35	29.2	6.2	5.2	5.6	15	29.8	23.5

Source: www.aswan.gov.eg (2013)

Living Conditions

Household Size and Density

Household is defined as “Family (and non-family) members who share residence and livelihood, and operates as one social and economic unit”. The customary levels of demographic parameters and the norms governing living arrangement patterns, together determine the size and composition of households in any population. The average family size of Aswan Governorate is about 4.36 persons. Households’ density rate is 1.38 person/room.

Access to Basic Services

a. Access to Electricity

Access to electricity in Upper Egypt is high at 99.0% (EHDR 2010). That is primarily due to the care given to improve living conditions for people in Egypt in particular access to electricity. Even squatter areas have access to electricity regardless of their formality and legality. That indicates to the stability of infrastructure in most of areas. Number of subscribers in the electricity grid in Aswan Governorate is estimated with 395,860 unit.

The census showed that the majority of households use electricity as the main source of light represents 99.0% of the population in Aswan Governorate. However, the continuity of electricity current is not satisfactory to the residents of rural areas. In Benban, the electricity current was not satisfactory during 2013-2014. However, the electricity continuity has enhanced in 2015.

¹²Source: Governorate Description by Information 2010

The Information Center in Benban reported that the total units subscribed legally to electricity are 6640 units. They are distributed as follow; 2600 units in Benban Bahary, 1960 units in Benban Qebly and 2080 units in El Raqaba.

Table 27. Electricity Sector in Benban 2014

Sub-village	Number of conductors		Number of illumination columns	Electricity grid subscribers	Private subscribers
	Public	Illumination			
Benban Bahary	18	22	2700	2600	
Benban Qebly	15	2	3250	1960	
El Raqaba	29	7	4310	2080	36
Total	62	31	10260	6640	36

Source: Benban Information Center (2015)

b. Source of Potable Water and Sanitation

The governorate depends almost entirely on Nile water for all its water needs whilst ground water. Accessibility to potable water is high in Aswan Governorate. Almost all the households in Benban have access to potable water. Average individual share from potable water is about 151 m³ versus 54 m³ in rural areas (source information center –Aswan Governorate 2012)

Benban village have access to water supply from the Nile. The total produced water is 73,100 m³/H. There is a water intake 13 km away from the project area. If constructed, the project water intake will be near the current one.

The total number of wells in Benban is 9 wells and 11 pumping unit. The majority of them are located in Benban Bahary. Only two were installed in Benban Qebly.

Table 28. Potable water Sector in Benban 2014

Sub-village	Potable water				Produced water per hour	No. of subscribers	
	Plants		Filters			Public	Private
	No	Capacity m ³ /Hour	No	Capacity m ³ /Hour			
Benban Bahary	2	200 m ³ /H	2	200 m ³ /H	400 m ³ /H		
Benban Qebly	3	300 m ³ /H	3	300 m ³ /H	600 m ³ /H		
El Raqaba	1	100 m ³ /H			100 m ³ /H		
Benban Bahary desert lands					72,000 m ³ /H		
Total	6	700 m³/H	5	500 m³/H	73,100 m³/H	5905	75

Source: Benban Information Center 2015



Figure 42. Potential water intake

Access to a proper Sewage System is not high in Aswan governorates, with a connectivity rate of 27.09 in Daraw. With regards to the project areas, the dominant sewage facility is septic tanks that should be evacuated. Two sewage plants are located in Daraw.

That should be fully considered as the sewage facility will not be provided to the workers. The potential sanitary system will be mainly septic tanks that will be in need for an evacuation vehicle.

Table 29. Sewage coverage in Daraw Markazs

Urban/rural	No. of Sewage plants	No. of sewage plants		No of pumping stations	
		Traditional	Compound	Main	Branch
Urban	0	0	0	0	1
Rural	2	2	0	0	0

Dwelling characteristics

The observation results reflect that the settlements, in Benban Bahary, Qebly and El Raqaba are of similar characteristics. Buildings and streets are in inadequate physical conditions. However, they are not densely occupied. Almost all houses are constructed of red bricks. The majority of houses consist of one floor. The residents are much in favor of horizontal expansion not vertical. They also reluctant to build multi stores houses as that might expose the small buildings. Almost all houses are painted with local materials.

The project will need to accommodate workers inside the site or lease apartments to the workers inside Benban village. That necessitates investigating the current dwelling conditions.



Figure 43. Rural house in Benban



Figure 44. Shops in Benban

In New Benban, the dwellings are of different characteristic. They are relatively of better conditions. Well-constructed and organized houses might be seen in new Benban. Almost all the houses are inhabited. Prior project implementation, it will be useful to investigate lease opportunity in New Benban



Figure 45. New developments in Benban

Human Development Profile

Egypt's Human Development Report (2010) ranked the governorates according to their human development index scores. Tracking the level of Human Development achieved in Aswan governorates since 2005, Aswan was ranked as the 12th Governorate. This is relatively reflects better socioeconomic conditions of the governorate. Some determinants constitute such index including, education, work status ...etc. this section will discuss in details such determinants

Educational status

The Egyptian Human Development Report (2010) stated that adult literacy rate (+15) is (77.0%) in 2007/2008 in Aswan Governorate. The percentage of those enrolled basic and secondary education represents 97.1% . The illiteracy rate in Aswan Governorate 2009-2010 is 23.0%. The total target illiterate people are 23.22 thousand people among which 8 thousand managed to be literate. Illiterate people in Daraw represent 26.4% of the population while they represent 27.5 in Benban.

Aswan Governorate pays more attention to schools. 1190 schools are located in Aswan Governorates among which 270 are located in Benban Markaz and 98 in Daraw. As it was anticipated about 60% of schools are for basic education. Vocational and commercial schools represent about 5.0%.

In Benban, there are 10 primary schools with total number of classes 69 class. The total number of students is 2704, 48.5% of the students are females. The density of classroom is about 38student/class. Total number of teachers is 142 teachers, 52 of them are females. Preparatory schools in Benban are 5. The total number of classes is 36. Students total number is 1153 almost half of them are females. The density of class varies between 27 in Benban Qebly to 33 in Benban Bahary.



Figure 46. School in Benban

General Secondary schools are limited to only one with 11 classes and 287 students. Females constitute 168 whereas males are only 119. The density of class is 26 students. Agriculture vocational schools are only one and the same for Girls vocational school. The total number of students is limited to 742 in the Agriculture school and 160 females in the vocational school.

El Azhar Religious education schools are found in the area as follow: 2 primary schools, 2 preparatory schools and 2 secondary schools. The total number of students is 469 in primary about 45 of them are females. 359 students attend preparatory school, whereas 235 students enrolled El Azhar secondary education.

Table 30. Schools distribution in Aswan Governorate, Benban and Daraw Markazs

Educational level	Aswan Governorate	Daraw	Benban
Pre schooling (kindergarden)	268	24	
One class schools	60	10	
Primary	456	36	10
Preparatory	272	19	5

Public Secondary	39	3	1
Vocational 3-5 years	39	3	1
Commercial and hotels schools	16	1	
Agriculture schools	5	1	1
Special needs	35	1	
Total	1190	98	98

Source: Information center www.aswan.gov. 2012

Employment Status

Labor force is an important indicator for any socio-economic study. In 2010 Aswan labor force represented 29.4% of the total population which 21.9% of them were females. Agriculture laborers represent 30.3% of the total labor force while those who work in services activities represented 43.0%. The least economical sector was industry which managed to absorb 26.7% of the total labor force.

Data about employment in Daraw and Benban is relatively limited. The total number of labor force in Daraw according to the Statistical Year Book 2013 is 26,172 among which 15.0% are unemployed.

Table 31. Employment status in Aswan Governorates

Information about employment	Aswan Governorate
% of labor force 15+ of total population	29.4
% of female labor force 15+ of total population	21.9
<i>Distribution of labor force by sector</i>	
% of agricultural laborer 15+2007	30.3
% of Industrial laborer 15+2007	26.7
% of services laborer 15+2007	43.0
<i>Professional & Technical staff</i>	
Professional & Technical staff (% of labor force 15+) 2007	20.5
<i>Wage earners (% of labor force 15+)</i>	
Total 2008	62.7
Female 2008	78.4
<i>Employees in Gov., public sector & public enterprise sector (% of total labor force (15+))</i>	
Total 2008	38.7
Female 2008	69.8

Source: Egyptian Human Development Report 2010

With regards to Benban, the team relied upon the rapid assessment conducted in Benban during September 2015. The figures presented are rough ones based on the view of participants, 40% of the villagers are unemployed due to the limited presentation of governmental authorities in the village as well as due to the limited investments done in this area. Nevertheless, community people think that the new project for the solar energy will absorb all unemployed people. The Arab tribes see their employment opportunities mainly in administration and operation activities. Employment in construction work seems to be not preferred and should according to them be implemented by emigrants from other governorates.

Most of the interviewed sample prefers working for governmental authorities or for private investors. They are not keen in investing and initiating their own small or micro projects as they will not find highly skilled laborers in the area.

Some of the interviewed community think it would be a better advantage for them to applying for a big loan and invest in a big project like a private operated ferry which can transport passengers and goods or a plant for fruit processing and import experienced labors from the surrounding villages to work for them.

Aswan governorate is privileged with low unemployment rate. 12.9% is approximately the unemployment rate reported in Aswan Governorate among which 34.5% are females. Unemployment rate is higher in rural areas. That is relatively not the case in Egypt as the unemployment rate is always higher in urban areas. Below secondary and university education do not suffer from severe unemployment problem, whereas, those who have secondary education face severe problem as 85.7% of them are unemployed. Due to the rapid growing of the community in Aswan, the potential future labor replacement will be 307.6.

Table 32. Unemployment status in Aswan Governorates and Egypt

Information about employment	Aswan Governorate
Unemployment rate (%)	
Total 2007	12.9
Female 2007	34.5
Unemployment rate (%)	
Urban 2007	11.4
Rural 2007	14.1
Unemployment rate by education (15+ %)	
Below secondary 2007	3.1
Secondary 2007	85.7
University 2007	11.2
Future force replace ratio	
Future labor force replacement ratio	307.6

Source Egypt Human Development Report 2010

Economic Wellbeing

In 2010, Egypt Human development report declared that Aswan GDP per capita is 7057.4 EGP. The poor represented 225.4 Thousand people among which 48.5% are defined as ultra-poor.

Economic Activities

The main three economic activities in Aswan Governorate are tourism, agriculture and industrial sectors. With regards to the tourism sector, it has been affected dramatically after the 25th Revolution. There are 32 hotels that have 3052 rooms¹³. However, the project areas have no hotels.

With regards to the second main activity, Aswan Governorate is privileged of having big scale industries i.e. sugar factories. The Information and Decision Support Center (IDSC) reported that Aswan Governorate has 171 registered industrial establishments that employed 10300 individuals. In the project area, one factory that produces sugar was noticed.

Table 33. Industrial Zones - Productive Cooperation Associations 2006/2007

Industrial zones and PCAs	Aswan Governorate	
	Unit	N
No. of registered industrial establishments	Establishments	171
No. of workers at registered industrial establishments	Worker	10300
No. of industrial zones	Zone	1
No. of productive factories in industrial zones	Factory	31
Area allocated for industrial activity :	Feddan	167.0
Area allocated for factories	Feddan	65.50
Area available for allocation	Feddan	101.50
No. of productive cooperation association	Association	5
Members in association	Members	1480

Source: Governorate Description by Information 2010

Agriculture activity is the main sector prevailed in the project areas. Residents work in farming and trading in farming yields. Some of the community people work in exporting the agriculture products. The total cultivated lands represent more than 7.8 thousand feddans in Daraw. 10 agriculture cooperative associations serve the community of Daraw.

¹³Source: Governorate Description by information 2010- Information and Decision Support Centre

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Table 34. Agriculture activities 2006/2007

Agriculture Activities	Unit	Aswan Governorate	Daraw	Benban
Total area of cultivated lands	Feddan	185260	7830	4671
Total area of old cultivated lands	Feddan	117010	7830	3396
Total area of newly cultivated lands	Feddan	68.24	0.0	
Total cropped area	Feddan	254040	10050	
No. of agricultural cooperative association	Association	93	10	
No. of specific associations	Association	9	1	
No. of poultry farm	Farm	0	0	
No. of cattle slaughter house	Slaughter house	18	2	
No. of poultry slaughter house	Slaughter house	1	0	

Source: Governorate Description by Information 2010

Economic status of the villagers depends mainly on agriculture activities and trading in crops annually. Besides, some of the villagers work in small industries, one bricks factory and one factory for drying tomato (Seasonally only during winter).

Few numbers of the residents in Benban work in governmental jobs.



Figure 47. Bricks factory

Additionally, some of households rely on money transferred from family members working abroad. The sample surveyed reported that residents of Benban don't have any further skills (as e.g. handicraft). However, they are quick learner and keen to work in Solar sector.

One of the main sources of income is hosting an annual festival in the village. During this festival, they invite a big number of horse and camel riders from different countries. The sample reported that they host all participants free of charge and provide them with food and shelter. They consider them as guests and it is socially unaccepted “*Eib*” to get any money from their guests. Yet, such festival is lucrative to supermarkets and small tuk tuk drivers.



Figure 48. Tomato canning

Health facilities

Health facilities are limited in the project areas. That might require certain arrangements in order to maintain proper health and safety standards. Aswan information center reported that one central hospital is located in Daraw. The labor force in Daraw is 63 doctors assisted by 161 nurses. However, in Benban, 6 doctors assisted by 102 nurses operate the primitive health units. With regards to the primitive care units, they are 20 in Daraw and 6 in Benban. In addition to that, the community people in Benbn relied upon their financial resources to construct a Kidney Failure unit.

Table 35. Health services availability in Aswan Governorate Benban, and Daraw Markaz

Facilities		Daraw	Benban*	Aswan Governorate
Central/Public Hospital	Number	1		5
	Doctors	63		289
	Nursing	161		600
	Beds	152		742
Primitive care unit	Number	20	6	200
	Doctors	14	6	192
	Nursing	214	102	1208
Ambulance	Number of ambulance vehicles	14	1	25
	Number of ambulance people	21		53
	Number of ambulance centers	4	2	8
Health insurance				
Workers (Number)	Male	6884		142470
	Female	4589		94979
	Total	11473		237449
Pensioner (Number)	Male	1321		33413
	Female	880		22275
	Total	2201		55688

Source: Information center www.aswan.gov. 2012

The village managed to equip a health unit that is operated by one newly graduate general practitioner. He commutes from Kom Ombo every day. The residents don't frequently use the health facility due to the absence of the general practitioner. The site visit paid to the health unit reflected that it is not operating properly.



Figure 49. Health unit in Benban

Social Services

Benban has limited social services. One Social unit is located in each village. With regards to the community based organizations i.e. NGOs, 7 are situated in Benban versus 2 NGOs in Fares. There are 4 event halls in Benban and one in Fares. Almost no clubs for women and children are available. That reflects the lack of social services in the project areas.

Table 36. Social services availability in Daraw Markaz and Benban village

Services	Aswan Governorate	Daraw	Benban
Social units	23	7	1
Productive families projects	8100	2559	531
NGOs	203	64	7
Events Halls	99	40	4
Nursery	90	34	2
Workshops for females	19	4	1
Vocational training centers	3	0	0
Reciting Holy Quran center	83	35	3
Women club	2	1	0
Children club	4	2	0
People with special need care office	3	1	0

Source: Information center www.aswan.gov. 2012

Security sector

Aswan Governorate is one of the border line provinces. The security is assured by both army forces and police forces. There are only one police units in Benban village, one fire distinguisher department and one fire fighting vehicle.

With regards to security inside the project site, it is handled by residents in the area. They will form a security company in order to



Figure 50. Guards at the Benban Solar Park Site

legalize their work. The strength of this security arrangement is that the guards reside in the site. In case of any theft, they will be responsible of restoring the stolen object.

They plan also to recruit a professional ex- security officer who will guide them into higher security standards i.e surveillance cam, etc. The developers plan to have a unified contract with those groups in order to secure the site with unified cost.

Road sector

As it was earlier mentioned the proposed DESERT TECHNOLOGIES project area of 0.98 km² at North Aswan is a part of a 37 km² large area owned by NREA, that is located 40 km North of Aswan, and approximately 1 Km West of the Aswan – Luxor Highway.

Table 37. Roads in Benban village

Sub-village	Regional paved roads			Internal paved roads			Dusty roads	
	Number	Length	Width	Number	Length	Width	Number	Length
Benban Bahary	1	10 km	8 m	14	18 km	5 m	15	15 km
Benban Qebly				4	5 km	5 m	5	4 km
El Raqaba	1	12 km	8 m	13	15 km	5 m	10	11 km
Total	2	22 km		31	38 km			30 km

Source: Information Center in Benban 2015

The project will be supported by a network of roads that have been constructed in October 2015. They connect the project with the main roads, as well as, working as access road to the plots of lands.



Figure 51. Roads in the site

It is crucial also to inform about how to reach Aswan Governorate as stated in the website of Aswan Governorate.

- There is a railway network (double) 158 km
- Roads networks connect the governorate with the Red Sea ports. That will facilitate shipping project equipment.
- There are also airports in Aswan and Abu Simbel.
- River Nile port named after the High Dam



Figure 52. Transportation to Aswan.

Source: Website of Aswan Governorate

4.5.1. Corporate Social Responsibility and Community Benefits

Community Issues

The Strategic Environmental and Social Assessment conducted and funded by the EBRD consultant was responsible for developing a common corporate social responsibility (CSR) programme that will (i) identify the needs of the local communities and other impacted stakeholders, and (ii) recommend focus areas and an implementation mechanism for social investments that will maximize the benefits for these communities and minimize the risks of tensions, unmet expectations or conflict which could result in project delays. The common CSR programme was designed to avoid creating a transactional relationship between communities and the Developers but instead to build relationships and trust. Each Developer wishing to participate in the SESA process will be expected to commit to the common CSR programme in due course.

The results of the CSR analysis reflected the community suffers from the following points

Health

- Lack of health service. The governorate provided them with a public hospital 20 years ago as well as a health unit a few years ago. The hospital was built and equipped but never worked. The health unit has 5 different clinics but without doctors. They have only one general practitioner. He is not a specialist, so community people go for special treatment in the surrounding cities.
- The health unit is not well equipped with medications and even cannot provide the people with the main serums (e.g. Scorpion serums).
- The nearest ambulance service is 6 km away from the village.
- They have about 18 kidney failure patients and they don't have a dialysis unit which is considered very important and can be categorized as priority demand. For treatment, the patients have to go 30 km to Aswan to the dialysis unit twice a week.
- They have several liver diseases.
- The village has only one pharmacist which is not available because he is in the military service now.

Education

- The community has enough schools with different educational stages. However, following are some problems:
 - Poor education system begins from precooling stage to high schools, Teacher are not well trained and as a result are incompetent to teach children. Children in the preparatory schools don't know how to write their name. Accordingly the children are not reaching the university level.
 - Given the fact that children receive poor educational service, the community is in lack of specialist (e.g. engineers, doctors, pharmacists etc.). If a student wants to study scientific professions, he has to go to Daraw city which is about 12 km away from the village.

Employment generation – male outmigration

- Due to the poor education system most graduates have poor qualifications. So far most of the graduated females enroll vocational education that enables them to have administrative job. Men are keen to travel and work in the Gulf countries. However, only a few qualified ones can find a good employment opportunity.
- Sample surveyed are keen to get a governmental job opportunity with fixed salary

Transportation

- Transportation problems can be seen under several aspects: transportation means , working hours and transportation expenses:
 - There are four means of transportation available in Benban:
- 11 Micro Buses for transporting people to the surrounding cities.
- State Ferries and private boats for connecting Benban with the surrounding villages.
- TukTuks for internal transportation and
- Private cars.

Micro buses are not sufficiently in number to accommodate people, especial during rush hours.

- The State Ferry service has stopped a few years ago and was replaced by some private boats owned by municipality staff. It is expected that the state owned ferries will not be repaired any longer. Ferries and private boats are working only up to 5:00 pm, which is badly affecting the community's economic conditions.
- Micro Buses start to work only up to 11:00 pm, meaning that there will be no access to any other city after 11:00 pm not even for health treatment. This problem could be solved soon, because the mayor promised to provide an evening sail ferries within 45 days.
- The cost of transportation in Benban is relatively high due to the limited number of transportation's means.

Utilities

- *Electricity*
 - The community confront with a problem in electricity power, as electricity power is sufficient only for ventilation and lightening. For other electrical equipment, which needs more electric power, the citizen have to get electricity generator which cost at least 2000L.E.
 - Electricity continuity is still a question in the area that made community people disrupted. Consequently, most families are obliged to buy electricity generators.
 - During the last few years, the state has steadily increased the electricity bill
- *Water*
 - As community people get their water from the Nile through water plant, the quality of water was not satisfactory to them. This is mainly due to lack of rigid

monitoring system. The person in charge is not around most of time. Therefore, workers add chlorine to the water with no control.

- Water continuity remains as a question. This is mainly due to rusted small and out of date pipeline

Sewage:

- The villagers rely on septic tanks as sewage, which is emptied once a month during summer time. Yet, in winter, the underground water increase water volume in the tanks. Therefore, they should be emptied twice or three times a month. That is costly . It is expected that with the finishing of the sewage pumping station, which is under construction, the citizen will be connected to a piped sewage system.

Groundwater:

- Underground water remains as a problem in Benban village. It affects the houses, plants and also the sewage system. The problem escalates during winter time. The community people rely upon their annual revenue to repair damage caused by the underground water.

Termites:

- Termites destroy houses and furniture in the village. Pesticides are not effective to get rid of the termites.

Solid waste

- The waste produced in the area is mainly municipal solid waste and organic waste. Regarding organic waste, no problems have been reported as community feed wastes to animal.
- The solid waste i.e. plastics, papers etc. community people had used them in the baking ovens. However, after using the gas ovens, they give them to a waste collector who collects it every 20 days with a monthly fee of 20 LE. Waste collector dispose wastes into desert lands where wind carries back wastes to the villages.

Natural gas

- In the last few months, the government increased the prices of the LPG cylinder, as well as, the cylinders were difficult to be found. Consequently, the community people expressed their willingness to be connected to the natural gas network especially because they are so close to the natural gas network. They submitted a

request to the Natural Gas Companies, but their request was rejected due to technical specifications related to the necessity to be connected to all facilities including sewage network.

