NEW AND RENEWABLE ENERGY AUTHORITY

(NREA)

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BENBAN 1.8GW PV SOLAR PARK, EGYPT

STRATEGIC ENVIRONMENTAL & SOCIAL ASSESSMENT

FINAL REPORT

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List of acronyms and abbreviations

AC	Alternating current
AQL	Air Quality Limit (legal limit value in Egypt)
BAT	Best Available Techniques
Benban Projects	The 41 individual projects to be implemented at the NREA Benban site
CAPMAS	Central Agency for Public Mobilization and Statistics
cbm	Cubic metre
cms	centimetre
dB	Decibel
DC	Direct current
EBRD	European Bank for Reconstruction and Development
EEAA	Egyptian Environmental Affairs Agency
EETC	Egyptian Electricity Transmission Company
EIB	European Investment Bank
EHCE	Egyptian Holding Company for Electricity
EHS	Environment, Health and Safety
EMS	Environmental Management System
ESIA	Environmental and Social Impact Assessment (previously EIA – Environmental Impact Assessment)
ESAP	Environmental and Social Action Plan
ESMP	Environmental and Social Management Plan
EU	European Union
FIT Scheme	Feed-in-Tariff Scheme
ft	Foot (30.4 cms)
GWh	Giga Watt hour
HV	High voltage
IFC	International Finance Corporation
IFI	International Financial Institution
ILO	International Labour Organization
kWh	Kilo Watt hour
Kom Ombo	Location of a planned Concentrated Solar Plant (CSP); location is part of the Benban site
MW	Mega Watt
MWe	Megawatt electric
MoU	Memorandum of Understanding
NREA	New and Renewable Energy Authority
PPA	Power Purchase Agreement
PR	EBRD Performance Requirement
PS	IFC Performance Standard
PV	Photo-voltaic
Project Companies	Companies implementing projects at the Benban site
RoW	Right of Way
SEP	Stakeholder Engagement Plan
SESA	Strategic Environmental and Social Assessment
SPV	Special Purpose Vehicle

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1 Introduction

1.1 Background

Egypt's expanding economy and growing population require a reliable electricity supply which can meet the rapidly increasing demand. Residential power demand increased by 40% between 2008 and 2013, and overall power demand by 28%. In recent years, this increase has led to blackouts as the generating capacity could not cope. The increased demand has also led to pressure on Egypt's gas supply and reserves. The existing installed generating capacity of c.34 GW is no longer sufficient. With demand growth expected to remain at the levels above, significant additional capacity is required each year. At present electricity generation is dominated by thermal power stations.

Table 1: Installed electricity generating capacity in Egypt (Source: Egyptian Electricity Holding Company, Annual Report 2013/14)

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

In order to meet the increasing demand, diversify the national energy mix and improve the environmental and climate footprint of the power sector, the Government of Egypt and the Ministry of Electricity and Renewable Energy (MoERE) are committed to exploit Egypt's renewable energy potential. 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 2022. Within that framework, Egypt has initiated a programme 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 Power Purchase Agreement (PPA), with a price guarantee for 20 years (for wind) and 25 years (for solar). The New and Renewable Energy Agency (NREA) - under MoERE- will make available multiple plots of land for usufruct arrangement. 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 (SPV).

The key entities in developing this programme are: the Egyptian Electricity Transmission Company (EETC), the New and Renewable Energy Authority (NREA), the Egyptian

Electricity Regulatory Authority (EgyptERA), the Egyptian Environmental Affairs Agency (EEAA), the Ministry of Finance, the Ministry of Electricity and Renewable Energy (MoERE) and the 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 programme. The authorities are now proceeding to finalize a contractual framework for these projects.

The Egyptian government has allocated a 37.2 km^2 plot of land located in Benban in the Daraw Markaz of Upper Egypt (the Benban PV site) to NREA for use for renewable energy generation. NREA has in turn divided the site into 41 separate but contiguous plots which it is making available to developers/companies to implement individual projects (the Benban Projects). NREA is granting initial access to the plots based on 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 plots are now allocated to developers. Once constructed, Benban will be the world's largest solar PV Park, at an estimated total cost of between 3.5 and 4 billion USD.

The 41 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. At a later stage EETC may also construct an additional connection to the neighbouring 500 kV line. EETC will construct the high voltage connections. NREA has prepared site access roads and on-site roads for the Benban project area.

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

- 41 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.

In addition a 16km water supply pipeline from the Nile river may be constructed in order to meet demands for water during operation, primarily for panel cleaning.
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 (less than one hour by car).

Figure 1: Location of Benban

In 2013, NREA initiated an Environmental and Social Impact Assessment (ESIA) for a proposed concentrated solar plant (CSP) on part of the Benban site. The Kom Ombo CSP project did not proceed due to technical and financial feasibility limitations. Its ESIA, carried out in 2014 by EcoConServ in conjunction with ERM Deutschland, which has in turn been cleared by the World Bank and approved by EEAA is a reliable source of information for the site, its environment and its social context and has therefore been used for this Strategic Environmental and Social Impact Assessment for Benban.
According to the Egyptian Environmental Affairs Agency (EEAA) and the New and Renewable Energy Authority (NREA) the developers of the Benban Projects will have to complete the normal environmental and social approval and permitting process; the SESA will be an umbrella ESIA for the entire site and individual projects will have to submit a Form B to the authorities (for details of applicable law and the permitting process kindly see Chapter 2). Additionally, projects seeking financial support from International Financial Institutions (IFIs) will have to meet the requirements of these lenders.

The site is located on Government land in the desert and distant from residential areas. Individual plots for the Benban Projects have identical environmental conditions, will be

constructed and operated in an identical social context, will have similar or identical construction and operations requirements, and will need to comply with national legislation and meet all permitting requirements. If ESIAs were to be carried out for each of the 41 projects, this would lead to duplication of effort, unnecessary cost, and loss of time. It would also be confusing to local communities and other stakeholders because of the large number of public meetings required as part of the ESIA process.

It is customary for the EEAA to require a Strategic/Regional Environmental and Social Assessment (SESA) in the case of large projects with a cluster of similar/adjacent sub-projects, as is the case with the Benban Solar Park. NREA, supported by EBRD, initiated a Strategic Environmental and Social Assessment (SESA) for the entire Benban site. The objective is to provide a high-level assessment, covering all key environmental and social issues relating to the site. Developers of Benban Projects would then be expected to complete a form B (scoped ESIA without Public Consultation) which addresses plot-specific issues and contains commitment to addressing the SESA requirements. EBRD is funding this SESA and has commissioned EcoConServ and its partners to carry out this assignment, in close cooperation with NREA, EEAA, and other authorities.

1.2 SESA Objectives

The overall objective of this SESA is to provide support for the assessment and subsequent management of the aggregate and cumulative environmental, health and safety, and social impacts of the proposed developments at the Benban PV site. More specifically, the SESA is intended to do the following:

- To assess the rationale and justification of the Benban Project as a whole.
- To provide a high level summary of the baseline environmental and social situation of the Benban Site and the surrounding area (including fauna and flora; land use and acquisition; security issues; and presence of any cultural heritage sites), with a particular focus on the socioeconomic conditions.
- To provide a high level assessment of the EHSS impacts of a representative single 50 MW Project.
- To provide a general overview of the type and scale of impacts (both negative and positive) anticipated from such a project.
- To assess the aggregate and cumulative EHSS impacts during construction and operation phases of all 41 Benban projects.
- To suggest high level measures that may be adopted to mitigate negative, and enhance positive, impacts; and identification of environmental and social opportunities and provide guidance on how best to maximize them with a view to strengthen the Benban Project and to achieve an overall improved management of environmental and social challenges and opportunities.

This SESA provides an over-arching assessment of the environmental and social impacts of the Benban site (and thus of all Benban Projects as a whole). It is intended to provide

authorities, project developers, and IFIs with enough information on the site, the potential impacts of the Project and mitigation measures to be able to address any adverse risks and maximise on environmental and social opportunities.

1.3 SESA Approach

Considering the above detailed objectives the approach to the development of the SESA has been to identify and assess the direct and indirect significant impacts the Benban Projects as a whole. Risks and impacts associated with all Benban projects in aggregate have been considered where they are likely to have an effect on the local population and on human health; on land, soil, water, air and climate; on landscape; on biodiversity; and on cultural heritage. The SESA assesses these impacts separately and identify how they interact. Furthermore, it identifies risks and suggests mitigation measures where appropriate.

This Strategic Environmental and Social Impact Assessment broadly follows the steps of a project ESIA although it should not be taken as an ESIA for any one Benban project to be developed by any one project sponsor. 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 which have been broadly adopted for this SESA. The two primary phases followed for this process are as follows:

- 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.

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

- Two site reconnaissance visits in August and September 2015;
- One additional site visit with NREA in September 2015;
- Meetings with authorities in order to obtain detailed information about the project and the Benban location on 8 September 2015;
- A meeting with the deputy of the science and environmental affairs college in Aswan on the 9th of September 2015;
- A meeting was conducted with the manager of networks at the Aswan regional branch of the Egyptian Electricity Transmission Company on the 9th of September, with a follow-up meeting with the head of electricity transmission line and environmental studies in EETC on 2nd November;

- Chairman of Health Directorate and the Head of Protective Medicine were interviewed on the 10th of September 2015;
- Head of an active NGO (Benban community development association, Daraw community development association and Raqaba community development association) was interviewed on the 10th of September 2015;
- Meetings with the local community of Benban were held on the 11th of September 2015 (electricity network, sewage facility, head of local unit, the mayor of Benban Bahary);
- A meeting with head of the ambulance facility was held on the 11th of September 2015;
- One public scoping session was conducted on the 15 September 2015 in Cairo;
- One public scoping session was 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 these meetings (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, operation and decommissioning phases). 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.

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 Impact Assessment Phase the Consultant assessed the impact of the project on sensitive receptors and on the local population. The results, conclusions, and recommendations of the assessment are presented in the SESA (this report).
The methodology used for obtaining baseline information and for impact assessment is presented in Annex 1: SSIA Methodology.

1.4 Limitations

This SESA is a high-level assessment of the environmental and social impact of the Benban PV site construction and operations phases. It is not an ESIA for a specific Benban Project plot. It relies on the data available to the Consultants at the time this assessment was prepared; this includes publicly available data; information from NREA, EEAA, and other authorities; information from Benban Project developers (inclusive of

information on their requirements for project implementation); information from the local communities. Where information is not available or insufficient to make a definitive statement (e.g. on impacts), this is indicated.

1.5 Report Structure

Table 2: SESA Structure

Chapter	Content
Chapter 1: Introduction	Presents the project and its context; and defines the objectives of the SESA and its approach.
Chapter 2: National Legal Framework and IFI Standards	Describes the legislative, policy and administrative requirements applicable to Benban Projects.
Chapter 3: Project Description	Includes a detailed description of the proposed activities at the Benban PV site.
Chapter 4: Project Alternatives	Describes and assesses alternatives to the Benban PV project.
Chapter 5: Baseline Conditions	Describes the environmental and social baseline conditions on the Benban site and the wider project area.
Chapter 6: Assessment of Environmental and Social Impacts	Describes and assesses the potential environmental and socio-economic impacts of the Benban site as a whole and of individual Benban Projects. Identifies necessary mitigation measures.
Chapter 7: Environmental and Social Action Plan	Presents a plan to manage and control the significant impacts of the Benban site as a whole and of the individual Benban Projects, both during the construction and operations phases.
Chapter 8: Information Disclosure and Stakeholder Engagement	Summarizes all consultation and public disclosure activities.

2 National Legal Framework and IFI Standards

This Chapter provides a short description of the legal and administrative framework of the proposed project. It lists the key 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, IFC Performance Standards and EIB environmental and social requirements for the assessment and subsequent management of environmental, health and safety, and social impacts of the 41 projects.

2.1 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 and Social Impact Assessments (ESIAs) for new projects and expansions and renovations of existing projects. The Competent Administrative Authorities (CAAs) for ESIAs in Egypt are Ministries and Governorates as they have the executive powers for development authorization. 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 Competent Administrative Authority 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. This includes projects which require an EIA. The CAAs are responsible for receiving the EIA 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.

As a general rule, the environmental permitting requirements for PV power plants allow projects to be classified as 'B' (requiring an abbreviated environmental approval process), however EEAA has the authority depending on the scale of the project to request a more detailed assessment and to classifies it as Category C; i.e. requiring an ESIA and Public Consultation meeting. In consultation with EEAA, NREA has reached an agreement with EEAA to conduct an overall Strategic Environmental and Social

Assessment study for the whole Benban solar park that meets the requirements of C Category projects. Thereafter, all components under the SESA umbrella for Benban (i.e. the individual Benban Projects) will then be classified as 'B' and will require only submission of a 'Form B' to the EEAA. Form B is a scoped ESIA with project/plot specific information and can be completed by the developer or his consultants without the need for additional public consultation. A decision on applications is made within a maximum of 30 days.

The Strategic Environmental and Social Assessment (SESA) will be submitted to NREA as the Competent Administrative Authority (CAA). NREA, shall then review and submit to EEAA for "No-objection". Plot-specific Environmental Screenings or Scoped EIAs shall be developed by the investors as Form B (or, if the investor chooses, full ESIA) will be also submitted to NREA, who shall then forward them to EEAA for approval. The EEAA review fees shall be paid by the developers. For the SESA and the full ESIA, the EEAA review fee is 55,000 EGP. The review fee for Form B studies is 14,000 EGP.

The implementation responsibilities of the mitigation measures identified by this SESA, and as approved by the EEAA, are identified in Section seven of this report. Cumulative and aggregate impacts will be addressed and monitored through the Benban Developers Association (currently under establishment). The fulfilment of the ESAP items will be monitored by the EEAA through the review of the Environmental Register, and the Lenders Environmental and Social teams through regular reporting and inspection visits.

2.2 Permits required to construct and operate the proposed project

The key permits required for the construction and operation of the proposed project and associated facilities (grid connection and potentially a water intake from the River Nile) are listed in the table below.

Table 3: Key required permits for construction and operation of the proposed project and the associated facilities

Key required permit	Applicability of the permit Yes/ NA			
	PV Power Plant	Associated Facilities		
		Substations / Trans. lines	Water intake	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

Key required permit	Applicability of the permit Yes/ NA			
	PV Power Plant	Associated Facilities		
		Substations / Trans. lines	Water intake	Pipelines
Buildings construction permit: according to the Egyptian Law for Buildings, Law 101 from 1996. The Local Government Unit on the District/ Markaz level 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 of an 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 and issue a permit to that effect. In case of underground water usage, the developers have to request a well digging permission and abstraction authorization	N/A	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 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

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

Table 4: Coordination with relevant authorities

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	➢ NREA will Coordinate with various concerned authorities including Ministry of Defense, EEAA, etc.
Egyptian Environmental	No objection for the construction	➢ ESIA for the Project

Concerned Authorities	Co-ordination Conclusion	Future Requirements
Affairs Agency EEAA	of the project in the allocated land	
Ministry of Civil Aviation	No objection for the construction of the project in the allocated land	➢ Building heights shall not exceed 45 m above ground 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	➢ 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

2.3 National Legislation Pertinent to the Benban Project and subprojects

Egyptian legislation related to environmental aspects:

- National environmental legislation law 4/1994, amended by Law 9/2009 with decree No 1095/2011, 710/2012 and 964/2015
- 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
- Labor Law number, Health and Safety Laws and Decrees 12/2003
- Traffic and Urban planning Laws
- Electricity Law No 87 of year 2015

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.

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

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

Protection of human rights
Law no. 94/2003 on establishing the National Council for Human Rights

2.4 International Standards

Benban projects are likely to be (part-) financed by International Financial Institutions (IFIs) and possibly national and international banks. All IFIs have Environmental Policies and operate strict environmental standards and approval processes as part of project appraisal. They also require compliance with all national environmental, social and health and safety requirements and in some cases refer to other international standards such as EU Directives or International Labour Organization (ILO) standards. Many national and international banks follow IFC procedures and requirements (Equator group banks).

The IFIs most relevant to the Benban Projects (as indicated in the TOR for this Strategic Environmental and Social Assessment) are the European Bank for Reconstruction and Development (EBRD) with its (2014) Environmental and Social Policy, the International Finance Corporation (IFC) with its (2012) Performance Standards, the European Investment Bank with its standards based on the European Principles for the Environment, together with the Overseas Private Investment Corporation, Proparco, FMO, the Commonwealth Development Corporation and the OPEC Fund for International Development, all of whom apply similar standards.

2.4.1 European Union (EU) Commission Directives which apply to EBRD and EIB projects

The EBRD is committed to the adoption of EU environmental principles, practices and substantive standards. The following list provides a brief description for the key pertinent **EU Directives**.

- **Directive 2001/42/EC** (SEA Directive) on the integration of environmental considerations into the preparation and adoption of plans and programmes with a view to promoting sustainable development.
- **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, and its amendment (**Directive 2014/52/EU)**.

The EBRD also explicitly requires compliance with the **ILO Core Labour Standards:**

- Freedom of association and the effective recognition of the right to collective bargaining;
- Elimination of all forms of forced or compulsory labor;
- Effective abolition of child labor;
- Elimination of discrimination in respect of employment and occupation.

and the **Aarhus Convention on Environmental Information** (Egypt did not sign this convention).

2.4.2 EBRD Performance Requirements and IFC Performance Standards

The EBRD Performance Requirements and IFC Performance Standards are broadly aligned in structure and content. These Performance Requirements / Standards are supported by sector and topic-specific guidelines of which a number of EBRD and IFC Guidelines are applicable to the Benban Projects. The Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice. Benban project developers seeking IFI finance will be required to meet the EBRD and IFC Performance Requirements / Standards throughout all phases of the project cycle, planning, construction, operation and decommissioning.

2.5 International Conventions and Agreements

Table 5: 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 (RAMSA)
	Convention Relative to the Preservation of Fauna and Flora in their Natural State

Environmental Category	Name of Multilateral Environmental Agreement
	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 the Conservation of Migratory Species of Wild Animals (Bonn)
	Convention on Biological Diversity (CBD)
	Convention Concerning the Protection of the World Cultural and Natural Heritage
	United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa
	Protocol Concerning Mediterranean Specially Protected Areas
	Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean
Hazardous Materials and Chemicals	Convention Concerning Prevention and Control of Occupational Hazards Caused by Carcinogenic Substances and Agents
	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal
	Amendment to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal
	Stockholm Convention on Persistent Organic Pollutants (POPs)
Atmosphere and Air Pollution	United Nations Framework Convention on Climate Change
	Kyoto Protocol
	Vienna Convention for the Protection of the Ozone Layer
	Montreal Protocol on Substances that Deplete the Ozone Layer
	(London) Amendment to Montreal Protocol on Substances that Deplete the Ozone Layer
	(Copenhagen) Amendment to the Montreal Protocol on Substances that Deplete Ozone Layer
Health and Worker Safety	Convention Concerning Protection of Workers Against Occupational Hazards in Working Environment due to Air Pollution, Noise and Vibration

3 PROJECT DESCRIPTION

This Chapter provides a description of the overall Benban project; its location and land requirements; the site layout; the technology to be used for electricity generation; associated projects necessary for its operation; details of sub-projects (the Benban Projects) as available. This chapter covers site construction as well as operations.

3.1 Overview of the Project

The project includes the construction and operation of 41 individual PV electricity generating facilities located on an area of approximately 37.2 square kilometres near the village of Benban in Aswan Governorate in Upper Egypt. The NREA, which owns the site, is making the 41 plots of between 0.3 and 1.0 km^2 available to developers who will construct individual solar PV electricity generating facilities.

NREA also provides limited basic infrastructure, in particular two access roads connecting the site to the nearby highway and a road network on the Benban PV site. It will also construct 4 electricity substations to which the individual plots are to be connected. These substations will then be connected to a 220 kV High Voltage Overhead Line near the site, at a distance of approximately 12 km, with a possible future connection to a 500 kV line nearby. The four substations and the connection to the grid are associated projects necessary for the operation of the Benban PV site. There is potentially a third associated project – a water supply pipeline from the River Nile. This is the most realistic option for a sustainable water supply. These associated projects are included in this SESA on the basis of the limited information available at this stage. These projects will be subject to separate environmental and social permitting in compliance with Egyptian legal requirements.

3.2 Project location

The Benban PV power plant site is located in the western desert, approximately 650 km south of Cairo and 40 km northwest of Aswan city. It is within Aswan Governorate. The area designated for the project is desert land owned by NREA. The following table shows the site coordinates and the following figures show the location of the site.

Table 6: Project coordinates

Point	Near	Longitude
1	24°27'21.5634"N	32°44'20.364"E
2	24°23'41.999"N	32°44'52.799"E
3	24°23'41.964"N	32°41'23.964"E
4	24°27'21.5634"N	32°41'23.964"E

Figure 2: Overall project location in Egypt. The air distance between Cairo and Benban is approximately 650 kms.

Figure 3: Project location in relation to Aswan and Luxor

The Benban PV site (see the placemark and red rectangle on Figure 3) is located approximately 15 kms west of the River Nile and approximately 1 km west of Aswan –

Luxor Highway (in yellow). The nearest cities are Aswan, with 1.35 million inhabitants (approximately 40 kms south to Benban) and Luxor with 490,000 inhabitants (approximately 140 kms north to Benban). The nearest villages are Benban village with 26,200 inhabitants (approximately 12 kms to the east of the project site) and Fares village with 11,000 inhabitants (approximately 25 kms to the north-east of the project site). This is a predominantly agricultural area.

Figure 4 shows the Benban site in relation to the Aswan—Luxor Highway and to Benban village. The entire area west of the River Nile is empty desert land. Figures below show the only buildings near the Benban PV site. These are an abandoned ambulance station and an unfinished and abandoned illegal building (the land is government owned) near Aswan – Luxor Highway, close to the Benban turnoff). The ambulance station was taken out of service because of the presence of two other stations on the highway; Benban village itself has its own ambulance station and also a medical centre. The abandoned buildings were constructed by illegal squatters; the site was cleared by the authorities.

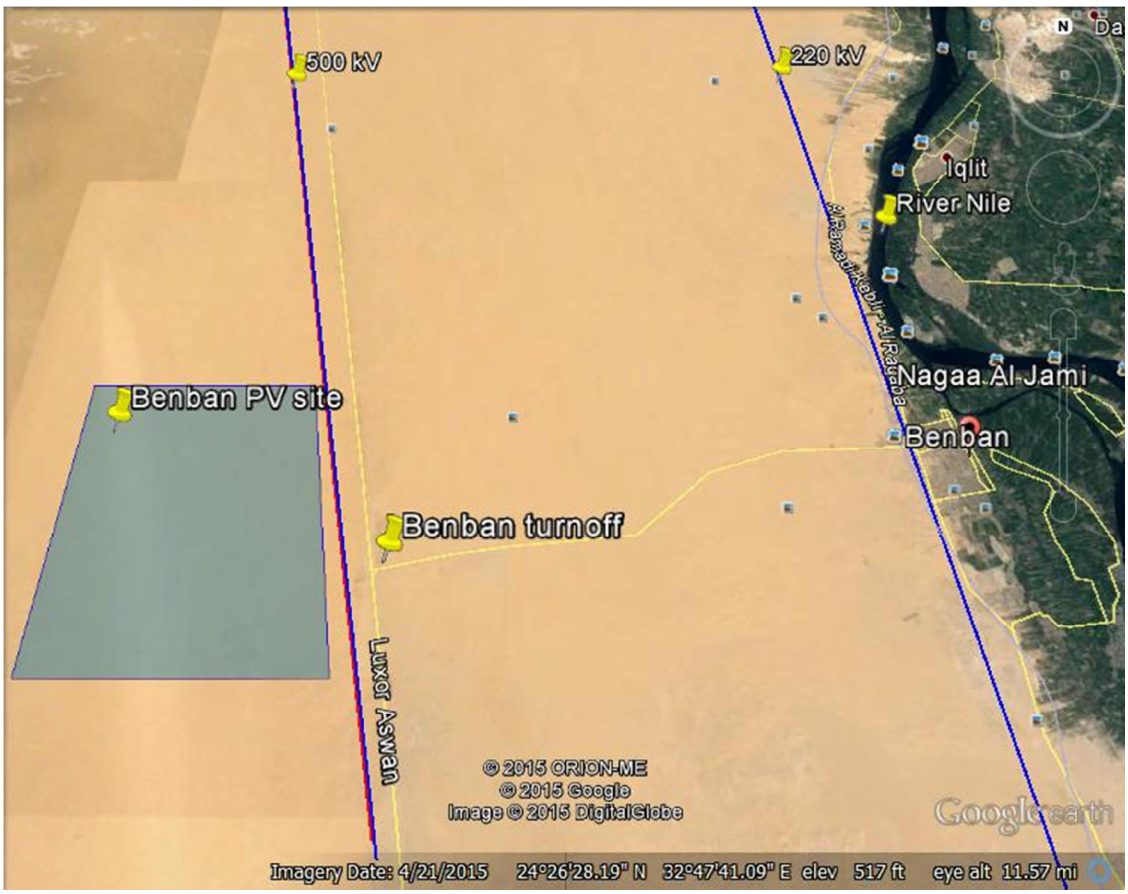


Figure 4: Project location near Benban village

Figure 5: Abandoned ambulance station near Aswan – Luxor Highway (close to the Benban village turnoff).

Figure 6: Illegal buildings near Aswan – Luxor Highway (close to the Benban village turnoff).

With the exception of the narrow and densely populated Nile Valley with its intensive agriculture, this is all desert land, largely unused and unpopulated. The following photos give an impression of the general appearance of the Benban PV site area and its surroundings.

Figure 7: Panoramic view north along Aswan - Luxor highway

Figure 8: Panoramic view from the site to the north and west, from the junction of site service roads

Figure 9: View to the west, along a site service road (under construction)

Figure 10: Gravel surface

Figure 11: View of the 500 kV transmission line; flat sand and gravel area

Benban itself is a compact village of 26,200 inhabitants. The economy is based on agriculture. The village has approximately 20 shops; a large and comparatively new school building at its southern outskirts; a medical station; and an ambulance station

(also at the southern outskirts). Figures below are representative of agricultural areas and Benban village.

Figure 12: Farmland near Benban

Figure 13: River Nile near Benban village

Figure 14: Supermarket and construction materials retailer

Figure 15: Means of transportation

3.3 Project Site

3.3.1 Benban PV Site Layout

The project site is subdivided into 41 plots. These are arranged in 4 rows. The plots range in size from 0.3 km^2 to 1.0 km^2. The site will have four substations, to be developed by NREA/EETC, at the perimeters to the east and south (SS1 to SS4 below).

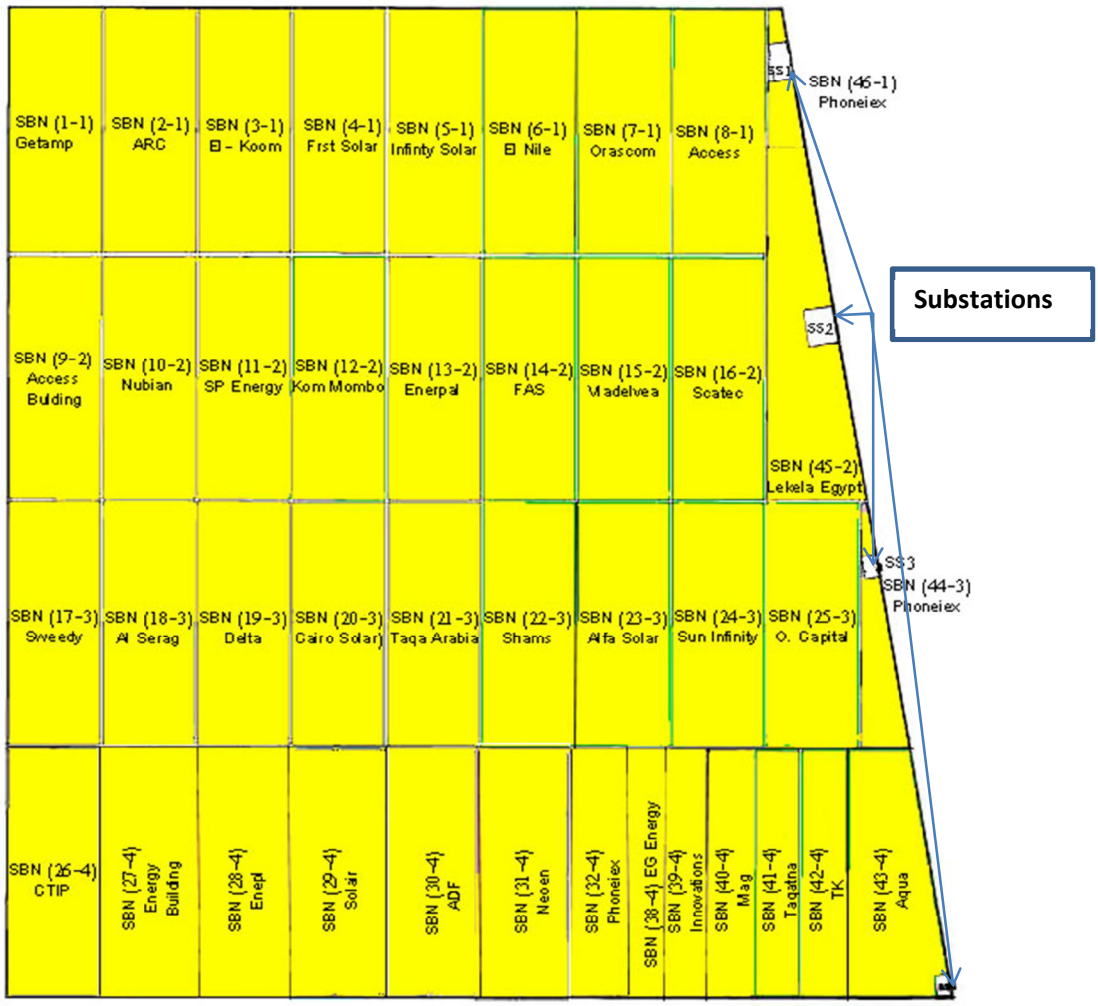


Figure 16: Site layout and plot distribution

3.3.2 Road Connection

The Benban PV site is located approximately 1 km west of Aswan – Luxor Highway. This is the major road connection along the River Nile. It is a modern, single carriageway with moderate traffic including a large proportion of heavy goods vehicles. Figure 17 shows the turnoff from the highway to Benban village.

Figure 17 Aswan - Luxor Highway at turn-off to Benban

3.3.3 Benban PV Site Road Network

The Benban PV site has its own road network to provide access to the individual plots and to connect to Aswan – Luxor Highway. There are two major site roads perpendicular to the highway (and connected in the middle of the site); these roads have a tarmac surface (Figure 17). The connection to the highway is via turnoffs. The tarmac roads on site will be 7 metres wide; a 7 metre strip of land on either side of these roads will be kept free to provide access to and storage for the plots. Any other roads connecting to the plots will consist of compacted sand and gravel. On-site road construction was ongoing at the time of the last site visits in September 2015 (Figure below). Almost all access roads have been levelled. Additionally, the two main entrances and the main roads were covered with Asphalt. The entrance for each plot has been paved but not yet covered with Asphalt layer.

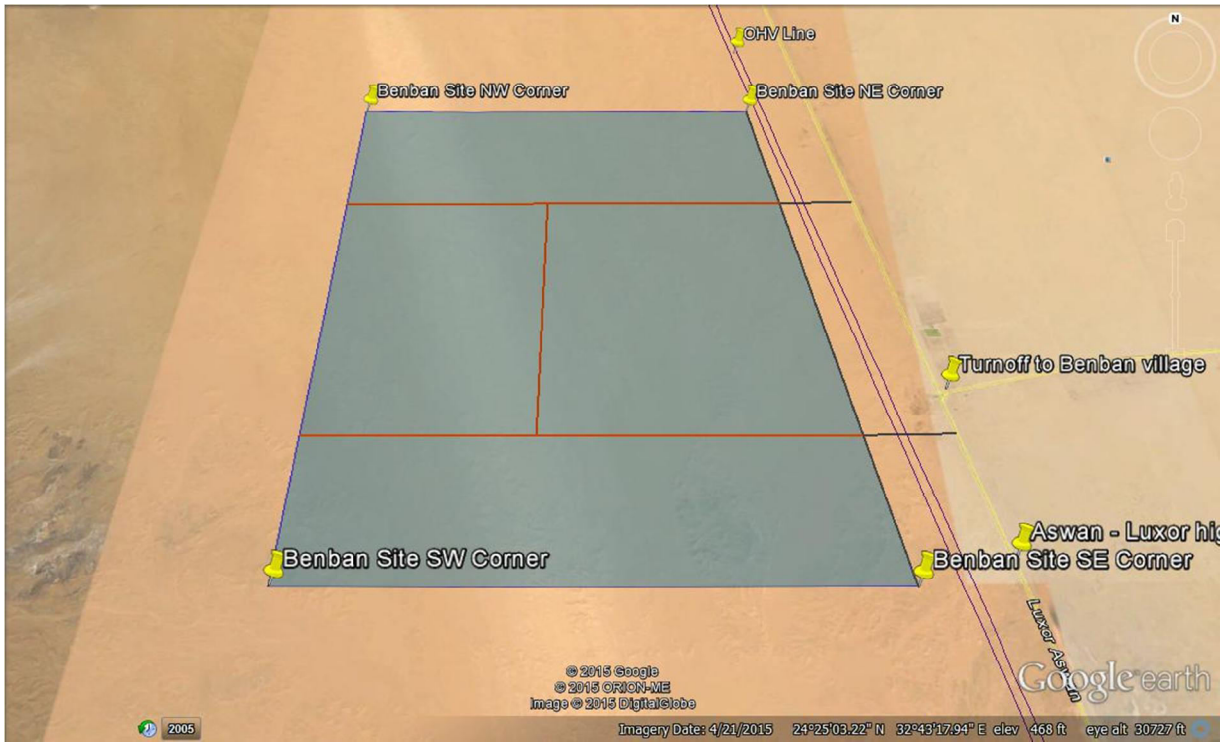


Figure 18: Benban PV site perimeter and site road network and connection to Aswan - Luxor Highway; double blue line shows the 500kV line corridor

Figure 19: Road construction on site (Fall 2015)

3.3.4 Site Security

Project stakeholders have mentioned that securing the site from intruders and theft is one of the main concerns for the Benban site development. At the time of this report, there was a basic security arrangement in place which is operated entirely by members of the Benban community, and commissioned by NREA. There is no site perimeter fence yet.

This arrangement was based on a meeting between the mayors of Benban Bahary, Qebly, Raqaba, and the head of Aswan security forces in 2013, in order to assign responsibility for securing the site. It was agreed that security guards should be from all tribes surrounding the site, and that the revenue from security activities will be equally distributed among the personnel. This representation arrangement was decided to limit any concerns pertaining to potential tribal tensions.

The security group includes 16 men working over two shifts. They are managed by one of the residents in cooperation with the police investigation officer in Daraw District. An agreement with the local police (who are trained and authorized to carry and use arms) is in place in order to provide support to the local security personnel who are yet to obtain official security permits.

The security personnel patrol the site using two vehicles (small truck and 4*4 vehicle), two tractors and one all-terrain-vehicle. Some are claimed to carry small arms. While the selected security personnel are trained on using guns, they do not use guns on site. They rely mainly on soft power; especially respect of their tribal affiliation.

This style of security arrangement is common in desert areas inhabited by Arab tribes.
Further training on security aspects and documentation of all activities is necessary. For the time being, private security companies' services are provided to some of the developers for securing their equipment on site.

The current security personnel have started to formalize their activities by establishing a security company and are currently in the process of preparing necessary permits and licenses.

There is a small hut on site allocated for this security staff. Some additional kiosks/light structures are being added in order to manage securing the 37 km^2.

Additionally, in the light of discussions which took place during the meeting conducted by the majority of developers (36 developers) on the 9 December 2015, investors have agreed to recruit a professional security firm which will be responsible for securing the site in the future. The security firm would be expected to collaborate with the national police force as well as the local security group. National police force will be responsible for protecting the site from criminals and encroachers.

The local security firm will be useful in terms of providing indirect job opportunities to members of the community as well as communicating with potential encroachments from other Arab tribes in the region.

3.3.5 Other Site Facilities and Services

Electricity: The site has currently no electricity supply. As electricity is required for construction and operation of the site and the individual Benban Projects a reliable electricity supply is required. The alternative option would be generators.
Water: There is also currently no water supply. A 16km water supply pipeline from the Nile River may be constructed.

3.3.6 Associated Projects

There are two associated projects which are required for the operations of the 41 Benban Projects. This is the construction of four electricity substations and a control centre on the site and a connection to the electricity grid. There is potentially a third associated project, water abstraction at the River Nile and a pipeline to the Benban PV site in addition to provision of other services.

On-Site Substations and Control Centre

The Benban PV site will have four substations at the eastern side towards Aswan – Luxor Highway as shown previously. The four substations are on the Benban PV site. Three (identical in layout) over 15,000 m^2 in area, with 175 MVA transformers and 22/220 kV switchgear. The fourth one covers 50,000 m^2, with 175 MVA 22/220 MVA transformers and 22/220/500 kV GIS switchgear. Figure below shows the layout of the smaller substations. Details of the technical specifications were not available to the Consultants. The substations will be subject to separate environmental permitting. In addition there will be a control centre containing monitoring and communications equipment for the four substations.

As all substations and the control centre are on the Benban site; there are no land ownership issues. The substations will be state-of-the-art design and construction, with good access to equipment and storage space and will be designed and operated in compliance with environmental regulations and good industry practice (e.g. oil spillage protection).

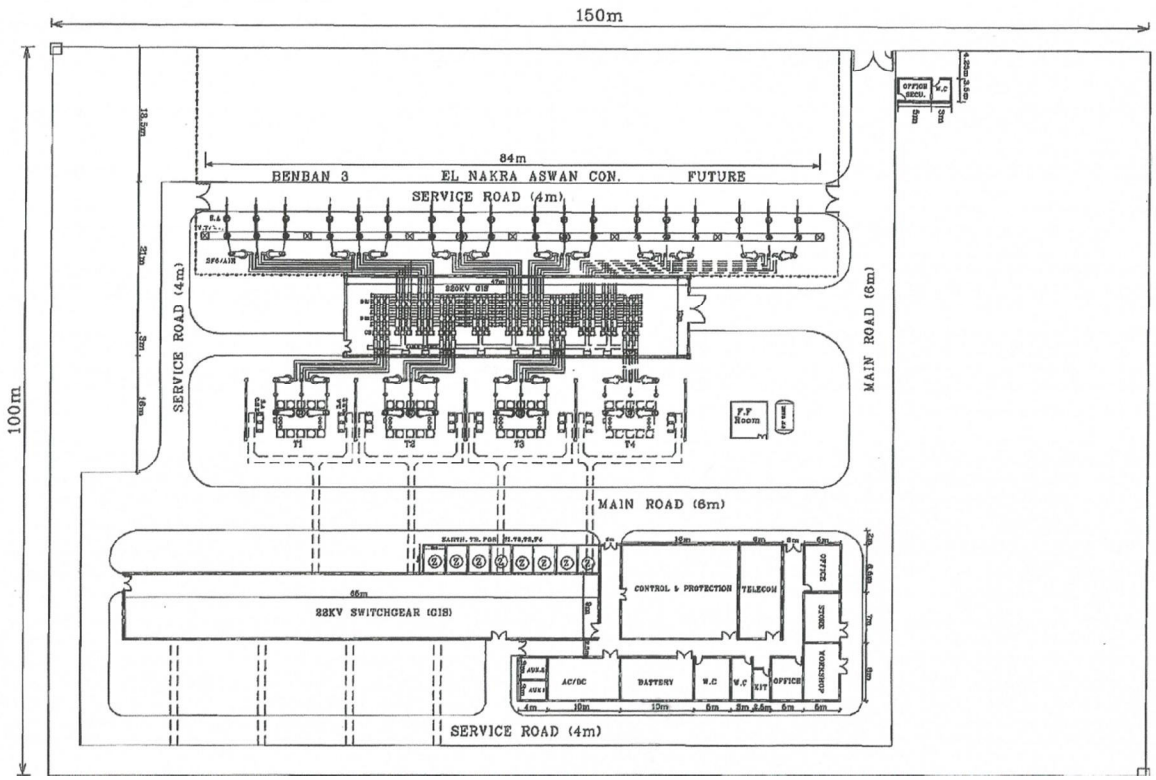


Figure 20: Layout of the three smaller substations

Grid Connections

Each Benban project will transmit its power from the site boundary to one of the four on-site substations using underground 220kV cabling. For the further evacuation of power from those substations the Benban site is close to two transmission corridors. There is a corridor with 2 x 500kV HVTL at a distance of approximately 0.5 km from the eastern site border, between the site and Aswan – Luxor Highway. A second corridor of high voltage lines, which includes 220 kV lines, is located at a distance of approximately 12 km. The location of both lines is shown previously; while Figures below are photos of the two high voltage lines. The four substations on site will initially be connected to the 220kV line through a new 220kV line, to be constructed by EETC across uninhabited and unused desert land. This grid connection is subject to a separate ESIA. At a later stage EETC may also construct an additional connection to the neighbouring 500 kV line.

Figure 21: 500 kV line

Figure 22: 220 kV line

River Nile Water Abstraction and Pipeline Connection

A reliable and sustainable water supply is required during construction (mainly water for sanitary purposes) and for the operations phase (mainly for panel cleaning to remove dust which reduces efficiency). The required water volumes are particularly high if many or all of the Benban Projects choose to use wet panel cleaning.

The most realistic water supply option is a pipeline to the Nile as it was envisaged for the Kom Ombo CSP. The figures below show the potential route of such a pipeline and the location of the water abstraction point at the Nile (Figures below). The sustainability and E&S impacts of a water connection along this route has previously been assessed as part of another project configuration which determined that this would be a feasible option and with the least E&S adverse impacts.

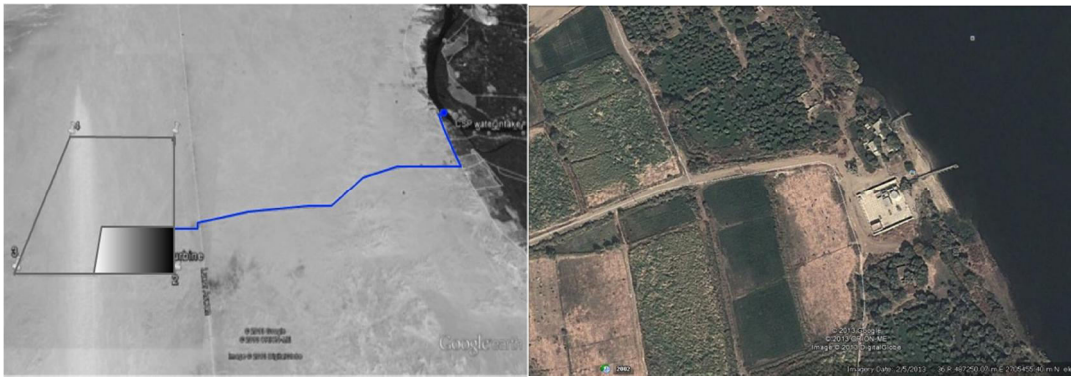


Figure 23: Water pipeline and abstraction point

Consultations between NREA, Ministry of Electricity, and the Ministry of Irrigation and Water Resources have concluded that river Nile abstraction is the most feasible option for water supply to the Benban Site, and the groundwater abstraction option has been refuted. Even at worst case scenarios of water consumption during operation (for panel cleaning), the volumes will be far less than the amounts previously approved for the CSP project in Kom Ombo. The worst case scenario for water requirements during operation is discussed in detail later in this SESA.

3.3.7 Current Site Activities

The only on-going activity on the Project site at the time of the last site visits in September 2015 was the construction of the site road network. There is not yet any other construction underway.

Developers have started to mark their plots (Figure below) and some operate meteorological stations to measure radiation; wind direction and speed; temperature; humidity (Figure 25). This is done individually; there are no coordinated joint measurements of the entire group of developers.

There are also some geotechnical investigations to establish the need for anchoring panel frames in concrete foundations (Figure 26).

Figure 24: Plot marking

Figure 25: Meteorological station

Figure 26: Geotechnical investigations

3.4 Benban Projects

Each of the 41 plots is allocated to a separate project company, although one company may have ownership stakes in more than one project so that some projects may be developed jointly. Each plot is a separate project, requiring separate permits. Plot layout and technical specifications as well as any construction work are at the discretion of the developer and thus differ from plot to plot. The following sections present generic information on the technology used and on the likely appearance of the site once construction is completed.

Impacts and resource requirements for the construction of the Benban Projects and the subsequent operations phase are presented in the Environmental and Social Impacts Chapter.

3.4.1 PV Technology

Renewable energies avoid the pollutant emissions that are the result of conventional thermal power generating stations which may release large volumes of sulphur dioxide, oxides of nitrogen and carbon dioxide (CO_2). A key argument for wind power and solar power is the avoidance of CO_2, the most common greenhouse gas. The volume of CO_2 emissions avoided by all Benban Projects together is estimated to be around 2 million tons of CO_2 per year.

PV technology consists of the following components:

- **PV cell**: a basic photovoltaic device, which generates electricity when exposed to solar radiation due to the photoelectric effect. The absorbed solar energy excites electrons inside the cells into a higher state of energy, producing electrical energy. PV cells are commonly constructed from mono or polycrystalline silicon or thin film technology. All photovoltaic cells produce direct current (DC).
- **PV module or panel**: is the smallest common assembly of interconnected PV cells sold commercially. In the case of crystalline silicon cells, following testing and sorting to match the current and voltage, the cells are interconnected in series and encapsulated between a transparent, anti-reflective front, and a backing material to provide environmental protection to the cells. Panel sizes vary; common sizes are 2,000x1.000 mm and 1.200x600 mm. The module is then typically mounted in an aluminium frame to provide mechanical strength to the assembly.

The solar cells utilize a variety of photovoltaic materials including mono-crystalline silicon, polycrystalline silicon, amorphous silicon, cadmium telluride (CdTe), and copper indium gallium selenide/sulfide (CIGS). The first generation solar cells are wafer-based cells of crystalline silicon, the commercially predominant PV technology. Second generation thin film solar cells use materials such as amorphous silicon, CdTe and CIGS cells and are commercially used in utility-scale photovoltaic power stations. Standard silicon solar cells have an efficiency of 15 – 20 %.

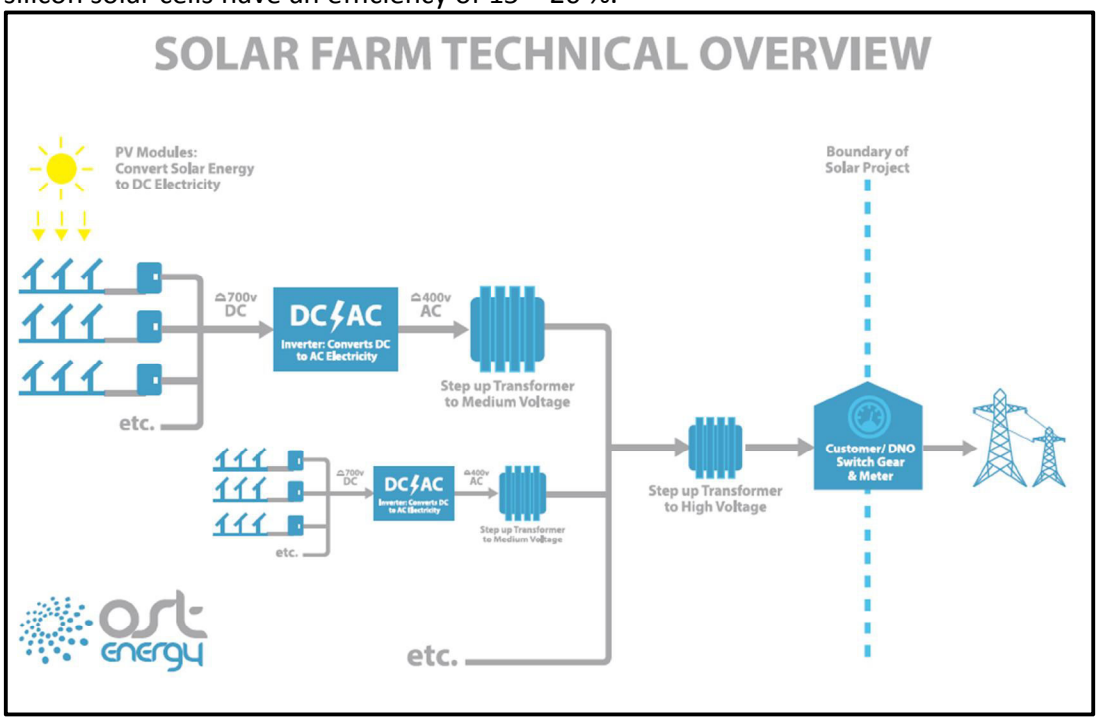


Figure 27: Schematic of the components of a solar PV system (source: OST Energy)

The PV panels are mounted on frames and set out in arrays. Panel sizes vary; common sizes are 2,000x1,000 mm and 1,200x600 mm. Panels can be mounted on fixed, immovable frames or on frames which track the sun and provide best exposure of the panels; Figure below shows panels on a single axis tracker system. Panels are connected together to form arrays, which in turn are connected to inverters to convert the DC power to alternating current (AC) power. The voltage of the power is stepped up by a transformer to the required voltage of the nearby electricity grid. The electricity is then fed from the site to the closest grid substation for distribution into the wider electricity grid. The tables supporting structures will be piled to a typical depth of around 1.5 – 2 m into the ground. The panels will be arranged in rows extending across the site facing due south.

The key components associated with a PV power plant, as shown above, include:

- PV modules
- Mounting structures and tracking systems/motors
- Cabling
- DC-AC current inverters
- Transformers
- Medium Voltage (MV) & High Voltage (HV) Switchgear
- Electrical connection cabin
- Supervisory Control And Data Acquisition (SCADA) System
- Transmission to grid.
- Associated infrastructure and utilities, including:
  - Site security, including fencing and CCTV
  - Buildings, including onsite substation, connection building, control building, guard cabin, and spare parts storage.
  - Access road and internal road network
  - Water supply infrastructure (for panel cleaning).

The technical design and layout of each project will be developed by each developer. The components listed above are typical for such projects but there may be deviation in the design due to technology selection and engineering requirements.

Figure 28: Tilted mounting of panels on fixed frames (Sonnedix Atacama)

Figure 29: Single axis tracker system

3.5 Overview of Project Phases and Activities

The general development phases for such a large scale solar PV projects are as follows:

- Pre-construction: such as site preparation, mobilisation of equipment and materials to site.
- Construction and Installation: including civil works, electrical works, and equipment installation.
- Operation: Plant operation and routine maintenance.
- Decommissioning: Dismantling of equipment and associated facilities and site restoration.

3.5.1 Mobilisation Phase

The mobilisation phase takes place before installation work can begin at the project site and it includes the ordering of materials and equipment, signing contracts with subcontractors and hiring of staff.

This phase involves the mobilization of workers, materials and equipment to site, as well as site preparation which involves clearing and levelling of the site and establishment of on-site facilities, including potentially worker accommodation.

Heavy-duty and other pieces of equipment will be moved to the project site at the beginning of construction activities for civil work activities and equipment installation. All PV, electrical and structural equipment is planned to be shipped and then trucked to site via road in "containers". Material and equipment will be transported in standard 40ft containers and it is estimated that each development would require around 600 such containers. Each project would also require large construction vehicles and equipment, such as bulldozers, excavators, cranes etc. to assemble the facility; around 30 such vehicles may be required per project.

During the site preparation period, the workforce required for site security, manual labour, civil works, transportation of goods and other similar services will most likely be drawn from the local labour pool. During this period each developer will establish a team of workers specific to the tasks required. It is anticipated that this phase will take around 2 months.

3.5.2 Construction Phase

The construction phase of the each project will include activities such as:

- Construction/improvement of internal access roads
- Levelling of the ground
- Fencing around the site
- Construction of a water connection pipeline from the river Nile.
- Installation of inverters/transformers
- Driven piles for mounting structure
- Construction of electrical substation and foundations
- Excavation, trenching and cable laying
- Fixing and wiring of the panels
- Installing CCTV around the fence line and access points
- Installing water tank for staff and O&M activities
- Installation of septic tank
- Construction of buildings

- testing and commissioning of equipment and the project as a whole
- Site clean-up.

During the construction phase the piles need to be driven into the ground to form the structural base of the PV arrays. Once the PV components have arrived on site, technicians will supervise the assembly of the panels and test the facility. The PV panels will be installed on the galvanized steel structures. There will be a basic dirt road layout for the construction activities. A phased approach is recommended during construction to minimise the consequent adverse impacts, especially in terms of traffic management.

Although it will vary by developer, an estimated 250-300 workers (peaking to around 500-600) will be needed during the construction period. A section of the site may be used as a laydown area where shelters, equipment, washing and toilet facilities (portable) and containers will be located. Workers accommodation may need to be provided through temporary construction camps onsite for non-locals/influx workers. The employment and labour arrangements for each developer should be a part of their project specific plans and should also be integrated with relevant collective plans to be coordinated by the developers association.

The need for cut and fill areas and/or borrow pits at each project site, along roads and at substation/ transformer sites, will be established during each project design phase.
It is anticipated that the construction activities phase will take around 8 months for each project.

3.5.3 Operation Phase

Once the facility is complete and operational, it is expected that it will have a lifespan of approximately 25 years.

Day to day facility operations will involve both regular on site preventive and corrective maintenance tasks in order to keep the PV power plant in optimal working order throughout the operational period. The preventive maintenance follows a routine service schedule aimed at preventing faults from occurring and keeping the plant operating at its optimum level. The frequency of the preventive maintenance depends on a number of factors such as the technology selected, environmental conditions of the site, warranty terms and seasonal variances. It contains for example activities like PV module cleaning, inverter servicing and checks on structural integrity of the mounting structure. Corrective maintenance is carried out in response to failures, for example the repair/exchange of damaged or faulty equipment.

Job opportunities will arise during the operation phase, including skilled and semi-skilled labour (such as electrical and mechanical technicians) and unskilled labour (such as module cleaners and security personnel) for the duration of the PV power plant lifespan.

3.5.4 Decommissioning Phase

Typically the following steps would be followed during plant decommissioning:

- PV panels will be removed from the fixed aluminium frames and tracker systems.
- Fixed aluminium frame and tracker system structures will be removed.
- PV panels will be transported to recycling facilities.
- Electrical equipment (transformers) will either be re-used on other developments/projects or recycled.
- Underground cable runs (where applicable) will be removed and recycled.
- Gravel/chipstone on the access roads, onsite service roads, guardhouse foundations will be removed and reused.
- For buildings, all the reusable material will be removed, the structures demolished and the rubble transported to a municipal waste site.
- Disturbed land areas will be rehabilitated.

The PV power facility will be decommissioned at the end of its projected 25 year operational life time. The decommissioning phase is expected to take around 6 months.
It is recommended that a comprehensive decommissioning plan be developed discussed with relevant stakeholders, at least one year prior to scheduled decommissioning.

4 PROJECT ALTERNATIVES

4.1 Introduction

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 kilometres. 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[1]:

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

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

Table 7: Total electricity generation and share of technologies (Source: Egyptian Electricity Holding Company, Annual Report 2013/14)

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

[1] Source: Egyptian Electricity Holding Company, Annual Report 2013/14

Main energy users were residential customers and industry and commerce. The Figure below 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 8: Development of electricity usage by customer sector (Source: Egyptian Electricity Holding Company, Annual Report 2013/14)

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.

4.2 '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 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 considered a valid option.

4.3 Technology Alternatives

Egypt uses a mix of generating technologies as shown before. This is currently dominated by thermal generation. Dependence on fuel oil and natural gas 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 and other emissions).

The second most important current energy source for electricity generation is hydropower generation. This is limited to the River Nile, and the potential is largely exploited. The five dams (High Dam; Aswan 1; Aswan2; Esna; Naga Hammady) 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. 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 (first phase) 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 50 MW. There is considerable interest 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 all the 41 Benban plots are committed to project developers.

4.3.1 Wind Energy

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

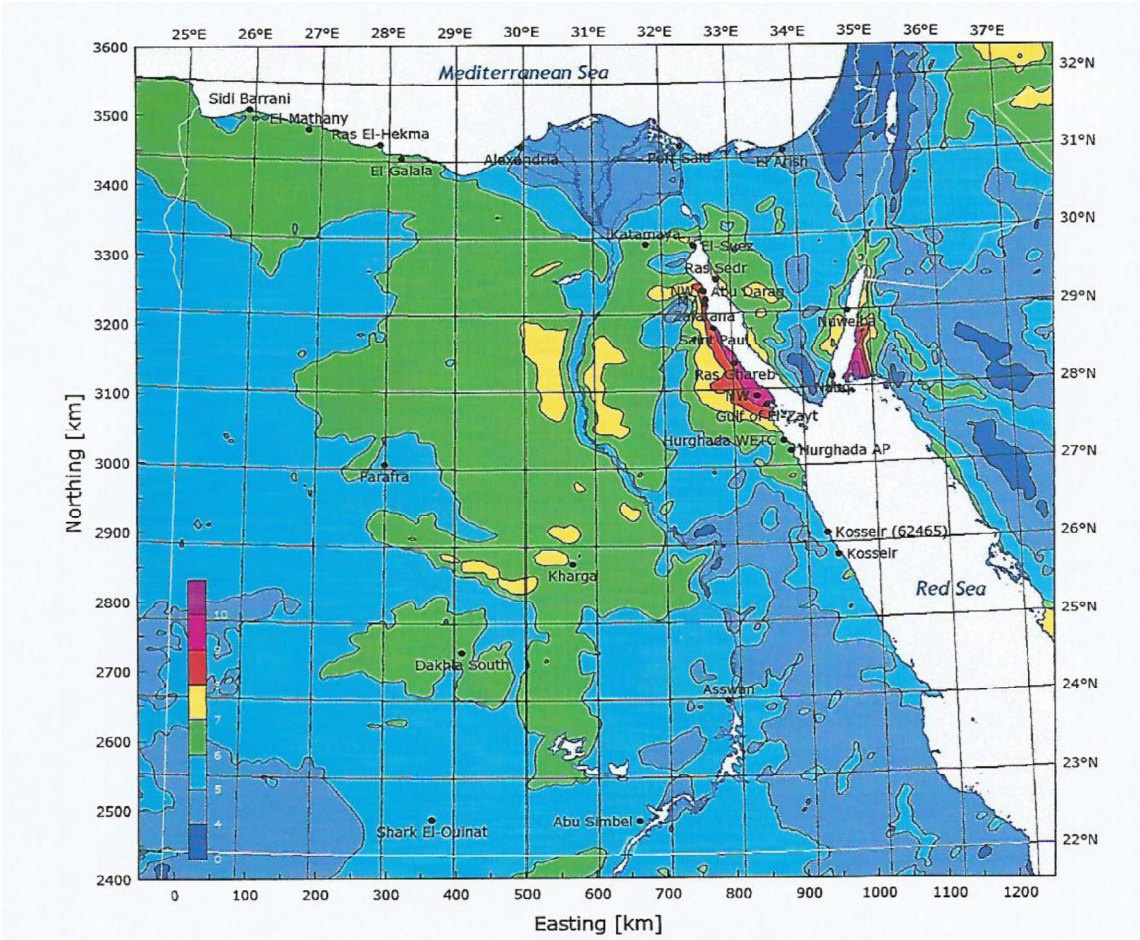


Figure 30: Wind power potential in Egypt

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.

4.3.2 Solar Power

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 (inclusive of an ESIA) for a Concentrated Solar Power plant (CSP) Project at Kom Ombo), but this project is not currently progressing. The 5.6 km^2 Kom Ombo site is a rectangular plot within the 37.2 km^2 Benban PV site, located in its south eastern corner.

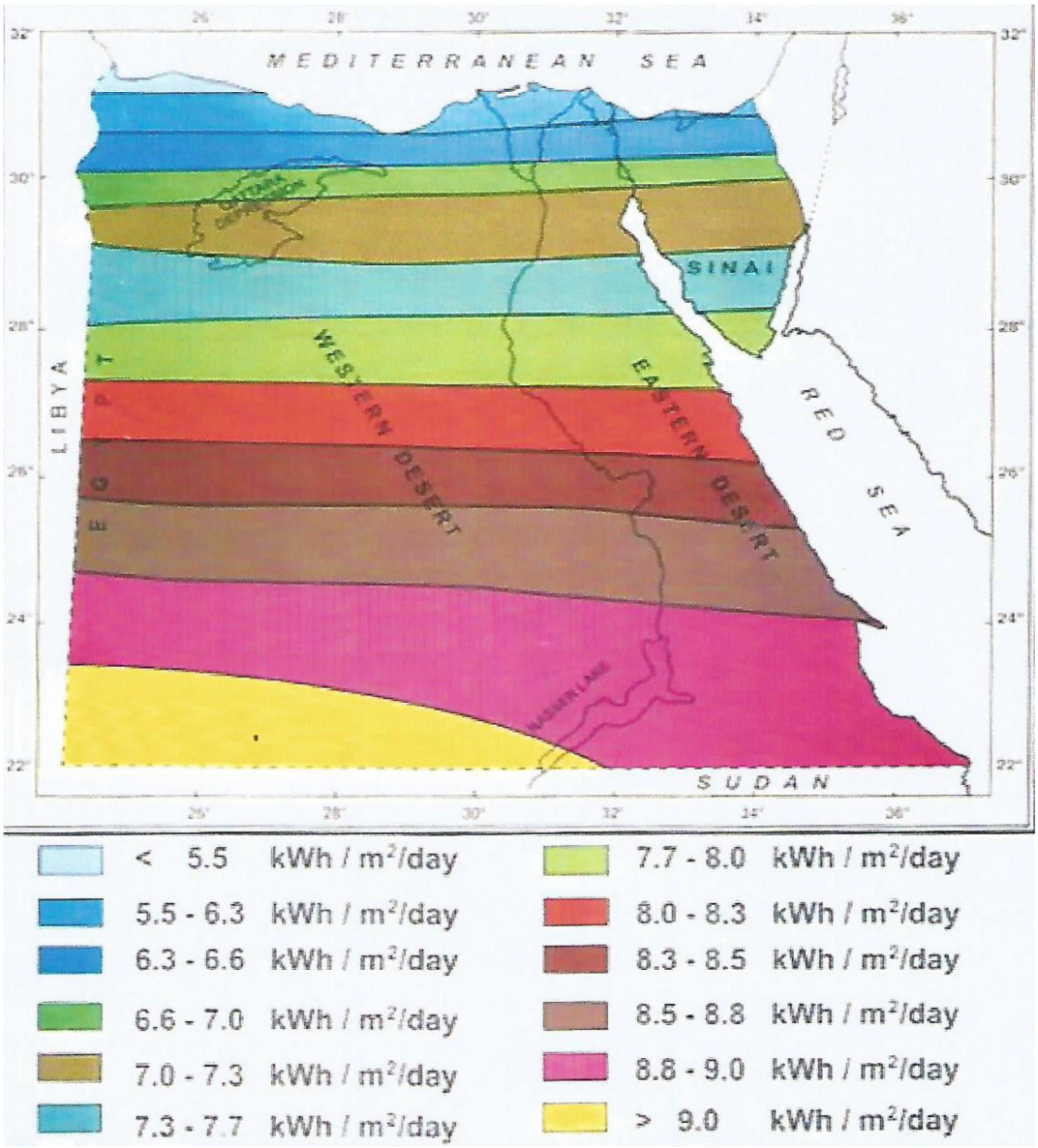


Figure 31: solar radiation potential in Egypt

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 shows the increase in global installed PV capacity. Predictions of annual new installations vary greatly and range from 38 and 86 GW, with total installations predicted to reach 403 and 696 GW respectively by 2020 (Wikipedia); the fastest growth for PV installations is predicted for China, South-East Asia, Latin America, the Middle-East, North Africa, and India.

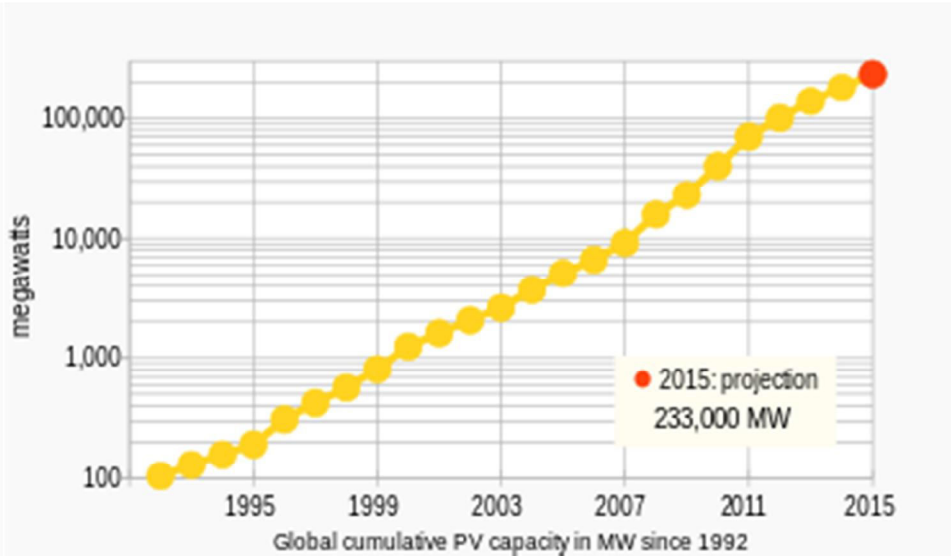


Figure 32: Global cumulative growth of photovoltaics (log scale)

The proposed development at Benban with 41 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. It is a technology which will help the Government of Egypt to reduce the country's Carbon Dioxide emissions from electricity generation. The precise amount of CO_2 emissions avoided by the Benban PV projects (compared to thermal power stations) cannot be calculated at this stage; this would require more detailed information on the precise capacity and technology to be installed at Benban and on the expected total annual electricity expected to be fed into the electricity grid from all Benban Projects. However, it can be estimated that the average CO_2 emissions avoided are approx. 2 million CO_2.