Streets illumination

- The municipality illuminates main roads. Community people have their own source of light they use in the side roads.
- Though they have lighting columns all over the village no lamps have been provided.

Wild animals

The absence of street lighting encouraged stray dogs to step into the villages. That result in insecure conditions to people, especially young people and children

- **Veterinary and agricultural associations service:**
 - The village has tremendous livestock. Animals perish every year due to the absence of sufficient veterinary care. In the past, the animals got vaccinated by the veterinary units but after the 25th of January Revolution, no serum is available.
 - The same is happening with the fertilizers: from time to time the agriculture associations provide limited amounts of fertilizers and distributed them immediately. *“Nowadays we have to collect them by ourselves and if we are not there on time then we are not provided with fertilizers”* reported by the farmers,

Community Needs assessment

The data collected reveal that the community people have come across various problems and obstacles that need quick action. Based on the above mentioned problems, the sample ranked their problem as follow:

- Need of basic utilities was the issue ranked highest, especially, water supply and electricity. Access to LPG or natural gas was one of the main problems as they rely upon LPG cylinders in baking bread. Sewage problem was not of the community priority,
- Provision of proper transportation was ranked as the second problem that necessitate immediate action

- Job opportunities remains as one of the most critical problems affecting community people,
- Lack of experience and limited capacity is also one of the problems reported by the participants,
- Lack of proper health facilities was ranked as the fourth problem. That also includes health service to be provided to the animal,
- The problem of termites was one of the problems that disturbs the community

Proposed initiatives to be provided under the CSR (focus areas)

The main concern that might be raised by any needs assessment is that turning the process into a shopping list. That might raise the expectations of community people and result in community disturbance in case of their needs is unmet. The following figure summarizes the main areas to focus on.

It is crucial to note that some of the problems might be solved through mobilizing other stakeholders i.e LPG cylinder problems. It might be solved by coordinating with the main LPG outlet. They can provide a quota to the area but in more disciplinary manner. This is also applied on the fertilizers distribution.

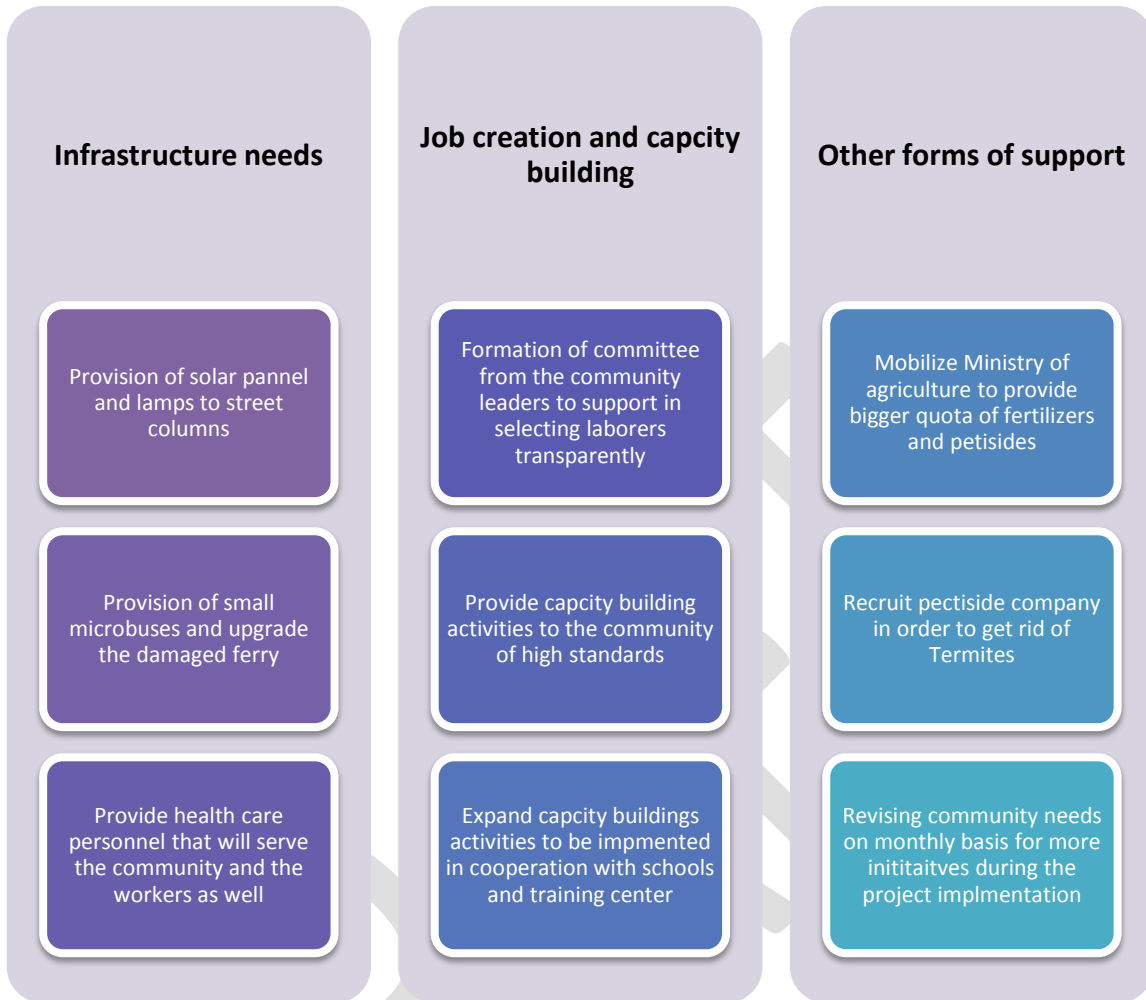


Figure 53. Preliminary Community Development Focus areas

As per IFI recommendations for this specific Solar Park, developers are to be committed to a unified CSR scheme in order to:

- 1- Economize developer resources
- 2- Avoid duplication of the projects and initiatives
- 3- Act as one association will put limitation to community exploitation
- 4- The CSR will benefit the community if the budget allocated to it is big. That might be only achieved in case of assemble resources from 39 developers
- 5- Unifying of efforts and budget will avoid any conflict of interest between various projects.

5. Analysis of Alternatives

Egypt, with a land area of just over 1 million square kilometres, has a population of 87 million who live predominantly near the banks of the Nile River in an area of about 40,000 square kilometers. It has a well-established electricity supply system operated by the Egyptian Electricity Holding Company (EEHC), which is responsible for electricity production, transmission and distribution, as well as bulk sales; there are also some privately operated generating facilities. The total installed generating capacity is 32,015 MW. This breaks down into the following split in generation technology.

Table 38. Installed Capacity in MW

	MW	32,015	% Share
Total Installed Capacity	MW	2,800	8.75
Hydro	MW	26,480	82.75
EEHC Thermal	MW	687	2.10
Renewable (Wind and Solar)	MW	2,048	6.40
Private Sector (Thermal)	MW		

In total, 168,050 GWh of electricity were produced in 1n 2013/14. Electricity generation by type of technology is dominated by thermal plant using natural gas or fuel oil. Following table shows the breakdown in total generation according to technology.

Table 39. Total electricity generation and share of technologies

Type		2013/14	% Share of Technology
Steam	EEHC Affiliated Companies	62,971	
	Private Sector	14,154	
Gas Turbine		10,790	
Combined Cycle		65,034	
Total of Thermal Generation		152,949	91.0
Renewable	Hydro	13,352	7.9
	Wind	1,332	0.9
	Solar/Thermal	114	
Total Grid		167,747	
Isolated Plants		241	0.2
Purchased from IPPs		62	
Total		168,050	100

Main energy users were residential customers and industry and commerce. Figure 5.3 provides a breakdown of user groups. It shows a steady increase in overall demand, largely driven by residential customers. Demand is widely forecast to rise by around 7% per year for at least the next decade.

Table 40. Development of electricity usage by customer sector

Usage	2009/10	2010/2011	2011/12	2012/13	2013/14	% Share in 2013/14
Industry	38916	40702	42098	39887	37320	26.10
Agriculture	4834	4927	5560	6230	6310	4.42
Utilities	5555	5759	6010	5904	5962	4.17
Public Lighting	7050	6186	6537	6210	5692	3.98
Governmental Entities	5443	5977	6385	7664	8297	5.80
Residential	47431	51370	56664	59757	61962	43.34
Commercial & Others	9674	10238	10715	14605	17392	12.16
Total	118903	125159	133969	140257	142935	

To meet this rapidly increasing demand, substantial new generating capacity has to be added to the system, by EEHC and by private operators. The projected necessary increase in generating capacity is around 7% p.a. for the next decade and possibly up to 2035.

5.1 'No action' Option

Under this option, the proposed project would not go ahead and the potential 1,800 MW of new capacity would not be added to the electricity supply system. This would exacerbate the already existing shortfall in overall generating capacity which is the cause of regional power outages. The 'no action' option would adversely affect all customers, from industrial/commercial customers to residential customers. The well-being and comfort of the population would be impaired; vital infrastructure systems (from hospitals to domestic water supplies) could possibly be affected by outages and would need to increasingly use back-up generators; and the development of industry and commerce would be affected as such areas are not attractive for new investment.

Because of this, 'no action' (i.e. no additional generating capacity) is not a valid option.

5.2 Technology Alternative

Egypt uses a mix of generating technologies as shown before. This is currently dominated by thermal generation. This current reliance on thermal generation (with fuel oil and natural gas as fuels) is a cause of concern mainly because of its strategic and economic implications, but also increasingly for environmental reasons (e.g. the objective to reduce Egypt's overall carbon emissions). The Egyptian Electric Utility and Consumer Protection Regulatory Agency comments on the current and likely future scenarios of continued fossil fuel reliance as follows:

Studies show that, even though Egypt possesses a reserve of primary energy resources; Egypt will face a deficit to cover its demand from these resources due to rapid utilization and increase of extraction costs. Expectations indicate that retaining balance between oil and natural gas production and their usage within three (3) years can be achieved after overcoming the economic challenges facing the oil and natural gas sector. However, according to the Egyptian energy strategy for 2030 and its update to 2035, it is expected that Egypt will be a net importer of oil and natural gas within ten (10) years from the start of the third decade of this century. This situation represents an additional challenge for the Egyptian economy which will become more vulnerable to the price fluctuations in the international energy markets, which can't be predicted or controlled. In addition, this will lead to Egypt's loss of foreign currency and the decrease in the competitiveness of the national economy. Therefore, there has to be diversification of the energy resources to maximize the benefits of using local resources which are characterized by continuous and stable prices such as investing in generation electricity from renewable resources that are rich in Egypt. (Source: EgyptERA website)

The second most important current energy source for electricity generation is hydropower generation. This is limited to the Nile and the potential is largely exploited. The five dams (High Dam; Aswan 1; Aswan 2; Esna; Naga Hammadi) provide a peak load of 2995 MW and already contribute to the maximum of their capacity to the overall electricity supply.

This leaves nuclear power and renewable energy technologies as remaining options. Egypt does not operate a commercial nuclear reactor and various attempts to revive an old civilian nuclear power programme have not led to a concrete development; plans for a 1,000 megawatt nuclear power station at El Dabaa were initially abandoned after the Chernobyl accident and the site is said to have been closed down following protests. More recently there have been renewed moves to develop nuclear power; Memoranda of Understanding to develop commercial nuclear power projects were signed between Egyptian authorities and The MOU was signed during a CNNC delegation's visit to Egypt between Rosatom of Russia (in February 2015) and China National Nuclear Corporation (CNNC) in May 2015.

Renewable technologies are currently a favoured technological option, particularly onshore and offshore wind-power and solar thermal and photo voltaic power stations. As the previous sections have shown, renewable energy production is at present not widely used in Egypt. Concentrated Solar Power (CSP) has been evaluated for Kom Ombo but this project

is not progressing; costs of approximately EURO 600 m for a 100 MW plant are very high in comparison to other renewable technologies. However, the potential for using wind-power and photo-voltaic for small to large-scale electricity generating plants has been evaluated and sites for wind and solar PV have been identified.

The overall target according to EEHC is to provide 20% of electricity from renewable sources by 2020, with an installed capacity of 7,200 MW of wind-power (providing 12% of electricity); 2,800 MW of hydro-power (providing 6% of electricity); and 1320 MW of solar (providing 2% of electricity). In September of 2014 the Egyptian Government approved the feed-in tariffs (FIT scheme) for electricity projects up to a total of 4300 MW using renewable energy resources (wind and photo-voltaic) to be implemented by 2027. This target includes 300 MW for small PV installations below 500 kW, 2000 MW for large-size PV installations (from 500 kW up to 50 MW), with the remaining 2000 MW consisting of wind energy installations from 20 MW up to 60 MW.

There appears to be considerable interest from developers in such projects. An invitation for prequalification for renewable power projects (wind and photo-voltaic), issued in October 2014, resulted in 185 applications for power projects totaling 3000MW for wind and 10000 for photo-voltaic power stations (Source: EEHC Annual Report 2013/14) and the 39 Benban plots are committed to project developers.

Regarding Wind energy the Wind Atlas for Egypt and International Renewable Energy Agency confirms the existence of a widespread and particularly high wind energy resource along the Gulf of Suez.

The existing wind-power resources are only partially used. Installed wind-power capacity accounted for 610 MW in 2014, which makes Egypt no. 32 in the list of nations with wind-power installations (Source: Wikipedia). However, the FIT Scheme provides an incentive and there is large interest in new developments.

A point of concern for wind-power installations, and potentially also for large-scale installations of solar panels with their glare potential, is bird migration from Europe to Africa, across Egypt. The Gulf of Suez region is a pathway of birds migrating from eastern and western Europe to the warm regions in east and central Africa in autumn, and back in spring.

In total, more than 470 bird species are known in Egypt, mostly non-breeding migratory species. This includes 16 species of global conservation concern; there are 34 Important Bird Areas in the country. This includes the white stork which is primarily migrating across Egypt along the Nile valley (Source: BirdLife International)

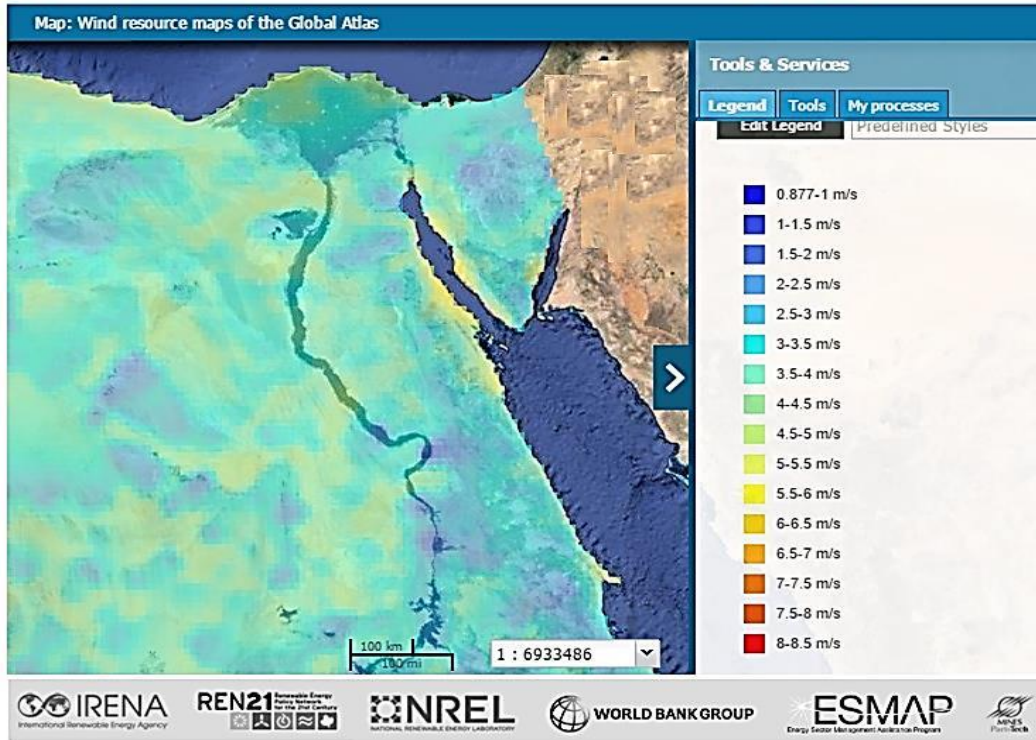


Figure 54. Wind Resource and Potential usage in Egypt

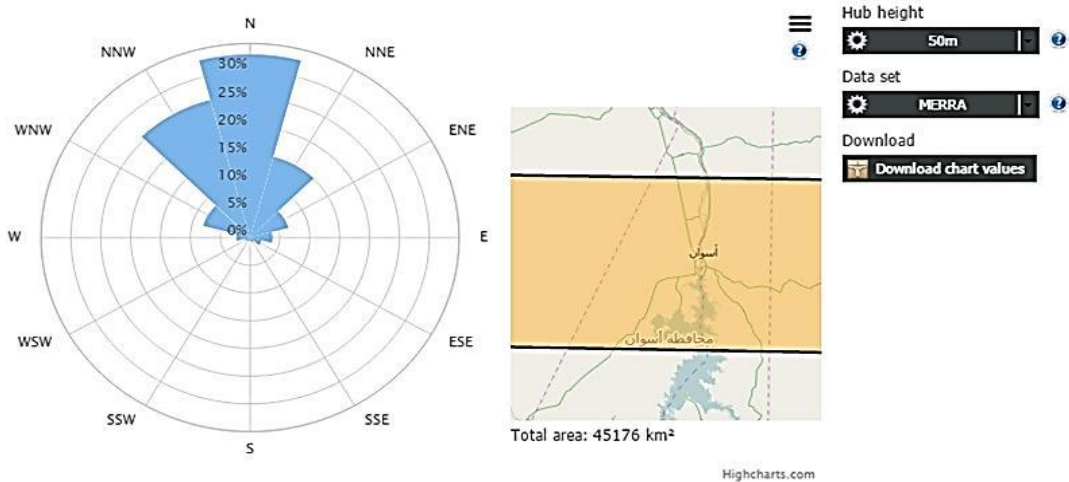


Figure 55. Wind rose (Wind direction on the area)

There is significant solar radiation potential in the country, particularly the southern part, as can be seen below. Benban is located within a high solar radiation area. This potential has so far rarely been used for electricity generation. A 140 MW Integrated Solar Combined Cycle Power Plant located at Kuraymat is in operation since 2011. The Government of Egypt has carried out preparatory work for a Concentrated Solar Power plant (CSP) Project at Kom Ombo (part of the Benban site), but this project is not progressing.

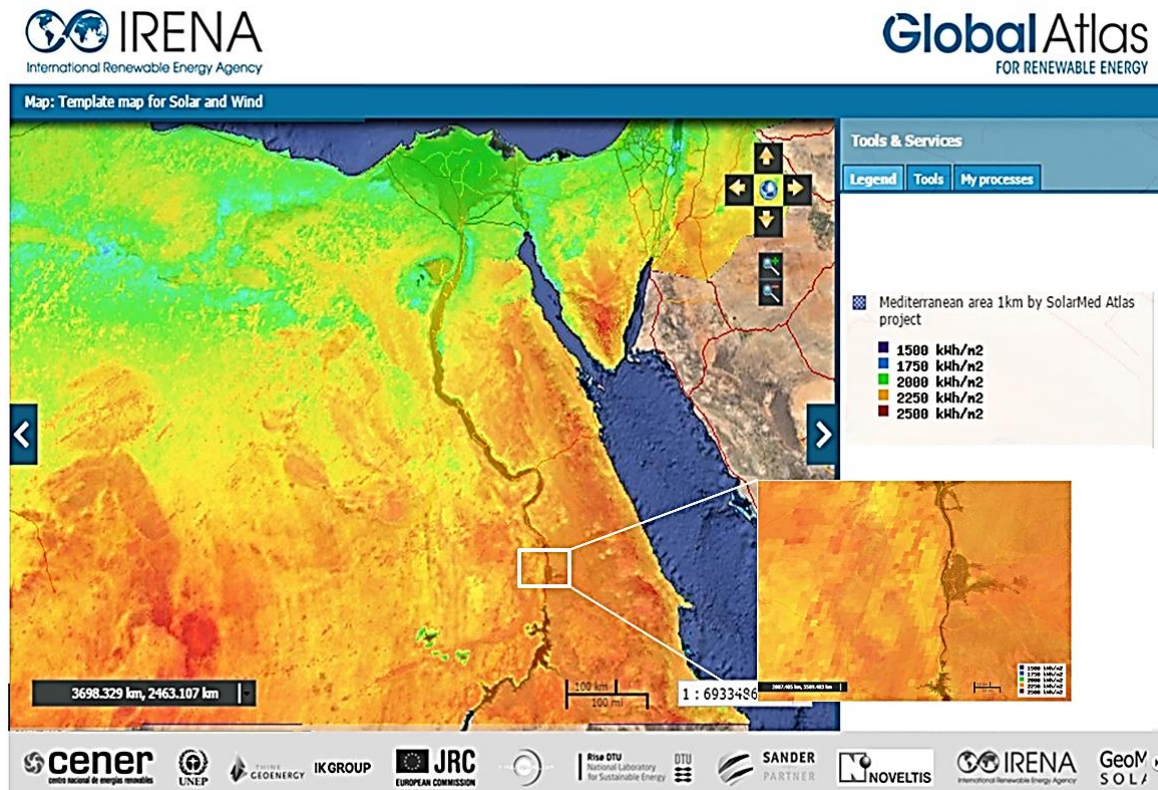


Figure 56. Solar Radiation in Egypt and in the project's area

With the exponential growth of photovoltaic installations, prices for PV systems have declined significantly in recent years and are in many countries now at parity or even below more conventional power generation technologies such as thermal and nuclear. In 2014, cumulative photovoltaic capacity reached at least 178 GW, sufficient to meet approximately 1% of global electricity demand. The graph below (from Wikipedia) shows the increase in global installed PV capacity. Predictions of annual installations vary significantly; a summary of forecasts provided by Wikipedia (Growth of Photovoltaics) lists forecasts ranging between 38 and 86 GW (annual), with total installations predicted to reach 403 and 696 GW respectively by 2020. The fastest growth for PV installations is predicted for China, South-East Asia, Latin America, the Middle-East, North Africa, and India.

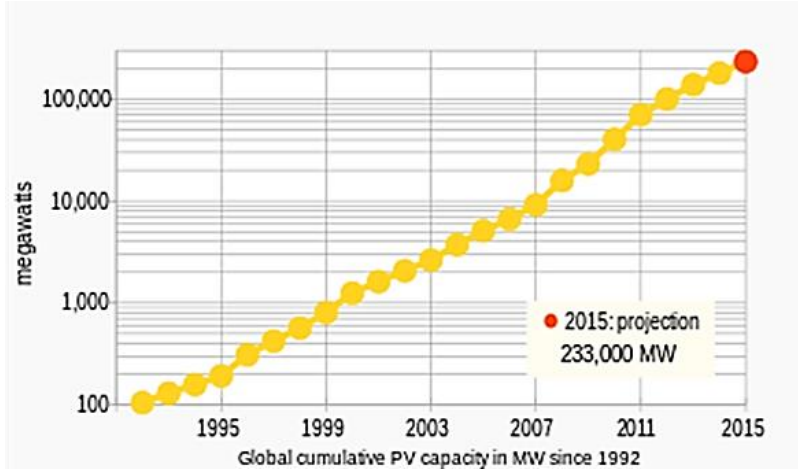


Figure 57. Global cumulative growth of photovoltaics

The proposed development at Benban with 39 individual projects would create the first large-scale photo-voltaic electricity generating plant in Egypt. If successful and commercially attractive this could pave the way for further large-scale PV developments and will be a major contributor to Egypt increasing power demand. It is also a technology which will help the Government of Egypt to reduce the country's Carbon Dioxide emissions from electricity generation. The precise amount of CO₂ emissions avoided by the Benban PV projects (compared thermal power stations) cannot be precisely calculated at this stage; this would require information on the precise existing emission factors for grid connected power generation; for the precise capacity and technology to be installed at Benban; and on the expected total annual electricity generated and fed into the electricity grid from all Benban Projects.

However, information from other, broadly comparable installations such as the planned Sonnedix plant in the Atacama desert in the North of Chile is sufficient to make a reasonable assumption (Atacama plant location in the Pica and Pozo Almonte community, province of Tamarugal, approximately 79 km to the south-east of Iquique City). The existing electricity supply system in Chile is also widely based on thermal generation (oil; gas; some coal) and on hydro-power and wind-power, and thus broadly comparable with Egypt.



Figure 58. Atacama Pilot PV plant

The Clean Development Mechanism Project Design Document for this Atacama project calculates CO₂ reductions due to each of its 50 MW installations at 82,161 tonnes of CO₂ per year.

Assuming similar reductions/avoidance of CO₂ generation at Benban, the total reduction in CO₂ emissions from this site (assuming operation at 1,800 MW) could be in the order of 3 million tonnes of CO₂ per year.

5.3 Site Alternatives

Key selection criteria for renewable energy installations such as Benban include:

- The availability of a sufficiently large land area which is unused and where ownership can be obtained easily (e.g. government land);
- The area has few receptors and no important receptors for environmental impact;
- The area is sufficiently distant from residential areas to avoid any social impact or to pose only a manageable impact;
- The site is close to a well-developed road network which allows transport of large volumes of equipment inclusive of large-scale components;
- The site is close to the electricity transmission grid, can be easily connected without any significant environmental and social impact, and would not have a negative impact on grid stability.

Benban meets all these requirements.

5.4 Operational Alternatives

Experience with PV modules, especially in desert areas, shows that soiling of the modules (deposition of sand and particulates on the surface) is a significant factor in reduced production. Cleaning techniques vary from high-automation to simpler labour intensive methods. The cleaning mechanisms may also involve a significant portion of dry cleaning (brushes) to reduce water consumption in the wet cleaning sessions. Regardless of the degree of dry cleaning, there exists a non-negligible water requirement for wet cleaning of the modules.

Alternatives for water supply to the Benban and similar desert areas are mainly:

- Based on site-specific groundwater resource assessment (quantity and quality); use groundwater as source of cleaning water
- Based on site-specific studies; either construct an intake from the nearest water body (the Nile in the case of Benban) or agree with relevant authorities to have the water utility extend the public network to the project site;
- Arrange for water shipments and install an on-site water storage tank to satisfy wet cleaning and other water needs

An association of Benban investors is being formed in order to collectively address the water supply issue for the 39 investors.

5.5 Conclusions

The Benban project meets all the requirements of site suitability as mentioned above; is in-line with the development strategy of the country; and uses a technology which is environmentally beneficial (low impact; avoidance of CO₂ emissions). It is sufficiently distant from residential areas to have a transient and manageable impact during construction and an almost negligible impact during operation. In conclusion, the project as envisaged meets all the positive criteria and can be considered beneficial with minimal long-term impacts.

6. Environmental and Social Impact Assessment

6.1 Introduction and methodology

A thorough analysis of environmental and social impacts is important to detail an effective management and monitoring plan which will minimize negative impacts and maximize positives.

The main objectives of the assessment are to identify, prevent and evaluate the potential impacts and, if it is the case, propose mitigation measures to minimize the impacts detected before the project start.

The impact assessment methodology adopted for this ESIA is a “cause-effect” matrix modified from Leopold; and Buroz’s Relevant Integrated Criteria to evaluate the impacts. The environmental impact assessment methodology encompasses a semi-quantitative assessment that considers the following:

- Probability of the impacts
- Spatial and temporal scale
- Intensity of the impacts (which also considers the sensitivity of receptors, and the reversibility nature of the impact)

This matrix is two-dimensional, where the stages of the project (activities) are assessed in relation to the existing environmental characteristics and conditions that may be affected during the execution of those actions.

6.1.1. Identification of environmental and social impacts

Based on the analysis of the expected activities to perform the project, such as to preparing the area, building the infrastructure necessary for proper operation, operating and maintenance of the PV Power Plant, the impacts were identified. The impacts were classified into:

*Impacts during the **Mobilization phase** related to:*

- Hauling of construction materials and equipment

*Impacts during the **Preparation of the site phase** related to:*

- Fencing the area for controlling the access
- Roads and corridors construction

- Leveling and preparing the land for setting the structures

*Impacts during the **Planning and Construction phase** related to:*

- Assembling structures
- Placement of temporary infrastructure
- Construction of infrastructure

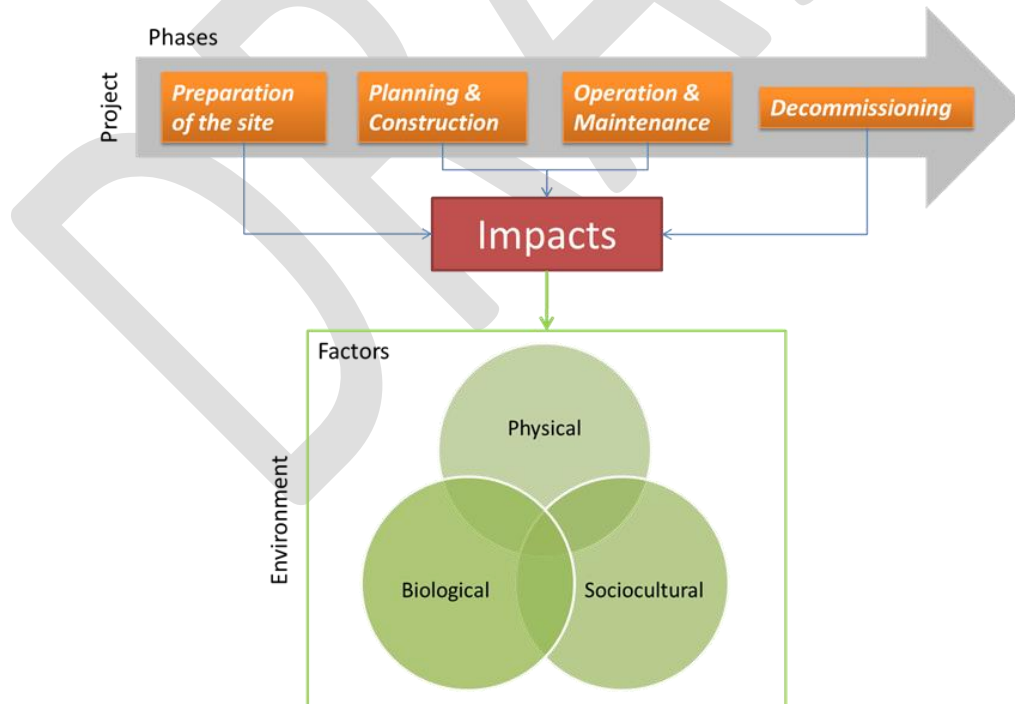
*Impacts during the **Operation and Maintenance phase** related to:*

- Operation of the Plant and energy generation
- Maintenance of the Plant

*Impacts during the **Decommissioning** related to:*

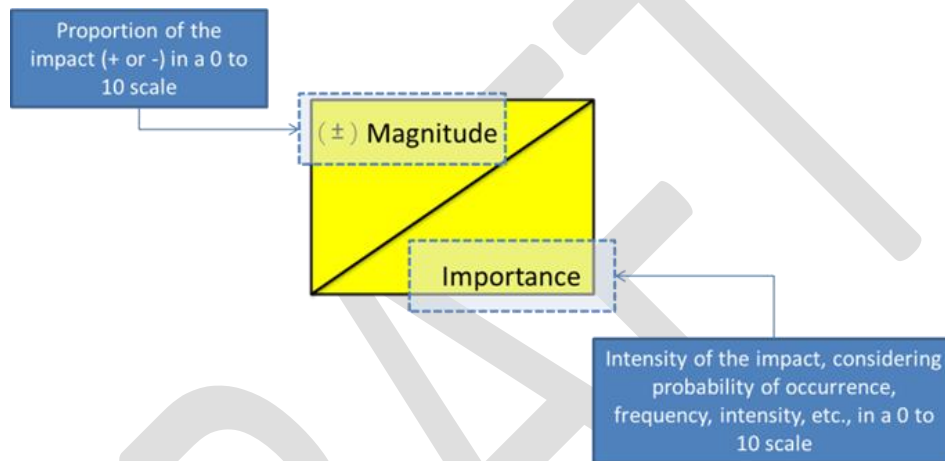
- Disassembling the plant
- Cleaning the land

The “cause-effect” matrix identifies the impacts during the mentioned phases, considering the elements of the environment and social context (*receptor of the impact*).



Each impact was identified considering:

- **Type of impact:** The negative or positive influence on the receptor.
- **Magnitude:** The extent of the impact within a scale (0-10)
- **Importance:** That includes the probability of occurrence, frequency, intensity of the impact, etc., within a scale (0-10)



The results of the analysis are presented in the following table.

6.1.2. Importance of the impacts identified

After the impacts are identified, the matrix of importance of the impacts by each phase reveals that the Preparation and Construction Phases are those who have more impacts, but according with the methodology, are moderated impacts. The importance of the impact reveals the relation through the impact is measured qualitatively in function of the grade of incidence or intensity of the alteration produced, and the characterization of the effect with some attributes such as extension, type of effect, persistence, accumulation, etc.

- **Sign:** The sign of effect, and therefore the impact refers to the beneficial character (+) or harmful (-) of the various loads acting on the various factors considered. There is the possibility of including, in some duly justified specific cases and argued, a third character (*), reflecting effects associated with the activity outside circumstances, so that only through a comprehensive study of all would be possible to know its harmful or beneficial nature.
- **Intensity (IN):** This term refers to the degree of impact of the action on the factor, in the specific field that acts. The rating scale will be between 1 and 12, in which 12 expressed total destruction factor in the area in which the effect occurs, and 1 minimal involvement. Values between those two terms reflect intermediate situations.

It should be noted that this assessment is made based on a percentage of the project area (project area and / or their catchment areas, if applicable) being directly affected. Extension (EX)

It refers to the theoretical area of influence of impact in relation to the environment of the activity (area percentage, relative to the environment, in which the effect manifests itself). Area of Direct Influence (AID) is used as a reference for quantification

If the action produces a much localized effect, the impact is considered to have an ad hoc basis (1). If, however, the effect does not allow a precise location within the environment of the activity, taking a widespread influence on the whole, the impact will be Total (8), considering the intermediate situations, by gradation, as partial impact (2) and large (4).

- **Momentum (MO):** The term refers to the manifestation of the impact time between the onset of action (t_o) and the beginning of the effect (t_i) on the factor / environmental aspect considered.

If the Momentum is zero, the impact will be immediate, and if it is less than one, short-term year, assigning a value in both cases (4). If a period of time ranging from 1 to 5 years, medium term (2), and if the effect takes to manifest more than five years, long-term, value assigned (1).

If concur any circumstances that would make the critical moment of impact, one might ascribe a value four units specified above.

- **Persistence (PE):** It refers to the time that would remain the effect from its appearance, and from which the affected factor would return to the pre-action by natural means or by introducing corrective measures initial conditions.

If the duration of the effect takes place for less than a year, we believe that the action produces a fleeting effect, assigning a value (1). If it lasts between 1 and 5 years, temporary (2); and if the effect is longer than 5 years, we consider the effect permanent assigning a value (4).

Persistence is independent of reversibility.

- **Reversibility (RV):** It refers to the possibility to rebuild the affected factor due to the thrust action, ie the possibility of returning to the pre-action initial conditions, by natural means, once that ceases to act on the environment. If short-term, ie less than a year, is assigned a value (1), if the medium term, ie a period ranging from 1 to 5 years (2) and if the effect is irreversible, or hard over 5 years, we assign the value (4). The time intervals comprising these periods, are identical to those assigned in the parameter above.
- **Recoverability (MC):** It refers to the possibility of reconstruction, all or part of the affected factor as a result of activity undertaken, ie the possibilities to return to the pre-action initial conditions, through human intervention (introduction of corrective measures).

If the effect is fully recoverable, and if so immediately, is assigned a value of 1 or a value of 2, if it is the medium term, if the recovery is partial and the effect is mitigated, it takes a value 4; when the effect is unrecoverable assign the value of 8. In the case of unrecoverable (impossible to repair, both natural action such as human disturbance), but there is the possibility of introducing countervailing measures, the value is 4.

- **Synergy (SI):** This attribute provides the reinforcement of two or more simple effects. The total component of the manifestation of the simple effects caused by actions acting simultaneously is higher than one would expect from the manifestation of effects when the actions that causes act independently and not simultaneously.

If action acts upon a factor, is not synergistic with other actions that act on the same factor, the attribute takes a value of 1, if you have a moderate synergism, it is set to 2 and if it is highly synergistic should be assigned a value of 4. Where cases of weakness occur, the present assessment of the effect of negative values, ultimately reducing the value of the significance of the impact.

- **Accumulation (Ac):** This attribute gives the idea of the progressive increase of the demonstration effect, when it persists continuously or repeated action that generates it.

If action does not produce cumulative effects (simple accumulation), the effect is evaluated as (1). If the effect is cumulative value increases. (4)

- **Effect (EF):** This attribute refers to the cause-effect in terms of its directionality, ie the form of manifestation of the effect of a factor as a result of an action. An impact may be direct or indirect at the same time, although various factors, since the scale is exclusive, and not the fact that it can be directly and indirectly is valued, it should be the exclusive rating.

The effect can be direct or primary, and in this case the impact of the direct result of this action, it is assigned a value of 4. If an indirect or secondary effect is present, that is taking place from a primary, and there is no direct effect associated with the

same action, the impact is assigned a value of 1. Its manifestation is a direct result of the action, but occurs from a primary effect, is acting as a share of second order.

- **Frequency (PR):** The periodicity refers to the regularity of manifestation of the effect, either cyclic or recurrent (periodic effect) way, sporadically in time (irregular effect), or constant over time (continuous). Continuous effects are assigned a value of 4, to a value of 2 newspapers, and irregular appearance, which discontinuous a value of 1 to be assessed in terms of probability of occurrence, as well.
- **Importance of the impact (I):** It has already been suggested that the significance of the impact, that is, the importance of the effect of an action on a factor / environmental aspect, not to be confused with the importance of the affected environmental factor.

$$I = \pm(3IN + 2EX + MO + PE + RV + SI + AC + EF + PR + MC)$$

The importance of impact has values between 13 and 300 points. It has intermediate values when any of the following circumstances:

- Total current and minimum condition of the remaining symbols.
- High or very high intensity, high or very high condition of the remaining symbols.
- High intensity, high unrecoverable effect and condition of any of the remaining symbols.
- Medium or low intensity, effect and high unrecoverable condition of at least two of the remaining symbols. Impacts with values lower than 25 are irrelevant or importance is compatible or environmental measures contemplated in the project design.
- Minor have an important impact between 26 and 50. They will be severe when the importance is between 50 and 75 and critical when the value exceeds 76.

IRRELEVANT	0	25
MINOR	26	50
SEVERE	51	75
CRITICAL	76	300

After the analysis of identification and importance of impacts, it is clear that the *Preparation of Land and Construction Phases* will be the most critical phase that can have negative consequences on receptors, especially on soil and water. It is expected that other phases generate impacts but minor and irrelevant.

Regarding positive impacts, the project will provide job opportunities and, especially considering the PV Benban Project as a whole, the economic impact on the area of influence will be significantly positive.

6.2 Waste generation

As a general condition, **waste** will be generated during all the phases of the project however, is predicted that some phases will have less generation of waste than others. *Mobilization, Construction* and *Decommissioning* phases will generate the highest rates; meanwhile *Operation* will generate the lowest.

The waste generated will include municipal solid waste; paper and plastic packaging waste; and waste from construction and maintenance of the PV installations (e.g. construction materials; hazardous materials such as cleaners, solvents; paints and their containers, etc.).

Likely Construction waste:

- Building Waste: Volumes are not known but construction of buildings (for security; control and maintenance; storage; sanitary facilities; food preparation and canteen facilities, etc.) is likely to be limited as many developers indicated that prefabricated structures or containers are a preferred option.
- Paper/packaging/plastics/wood: Mainly from the transport packaging for frames, panels and electrical equipment.
- Hazardous wastes: Mainly cleaning fluids, solvents, paints and their containers; will include others than solder from electrical connections.
- Municipal waste: Mainly from food production and plastic waste. Assuming that in labor conditions, each worker produces 1.3kg/day, the generation of MSW will be as follows:

Mobilization & Preparation Phase

number of workers	Estimated Solid Waste Generation		Total during phase	2 months
	Daily tons	Monthly tons	5.46	
70	0.091	2.730		

Construction Phase

number of workers	Estimated Solid Waste Generation		Total during phase	7 months
	Daily tons	Monthly tons	81.9	
300	0.39	11.700		

O & M Phase

number of workers	Estimated Solid Waste Generation	
	Daily tons	Monthly tons
8	0.0104	0.312

Proper waste collection and storage plus regular (preferably twice a week) waste collection by licensed contractors will need to be arranged by developers or site management. To coordinate and control this, site management should develop a waste management plan for municipal solid waste and a plan for hazardous solid and liquid waste.

Operations waste: Waste during normal operations will be minimal and will largely consist of municipal waste (e.g. food; packaging) and over time potentially defunct panels, cabling and control equipment etc. Waste management arrangements for the construction phase should be continued (proper control of collection, storage and final disposal via licensed contractors).

6.3 Description of the impacts by receptor and phase of the project

The identified impacts were organized according to the phase where they will be generated and the receptor of the impact.

6.2.1. RECEPTOR: SOIL

Soil Degradation and potential soil pollution

Impacts on soil because of degradation and potential soil pollution can occur during all the phases, especially during *Preparation & Planning* and *Operation & Maintenance* phases if hazardous substances such as oils, paints, fuel, cleaning agents and other chemicals are

spilled in larger quantities, moreover waste generation and waste management are activities that must be considered. The impacts can be easily controlled by good working practices, worker and contractor training and supervision, and overall good site management practices.

Soil erosion and possible changes in albedo/surface temperature were deemed insignificant for the site due to the shallow and limited nature of the excavations.

Mobilization Phase: During hauling and reception of materials and equipment to the site and storage on site, compaction of the soil result of lorries and vehicles, and waste generation of unpacking and workers activities can be presented.

Preparation Phase: During this phase, land leveling and earth works will be necessary to place the PV structures. Generation of dust and compaction of the soil result of reception of lorries and equipment will be presented.

Regarding to potential soil pollution, during **Construction Phase** large quantities of wastewater from sanitary facilities and possibly on-site food production will occur. Unless treated on site (e.g. in small waste water treatment facilities) this has to be stored in suitable septic tanks and transported off-site. Any facilities, temporary or permanent, will have to comply with sanitary and environmental requirements and have to be controlled by the individual Benban Project companies (if on their plot) or by overall Benban PV site management.

Similarly, other liquid wastes (inclusive of hazardous chemicals) and solid wastes need to be controlled; stored in adequate containers; and disposed of properly according to the applicable legislation. This also requires good working practices and site control and management.

If generators are to be used on site during construction there will be need for fuel transport to the site; for fuel storage; and for regular refueling of generators. This will have to be handled carefully to avoid any spillages and accidents (e.g. fire hazard). Storage facilities have to have a concrete base and bunding; spillage protection needs to be in place; spillage clean-up needs to be organized.

Operations Phase: Once completed the site will have comparatively small numbers of workers and contractors on site at any given time. Sanitary wastes and waste from maintenance and food production will occur only in small quantities. Site management practices introduced during construction should be continued (e.g. storage and disposal of wastes; training and supervision of staff and contractors).

Decommissioning phase: High probability of having the mentioned impacts.

Proposed mitigation measures

- Develop and implement waste management plans for liquid waste; solid waste; hazardous waste;
- Install suitable sanitary facilities with appropriate septic tanks; ensure regular disposal of liquids;
- Install proper food preparation facilities with waste collection;
- Construct an impermeable protective base layer underlying areas with potential hazardous liquids storage or use.

Proposed monitoring measures

- Regular checks of waste collection and storage sites;
- Regular checks of storage of chemicals (e.g. cleaning fluids);
- Regular checks and maintenance of any sanitary facility with liquid waste storage (e.g. septic tanks).

Landscape and Visual Impact

Mobilization and Construction Phase: Considering that the plot (2-1) of DESERT TECHNOLOGIES is part of the Benban PV Solar part that will be covering 37.2 km, Benban will be a large construction site with considerable traffic movements during the construction period, clearly visible from the Aswan – Luxor Highway. Increased dust levels from lorries driving on unpaved roads and from excavation works for foundations of panel frames and buildings are likely.