4.4 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.

4.5 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; displacement of CO_2 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.

5 Baseline Conditions

5.1 INTRODUCTION

This chapter includes the environmental and social baseline conditions at the project's area of influence. As mentioned previously, the Consultant has reviewed available literature and public sources and visited the site and its surrounding area. This chapter makes direct use of information on the physical environment; biological environment; and heritage as presented in the Kom Ombo CSP ESIA. Many of the data collected for this study are still valid and cover the same area (the 5.6 km^2 Kom Ombo site is part of the 37.2 km^2 Benban site). All information used from the Kom Ombo ESIA was checked and was confirmed during site visits in August, September, and throughout autumn 2015. Secondary socioeconomic data as used for the Kom Ombo study was checked for validity and updated/extended.

5.2 PHYSICAL ENVIRONMENT

5.2.1 Meteorological Conditions

5.2.1.1 Temperature

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 predominantly from NW to SE. Solar radiation levels are high throughout the year.

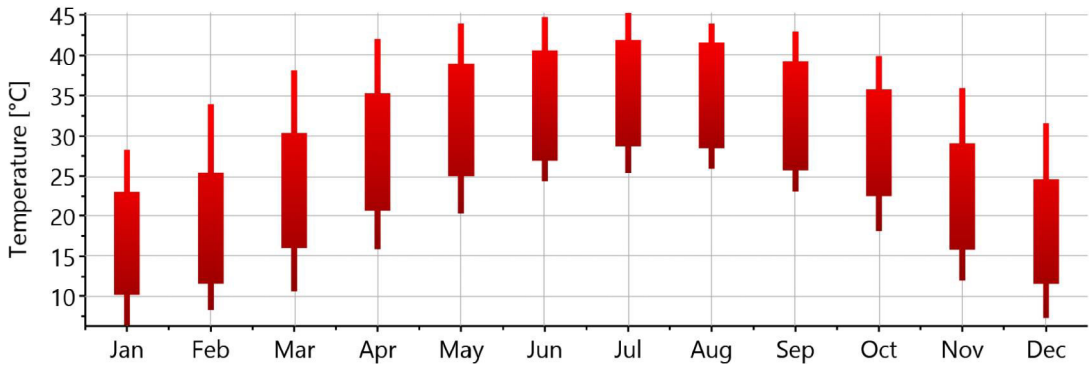


Figure 33: Monthly temperature variation at Benban (Source: meteonorm)

5.2.1.2 Precipitation

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 maximum relative humidity is 51 % in winter and 27% in summer.

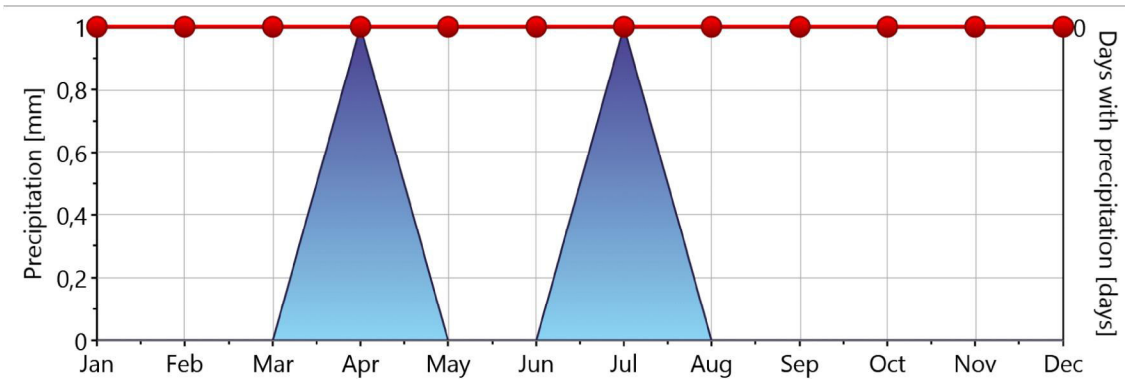


Figure 34: Periods with precipitation (Source: meteonorm)

5.2.1.3 Radiation

Sunshine duration and radiation levels are high and very suitable for a PV installation.

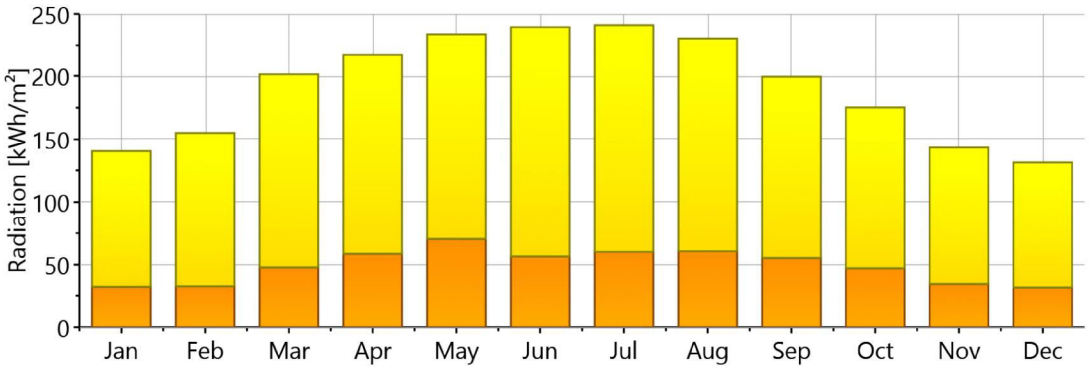


Figure 35: Monthly radiation; orange is diffuse radiation, yellow global radiation (Source: meteonorm)

5.2.1.4 Wind

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). Sandstorms are rare.

5.2.2 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 Aswan Dam at the beginning of 20th century inundated part of the

agricultural land along this stretch and 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 area, 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:

5.2.2.1 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.

5.2.2.2 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.

5.2.3 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.

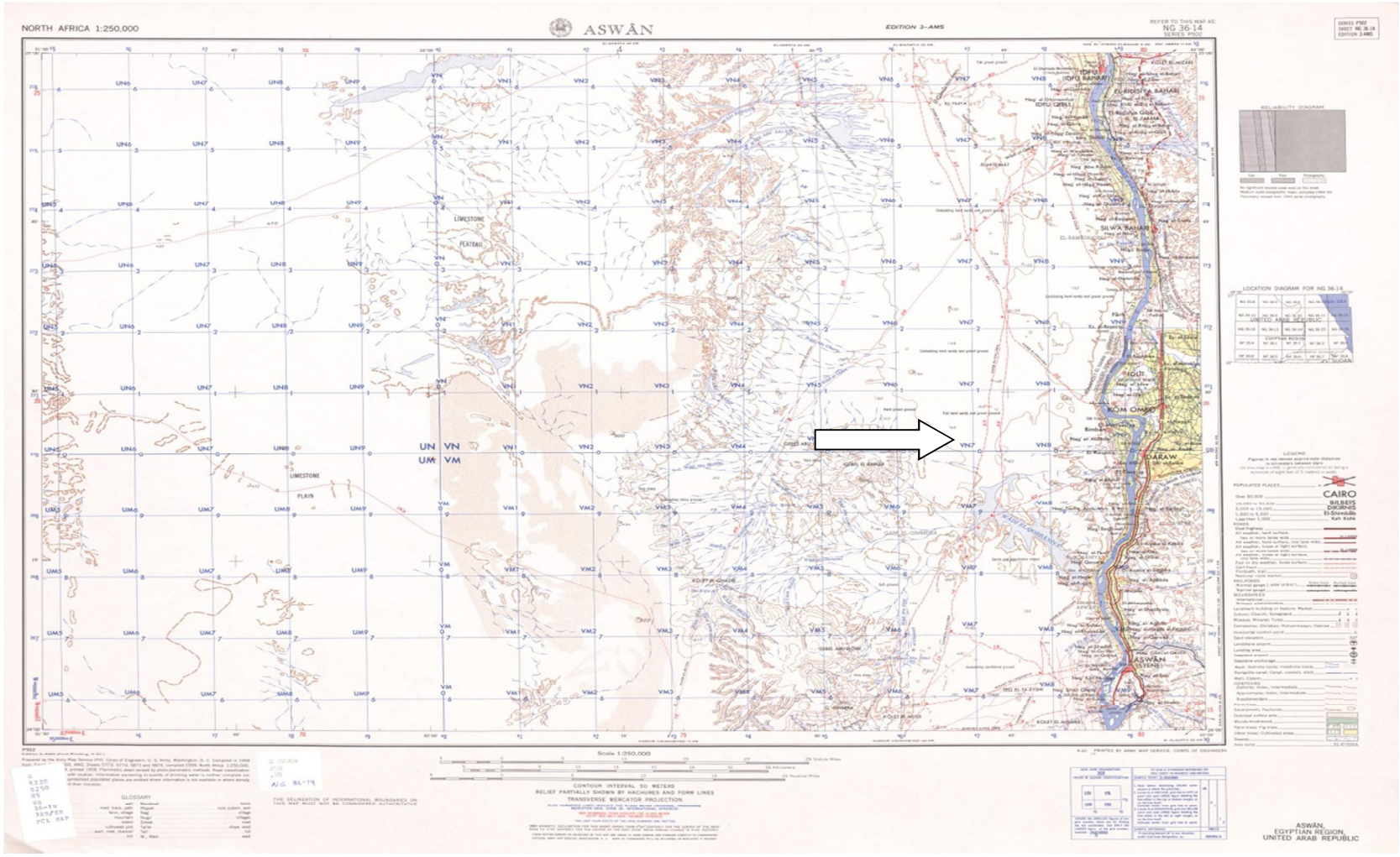


Figure 36: Topographic Map of Aswan area (Scale 1:1.250.000). The Nile is at the right hand side, with the Kom Ombo area clearly visible at the right border of the map. The arrow points to the location of the Benban site.

5.2.4 Geology of the Region

In Aswan region, the sedimentary succession can be differentiated into the lithostratigraphic units described below (from the younger (top) to the older unit):
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.

5.2.5 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 in windy periods be blown over the PV panels and may decrease their efficiency.

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. Some developers are already carrying out such studies.

Figure 37: Sand and gravel sheets

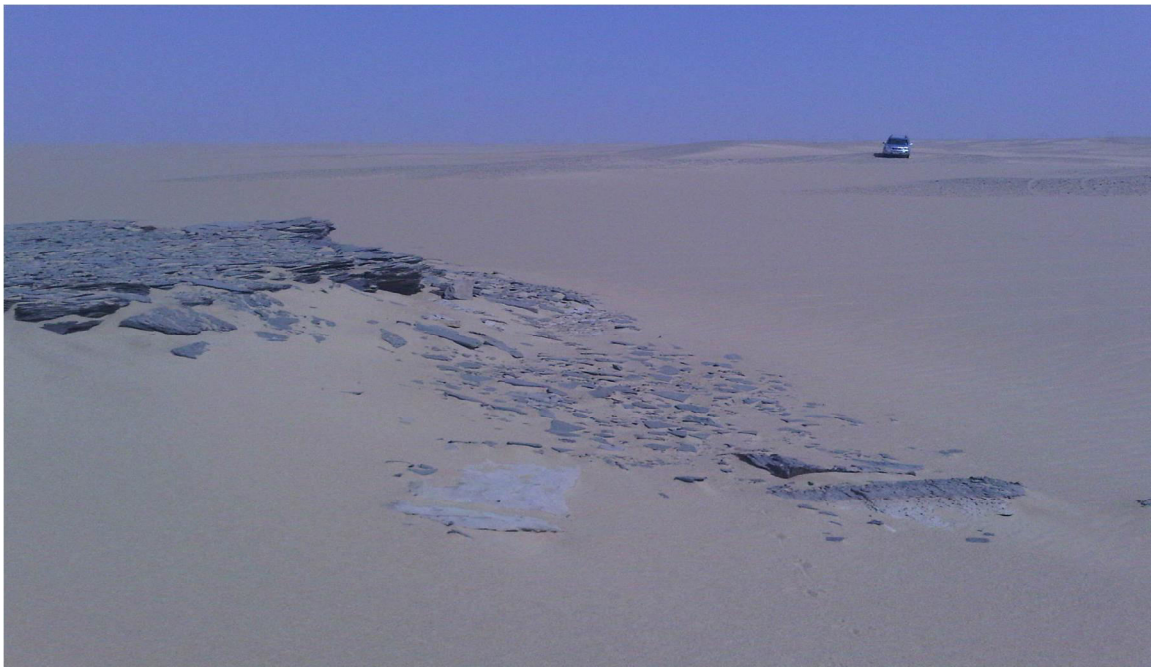


Figure 38: Sandstone bed

5.2.6 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, Toppozada et al. 1984).

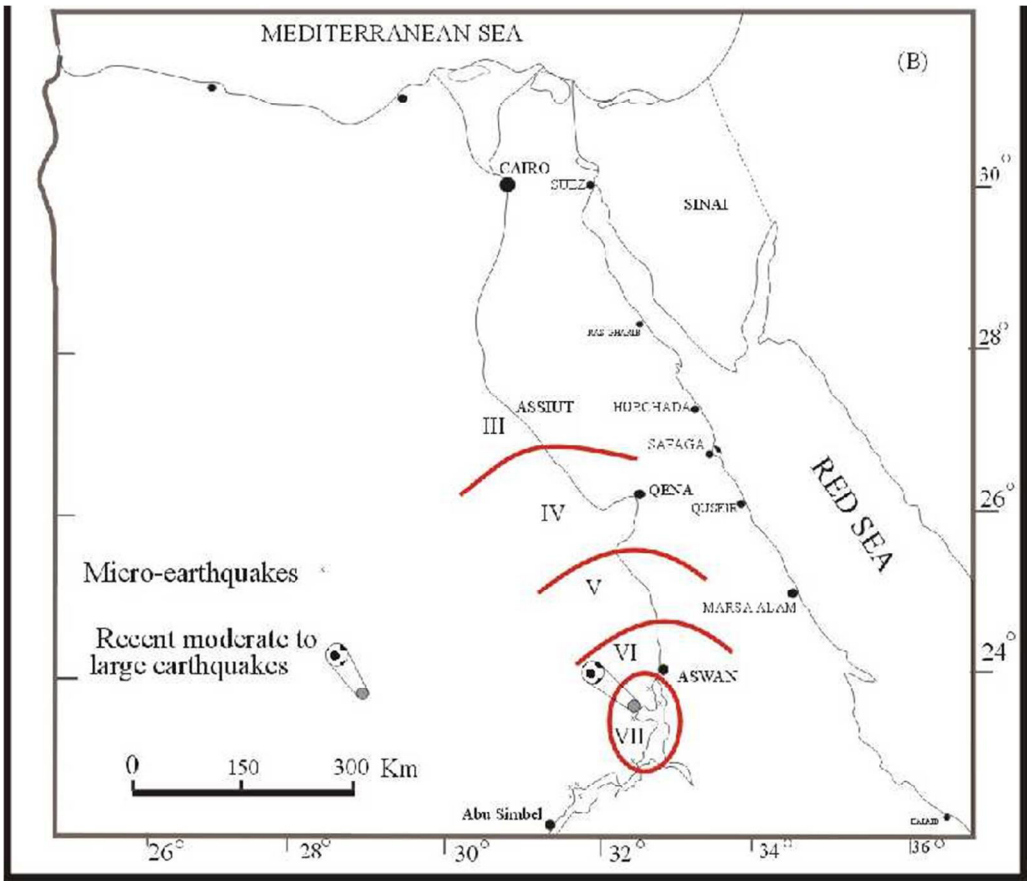


Figure 39: Epicentral distribution of earthquakes in the Lake Nasser are (III-VII on the Mercalli earthquake intensity scale)

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.

5.2.7 Hydrogeology

Data about the hydrogeology of Aswan area are available from observation wells drilled by RIGW (Research Institute for Groundwater) 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 wider 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 south-eastern corner of the Benban site showed that the groundwater level might be at 245m below surface, producing slightly brackish water.

5.2.7.1 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 phereatic 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 phereatic 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 southeastern 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).

5.2.7.2 Aquifer Systems

There are two main aquifer systems in 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. This system is mainly recharged by infiltration of excess irrigation water, and since the source of this irrigation water is the Nile water, this groundwater system is not a separate resource.

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 areas just east of the project site depend on this aquifer.

5.2.7.3 Groundwater Flow

The regional flow pattern in the Quaternary Fluviatile 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.

5.2.7.4 Recharge and Discharge of Groundwater

For the Quaternary Fluviatile 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 because of 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 highlands 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.

5.2.7.5 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 a TDS (total dissolved solids) value of less than 1000 ppm. This water becomes brackish in the shallow and outer parts of the valley, with TDS values greater than 1000 ppm. The water pollution is mainly due to naturalite halite and gypsum dissolution in the soil and nitrate leaching from fertilizers. Similar water qualities are recorded in the downstream portion of Wadi Qena.

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

5.2.8 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 and no irrigation or other man-made channels.

5.2.9 Ambient Noise and Air Quality

5.2.9.1 Noise

The main sources of noise in the project vicinity are:

- Traffic on the Aswan - Luxor Highway
- Prevailing wind

For the Kom Ombo CSP 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 and Figure below; i.e. the Kom Ombo CSP location (SE corner of the Benban site); Benban village; and the water intake structure on the Nile. The intensity of noise at all three locations was within the legally permitted limits.

A similar measurement campaign was carried out in 2015 and findings of the 2013 measurements were confirmed.

Table 9: Noise monitoring locations

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

Figure 40: Location of noise and ambient air quality monitoring sites

5.2.9.2 Ambient Air Quality

Air quality was measured on 12th June 2013 by a certified laboratory at the same three locations as the noise measurements. The measured parameters included CO, NO_x, SO_2, PM_{10}, $PM_{2.5}$, and TSP. All parameters were below the normal detection limits of the used equipment, and were thus fully in compliance with the ambient air quality regulations.
A similar measurement campaign was carried out in 2015 and findings of the 2013 measurements were confirmed.

5.3 BIOLOGICAL ENVIRONMENT

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

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

5.3.1 Natural Habitats

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

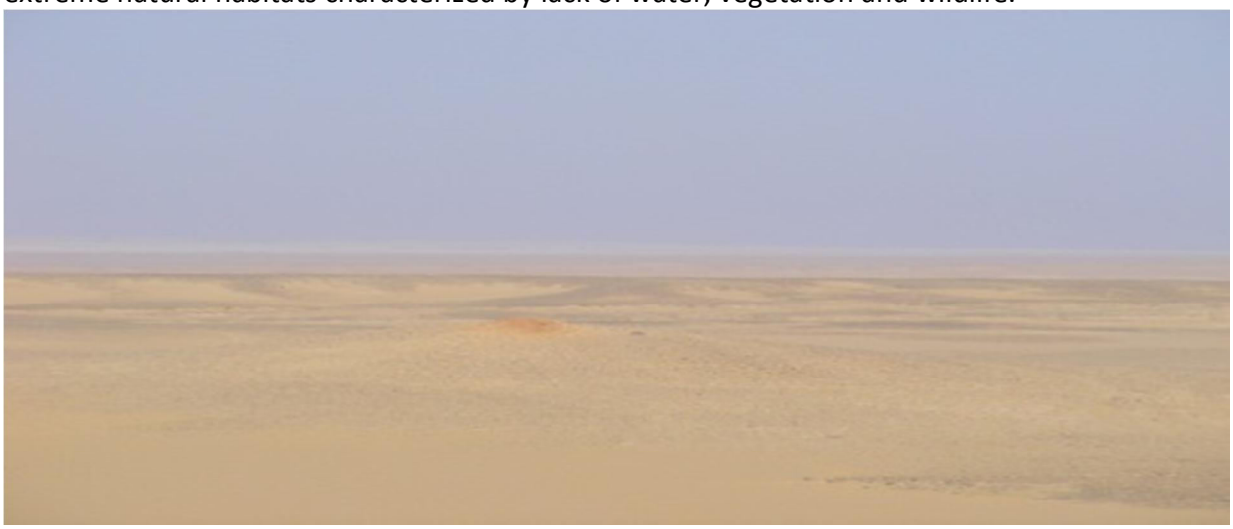


Figure 41: View of the wider Benban area

5.3.2 Flora

The project site is located in an arid/extremely arid area without vegetation or natural habitats. The nearest vegetation 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 (Figures below).

Figure 42: Agricultural land near Benban

Figure 43: River Nile

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

Table 10: Crops grown in the Benban area

Latin name	Family
Triticum pyramidale	Gramineae
Saccharum offiicinarum	
Medicago staiva	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, Tamatix passeroides, Tamarix nilocita, Cynodon dactylon and Polypogon monspeliensis also exist near farmlands, sides of village roads, canal banks, pasture areas, and the settlements themselves (but were not found on the Benban site). Figures below show some of these common plants.

Figure 44: Tamarix passeroides

Figure 45: Tamarix amplexicaulis

Figure 46: Hyphaene thebaica

Figure 47: Calotropis procera

Figure 48: Alhagi graecorum

5.3.3 Fauna

No terrestrial animals or birds were observed during the site visits in 2015, but there are records of a limited number of species observed on the same site during the Kom Ombo CSP study on the same site. There were no fauna databases available.

For the CSP study in 2013, the Consultant had conducted baseline surveys in order to assess the presence and distribution of ecologically sensitive species and habitats. Consequently, it was concluded that no endangered faunal or floral species according to IUCN Red List of threatened species have been recorded at the project's areas. All recorded species are under the "Least Concern" category.

5.3.3.1 Mammals

Mammalian species which represent these habitats are *Dorcas Gazelle, Gazella dorcas*, Red fox, *Vulpes vulpes* and *Ruepple Fox Vulpes rueppleii* and other small mammals which were recorded before in such western desert habitats. All are common, none is rare or endangered.

Tracks found during the Kom Ombo CSP study in 2013 suggest the presence of one or more fox species likely to live in similar habitats, e.g. Vulpes vulpes and Vulpes rueppleii.

5.3.3.2 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 (16km to the east).
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 CSP study are listed in Table below. Migratory birds regularly pass the area. This includes the white stork whose main north-south migration route along the Nile valley.

Table 11: Bird species recorded during the Kom Ombo ESIA (all are common, none is rare or endangered)

No.	Scientific name	English name	Number
1	Corvus ruficollis	Brown necked raven	4
2	Oenanthe isabellina	Isabelline wheatear	2
3	Milvus migrants	Black Kite	2
4	Otus scops	Eurasian Scops Owl	3

5.3.3.3 Herpetofauna

Potential species: These include Acanthodactyllus spp. and Mesalina spp.
No reptilian species were found during the Kom Ombo study or later site visits in 2015.

5.3.3.4 Insects

The Benban project area generally lacks the vegetation cover required by most species, as well as food. The following species were seen during the Kom Ombo CSP ESIA (Table/Figures below).

Table 12: Insect species found during the Kom Ombo ESIA

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

Figure 49: Desert locust

Figure 50: Desert pebble mantis

5.4 ARCHAELOGY AND CULTURAL HERITAGE

The Benban site as such has no man-made structures. However, an important temple exists in the wider area, at Kom Ombo, on the River Nile. The temple is 19 kms distant (air distance) from the eastern border of the Benban PV site (see Figure below).

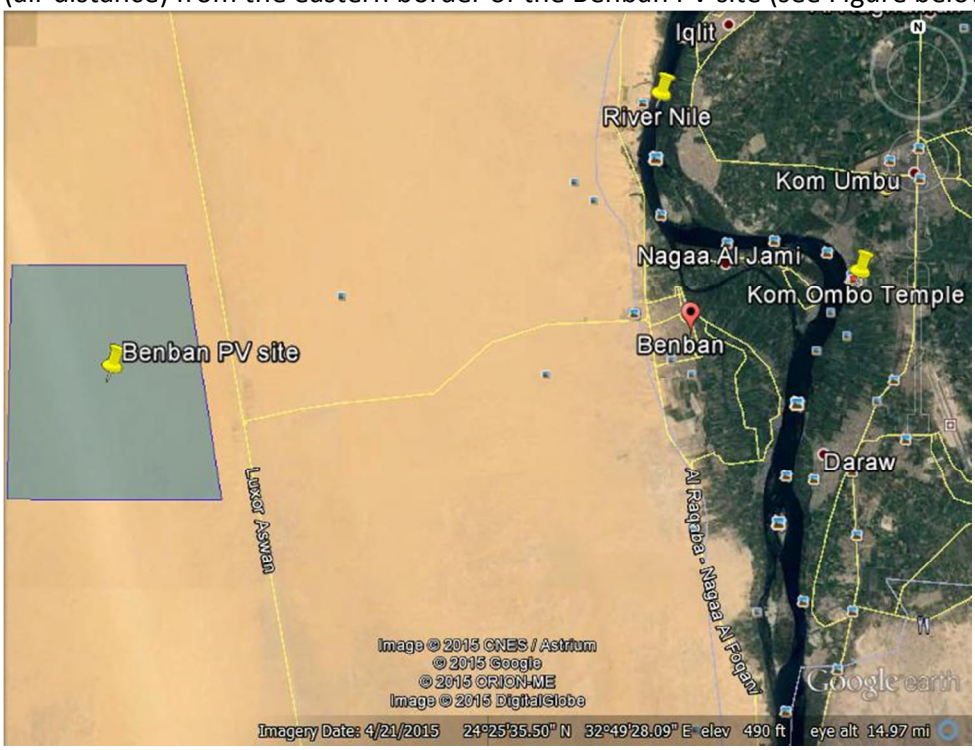


Figure 51: Location of Kom Ombo Temple from Benban PV solar park

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 (Figure below) 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 52: Kom Ombo Temple

5.5 Socioeconomic Characteristics

This section of the SESA Study contains a description of the baseline socio-cultural characteristics of the social environment at the proposed project areas. Description of the existing baseline socioeconomic conditions was assessed through a combination of a desk-based study, site visits, and consultation with relevant authorities and stakeholders. Based 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 services; and description of the project and predicted impacts.

5.5.1 Basic information about the project site

The project will be implemented in Aswan Governorate, 40 km northwest of Aswan City, on land owned by NREA. Project land ownership is public (Aswan Governorate). NREA completed a transfer of ownership from the governorate for allocation to renewable energy projects. A small number of encroachers illegally settled on an insignificant portion of the land during the aftermath of the 2011 revolution due to the absence of security forces. By 2013, the security forces had regained control and all encroachers left the land. There is no site perimeter fence.

Routes of high-voltage lines will also be established on vacant desert lands owned by the state/governorate. As for the (likely) water intake from the Nile to supply the Benban PV solar park, the start of the pipeline is located in state owned lands with one farmer utilizing parts of it based an annual contract with the Local Governmental Unit. The remainder of the pipeline will be extended in through public land.

Aswan is one of the governorates of the South Upper Egypt Region that includes Sohag, Aswan, Qena, Red Sea, and Luxor City. It is the south gate of Egypt and the connection between the northern and southern parts of the Nile Valley, and between Egypt and Africa. The area of the governorate covers 62.7 thousand km^2, representing 6.2% of Egypt's total area. It encompasses 5 Markaz (regions), 10 cities, 33 rural local units composed of 79 villages and 342 hamlets.

Figure 53: Benban village

Figure 54: Project location

According to the 2006 census, the Aswan population is about 1,323,315 million: 42.5 % in urban areas and 57.5% in rural areas. The natural annual population growth rate is 22.8 per thousand.

The following description of the project area presents basic information about Aswan Governorate, Kom Ombo Markaz, Fares village, Daraw Markaz and Benban village. Additionally, all information available about the New Benban and New Fares settlements that could host workers is included. Where available, information on the level of Benban sub-villages is also included.

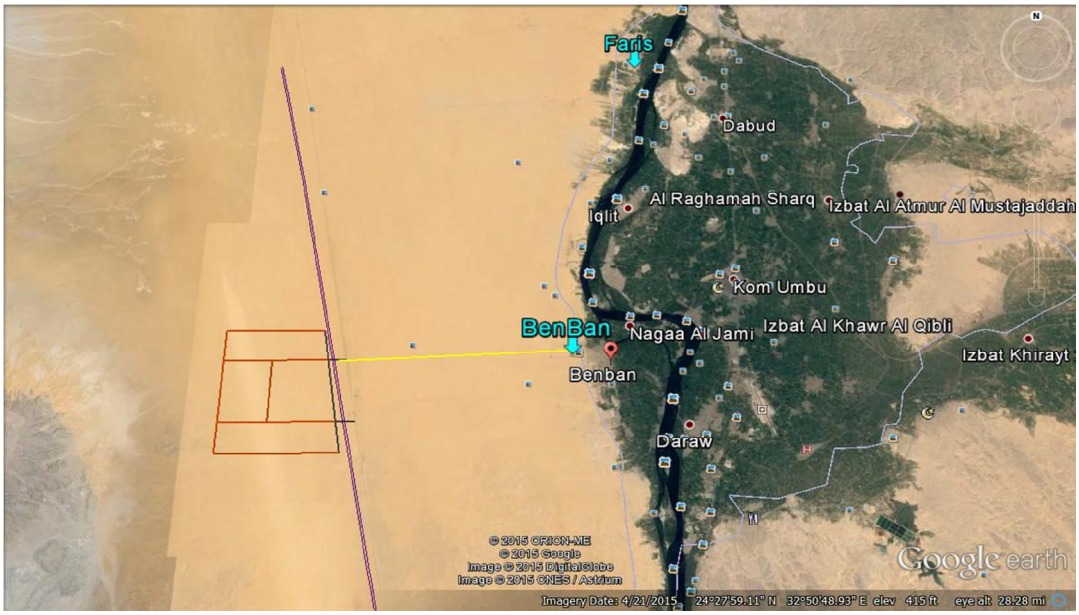


Figure 55: Site in relation to Benban and Fares villages

5.5.2 Administrative divisions

Egypt is divided into 27 governorates. Egyptian governorates are the top tier of the country's five-tier jurisdiction hierarchy. A governorate is administered by a governor, who is appointed by the President of Egypt and serves at the president's discretion. Most governorates have a population density of more than one thousand per km², while the three largest in terms of surface area have a population density of less than two per km².

Governorates are either fully "urban" or a mixture of "urban" and "rural". The official distinction between "urban" and "rural" is reflected in the lower tiers: i.e. fully urban governorates have no regions (*Markaz*), as the Markaz is, natively, a conglomeration of villages. Governorates may comprise just one city, as in the case of Cairo Governorate

or Alexandria Governorate. Hence, these one-city governorates are only divided into districts (urban neighbourhoods). Aswan governorate is a mixture of urban and rural.

5.5.3 Site-neighbouring settlements

The project eastern boundary runs roughly parallel to, and 500 m west of, the existing 500 KV high voltage line (blue double-strip) and Aswan – Luxor highway . The closest existing building to the site is an ambulance station which is currently abandoned, and there are some uncompleted structures nearby. There is no evidence of existing activities or constructions within sight of the other three boundaries of the site. The nearest settlement to the boundaries of the Benban PV site is the New Benban village which is located in the jurisdiction of Daraw Markaz[2], about 12 Km east of the site. Benban village itself is located 13 Km east of the project boundaries. Additionally, Fares village is located 23 km away from the project and New Fares is about 20 km away from the project. Benban and New Benban represent the closest human settlements. Benban village encompasses three main villages, Benban Qebly, Benban Bahary and El Raqaba.

Information available about Aswan Governorate was sufficient to get a good picture of the governorate that will host the project. However, the information available about Benban and Fares was relatively limited. With regards to New Benban and New Fares official information was scarce and limited due to the fact that the two settlements were constructed after the last national census was conducted in 2006. Therefore, the information available was based on interviews with local officials, residents, and the community people.

Based on the information available from the Information and Decision Support Centre 2010, Aswan Governorate consists of 5 Markazs[3] and 10 cities. Additionally there are 37 rural local units and 79 affiliated villages plus 342 hamlets. The following table contains details of the relevant Markaz and the Benban village.

[2] The governorate is divided into regions which are named Markaz
[3] Markaz represents the main administrative division in the governorate. It is equivalent to a region

Table 13: Administrative division of Aswan Governorate, Kom Ombo Markaz, Daraw Markaz, Fares village and Benban village

Administrative Division	Aswan	Kom Ombo	Daraw	Benban	Fares
No. of Markaz	5				
No. of cities	10	1	1		
No. of districts (Hai)	0	0	0		
No. of rural local units	37	8	4		
Affiliated villages	0	8	3	3	1
Villages outside local units	79	0	0		
Hamlets	342	123	46	20	1

Source: Statistical Year Book of Aswan Governorate 2015

With regards to New Benban settlement, 50 residential units have been constructed (only 15 inhabited). There are plans to construct 50 additional 50 units. Similarly, New Fares has been constructed but has no residents to date. The two settlements may provide accommodation project personnel.

Figure 56: Layout of New Benban
Source: Local Governmental Unit

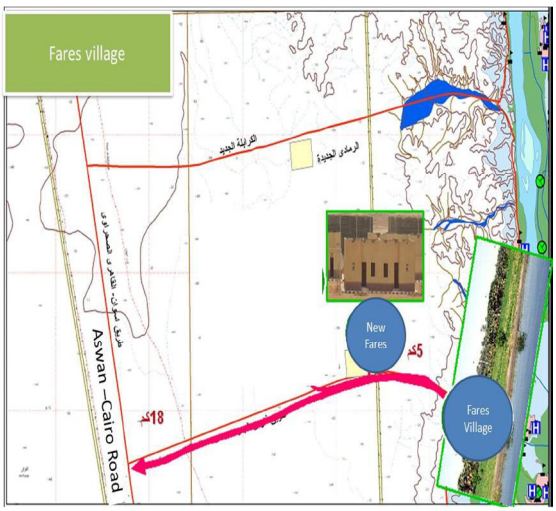


Figure 57: New Fares location
Source: Local Governmental Unit

Table 14: Sub-villages and hamlets affiliated to Benban

Sub-village	Total Number of Hamlets	Names of Hamlets
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 Aswan Governorate is 62,726 square Km.[4] .The total populated area represents about 5.2% of the that area. Housing and scattered residential areas represent 2.25%. Agriculture land accounts for about 646.4 km2. The area of Daraw covers 50.54 km^2 and Benban 22 km^2. The total area of Kom Ombo Markaz is 420.88 km^2. The total area of Fares village is 7.526 km^2

Table 15: Distribution of area and land use in Aswan Governorate

Area	Aswan Governorate
Total area	62,726 km^2
Total populated area	1,004 km^2
Housing and scattering areas	69.7 km^2
Facilities and cemeteries	254.42 km^2
Ponds and fallow	34.61 km^2
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

[4] Description of Egyptian Governorate, 2012, IDSC

5.5.4 Urbanization trends

Aswan Governorate includes a wide range of unfenced desert land that allow encroachers to seize lands illegally. Additionally, the most dominant type of land ownership is customary (Wad'a Yad). This resulted in substantial problems with squatters. Aswan has 10 entirely unplanned areas that are distributed as follows: 7 areas in Aswan city, 2 in Bousilia Bahary and one in Benban.. With regards to the new cities, there is one in Aswan Governorate, 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 at 1.9%. The urbanization trend in Aswan is relatively rapid from the Nile valley towards desert lands.

5.5.5 History and Cultural Heritage

Aswan is the ancient city of Swentet, which in antiquity was the frontier town of Ancient Egypt towards the south. The ancient Egyptians looked towards the origin of the life-giving waters of the Nile in the south, Swentet was the first town in the country, and Egypt always was considered to begin at Swentet. The city stood upon a peninsula on the right (eastern) bank of the Nile, immediately below (and north of) the first cataract. Navigation to the delta was possible from this location without encountering any barrier.

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

Benban and Fares are considered to belong to the oldest areas in Aswan where Arab tribes - migrating from the Arabian Peninsula to the South of Egypt - settled 1000 years ago. The tribes are believed to be descendants of El Husein (Grandson of Prophet Muhammad). They have a wide range of norms and traditions that should be fully abided to. Respecting woman, honesty, integrity, hospitality and chivalrous attitudes are personal attributes valued and to be respected. Benban village is inhabited by tribes who regard themselves of important heritage and pure lineage. The largest tribes in these areas are El Ansar and El Ababda. Some Nubians are also present in the village. Nubians are believed to be descendants of an ancient African civilization which ruled the

south of Egypt in Pharaonic times. There are three Nubian households in this village. Almost all Benban inhabitants are Muslim. About 3.0% are Christian (Copt). Benban has a small church administered by a resident priest. In general, Benban residents value traditions and norms and have formed local a dispute settlement committee (Shoura Council)[5].

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

Figure 58: Equestrian Festival in Benban and Fares

These Arab tribes tend to respect the central authority in Egypt. They also feel proud of any communication with those authorities. They are not generally receptive to liberal or revolutionary approaches. They are generally active during parliamentary elections.

[5] Based on a meeting with the Mayor of Benban Bahary

Figure 59: Community leaders meetings with authorities

5.5.6 Demographic characteristics and human development profile

5.5.6.1 Total Population

The total population of Aswan Governorate is 1,323,315 inhabitants, in 310,679 households. Females represent 48.12% of the total population. Daraw Markaz's population is estimated to be 109,346 people, in 25,488 households. Kom Ombo Markaz' population was 335,643 people, in 76,805 households (Aswan Statistical Year book, 2013). Fares population was estimated as 10,999 people (CAPMAS estimations 2013), in 2,728 households; this represents about 3.19% of the total population of Kom Ombo. The Fares population originates from 10 tribes. These tribes are classified as Upper Egyptian tribes as they were integrated in the Egyptian society through marriage and trading. They are as follows: Al Rashed, Al Gawad, all Khatab, Al Gamea' , Al Omran, Al Ammar, Al Najar, Al Agdab, Al Hegaz, Al Khatba.

Table 16: Population of Aswan Governorate, Daraw Markaz and Kom Ombo Markaz

District/Markaz	Urban/Rural	Estimating Population			
		Males	Females	Total	Families
Aswan Governorate	Urban	305,553	292,394	597,947	149,486
	Rural	360,112	365,256	725,368	161,193
Total of Aswan Governorate		665,665	657,650	132,3315	310,679
Daraw Markaz	Urban	20,863	21,967	42,830	10,707
	Rural	32,291	34,225	66,516	14,781
Total of Daraw Markaz		53,154	56,192	109,346	25,488
Benban village	Rural	12,728	13,492	26,220	5,797

Total of Benban Markaz		12,728	13,492	26,220	5,797
Kom Ombo Markaz	Urban	40,695	39,158	79,853	19,963
	Rural	129,371	126,419	255,790	56,842
Total of Kom Ombo Markaz		170,066	165,577	335,643	76,805

The percentage distribution reflected that 45.19% of the total population live in urban areas in Aswan Governorate, while only 23.79% of population in Kom Ombo Markaz reside in urban areas. With regards to percentage distribution by sex, there are 51.1 % males in urban areas in Aswan Governorate, and 48.9 % females. The following table summarizes the distribution of the population by area and sex:

Table 17: % Distribution of Population of Aswan Governorate, Daraw Markaz and Kom Ombo Markaz by area

% Distribution	Urban/Rural	Males	Females	% of Total	% Families
Aswan Governorate	Urban	51.1	48.9	45.19	48.12
	Rural	49.6	50.4	54.81	51.88
Daraw Markaz	Urban	39.3	39.1	39.2	42.0
	Rural	60.7	60.9	60.8	58.0
Kom Ombo Markaz	Urban	23.93	23.65	23.79	25.99
	Rural	76.07	76.35	76.21	74.01

The total population in Benban, the village closest to the project area, was estimated as 26,220 people, who live in its three main sub-villages: 36.0% in Benban Bahary, 34.9% in El Raqaba and 29.0% in Benban Qebly. The total number of households is estimated at 5,797. The average household size varies between 4.4 in El Raqaba and 4.6 in Benban Bahary.

New Benban village is a new development consisting of 50 residential buildings (all sold, around 15 inhabited). The number of people living in New Benban is around 75 persons[6]. The Local Governmental unit plans to construct an additional 50 residential units.

[6] Data based on interviews with the community people and officials.

Figure 60: New Benban Schematic

Table 18: 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

Source: SYB Benban village 2014

The total population of Fares village is 13,122 according to the estimations of the Information Center within the LGU (51.15% male and 48.9% female).

5.5.6.2 Age structure

The age-distribution of the population in Aswan Governorate shows that almost 30.0% are less than 15 years old; while those between 15 and 45 years old represent about 50.0%. Age distribution in Benban is almost identical with that of the overall Aswan Governorate. The population between 15 and 45 years represents 50.34% of the total population of Benban. Those under 15 years of age represent 29.9% of the total population.

About 38.0% of the total population in Fares are under 15 years old. Those 15 to 45 years old represent about 45.0% of the total population.

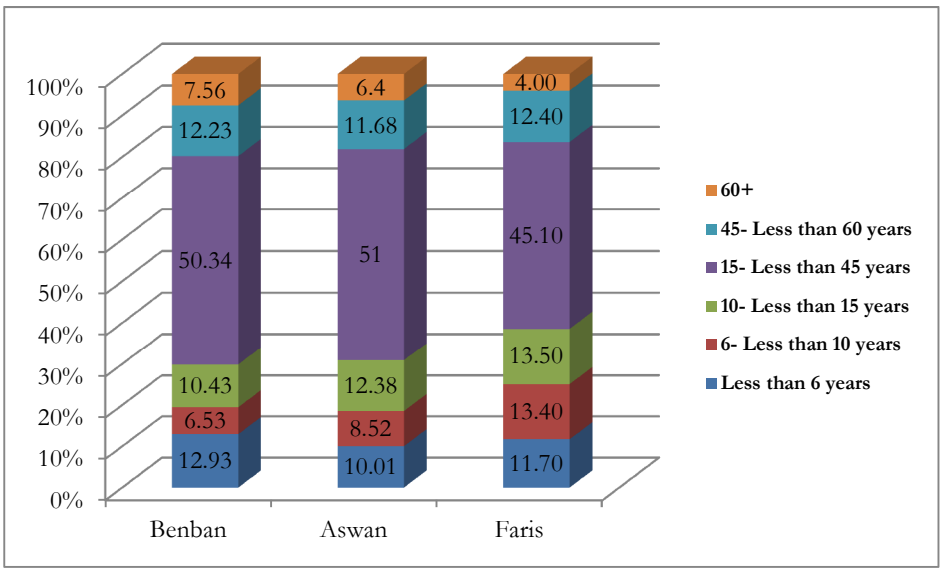


Figure 61: % Distribution of the total Aswan Governorate population by age.
(Source: CAPMAS Census 2006)

5.5.6.3 Rate of Natural Increase

The birth rate in Aswan governorate overall is 29.2 births per 1000 persons and reaches 31.7 in Daraw. The adult mortality rate is relatively identical among the three communities; in Aswan Governorate and Daraw Markaz the mortality rate is 5.6 per 1000 people. That gives a natural growth rate which of 23.5 per thousand persons in Aswan Governorate, and 26.2 per thousand persons in Daraw. The IDSC 2012 Description of the Egyptian Governorate reported that the new born mortality rate is 6.8 per 1000, while infant mortality is 14.4 per thousand live births. With regards to the children below five years of age, the mortality rate is 18.6 per thousand live births.

Table 19: Natural growth rates of Aswan Governorate, Kom Ombo and Daraw Markaz

Markaz	Birth rate (per 1000 PP)			Mortality rate (per 1000 PP)			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
Kom Ombo	30.4	32.7	32.1	7.4	4	4.8	23	28.6	27.3
Aswan Governorate	21.2	35	29.2	6.2	5.2	5.6	15	29.8	23.5

Source: Aswan Statistical Year book, 2013 (Birth rate = Live birth/ thousand persons; Mortality rate = Dead person/ thousand persons)

5.5.7 Living Conditions

5.5.7.1 Household Size and Density

A household is defined as "Family (and non-family) members who share residence and livelihood, and operate as one social and economic unit". The average family size in Aswan Governorate is about 4.36 persons. The household density rate is 1.38 persons per room.

5.5.7.2 Access to Electricity

Access to electricity in Upper Egypt governorates is 99.0% (Egyptian Human Development Report 2010). Even squatter areas have access to electricity regardless of their legality. The number of customers of the electricity utility company in Aswan Governorate is 395,860 units.

The census showed that the majority of households use electricity as the main source of lighting. However, the electricity supply is not stable and frequently uninterrupted, particularly in rural areas. In Benban, interruptions (blackouts) occurred in 2013-2014 but the system improved in 2015.

The total number of customers who have formal contracts with the electricity distribution company is 6,640: 2,600 units in Benban Bahary; 1,960 units in Benban Qebly; and 2,080 units in El Raqaba.

Table 20: Electricity Supply in Benban Village in 2014

Sub-village	Number of conductors		Streetlights	No. of residential subscribers	Non-residential subscribers
	Public	Illumination			
Benban Bahary	18	22	2,700	2,600	
Benban Qebly	15	2	3,250	1,960	
El Raqaba	29	7	4,310	2,080	36
Total	62	31	10,260	6,640	36

Source: Benban Information Center 2015

5.5.8 Access to potable water and sanitation

The governorate depends almost entirely on Nile water for all its water needs. Occasionally, ground water is utilized in remote areas. Accessibility to potable water is high in Aswan Governorate, and almost all the households in Benban have access to running potable water. Average individual consumption of potable water is about 151 m^3 compared with 54 m^3 in rural areas (Source: Information Center, Aswan Governorate 2012). The Benban village water supply is based on Nile water which is treated to potable water standards. The water intake to the village treatment plant is 13 km away from the project area. The potential water abstraction point for the solar project would be located in the same area. There are also 9 wells and 11 pumping stations in Benban. The majority of them are located in Benban Bahary. Two are located in Benban Qebly.

Table 21: Potable Water Supply in Benban Village in 2014

Sub-village	Potable water				Produced water	No. of subscribers	
	Plants		Filters			Public	Private
	No	Capacity	No	Capacity			
Benban Bahary	2	200 m^3/hr	2	200 m^3/ hour	400 m^3/ hr		
Benban Qebly	3	300 m^3/ hr	3	300 m^3/ hour	600 m^3/ hr		
El Raqaba	1	100 m^3/ hr			100 m^3/ hr		
Benban Bahary desert lands					72,000 m^3/ hr		
Total	6	700 m^3/ hr	5	500 m^3/ hour	73,100 m^3/ hr	5,905	75

Source: Benban Information Center 2015

Figure 62: Potential water intake location

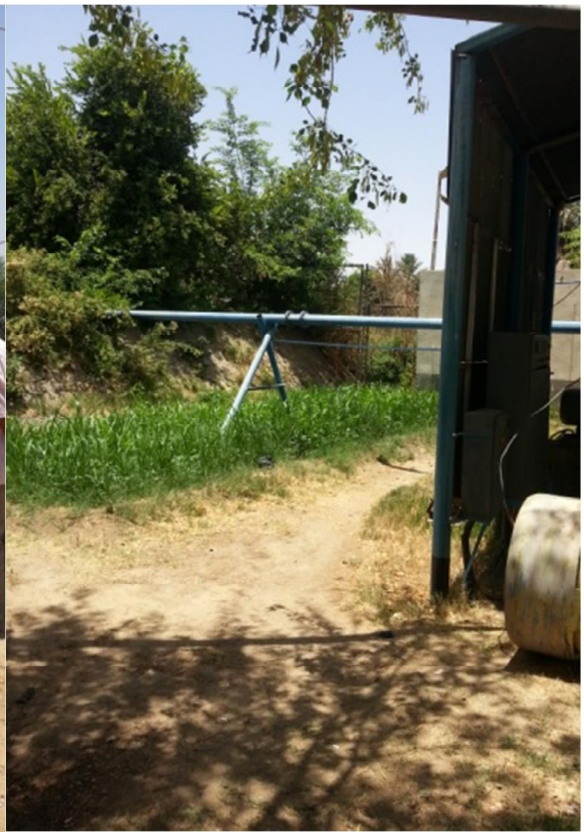


Figure 63: Existing Benban village intake

Access to a proper sewage system is not high in Aswan Governorate. The connectivity rate is only 27.09 % in Daraw and Kom Ombo. With regards to the project areas, the dominant sewage facility is septic tanks that need to be regularly emptied. Two sewage plants are located in Daraw and one in Kom Ombo. The capacity of the sewage treatment plant in Daraw Markaz is 18.00 thousand m3/ Day, whereas there is no sewage system in Kom Ombo (source: Egypt Governorates Description by information 2012). Septic tanks evacuation services are provided through the Local Governmental Unit and private contractors. Each local unit has 2-4 vehicles that empty the tanks. The governmental vehicles cost 30 EGP, while the private contractors charge 50 EGP.

5.5.9 Dwelling characteristics

Buildings and streets in Benban Bahary, Qebly and El Raqaba are in inadequate physical condition. Almost all houses are constructed of red bricks. The majority of houses consist of one floor as residents prefer horizontal expansion of living space, not vertical. Fences constructed around the houses secure privacy to the residents. In case of building more than one floor, the new construction may affect the privacy of dwellers. Almost all houses are painted and plastered using local materials.

Figure 64: Rural house in Benban

Figure 65: Shops in Benban

Figure 66: Benban main street

Figure 67: Houses in Fares

In New Benban, the dwellings are different in style and well-constructed. Official data on New Benban was limited as it was constructed after the national census conducted in 2006. However, based on site visits conducted there are currently 75 dwellings which are all sold. However, there are currently only 15 households in residence. The government plans to construct another 50 dwellings in the settlement. Prior to implementation of the Benban PV projects, it might be useful to investigate opportunities to lease buildings in New Benban during the project construction phase.

Figure 68: New Benban

5.5.10 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 (of 27) governorates. This reflects the relatively good socioeconomic conditions of the governorate. Determinants of this index include education and work status which will be presented in this section.

5.5.10.1 Educational status

The Egyptian Human Development Report (2010) stated that the adult literacy rate (+15 years) was 77.0% in 2007/2008 in Aswan Governorate. The percentage of those with basic and secondary education represents 97.1%. The illiteracy rate in Aswan Governorate 2009-2010 is 23.0% (females illiteracy in Aswan is 33.4%). Illiterate people in Daraw represent 26.4% of the population (the illiteracy ratio among females is 34.8%). In Kom Ombo Markaz illiterate people represent 27.5%. Female illiteracy in Kom Ombo represent 38.9% (source: poverty mapping based on 2006 national census). In Benban, the illiteracy rate among males is estimated with 23.3% while it represents 43.7% among females. With regards to Fares the total percent of illiterate males is 20.6% and 40.8% among females

Figure 69: Schools in Benban

Aswan Governorate has 1190 schools 270 are located in Kom Ombo Markaz and 98 in Daraw Markaz. Approximately 60% of schools are for basic education. Vocational and commercial schools represent about 5.0%.

Benban has 10 primary schools with total number of 69 classes and 2,704 students; 48.5% of the students are female. The class size is about 38 per class. There is a total of 142 teachers, 52 of whom are female. Benban has 5 preparatory schools with 36 classes and 1,153 pupils; almost half of them are female. The class size varies between 27 in Benban Qebly and 33 in Benban Bahary. Secondary schools are limited to only one with 11 classes and 287 students. Females account for 168, males for 119. The class size is 26 students. There is one agriculture vocational school and one vocational school for girls. The total number of students is 742 in the agricultural school and 160 females in the vocational school for girls.

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

In Fares village, there are 4 primary schools and 2 preparatory schools. The total number of students in the primary schools are 1040 person. The total number of classes is 35 with density ratio of 35 students per class.

El Azhar religious education school are found in Fares as one primary school is located in Fares and one institute for preparatory and secondary schooling.

Table 22: Schools distribution in Aswan Governorate and Markazs

Educational level	Aswan Governorate	Kom Ombo	Daraw	Benban	Fares
Pre schooling (kindergarten)	268	66	24		
One class schools	60	13	10		
Primary	456	104	36	10	6
Preparatory	272	64	19	5	2
Public Secondary	39	6	3	1	
Vocational 3-5 years	39	8	3	1	
Commercial and hotels schools	16	1	1		
Agriculture schools	5	1	1	1	
Special needs	35	7	1		
Total	1190	270	98	18	

Source: Information center www.aswan.gov. 2012

Information about Fares was obtained from the Local Governmental Unit Information center.

5.5.10.2 Work Status

In 2010 the Aswan labour force represented 29.4% of the total population; 21.9% of them were female. Agricultural labourers represent 30.3% of the total labour force while those who work in services activities represented 43.0%. The smallest economic sector was industry (26.7% of the total labour force.

Data about employment in Daraw and Benban is relatively limited. The total number of the labour force in Daraw is 26,172 of which 15.0% are currently unemployed (the Statistical Year Book 2013); similar official data were not available for Benban.

Table 23: Employment status in Aswan Governorate

Information about employment	Aswan Governorate
% of labor force 15+ of total population	29.4
% of female labor force 15+ of total population	21.9
Distribution of labor force by sector	
% of agricultural laborer 15+2007	30.3
% of Industrial laborer 15+2007	26.7
% of services laborer 15+2007	43.0
Professional& Technical staff	
Professional& Technical staff (% of labor force15+) 2007	20.5
Wage earners (% of labor force 15+)	
Total 2008	62.7
Female 2008	78.4
Employees in Gov., public sector & public enterprise sector (% of total labor force (15+)	
Total 2008	38.7
Female 2008	69.8

Source: Egyptian Human Development Report 2010

With regards to Benban and Fares, a rapid assessment was conducted in Benban during September 2015. Estimates based on input from participants showed 40% unemployed due to limited government jobs and limited investments in this area. The Arab tribes see their employment opportunities mainly in administration and operational activities out of cultural considerations.

Employment in construction work seems to be not preferred and should (according to them) be done by migrants from other governorates.
Most of the interviewed locals prefer employment with governmental authorities or private companies. They are generally not interested in starting their own small or micro projects (below 2000 US$). The main reasons for these preferences can be summarized as follow:

- Governmental work is still more stable than the private sector.
- They consider micro projects to be non-lucrative. Some of the interviewed community think it would be better for them to apply for a big loan and invest in a large-scale project (more than 20 thousand US$), similar to patterns they are already familiar with, like a private operated ferry for transport of passengers and goods, or for an establishment for fruit processing, with experienced workers from the surrounding villages.

In Fares village, the labor force is estimated at 39.2% of the population, with those in the agriculture sector representing 75% of the total labor force. Almost all residents with jobs are male (only 11 females have jobs). The total unemployment ratio among

males is 16% while Female unemployment ratio is at 99.5%. The majority of females are unemployed due to the traditions and norms of the community. Yet, the majority of females do certain types of work i.e. raising poultry and livestock inside the house and some farming.

Aswan Governorate has a relatively low total unemployment rate of 12.9% of which 34.5% are female. Unemployment is higher in rural areas. That is not often the case as the unemployment rate is generally higher in urban areas. People with education below secondary and university level generally do not face severe unemployment problem, whereas those with secondary education face an unemployment rate of 85.7%. Because of that many migrate to major cities or European and Arab countries for work.

Table 24: Unemployment status in Aswan Governorate

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+ years, %)	
Below secondary 2007	3.1
Secondary 2007	85.7
University 2007	11.2

Source Egypt Human Development Report 2010

5.5.10.3 Economic Wellbeing

In 2010, the Egypt Human Development Report reported that the Aswan annual GDP per capita is 7,057.4 EGP. The poor represented 225.000 people among which 48.5% were defined as ultra-poor.

Economic Activity in Aswan

The main three economic activities in Aswan Governorate are tourism, agriculture and industry. With regards to the tourism sector, this has been badly affected by the 25th of January Revolution. There are 32 hotels with a total of 3052 rooms[7]. However, the project area in Benban has no hotels.

[7]Source: Governorate Description by information 2010- Information and Decision Support Centre

With regards to industry, Aswan Governorate has limited large-scale industries, e.g. sugar factories. The Information and Decision Support Center (IDSC) reported that there are 171 registered industrial establishments which employ 10,300 individuals. In the wider Benban project area there is one sugar factory.

The dominant economic activities in both Fares and Benban villages are farming and raising cows. Few villagers work in a brick factory and are employed in food canning.

Table 25: Industrial Zones - Productive Cooperation Associations 2006/2007

Industrial zones and PCAs		Aswan Governorate
	Unit	N
Number of registered industrial establishments	Establishments	171
Number of workers at registered industrial establishments	Worker	10,300
Number of industrial zones	Zone	1
Number 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
Number of productive cooperation association	Association	5
Members in association	Members	1480

Source: Governorate Description by Information 2010 (* Feddan equals 4,200 sq. metres)

Table 26: Agricultural activities 2006/2007

Agriculture Activities	Unit	Aswan Gov	Kom Ombo	Daraw	Benban
Area of cultivated land	* Feddan	185260	76770	7830	4671
Area of old cultivated land	Feddan	117010	69510	7830	3396
Total area of newly cultivated land	Feddan	68.24	7260	0.0	
Total cropped area	Feddan	254040	110870	10050	
No. of agricultural cooperative association	Association	93	32	10	
No. of specific associations	Association	9	1	1	
No. of poultry farms	Farm	0	0	0	
No. of cattle slaughter houses	Slaughter house	18	2	2	
No. of poultry slaughter houses	Slaughter house	1	0	0	

Source: Governorate Description by Information 2010 (*Feddan equals 4,200 metres^2)

Figure 70: Brick factory

Economic Activities in Benban

Agriculture is the main sector in the Benban area. Residents work in farming, processing of farm products and trading of agricultural products. The total cultivated land consists of more than 7.8 thousand feddans in Daraw. 10 agricultural co-operative associations serve the community of Daraw. Some villagers work in small industries which include one brick factory and one factory for drying tomatoes (seasonal work during winter).

Only few residents of Benban have government jobs. Some households rely on money transferred from family members working abroad. The sample surveyed showed that residents of Benban do not have further skills (e.g. as in handicraft production). However, they said that they are quick learners and keen to work on the solar projects.

One of the main sources of income is hosting an annual festival in the village. During this festival, the village invites a large number of horse and camel riders from different countries. The people interviewed 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 unacceptable to take any money from their guests. Nevertheless, the festival is lucrative for supermarkets and small tuk tuk drivers. That might influence the project in terms of overconsumption of community resources, resulting in traffic problems and increase the risk of disease transmission to the workers (e.g. flu and skin diseases) as a result of

inflowing travelers. However, it is worth noting that the festival duration is limited to 2-3 days maximum. Therefore the negative impact on vehicle traffic will be limited and additional pressure on community resources can be avoided by securing sufficient food and water supplies prior to the festival.

Figure 71: Tomato processing

5.5.10.4 Health facilities

Aswan Information Center reported that one central hospital is located in Daraw and one in Kom Ombo. The one in Daraw has 63 doctors assisted by 161 nurses. However, Kom Ombo with a higher population has only 97 doctors assisted by 133 nurses. With regards to the primary care units, there are 20 in Daraw and 40 in Kom Ombo. In addition to that, the community people in Fares used their own financial resources to construct a specialist unit for kidney failure.

Table 27: Health services availability in Aswan Governorate, Kom Ombo, Daraw Markaz and Benban

Facilities		Kom Ombo	Daraw	Benban*	Aswan Governorate
Central/Public Hospital	Number	1	1		5
	Doctors	97	63		289
	Nurses	133	161		600
	Beds	197	152		742
Primary care unit	Number	40	20	6	200
	Doctors	33	14	6	192
	Nurses	185	214	102	1208
Ambulance	Number of ambulance vehicles	11	14	1	25
	Number of ambulance staff	32	21		53
	Number of ambulance centers	4	4	2	8

Source: Information center www.aswan.gov. 2012; * Source: Information center in Benban

Table 28: Health insurance availability in Aswan Governorate Kom Ombo, and Daraw Markaz

		Kom Ombo	Daraw	Aswan Governorate
Workers (Number)	Male	6,884	30,433	14,2470
	Female	4,589	20,288	94,979
	Total	11,473	50,721	237,449
Pensioners (Number)	Male	1,321	5,998	33,413
	Female	880	3,999	22,275
	Total	2,201	9,997	55,688

Source: Information center www.aswan.gov. 2012

Figure 72: Health unit in Benban

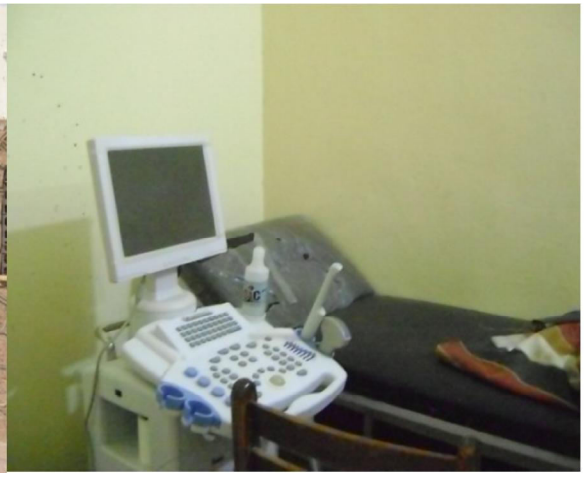


Figure 73: Health unit in Fares

Benban village has a health unit that is operated by one newly graduate general practitioner. This facility is not fully utilized as the physician is not available most of time and he is not trusted by people. With regards to ambulance facilities, the nearest one to Benban village was damaged during the previous year. It was abandoned and the community now relies upon two other ambulance units that are located 7-12 km away from the village. The head of the ambulance department of Aswan Governorate assured us that it will be useful to re-open the damaged unit. Their proposal is that the developers might be able to reconstruct the ambulance station and the ambulance department will furnish and equip it.

5.5.10.5 Social Services

Benban Markaz has limited social services. One social unit is located in each village. With regards to community based organizations (i.e. NGOs), 7 are located in Benban and 2 in Fares. There are 4 event halls in Benban and one in Fares. There are very few recreational facilities and almost none are accessible to women and children.

Table 29: Social services availability in Aswan Governorate, Daraw and Kom Ombo Markazs

Services	Daraw	Benban	Kom Ombo	Fares	Aswan Governorate
Social units	7	1	15	1	23
Productive families projects	2,559	531	5,010	771	8,100
NGOs	64	7	132	2	203
Event Halls	40	4	55	1	99
Nursery	34	2	54	3	90
Workshops for females	4	1	14	0	19
Vocational training centers	0	0	0	0	3
Holy Quran Recitation center	35	3	45	1	83
Womens club	1	0	1	0	2
Childrens club	2	0	2	0	4
Special needs care Facilities	1	0	2	0	3

Source: Information center www.aswan.gov. 2012

5.5.10.6 Security and emergency facilities

Aswan Governorate is one of the border provinces with both armed forces and a police force. There is one police unit in Benban village and one fire station department with one fire engine.

Figure 74: On-site guards

Project stakeholders have mentioned that securing the site from intruders and theft is one of the main concerns for the Benban site development. At the time of this report, there was a basic security arrangement in place which is operated entirely by members of the Benban community, and commissioned by NREA. There is no site perimeter fence yet.

This arrangement was based on a meeting between the mayors of Benban Bahary, Qebly, Raqaba, and the head of Aswan security forces in 2013, in order to assign responsibility for securing the site. It was agreed that security guards should be from all tribes surrounding the site, and that the revenue from security activities will be equally

distributed among the personnel. This representation arrangement was decided to limit any concerns pertaining to potential tribal tensions.

The security group includes 16 men working over two shifts. They are managed by one of the residents in cooperation with the police investigation officer in Daraw District. An agreement with the local police (who are trained and authorized to carry and use arms) is in place in order to provide support to the local security personnel who are yet to obtain official security permits.

The security personnel patrol the site using two vehicles (small truck and 4*4 vehicle), two tractors and one all-terrain-vehicle. Some are claimed to carry small arms. While the selected security personnel are trained on using guns, they do not use guns on site. They rely mainly on soft power; especially respect of their tribal affiliation.

This style of security arrangement is common in desert areas inhabited by Arab tribes. Further training on security aspects and documentation of all activities is necessary. For the time being, private security companies' services are provided to some of the developers for securing their equipment on site.

The current security personnel have started to formalize their activities by establishing a security company and are currently in the process of preparing necessary permits and licenses.

There is a small hut on site allocated for this security staff. Some additional kiosks/light structures are being added in order to manage securing the 37 km^2.

Additionally, in the light of discussions which took place during the meeting conducted by the majority of developers (36 developers) on the 9 December 2015, investors have agreed to recruit a professional security firm which will be responsible for securing the site in the future. The security firm would be expected to collaborate with the national police force as well as the local security group. National police force will be responsible for protecting the site from criminals and encroachers.

The local security firm will be useful in terms of providing indirect job opportunities to members of the community as well as communicating with potential encroachments from other Arab tribes in the region.

5.5.10.7 Access to transport

The project area is 40 km North of Aswan, and approximately 1 Km West of the Aswan – Luxor Highway.

- There is a railway network (double track) that runs from Alexandria to Aswan.

- The road networks connect the governorate with the Red Sea ports. That allows project equipment to be transported by sea to:
    - Safaga port
    - Noeiba port
    - Hurghada port
- There are airports in Aswan and Abu Simbel.
- A River Nile port is located near the dam.
- The road network in Benban itself is only rudimentary.