Operations Phase: Once completed, the plot (2-1) will be an important feature of this largely flat and uniform landscape. However, as structures are low (arrays of panels; single story maintenance and storage buildings), this will not be visually dominant from a longer distance, but will be clearly visible from the Aswan – Luxor Highway which runs parallel to its eastern border, at a distance of approximately 1 km and for a length of 7 kms.

A potential issue considering the Benban PV Solar as a whole, is glare (and glint) caused by sunlight reflected off the PV panel arrays. PV Panels are designed to absorb sunlight (rather than reflect it), and are not usually reflective. Typical panels are designed to reflect only 2% of incoming sunlight. To further minimise nuisance from reflections an antireflective coating is commonly added to the surface of PV cell.

Limited glint and glare can be experienced momentarily (as the sun keeps moving) at sunrise and / or sunset. The effect can be described as a ‘shine’ or ‘glow’. At these times the sun is low in the sky and reflection could be at a low level. At other times reflection is upwards, towards the sky.

In general, there are no aircraft landing strips in the immediate vicinity of Benban; the nearest commercial airport is in Aswan. Road users on the Aswan – Luxor Highway are highly unlikely receptors for glint/glare from Benban panel arrays.

6.2.2. RECEPTOR: AIR

Noise impacts

Noise will be an issue during construction and, to a much lesser degree, during maintenance of the Benban Projects. Construction on the Benban site consists mainly of:

- Limited construction of maintenance and storage buildings;
- Construction of frames;
- Mounting of panels onto the frames;
- Connections between arrays and the substations (cables in underground ducts).

Mobilization & Construction Phase: Construction of buildings and associated ground-works for foundations are likely to be very limited that custom-made containers are a preferred option for buildings. The Company will use piling for construction of panel frames. Excavation and particularly piling could lead to local noise affecting workers. There is likely to be excavation for cable ducts and there will be significant heavy lorry traffic when containers with frames and panels are delivered onto the site. Unloading will require limited use of heavy machinery and construction of the frames will involve hand-held electrical machinery. There may also be a need for generators unless an electricity supply is provided by the local electricity supply company. All equipment needs to meet Egyptian legal requirements regarding occupational health and safety and environment (e.g. for noise).

Receptors for noise are predominantly the workers on site. Good working practices inclusive of use of Personal Protective Equipment (e.g. ear protection) have to be mandatory and need to be controlled. There is no residential buildings close enough to be affected. Noise measurements carried out in October 2015 on a representative plot of the Benban site are comparable to those carried out for the Kom Ombo CSP ESIA in 2013. According to the assumed worst case scenario for the Kom Ombo ESIA (extensive use of heavy machinery on the Kom Ombo site), noise modelling showed that the total measured noise at the Ambulance Station location would be around 50 dBA (compliant with national and IFC standards).

Operations Phase: No noise other than wind and very limited noise from vehicles used on site are expected during normal operations.

Proposed mitigation measures

Implement an occupational health and safety plan which includes:

- Provisions of Personal Protective Equipment (e.g. ear protectors);
- Training on how and when to use protective equipment to be part of the workers' induction training;
- Clear instructions in areas where noise emissions are significant;
- Optimize the use of noisy construction equipment and turn off any equipment if not in use;
- Regular maintenance of all equipment and vehicles.

Proposed monitoring activities

- Measure ambient noise levels in noise critical areas, using a portable noise meter;
- Investigate and follow-up on noise complaints from workers and others, on each site and on the Benban PV site as a whole.

Air Quality and Emissions

It is important to highlight that the impacts generated by the construction of the Photovoltaic Plant in plot (2-1) of DESERT TECHNOLOGIES are *irrelevant/minor* when are considered as an isolated construction. However, considering the project as part of the Benban PV site, the impacts become more intense.

Mobilization: During this phase, local air emissions particularly exhaust gases from large delivery lorries and dust blow will be presented.

Construction Phase: Construction will include excavation; transportation of construction material and other equipment; assembly of frames and arrays; burial of cables etc. Those activities will lead to local air emissions, particularly from generators and dust blow. This will cause

- Fugitive dust emissions (PM₁₀, PM_{2.5})
- Exhaust emissions from (mainly diesel) vehicles and equipment such as temporary generators.

Impacts of dust emissions from unpaved roads and gaseous emissions from vehicles and electricity generators will be local and can be temporarily significant at site entrances, requiring control and good management of delivery logistics at peak construction time. Residential areas are too far at a distance to be directly affected, unless a large proportion of

delivery vehicles use the Benban to Fares road as an alternative to the Aswan – Luxor Highway, this is unlikely.

Operations Phase: Once operational, the most significant environmental impact of the Benban Projects will be the displacement of CO₂ that would occur if, as an alternative to solar PV, thermal generation were to be used to provide the same amount of electricity to the grid. The 41 Benban Projects with a total generating capacity of 1,800MW are estimated to displace approximately 2 million tons of CO₂ per year.

Proposed mitigation measures

Implement a construction site management plan which includes the following measures:

- Use gravel collected on site to improve roads and reduce dust emissions;
- Develop and implement a site delivery plan to regulate traffic and to avoid build-up at the site entrances;
- Regulation of speed to a suitable speed (30 km/h) for all vehicles entering the site;
- Implement preventive maintenance program for vehicles and equipment working on site and promptly repair vehicles with visible exhaust fumes.

Monitoring Activities:

- Investigate dust complaints from workers and residents of Benban village;
- Measure the ambient air quality by active collection of samples on and off-site, including within the nearest communities.

The positive impact of permanent displacement of pollutant gases during the operations phase (including greenhouse gases) when compared with a conventional thermal power station is considered to be POSITIVE-MAJOR.

Traffic/transport

Mobilization and Construction Phase: Transport of materials and workers will have a significant local impact. The highest potential for traffic impacts arises during peak times of construction as the transport of large containers with PV panels, frames and other equipment can require hundreds of vehicle movements per day during peak construction time (2-3 months per plot; construction on many/all plots could occur at roughly the same

time). In addition to materials delivery there will be large numbers of buses ferrying workers to and from the site, plus traffic of contractors and deliveries of food etc.

Transportation of construction materials and equipment from sea ports (most likely in the Gulf of Suez) will be mainly via the Luxor-Aswan Highway. It is not likely that much of heavy traffic will use the minor Benban - Fares road. Large parts of the Aswan – Luxor Highway are single lane in both directions and traffic density is generally low (but many vehicles travel at high speed). At peak construction time the increase in overall traffic density can be significant, with associated noise, dust, exhaust fumes and road safety risks.



Figure 59. Aswan – Luxor Highway

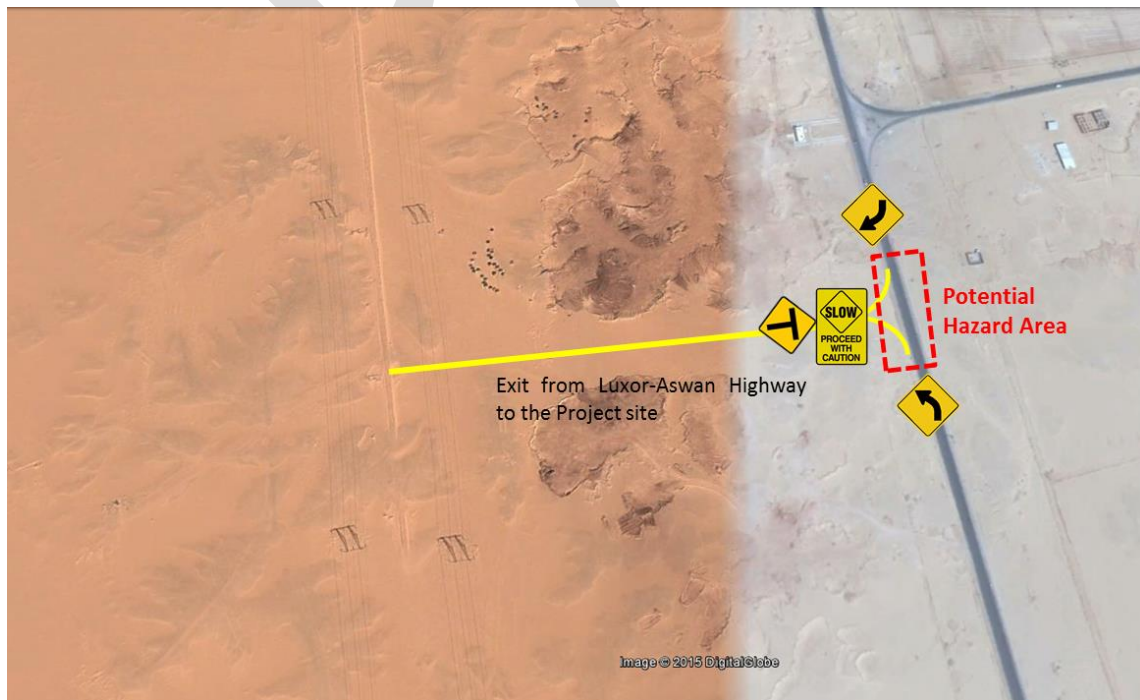


Figure 60. Connection of the site with the Aswan - Luxor Highway

DESERT TECHNOLOGIES [ARC] project stated that

- They aim to start construction on February 2016;
- The construction period would be between 11 months;
- Peak construction time would be 2-3 months;
- Delivery of components would be by road from sea ports, in full-size containers (40 ft);
- The number of containers for panels and frames would be between 600 and 1,000 (for the 50 MW installation with approximately 190,440 panels);
- Containers would normally be stored in front of the plot (according to NREA there is a 7 meters space between the paved main roads and the plots) or on the plot;
- Construction would require between 150 and 300 workers (direct and indirect) at peak time;
- Workers would generally live off-site and be brought in by bus.

	Desert Technologies [ARC] Plot (50MW)
Daily number of workers at <u>peak construction time</u> (90 days)	150
Daily number of workers at <u>normal construction time</u> (11 months)	150-300
Daily number of buses required to transport workers on/off site at <u>peak construction time</u>	10
Daily number of buses required to transport workers on/off site at <u>normal construction time</u> (not peak time)	4 - 6
Total number of containers delivered within 90 days	600
Daily number of containers delivered during 90 days <u>peak construction time</u>	7
Daily number of other vehicles at <u>peak construction time</u> and at <u>normal construction time</u> entering and leaving the site	10
Daily total number of vehicles at <u>peak construction time</u>	27
Daily total number of vehicles at <u>normal construction time</u> (not peak time)	4-6
Daily total number of vehicles leaving and entering the highway at <u>normal construction time</u> (not peak time)	8-12
Daily total number of vehicle movements (i.e. vehicles leaving or entering the highway) at <u>peak construction time</u>	54

Table 41. Transport table estimation

To minimize risk of collision may well require applying effective traffic management measures that must include training of the drivers; traffic signals placed on site and trained supervisors “traffic marshals” that control the transport activities on the site, considering that many developers will have the same activities during the same periods.

Mitigation measures

Implement a traffic management plan including:

- Scheduling of deliveries to avoid bottle-necks (i.e. queues of lorries waiting for site entrance);

- Construction of long slip roads or provision of sufficient space for temporary parking prior to entrance of the Benban site will be necessary; an underpass should be considered;
- Placing of warning signs at 50, 100, 500 and 1000 m north and south of the site entrance/exit. Warning signs to be clear and visible at night;
- Limiting the speed on the road from the highway to the site and on the Benban PV site;
- Coordination of road traffic management with the Ministry of the Interior and the police;
- Use of trained ‘traffic marshals’ to regulate traffic flow;
- Good road maintenance of the Luxor-Aswan Highway and the Benban – Fares connecting road.

Proposed monitoring measures:

- Monitoring of traffic density near the site entrance and exit;
- Monitoring and evaluation of any local traffic accident;
- Recording and documentation of complaints related to traffic congestions from drivers, neighboring communities and other users of the highway and the local road network.

Also, it is recommended

- To assess the potential of glare at the highway roadside and, if significant, to put a screen or a low landscaped wall of local gravel along the highway or along the southern, eastern and northern borders of the Benban PV site;
- To analyze, during operation of the site, all accidents occurring on this stretch of the highway and to establish whether glare of drivers could have been a cause. If that were a contributory cause the screening of the site will have to be improved.

Operations Phase [PV Benban project as a whole]: Traffic to the Benban PV site and on-site during normal operations will be slight to moderate. The number of workers and contractors on site, plus any other site maintenance staff, is unlikely to exceed 400 per day (based on developer’s estimates), unless labour-intensive repair or maintenance work on plots is to be done. The mitigation and monitoring measures recommended for the construction phase should remain in place.

Energy Supply

Construction Phase: Construction works require an electricity supply to each plot; alternatively the developers will have to use their own generators. A decision on whether a central electricity supply to the site with separate connections to each plot is to be installed has not yet been made (November 2015).

Operations Phase: It is assumed that no generators are in use.

6.2.3. RECEPTOR: WATER

Superficial Water Sources Consumption

Construction Phase: During construction, large volumes of water will be required for sanitary purposes. Assuming 50 liters per capita this can amount around 7.5 m³ per day during peak time, plus any water required for construction (concrete production for building work; equipment cleaning). There can also be a requirement to control fugitive dust (e.g. from vehicle traffic on unpaved roads) by water spraying.

		Estimated Water Consumption			
Number of workers	Consumption by worker (lt/day)	Daily		Monthly	
		Liter	m ³	Liter	m ³
150	50	7,500	7.5	225,000	225

Some structures need to be built before placing the PV supporting structures. Some of these structures need cementation on the base.

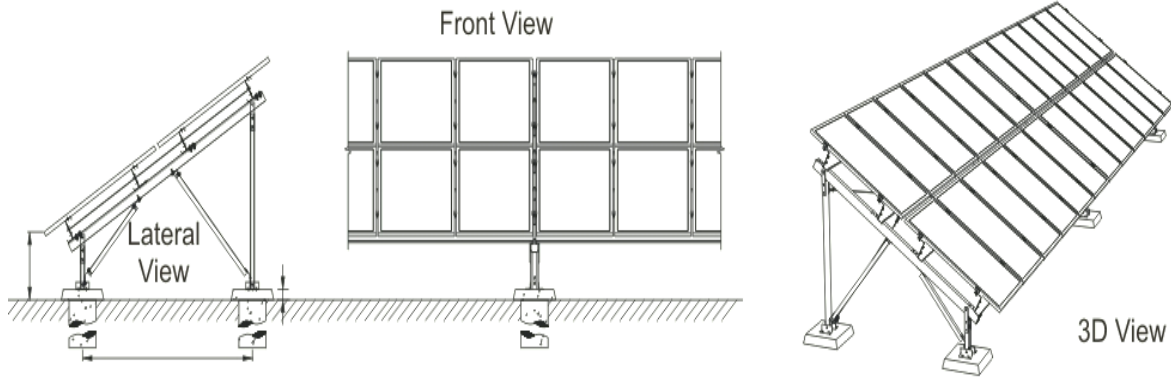


Figure 61. Cement piling for PV structures

The waste consumption for construction activities and fugitive dust emission control is estimated on 10m³/day

	Estimated Water Consumption			
	Daily		Monthly	
	Liter	m ³	Liter	m ³
Construction activities	10,000	10	300,000	300
Workers consumption	7,500	7.5	225,000	225
Total Consumption	17,500	17.5	525,000	525

Table 42. Water consumption during Construction Phase

Operations Phase: During operations, water large quantities could be required for panel cleaning; water requirements for sanitary purposes will be low as the number of control and maintenance workers.

Because of sand-blow, panels will have to be cleaned regularly to prevent dust build-up which would affect panel performance. Figure below shows a panel exposed at Benban, covered with a thin film of sand, next to a clean one. A realistic frequency for cleaning is not known and depends on weather conditions. Cleaning can be done with or without water (brush cleaning), in commercial PV installations often with automatic or semi-automatic cleaning systems. The figures below show examples of both cleaning methods.



Figure 62: Trial panels at Benban

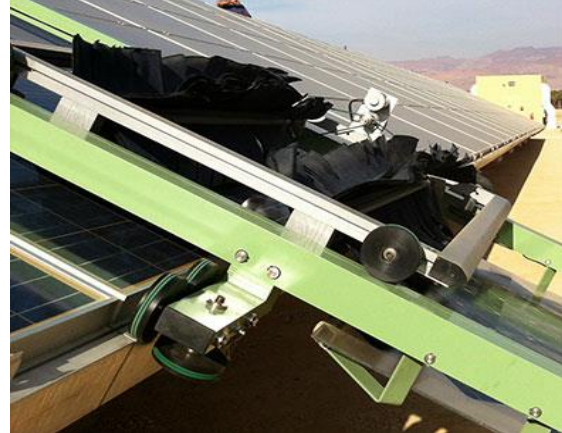


Figure 63. Fixed installed brush (dry) cleaning system



Figure 64. Wet cleaning system

According to developers with PV installations operating in similar conditions (desert environment), cleaning could become necessary once or twice per month. In case of DESERT TECHNOLOGIES [ARC] PV Plant, ‘dry cleaning’ mechanism will be utilized, alternating with ‘wet cleaning’ every two months for optimize the use of water resources an maximizes water use efficiency. Cleaning with water could require between 2 and 4 liters per panel for each cleaning cycle. The estimated water consumption during Operation and Maintenance Phase is presented in the following table.

		Estimated Water Consumption			
		Bimonthly		Annual	
Number of PV panels	Liter / panel	Liters	m ³	liters	m ³
190,440	3	571,320	571.3	3,427,920	3427.9

Table 43. Water consumption during O&M phase

Sanitary Installations and Waste Water

Construction Phase: Provision of adequate sanitary facilities during construction will require substantial volumes of water during the construction phase. DESERT TECHNOLOGIES [ARC] project will install, at least temporarily during the construction phase, containerized sanitary facilities. Assuming 50 liters per day per person on site this could in total require around 7.5 m³ per day (for 150 workers). These volumes are manageable and could even be brought in by tanker.



Figure 65: Sanitary container

Operation Phase: The much reduced number of permanent staff, temporary staff (e.g. for panel cleaning) and of contractors will be during operation phase, hence the same facility can easily contain and handle the waste water.

6.2.4. RECEPTOR: FLORA AND FAUNA

Flora and Fauna

As part of the Kom Ombo ESIA the Consultant has in 2013 conducted baseline surveys in order to assess the presence and distribution of ecologically sensitive species and habitats; the validity of these findings was confirmed during site visits in 2015. Given the characteristics of the Benban site (desert without vegetation) it is concluded that the construction activities on the site will not affect endangered fauna or flora species or disturb valuable habitats. The few recorded species are common and rarely found on the site.

However, it is unclear if and to what extent migratory birds may be affected. Once completed, Benban is a very large structure which may attract birds migrating along the River Nile. This will need to be monitored at migration periods.

Uncontrolled waste disposal will affect negatively to the fauna. This activity attract birds, rodents, feral dogs and cats and other vectors, hence the proper control and handling of waste must be applied.

6.2.5. RECEPTOR: SOCIAL

Land Use

The Benban PV site is currently vacant, unused desert land, thus land use will change completely from desert to a high technology solar park.

Project affected People and Project Stakeholders

Consultation with project stakeholders has been carried out as part of the Strategic Environmental and Social Assessment (SESA). This included consultation meetings with local people, individually, in groups, and at formal consultation meetings. In general local communities welcome the project and anticipate its benefits to the local economy.

- 1- Workforce and supply chain
- 2- Socioeconomic impacts
- 3- Community health, safety and security impacts
- 4- Land use, involuntary resettlement and economic displacement
- 5- Risk to existing infrastructure

- 6- Cultural resources impacts
- 7- Overconsumption of community resources

These impacts are in the following presented for the construction phase and the operations phase. Project impacts were discussed with various stakeholders during the scoping and data collection phase as well as during public consultations.

Workforce Impacts and Benefits

Impacts and benefits are considered for both direct and indirect labour as defined by IFC Performance Standard 2 (PS2) 'Labour and Working Conditions' and in EBRD Performance Requirement 2 (PR2) 'Labour and Working Conditions'. The following definitions have been used:

- Employees – includes direct employees (staff/personnel) of developers;
- Contractor workers – refers to workers who are engaged with the Project through contractors or other intermediaries, and who perform work directly related to core functions and activities essential to the project or services for a substantial duration of time; and
- The supply chain includes any suppliers of goods and services to the Project. The remit of suppliers is recognized as an area where project developers have no direct authority for interference, but can exert influence in terms of policy and enforcement of good practice (please see the guidelines of workers)

During construction phase: direct and indirect employees

The PV Benban project as a whole is expected to result in the creation of job opportunities, both directly and indirectly. Daily average number of workers during the peak time will be about 150 workers in DESERT TECHNOLOGIES [ARC] plot. In case of a simultaneous start of all the construction activities in the whole area, this would require 18,000 workers. The local community of Benban and Fares could theoretically provide a proportion of this temporary labour force dependent on skills needed and the strategies of the individual developers in sourcing their workforce. To maximize employment opportunities in the local communities it is anticipated that training will be required for currently unskilled workers. On-the-job training will also supplement opportunities for the local workforce for both temporary construction roles and for long-term operations phase positions, where these are available.

To avoid the potential negative impacts associated with sourcing a local workforce (including but not limited to issues such as discrimination, people trafficking, forced and child labour, community health impacts through worker influx, and avoidance of community tensions) a coordinated and comprehensive policy to Benban workers will be required to be developed. This will be coupled with identifying the exact employment needs of the project, the availability of local communities to provide the workforce and specific training needs.

Additionally, the project is expected to result in a number of backward linkages for local business including food suppliers, other contractors and drivers will benefit from the project that will also result in increasing the revenue of taxes for the state. A coordinated approach to small business development will be required to ensure equitable distribution and suitability of the project benefits.

Operations Phase: Direct and indirect employees

During normal operations only a very limited number of workers will be required. DESERT TECHNOLOGIES [ARC] stated that they need 5 permanent staff on site during daytime, plus additional workers for panel cleaning (around 15 workers). Most permanent staff is likely to live locally and should be sourced on the basis of non-discrimination and in line with internationally accepted employment conditions.