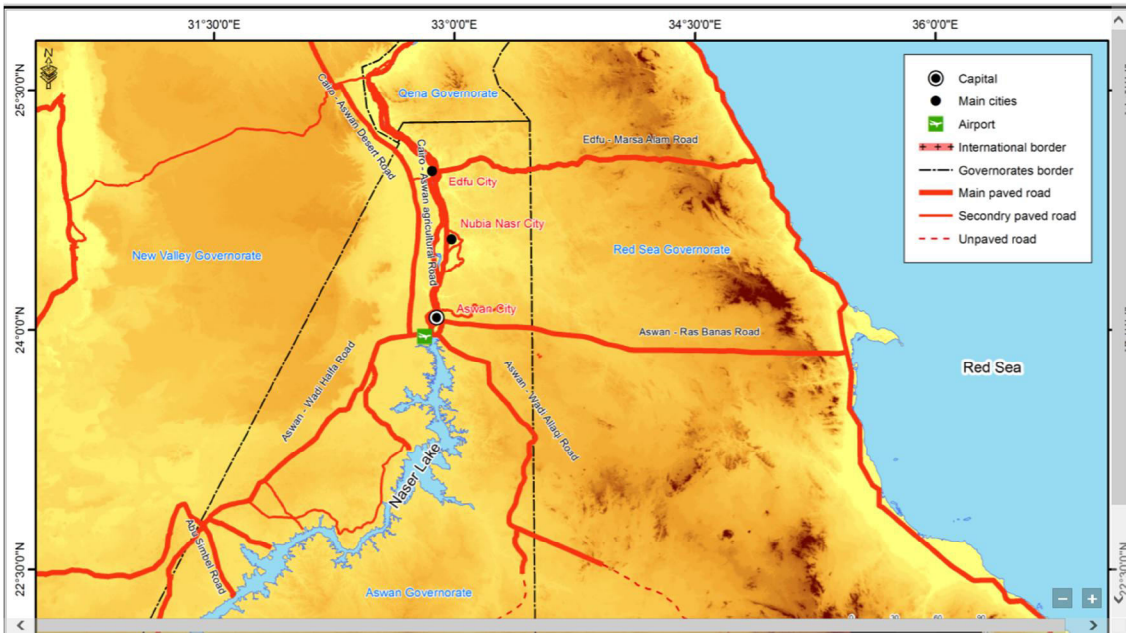


Figure 75: Transportation to Aswan
(Source: Website of Aswan Governorate)

Table 30: 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

5.5.10.8 Roads in Fares village:

- Regional roads:
  - The Western Desert road: it is the main road for the villages located west and east of the Nile. It is the most important urban development in the region as it links the villages with the governorate in the south.
- The Fares-Karabilah road is connecting the villages to the west of the Nile [Fares Benban, El Hamam Karabilah].
- Secondary roads:
  - These consist of the road into the village of Nag Aqaba, with a length of 2 km and a width of 8 meters, and the western entrance to the village (1.5 km long and 12 metres wide.
  - Within Fares village: Fares Canal main street, which runs through the middle of the village at a length of 850 metres and a width ranging from 6 m – 8 metres, and Dayer El Nehia Street at the outskirts of the village (1.5 km long).

5.5.11 Corporate Social Responsibility and Community Benefits

5.5.11.1. Community needs assessment

The Consultants were asked to develop a separate 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.

Various meetings and a workshop were conducted in order to identify the needs of the community. The team aimed to identify the main problems of the community and tried to identify the most pressing community needs as well as practical feasible interventions while trying to manage the scale of proposed initiatives in order not to raise community expectations.

Although the community expressed the need for the construction of schools and hospitals, those fall entirely under the responsibility of relevant government bodies (e.g. ministry of education and ministry of health and population) and therefore cannot be implemented by independent investors. Consequently, proposed interventions were geared towards projects including building the capacities of youths, facilitating access to employment and upgrading existing services.

The results of this analysis (based on meetings and workshops conducted with the community people and the governmental entities show that the Benban village community is affected by the following deficiencies:

Health:

- Poor health service and lack of health practitioners in the village (only one newly graduated general practitioner) force people to seek treatment outside of the village as far away as Aswan which is an additional financial burden due to expensive transport.
- The dispensary is not well equipped with medications and cannot even provide the main serums (e.g. Scorpion antivenom). The village has only one pharmacist who is currently doing his military service; with no replacement.
- The nearest ambulance station is 6 km away from the village.

Education

- There is a mismatch between the education outputs and the market needs which affects the ability to generate growth and generate jobs.
- While there are sufficient schools in Benban, the education system remains poor due to a lack of teaching resources.
    - There is a vicious circle of poorly trained teachers which results in poorly educated generations who will later join the teaching force in the village. Accordingly it is reported that students fail to qualify for university education.
    - There is a lack of science-oriented education. Students who want to study scientific professions at high school level have to go to Daraw district .
- There is a lack of entrepreneurial initiatives. Benban residents still prefer a stable job with the government or working for private investors rather than investing in their own small start-up project.
- Poor qualifications of graduates lead to reduced value added to the community. Most of the female graduates go into teaching or government jobs whilst male graduates prefer migrating to the Gulf countries for work.

Transportation:

- Public transport is limited:
    - There are only 11 Micro Buses for transporting people to the surrounding cities, which is not sufficient during rush hours.
    - There is a lack of State-owned Ferries (currently not available) and private boats for connecting Benban with the surrounding villages.
    - There is a lack of tuk tuks and private cars.
- There are only limited service hours

- Micro Buses operate only until 11:00 pm; ferries and private boats operate only until 5:00 pm.

- High cost of transportation: The cost of transportation in Benban is relatively high due to lack of competition.

Infrastructure:

- Electricity
  - Voltage fluctuations and power cuts are forcing people to buy electricity generators (cost at least LE 2,000);
  - Increasing cost of electricity services.
- Water
  - Poor quality of water from the general water network. The respondents attribute the poor quality of the water to the absence of monitoring system to water facility and its network. Additionally chlorination process is not adequately performed.
  - Regular cuts in the water service which the water authority blames on the old water pipes, which are often defect and need to be replaced. The pipelines have not been upgraded for a long time due to the limitation of budget and the absence of regular maintenance activities, s well as the community not fully committed to paying the cost of water consumption.
- Sewage
  - High cost of emptying septic tanks especially during the winter. The governmental septic tanks evacuation vehicles cost 30 EGP per time, while the private vehicles cost 50 EGP It is expected that after completion of a sewage pumping station the community will be connected to a sewage system. The sewage system has been constructed but not operating until now.
- Underground water:
  - Damage caused by high groundwater levels is a long-standing problem in Benban village. It affects the houses and the crops as well as the sewage collection systems. The problem increases during the winter.
- Termites
  - Termites are affecting the livelihood of the population by destroying houses and furniture. Attempts to exterminate them with pesticides have failed.
- Solid waste
  - Solid waste like plastics, papers etc. It is collected every 20 days at a cost of 20 Egyptian Pounds. Lack of proper final disposal by the waste collector (*Zabal*) (it is just left in the nearby desert) leads for the waste often being blown back into the village. The Local Governmental Unit has no role in waste collection activities due to

budget constraints. Municipal solid waste stockpiles in the nearby desert could also lead to spontaneous ignition causing local fire incidents and pollutant emissions.

- Natural Gas
  - High prices of gas cylinders and inability to install natural gas connections in the village as houses do not meet the technical specifications set by the gas supply companies.
- Streets lights
  - The municipality only changes light bulbs in main roads while the lighting on secondary roads depends on the residents. The main concern of the villagers relates to stray dogs coming from the desert and the surrounding mountains in the evening, which are considered to be a threat to their lives.

Veterinary and agricultural service:

- Inadequate veterinary care which results in financial losses for livestock breeders who are losing large numbers of animals every year.
- Insufficient fertilizers and inadequate distribution methods.

Institutional presence

The area has limited administrative services which include:

- Benban Municipality
- The Health affairs unit outside the area
- A limited number of NGOs outside the project area
- The Social Fund for Development in Aswan
- A Fire station in Kom Ombo

5.5.11.2. Community proposed needs

Based on the list above, the sample of residents and government employees proposed the following:

Table 31: Priority Community needs and budget

Initiative	Detailed activities	Responsible entities	Estimated costs
Building capacity of community young people	Mobilize young people who are willing to work in the project; Provide vocational training for young graduates and other young people; Monitor the results of training	NREA; Developers association Vocational secondary schools Training centers in Aswan	Advertising for the trainings+ curriculum preparation + training provision: Total annual cost in the order of 10,000 $
Upgrading infrastructure in New Fares	The electricity supply system needs upgrading;	NREA; Developers association; Electricity company; The governorate of Aswan	The cost of new cables would be covered by electricity company; the developers association and NREA should initiate this upgrading project
Termites combating	Hire a specialized company in order eliminate termites	Developers association; Agriculture Directorate; Private companies	5,000 $ annually
Enhancement of health service	Provision of health care personnel that will serve the community and the Benban PV project workers	The developer association Health Directorate	No cost as the health directorate would provide staff. The developers could provide health facilities for their workers which could also serve community people
Upgrading the ambulance unit	Reconstruct the collapsed near the highway; the Ambulance department proposed to furnish the ambulance unit	The Ambulance Department in Aswan and the Developers Association	Construction will cost about 3,000 $
Street lighting	Provision of solar panel and lamps	Developers Association; Electricity Company	300 $ per each column

Initiative	Detailed activities	Responsible entities	Estimated costs
Provision of small microbuses or minibus	Provide number of microbuses to the community	Developers Association	Microbus (14 passenger) = 9,000 $ per one Minibus (26 passenger) =26,875 $ per one
Provision of waste collection service and recycling	Have an agreement with waste contractor to collect domestic wastes from the project sites and the nearby villages	Developers Association	The cost would be about 5,000 $ per month

The information provided in this section of the SESA can be taken as a preliminary outline of potential CSR related investments that could be adopted by the Benban developers to maximize project benefits to project affected people. A full needs assessment and further consultation will be required to be undertaken by the developers association.

6 Assessment of Environmental and Social Impacts

6.1 Impact Assessment Methodology

The Benban PV projects involve large-scale, short-term construction work on the entire site, involving a large number of workers and shipments/deliveries. During subsequent operations comparatively few staff will be on site, mainly for control and maintenance work. The following assessment of impacts distinguishes between the construction phase and the operations phase. It covers impacts on

- landscape and visual impact;
- land use, soil and groundwater;
- biodiversity
- noise and air quality;
- archaeological and cultural heritage;
- infrastructure and utilities;
- occupational health and safety;
- socioeconomic impacts
- community health, safety and security impacts
- land use, involuntary resettlement and economic displacement
- risk to existing infrastructure
- cultural resources impacts
- overconsumption of community resources

Impacts are described both for construction and operations phases and are rated for their significance taking severity, geographical scale and duration into account. Ratings are:

- **None** (no impact);
- **Minor** (minimal impact; restricted to the Benban PV site and immediate surroundings);
- **Medium** (larger scale impacts; local or regional; appropriate mitigation measures readily available);
- **Major** (large scale long-term local; regional or global impacts; for negative impacts mitigation difficult or impossible or in case of positive impact is not required).

6.2 Environmental Impacts Assessment

6.2.1 Landscape and Visual Impact

Construction Phase: Covering 37.2 sqkm, 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 Benban PV site 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 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.
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 analyse, 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.

Impact Rating
Following the implementation of the listed mitigation measures, the significance of the visual impact (appearance) of the Benban Projects and the potential for glare are considered MINOR.

6.2.2 Land use, Soil and Groundwater

6.2.2.1 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.

6.2.2.2 Soil and Groundwater

Impacts on soil and groundwater can occur during construction and operation if hazardous substances such as oils, paints, cleaning agents and other chemicals are spilled in larger quantities. This 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.

Construction Phase: During construction 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. 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).

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).

Impact Rating

Overall, impacts are considered MINOR for both the construction and operations phase as long as good working practices and site management practices are in place.

6.2.3 Biodiversity

The construction of the PV facilities will permanently change the site and its value as a habitat.

6.2.3.1 Flora and Fauna

As part of the Kom Ombo CSP 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. The few recorded species are common and only found in small numbers on the site. None of the species found on or near the site is rare or endangered. Nevertheless, care should be taken to keep any impact as low as reasonably possible, both on the site itself and on any surrounding area affected by the project (e.g. site access roads), as a precautionary measure.

Proposed mitigation measures

- Restrict traffic to designated roads;
- 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.

Monitoring measures

- Recording and documentation of complaints from neighboring communities related to floral and faunal health/impacts;
- Monitor the disposal of solid, liquid, and dangerous waste to ensure that it is in compliance with legal requirements.

Impact Rating
Given the characteristics of the Benban site (desert without vegetation) it is concluded that neither the construction activities nor the subsequent operations will affect endangered fauna or flora species or disturb valuable habitats; therefore impacts are considered MINOR.

6.2.3.2 Migratory Birds

A point of environmental concern for renewable energy installations, notably large wind-power installations but also industrial-scale solar installations, is their potential impact on birds. Key possible impacts are risk of entrapment under the panels and attraction to/ingestion of polluted water or food. According to BirdLife International, more than 381 bird species in total are known in Egypt, mostly non-breeding migratory species (298 species). This includes 16 species of global conservation concern. There are 34 Important Bird Areas in the country; the areas closest to Benban are the Upper Nile Qena near Luxor; the Aswan Reservoir; and Lake Nasser south of Aswan. None of them is closer than 40 km. The Benban PV site and its immediate surroundings (10 km) do not provide a habitat for birds, breeding or migratory. Delivery of materials and construction works will therefore not have any direct impact on local bird populations.

However, the Nile Valley at a distance of approximately 12 km provides a habitat for local bird life and the construction of a water abstraction point and a pipeline (should this option be taken by the Benban site developers) would have a local impact. As it is unclear whether such works will be carried out an assessment of impact will have to be done if and when a decision on that option has been made and the exact location of any structure is known.

The Nile valley is an important migratory path for birds on their way from Europe to Africa, as part of the Rift Valley / Red Sea flyway. The Rift Valley/Red Sea is used by more than 2 million soaring birds during spring and autumn migration and constitutes one of the largest avian flyways in the world. Important species migrating along this flyway include the white stork which is primarily migrating across Egypt along the Nile valley (see figure below; Source: BirdLife International).

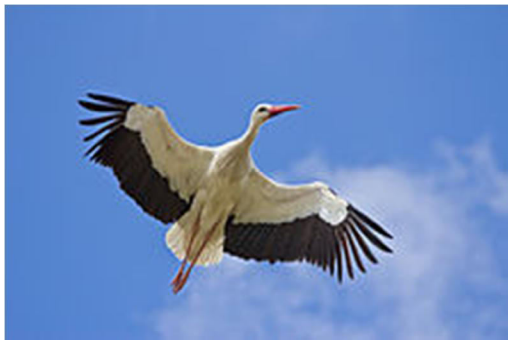


Figure 76: White Stork

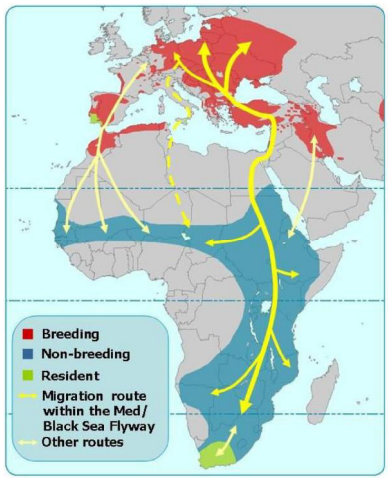


Figure 77: Migration routes for the White Stork

Once the Benban Projects are constructed, the site appearance from the air will have changed significantly over the entire 37.2 km^2 area. There is a potential for disorientation of birds from dense arrays of panels which may resemble water bodies. With 37.2 km^2, Benban will be the world's largest solar park. The visual impact from the air will be considerable as can be seen in photos from two other large solar parks (Figures below).

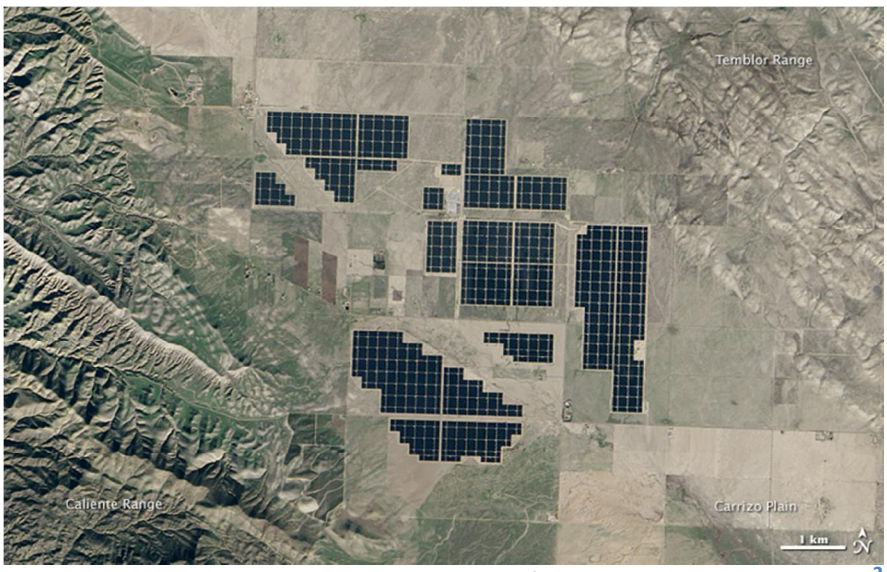


Figure 78: Topaz Solar Farm in California/USA (total site area 25 km^2)

Figure 79: Panoramic view of the Gujarat solar park, India (21 km^2)

Impact Rating

The potentially negative effect of glare and panel appearance at Benban on soaring birds cannot be assessed at this stage. As this is not an area with high bird sensitivity an impact it is, at this stage, considered to be MINOR. However, as a precautionary measure, site management (once such an entity has been set up) should commission a study.

6.2.4 Archaeological and Cultural Heritage

There is no evidence of archaeological structures on the Benban PV site, and no indication that the site is any cultural heritage value. However, chance finds are possible.

Proposed Mitigation measures

- Chance-find procedures must be developed as part of the site construction management plan.

Proposed Monitoring measures

- Monitoring the implementation of chance-finds procedures.
- Photo documentation of any chance finds.

Impact Rating

Impacts of construction and operations are considered MINOR.

6.2.5 Noise and Air Quality

6.2.5.1 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).

Construction Phase: Construction of buildings and associated ground-works for foundations are likely to be very limited as many developers indicated that custom-made containers are a preferred option for buildings. It is not yet known whether developers will use concrete foundations or piling for construction of panel frames; developers informed the Consultant that they will try to avoid this, but a final decision will depend on their geotechnical investigations. 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 are 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.

Impact Rating
If these mitigation measures are implemented impact of noise on site during construction is considered MINOR and short-term; the impact of noise during normal operations is also considered MINOR.

6.2.5.2 Air Quality

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 exhaust gases from large delivery lorries and from generators (if used) and dust blow. This will cause

- Fugitive dust emissions (PM_{10}, $PM_{2.5}$)
- 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 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. However, this is unlikely.

Operations Phase: Once operational, the most significant environmental impact of the Benban Projects will be the displacement of CO_2 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 CO_2 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.

Impact Rating
Impacts on local ambient air quality during the construction phase are considered to be MEDIUM. Machinery and working practices must be in compliance with legal requirements and good working practices are enforced.
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 MAJOR.

6.2.6 Traffic/Transport

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 80: Aswan – Luxor Highway

Benban Project developers stated that

- They aim to start construction no later than spring 2016;
- The construction period would be between 8-12 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 a 50 MW installation with approximately 200,000 panels);
- Containers would normally be stored in front of the plot (according to NREA there is a 7 metre space between the paved main roads and the plots) or on the plot;
- Construction would require between 250 and 1,500 workers at peak time;
- Workers would generally live off-site and be brought in by bus.

To make an assessment of the potential impact of transport two scenarios has been assessed. These are based on the aforementioned information from developers and additional information from similar project sites. These scenarios are for peak construction time only.

Scenario 1 assumes the following:

- Construction peak time for each Benban plot to be 90 days;
- A number of 36 plots is being used for these calculations because of different plot sizes – 36 plots x 50 MW/ea. would give the overall installed capacity of 1,800 MW;
- All Benban plots to complete peak construction (with the highest number of workers and all container deliveries) within a period of 6 months (i.e. half the plots will, at any given time, have peak time numbers of workers and maximum delivery of construction materials);
- Each plot takes delivery of 600 containers (600 lorries); total number of lorry deliveries over a 6 month period: 21,600 (i.e.120 per day);
- Container storage on site to be kept to a minimum and an efficient container return system to be in place – i.e. lorries bringing a container on average take back a container (i.e. the delivery/return of a single container counts as a single lorry movement);
- Container deliveries equally spread over the entire 6 months period;
- Lorries leave the site on the day of delivery;
- Each plot (Benban Project) has a maximum of 30 vehicles (other than delivery vehicles or transport buses for workers) on site; these are construction vehicles such as bulldozers, excavators, cranes etc.; of these 30 vehicles, 20 remain on site, and 10 come and leave each day;

- Each plot has 500 workers on site during the 3 months peak construction time period (i.e. during the 6 months construction period up to 9,000 workers on site each day);
- Construction work will be 7 days per week;
- Workers would live off-site, most likely in Aswan, partly in the Benban/Fares area; all need transport; 9,000 workers would require 180 buses to and from the site each day (based on a seating capacity of 50);

Scenario 2 is a worst case scenario. It uses the same figures (workers, vehicles, deliveries etc.) as Scenario 1, but assumes that all developers start (and finish) their 90 day peak time construction period simultaneously, i.e. daily peak time worker numbers, deliveries and vehicle movements are double that of Scenario 1.

The scenarios also include information on 'normal construction' outside the 90 day peak period. Normal construction is the period leading up to peak time and following peak time, with numbers building up and later being gradually reduced as work is completed. For this 'normal construction' a number of 200-300 workers on each plot is being used. Both scenarios are presented in Table below, together with a column showing the underlying assumptions related to a single plot.

Table 32: Transport scenarios

	Single Plot (50MW)	**Scenario 1: 50% of projects ongoing any time**	**Scenario 2: All projects peak construction simultaneously**
Daily number of workers at peak construction time (90 days)	500	9,000	18,000
Daily number of workers at normal construction time (5 months)	200-300	3,600-7,200	7,200 – 10,800
Daily number of buses required to transport workers on/off site at peak construction time	10	180	360
Daily number of buses required to transport workers on/off site at normal construction time (not peak time)	4 - 6	72-108	144 - 216
Total number of containers delivered within 90 days	600	10,800	21,600
Daily number of containers delivered during 90 days peak construction time	7	120	240

	Single Plot (50MW)	**Scenario 1: 50% of projects ongoing any time**	**Scenario 2: All projects peak construction simultaneously**
Daily number of other vehicles at peak construction time and at normal construction time entering and leaving the site	10	180	360
Daily total number of vehicles at peak construction time	27	480	960
Daily total number of vehicles at normal construction time (not peak time)	4-6	252-288	144-216
Daily total number of vehicles leaving and entering the highway at normal construction time (not peak time)	8-12	504-576	288-432
Daily total number of vehicle movements (i.e. vehicles leaving or entering the highway) at peak construction time	54	960	1,920

Under both scenarios a large number of vehicle movements will take place each day, off and onto the highway. The turn-off of large numbers of vehicles from the highway to the site poses a major hazard; this is also the case when slow-moving vehicles with slow acceleration enter the highway where traffic is generally at high speed. The risk increases when vehicles have to cross the highway if they are bound to go back to their point of origin to carry back empty containers or to bring workers back to their accommodation.

To minimize risk of collision may well require construction of a long slip road or a short-term parking area for times when vehicles are queuing up for site entrance (so that no queue is building up on the highway itself). An underpass would be the safest option for entering the offsite lane on the highway. Effective traffic management measures will have to be put in place (and enforced) during by site management. This should include use of trained 'traffic marshals'. Timed (staggered) construction may be the preferable option to reduce congestion.

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.

Operations Phase: 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.

Impact Rating
Impacts on traffic and potentially on road safety are considered MAJOR during peak time construction, even if construction is staggered over a longer period. These impacts can be partially mitigated by appropriate traffic management.

Impacts during normal operations are MINOR (unless major works on one or more plots require significant deliveries and significant contractor/worker transport).

6.2.7 Infrastructure and Utilities

6.2.7.1 Electricity 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.

Impact Rating
Should generators be used for temporary local electricity supply during construction this would be considered as MINOR.

6.2.7.2 Water supply

Construction Phase
During construction, large volumes of water will be required for sanitary purposes. Assuming 50 litres per capita this can amount to between 450 and 900 m^3 per day during peak time (for the two scenarios used in Section 6.6.1, i.e. 9,000 and 18,000 workers on site each day), 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.

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 and contractors on site is unlikely to exceed a total of 400 (unless major maintenance is to be carried out on individual plots).

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 81: Trial panels at Benban

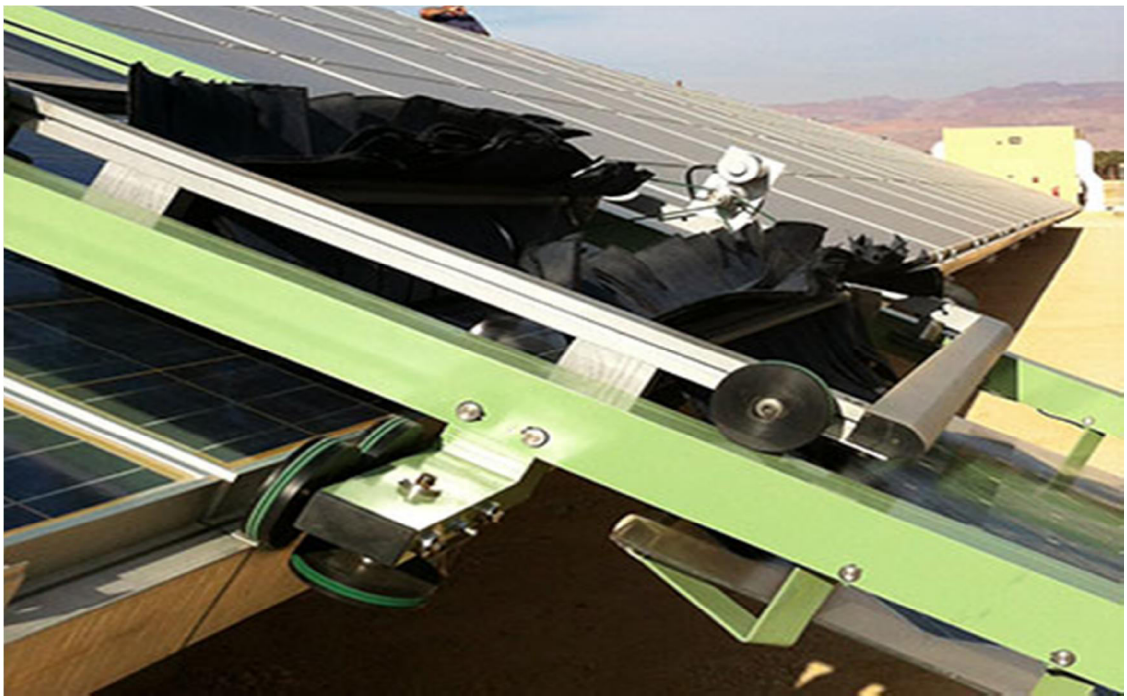


Figure 82: Fixed installed brush (dry) cleaning system

Figure 83: Wet cleaning

According to developers with PV installations operating in similar conditions (desert environment), cleaning could become necessary once or twice per month. Cleaning with water could require between 2 and 4 litres per panel for each cleaning cycle. It is not known how many panels in total will be installed on the Benban PV; how often they need to be cleaned; what option the developers will take (dry or wet); and how much water will be used per panel for wet cleaning. The following table presents two scenarios which are based on:

- 200,000 panels per 50 MW plot;
- Total of 1,800 MW installed at the Benban site (i.e. 7,200,000 panels in total);
- 50% or 100% of panels to be wet cleaned;
- 2 or 4 litres per panel for each cleaning cycle (400 m^3 or 800 m^3 per plot per cycle)

Table 33: Water requirement scenarios for panel cleaning for the entire Benban site

	Plots (MW) to be cleaned)	Panels to be cleaned	Water requirement per panel (litres)	Water requirement (in m^3)	Monthly water needs (m3) [8]	Daily water needs (m3) [9]
50% of panels on site wet cleaned; once cycle	18 (900)	3,600,000	2	7,200	14400	480
			4	14,400	28800	960
75% of panels on site wet cleaned; one cycle	27 (1,350)	5,400,000	2	10,800	21600	720
			4	21,600	43200	1,440
100% of panels on site wet cleaned; one cycle	36 (1,800)	7,200,000	2	14,400	28800	960
			4	28,800	57,600	1,920

It is not known whether these water requirements will be for one day or will arise over a period of many days. This will depend on the length of the cleaning cycle, which again will depend on the method applied (manual/semi manual/fully automated). The Consultants have no information about this and more realistic calculations of water requirements will have to be made by the developers and by Benban PV site management, to ensure a reliable and environmentally sustainable supply of water.

The figures above are for one cleaning cycle. If we assume 2 cleaning cycles per months, for 100 % of the panels, as a worst case scenario then total monthly water usage *during operation* could reach 57,600 m^3. This is equivalent to 1920 m^3per day or 1.3 m^3 per second and is considered negligible compared to river flow rate (700 m^3 per second).

According to NREA there are currently no plans to provide a fixed water supply to the Benban site; however, as the Ministry of Irrigation rules out the use of new groundwater wells the most realistic solution is either a connection to the Benban municipal system or a separate water supply (inclusive of a water treatment plant) via a 16 km pipeline from the River Nile, as it was planned for the Kom Ombo CSP project. The key environmental implications of both options are summarized below (based on the Kom Ombo CSP study data).

[8] assuming 2 cleaning cycles per month
[9] assuming 2 cleaning cycles per month

River Nile Water Extraction Option:
Construction and operation of a water supply to the Benban PV site (Figures below) could have the following impacts:

- The construction of the water intake structure would temporary affect the water, riverine flora/fauna, soil and air quality in the vicinity of the water intake structure.
- The construction of a 16 km pipeline to the south-eastern corner of the Benban PV site would cause nuisance due to dust and noise emissions in addition to traffic impacts.

Major impacts during operation would be the following:

- Water subtracted from the Nile may have an impact on the existing water flow and velocity and may affect the performance of the existing water intake facilities serving Bin Ban village.
- The operation of the pumps needed to subtract and transport the required amount of water will result in noise emissions.

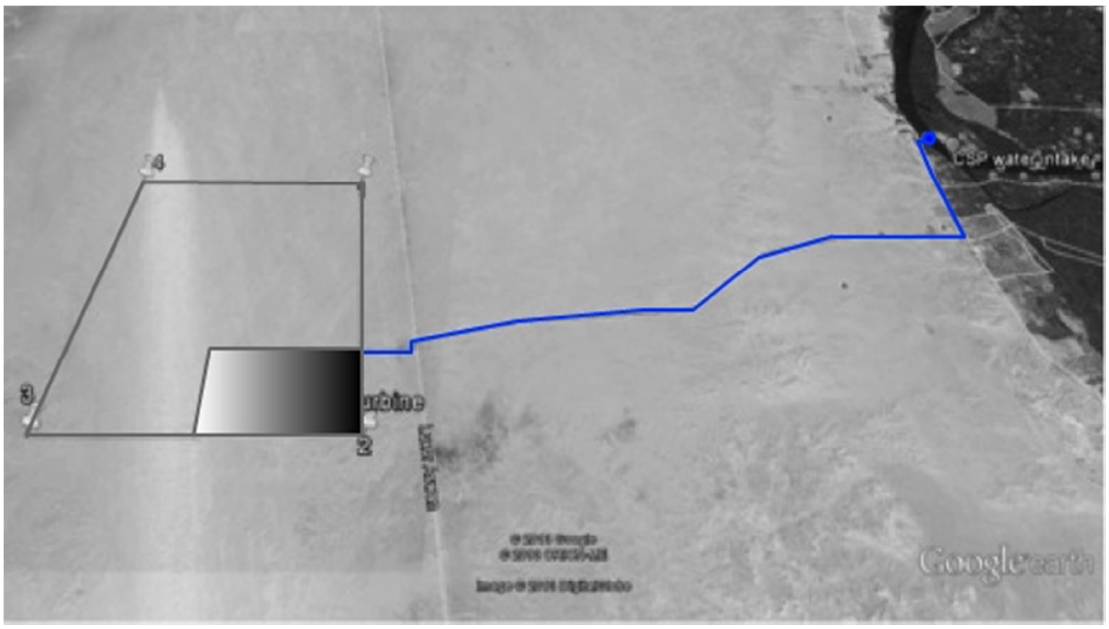


Figure 84: Water supply pipeline from the river Nile to the Kom Ombo/Benban PV site

Figure 85: Proposed Kom Ombo water extraction point on the River Nile

The Kom Ombo impact assessment is based on water abstraction from the River Nile at a rate of around 380m^3/h to 600m^3/h (0.11 to 0.16 m^3 per second), or 9-14,000m^3/day. For comparison, the current water extraction for Bin Ban village is 0.09 m^3/s. As mentioned before, it is not possible to accurately how much water will be required (daily of monthly) for panel cleaning. Under a worst case scenario (2 cleaning cycles per month; 4 litres per panel) a total of 1,920 m^3 would be required per day (1,3 m^3/per second). Comparing this with the overall river flow (minimum flow approximately 700 m^3 per second) this would be an insignificant volume, particularly if panel cleaning is staggered and takes days per cycle.