Supply chain: Construction and Operation

In addition to direct and indirect employment, services and resources provided to the project will include the following:

- Implementation of works and provision of supplies related to construction, operation and closure of the site and ancillary facilities;
- Provision of transportation, freight and storage services to the Project;
- Provision of food supplies and cleaning services;
- Provision of building and auxiliary materials and accessories, engineering, installation and maintenance;
- Provision of white goods, electronic appliances, communications and measurement equipment;
- Security personnel;
- Accommodation, laundry and clothing;
- Retail services; and
- Provision of fuel

In-migration to the PV Benban project area triggered by the project development will also result in local businesses benefiting from the growing demand for resources, goods and

services. Small and medium-sized enterprises are likely to gain from the movement of people into the area, particularly those engaged in the accommodation, food service and other domestic supply sectors. It is expected that this will lead to some businesses from elsewhere in the region.

Impact significance: The creation of jobs and provision of supplies' contract will be the primary impact of the Benban project that has the potential to result in a positive impact, although there are a number of potentially significant risks that need to be adequately managed to ensure that the project benefits are fully realized. Risks that need to be further assessed and adequately managed include:

- Labour and working conditions covering the full suite of employment issues from contractual terms, setting wages, representation, sourcing workers, avoiding harmful working practices, and contract termination need to be fully considered and applied in a consistent manner between all developers and their contractors. Labour and working conditions will need to be consistent for direct and indirect employees alike without differentiation.
- Inter-tribal issues will need to be carefully considered to avoid discriminatory procedures and community tension when sourcing labour.
- The majority of available work will be on a temporary basis only and expectations will need to be managed accordingly.
- Community impacts of worker influx need to be carefully considered and minimized where possible. This includes domestic and international migrant workers and workers mobilized by the project developers to fill specific roles where local workforce cannot provide such personnel. Housing of influx workers needs to be fully considered before the commencement of construction activities. Additionally, workers should be fully oriented about the norms and traditions of the community people in order to avoid any conflict.

Proposed mitigation measures

- In order to mitigate the above impacts project developers, through a collective association, need to agree on minimum standards for labor working practices and a common set of labour and working conditions that meet Egyptian Law, international standards such as ILO conventions and EBRD and IFC Performance Requirements / Standards.
- Following the agreement of a common set of standards an employment census will be required to form a job management plan will be required for all opportunities clearly setting expectations.
- Need to fully ensure that the common labour and working conditions established are fully implemented along the supply chain

- A community liaison team will be required and a central resource for coordination of all labour related activities. This will include a transparency mechanism and to mobilize a Community Based Committee (CBC) representing all tribes which will be responsible for nominating workers.;
- The Developers Association (which DESERT TECHNOLOGIES is part of) has the opportunity to coordinate the interaction between the CBC and the contractors which will uphold the common standards, including priority sharing and non-discrimination;
- The Developers Association should establish a Grievance and Redress Mechanism that enables community people to voice their concerns about the employment process and working conditions To meet IFI requirements a detailed assessment of worker accommodation arrangements for influx or migrant workers is required to be undertaken collectively and by each developer individually, if necessary, in line with EBRD/IFC guidance notes. The extent of which will be determined when developer arrangements become more defined.
- Advance planning of retrenchment and workforce demobilization.

Proposed monitoring measures

- The developers association and / or their advisor will need to monitor the successful implementation of recruitment planning and execution, particularly prior to peak construction activities.
- A detailed monitoring plan should be developed concurrently with the recruitment plan and include independent verification that the minimum standards are being adhered to.
- Contractor will report on all aspects of workforce arrangements to the developers association advisor;

Occupational Health and Safety

Community Health, Safety and Security impacts arising from the construction and operations (and eventual decommissioning) are likely to be as follows:

- Increased risk of traffic hazards and incidents associated with the use of the highway for freight and local roads for workers;
- Increased incidence of communicable disease;
- Risks associated with the presence of security personnel on site (within the project area) and at offsite operations and activities (within the community); and

- Personal safety and well-being impacts associated with worker influx.

The specific risks and associated mitigation measures associated with the construction and operation phases are detailed below:

Mobilization and Construction Phase: Throughout this phase there will be many occupational health and safety risks to workers on site. These are generic risks associated with construction sites and include slips and falls; moving lorries and machinery; exposure to chemicals and other hazardous materials; exposure to electric shock and burns; weather related impacts (dehydration; heat stroke). This is short term (9 months) but because of the large number of mostly unskilled workers a reliable, but simple-to-understand, occupational health and safety management system has to be implemented on DESERT TECHNOLOGIES ARC-plot and for the Benban PV. Developer confirmed that they operate their own H&S systems, mainly based on OHSAS 18001.

Site management or the developer group should agree on general H&S standards and working practices to be applied to the site as a whole. This would provide guidance for individual developers. A common H&S Manual and easy-to-follow instructions (inclusive of graphic instructions for illiterate workers) for contractors and visitors should also be developed for use on the entire site. Worker training and site audit protocols could also be standardized to achieve uniformly high standards of performance.

Operations Phase: Permanent staff employed for normal operations are likely to be well trained and aware of H&S requirements and company H&S policies and management systems. The risk of accidents would therefore be much lower and can be managed by continuing to apply the H&S management practices introduced during construction.

Benban village has a medical center and an ambulance station on the Fares - Benban road. This should be sufficient for medical emergencies; it is therefore not necessary to establish a separate medical station on the Benban PV site as long as developers are making arrangements for on-site medical treatment of minor injuries. If site management decides otherwise, re-opening the abandoned ambulance station at the Aswan – Luxor Highway near the Benban turnoff would be a possibility.

DESERT TECHNOLOGIES provided information stated that

- Workers will either live locally (own accommodation; Benban, New Benban, New Fares and Fares villages; labour camps on the Benban PV site) or as far away as Aswan, which is 45-60 minutes by car;
- Contractors will have to provide transport.

Operations Phase: During normal operations only a very limited number of workers will be required. DESERT TECHNOLOGY stated that they need 5 permanent staff on site during daytime, plus additional workers for panel cleaning. Most permanent staff is likely to live locally.

Proposed mitigation measures

- A community development plan should be developed including a strategy to manage a large population influx.
- A definitive, enforceable and standardized worker Code of Conduct is required to ensure community interactions are positive.
- A worker and community health strategy will be required to manage both project related risks and population influx risks.
- A security strategy is required to mitigate any negative interactions between security personnel (especially if armed) and the local communities.
- A road safety strategy is to be developed which is comprehensive in nature and includes all levels of road safety from training, awareness, vehicle safety, community education and infrastructure improvements.

Proposed monitoring measures

- Each of the strategies related to community Health, safety and security will need to include detailed monitoring plans

Impacts on the existing infrastructure

- 1- **Impacts on road and traffic:** As it was previously mentioned in the environmental section roads and will be a major impact and traffic will be affected due to moving the vehicles and equipment of the constructing area. That will necessitate a detailed traffic management plan to be prepared in full collaboration among the developers, and DESERT TECHNOLOGIES has stated the fully participation. That plan should be based on the regular activities of the community and the seasonal activities related to crop harvest and the annual horse festivals. Additionally, the project will construct a network of roads inside the site that will serve the developers. In the meantime, water intake that might be constructed will result in cutting the roads. That will necessitate rehabilitation of the roads in order to restore their normal conditions.
- 2- **Impacts on water supply:** The main pressure on water supply will occur during the operation phase due to panel cleaning and human water requirements. The environmental section discussed water needs for cleaning panels. Water intake at the

abstraction point may lead to damage of existing water pipelines that are already fragile. A comprehensive impact assessment has been carried out on the water intake and pipeline as part of the Kom Ombo CSP ESIA.

Water for activities other than panel cleaning are estimated at around 50L per person per day. These are insignificant compared to the water pipeline capacity required for panel cleaning. Drinking water of acceptable quality must be provided either through treatment of the intake water or through bottled water. In case of bottled water, the empty bottles must be included in the site, and plot, waste management plans.

- 3- **Impacts on electricity:** during the construction phase it is not anticipated to result in any impacts on the electricity supply due to relying upon generators that will be installed inside the construction site. However, the project will inject the produced electricity in the national grid. This process will result in a certain level of enhancement on the electricity supply on the regional level

Proposed mitigation measures

The developers will identify, evaluate and monitor the potential traffic and road risks to workers and potentially affected communities throughout the project life cycle and, where appropriate, will develop measures and plans to address them. This will only be possible once developers have clear and specific plans for their requirements during the construction as well as operation phases.

- The developers will take into consideration relevant EU road and traffic safety management standards, identify road safety measures and incorporate¹⁴ Technically and economically feasible and cost-effective road safety components into the project design to mitigate potential road safety impacts on the local affected communities.
- All underground utility maps should be obtained prior to the construction phase by the contractors;
- Contractors should coordinate with the local governmental units in order to secure quick repairs in case of damage.

Proposed monitoring measures

- Regular checks of the contractors log related to impact on the infrastructure;
- Regular checks of the complaints related to infrastructure damages.

¹⁴ Consistent with the objectives of Directive 2008/96/EC of 19 November 2008 on Road Infrastructure Safety Management

Over-consumption of community resources

As previously mentioned, the 50 MV PV plant to be constructed by DESERT TECHNOLOGIES will be part of the Benban PV Project. As plot-specific project, the consumption of community resources, especially water resources does not have mayor impact, but considering the Project as a whole, where all developers will be performing Construction and Operation activities during the same period, the impacts become significant.

In this section, the impacts will be described considering the whole Benban PV Project, but the analysis of the impacts was made based on plot-specific bases.

During construction: Having up to 18,000 workers on a site close to Benban and Fares villages will have an impact of the available resources, e.g. accommodation, food, health care and medication and potable source of water. The availability of these resources needs to be investigated by Benban site management and site management, developers and contractors should be instructed to work with the community to prevent any negative impact (and to act immediately on complaints). The various studies and strategies mentioned above should incorporate these together.

During operation: Given the limited number of workers within each site, overconsumption of community resources is not envisaged. The majority of workers will be recruited from the local community. Thus, there is no such impact during the operation.

Proposed mitigation measures

- A guideline should be prepared by the developers association about procurement procedures and sources of supplies and suppliers;
- The developer association should negotiate with the governorate in order to increase the quota of potable water in the area in order to satisfy worker needs;
- Contractors should be committed to provision of food and water to workers from various sources.

Proposed monitoring measures

- Regular checks for supplies vouchers and address of suppliers;
- Regular checks of complaints raised due to the overconsumption of community resources;

Impact significance: This is expected to be MINOR and temporary impact during construction phase. In order to mitigate that effect, it has been recommended in the ESAP to secure supplies from many food contractors. Additionally, the contractors should obtain food and water supply from various districts and the main city of the governorate.

The Benban Projects are expected to require an intensive yet short-term construction program. If all 41 Benban projects were to be carried out at the same time, and all were to require 500 workers per plot at peak construction time (2-3 months) then the site would temporarily receive up to 18,000 workers. Even if the individual projects were staggered over a year, this could lead to the need for 4,500 temporary workers (i.e. equal peak manpower requirement spread over the whole year). These calculations are based on 36x50MW facilities, to equalize for different plot sizes.

It is expected that a proportion of these jobs will be filled by the local people, temporarily alleviating the high rate of local unemployment. Discussions held with local authorities and community leaders in Benban village indicated that the local communities in Benban are expected to provide around 2,000 workers, while Fares village may contribute an additional 1,000. The termination of work for most of the workers employed during the peak construction phase (who will be informed that these jobs are temporary but may still hope they turn into permanent) will have to be handled carefully. It has to be absolutely clear that this is short-term work and that the prospects for long-term employment on the Benban Projects are quite limited. The end of temporary work and income can be a social problem as it impacts on the individual and the entire community. This can lead to resentment and opposition to the Benban Projects. A participatory community support programme could help alleviate such impacts.

Cultural Resources / Heritage

During construction: Potential impacts on cultural resources might occur as workers from outside the community and with different behavioral patterns might affect the norms and traditions of the community people. This may not be a significant concern in urban areas, but in the conservative rural and Bedouin areas this may affect the local people's cultural privacy. Further assessment of population influx and worker code of conduct should be fully cognizant of local sensitivities.

During operation: Impacts during operation phase are likely to be similar to those during construction although on a smaller scale. However, if construction related risks are not managed sufficiently the residual risks associated with operational phases may be exacerbated.

Proposed mitigation measures

- Worker code of conduct and population influx studies required need to be
- A guideline should be prepared by the developers association about norms and traditions that workers need to follow;
- Contractors need to be informed about norms of the local community;
- Direct contacts with women should be avoided;
- Contractors should coordinate with the community based committee in order to identify, avoid, or mitigate any violations.
- A chance finds procedure is required in the event that any items of potential cultural heritage are discovered during construction activities.

Proposed monitoring measures

- Regular meetings of Benban site management with the community based committee;
- Regular checks of the instructions provided to workers.

Impact significance: This is expected to be a minor and temporary impact. It has been recommended in the ESAP to develop a plan to maximize the use of local labour and to maximize benefits to the local communities to win their trust and support. Additionally, workers recruited from outside Aswan should be informed about the norms and traditions of the community.

Women and Vulnerable groups

The term “vulnerable groups” refers to people who, by virtue of gender identity, ethnicity, age, disability, economic disadvantage or social status may be more adversely affected by project impacts than others and who may be limited in their ability to claim or take advantage of project benefits. Vulnerable individuals and/or groups may also include people living below the poverty line, the landless, the elderly, women- and children- headed households, refugees, internally displaced people, ethnic minorities, natural resource dependent communities or other displaced persons who may not be protected by national and/or international law. It is important to identify and address these groups during the early consultation phases of the projects in order to avoid placing additional strains on these groups as a result of the project.

Ethnic and Religious Groups

The population of Benban and Fares are largely homogeneous with no religious or ethnic minorities. They all have originated from the same ancestors and are bound by values and morals which encourage the support of economically deprived relatives. These values add more cohesion among members of the community.

Workers recruited from outside Aswan to work in the bricks factory and food canning industry are in most of cases also Muslims and face no vulnerability due to their religious background.

Children and Youth

Children and youth constitute the biggest strata of population in Benban (about 30.0) and Fares (38.5%).

Some of the workers recruited from outside Aswan are under 18 years of age and are thus officially classified as children. They work under summer sun in extreme temperatures above 47 degree. They suffer from malnutrition and diseases. Their hygienic attitudes are below standards. These children can be classified as vulnerable groups and may benefit from the project which is foreseen to follow better working conditions and provide protection from any potential forms of exploitation.

As a conclusion, Benban and Fares male young population are not marginalized or voiceless; however, the workers recruited from outside Aswan are poor, voiceless and vulnerable groups.

Elderly People

There are no reliable statistics available for the number and conditions of elderly people in Benban and Fares. On site observation and discussions within the community indicate that old people are respected cared for within the community. As per old Arab traditions, a heavy weight is placed on the wisdom of elders, making their contribution is essential in solving disputes in Aswan governorate.

Elderly groups are not marginalized in both Benban and Fares as they take the lead among their community. They have access to health care and the entire family is committed to their welfare.

Women's Rights and Participation

Men and women have the same rights under Egyptian constitution and laws. Women are increasingly holding positions in Government, politics, media, private business and universities.

However, older tribal communities such as Benban and Fares still follow a strongly patriarchal and conservative ideology. Women are generally expected to take on the traditional role as wife and mother in running the household and raising children, rather than pursuing a career or participating in the labor force.

Women's social status and rights have frequently been disregarded during the consultation process. In practice, women continue to suffer limitations to their rights to expression, association, movement, speech and personal freedom.

Men and women generally socialize in separate circle. It was reported that males are of better conditions than females, as they are empowered and enabled to get into the social networks. Females are still marginalized and not fully engaged in the society due to norms and traditions constrains. The mobility of females is still limited.

However is it worth noting that females who participated in the consultation activities did not seem to complain from the patriarchal system but rather conformed to these beliefs and regarded them as "the norm".

Despite the rise in political participation for females all over Egypt in the wake of the 25th of January uprising, Fares and Benban women still show little interest in political participation.

It was reported that some women might work in the field with their spouses but they can never declare that they work in the field out of cultural and traditional limitations on women's work outside of the house.

Elder woman are fully respected in the community, they can run the house with no interference from males. Women always take care of all family members and socialize with all other women in the village.

Aside from females of Benban and Fares, almost all food canning products are operated by migrant females who work hand in hand with migrant males. They suffer due to poor quality of life, poor health conditions, working under extreme temperature with limited access to sanitary facilities

Males managed to maintain their right to work abroad which is entirely prohibited for females. The majority of young females were not allowed to continue education, particularly,

due to the absence of transportation. The needs assessment workshop reflected that the female young people are keen to perform some works inside their house.

Vulnerability Status

The investigation of vulnerable groups in the Benban and Fares showed that the main vulnerable groups are as follows:

- Economically underprivileged local females who have no access to jobs due to community norms and traditions. However, well off male relatives are responsible of securing financial support to those groups;
- The second category is marginalized young people who are voiceless. Female young people are more marginalized than males;
- There is no ethnic group or marginalization based on the community people origin and religion
- Male and female migrant workers who work under extreme conditions and remain unprotected

All previous impacts discussed will be more severe for the vulnerable groups. Thus, special attention should be paid to those categories and the following is proposed:

- Special attention should be placed on local women and vulnerable groups require particular attention. Females should be encouraged to apply to temporary and permanent jobs announced by the investors. There may be discrimination against women when temporary and permanent jobs are offered.
- The developers should also invite migrant women from outside the villages (not the residents of Benban and Fares) to apply for these jobs and should avoid any gender discrimination. However, woman themselves might be reluctant to work in the project due to norms and traditions constraints. Young marginalized and voiceless people who have limited skills should be engaged in the project through providing them with job opportunities. No discrimination should take place based on gender, religion or social groups. Therefore, all job opportunities should be advertised on the level of the community based committee and the local governmental unit (Benban and Fares) in visible places.

Vulnerable groups related to impacts on livelihoods and source of income

As the project might result some unfavourable economic impacts during the construction and operational phase. The potential loss of income might result due to the construction activities that might affect the flow of traffic. Daily wage workers who work on vehicles might be affected due to the traffic jam.

Vulnerable groups due to accumulation of wastes

Accumulation of construction wastes in the sites might result many hazards on the surrounding communities and project workers. The hazardous effect will be high among those who have a fragile health condition, particularly, if they are of poor living conditions and uncovered with medical insurance umbrella ,

Vulnerable groups due to health and safety impacts

Children, elder people and those who suffer due to any accidents or health problems resulted from the project, including laborers. These groups will be considered as vulnerable in case if they belong to poor families and if they are not covered by health care insurance.

6.4 Potential Aggregate and Cumulative Impacts

From a purely environmental point of view the land-take of each project does not constitute a significant impact on the natural habitat and its components, given the characteristics of the site. Similarly, there is no negative impact on archaeology and cultural heritage.

The situation is different for the use of resources (from sanitary water usage during construction to water required for panel cleaning during operations); generation of liquid and solid waste (mainly during construction); and the impact of the workforce (mainly during construction). The Benban Projects will use comparable technology but are likely to differ in plot layout; in construction schedule; in manpower used during construction, and in the infrastructure required for their temporary workforce (e.g. housing); plots they may have different support structures such as types of panel mountings; there may be different maintenance schedules and methodologies; and plot infrastructure may differ (temporary and permanent facilities for storage; collection of waste; sanitary facilities; control and maintenance buildings etc.). This has a significant social environmental and social impact on the construction phase and a smaller impact on the operations phase.

Individually, construction of a Benban project does not have an appreciable impact on the natural environment. Construction impacts are temporary and can be mitigated by appropriate management. Operational impacts are generally low, with the exception (optionally) of water use for panel cleaning. The social impacts of operations are small, given the limited number of staff necessary for security and maintenance.

Analysis of the scarce preliminary data available shows that whilst the environmental and social pressure of constructing a single Benban Project might be low and easily mitigated and managed, the aggregated impact of all projects are significant and can put a high level of pressure on resources and the socio-economic baseline. The feedback from developers indicates that all companies want to start project implementation as soon as possible. If all projects were to be carried out at the same time, with peak construction times overlapping, there could easily be an estimated 20,000 workers on site - albeit for a short period of time. Delivery of components could reach a total of 39 x 1,000 lorry loads (39,000 single 40 ft containers), many of which will have to be securely stored for a period of time.

And during operations large volumes of water may be required – if this is the preferred cleaning option for panels.

The IFC defines cumulative impacts as ‘those that result from the successive, incremental, and/or combined effects of an action, project, or activity when added to other existing,

planned, and/or reasonably anticipated future ones. For practical reasons, the identification and management of cumulative impacts are limited to those effects generally recognized as important on the basis of scientific concerns and/or concerns of affected communities.

The IFC proposes, where appropriate, Cumulative Impact Assessments (CIAs). Such assessments would focus on the impact on **Valued Environmental and Social Components (VECs)**.

VECs are environmental and social attributes that are considered to be important in assessing risks and may be:

- Physical features, habitats, wildlife populations (e.g., biodiversity),
- Ecosystem services,
- Natural processes (e.g., water and nutrient cycles, microclimate),
- Social conditions (e.g., health, economics), or
- Cultural aspects (e.g., traditional spiritual ceremonies).

While VECs may be directly or indirectly affected by a specific development, they often are also affected by the cumulative effects of several developments. VECs are the ultimate recipient of impacts because they tend to be at the ends of ecological pathways.

A CIA would have six objectives in relation VECs:

1. Assess the potential impacts and risks of a proposed development over time, in the context of potential effects from other developments and natural environmental and social external drivers on a chosen VEC.
2. Verify that the proposed development's cumulative social and environmental impacts and risks will not exceed a threshold that could compromise the sustainability or viability of selected VECs.
3. Confirm that the proposed development's value and feasibility are not limited by cumulative social and environmental effects.
4. Support the development of governance structures for making decisions and managing cumulative impacts at the appropriate geographic scale (e.g., airshed, river catchment, town, regional landscape).
5. Ensure that the concerns of affected communities about the cumulative impacts of a proposed development are identified, documented, and addressed.
6. Manage potential reputation risks.

A CIA is beyond the scope of this ESIA. However, DESERT TECHNOLOGIES should anticipate accommodating the E&S mitigation and monitoring measures in its own ESM/AP should a strategic CIA for the whole solar park.