Impact Rating
The impact on water abstraction from the River Nile at the maximum calculated rate for Benban (worst case scenario) is considered MINOR.

6.2.7.3 Sanitary Installations and Waste Water

Construction Phase: Provision of adequate sanitary facilities during construction will require substantial volumes of water during the construction phase. It is likely that most Benban Projects will install, at least temporarily during the construction phase, containerized sanitary facilities (see Figure below). Assuming 50 litres per day per

person on site this could in total require around 450-900 m^3 per day (for 9,000 or 18,000 workers respectively). These volumes are manageable and could even be brought in by tanker.

Operations Phase: The much reduced number of permanent staff, temporary staff (e.g. for panel cleaning) and of contractors will require around 20 m^3 of water per day (based on 400 workers on site).

Figure 86: Sanitary container

Waste water volumes would be roughly equal to water used and will have to be treated on-site or temporarily stored in septic tanks for off-site transport for treatment in a municipal waste water treatment facility.

Impact Rating
These impacts are considered MINOR, for both the construction and operations phases.

6.2.7.4 Waste

Waste will be generated during both construction and operations phases. This 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 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.
- Excavation spoil: Volumes are not known. Developers indicated that they expect little need for foundations.

- Paper/packaging/plastics: Mainly from the transport packaging for frames, panels and electrical equipment.
- Hazardous wastes: Mainly cleaning fluids, solvents, paints; solder from electrical connections.
- Municipal waste: Mainly from food production; two developers of 50 MW plots estimated this to amount to 15 tons per week (which translates into around 540 tons for the entire Benban PV site).

One developer provided a breakdown of the anticipated waste streams for a 50MW plot. He estimates that solid waste during the construction phase will amount to 200 tons in total (which would translate into 7,200 tons for the entire Benban PV site) and will consist of

- Organic waste 56 %
- Others 15 %
- Plastics 13 %
- Paper/cardboard 10 %
- Glass 4 %
- Metal 2 %

The total of 7,200 tons is a manageable volume as it would occur over a long period of time (6-12 months). Proper waste collection and storage plus regular (preferably daily) waste collection by licensed contractors will need to be arranged by developers or site management. To co-ordinate 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).

Impact Rating
With proper and controlled management these impacts are considered MINOR, for both the construction and operations phases.

6.2.8 Occupational Health and Safety

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 (6-12 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 each plot and for the Benban PV site as a whole. Developers 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 centre 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.

The social implications of the project are in detail assessed later in this chapter, however, labour requirements are closely related to logistical and traffic arrangements mentioned in this section of this report.

Construction Phase: A key issue is the number of workers required for construction. As set out in the previous section, this can be 500 workers for each plot for a period of up to 3 months, with lower numbers during the run-up to construction and during finishing (e.g. electrical connections; commissioning).

Most developers who 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. Developers generally stated that they need 6-10 permanent staff on site during daytime, plus additional workers for panel cleaning. Most permanent staff are likely to live locally.

Impact Rating

Assuming that each plot has its own H&S management system with clear guidance and training and supervision of all workers and contractors, these occupational health and safety impacts can be considered MINOR for both the construction and operations phases.

Table 34: Potential Environmental Impacts during Construction Phase

Context	Likely Impact					
		Positive/ Negative	Location	Duration	Mitigation available	Significance after mitigation
Landscape and visual impact	Large construction site with large number of vehicle movements on and off site. Highly visible from the Aswan – Luxor Highway.	Negative	Local	Short-term	Yes	Minor
Land use, soil and groundwater	Risk of soil and groundwater contamination from municipal and hazardous wastes is low (groundwater is at a depth of approximately 240 metres)	Negative	Local	Short-term	Yes	Minor
Biodiversity	Construction works can destroy habitats and their flora and fauna. However, this is desert land without biodiversity value. Only few and common flora and fauna species were found.	Negative	Local	Long-term	No	Minor
Archaeological and cultural heritage	There is no evidence of archaeological structures on the Benban PV site, and no indication that the site has any cultural heritage value. However, chance finds are possible.	Negative	Local	Long term	Yes	Minor
Noise and Air Quality	There can be considerable local noise from transport vehicles and machinery used for panel array construction and, to a lesser extent, from excavation work for foundations and cable ducts. The large number of vehicles entering the site for deliveries during peak construction time will lead to a deterioration of ambient air quality due to vehicle exhaust gases; similarly, if generators are used, local air pollution will occur. There may also be significant impact due to dust. The large area under construction will generate high levels of dust that has the potential to have a significant impact particularly on site workers and to a lesser extent on local communities and road users under certain weather conditions. Furthermore, high dust levels can also have significant impact on projects when commissioning and testing, since some will commission whilst others are still constructing, and it is important for performance tests that the panels are not covered in dust. Therefore dust mitigation is key.	Negative	Local	Short term	Yes	Medium

Context	Likely Impact	Positive/ Negative	Location	Duration	Mitigation available	Significance after mitigation
Traffic	Delivery of components for the PV panel arrays and transport of a large number of workers will cause a high number of vehicle movements during construction time. This is a cause of air pollution; a risk to workers on site; and a risk to other road users on the highway at the connections to the Benban PV site.	Negative	Local and regional	Short-term	Yes	Major
Infrastructure and Services	Electricity supply – There is currently no electricity supply to the Benban site, and none is planned at the moment. In the absence of a central electricity supply to the Benban PV site developers will have to use generators which will produce exhaust gases and can be noisy.	Negative	Local	Short term	Yes	Minor
	Water - Significant volumes of water are required for sanitary services (estimated 50 litres per worker per day).	Negative	Local	Short term	Yes	Minor
	Sanitary Installations and waste water – Sanitary installations have to be provided temporarily for the large number of workers during peak construction time.	Negative	Local	Short term	Yes	Minor
	Waste – Construction phase wastes are likely to consist of building waste; excavation spoil; paper, packaging, wood, and plastics: hazardous wastes from cleaners, solvents, paints; and municipal waste mainly from food production. Developer estimates indicate that organic food waste, packaging (including wood) and plastics are expected to be dominant waste groups.	Negative	Local	Short term	Yes	Minor
Occupational health and safety	There are generic risks associated with construction sites. These 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). The risk for such impacts is temporary (6-12 months) but an effective occupational health and safety management system has to be implemented on each plot and for the Benban PV site as a whole. The largely unskilled construction workforce will have to be instructed and supervised	Negative	Local	Short term	Yes	Minor

Table 35: Potential Environmental Impacts during Operation Phase

Context	Likely Impact	Assessment of Impact				
		Positive/ Negative	Location	Duration	Mitigation available	Significance after mitigation
Landscape and visual impact	Panel arrays will become the dominant feature in this flat landscape.	Negative	Local	Long term	Yes	Minor
Land use, soil and groundwater	Limited risk of soil contamination from municipal and hazardous wastes including fuels and lubricants. Groundwater is at a depth of approximately –240 metres, so risk of contamination is very low)	Negative	Local	Long term	Yes	Minor
Biodiversity	Project site is desert land with limited terrestrial biodiversity. Only few and common flora and fauna species were found. Water from panel cleaning during operation may support biodiversity. There is potentially an impact on birds which use the Nile valley as a migratory path (disorientation due to the large area of panels). This may be related to the altered aerial appearance of the desert which may attract the soaring birds and should be investigated as a precautionary measure.	Negative	Local	Long term	Yes	Minor
Archaeological and cultural heritage	There is no evidence of archaeological structures on the Benban PV site, and no indication that the site has any cultural heritage value. However, chance finds of buried artifacts is a highly unlikely possibility.	Negative	Local	Long term	Yes	Negligible
Noise and air quality	During normal operations there should be no significant noise or air pollution sources.	Negative	Local	Long term	Yes	Negligible

Context	Likely Impact	Assessment of Impact				
		Positive/ Negative	**Location**	**Duration**	**Mitigation available**	**Significance after mitigation**
	Solar generated electricity will displace a significant volume of gaseous pollutants such as particulate matter, SO_2, NO_X and CO_2, compared with thermal generation.	Positive	Regional/Global	Long term	N/A	Major
Transport/Traffic	Vehicle traffic will be low.	Negative	Local	Long term	Yes	Minor
Infrastructure and utilities	Electricity supply – it is assumed that no generators will be required	No impacts			N/A	NA
	Water – river water supply. Solar panels will have to be cleaned to avoid reduced efficiency due to dust built-up. Wet cleaning is a commonly used option and requires large volumes of clean water. Dry (brush) cleaning is an alternative. River Nile water abstraction will have a minor impact..	Negative	Local	Long term	Yes (supply of river water from the Nile)	Minor
	Water – groundwater abstraction Groundwater extraction has been considered as an option but was recently (Autumn 2015) ruled out by the Ministry of Irrigation and Water Resources.	No impacts	Local	Long-term	NOT assessed for groundwater extraction	NA
	Sanitary installations and waste water – Only a small number of temporary workers will be on site during daytime; volumes of sanitary water and subsequently waste water to be disposed of will be small and easily manageable (septic tanks/treatment off site).	Negative	Local	Long term	Yes	Minor
	Waste- Waste will mainly consist of municipal waste; volumes will be low and can be easily managed.	Negative	Local	Long term	Yes	Minor
Occupational health and safety	Occupational health and safety risks will be associated with repair and maintenance of panels and their electrical connections. These can be managed with a H&S system.	Negative	Local	Long term	Yes	Minor

6.2.9 Social and socio-Economic Impacts

Project affected People and Project Stakeholders

Consultation with project stakeholders has been carried out. This includes 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.

Social impacts identified as a result of stakeholder engagement activities, SESA scoping and project locality observations include the following:

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 assessed in detail in the following sections of this report and are presented for the construction phase and the operations phase of the Benban development. Project impacts were discussed with various stakeholders during the scoping and data collection phase as well as during public consultations.

6.2.10 Socioeconomic impacts – workforce and supply chain

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 project 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 500 workers per plot. In case of a simultaneous start of all the construction activities 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 who will benefit from the project. This 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. Developers generally stated that they need 6-10 permanent staff on site during daytime, plus additional workers for panel cleaning. Most permanent staff are 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, catering, 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 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, though 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.
- Where labour agencies are to be used to source workers the Developers will 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 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;

Workforce Impact Rating

Overall, impacts are considered MAJOR for the construction phase with the potential for this impact to be positive but with a high risk that it could result in a negative impact if not adequately mitigated. Operational impacts are relatively MINOR positive as long as good working practices and site management practices are in place. A number of points within the action plans are specifically aimed to address some of these issues.

6.2.11 Community Health Safety, and Security

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:

Construction Phase: Throughout this phase there will be many potential health and safety risks to the communities in the area. These include risks associated with increased traffic and the influx of workers. Many of the worker influx issues have been discussed in the employment section above however the specific interactions of influx workers on local communities are discussed further here.

It is recognized that there will population influx to the area from a variety of sources including domestic and international sources whether seeking formal or informal; direct or supply chain related jobs. The interactions between the various stakeholders will determine the level of impact.

Operations Phase: Permanent staff employed for normal operations will reside the project areas. Similar issues for permanent workers and their impact on local communities exist although on a much smaller scale.
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

Impact Rating
The development and implementation of various strategies and plans identified in this SESA will mitigate many of the risks. Nevertheless, the high population influx anticipated and the many stakeholders involved result in some residual risk remaining. As such, these community health and safety impacts can be considered MAJOR for construction and MINOR for operational phases.

6.2.12 Land use, land acquisition and involuntary resettlement

During construction phase
The project area of 37.2 km ^{2} falls within the desert borders of the Aswan governorate-owned land. Ownership has been transferred to NREA in light of communications and approvals by the governorate, the armed forces as well as other relevant entities (e.g. civil aviation, General Authority for Rehabilitation Projects and Agricultural Development). The site is completely bare desert land that was allocated for future agricultural investments. The project site has never been in private ownership or subject to informal use. Based on Presidential decree number 274, Aswan Governorate approved the transfer of ownership to NREA. Similarly to other cases of allocation of state-owned land across Egypt, the National Center for Land Use planning, Ministry of Civil Aviation, New Settlements Authority, and the

Armed Forces provided their consent/clearance on using the land for solar Energy Development.

Following the 25th of January 2011 revolution some individuals felt that there were greater opportunities to encroach on unoccupied land. Therefore NREA asserted its ownership of the site and implemented security measures to prevent this. In cooperation with local authorities NREA announced a deadline for trespassers to leave the project site – following this security measures were implemented to prevent any encroachment.

The projects are not expected to require additional land other than for a water abstraction point (if river water abstraction is chosen as the water supply option). A right of way over unused and unoccupied desert land will also be required for the associated high voltage transmission line.

Knowing that the land was allocated for solar projects, some encroachers occupied the site and constructed primitive fences from white bricks in order to claim ownership. During April 2015, the army in cooperation with the national security force removed all encroachers and hired local guards to protect the area until a fence is constructed. The mayors and community leaders were invited to a meeting with the army in Benban where they were informed about the illegal status of the encroachers. Thereafter, mayors and community leader asked all encroachers to leave the land. As the invaders were aware about their illegal actions, they agreed to leave. The land was handed over to NREA and a formal handover document was signed and registered in the local governmental unit. Various approvals were obtained for the transfer of ownership:

1- Aswan Governorate Authority, transfer of ownership decree on 15th of April 2013
2- General Organization for Physical Planning on 28th of April 2013
3- General Authority for tourism development on the 15th of May 2013
4- South Valley Oil Company approval on the 14th of May 2013
5- Ministry of Hosing, Utilities and Urban Development approved on the 8th of May 2013 upon transfer of lands
6- Ministry of Civil Aviation approved on the 15th of August 2012
7- EEAA approved on the site in June 15th 2013
8- Army approval on the 12th of April 2014
9- National Centre for Planning State Lands Usage 11 March 2013

During the process of evacuation of encroachers, these did not claim any kind of ownership as they were aware of having no right in the land. They just tried to take advantage of the proposed project. Regarding the overhead transmission lines and associated facilities, they will pass across vacant desert land owned by the governorate. If a temporary workers camp is to be erected near the Benban PV site additional land would need to be temporarily used; these areas near the site are also state owned. Based on a discussion with the governorate authority held on the 21st

of November 2015, the head of investment department reported that additional land will be transferred to NREA in case this is needed for workers accommodation.
Operations Phase: There will be no additional land acquisition activities during the operation phase.

Impact significance
As this is all government owned and vacant desert land, the impact is considered MINOR. There is no resettlement.
Proposed mitigation measures

- The project area (and other areas which might be required temporarily for a workers camp or for parking and materials storage) should be fenced in order to avoid any potential intrusion;
- The Developers Association should hire a professional security company that will provide protection in compliance with national law and IFI requirements;
- The Developers Association should liaise with police and other security officials to keep track of any intrusion.

Proposed monitoring measures

- Regular check of site security arrangements;
- Regular checks of security personnel (to ensure compliance with legal and IFI requirements;
- Review of grievance management systems regarding security;
- Review of any claims to land ownership on a plot by plot basis.

Impact Rating
Overall, impacts are considered MINOR for the construction phase and no impacts for operations phase as long as good security and site management practices are in place. As it was mentioned above, the land is completely vacant desert lands with no customary ownership claims.

6.2.13 Impacts on the existing infrastructure

1- **Impacts on road and traffic:** As it was previously mentioned in the environmental section roads and traffic will be affected due to moving the vehicles and equipment of the developers. That will necessitate a detailed traffic management plan to be prepared in full collaboration among the developers. That plan should be based on the regular activities of the community and the seasonal activitieconsider the crop harvest and the annual horse festivals. Construction of a water supply might also result in damage to roads which will necessitate rehabilitation.
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 supply:** Construction is not anticipated to result in any impacts on the local electricity supply due to reliance on generators installed inside the construction site.

Proposed mitigation measures
The developers need to identify, evaluate and monitor the potential traffic and road risks to workers and potentially affected communities throughout the project life cycle and, where appropriate, 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 need to take into consideration relevant EU road and traffic safety management standards, identify road safety measures and incorporate[10] 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.

Impact Rating
Overall, impacts related to infrastructure are considered MINOR for the construction phase and no impacts for operations phase as long as the mitigation measures related to traffic, water, underground utility and electricity supply management practices are in place.

6.2.14 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

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

areas, but in the conservative rural and Bedouin areas this may affect the local people's cultural privacy. Further assessment of population influx is necessary and a worker code of conduct, fully cognizant of local sensitivities, will be necessary.
During operation:

Impacts during operation phase are likely to be similar to those during construction, although on a smaller scale. Proposed mitigation measures

- A 'Worker code of conduct' and population influx studies are required;
- 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.

6.2.15 Overconsumption of community resources

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. Proposed mitigation measures

- A guidance note should be prepared by the developers association for procurement procedures and sources of supplies and suppliers;

- The developer association should negotiate with the governorate in order to increase the quota of flour 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 related to 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 jobs) 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 is 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.

Additional benefits will be the creation of a number of permanent jobs for during the operation phase (probably 6-10 per facility, plus some temporary employment).

Table 36: Potential Social Impacts during Construction Phase

Component	Impact	Positive/ Negative	Location	Duration	Mitigation available	Significance (after mitigation)
Socioeconomic impacts	**Job creation:** Creation of direct and indirect temporary jobs	Positive	Local/regional	Temporary	Yes	Major
	Worker influx: The risks and impacts of influx of skilled and unskilled workers, opportunists and others requires robust mitigation and monitoring	Negative	Local / regional	Temporary	Yes	Minor
Community health and safety	Influx of workers and vehicles may have adverse impacts on community health and road safety	Negative	Local	Temporary	Yes	Minor
Land use, acquisition and involuntary resettlement	**Land needed for the project:** The project will need 37.2 km square of lands to be obtained from state owned lands allocated to NREA for establishing the solar units. The land is owned by the governorate of Aswan. The land was reserved for future investments i.e. solar projects	No impacts	NA	NA	NA	NA

Component	Impact	Positive/ Negative	Location	Duration	Mitigation available	Significance (after mitigation)
	The overhead transmission lines: That will connect the substations with the national grid. The OHTL trespasses bare desert lands	No impacts	NA	NA	NA	NA
	the potential water intake land: It is anticipated that the water intake will extract water from the Nile from a vacant land owned by the Local Governmental unit	No impacts	NA	NA	NA	NA
	Land needed for any other associated facilities (e.g. workers accommodation, storage of equipment ..etc) The project might require additional plots of land in order to accommodate workers and construct any other facilities. Such activities should meet the requirement of PR/PS 5 pertaining to Land Acquisition, Involuntary Resettlement and Economic Displacement	Negative	Local	Temporary	Yes	Minor

Component	Impact	Positive/ Negative	Location	Duration	Mitigation available	Significance (after mitigation)
Infrastructure related impacts	Transport – vehicle traffic will be low. That will affect the income of small vehicles drivers	Negative	Local	Temporary	Yes	Minor
	Electricity supply – it is assumed that generators will be utilized. Therefore, load on electricity grid is not applicable	No impacts	NA	NA	NA	NA
	Water – river water supply. Solar panels cleaning and domestic usage by workers	Negative	Local	Temporary	Yes	Minor
	Water – groundwater abstraction Groundwater extraction would have to be evaluated and it is assumed for these purposes that this option will not be adopted	No impacts	NA	NA	NA	NA
	Sanitary installations and waste water – Sanitary water to be evacuated by private vehicles. That will generate income to the owners and workers of vehicles	Positive	Local	Temporary	Yes	Minor

Component	Impact	Positive/ Negative	Location	Duration	Mitigation available	Significance (after mitigation)
	Waste- Waste will mainly consist of municipal waste; volumes will be low and can be easily managed. A private contractor will benefit from waste collection services	Positive	Local	Temporary	Yes	Minor
Cultural resources	Cultural impacts on community traditions	Negative	Local	Temporary	Yes	Minor
Community resources	Influx of hundreds of workers to the project site will result in affecting community resources	Negative	Local	Temporary	Yes	Minor

Table 37: Potential Social Impacts during Operation Phase

Component	Impact	Positive/ Negative	Location	Duration	Mitigation available	Significance (after mitigation)
Socioeconomic	Creation of direct and indirect permanent jobs.	Positive	Local	Permanent	NA	Major
Community health and safety	Influx of workers and vehicles may have adverse impacts on community health and road safety	Negative	Local	Temporary	Yes	Minor
Infrastructure related impacts	Transport – vehicle traffic will be low. That will affect the income of small vehicles drivers	Negative	Local	Permanent	Yes	Minor
	Electricity supply – the Benban park will generate electricity to the national grid	Positive	Regional	Permanent	NA	Medium
	Water – river water supply. Solar panels cleaning and domestic usage by workers	Negative	Local	Permanent	Yes	Minor
	Sanitary installations and waste water May generate income to the owners and workers of septic tank evacuation vehicles	Positive	Local	Permanent	Yes	Minor
	Waste- Mainly small amounts of municipal waste. Contractors may benefit from providing services	Positive	Local	Permanent	Yes	Minor
Cultural resources	Cultural impacts on community traditions	Negative	Local	Permanent	Yes	Minor
Community Resources	Limited or no pressure on local resources expected	Negative	Local	Permanent	Yes	Minor
Security arrangements	Arrangements will be required to ensure that adequate measures are in place to manage security teams and their community interactions	Negative	Local	Permanent	Yes	Minor
Land use, acquisition and inv. resettlement	No additional land needs expected	No Impacts	NA	NA	NA	NA

6.3 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 degrees. They suffer from malnutrition and diseases. Their hygienic attitudes are below standard. 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 form 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 and 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 the 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 empowered and enabled to get into the social networks. Females are still marginalized and not fully engaged in the society due to prevailing norms and traditions. 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.

Elderly 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 some females from Benban and Fares, almost all food canning production is operated by migrant females who work hand in hand with migrant males. They suffer due to poor quality of life, poor health conditions, and 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 (by social norms). 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. 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. 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.

6.4 Aggregate Impacts

From a purely environmental point of view the land-take for each project does not constitute a significant impact on the natural habitat and its components, given the characteristics of the site. The same applies to the Benban PV project as a whole. There is also no apparent negative impact on archaeology and cultural heritage, from either individual projects or from the whole site.

The manifested impact of the Benban PV site becomes apparent when considered as a construction project.

Each of the 41 individual Benban Projects is a medium-sized construction project. However, taken as a whole, the Benban PV site is collectively a mega construction project which will turn a large tract of desert area into a high-tech facility.

Individual Benban Projects are not identical. They use comparable technology but differ in details of plot layout;

- construction schedule;
- manpower requirements during construction (and thus in associated infrastructure requirements for the temporary workforce, e.g. housing);
- panel technologies and frames;
- maintenance schedules and methodologies; and
- plot infrastructure (temporary or permanent facilities for storage; collection of waste; sanitary facilities; control and maintenance buildings etc.).

However, the manifested impact is aggregated by the similarities. Each project will

- Require a large number of temporary workers for construction (who require accommodation; food and transport);
- Receive a large number of containers with components, within a short period of time (probably 3-6 months);
- Use resources (notably water for sanitary facilities during construction and for panel cleaning during the operations phase);
- Generate liquid and solid waste (mainly during construction).

Whilst these pressures of a large workforce; the large number of vehicle movements to and from the site; the volume of solid waste; and the water requirements on the local environment and community are low-to-medium for a single project, they become more significant when combined for all 41 projects. This becomes obvious when comparing data for a representative single plot with aggregate data for all plots. This is presented in the following tables (based on feedback from a number of developers and previous experience with similar project), for the number of workers; traffic (with emphasis on the peak construction period); and for water usage during normal operations. These data may not be absolutely precise, but they are a good indicator for local environmental and social pressures.

Table 38:Key aggregate impacts- Traffic

	Single Plot (50MW)	Scenario 2 (worst case): All 41 Plots (1,800 MW equal to 36x50MW) start peak time construction simultaneously
Daily number of workers at peak construction time (90 days)	500	9000- 18,000
Daily number of workers at normal construction time (5 months)	200-300	7,200 – 10,800
Daily number of buses required to transport workers on/off site at peak construction time	10	360
Daily number of buses required to transport workers on/off site at normal construction time (not peak time)	4 - 6	144 - 216
Total number of containers delivered within 90 days	600	21,600
Daily number of containers delivered during 90 days peak construction time	7	240
Daily number of other vehicles at peak construction time and at normal construction time entering and leaving the site	10	360
Daily total number of vehicles at peak construction time	27	960
Daily total number of vehicles at	4-6	144-216

	Single Plot (50MW)	Scenario 2 (worst case): All 41 Plots (1,800 MW equal to 36x50MW) start peak time construction simultaneously
normal construction time (not peak time)		
Daily total number of vehicles leaving and entering the highway at normal construction time (not peak time)	8-12	288-432
Daily total number of vehicle movements (i.e. vehicles leaving or entering the highway) at peak construction time	54	1,920

Table 39: Key aggregate impacts- Manpower Requirements

	Single Plot (50MW)	Scenario 2 (worst case): All Plots (36x50=1800MW) peak construction simultaneously
Daily number of workers at peak construction time (90 days)	500	18,000
Daily number of workers at normal construction time (5 months)	200-300	7,200 – 10,800
Daily number of workers (operations phase)	10 (plus workers for panel cleaning)	360

Table 40: Key aggregate impacts- water requirements for panel cleaning

	Single Plot (50MW)	Scenario 2 (worst case): All Plots (36x50=1800MW) peak construction simultaneously
Daily number of workers at peak construction time (90 days)	500	18,000
Daily number of workers at normal construction time (5 months)	200-300	7,200 – 10,800
Daily number of workers (operations phase)	10 (plus workers for panel cleaning)	360

These impacts and resource requirements provide a challenge to NREA and the developers. The most important requirement for successful and timely construction and operation of the Benban PV site is the establishment of an effective site management entity.

All developers contacted stated that they plan to start construction at the earliest possible date (i.e. when all permits are obtained and finance is in place), and complete construction within 6-12 months. This is a demanding schedule and to ensure smooth construction work and to minimize delays and risks, the following will need to be done by site management:

- All utilities and services necessary for construction work are in place at the beginning of construction (e.g. electricity supply; water supply; parking and container storage; site security; worker sanitary installations; food production emergency services; waste management on site and disposal arrangements);
- A traffic management plan for the construction period is in place and materials delivery schedules have been agreed between the developers;
- Environmental management is in place (development of an overall, ISO based site management system to manage and reduce impacts);
- Stakeholder engagement and public information and consultation is functioning;
- A high –level occupational health and safety management plan is in place (to support individual developers; minimum labour standards have been agreed;
- Training and supervision of workers (largely unskilled workers during the construction period) has been agreed, trainers and training materials are available and a training schedule has been agreed;
- A procedure for archaeological chance-finds is in place.

This is a high profile project for the country, for individual developers, the solar PV industry as a whole, and for the financial institutions supporting individual Benban Projects. Its implementation carries a considerable reputational risk. The reputation of the overall Benban project depends on the performance of individual Benban Projects and the perceived overall performance of the entire project with its aggregate environmental and social impacts and benefits. To minimize reputational risk 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.

6.5 Summary of Common E&S Issues for all developers

Based on the outcome of E&S assessment and several consultations workshop held at the NREA premises in Cairo, common issues raised by developers and stakeholders and recommended actions to address such issues are presented below:

Table 41: Common issues for Benban developers

Issue	Description	Priority	Response
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	The Benban SESA will propose a common 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. **However** this will still require a mechanism for developers to collectively pay for and commit to this programme.
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.
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.

Issue	Description	Priority	Response
Emergency procedures	Contiguous sites mean 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.
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.
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.
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.
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.

Issue	Description	Priority	Response
During construction			
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.
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.
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.
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.

Issue	Description	Priority	Response
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.
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.
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.
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.
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.

The Environmental and Social Action Plan in the following Chapter provides recommendation for high-level mitigation and management measures to reduce the impact and risk from the Benban project and to maximize benefits for local communities. All project developers will be expected to meet the requirements of the SESA through a Developers Association.

7 ENVIRONMENTAL AND SOCIAL ACTION PLAN

7.1 OBJECTIVES OF THE ESAP

This chapter presents the environmental and social measures required to manage and minimize potential negative impacts of the project identified in this SESA and / or to complete additional studies to further identify appropriate mitigation measures where necessary. Outcomes of the ESAP will not only minimize project risks but also maximize positive impacts on the local communities. Equally, the measures identified are designed to reduce project delivery / logistical risks through good E&S stewardship.

The overall objective of the ESAP is to provide a mechanism by which the common mitigation issues identified in this SESA are carried through to development. These are high level recommendations for the entire site, to provide an 'umbrella' of agreed measures to be followed and implemented by all Benban Projects/developers, these action items would be best served through the Developers Association currently being formed.

It is anticipated that specific project management plans and procedures will need to be developed by site management that supplement the Benban Development policies, plans and procedures. However, if the below ESAP can be actioned by a central coordinated body cost benefits and efficiencies for all developers and project stakeholders can be realized. Therefore, the ESAP presented below anticipates a key role for an entity responsible for overall site management and coordination. It is an important risk mitigant, to minimize negative impacts and maximize positive impacts, that NREA, EETC and the developers coordinate to establish such an entity.

Specific measures for individual Benban Projects depending on their specific characteristics will be identified when developers prepare 'Form B' submissions to the Egyptian authorities or when Benban Projects are subject to due diligence by IFIs who will apply their own requirements and safeguards for construction and operations. This ESAP does not replace the Form B / Lender requirements but it is anticipated that many of the regulatory / lender requirements will be fulfilled through the adoption of this ESAP.

The below ESAP sets out a common agreement between NREA and the project developers to ensure that the mitigation measures proposed for the Benban complex are fully addressed.

Table 42: Environmental and Social Action Plan

Issue and Mitigation Action	Benefits	Requirement (Legal; IFI; BP)	Responsibility and Resources	Schedule	Target/Evaluation Criteria
E&S Capacity, consistency and management Many of the mitigation measures identified in the SESA to address aggregated impacts require a consistent approach by all developers. The Developers Association, supported by the individual developers, will need to appoint a suitably qualified team, with adequate budget, to develop the various strategies and plans identified in the SESA prior to commencement of any construction related activities. The Developers Association E&S team, site management arrangements, the local communities and the regulatory authorities will need to be consulted to form a fully integrated working group.	Ensure a single, coordinated and complimentary approach to E&S issues by the Benban developers. Reduction in project related risks such as logistics, workforce and resources. Reduction in costs for any one developer to E&S management. Full integration of E&S matters with logistics, project management, community interaction and other stakeholders will increase the project benefits and mitigate the risks and negative impacts.	NREA requirements IFI requirements Best practice	Developers Association / All Developers	Prior to any construction related activities	Fully staffed advisory team developing all relevant plans prior to construction.

Issue and Mitigation Action	Benefits	Requirement (Legal; IFI; BP)	Responsibility and Resources	Schedule	Target/Evaluation Criteria
Development and Completion of relevant plans and strategies The SESA for Benban has identified a number of plans and strategies required to be developed prior to construction works, these include: • Environmental & Social Management Systems; • Contractor management plan including minimum EPC requirements; • Labour and Working Conditions strategy and employment plan; including worker accommodation 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. Each of these items is covered in detail in the following sections of this ESAP.	Additional studies have been identified by way of this SESA to fully assess and mitigate detailed E&S issues in aggregate. The completion of these studies identified in the SESA will facilitate adequate management of E&S issues prior to the commencement of project activities. It is essential that these works are completed prior to construction.	NREA requirement IFI requirements Best Practice	Developers Association and their Advisory team	Prior to construction	Delivery of each strategy and plan for approval by NREA and EEAA.

Issue and Mitigation Action	Benefits	Requirement (Legal; IFI; BP)	Responsibility and Resources	Schedule	Target/Evaluation Criteria
Environmental & Social Management Systems An E&S management system is required for the Benban Development to establish a framework, with detailed management plans, for all pertinent common E&S issues which will cover common areas / facilities used by all developers. A management system will be required for 1, construction and 2, operation phases of the project and will be aligned (for construction) and certified (for operation) with national requirements and international good practice.	A management system with associated construction and operation management plans will provide a common framework for E&S management of all shared and common facilities.	Included above	Included above	Included above	Included above

Issue and Mitigation Action	Benefits	Requirement (Legal; IFI; BP)	Responsibility and Resources	Schedule	Target/Evaluation Criteria
Labour and Working Conditions strategy and employment plan To avoid the potential negative impacts association with substandard labour practices a detailed strategy is to be developed setting common standards for labour and working conditions, and code of conduct. In addition, a detailed assessment of the local labour market is needed with a view to developing a local employment and training plan. This could include the development of a centralised database for available workers. Where external workforce is required, a worker influx strategy is to be developed which will include an accommodation plan and procedures to manage issues associated with host communities and worker interactions with local populations. The plan should be shared with all developers, the Ministry of Labour and ILO representatives in Egypt for consultation and approval. Project developers will set out their staffing needs during the production of the plan and a common employment sourcing arrangement will be established. The strategy will include a detailed monitoring plan during labour sourcing.	Minimise risks associated with poor labour practices and opportunist labour agencies exploiting the local labour market. Reduce the risks of inter-community tensions and between communities and influx workers. Maximise the benefits of employment opportunities to project affected people. Provide safe and sustainable employment opportunities, set realistic employment expectations - including contract termination planning and communication. Minimise the potential for project delays as a result of 1, labour shortages and 2, local communities protesting at employment practices. Facilitate the identification and recruitment of available workers.	Included above	Included above	Included above	Included above

Issue and Mitigation Action	Benefits	Requirement (Legal; IFI; BP)	Responsibility and Resources	Schedule	Target/Evaluation Criteria
Security management plan Where common security arrangements are required the Developers Association will establish a common security management plan which will be benchmarked against the UN Guiding Principles of Security and Human Rights. The plan will include all appropriate employment, training, registration and community interaction procedures. The use of private security will be agreed with local police and other local authorities, will include measures to address opportunists occupying any areas of the site, and include a community grievance mechanism. A coordinated approach to security management will avoid multiple security arrangements between developers.	A properly trained and managed security team will both ensure adequate site security and also minimise risks association with security personnel and their interactions with the community.	Included above	Included above	Included above	Included above
Community H&S and security study, and population influx plan; A community health, safety and security plan is required to address issues related to population influx resulting from the Benban development, including establishing baseline health conditions of local population, establishing population influx management plans and procedures to mitigate risks to community associated with construction and operational phases of the project.	The risks associated with population influx and other project hazards will be better understood and managed with an adequate community H&SS plan and the project benefits to project affected people will be maximised.	Included above	Included above	Included above	Included above

Issue and Mitigation Action	Benefits	Requirement (Legal; IFI; BP)	Responsibility and Resources	Schedule	Target/Evaluation Criteria
Traffic, logistics and road safety management plan; The traffic management and road safety plan will be developed in close coordination with the community H&SS plan. The traffic management plan will be provided to the local law enforcement and parties responsible for road safety and will include training and capacity building where necessary. The plan will also consider general delivery logistics for equipment and material, including the provision for a centralised material and equipment storage area.	Road safety risks have the potential to represent significant risks and a comprehensive road safety plan will provide opportunities for community employment and mitigation of negative impacts. Applying a co-ordinated approach to delivery of material and equipment can reduce the risk of delays in construction.	Included above	Included above	Included above	Included above
Community development strategy and CSR programme A detailed community development strategy is required in order to maximise community benefits from the Benban project; this will then be used to develop the CSR needs assessment and strategy.	Project developers coordinating their respective CSR activities will have a positive impact on local communities, avoid duplication or conflicting efforts, and deliver sustainable benefits based on the communities identified needs.	Included above	Included above	Included above	Included above
Resource and utility plan, including provision of adequate water needs and associated studies Project developers will have common needs of resources and utilities and where these cannot be established at the specific land plots a resource needs plan will be developed, particularly regarding water sourcing, needs and efficiencies. The plan will identify the needs for additional studies required, e.g. Nile connection EIAs etc. This plan would also cover wastewater, drainage, waste management, electricity, and communication needs and apply a common approach where appropriate.	Reduce the risks of competing resourcing needs, minimise the impacts to local infrastructure / supplies and other stakeholders using the resources locally. Satisfy local permitting requirements. Maximise the efficiency in use of local resources.	Included above	Included above	Included above	Included above

Issue and Mitigation Action	Benefits	Requirement (Legal; IFI; BP)	Responsibility and Resources	Schedule	Target/Evaluation Criteria
Construction Environmental Management Plan (CEMP) A generic CEMP to establish minimum environmental management, mitigation and monitoring requirements for individual developers to use as a basis for on-site management. This will consider the benefits of a co-ordinated waste management strategy, including the provision of a centralised waste storage facility. The CEMP will also cover any additional survey that may be required, such avifauna.	Establish a common approach to environmental management, and save time and costs by minimising duplication of work by developers	Included above	Included above	Prior to construction	Included above
Implementation of the master stakeholder engagement activities and Establishing a community liaison office A common agreement will be reached regarding stakeholder engagement and information dissemination. This SESA has provided a proposed format for a common SEP which will be used by the Developers Association, amended where necessary, as the basis for implementing a Benban wide SEP. This will include the establishment of a community liaison office, a mechanism for information dissemination, and a grievance redress mechanism. The SEP will be closely linked to the CSR programme.	Avoidance of consultation fatigue, competing interests and community confusion over project risks and benefits. Common approach to stakeholder engagement and grievance management will avoid duplication and conflicting information.	NREA requirements IFI requirements Best practice	Developers	Prior to first project impacts.	Mechanism in place to disseminate information and engage with local stakeholders.

8 Information Disclosure and Stakeholder Engagement

It is an established principle that 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.

On environmental matters in particular, IFIs typically support the approach of the UNECE Aarhus Convention, which identifies the environment as a public good. The Convention affirms the public's right to be informed as to the state of that environment and what emissions and discharges are being released into it; the right to meaningful consultation on proposed projects or programs that might affect the environment; and the right to complain if they believe that the environment is not being adequately taken into account.

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

This public consultation chapter summarizes the consultation and community engagement activities and their outcomes.

Throughout the various consultation and engagement activities, the work team came across various prejudices and misconception related to the project. Such perception originated from the unfavorable experience the community had with various previous development projects.

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.

8.1.2 International legal requirements for stakeholder engagement (Public Consultation)

8.1.2.1. EBRD Environmental and Social Policy (May 2014)

The EBRD Policy states the following:

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 Transboundary 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.

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

The Standard states the following:

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

8.1.2.3. EIB Environmental and Social Practices Handbook (2013)

The following outlines EIBs requirements: 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.

8.2 Stakeholder engagement objectives and methodology

8.2.1 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.

The results will provide documentation of stakeholder feedback and will improve the scope and quality of the ESIA/SESA.

8.2.2 Stakeholder engagement methodology

The research team for this study has adopted multi-dimensional consultation activities that enable the marginalized, voiceless, youth and women to gain information about the project. The team also collected information about community concerns and worries regarding the project during various implementation phases.

In order to achieve comprehensive and meaningful stakeholder engagement, a local team from Aswan Governorate and Benban village was mobilized to consult with community people and stakeholders. The study team was able to use the simple local dialect that can be comprehended by all community members. It was decided to carry out most consultations in familiar acceptable areas for the community. This enabled the team to conduct Stakeholder engagement 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 in the widest sense was introduced in 2013 when the Kom Ombo CSP was planned (the project was later deferred in favor of the Benban PV project). Consultation with the local communities started at this stage. The Benban PV SESA consultations was able to build on these consultations and added to these though additional consultations in 2015.

The adopted methodology for stakeholder engagement comprised of various phases. The Consultant targeted different relevant stakeholders inside the project community. These included youth, elderly, officials, representatives from the NREA, NGOs, information centres, traders and retailers, natural leaders and key informants. Inside each community, both the decision makers and the people likely 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 (scanned and printed lists respectively). The Consultant used different Participatory Rapid Appraisal tools (PRA) 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.

The Consultant has used a multi- level approach that reaches the areas adjacent the project and various stakeholders. Most of the community people were completely unaware about solar power; the Study team faced various misconceptions about the project and the technology. The following are the main stakeholder engagement activities carried out in 2015

- The study team visited the project area in order to define the various stakeholders during August 2015;
- Meetings were conducted between 'local mobilizers' and the consultants during August 2015 in order to develop an engagement plan that is tailored to the specific stakeholder groups;
- 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 relevant governmental environmental departments, vii) developers and viii) 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 provide the appropriate level of transparency.

8.3 Strengths and Limitation of the Consultation Activities

8.3.1 Strengths of the consultation

The consultations benefitted from the following preparatory activities:

1- Local facilitators were recruited in order to facilitate stakeholder meetings and collection of primary data;
2- The local mobilizers proposed the main stakeholders that play a key role or have interest in the project based on a list of potential stakeholders provided by the Consultant;
3- They managed to facilitate various meetings conducted with governmental and non-governmental entities;
4- Prior to each consultation event, the local mobilizers motivated the community people to take part, using flyers, posters and pre-meetings with the local authorities;
5- Needs assessment (part of the SESA) was helpful as it paved the road to additional discussions with the affected population;
6- The project benefitted from extensive media coverage. Radio and TV interviews with the chairman of NREA, the project manager, the SESA Consultant and the residents led to a lot of information being made available to the community. The social expert also had a full interview on Channel 8 (the local radio channel) about the importance of stakeholder engagement and the contribution of the community;
7- The mayor of Benban was supportive to the project by mobilizing people and supporting the team in consultations with governmental units.

8.3.2 Limitation of the consultation

1- The community's stakeholder engagement for Kom Ombo began in 2013, continued in 2014, and was again carried out in 2015 for Benban. This led to considerable 'stakeholder fatigue'. The majority of stakeholders stated that 'we been informed about the project for years and already had consultations with you'. That will necessitate additional effort to convince the community to be consulted i.e. visit the villages themselves and conduct the activities inside the villages. The community people in such cases act as hosts who should welcome their guests. [11]
2- In the Kom Ombo CSP project it was obvious that female representation was limited. Thus, the team tried to integrate more females during this stage, and managed to include 22 women.
3- As Benban village comprises three sub-villages which are governed by three mayors, it was of concern that all three sub-villages were equally targeted and thus the majority of community people involved.

8.4 Stakeholder Identification

The first step in successful stakeholder engagement is for the project 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 segregated into two main categories:

- Directly and indirectly potentially affected groups which might be influenced by the project, either positively or negatively. This category is segregated into the main potential affected groups and the main entities collaborating 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 in the project or might benefit from it.

Table 43: Stakeholders identification

Stakeholder groups	Stakeholders bodies	Relevance to project
Directly affected groups		
Local project affected communities	Local community near the plant in Benban and its sub-villages	They are the direct receptors of the project impacts. Thus they are ranked as the most important stakeholders They might also benefit from job opportunities and might be affected by community resources overconsumption
	The mayors	They are the opinion and decision makers in the surrounding community. Their villages could temporarily host many thousands of workers
	Small-scale grocery shops and the bakery within Benban village	Provide workers with food and amenities. Thus, they will benefit from the project
	Suppliers and whole-sale traders	They will benefit from supplies contracts for the project side. This includes food supplies and transportation
	Owners of residential units in Benban or Aswan	They can let their houses to temporary and permanent workers
	Young people	They may be able to take advantage of job opportunities or receive training
	Vulnerable groups (include women)	They might be affected negatively by the associated projects (e.g. competition at the water intake if this option is taken)
	Benban Local Unit &	They may benefit from initiatives which improve

Stakeholder groups	Stakeholders bodies	Relevance to project
	Daraw Markaz Authority and Fares village & Kom Ombo Markaz	local conditions, e.g. rehabilitation of roads; the ambulance station, etc.
Developers	All Benban project developers	They are the key player in this project and will have major roles regarding employment, accommodation, and transportation.
Indirectly affected groups		
Governmental entities	Aswan Governorate Authority	The main role of the governorate is the provision of general support to the project inclusive of permitting.
	Information Centres on the governorate level	They provide the project with the detailed technical and geographical information inclusive of information about the surrounding communities
Collaborating companies	Egyptian Electricity Transmission company (EETC)	EETC is responsible for providing the new plant with substations and for the transmission of produced electricity to the electricity grid. They are responsible for the preparation of an ESIA to for the OHTL connection
Environmental institutes and agencies	Environmental Affairs Agency (EEAA)	EEAA is responsible for reviewing and approving ESIAs and SESAs, and for monitoring of the implementation of any agreed Environmental and Social Management/Action Plan
	Environmental Office within the governorate	This office is responsible for monitoring compliance with environmental requirements; it also attends consultation activities
Ministries and General Authorities	Ministry of Water Resources and Irrigation	They will be responsible for permissions for river water abstraction or for construction of wells
	Ministry of Health and associated health facilities	They will provide health facilities to the workers within the site and generally act as health service providers
	Labour department	They monitor working conditions and to health and safety
	Ministry of Social Solidarity	They monitor compliance with workers legal social insurance regulations
Army and police force	Ministry of Defense	They are responsible for permitting the location of substations and the routes of overhead transmission lines plus overall Securing the project area in cooperation with police force
	Police force	Responsible for securing the project area.
International Financial Institutions	All funding agencies (e.g. EBRD, EIB, IFC, Proparco, FMO, OFID, CDC, AfDB)	Financiers
Additional stakeholders who have interest		
University and educational institutes	Aswan University	They can play a major role in ESIAs studies as well as proposing corrective procedures
Industry and Business	All industrial and	They will benefit indirectly from the enhancement of

Stakeholder groups	Stakeholders bodies	Relevance to project
	business within the project Markazs	the overall electricity supply (less outages, better stability)
NGOs and civil society	NGOs in Benban	They can consult with residents of the local communities and the environment during the project implementation and act on their behalf. They can also provide information to poor and marginalized women
Press and Media	El Youm El Sabea Newspaper El Ahram Newspaper El Watan newspaper El Nahar website	The provide information about the project to the communities and all stakeholders

8.5 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, the EBRD Environmental and Social Policy 2014; EIB Environmental and Social Practices Handbook the project carried out various consultation activities.

- During the CSP project
- During the scoping phase of project
- During the final consultation of project

The specific consultation activities carried out from 2013 to date include::

During the Kom Ombo CSP project

- Scoping meetings were carried out with the community people in Fares and Benban villages in the period in the 23rd to 26th of March 2013.
- Scoping meetings were carried out with the governmental representatives and the community-based associations in the period from 23rd to 26th of March 2013. The meetings took place in Aswan City, Benban District and Daraw District.
- A public session with the different project's stakeholders was held on the 25th of March 2013 in Aswan.

During the Benban SESA preparation

- Scoping meetings were carried out with the community developers in NREA premises on the 15th of September 2015.
- Scoping meetings were carried out with governmental and non-governmental entities in Aswan Governorate during September 2015.
- Scoping meetings with community people were carried out in in the 9th of September 2015 in order to identify their needs.
- On the 8th of September 2015, an interview was broadcast on the local radio of Aswan Governorate for one hour with the SESA Consultant about the project and potential impacts as well as the importance of community engagement.

- A public consultation session with the project's different stakeholders was held on the 17th of September 2015 in Aswan.

Figure 87: Participants

Figure 88: NREA presentation

Figure 89: Governorate representation

Figure 90: NREA Chairman TV interview

Figure 91: Benban community leaders

Figure 92: Developers

These meetings and the key points discussed are summarized in the following table.

Table 44: Summary of consultation activities carried out

Time	Consultation activity/method	Number of participants	Phase	Information disclosed	Stakeholder(s) engaged	Shared documents	Community Feedback
23rd 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

Time	Consultation activity/method	Number of participants	Phase	Information disclosed	Stakeholder(s) engaged	Shared documents	Community Feedback
15th of September 2015	Scoping meetings	84 persons	During the SESA preparation	Information about the SESA assignment and the environmental requirements	EETC Developers Funding Agencies (EBRD) NREA SESA consultant	PowerPoint presentation	Developers requested information on the environmental requirements Cumulative impacts of the project Their contribution to SESA project
9th of September 2015	Workshop	45 (about half of them are females	During the SESA 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 SESA 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

Time	Consultation activity/method	Number of participants	Phase	Information disclosed	Stakeholder(s) engaged	Shared documents	Community Feedback
8th of September 2015	Radio interview	NA	During the public consultation project and the SESA 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 SESA	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
15th of November 2015	Consultation event with the developers	42 persons	During the SESA preparation	Information about the Potential Impacts of the project	EETC Developers Funding Agencies (EBRD, IFC and EIB) NREA SESA 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
21st of November 2015	Public consultation event in Benban village for two developers (FRV Shams one and Infinity solar)	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

8.6 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 SESA.

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 SESA. However, at least 50% of the developers have collectively agreed to form a standalone association. *Based on that action, the Consultants for this SESA 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.

Table 45: Suggested Engagement Activities

Target Stakeholder	Information to be disclosed	Time frame	Communication / media tool	Related Documentation	Stakeholder Feedback
Preconstruction and construction phase					
Project Contractors/ construction workers	Introduce the Environmental management plan, Introduce H&S requirements Grievance mechanism for workers Information sharing channel	From commencement of project activities	Induction training to all workers. Prior to work a daily briefing to be given to the workers Regular bulletin disclosed on site; tool box talks; induction information for new workers	NTS, SEP, ESMP and Monitoring reports; Health and safety instructions; Labour rights	Workers can lodge grievances at any time during their employment on the project site Any feedback and grievances (and response to grievances) by workers should be documented
Developer Project management unit and employees	Construction program and timing; Communication channels and practices Grievance mechanism allocated for workers	From the commencement of project activities	Internal bulletins; Regular intranet and email updates	NTS, SEP, ESMP; Monitoring reports	Workers can lodge grievances at any time during their employment on the project site . Any feedback and grievances (and response to grievances) by workers should be documented
Benban villagers and young people	Project schedules provided to directly affected stakeholders to notify them in advance of	From the commencement of project activities	Regular community meeting/s as required or Monthly	ESIA, SEP, ESMP; Traffic Management	Stakeholder requests (and response given) should be documented

Target Stakeholder	Information to be disclosed	Time frame	Communication / media tool	Related Documentation	Stakeholder Feedback
	construction works Disclosure of the ESIA, SEP and ESMP reports on the website of the Ministry of Electricity, the NREA and funding agencies.		at the beginning and later quarterly meetings. Additional information on NREA and the Ministry of Electricity websites	Plan; Monitoring Plans; Safety procedures; Employment opportunities Grievance Procedure; Progress of ESMP	
	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 Benban site An inventory of job opportunities available should be disclosed to people on the NREA and the Ministry of Electricity websites.	Lists of jobs to be provided by the contractors together with required specifications	
	Grievance and redress mechanism	Prior to construction activities and during the construction	Posters in main streets and market area, as well as the entrance of the site	Grievance and redress mechanism in the SESA and ESIA	All grievances received should be documented, analyzed
Other interested stakeholders	Project progress; performance on environmental and social issue	Prior to the construction and	Direct communication	Fact sheets; Monitoring results	Meetings and initiatives should be documented

Target Stakeholder	Information to be disclosed	Time frame	Communication / media tool	Related Documentation	Stakeholder Feedback
	management; and new activities	during operation	through individual meetings, additional public consultation activities (as required) and Community Panel meetings (Quarterly)	(progress against ESMP); Employment opportunities	
Operation Phase					
Benban residents	Update of operational performance, and ongoing communication on key issues.	After operation commencement	Regular community meeting/s as required or Quarterly	Monitoring Plans; Grievance Procedure	
Project workers	Environmental management plan, and grievance mechanism; H&S requirements; Grievance mechanism allocated for workers and information sharing channel	After starting operation	Induction training to newly recruited worker workers. Daily construction training to the workers Regular bulletin disclosed in the site, tool box talks, induction information for new workers	SEP, ESMP and Monitoring reports Health and safety measures Labour rights	Workers can lodge grievances at any time during their employment on the project site . Any grievances (and response given) to be documented
Project management and employees	construction program and timing; communication issues related to	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 during their

Target Stakeholder	Information to be disclosed	Time frame	Communication / media tool	Related Documentation	Stakeholder Feedback
	operations grievance mechanism allocated for workers				employment on the project site . Any grievances (and response given) to be documented
Governorate Environmental Office Local authority Other interested stakeholders (Some industrial parties)	Update on operational performance, and ongoing communication on key issues.	During operation	Direct communication through individual meetings; public consultation activities (as required); Community Panel meetings (Quarterly)	Monitoring results Progress against ESMP; Employment opportunities	Meetings and comments to be documented

8.7 Suggested Framework for Disclosure of Information

In accordance with EBRD PR 10 (and similar requirements of IFC and EIB) the site management should ensure disclosure of relevant project 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 is to 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). The following describes the current status of this requirement.

8.7.1 During the planning phase

The project has good access to media, All news regarding work at Benban operations is disclosed to the public through national and local media, including state owned etc. Additionally, the social media are used to publishing l news related to solar project in Benban. To facilitate effective public information, a technical officer should be been assigned to communicate with people and provide information on the site.

8.7.2 During the construction phase (2016-2017)

During construction, the developers should provide ongoing information to the people of Benban and surrounding areas. Information should 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 ESAP. This information could be provided in a range of ways including:

- Monthly meeting with the Community Advisory Committee
- Face-to-face meetings, which could involve the whole community or smaller focus groups.
- Written updates posted at the local school;
- Via the Community Committee; and
- Annual project progress reports, including environmental and social impacts, health and safety performance, and implementation of the external grievance mechanism.

8.7.3 During the project operation phase (2018 onwards)

During operation, all developers should continue providing information on the project as necessary. This could focus on monitoring of operational impacts such as noise and emissions , and any issue raised by stakeholders during the earlier phases of the project. Existing communication channels can continue to operate, including the Community Liaison Committee and grievance mechanism.
Each year a community communication programme should be developed and documented.

8.8 Suggested Grievances and Redress Mechanism disclosure

Grievances may arise during the construction and operation of the Benban PV facility, addressed to an individual Benban Project or the site as a whole. To ensure that stakeholders have an easy mechanism for making their grievances known, and to get redress, detailed grievance procedures need to be established. The objective is to respond to the complaints of stakeholders in a timely and transparent manner, without resorting to complicated formal channels as far as possible.
It is proposed that anyone should be eligible to submit a grievance about the project if they believe a working practice or aspect of the project is having an adverse impact on the community, the environment, or on their quality of life. The following provides details of a suggested grievance procedure:

- **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 the grievance mechanism will be worded accordingly. Community leaders, social entities and the governmental units will be informed about the GRM. All information about the grievance mechanism will made available in public areas and communicated to the community leaders.
- **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, which will be available on the company (NREA) website.
- **Grievance channels:** Comments and concerns regarding the project can be submitted in writing in through the following channels until the developer association assign a social officer. For the time being NREA will be the responsible entity for 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 plant, grievances in relation to construction activities will be managed by the respective developers and related contractors (if addressed to them; they will inform site management and the Developers Association) or by site management (if it relates to the site as a whole and/or is addressed to site management).

A separate grievance mechanism is available in the same manner for all workers on site (inclusive of contractors and any day-labourer).

8.9 Suggested Resources and Responsibilities

Until a permanent Stakeholder Liaison Officer (STL) for the project is appointed, NREA should take 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 should be the primary contact person.

Contact details for the representatives are included below.

1. Email: reic@nreaeg.com
2. By telephone : **22725891** and /fax **22717173**
3. By post or hand delivered to: Ibrahim Abu el Naga St. Abas El Aqad, Nasr City Cairo Governorate

8.10 Suggested Monitoring and Reporting Framework

8.10.1 Monitoring of grievances

All grievances activities should be monitored in order to ensure proper response. This should be done by NREA until the Developers Association is fully set up..

The effectiveness of the grievance mechanism should be evaluated using the following parameters:

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 resolved;
4. Number of unsolved grievances and the reasons for not solving them;
5. Satisfaction levels with proposed solutions;
6. Documentation efficiency;
7. Time consumed to solve the problem;

8.10.2 Monitoring of community engagement activities

Once commitments have been made within a Stakeholder Engagement Plan (SEP), it is important to monitor the progress against commitments and report on the status of the plan's implementation. The SEP should identify how the public will be informed of the implementation of the plan.

Specific stakeholder activities are not defined at this stage and a plan has still to be developed and agreed by the developers/Developers Association. Such a plan should specify:

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

The implementation/progress against commitments will then to be monitored quarterly and targets will have to be adjusted accordingly.

Annex 1: SSIA Methodology

Physical and Biological Baseline and Impact Assessment

This SESA is making use of the investigations carried out for the Kom Ombo Concentrated Solar Power ESIA which was completed in 2014. The Kom Ombo project site of 5.6 km^2 is a rectangular plot of land in the south-eastern part of the Benban PV site. As the consultant of this SESA was also the consultant for the Kom Ombo study all underlying information was readily available and was used as the basis for this SESA. It was re-checked to ensure that it is relevant; still up-to-date; and sufficiently detailed for this SESA. The environmental aspects remained unchanged, though the land take is significantly higher (37.2 km^2 vs. 5.6 km^2). The socio-economic information was up-dated.

Physical Environment:

The baseline as well as impact assessment sections relating to components of the physical environment were based on the Kom Ombo ESIA as the sites are identical (Kom Ombo being part of the overall Benban site) and as there was no change in characteristics.

Biodiversity, Flora and Fauna

A desk-based study was carried out for the Kom Ombo ESIA to identify flora and fauna species likely to be found within the study area. This was used for this SESA and additional site visits were carried out in August and September 2015 to review the validity of the Kom Ombo project findings and conclusions. For the Kom Ombo study a grid system was used and all quadrates were surveyed by systematic active search for all existing biodiversity. Flora and fauna species were recorded and wherever possible photographed for documentation purposes.

Noise and Air Quality

The Kom Ombo ESIA included noise modeling because this project would involve heavy construction and on the Kom Ombo site and also construction for the water supply near and in residential areas. These investigations were considered for the Benban ESIA and air quality and noise measurements repeated for Benban in 2015.

Archaeology and Cultural Heritage

A desktop study was carried out for the Kom Ombo ESIA, based on a literature review of publicly available documents and reports. In addition, an archaeological and heritage field survey was carried out. These investigations were used for the Benban SESA.

Socio-economic Baseline and Impact Assessment

The socio-economic study of the Kom Ombo ESIA was used as the starting point for this SESA; additional meetings with the local community were carried out in August and September 2015; this included a Public Consultation Meeting in Aswan on 17th of September 2015. For the Kom Ombo ESIA and this SESA the social team has applied the Participatory Rapid Appraisal Methodology and then developed a cross-sectional study that uses a multi-data sources approach including primary and secondary data collection as shown in the following figure:

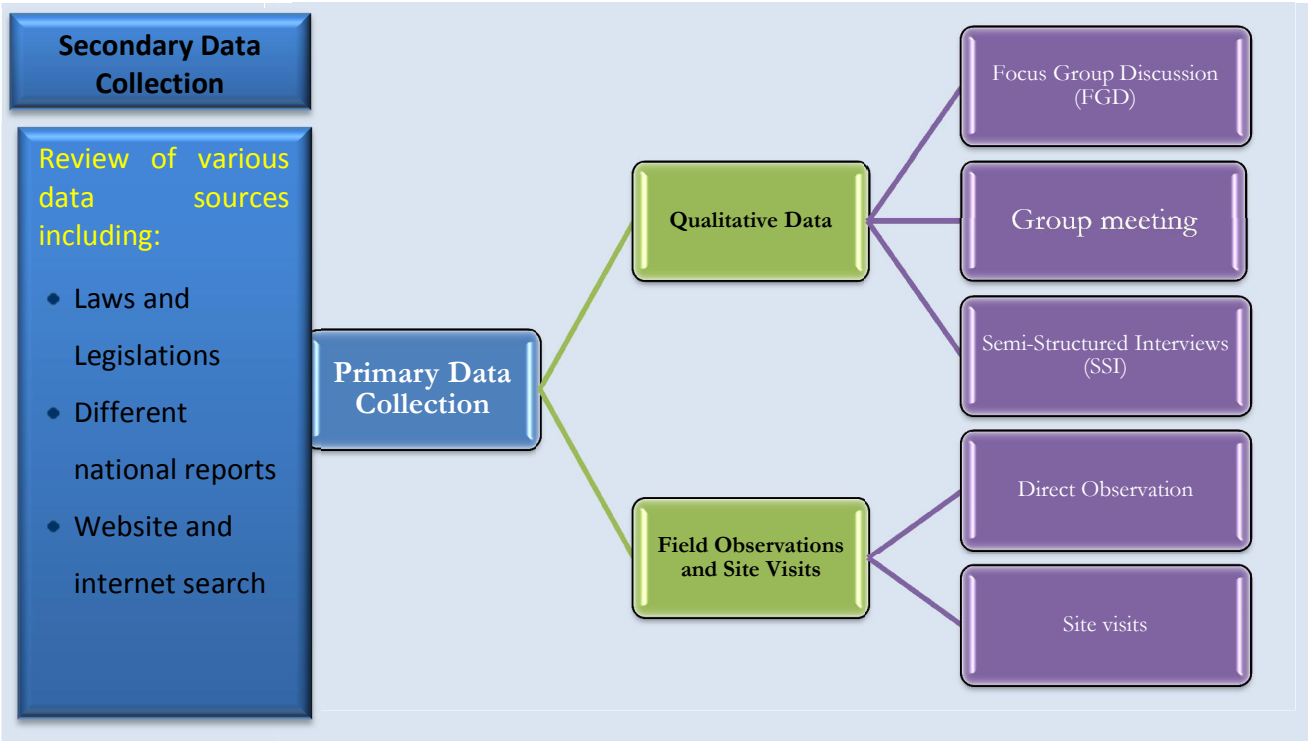


Figure1: Data collection Scheme

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. Quantitative data was obtained, analyzed and summarized.

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 data collection tools. Following is a brief description of data collected:

During this phase the study team have 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 to Benban village in order to interview the mayor, environmental related groups, NGOs and community leaders. The first site visit oriented with social activities were implemented in cooperation with the environmental experts
- Preliminary meetings with NREA staff were conducted 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:

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 groups…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:

- What are different socioeconomic criteria for the areas?
- What is the community perception of the project?
- What are the policies and legislations that have influence on the project?
- What are the potential impacts of such project?
- How can the project be implemented with limited disturbance for the community?
- How can the NGOs and community stakeholders support the project?
- 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 to suffer negative impacts.

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 was identified by 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 located near the project site. Hence, the sample was selected as follows:

a. Group meeting with NREA staff (legal – technical – health and safety)
b. in-depth interviews with the governmental organizations
    - Environmental Management Unit manager in Aswan Governorates

- Head of the Environmental Management Unit in Benban
- Deputy chairman of the Faculty of Science in Aswan University
- Director of Aswan Ambulance Service
- Director of Protective Medicine Department
- Head of Health Directorate
- Planning and auditing manager
- Manager of electricity grid EETC regional branch
- Head of Benban electricity grid
- Specialist in Water and Wastewater Company in Aswan Governorate
- Technician in Water and Wastewater Company in Aswan Governorate
- Head of Local Governmental Unit in Benban
- Urban planning in Aswan governorate

c. Group meeting (Workshop)
    - 45 persons participated among which 23 were males

Annex 2: Detailed Legal Framework

National Legal Framework and IFI Standards

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, IFC Performance Standards and EIB environmental and social requirements.

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 Ministries and Governorates as they have the executive powers for development authorization. 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 and following-up their execution in coordination with Competent Administrative Authorities (CAAs).
- EAA is responsible for reviewing and approving the environmental impact assessment studies 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 is 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. This includes projects which require an EIA. The CAAs are responsible for receiving the EIA 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)

Figure 93 presents the steps of the approval process.
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. NREA 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 NREA 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

NREA 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. NREA shall follow-up construction and operation of the proposed project contractor to ensure that the ESMP is adequately implemented in the construction phase.