6.3.1. Impact and Risk

From a purely environmental point of view the aggregate land-take for all projects on the Benban site does not constitute a significant impact on the natural habitat and its components, given the characteristics of the site. Similarly, there is no negative impact on archaeology and cultural heritage. As there are no plans for any other future development on or near the site cumulative environmental impacts are also unlikely.

6.3.2. Exceedance of thresholds

Similarly, the aggregated effect of the Benban site on physical features, habitats, wildlife, biodiversity, ecosystem service, archaeology and cultural heritage is limited and does not constitute a significant impact. The assessment is different for potential water use both during construction and particularly during operations. Large –scale water abstraction of water from the River Nile or from groundwater resources would be a significant impact and would have to be carefully managed, Minimization of water use through alternative techniques (e.g. dry brushing of panels) will need to be evaluated and should be the preferred option.

6.3.3. Reputational risks

The reputation of the overall Benban project depends on the performance of individual Benban Projects and, more importantly, the perceived overall performance of the entire projects with its aggregate potential impacts. As mentioned above, this requires competent site management and compliance of individual Benban Projects with all national laws; compliance with the requirements of IFIs (as most projects are likely to seek such finance); and adherence to best industry standards.

Table 44. Impacts identified by receptor and mitigation actions

Receptor	Phases of the Project					Impacts identified	Mitigation actions	Impact Rating
	Mobilization	Preparation of Land	Construction	Operation & Maintenance	Decommissioning			
Landscape and visual impact	X	X	X	X		<ul style="list-style-type: none"> Visual impact for PV infrastructure on desert land close to highway 	Follow in the original design without additional structures or buildings	Negative Minor
Soil degradation and potential pollution	X	X	X		X	<ul style="list-style-type: none"> Compaction of soil & Earthworks. Probability of spills of substances and wastewater. 	<ul style="list-style-type: none"> Develop & implement waste management plans for liquid waste; solid waste; hazardous waste; Install suitable sanitary facilities with appropriate septic tanks; ensure regular disposal of liquids; Install proper food preparation facilities with waste collection; Construct an impermeable protective base layer underlying areas with potential hazardous liquids storage or use. 	Negative Minor
Waste generation	X	X	X	X	X	<ul style="list-style-type: none"> Waste generation can affect soil conditions 	<ul style="list-style-type: none"> Prepare waste management plan 	Negative Minor

Receptor	Phases of the Project					Impacts identified	Mitigation actions	Impact Rating
	Mobilization	Preparation of Land	Construction	Operation & Maintenance	Decommissioning			
Noise impacts	X	X	X			<ul style="list-style-type: none"> Worker can be affected for heavy equipment operations 	<ul style="list-style-type: none"> Restrict activities to designated areas Provisions of Personal Protective Equipment and training on the proper use. Clear instructions in areas where noise emissions are significant. Optimize the use of noisy construction equipment and turn off any equipment if not in use. Regular maintenance of all equipment and vehicles 	Irrelevant
Air quality and air emissions	X	X	X			<ul style="list-style-type: none"> Generation of dust Air emission from vehicles and machinery 	<ul style="list-style-type: none"> Develop & implement a site delivery plan to regulate traffic and to avoid build-up at the site entrances. Speed restriction (30 km/h) for all vehicles. Implement preventive maintenance program for vehicles and equipment working on site and promptly repair vehicles with visible exhaust fumes 	Negative Minor/ irrelevant

Receptor	Phases of the Project					Impacts identified	Mitigation actions	Impact Rating
	Mobilization	Preparation of Land	Construction	Operation & Maintenance	Decommissioning			
Water consumption of workers		X	X	X	X	<ul style="list-style-type: none"> Monthly: 105 m³ of water needed Generation of wastewater 	<ul style="list-style-type: none"> Controlling wastewater with sanitary facilities. On Human consumption: <ul style="list-style-type: none"> Avoid disposable cups and bottles to prevent waste generation. Water dispensers. 	Negative Minor
Water consumption (Construction and O&M phases)			X	X		<ul style="list-style-type: none"> Monthly: Approx. 405 m³ of H₂O during Const.Phase Bimonthly: Approx. 70 m³ of H₂O during O&M. Consumption of water resources 	<ul style="list-style-type: none"> Applying preferably 'dry cleaning' Optimize 'wet cleaning' with proper equipment. Usage of tank trucks & storage tanks on site. 	Negative Severe

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Receptor	Phases of the Project					Impacts identified	Mitigation actions	Impact Rating
	Mobilization	Preparation of Land	Construction	Operation & Maintenance	Decommissioning			
Flora and Fauna	X	X	X	X	X	<ul style="list-style-type: none"> • Probability of disturbance in some species. • Probability of attraction of animals and vectors because of inappropriate waste management. 	<ul style="list-style-type: none"> • Restrict construction and material storage activities to the project's site. • Implement a waste management plan and prohibit dumping/uncontrolled disposal of any types of wastes. • Restrict activities to designated areas. 	Negative Minor

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Receptor	Phases of the Project					Impacts identified	Mitigation actions	Impact Rating
	Mobilization	Preparation of Land	Construction	Operation & Maintenance	Decommissioning			
Land Use	X	X	X		X	No significant impacts		Irrelevant
Social: Workforce impact	X	X	X	X	X	<ul style="list-style-type: none"> Job creation and opportunities Probability of conflict between different resident groups. 	<ul style="list-style-type: none"> Apply labor working practices and international standards such as EBRD and IFC Performance Requirements/Standards 	Positive Mayor
Workforce, Occupational Health and Safety	X	X	X	X	X	<ul style="list-style-type: none"> Increase of risk of accidents 	<ul style="list-style-type: none"> Apply H&SE measures and management. Apply EBRD and IFC Performance Requirement/Standards Provide constant training and supervision 	Positive Mayor
Transport/ Traffic	X	X	X			<ul style="list-style-type: none"> Risk of collisions Increase of vehicular traffic Increase of air emissions 	<ul style="list-style-type: none"> Implement Traffic Management Plan 	Negative Minor/Severe
Impacts on the existing infrastructure	X	X	X			<ul style="list-style-type: none"> Impacts on road and traffic Impacts on water supply Impacts on electricity 	<ul style="list-style-type: none"> Apply road safety management standards Developers association must coordinate with local authorities in order to secure quick repairs in case of damage. 	Negative Minor

Over-consumption of resources		X	X			<ul style="list-style-type: none"> • Consumption of water • Consumption of other resources 	<ul style="list-style-type: none"> • Maximize resources for each activity in the plot 	Negative Minor
Cultural resources /heritage						<ul style="list-style-type: none"> • Change of habits on population, especially beduins 	<ul style="list-style-type: none"> • Workers recruited should be informed about the norms and traditions 	Negative Minor

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6.5 Conclusions

- The *Construction* phase will have SEVERE impacts.
- The *Mobilization, Preparation & Planning* phases will have MINOR impacts.
- The *Operation & Maintenance* and *Decommissioning* phases will have IRRELEVANT impacts.
- Most of the impacts will be on the *Physical Factors*, especially in the “Soil and water Component” due the construction, operation and the activities related. Mitigation actions must to be focused to prevent and minimize the negative impacts on the Soil.
- The project will have a positive impact in the *Socioeconomic Factors* due the local consumption of products, the need of local manpower and the generation of energy.
- In general, the project will have a MINOR impact.
- Waste Generation and Water consumption will be the most critical activities that need attention during the project.
- **The overall conclusion on aggregate and cumulative impacts** is that the Benban project as a whole does not present environmental or social impacts and risk that cannot be mitigated and minimized by appropriate management and supervision during construction and operations. This requires an effective site management system with regular performance control and a mechanism to correct non-compliances quickly and effectively.

7. Environmental and Social Management Plan

7.1 Objectives of the ESMP

The objective of the Environmental and Social Management Plan (ESMP) is to outline a mechanism for neutralize or minimizing potential negative impacts; also for monitoring the application and performance of mitigation measures. The ESMP identifies roles and responsibilities for different stakeholders for implementation and monitoring of mitigations. This section also presents an assessment of the institutional capacity for implementing the ESMP.

7.2 Relevant Plans and Strategies according to the SESA

The Strategic Environmental and Social Assessment (SESA) developed for Benban PV Solar Project has identified a number of actions and plans that have to be considered for the individual projects, however some plans and strategies must be implemented collectively, these include:

- Environmental and Social Management System
- Contractor Management Plan including minimum EPC requirements.
- Labour and Working Conditions Strategy and Employment Plan; including worker accommodations requirements during construction.
- Security Management Plan
- Emergency Response Plan
- Community H&S Study and Population Influx Plan
- Community Development Strategy and CSR Programme
- Traffic Management, Logistics and Road Safety Plan
- Resource Use Plan, including provision of adequate water needs and associated studies
- Stakeholder Engagement Plan

The following table identifies the areas where coordination between the developers is necessary to address possible solutions.

Table 45. Common issues and response

Issue	Description	Priority	Response	Comment
Throughout project life				
Stakeholder engagement	Each developer must communicate with project stakeholders, in particular the local communities, as well as operate a grievance mechanism. Separate communications by 20+ developers in relation to 41 projects will be confusing and overwhelming for stakeholders. Similarly it will be difficult for stakeholders to identify whom to direct a grievance, complaint or question at, especially if their concern relates to the site as a whole.	Necessary	DESERT TECHNOLOGIES will provide Stakeholder Engagement plan based on (1) a joint stakeholder relations team, (2) a single grievance mechanism, and (3) a master Non-Technical Summary, to be supplemented by project-specific NTSS	Individual actions will be performed. Collective actions will be developed according the collective agreed terms.
Corporate Social responsibility	In order to maximise stakeholder benefits and maintain good relationships each developer is likely to want to operate a corporate social responsibility programme to benefit the local communities. An uncoordinated bilateral approach by each developer may confuse or even alienate stakeholders.	Necessary	As with the stakeholder engagement plan the Benban SESA will propose a common CSR programme but an implementation mechanism will still be required.	To be developed according the internal policies of DESERT TECHNOLOGIES
Road safety	Shared site roads necessitates common rules for road safety, such as speed limits, signage, access etc.	Necessary	Road safety rules should be developed, together with a mechanism for adoption and enforcement.	DESERT TECHNOLOGIES will adopt the common mechanisms developed.
Emergency procedures	Contiguous sites means that each developer may be affected by an emergency on another site. Common procedures for evacuation routes, rally points, emergency signals etc. would avoid problems. Common provision of emergency response facilities such as firefighting or first aid equipment would be more efficient.	Necessary	Common procedures should be developed. Common facilities would require a third party provider, together with a mechanism for developers to collectively procure and pay for these facilities.	DESERT TECHNOLOGIES will adopt the common mechanisms developed.

Issue	Description	Priority	Response	Comment
Waste handling	Each plant will produce a certain amount of solid and liquid waste. Common standards for handling this will prevent sites being impacted by others with lower standards. Common provision of waste disposal facilities would be more efficient and convenient.	Desirable	Common procedures should be developed. Common facilities would require a third party provider, together with a mechanism for developers to collectively procure and pay for these facilities.	Individual actions will be performed. DESERT TECHNOLOGIES will collaborate on common actions. Common provision of waste temporary disposal facilities will be agreed and developed.
Health and safety policies	Common rules on health and safety would ensure that projects are not affected by being associated with projects with lower standards and help cultivate best practices across the entire site.	Desirable	Common procedures should be developed, together with a mechanism for adoption and enforcement.	DESERT TECHNOLOGIES will collaborate on common actions.
Site access, fencing and security	Many projects will share a common access point to the overall site and be dependent for their security on the security put in place by their neighbours. Each project's security would be considerably enhanced by a common security policy and the common provision of perimeter security and site access controls.	Desirable	Common procedures should be developed. Common facilities would require a third party provider, together with a mechanism for developers to collectively procure and pay for these facilities.	DESERT TECHNOLOGIES will collaborate on common actions.
Telecommunications	Each project site will need both telephone and high speed internet access. Common provision of this interconnectivity will be much more efficient than individual.	Desirable	Common facilities would require a third party provider, together with a mechanism for developers to collectively procure and pay for these facilities.	DESERT TECHNOLOGIES will collaborate on common actions.
During construction				
Drainage	Each project's drainage solution will affect all projects downstream or downhill of it. Accordingly a coordinated drainage plan will avoid unforeseen impacts.	Necessary	A coordinated plan should be prepared either by the developers collectively or by a third party engineer on their behalf.	Individual actions will be performed. DESERT TECHNOLOGIES will collaborate on common actions.

Issue	Description	Priority	Response	Comment
Traffic management	There will be multiple traffic movements in a short period of time, all using the single carriageway Luxor-Aswan highway, and there do not appear to be areas allowing lorries to park pending access to the site. Coordination of traffic movements will be necessary to avoid serious congestion accessing the site and significant risk of accidents as vehicles enter and leave the site, especially at peak periods.	Necessary	Common procedures should be developed, together with a mechanism for adoption and enforcement. This should include (1) detailed procedures to manage exit from, and entry to, the public highway, (2) precautionary measures on that highway such as warning signs and (3) general logistical coordination to spread the peak demands on roadspace.	DESERT TECHNOLOGIES will collaborate on common actions, and it will inform the providers about the procedures and rules related to this issue.
Labour policies	Stakeholders will not easily distinguish between individual projects and accordingly different labour standards will cause confusion and potentially labour difficulties. Common standards for recruitment and treatment of all workers would avoid this problem.	Necessary	The Benban SESA will propose common workers' rights guidelines but an implementation mechanism will still be required, together with a mechanism for adoption and enforcement.	DESERT TECHNOLOGIES will collaborate on common actions.
Worker recruitment	A coordinated approach to communicating labour opportunities, receiving expressions of interest and managing recruitment, especially of unskilled local labour, will maximise the benefits for local stakeholders and avoid confusion or labour unrest.	Desirable	A centralised portal for the dissemination of labour opportunities would be beneficial.	DESERT TECHNOLOGIES will collaborate on common actions.
Worker accommodation, transport, catering and sanitary facilities	At the peak of construction there may be up to 18,000 workers on the Benban site. Common standards for their accommodation, transport, catering and sanitary needs will avoid projects being impacted by others with lower standards. Common provision will be more efficient and convenient.	Desirable	Common standards should be developed, although the Benban SESA will propose specific accommodation standards. Common facilities would require a third party provider, together with a mechanism for developers to collectively procure and pay for these facilities.	DESERT TECHNOLOGIES will collaborate on common actions.
Electricity provision	Each site will need auxiliary power during construction. Common provision would be more efficient than bilateral provision.	Desirable	Common facilities would require a third party provider, together with a mechanism for developers to collectively procure and pay for these facilities.	Individual actions will be performed. DESERT TECHNOLOGIES will collaborate on common actions.

Issue	Description	Priority	Response	Comment
Water provision	Each site will need water during construction for drinking, sanitary use. Common provision would be more efficient than bilateral provision.	Desirable	Common facilities would require a third party provider, together with a mechanism for developers to collectively procure and pay for these facilities.	Individual actions will be performed. DESERT TECHNOLOGIES will collaborate on common actions.
Laydown areas	Each project will need secure areas to store materials and equipment prior to their use or installation. The project sites may not be sufficiently large to allow this to happen on site, necessitating laydown areas nearby. Common provision of this facility would be more efficient and avoid competition for space.	Desirable	Common facilities would require a third party provider, together with a mechanism for developers to collectively procure and pay for these facilities.	Individual actions will be performed. DESERT TECHNOLOGIES will collaborate on common actions.
During operation				
Water provision	The site will have significant water needs during operation, which are likely to be met by a pipeline from the Nile, for which coordination is inevitable..	Necessary	Common facilities would require a third party provider, together with a mechanism for developers to collectively procure and pay for these facilities.	Individual actions will be performed. DESERT TECHNOLOGIES will collaborate on common actions.

DESERT TECHNOLOGIES has stated the agreement to collaborate collectively on the activities defined by the SESA for the fulfillment of the common issues.

7.3 Environmental and Social Management Plan

Table 46. Environmental Management by activity identified on the Impact Assessment

Activity	Potential Impact	Plan / Action proposed	Proposed Mitigation Measures	Level of implementation		Responsibility for Implementation	Responsibility of direct supervision	Means of supervision
				Individual	Collective			
During ALL THE PHASES								
Solid Waste and Bulky Waste generation	Soil degradation and soil pollution	Final disposal of waste on authorized landfill(s)	<ul style="list-style-type: none"> Identify disposal sites and facilities nearest to the PV Plant area. In coordination with LGU or/and Governorate authorities, obtain the permission to access and dispose on the landfill. To avoid inappropriate methods of waste management and disposal, such as open-burn of waste, dumpsites and uncontrolled landfilling. 			Developers Association	Developers Association	<ul style="list-style-type: none"> Disposal of waste on site(s) designated by the LGU and/or Governorate. 100% of the generation is sent to landfilling Avoid sending Hazardous and Special Waste
	Landscape and Visual Impact Air emission and air quality Impacts on fauna (attraction on feral dogs, cats, rats, insects and other vectors)	Solid Waste Management Plan	<ul style="list-style-type: none"> To develop a waste management plan for solid waste generated that includes: control of plastic and other lightweight waste, classification of waste and temporary storage of solid waste on site. To design a comprehensive handling and transportation plan for all waste types. To avoid inappropriate methods of waste management and disposal, such as open-burn of waste, dumpsites and uncontrolled landfilling in the surrounding of the area. 			Construction contractor Waste Collection Service Provider	DESERT TECHNOLOGIES Site Supervisor	<ul style="list-style-type: none"> Report of waste sent to disposal (ton/week)
			<ul style="list-style-type: none"> To define a temporary storage for bulky waste on a common site on PV Benban Area. 			Developers Association	Developers Association	<ul style="list-style-type: none"> Report of waste received in the temporary storage area. Report of waste sent to disposal

Activity	Potential Impact	Plan / Action proposed	Proposed Mitigation Measures	Level of implementation		Responsibility for Implementation	Responsibility of direct supervision	Means of supervision
				Individual	Collective			
			<ul style="list-style-type: none"> To have a contract agreement with a Waste Collection Service Provider 			DESERT TECHNOLOGIES Waste Collection Service Provider	DESERT TECHNOLOGIES Site Supervisor	<ul style="list-style-type: none"> Verification of the waste management that the service provider is performing, especially final disposal of waste in authorized landfills.
Hazardous waste generation	Soil degradation and soil pollution Air emission and air quality Health & Safety of the workers and community	Hazardous Waste Management Plan	Identify and contract certified hazardous waste handling and transportation contractors. To develop a hazardous waste management plan. Transfer hazardous waste containers to Alexandria facilities (Nasreya or UNICO) and landfill(s)			Construction contractor Hazardous waste collection Service Provider	DESERT TECHNOLOGIES Site Supervisor	<ul style="list-style-type: none"> Report of hazardous waste sent to disposal (ton/week)
			To prevent fuelling, lubricating and any activity that would entail production of hazardous materials empty containers.			DESERT TECHNOLOGIES Site Supervisor Construction contractor	DESERT TECHNOLOGIES Site Supervisor	<ul style="list-style-type: none"> Revision of proper storage of fuels and liquid materials. Revision of activities of preventive maintenance of machinery and vehicles are performed in the designated area.
			<ul style="list-style-type: none"> To prevent spill of fuel, lubricants and other potential pollutants, it is necessary to define an area, which cement floor to storage liquid components, and to perform preventive maintenance, such as refilling levels of fuel and oil in some machinery. 					
			To define an area for temporary storage of hazardous waste of Benban developers.			Developers Association	Developers Association	<ul style="list-style-type: none"> Report of waste received in the temporary storage area. Report of waste sent to disposal

Activity	Potential Impact	Plan / Action proposed	Proposed Mitigation Measures	Level of implementation		Responsibility for Implementation	Responsibility of direct supervision	Means of supervision
				Individual	Collective			
Constructio n of PV plant. O & M of PV Plant	Potential disturbance on fauna		Seek expert advice in case of significant risk of fauna disturbance or behaviour changes To improve workers behaviour To improve best practices to avoid disturbance on fauna			Construction contractor	Developers Association	<ul style="list-style-type: none"> Field supervision
During MOBILIZATION, PREPARATION OF LAND AND CONSTRUCTION PHASES								
Reception of materials, equipment, and machinery	Air emissions	Dust control	Best practice in controlled wetting and compaction of excavations to minimize dust emission.			DESERT TECHNOLOGIES Site Supervisor	DESERT TECHNOLOGIES Site Supervisor	<ul style="list-style-type: none"> Field supervision
	Air quality					Construction contractor		
	Water consumption	Air emissions control	Compliance with legal limits of air emissions from all relevant equipment			Construction contractor	DESERT TECHNOLOGIES Site Supervisor	<ul style="list-style-type: none"> Review manufacturer catalogues and exhaust certificate or request emission measurements
	Air emissions							
Generation of energy (DIESEL generators)	Noise generation	Air emissions control	Compliance with legal limits of air emissions from all relevant equipment			Construction contractor	DESERT TECHNOLOGIES Site Supervisor	<ul style="list-style-type: none"> Review manufacturer catalogues and exhaust certificate or request emission measurements
	Noise generation							

Activity	Potential Impact	Plan / Action proposed	Proposed Mitigation Measures	Level of implementation		Responsibility for Implementation	Responsibility of direct supervision	Means of supervision
				Individual	Collective			
Wastewater generation	Soil degradation and soil pollution	Wastewater control	<p>Sanitary facilities: Suitable and sufficient portable sanitary conveniences shall be provided at readily accessible places.</p> <ul style="list-style-type: none"> Portable Sanitary facilities will comply with HSE requirements. Properly store and handle potential contaminants (portable toilet waste, disinfectants, detergents etc.) to prevent any spills or discharges onto the ground. Adequate secondary containment must be provided around any potential contaminants being stored at the facility. Maintain appropriate spill equipment (such as septic tanks). To have a contract agreement with a Service Provider Compliance with legal limits of wastewater discharge. 			<p>DESERT TECHNOLOGIES Site Supervisor</p> <p>Construction contractor</p>	DESERT TECHNOLOGIES Site Supervisor	<ul style="list-style-type: none"> Field supervision Reports of wastewater generation and discharge.
Water resource	<p>Shortage of water availability</p> <p>exsiccation of water resource</p> <p>Aggregated damage to other resources</p>	<p>Water resource plan</p> <p>Hydrogeological study</p>	<p>Compliance with water legal extraction means</p> <p>Water estimation matrix</p>			<p>DESERT TECHNOLOGIES Site Supervisor</p> <p>EPC contractor</p> <p>Developers Association</p>	DESERT TECHNOLOGIES Site Supervisor	<ul style="list-style-type: none"> Water monitoring system

Activity	Potential Impact	Plan / Action proposed	Proposed Mitigation Measures	Level of implementation		Responsibility for Implementation	Responsibility of direct supervision	Means of supervision
				Individual	Collective			
Water consumption	Superficial water resources consumption Overconsumption of community resources	Reducing water consumption plan	<ul style="list-style-type: none"> Improve efficiency of water using processes. To improve construction site water use behaviour Improve efficiency of water during construction activities. Improve efficiency of water for maintenance during operation Plan Best practices for cleaning PV panels during maintenance. Water efficiency for sanitary facilities Water efficiency during general cleaning 			DESERT TECHNOLOGIES Site Supervisor Construction contractor	DESERT TECHNOLOGIES Site Supervisor	<ul style="list-style-type: none"> Field supervision Lt used/month Reports of usage of water on site

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Table 47. Social Management Plan

Activity	Potential Impact	Plan / Action proposed	Proposed Mitigation Measures	Level of implementation		Responsibility for Implementation	Responsibility of direct supervision	Means of supervision
				Individual	Collective			
Before Starting Phases								

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Activity	Potential Impact	Plan / Action proposed	Proposed Mitigation Measures	Level of implementation		Responsibility for Implementation	Responsibility of direct supervision	Means of supervision
				Individual	Collective			
Labour contracting and employment activities	Job opportunities Community development Potential conflicts between local groups	Employment Plan	<ul style="list-style-type: none"> Minimizing the number of workers from outside the project areas is highly recommended. The contractor should be advised to employ construction labour from the areas where construction works will take place. The incentives to contractors for such measure include reducing accommodation and transportation for his workers. Ensure the availability of local advertisement for open positions Community leaders could take part in the process of employment in terms of informing their local community about job opportunities. This will fall under the responsibility of the Social Development Officer. All staff and contractors should be provided with a written employment agreement, which clearly defines their roles and responsibilities and working arrangements. It is committed to deal equitably with all employees, avoiding any form of discrimination (such as that based on age, race, sex, nationality, religion and opinions) and child labor. Enable grievance and redress mechanism in order to receive people concerns about such impact. 			Developers Association Construction contractor	Developers Association DESERT TECHNOLOGIES Site Supervisor	<ul style="list-style-type: none"> Reporting on percentage of labour recruited from local governorates as well as employer age should be presented by the contractor to the supervisor consultant and to EHC on quarterly basis. Reporting on meetings conducted with the community people. Reports about training sessions conducted with the workers. The Social Development Officer should provide reports about any stakeholder engagement activities (meetings- interviews- group discussions) conducted with the communities in case of any problem occurred with the residence of project areas.

Activity	Potential Impact	Plan / Action proposed	Proposed Mitigation Measures	Level of implementation		Responsibility for Implementation	Responsibility of direct supervision	Means of supervision
				Individual	Collective			
Security	In-fluxing of encroachers Robbery of equipment Attacking the workers and vehicles	Security management plan	<ul style="list-style-type: none"> • Good international practices should be fully adhered to in accordance to PS No. 4 • The developer will make reasonable inquiries to ensure that those providing security are: not implicated in past abuses; will train them adequately in the use of force (and where applicable, firearms) and appropriate conduct toward workers and require them to act within the applicable law. The developer will not consent any use of force except when used for preventive and defensive purposes in proportion to the nature and extent of the threat. • The developer will provide a grievance mechanism for Affected Communities to express concerns about the security arrangements and acts of security personnel 			Developers Association Construction contractor	Developers Association DESERT TECHNOLOGIES Site Supervisor	<ul style="list-style-type: none"> • Use of surveillance system (such as camera) and monitoring log
During MOBILIZATION, PREPARATION & CONSTRUCTION Phases								
Mobilization of equipment work team and machinery	Traffic impact Potential damage of utilities and infrastructure	Traffic management, logistics Plan	<ul style="list-style-type: none"> • Under take Traffic and transport study • Consult with the local authority on transportation schedule in the affected areas • Define and utilize best hours of material transport 			Construction contractor	DESERT TECHNOLOGIES Site Supervisor	<ul style="list-style-type: none"> • Traffic and transport study • Verified documented corresponding with local authorities • Percent of trucks moving during peak hours/roadway level of service

Activity	Potential Impact	Plan / Action proposed	Proposed Mitigation Measures	Level of implementation		Responsibility for Implementation	Responsibility of direct supervision	Means of supervision
				Individual	Collective			
		Road safety Plan	<ul style="list-style-type: none"> • Vehicular traffic should not be allowed after dark in order to limit Accidents • Enforced speed limit • Truck traffic should be routed away from noise sensitive areas, where possible • Pre-hire screening that reflect safe driving behaviours 			Construction contractor	DESERT TECHNOLOGIES Site Supervisor	<ul style="list-style-type: none"> • Journey management schedule • In-vehicle monitoring systems
Mobilizing workers to temporary accommodation/construction camp	Inappropriate working conditions	Accommodation plan	<ul style="list-style-type: none"> • Follow the accommodation standards provided by IFI • Consultation with local community before construction camp is developed • Uphold labour rights in tender documentation and contract negotiation discussions. • Require the main contractor to request their subcontractors to provide regular and written confirmation of timely payment of wages as a preventive measure • Hiring of an HSE officer responsible for internal monitoring of accommodation and food services 					<ul style="list-style-type: none"> • Regular documented inspection (e.g. surveys, translocation, meetings with communities, site inspections and findings) • Reviewing of key performance indicators (KPI) data (e.g. waste volumes, types and disposal; complaints received and resolved)
	Poor housekeeping conditions Conflict with local community	Construction labour monitoring plan						
		Transportation of workers	<ul style="list-style-type: none"> • Regular shuttle to mobilize personnel to and fro the temporary accommodation/construction camp 					<ul style="list-style-type: none"> • Transportation schedule log

Activity	Potential Impact	Plan / Action proposed	Proposed Mitigation Measures	Level of implementation		Responsibility for Implementation	Responsibility of direct supervision	Means of supervision
				Individual	Collective			
Construction and O&M activities	Risk of injury on site.	H&S Plan	<ul style="list-style-type: none"> In accordance to Labor laws related to occupational health and safety No. 12 of year 2003, workers should be oriented about health and safety procedures. The contractor and subcontractors should assign a H&S supervisor who ensures the workers are abided to the H&S procedures The contractor should make all health and safety facilities (i.e. firefighting equipment, first aid materials, protective tools, etc.) available in the project site A guard should be assigned to assure that the community people are not stepping into the project sites. A daily and weekly training should be made to laborers in order to refresh their information Develop a formal grievance mechanism for employees and contractors and disseminate information about its uses to the workforce, in the language(s) of the workers 			DESERT TECHNOLOGIES Site Supervisor Construction contractor	DESERT TECHNOLOGIES Site Supervisor	<ul style="list-style-type: none"> Monthly reporting should be prepared by the H&S supervisor and handed to the H&S manager within the PMU Orientation session reports should be prepared by the H&S consultant A report should be prepared by the H&S manager within the PMU and shared with the funding agencies on quarterly bases. That report should include the following parameters: Total injured workers distributed by their type of work, age and project site Total injured people among the community people distributed by age category, sex and area
		Emergency Response Plan (health and safety)	<ul style="list-style-type: none"> Contracts should be signed with the health facilities close to the construction site Clearly define offsite emergency response procedures to transportation incidents 24/7 A Station equipped with basic tools to provide First Aids measures and a vehicle in compliance with standards for automotive ambulances. 					<ul style="list-style-type: none"> Measured compliance with offsite emergency response procedures Periodic check on First Aids station and availability of automotive ambulance

Activity	Potential Impact	Plan / Action proposed	Proposed Mitigation Measures	Level of implementation		Responsibility for Implementation	Responsibility of direct supervision	Means of supervision
				Individual	Collective			
	Risk minimization	Hazards and risks identification study	<ul style="list-style-type: none"> Assessment of hazards and risks findings from the study and setting additional safety precautions 					<ul style="list-style-type: none"> Hazards and risks identification study
Land acquisition	<p>The project will require lands for the solar panels, lands have already been allocated for the panels with no encroachment</p> <p>substations and overhead transmission lines lands</p>	Involuntary resettlement Action Plan should be prepared	<ul style="list-style-type: none"> The overhead routes should be explicitly defined Land use will be defined and all PAPs will be defined In case of any land acquisition is notified , performance standard No. 5 will be triggered EETC should prepare a full Resettlement Action Plan or an abbreviated resettlement action plan Land rights or land use rights acquired through expropriation or other compulsory procedures in accordance with the legal system of Egypt Land rights or land use rights acquired through negotiated settlements with property owners or those with legal rights to the land if failure to reach settlement would have resulted in expropriation or other compulsory procedures Project situations where involuntary restrictions on land use and access to natural resources cause a community or groups within a community to lose access to resource usage where they have traditional or recognizable usage rights 			EETC with expropriation committee within the governorate	NREA	<ul style="list-style-type: none"> Resettlement Action Plan or Abbreviated Action Plan are developed and executed

8. Stakeholder Engagement and Public Consultation

The public consultation chapter aims to highlight the key consultation and community engagement activities and their outcomes, in addition to outlining the key aspects to be addressed when holding the consultation activities.

IFIs and national authorities consider stakeholder engagement as an essential part of good business practices and corporate citizenship, and a way of improving the quality of projects. In particular, effective community engagement is central to the successful management of risks and impacts on communities affected by projects, as well as central to achieving enhanced community benefits.

Stakeholder engagement is an ongoing process involving (i) the client's public disclosure of appropriate information so as to enable meaningful consultation with stakeholders, (ii) meaningful consultation with potentially affected parties, and (iii) a procedure or policy by which people can make comments or complaints. This process should begin at the earliest stage of project planning and continue throughout the life of the project.

8.1 Regulatory Context

8.1.1 EEAA legal requirements for stakeholder engagement (Public Consultation)

Under the Egyptian environmental law no. 4/ 1994 and its executive amendment no. 9/2009 modified with ministerial decrees no. 1095/2011 and no. 710/2012, a number of institutional stakeholders (representatives of the Egyptian Environmental Affairs Agency "EEAA" and its regional branches, related governmental authorities, governorate where the project is located, local parliaments and influenced groups of nearby institutions or residents) must be represented in the public consultation held prior to the approval for proposed projects that need an Environmental Impact Assessment (EIA). Other parties may participate such as the NGOs and the universities.

8.2 International legal requirements for stakeholder engagement (Public Consultation)

8.2.1. EBRD Environmental and Social Policy (May 2014)

The EBRD's appraisal requires the borrower to classify stakeholders potentially affected by and/or interested in the projects, disclose sufficient information about the impacts and issues arising from the projects and consult with stakeholders in a meaningful and culturally appropriate manner. In particular, the EBRD requires its clients to engage with relevant stakeholders, in proportion to the potential impacts associated with the project and level of concern. Such stakeholder engagement should be carried out bearing in mind the spirit and principles of the UNECE Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters. For projects subject to ESIA that have the potential to have significant environmental impacts across international boundaries, the Bank will encourage the approach of the UNECE Convention on Environmental Impact Assessment in a Tran boundary Context, regardless of geographical location of a project or its potential impacts. The Bank may, in some cases, conduct its own public consultation activities to gauge stakeholder views. Stakeholder identification and engagement may also be built into the Bank's technical cooperation activities, as appropriate.

8.2.2. IFC Performance Standard 1: *Assessment and Management of Environmental and Social Risks and Impacts*

- Stakeholder engagement is the basis for building strong, constructive, and responsive relationships that are essential for the successful management of a project's environmental and social impacts.
- Stakeholder engagement is an ongoing process that may involve, in varying degrees, the following elements: stakeholder analysis and planning, disclosure and dissemination of information, consultation and participation, grievance mechanism, and ongoing reporting to Affected Communities. The nature, frequency, and level of effort of stakeholder engagement may vary considerably and will be commensurate with the project's risks and adverse impacts, and the project's phase of development.
- Clients should identify the range of stakeholders that may be interested in their actions and consider how external communications might facilitate a dialog with

all stakeholders. Where projects involve specifically identified physical elements, aspects and/or facilities that are likely to generate adverse environmental and social impacts to Affected Communities the client will identify the Affected Communities and will meet the relevant requirements.

- The client will develop and implement a Stakeholder Engagement Plan that is scaled to the project risks and impacts and development stage, and be tailored to the characteristics and interests of the Affected Communities.
- Where applicable, the Stakeholder Engagement Plan will include differentiated measures to allow the effective participation of those identified as disadvantaged or vulnerable. When the stakeholder engagement process depends substantially on community representatives, the client will make every reasonable effort to verify that such persons do in fact represent the views of Affected Communities and that they can be relied upon to faithfully communicate the results of consultations to their constituents.

8.2.3. EIB Environmental and Social Practices Handbook (2013)

- The purpose of public consultation in the EIA process is to allow the promoter to identify and address public concerns and issues, and to provide the public with an opportunity to receive information and make meaningful input into the project assessment and development.
- The nature and magnitude of different stakeholder interests should be established. The interests of those most likely to be significantly impacted by the project should be addressed during the public consultation associated with the EIA, public hearings, via the media, or be drawn to the Bank's attention by the promoter, a civil society organization, or a government body.
- The EU EIA Directive defines the term 'public' as: "one or more natural or legal persons and, in accordance with national legislation or practice, their associations, organizations or groups"; and 'public concerned' as: "the public affected or likely to be affected by, or having an interest in, the environmental decision-making procedures for the purposes of this definition, non-governmental organizations promoting environmental protection and meeting any requirements under national law shall be deemed to have an interest".
- During appraisal, stakeholders' concerns or complaints should be established through EIA documents and discussions with the promoter. If necessary the

mission should be organized to include meetings with concerned parties and understand better their issues regarding the project

8.3 Stakeholder engagement objectives and methodology

8.3.1. Stakeholder engagement objectives

The objective of the Stakeholder Engagement is to ensure safe and successful Project delivery by:

- Informing stakeholders, including persons or groups who are directly or indirectly affected by a project, as well as those who may have interests in a project and/or the ability to influence its outcome, either positively or negatively;
- listening to their comments, ideas and concerns and recording the same for follow up;
- Avoiding conflict by addressing impacts and issues raised by stakeholders promptly; particularly with the communities that will not be served by the project
- Ensuring that fears and anxieties about the nature, scale and impact of the operation have been properly considered in the development and management of the Project;
- Accessing and making good use of existing local knowledge of the area;
- Avoiding any misconceptions about the project and properly manage expectations;
- Communicating and implementing a viable community feedback mechanism.

Thereafter the results will provide proper documentation of stakeholder feedback and enhance the ESIA accordingly.

8.3.2. Stakeholder engagement methodology

The research team for the ESIA has adopted multi-dimensional consultation activities that enable the marginalized, voiceless, youth and women to gain information about the project. As well as, the team managed to collect information about community concerns regarding the project during various implementation phases.

In order to apply comprehensive and meaningful stakeholder engagement activities, a local team from Aswan Governorate and Benban village was mobilized to consult with community people and stakeholders. The study team managed to use the simple dialect that can be comprehended by all community members.

It was recommended to apply most of consultation activities in familiar acceptable areas for the community. Such practices enabled the team to conduct Stakeholder engagement activities free of manipulation, interference, coercion, and intimidation.

Information shared with the community was simplified and photos were added in order to visualize the project to illiterate groups.

This project adopted rich day to day consultation and community engagement activities since 2013. As Benban village was planned to host another solar project named concentrated solar power project in 2013. Due to financing constrains, the CSP was replaced by the Photovoltaic projects in Benban. Yet, stakeholder engagement plan commenced in 2013.

The adopted methodology for the stakeholder engagement comprised of various phases. The Consultant targeted different relevant stakeholders inside project community. Different groups including men, women, youth, elderly, officials, representatives from the NREA, NGOs, information centres, traders and retailers, natural leaders and key informants were consulted and were informed of the proposed project. Inside each community, both decision makers and the people expected to be affected by the project were consulted, and had the chance to voice their concerns and expectations. A list of the names of the stakeholders who were consulted is attached in Annex A and B for scanned and printed lists respectively.

Participatory Rapid Appraisal tools (PRA) were utilized during the scoping and consultation phases. These varied between group meetings, focus group discussions (FGDs), semi structured interviews (SSI), in depth individual interviews, and observations.

A multi- level approach that outreaches the areas adjacent the project and various stakeholders was adopted. Most of the community people were completely unaware about solar power.

With regards to the DESERT TECHNOLOGIES project, stakeholder engagement activities were carried out in parallel to those held as part of the Strategic Environmental and Social Assessment (SESA) being prepared for the whole Benban PV Solar Park.

Following are the main stakeholder engagement activities to date

- The study team visited the project area in order to define the various stakeholders during August 2015.

- Meetings were conducted between the local mobilizers and the consultants during August 2015 in order to develop an engagement plan that is locally tailored for the residential communities with the study team members.
- Based on the identification of stakeholders, various questionnaires and guidelines were prepared in order to engage: i) the residents in the project areas, ii) NREA , iii) the NGOs, iv) Governmental entities, v)health and safety department ,vi)the environmental departments, vii)developers and EETC.
- The study team divided the various engagement activities of the project to:
 - i. Pre-project designing
 - ii. Scoping phase,
 - iii. Data collection phase and,
 - iv. Public consultation phase.
- All activities conducted were documented with photos, videos and lists of participants in order to warrantee appropriate level of transparency.

8.4 Strengths and Limitations of Consultation

8.4.1. Strengths of the consultation

- 1- Local mobilizers were recruited in order to facilitate conducting stakeholder meetings and collecting primary data,
- 2- The local mobilizers proposed the main stakeholders that play role or have interest in the project based on a list of potential stakeholders provided by the consultant. In addition to, the primary list proposed by the EBRD
- 3- Mobilizers facilitated various meetings conducted with the governmental and non-governmental entities,
- 4- Prior to each consultation event, the local mobilizers invite the community through distribution of flyers, posters and meeting with the local authorities,
- 5- Community Needs Assessment carried out as part of the SESA paved the road to additional consultation to be conducted for the DESERT TECHNOLOGIES and other projects in the Benban Solar Park.
- 6- The project was privileged by a dense media coverage that facilitates the discussion about the project itself. Radio and TV interviews with the chairman of NREA, the project manager, ESIA consultant and the residents brought forward lots of information to the community. The social expert also had a full interview in channel 8 (the local channel) about the importance of stakeholder engagement and the contribution of the community. All of those activities encouraged the community to attend all stakeholder engagement activities.
- 7- The mayor of Benban was supportive to the project by mobilizing people and supports the team in consultation with governmental units.

8.4.2. Limitation of the consultation

- 1- Community stakeholder activities began in 2013 and some stakeholders have become saturated with information about the on-going solar project. Hence, the team applied unconventional methods of consultation and stakeholders activities.
- 2- Female representation in engagement activities was limited. Thus, the team tried to integrate more females to the extent possible.
- 3- As Benban village comprises of three sub-villages that are governed by three mayors, it was a concern that the consultation activities focus on one sub-village. In order to avoid such constrain, all three sub-villages were targeted and the majority of community people were informed

8.5 Stakeholder Identification

In compliance with IFI requirements for stakeholder identifications, the first step in successful stakeholder engagement is for the DESERT TECHNOLOGIES to identify the various individuals or groups who (i) are affected or likely to be affected positively or negatively (directly or indirectly) by the project (“affected parties”), or (ii) may have an interest in the project (“other interested parties”). Resources for public information and consultation should focus on affected parties, in the first instance.

Stakeholders were classified into two categories, directly and indirectly affected, the first category are the main affected groups and collaborators with the project. The second category is those who might support the project. Additionally, a separate group was identified. They are those who have an interest of the project or might benefit from it. Stakeholders are categorized as follow:

Table 48. DESERT TECHNOLOGIES ’s stakeholders identification

Stakeholder groups	Stakeholders bodies	Relevance to project
<i>Directly affected groups</i>		
Local project Affected communities	Local community around the plant in Benban and its sub-villages	Direct receptors of the project impacts. Thus they are ranked as the most important stakeholders They might also benefit from job opportunities and might get affected due to community resources overconsumption
	The mayors	Opinion formers and decision makers in the community. Their villages will host up to 9000 workers simultaneously.
	Small scale grocery shops and bakery within Benban village	Provide workers with food and amenities. Thus, they will be positively benefit from the project
	Suppliers and whole sale traders	Benefit from supplies contracts in the project side. This includes food supplies, and transportation
	Owners of residential units in Benban or Aswan	Lease to workers and engineers

Stakeholder groups	Stakeholders bodies	Relevance to project
	Young people	May be able to take advantage of job opportunities or to receive training to upgrade their capacity
	Vulnerable groups (include women)	May be affected negatively by the associated projects (if water intake is implemented)
	Benban Local Unit and Daraw Markaz Authority	<p>Permissions for the road cut during the implementation</p> <p>Permissions for the lands needed for the project</p> <p>Rehabilitation of roads, which is one of the major issues raised by the community, will be performed by the LGU.</p>
Developers	All Benban project developers	Key player in this project and will have major roles regarding utilities, labor employment, accommodation, and transportation. DESERT TECHNOLOGIES shall ensure participation in collective arrangements.
<i>Indirectly affected groups</i>		
Governmental entities	Aswan Governorate Authority	Provision of support to the project through providing various permissions needed.
	Information Centres on the governorate level	Provide the project with the underground utilities and infrastructure maps. As well as, providing information about the surrounding communities
Collaborating companies	Egyptian Electricity Transmission company (EETC)	<p>Responsible for providing the new plant with substations</p> <p>As well as, preparation of the electricity code to inject produced electricity into the grid</p> <p>Responsible for the transmission of produced electricity through an overhead transmission line. They are responsible for the preparation</p>

Stakeholder groups	Stakeholders bodies	Relevance to project
		of an ESIA to the OHTL
Environmental institutes and agencies	Environmental Affairs Agency (EAAA)	Responsible for reviewing and approving ESIA's, and monitoring implementation of the Environmental Management Plan
	Environmental Office within the governorate	Responsible for monitoring the compliance to environmental requirements and attending consultation activities
Ministries and General Authorities	Ministry of Water Resources and Irrigation	Responsible for provision of permissions for water intake or digging wells
	Ministry of Health and associated health facilities	Provide health facilities to the workers within the site and well act as health service providers
	Labor department	Monitoring working conditions and commitment to health and safety measures
	Ministry of Social solidarity	Assure the workers receiving social insurance
Army and police force	Ministry of defense	Permitting the location of substations and the routes of overhead transmission line Securing the project area in cooperation with police force
	Police force	Securing the project areas. In case of any encroachment or robbery they will interfere
International Financial Institutions	All funding agencies (EBRD, EIB, AFD, AFDB)	Financiers and regulators
Additional stakeholders who have interest		
University and educational institutes	Aswan University	Play a major role in ESIA's as well as proposing corrective procedures
Industry and Business	All industrial and business within the project Markaz	Benefit indirectly from the enhancement of electricity grid
NGOs and civil society	NGOs in Benban	Consult about rights of residents of the local communities and the environment during the

Stakeholder groups	Stakeholders bodies	Relevance to project
		project implementation. Provide information to poor and marginalized women
Press and Media	El Youm El Sabea Newspaper El Ahrma Newspaper El Watan newspaper Akheralanbaa website El Nehar website	Disclosure of information about the project

8.6 Summary of Previous Stakeholder Engagement Activities

In line with the Egyptian Environmental law no. 4/ 1994 and its executive amendment no. 9/2009 modified with ministerial decrees no. 1095/2011 and no. 710/2012, EBRD environmental and social policy 2014; EIB environmental and social practices handbook; the project managed to adopt and conduct various consultation activities. The consultation activities conducted were:

- During the scoping phase of DESERT TECHNOLOGIES ESIA
- During the final consultation of DESERT TECHNOLOGIES project

8.6.1. During the DESERT TECHNOLOGIES' ESIA and the SESA preparation

- Scoping meetings were conducted with the community developers in NREA premises on the 15th September 2015
- Scoping meetings were conducted with the governmental and non- governmental entities in Aswan Governorate during September 2015
- Scoping meetings with the community people in order to identify their needs in the September 2015

- On the 8th September 2015, an interview was broadcast on air for one hour with the SESA consultant about the project and potential impacts. As well as, the importance of community engagement
- Public consultation session with the different project’s stakeholders was held on the 17th September 2015 in Aswan



Figure 66: Participants



Figure 67: NREA presentation



Figure 68: Governorate representation



Figure 69: NREA Chairman TV interview



Figure 70: Benban community leaders



Figure 71: Developers

Table 49. Summary of consultation activities to date

Time	Consultation activity/method	Number of participants	Phase	Information disclosed	Stakeholder(s) engaged	Shared documents	Community Feedback
23 rd of March 2013	Meetings	40 persons (all males)	Scoping phase of the Kom Ombo CSP project	Information about the project and potential impacts	Community people Fares and /Benban residents	PowerPoint presentation	Older groups were concerned about the project as it was completely new for them. Younger groups expressed their positive perception of the project
23-26 of March 2013	Interviews	13 persons (only one female)	Scoping phase of the Kom Ombo CSP project	Information about the project and potential impacts	Environmental staff on the governorate level NGOs EETC representatives Other entities	Interviews	All reported the positive impacts of the project Job opportunities were the main focus

Time	Consultation activity/method	Number of participants	Phase	Information disclosed	Stakeholder(s) engaged	Shared documents	Community Feedback
25th of March 2013	Public Consultation event	111 persons (88 males and 23 females)	Kom Ombo CSP project	Information about the project and potential impacts The ESIA methodology also was presented	Governorate Environmental Affairs Media Electricity Water resources Fares villagers Benban villagers NGOs and civil society Educational sector Academic sector Local Governmental Units Investment Funding Agencies NREA	Brief description about the project News items published one week before Fact sheet about the project	A long list of feedback was raised that included: project impact, technical specifications, job opportunities and community role
15 th of September 2015	Scoping meetings	84 persons	During the ESIA preparation	Information about the ESIA assignment and the environmental requirements	EETC Developers Funding Agencies (EBRD) NREA ESIA consultant	PowerPoint presentation	Developers requested information on the environmental requirements Cumulative impacts of the project Their contribution to ESIA project

Time	Consultation activity/method	Number of participants	Phase	Information disclosed	Stakeholder(s) engaged	Shared documents	Community Feedback
9th of September 2015	Workshop	45 (about half of them are females)	During the ESIA preparation	Information about the project and CSR Information about potential project impacts	45 participants from both genders with the age between 11 to 39 years old were invited	Leaflet about the project	They managed to develop a long list of community needs
September 2015	Individual interviews	20 persons	During the data collection for the ESIA preparation	Information about the project in general	Local governmental units and NGOs EETC NREA	No shared documents	Feedback about their perception of the project and their positive attitude related to the project
8th of September 2015	Radio interview	NA	During the public consultation project and the ESIA preparation	Information about the project Information about project impacts Community engagement plan and importance to participate All community people are invited to the public events	NA	NA	NA

Time	Consultation activity/method	Number of participants	Phase	Information disclosed	Stakeholder(s) engaged	Shared documents	Community Feedback
17th of September 2015 in Aswan	Public consultation event	117 person (89 males)	Public consultation phase of the ESIA	All information related to the project Potential project impacts Job opportunities	Governorate Environmental Affairs Media Electricity sector Water resources Benban villagers NGOs and civil society Educational sector Academic sector Local Governmental Units developers NREA	Non-technical executive summary	Positive perception of the project due to its limited impacts Job opportunities to be given primarily to the community Capacity building activities Water resources
15 th of November 2015	Consultation event with the developers	42 persons	During the ESIA preparation	Information about the Potential Impacts of the project	EETC Developers Funding Agencies (EBRD, IFC and EIB) NREA ESIA consultant	PowerPoint presentation	Developers requested information on the environmental requirements Cumulative impacts of the project

Time	Consultation activity/method	Number of participants	Phase	Information disclosed	Stakeholder(s) engaged	Shared documents	Community Feedback
21 st of November 2015	Public consultation event in Benban village for two developers	350 person (89 males)	Public consultation phase	All information related to the project Potential project impacts Job opportunities	Governorate Environmental Affairs Media Electricity sector Water resources Benban villagers NGOs and civil society Educational sector Academic sector Local Governmental Units developers NREA Members of People Assembly	Non-technical executive summary	They were pleased with consultation approach as the project consulted them in their village. Positive perception of the project due to its limited impacts Job opportunities to be given primarily to the community Capacity building activities Water resources Fares and other surrounding villages roles

8.7 Suggested Stakeholder Engagement Program

A Stakeholder Engagement Plan is necessary to ensure that stakeholders are kept well informed about the project throughout its lifecycle. Stakeholders should have the opportunity to express their views about the project and also to raise complaints.

In order to assure proper implementation of such a stakeholder engagement program, it is strongly recommended defining roles and responsibilities of the entity that will handle this program. For the time being, there is no establishment or entity implementing any kind of stakeholder engagement activities. However, some actions have been initiated by the Consultant during the Kom Ombo CSP ESIA phase and during the preparation for this ESIA .

During the previous years some unofficial meetings with community people, developers and stakeholders took place. These activities are not documented.

As it was previously mentioned there is a need for effective management of the Benban PV project as a whole. It was proposed to form a 'developers' association' that will handle all activities related to the project, including stakeholder engagement.

A developers' association had not been formally established at the time of completion of this ESIA. However, at least 50% of the developers have collectively agreed to form a standalone association. *Based on that action, the Consultants for this ESIA assume that such a 'Developers Association' will be formally established.*

The following are recommendations by the Consultant on the proposed duties of this Developers Association:

Recommendation 1:

The Developers Association will need to carry out stakeholder engagement activities as one of its main tasks. It should assign a Community Liaison Officer who will be responsible for communication with the community. A social Development Officer should also be assigned to handle the grievance and redress mechanism.

Recommendation 2:

In full cooperation with Community Advisory Committee (CAC) which should be set up with the various tribes, the Community Liaison Officer should share information and respond to inquiries in a monthly meeting. This would result in:

- Facilitating access to information on the project through conducting informal meetings with the community members regularly;

- Informing stakeholders of on-going communications and meetings;
- Informing stakeholder about project progress, issues to expect, construction time table etc.;
- Providing feedback from stakeholders on issues that have been raised through having an active channel with the NREA.

Recommendation 3:

It is recommended that NREA work closely with the committee and the Developers Association. Alongside NREA, the Committee would facilitate implementing community projects as appropriate through mobilizing community members. The Committee would initially meet monthly, though more frequent meetings can be convened if requested by the village members. Minutes of all meetings would need to be taken and follow-up on actions identified and agreed would need to be available on request and monitored.

Recommendation 4:

Additionally, separate focus group meetings should be conducted with women, young people and vulnerable groups in order to be able to voice their concerns and worries. Posters and leaflets about the project and an agreed contact person would need to be published in the main streets of the village, the market place and in the vicinity of the power plant. Women-oriented NGOs should be engaged in order to cooperate with them to pass information in simple dialect to poor marginalized women. Young people could be reached via informal meetings in the Youth Center.

Recommendation 5:

It is proposed that the Developers Association forms a project management unit (PMU) to carry out the following:

- Raise workers awareness about:
 - Environmental management on site
 - H&S requirements
 - Grievance mechanism for project affected people
- Establish information sharing channels
- Provide information to the community about the construction program and timing.
- Inform directly affected stakeholders in advance of construction works

Initiate disclosure of the ESIA, SEP and ESAP reports on the website of the Ministry of Electricity, the NREA and funding agencies. This is aimed at having information available

for the village community and all other stakeholders and interested groups. Regarding the illiterate people, they should be informed about the main contents of the reports through meetings with the community leaders and NREA.

The following table summarizes specific suggested actions

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Stakeholders	Information to be disclosed	Time frame	Communication / media tool	Related Documentation	Stakeholder Feedback
A. Preconstruction and construction phase					
DESERT TECHNOLOGIES project Contractor/ construction Workers	Provide information on : <ul style="list-style-type: none"> • Environmental management plan, and code of conduct; • raise awareness of requirements • Grievance mechanism allocated for workers and information sharing channel 	From the commencement of Project activities	Induction training to all workers. Daily construction training to the workers Regular bulletin disclosed in the site, tool box talks, induction information for newly workers	NTS, SEP, ESMP and Monitoring reports Health and safety measures Labor rights	Workers can lodge grievances at any time throughout their employment on the project site. Information required by the workers should be documented
DESERT TECHNOLOGIES project management and employees	Provide information on: <ul style="list-style-type: none"> • construction program and timing; • communication issues related to operations • Grievance mechanism 	From the commencement of Project activities	Internal letters Regular intranet and email updates	NTS, SEP, ESMP Monitoring reports	Workers can lodge grievances at any time throughout their employment on the project site . Information required by the workers should be documented

Stakeholders	Information to be disclosed	Time frame	Communication media tool /	Related Documentation	Stakeholder Feedback
	allocated for workers				
Benban villagers and young people	<ul style="list-style-type: none"> Project schedules provided to directly affected stakeholders to notify them in advance of construction works. As well as the ESIA, SEP and ESMP reports will be disclosed on the website of the Ministry of Electricity, the NREA and funding agencies. Aiming at having information available for the village community, the reports will be handed to the Local Governmental Unit. Regarding the illiterate people, they will be informed about the main contents of the reports through meetings with the community leader and NREA. 	From the commencement of Project activities	Regular community meeting/s as required / Monthly at the beginning and after 3 months will be quarterly meetings. Additionally on NREA and the Ministry of Electricity.	ESIA, SEP, ESMP Traffic Management Plan Monitoring Plans Safety procedures Employment opportunities Grievance Procedure Progress against ESMP	Documentation of the required information sought by the residents
	Project opportunities available and required skills	Once prior to construction phase	Posters to be broadcast in the main streets and market area, as well as, the entrance of the	Lists of jobs to be provided by the contractor and required specifications	The documentation of applicants

Stakeholders	Information to be disclosed	Time frame	Communication media tool /	Related Documentation	Stakeholder Feedback
			current power plant. An inventory of job opportunities available should be disclosed to people on the NREA and the Ministry of Electricity websites.		
	Grievance and redress mechanism	Prior to construction activities and during the construction	Posters to be broadcast in the main streets and market area, as well as, the entrance of the current power plant	Grievance and redress mechanism in the SESA and ESIA	All grievance and redress received should be documented, analyzed
Other interested stakeholders	Project progress, performance on environmental and social issue management, and new activities	Prior to the construction and during operation	Direct communication through individual meetings Public consultation activities (conducted during preparation) Community Panel meetings (Quarterly)	Fact sheets Monitoring results Progress against ESMP Employment opportunities	All individual meetings and comments should be documented.

Stakeholders	Information to be disclosed	Time frame	Communication media tool /	Related Documentation	Stakeholder Feedback
B. Operation					
Benban residents	Update of operational performance, and ongoing communication on key issues.	After operation commencement	Regular community meeting/s as required / Quarterly	Monitoring Plans Safety procedures Grievance Procedure	Starting in 2018
DESERT TECHNOLOGIES project workers	Provide information on : <ul style="list-style-type: none"> Environmental management plan, code of conduct, and grievance mechanism; Raise awareness of requirements Grievance mechanism allocated for workers and information sharing channel	After starting operation	Induction training to newly recruited workers. Daily construction training to the workers Regular bulletin disclosed in the site, tool box talks, induction information for newly workers	SEP, ESMP and Monitoring reports Health and safety measures Labor rights	Workers can lodge grievances at any time throughout their employment on the project site. Any grievances (and response given) to be documented
DESERT TECHNOLOGIES project management and	Provide information on: <ul style="list-style-type: none"> construction program and timing; communication issues 	From the commencement of Project activities	Internal letters Regular intranet and email updates	NTS, SEP, ESMP Monitoring reports	Workers can lodge grievances at any time throughout their employment on the project site. Any grievances (and response

Stakeholders	Information to be disclosed	Time frame	Communication media tool /	Related Documentation	Stakeholder Feedback
employees	<p>related to operations</p> <ul style="list-style-type: none"> Grievance mechanism allocated for workers 				given) to be documented
<p>Governorate Environmental Office Local authority</p> <p>Other interested stakeholders (Some industrial parties)</p>	Update of operational performance, and ongoing communication on key issues.	During operation	<p>Direct communication through individual meetings</p> <p>Public consultation activities (conducted during preparation)</p> <p>Community Panel meetings (Quarterly)</p>	<p>Monitoring results</p> <p>Progress against ESMP</p> <p>Employment opportunities</p>	All individual meetings and comments should be documented.
EETC	Substations and OHTL activities and environmental requirement	During operation in 2018	Direct communication through meeting inside the DESERT TECHNOLOGIES project.	Minutes of meetings	

8.8 Suggested Framework for Disclosure of Information

According to EBRD performance requirement 10 (and similar requirements of IFC and EIB), disclosure of relevant project information helps stakeholders understand the risks, impacts and opportunities of the project. If communities may be affected by adverse environmental or social impacts from the project DESERT TECHNOLOGIES will disclose to them the relevant information including:

- The purpose nature and scale of the project
- The duration of proposed project activities
- Any risks to and potential impacts with regard to environment, worker health and safety, public health and safety and other social impacts on communities, and proposed mitigation plans
- The envisaged consultation process, and opportunities and ways in which the public can participate
- Time/venue of any envisaged public meetings, and the process by which meetings are notified, summarized, and reported.

Information will be disclosed in the local language(s) and in a manner that is accessible and culturally appropriate, taking into account any vulnerable people (for example ethnic groups or displaced persons). For projects with potentially significant adverse social or environmental impacts, disclosure should occur early in the environmental and social appraisal process.

8.8.1. During planning phase

The project has good access to media as all news regarding operations is disclosed to the public through national and local media, including state owned etc. Additionally, the social media got accustomed to publishing all news related to solar project in Benban village. Please see published news in Annex 8-1 In the meantime, a technical officer has been assigned to communicate with people and provide information on the site.

The ESIA after being reviewed by the funding agencies and approved will be translated into Arabic and uploaded to the Websites of NREA, EBRD, EIB, and EEAA.

8.8.2. During the construction phase (2016-2017)

During construction, DESERT TECHNOLOGIES will provide ongoing information to the people of Benban and, if needed, surrounding areas. Information will be provided in a timely manner and will relate to planned, unplanned and ongoing construction activities. This could include safety measures in the vicinity of the construction site, traffic management, employment opportunities, opportunities for service provision (for example, catering,

laundry services, etc.) and any other information identified through the development of the ESMP. This information will be provided via a range of methods, including:

- Monthly meeting with the community advisory committee
- Face to face meetings with men and/or women, which could involve the whole community or smaller focus groups. These will be facilitated by the male or female Community Liaison Officers, as appropriate;
- Written updates posted at the local school;
- Via the Community Advisory Committee; and
- Annual project progress reports, including environmental and social impacts, health and safety performance, and implementation of the external grievance mechanism.

8.8.3. During the project operation phase (2018 onwards)

During operation, the company will continue to provide information on the project as necessary. This will focus on monitoring of operational impacts such as noise and emissions, and any key issues to be raised by stakeholders during the earlier phases of the project. Existing communication channels will continue to operate, including the Community Liaison Committee and grievance mechanism. A summary of the consultation activities is provided below.

Each year a community communication program will be developed and documented.

8.9 Suggested Grievances and Redress Mechanism Disclosure

It is expected that no major grievance issue will arise. However, to ensure that stakeholders have avenues for redressing their grievance related to any aspect that may result from the project, detailed procedures of redressal of grievances have been established. The objective is to respond to the complaints of stakeholders in a timely and transparent manner, without resorting to complicated formal channels to the extent possible. The procedure covers stakeholder grievances generated during construction and operation activities.

Anyone will be eligible to submit a grievance to the Project if they believe a practice is having an adverse impact on the community, the environment, or on their quality of life. They may also submit comments and suggestions to the DESERT TECHNOLOGIES project through the social development officer assigned by developer association.

- **Objectives:** The objective of a grievance procedure is to ensure that all comments and complaints from any project stakeholder are considered and addressed in an appropriate and timely manner.
- **Disclosure of the GRM:** The Community will be fully informed about the Grievance procedures in simple language. Information about grievance mechanism will be tailored according to the community. Community leaders, social entities and the governmental units will be informed about the GRM.
- **Mode of Grievance:** The Company will accept all comments and complaints associated with the project from any stakeholder. Comments can be made via email, post, fax, on the telephone or in person. The comments and complaints will be summarized and listed in a Complaints/Comments Log Book, containing the name/group of commenter/complainant, date the comment was received, brief description of issues, information on proposed corrective actions to be implemented (if appropriate) and the date of response sent to the commenter/complainant.
- **Response to grievances:** All comments and complaints will be responded to either verbally or in writing, in accordance to preferred method of communication specified by the complainant. Comments will be reviewed and taken into account in the project preparation; however they may not receive an individual response unless requested.
- **Registration of GRM:** All grievances will be registered and acknowledged within 6 working days and responded to within one month. The project management will keep a grievance log and report on grievance management, as part of annual project progress reports.
- **Grievance channels:** Comments and concerns regarding the project can be submitted in writing in through the following channels until the developer association assigns a social officer. For the time being NREA will be the responsible entity of any grievance:
 - Email: reic@nreaeg.com
 - By telephone : 22725891 and /fax 22717173
 - By post or hand delivered to: : **Ibrahim Abu el Naga St. Abas El Aqad, Nasr City Cairo Governorate**

- **Confidentiality:** Individuals who submit their comments or grievances have the right to request that their name be kept confidential, though this may mean that the company is unable to provide feedback on how the grievance is to be addressed.
- **Management of GRM:** During construction of the DESERT TECHNOLOGIES plant, grievances in relation to construction activities will be managed by DESERT TECHNOLOGIES and the contractor in full cooperation with the developer association and the construction contractor(s). The Company will provide contact information for the contractor to residents of Benban before construction begins.
- A separate grievance mechanism is available in the same manner for workers, including employees of DESERT TECHNOLOGIES project-and contractors.

8.10 Resources and Responsibilities

Until a permanent Stakeholder Liaison Officer (STL) for project is appointed, NREA will have the overall responsibility for handling the consultation and information disclosure process, including organization of the consultation process, communication with identified stakeholder groups, collecting and processing comments/complaints, and responding to any such comments and complaints.

Depending on the nature of a comment/complaint, some comments or complaints will be given to the appropriate person in the company for a response. In order to ensure that all stakeholders have adequate access to information, NREA will be the primary contact person.

Contact details for the company representatives are included below.

- Email: [\[email\]](#)
- By telephone : [\[phone number\]](#) and /fax [\[fax number\]](#)
- By post or hand delivered to: [\[responsible\]](#) at [\[post address\]](#)

8.11 Monitoring and Reporting

Monitoring of grievances

All grievances activities should be monitored in order to verify the process. The monitoring process should be implemented on the level of NREA. The following parameters will be monitored:

1. Efficiency of grievances recipients monthly (Channel, gender, age, basic economic status of the complainants should be mentioned)
2. Type of grievance received (according to the topic of the complaint)
3. Number of grievances solved
4. Number of unsolved grievances and the reasons behind not solving them
5. Satisfaction levels with proposed solutions
6. Documentation efficiency
7. Time consumed to solve the problem
8. Efficiency of response to received grievance dissemination activities undertaken

All grievances received verbally or in written shall be documented in a grievance register. They should be analyzed and reported to the funding agency

Monitoring of community engagement activities

Once commitments have been made within an SEP, it is important to monitor the company implementation and report on the status of the plan's implementation, along with explanations for delays or changes. The SEP should articulate how the public will be informed of the implementation of the plan.

Given the fact that most of stakeholder activities within this plan are not fully defined yet it will be useful to prepare a time plan on quarterly basis for all Stakeholder engagement activities. The quarterly plan should indicate:

- 1- Groups to be engaged
- 2- Objective of engagement
- 3- Method or tool of engagement
- 4- Main information to share with them

Having prepared the quarterly plan and implementing the planned activities, all information related to stakeholder engagement should be available summarized and reported to the funding agencies.

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9. ANNEX

9.1 ANNEX A

9.2 ANNEX B

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