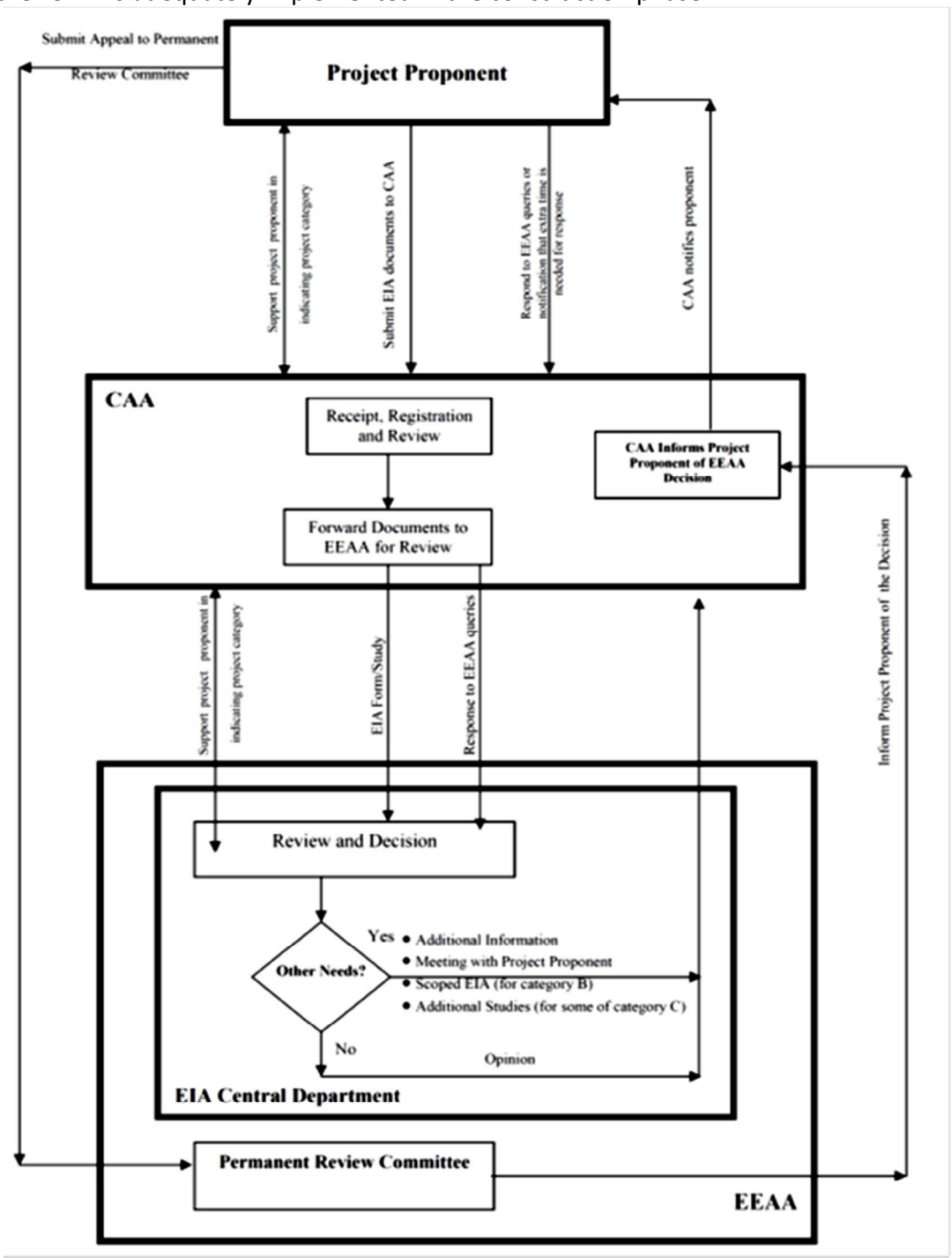


Figure 93: EIA Procedure overview

The environmental permitting requirements for PV power plants allow projects to be classified as 'B' (requiring an abbreviated environmental approval process), however EEAA has the authority depending on the scale of the project to raise the category to 'C' (requiring a full ESIA). In consultation with EEAA, NREA has reached an agreement with EEAA to conduct an overall SESA study for the proposed projects that meets the requirements of C Category projects. Thereafter, all components under the SESA umbrella for Benban (i.e. the individual Benban Projects) will then be classified as 'B' and will require only submission of a 'Form B' to the EEAA. Form B is a scoped ESIA with project specific information and can be completed by the developer or his consultants without the need for additional public consultation. A decision on applications is made within a maximum of 30 days.

Upon approval by EBRD, the Strategic Environmental and Social Assessment (SESA) will be submitted to NREA as the Competent Administrative Authority (CAA). NREA, shall then review and submit to EEAA for "No-objection". Plot-specific ESIAs shall be developed by the investors as form B (or, if the investor chooses, full ESIA) will be also submitted to NREA, who shall then forward them to EEAA for approval. The EEAA review fees shall be paid by the developers. For the SESA and the ESIA, the EEAA review fee is 55,000 EGP. The review fee for Form B ESIAs is 14,000 EGP .

It is recommended that the proposed developers Association manage mitigation measures implementation. NREA will not be responsible for the Environmental and Social Management Plan as they have limited resources and personnel.

Permits required to construct and operate the proposed project

The key permits required for the construction and operation of the proposed project and associated facilities (grid connection and potentially a water intake from the River Nile):

Table 46: Key required permits for construction and operation of the proposed project and the associated facilities

Key required permit	Applicability of the permit Yes/ NA			
	PV Power Plant	Associated Facilities		
		Substations / Trans. lines	Water intake	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 Government Unit on the District/ Markaz level**] 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 of an 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. ***Permit required if the project includes water abstraction from the River Nile*** ***In case of underground water usage, the developers have to request a well digging permission and abstraction authorization***	N/A	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 from Egyptian Electric Utility and Consumer Protection Agency to authorize the operation of electric utilities	Yes	Yes	Yes	N/A

Key required permit	**Applicability of the permit Yes/ NA**			
	PV Power Plant	**Associated Facilities**		
		Substations / Trans. lines	Water intake	Pipelines
Height construction permit: according to the Ministry of Defense and civil aviation authority.	Yes	Yes	N/A	N/A

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

Table 47: Coordination with relevant authorities

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	➢ NREA will Coordinate with various concerned authorities including Ministry of Defense, EEAA, etc
Egyptian Environmental Affairs Agency EEAA	No objection for the construction of the project in the allocated land	➢ ESIA for the Project
Ministry of Civil Aviation	No objection for the construction of the project in the allocated land	➢ Building heights shall not exceed 45 m above ground 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	➢ 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

National Legislation Pertinent to the Benban Project and subprojects

The national environmental regulatory framework applicable to the project includes the following laws and decrees.

Egyptian legislation related to environmental aspects:

- National environmental legislation law 4/1994, amended by Law 9/2009 with decree No 1095/2011, 710/2012 and 964/2015
- 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
- Labor Law number, Health and Safety Laws and Decrees 12/2003
- Traffic and Urban planning Laws.
- Electricity Law No 87 of year 2015

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.

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

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

Protection of human rights

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

Protection of Antiquities

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

Table 48: Summary of National Legislation

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	Electricity generation plants using solar PV technology are categorized as "B". The SESA will be categorized as C (due to scale and public consultation requirement)and each site specific project will be classified as B It should be noted that projects categorized C require full assessment and public consultation	October 2010
Executive regulation and Decree 1095/2011) Annex 6 Table 12	States that it is not allowed to use 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

Title of legislation	Summary and how this legislation applies to this project	Year
EEAA ESIA guidelines related to Public Consultation		
Based on Law number 4/1994 on Environmental Protection	Consultation of the community people and concerned parties with the needed information about the project. All 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 **Paragraph 6.4.3 Requirements for Public Consultation in the EEAA ESIA Guidelines[12]** • 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	1994
Electricity Law		
Law No 87 of year 2015	**Article 25:** stipulates the responsibility of the entities licensed to produce electricity **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 law, medium and high voltages **Article 53:** stipulates the right of proper compensation for persons affected by the establishment of electricity projects **Article 55:** identifies the Right of Ways that should be avoided for the OHTL and the underground cables: 1- 25 meters from the center of the OHTL of extremely high voltage 2- 13 meters from the center for high voltage OHTL 3- 5 meters for medium voltage OHTL 4- 5 meters for high and extremely high voltage cables 5- 2 meters for low and medium voltage cables	

[12] 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
Land acquisition and involuntary resettlement		
Law 10/1990	On Property Expropriation for Public Benefit; the following relates to the construction of a water supply from the River Nile, as envisaged for the Kom Ombo CSP; this project is a public benefit project. This water supply option is not envisaged for Benban but the Consultants consider it a potentially valid option. The law describes acquisition procedures as follows: 1. The procedures start with the declaration of public interest pursuant to a 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. This law specifies, 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. This information is provided by way of background. However, note that the Benban project will not entail any land acquisition activities due to the following: 1- The PV main site is located on state-owned lands which, according to law no. 10/1990, does not trigger any expropriation activities. 2- The lands that would be used for a water intake pipeline if this was constructed are located within the public street network. 3- The water intake pump station would be located adjacent to the existing Benban Water station (this plot of land is owned by the Local Government Unit) The OHTL is located inside state owned lands. They are desert vacant lands with no encroachers. 4-	1990
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

Title of legislation	Summary and how this legislation applies to this project	Year
Civil code 131/1948	**Articles 802-805 recognize private ownership right**. • 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 Law 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	Chapter one- Article 2 It is banned to construct any buildings or structures outside the urbanized area endorsed for villages and cities that did not develop strategic planning. Use of lands allocated for agriculture products or livestock are prohibited. In case of constructing any structures on agriculture lands a ministerial decree and approval from the Ministry of Agriculture should be obtained. Chapter 2: Article 10 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. The GOPP is responsible for adopting techniques, standards and measurement of monitoring of the plans	2008

Title of legislation	Summary and how this legislation applies to this project	Year
Laws and regulations related to archaeology		
Law 117/1983	**Definition of monuments** 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. 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 Article 5 of the law states that the Supreme Council of Antiquities (SCA) is the competent authority responsible for antiquities in Egypt	1983

Title of legislation	Summary and how this legislation applies to this project	Year
	Construction license 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 to dig channels or construct roads or agricultural land or for public benefits in archaeological sites or land within its approved border lines. Also, Article 20 states that a buffer zone around the monument or the site is defined as three kilometres 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. 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 imposes 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. **During Construction** 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]. 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	

International Standards

Benban projects are likely to be (part-) financed by International Financial Institutions (IFIs) and possibly national and international banks. All IFIs have Environmental Policies and operate strict environmental standards and approval processes as part of project appraisal. They also require compliance with all national environmental, social and health and safety requirements and in some cases refer to other international standards such as EU Directives or International Labour Organization (ILO) standards. Many national and international banks follow IFC procedures and requirements (Equator group banks).

The IFIs most relevant to the Benban Projects (as indicated in the TOR for this Strategic Environmental and Social Assessment) are the European Bank for Reconstruction and Development (EBRD) with its (2014) Environmental and Social Policy, the International Finance Corporation (IFC) with its (2012) Performance Standards, the European Investment Bank with its standards based on the European Principles for the Environment, together with the Overseas Private Investment Corporation, Proparco, FMO, the Commonwealth Development Corporation and the OPEC Fund for International Development, all of whom apply similar standards.

These IFI requirements are listed in the following parts of this Chapter. This is then followed by a listing of key EU Directives which apply to EBRD and EIB funded projects.

European Bank for Reconstruction and Development (EBRD) Performance Requirements

The European Bank for Reconstruction and Development (EBRD) has 10Performance Requirement (PRs) covering key areas of potential environmental and social impacts. These PRs cover the following:

PR 1: Assessment and Management of Environmental and Social Impacts and Issues
PR 2: Labour and Working Conditions
PR 3: Resource Efficiency and Pollution Prevention and Control
PR 4: Health and Safety
PR 5: Land Acquisition, Involuntary Resettlement and Economic Displacement
PR 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
PR 7: Indigenous Peoples
PR 8: Cultural Heritage
PR 9: Financial Intermediaries
PR 10: Information Disclosure and Stakeholder Engagement

European Union (EU) Commission Directives which apply to EBRD and EIB projects

The EBRD is committed to encouraging the adoption of EU environmental principles, practices and substantive standards. The following list provides a brief description for the key pertinent **EU Directives**.

- **Directive 2001/42/EC** (SEA Directive) on the integration of environmental considerations into the preparation and adoption of plans and programmes with a view to promoting sustainable development.
- **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.
- **Directive 2014/52/EU** amends the above Directive in Article 3, requiring the EIA to "identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project on the following factors:

  a) Population and human health
  b) Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC
  c) Land, soil, water, air and climate
  d) Material assets, cultural heritage and the landscape
  e) The interaction between the factors referred to in points a) to d).
- **Directive 2008/50/EC on ambient air quality and cleaner air for Europe** which, inter alia, defines and establishes objectives for ambient air quality designed to avoid, prevent or reduce harmful effects on human health and the environment as a whole.
- **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.
- **Directive 92/43/EEC** aims to contribute towards ensuring biodiversity through the conservation of natural habitats and of wild fauna and flora.
- **Directive 2009/147/EC** relates to the conservation of all species of naturally occurring birds.

The EBRD also explicitly requires compliance with the **ILO Core Labour Standards:**

- Freedom of association and the effective recognition of the right to collective bargaining;
- Elimination of all forms of forced or compulsory labor;
- Effective abolition of child labor;
- Elimination of discrimination in respect of employment and occupation;

and the **Aarhus Convention on Environmental Information** (Egypt did not sign this convention).

IFC Performance Standards

The **IFC Performance Standards** are very similar to EBRD requirements, in structure and requirements. These Standards cover the following:

Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts
Performance Standard 2: Labor and Working Conditions
Performance Standard 3: Resource Efficiency and Pollution Prevention
Performance Standard 4: Community Health, Safety, and Security
Performance Standard 5: Land Acquisition and Involuntary Resettlement
Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
Performance Standard 7: Indigenous Peoples
Performance Standard 8: Cultural Heritage

These Performance Standards are supported by sector and topic-specific guidelines of which the IFC General EHS Guidelines are the most important ones for the Benban Projects. The EHS Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice. The EHS Guidelines list the performance levels and measures that are generally considered to be achievable in new facilities at reasonable costs by existing technology. All IFC PSs are listed in Table 6; for PSs relevant to the project key requirements are listed.

The following guidelines will be used aiming at fulfilling the requirements of 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.

European Investment Bank Standards

The European Investment Bank (EIB) environmental and social safeguards are based on the European Principles for the Environment (EPE) and cover the following:

1. Assessment and Management of Environmental and Social Impacts and Risks
2. Pollution Prevention And Abatement
3. EIB Standards on Biodiversity And Ecosystems
4. EIB Climate-Related Standards
5. Cultural Heritage
6. Involuntary Resettlement
(not triggered for the Benban PV projects)
7. Rights and Interests of Vulnerable Groups
8. Labour Standards
9. Occupational And Public Health, Safety And Security
10. Stakeholder Engagement

International Conventions and Agreements

The following Table is showing a list of international conventions likely to be relevant to this project.

Table 49: 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 the Conservation of Migratory Species of Wild Animals (Bonn)
	Convention on Biological Diversity (CBD)
	Convention Concerning the Protection of the World Cultural and Natural Heritage
	United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa
	Protocol Concerning Mediterranean Specially Protected Areas
	Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean
Hazardous Materials and Chemicals	Convention Concerning Prevention and Control of Occupational Hazards Caused by Carcinogenic Substances and Agents
	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal
	Amendment to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal
	Stockholm Convention on Persistent Organic Pollutants (POPs)
Atmosphere and Air Pollution	United Nations Framework Convention on Climate Change
	Kyoto Protocol
	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
	(Copenhagen) Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer
Health and Worker Safety	Convention Concerning Protection of Workers Against Occupational Hazards in Working Environment due to Air Pollution, Noise and Vibration

Annex 3: Benban Land Allocation Documents

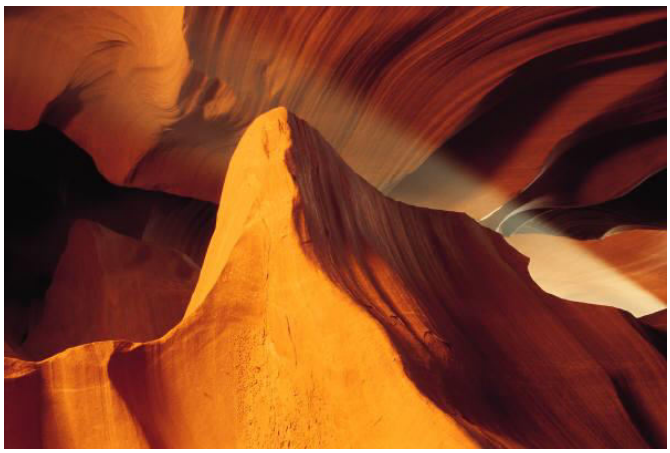
Benban, 50 MW

Solar Photovoltaic (PV) Power Facility

Aswan Governorate, Egypt

Environmental Impact Assessment Form B

Volume 1. Attachments



Prepared for: Access Building Energy Solar One

March 2016

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List of Acronyms

Abbreviation	Meaning
CAA	Competent Administrative Authorities
EBRD	European Bank for Reconstruction and Development
EEAA	Egypt Environmental Affairs Agency
ABESO	Access Building Energy Solar One
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
ESMMP	Environmental and Social Management and Monitoring Plan
ESIA	Environmental and Social Impact Assessment
ESSR	Environmental and Social Scoping Report
FIT	Feed-in-tariff
IBA	Important Bird Area
IFC	International Finance Corporation
IFI	International Finance Institution
NREA	New and Renewable Energy Authority
PBF	Priority Biodiversity Feature
PR	Performance Requirement
WB	World Bank

1 Introduction

The Government of Egypt and the New and Renewable Energy Authority (NREA) are promoting the construction of a photovoltaic solar power complex under the Egyptian Solar Plan. In 2014 the government adopted a feed-in-tariff (FiT) scheme for solar PV with a target of 2,300 MW. The land is leased by NREA to private investors to construct, operate and own solar photovoltaic power generation plants of between 20MW and 50MW capacity (each project). The entire solar complex (Benban Complex) is divided on 41 plots of 37.3 km^2. The total capacity of the site is 1,800 MW.

Access Building Energy Solar One (ABESO) is one of the pre-qualified developers that has been assigned a plot to develop a single 50MW Photovoltaic Power Plant in Aswan Governorate, 43km to the north of Aswan.

A Strategic Environmental and Social Impact Assessment (SESA) has been prepared for the entire Benban Complex with the objective to asses the environmental and social impacts associated to all projects as a whole. Following the approval and disclosure of the SESA, EEAA will categorise individual developments as a Category B project.

According to the Guidelines of Principles and Procedures for Environmental Impact Assessment (Egyptian Environmental Affairs Agency, 2009), Category B Projects: "*The proponent has to fill in the environmental impacts form B included in annex five (5) of the guidelines as well as attach the required documentation*".

Volume 1 and 2 contain the documentation required for the compilation of the environmental impact Form B included in Annex five (5) of the Guidelines of Principles and Procedures for Environmental Impact Assessment (EIA). This **Volume 1** contains all the documentation required on the Form B (see Table 1-1), with the exception of the EMP, which is presented as a standalone document on Volume 2.

1.1 Documentation included

The following table outlines the documentation submitted to EEAA, as per the Guidelines of Principles and Procedures for Environmental Impact Assessment (Category B Projects).

Table 1-1 Documentation provided

No.	Attachment	Was it attached? (Yes/No)	Reasons (If not attached)
1	EEAA approval of the EIA for the original project (in case of extensions)	No	New Project
2	Copy of the project license (in case of extensions)	No	New Project
3	EEAA Approval of the integrated EIA of the development (in case the project is located in a wider development)	Yes, Volume 1, ANNEX 1, page 61	-
4	General description of the Project Site with a map	Yes, Volume 1, Chapter 2	-
5	General description of the Project Site	Yes, Volume 1, Chapter 4	-
6	Description of the project activities with illustrative figures	Yes, Volume 1, Section 2.2	-
7	Expected analysis for air emissions	No	Not required, not air emissions expected
8	Specifications of the sewage and/or industrial wastewater treatment unit	No	No sewage treatment onsite
9	List of environmental laws and regulations	Yes, Volume 1, Chapter 3	-
10	Assessment of Environmental Impacts	Yes, Volume 1, Chapter 5	-
11	Analysis of Alternatives	Yes, Volume 1, Chapter 2.4	-
12	Environmental Management Plan (EMP)	Volume 2. Environmental and Social Management and Monitoring Plan.	-

2 Project Background

2.1 Project Location

The proposed Ben Ban 50MW PV Plant will be located in Aswan Governorate, which is located in Southern Egypt, 18km to the west bank of the Nile river and 43km to the north of Aswan.

Aswan Governorate borders Qena Governorate to the north, Red Sea Governorate to the East, New Valley Governorate to the West and Sudan's Northern State to the south. It has a population of 1,394,687 inhabitants and occupies an area of 62,726 km^2.

Physically, the proposed Ben Ban 50MW PV Plant lies approximately on latitudes 24^o 26^l and 24^o 27^l *North* of the equator, 32^o 41^l degrees East of the Prime Meridian and is 0 m above Sea Level. The site coordinates are provided below.

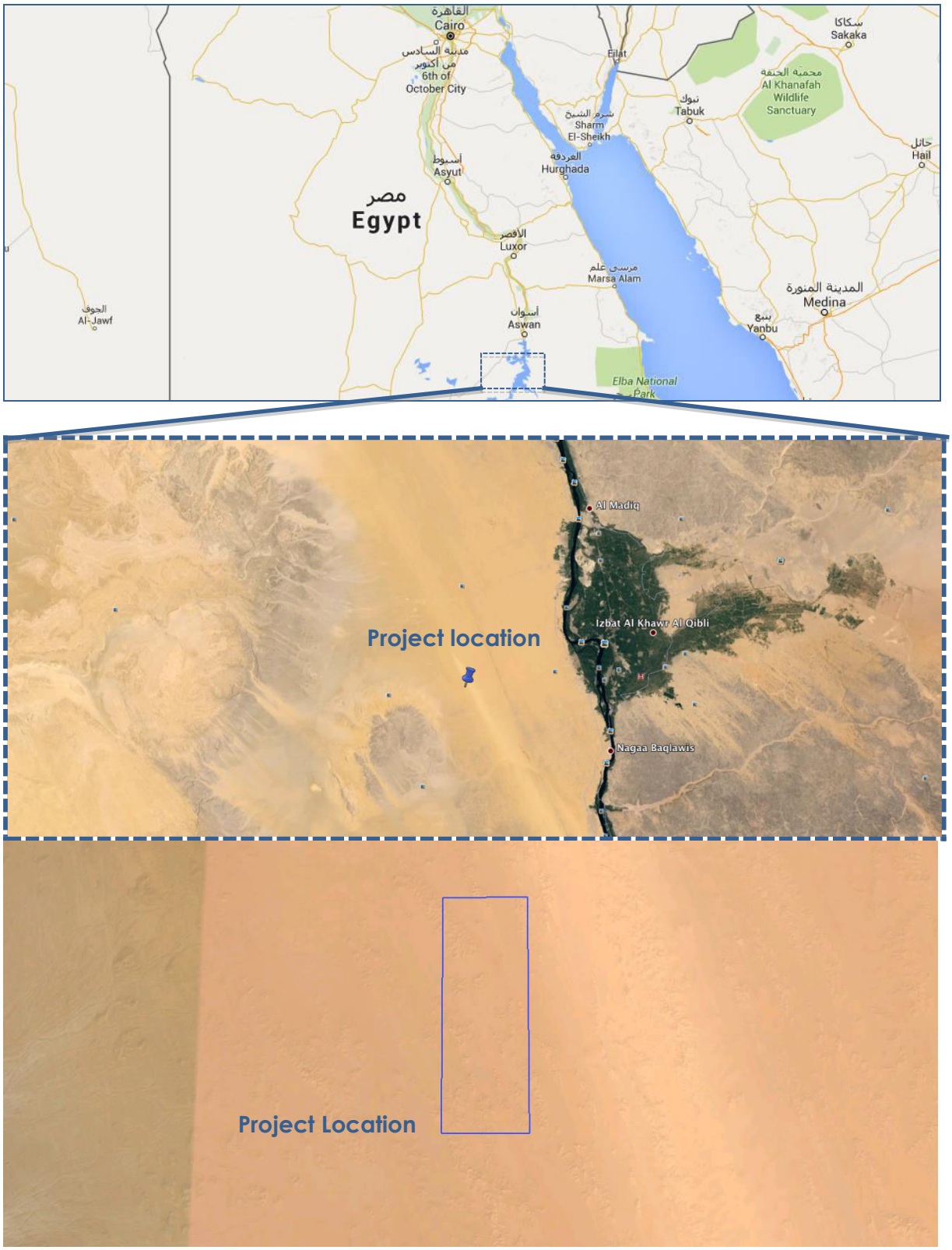
The proposed plant will be located approximately 5,7km West to Luxor-Aswan Road.

Table 2-1 Site Location, Coordinates

Project Site Coordinates		
Point	**Latitude**	**Longitude**
1	24°26'24.66"N	32°41'23.34"E
2	24°26'24.80"N	32°41'44.48"E
3	24°25'31.46"N	32°41'23.35"E
4	24°25'31.46"N	32°41'44.77"E

A new 220 kV power line is proposed to be constructed and connected into an existing HV Transmission line located approximately 12 km to the east of the Complex and to a new 220/500kV Substation. The proposed alignment of the 220 kV power line is not known at this stage.

Figure 1 Project Location



2.1.1 Existing Land Uses on the Proposed Site

The proposed site for the 50MW PV Plant is located within a vast rocky plateau with no human settlements or vegetation coverage, and is considered to be part of the habitat known as Sands and Dunes of the Western Desert (BioMap Project, 2007).

Figure 2 Existing Land Uses in the Proposed Site and the nearby.

2.1.2 Neighbouring developments

Currently there are no neighboring developments around the Project Site. However, it is expected that a significant number of PV plants will be developed concurrently. It is also possible that temporary worker accommodation facilities could be developed close to the Benban Complex (Figure 7).

The Project Site is 5,7km west of the Luxor-Aswan Highway, running from Luxor to Aswan. Internal roads within the Benban Complex will be developed to connect individual Projects with the highway.

2.1.3 Archaeological sites

The nearest cultural and archaeological site is Temple of Kom Ombo, and this is located 23,5 km to the east of the proposed development, on the eastern side of the Nile River. For more information see Section 4.2.4)

2.1.4 Natural protectorates

There are no environmentally protected areas close to the proposed site. The nearest protectorate is located approximately 41 km to the south of the Benban Complex (For more information see Section 4.1.6.1)

2.1.5 Site Location Map

A Site Location Map, to scale and stamped by the Competent Administrative Authority is presented on ANNEX 2.

2.2 Project Design

The proposed 50 MW PV Plant will consist of numerous PV cells within modules arranged in arrays upon mounting structures in a specific arrangement across the proposed site. The arrays will be designed to ensure the most efficient alignment to capture solar rays.

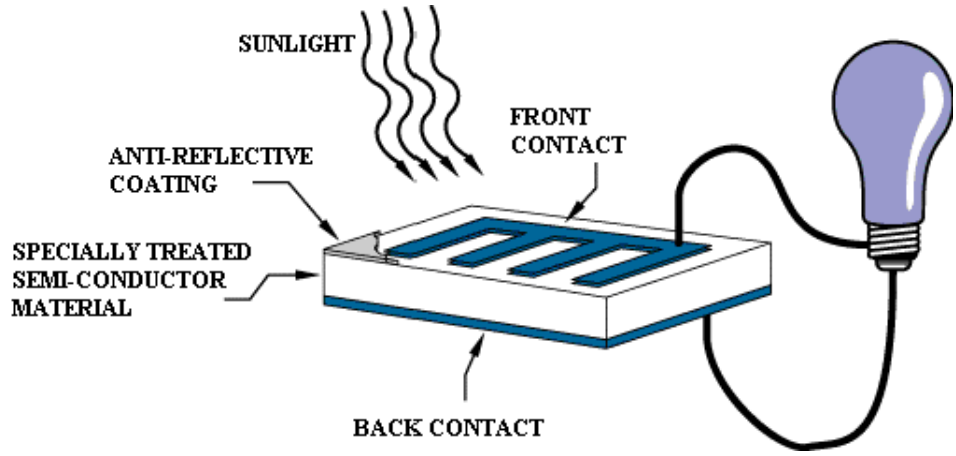
The electricity generation process using photovoltaic technology and the main components required for this process are briefly described below.

PV Cell: A single photovoltaic cell comprises a specially treated semi-conductor material (typically silicon) with separate front and back electrical contacts (positive and negative) that are connected to form a circuit. Upon exposure to light, electrons are knocked from the semi-conductor material under the photoelectric effect and are transported around the electrical contacts to form a direct current.

PV Module: A module is the assembly of multiple PV cells mounted into a module. Modules are designed to supply electricity at a certain voltage. PV modules typically are covered with an anti-reflective glass or coating to protect the solar cells and to limit the amount of reflected sunlight.

PV Array: Multiple modules wired together form an array, or 'panel' that are then arranged to form the solar plant. The arrays will be mounted onto a structure to provide the optimum solar alignment.

Figure 3 PV Cell



Source: science.nasa.gov, How Do Photovoltaic Work (2011)

Figure 4 PV Cell, Module & Array (left) machine of ramming spikes (right).

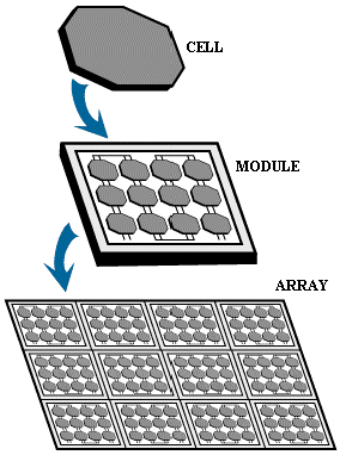


Table 2-2 presents the characteristics of the PV Arrays.

Figure 5 Mounted 1-axix tracker PV (example)

2.2.1 Layout

ANNEX 2 shows the layout of the proposed 50MW PV Plant.

2.2.2 PV Elements

2.2.2.1 PV Array Characteristics

The following Table present the main characteristics of the PV Arrays.

Table 2-2 Characteristics of the PV Arrays

Equipment	Characteristics
Total Area of the PV Arrays	338.070m^2
Number of modules	3 x 200,000
Number of structures	3 x 10,000 (rows)
Alignment direction	N - S
Slope of arrays	~0°
Distance between rows	4.10 m
Percentage of ground slope	0
Assembly structure	1-axis tracker
Assembly of Metal foundations	Direct ramming

2.2.2.2 Trenches

DC and AC low voltage and AC medium voltage cables will be buried directly in the trenches, while communication cables and optical fiber will be placed inside PVC ducts, so different types of trenches in size will be dug during the PV plant construction.

MV trenches will be approximately 1.15 meters deep while LV trenches (between the rows of solar panels) will be 0.8m deep.

Sand will be used to backfill trenches and will be compacted to match existing conditions.

2.2.2.3 PV Support structures

The foundation design will be appropriate to the soil conditions of the PV Plant area. The different types of foundation will be in accordance with the Geotechnical, Soil Report and Pull Out tests to be carried out by the Contractor.

Galvanized steel H-beams will be installed to anchor the solar panel foundations to the ground. At the current stage the EPC is considering driven/hammered Pile Foundation. If the soil investigation's findings prove this type not feasible, the EPC will be review the design accordingly.

A 0.5 m excavation will be undertaken to place the foundation of the inverter buildings, and the sand will be compacted. Due to flooding considerations some of the building will have to be elevated.

2.2.2.4 Electrical Configuration

The electrical diagrams in the PV Facility will be as follows: 22 units of 2.5MW$_{AC}$, feed by 456 (228+228) strings.

There will be a single switchgear and this will be located on the north-east of the Project site.

Inverters will be located inside the 2MW Power Conversion station (please see Project Layout ANNEX 2 for location of power conversion station).

A diagram of the SLDs (LV and MV) is attached on ANNEX 4.

2.2.3 Associated Facilities

2.2.3.1 Laydown Areas

The laydown area for the construction phase will be located within the boundary of the proposed project and it will cover approximately 1,250m^2

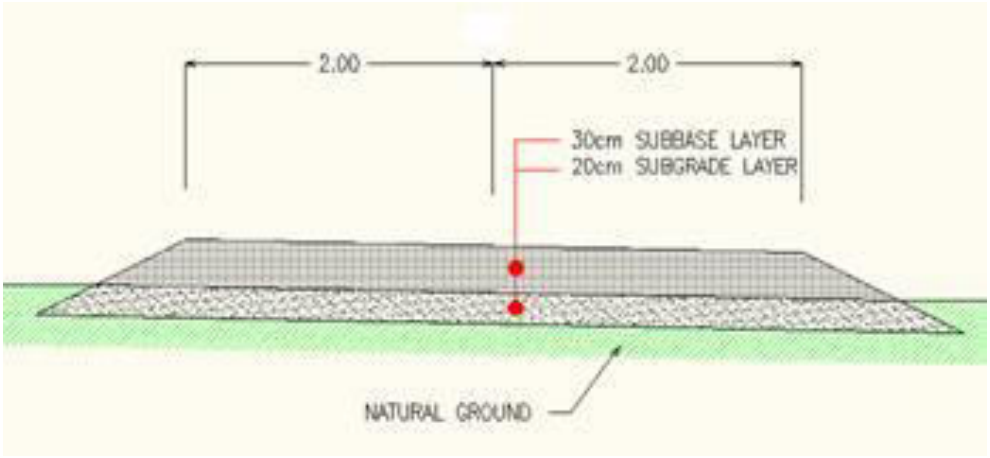
2.2.3.2 Access Roads and Temporary Internal Roads

The proposed access road location for the proposed 50MW PV will be developed by NREA or by the Developer's Association, and has been assessed in the SESA approved by EEAA. It will not be constructed as part of individual projects.

The plant will have internal roads to facilitate access. The roads will be constructed according to the following specifications: refilling based on stone-gravel/quarry-run, and compacted soil (Width 4 m/Thickness 0.25 m).

These inner service roads in the plant will be approximately 4 meters wide. The drawing below depicts the size of the road. The sub base layer material will be brought in from a nearby source to the PV Plant site location.

Figure 6 Internal Roads



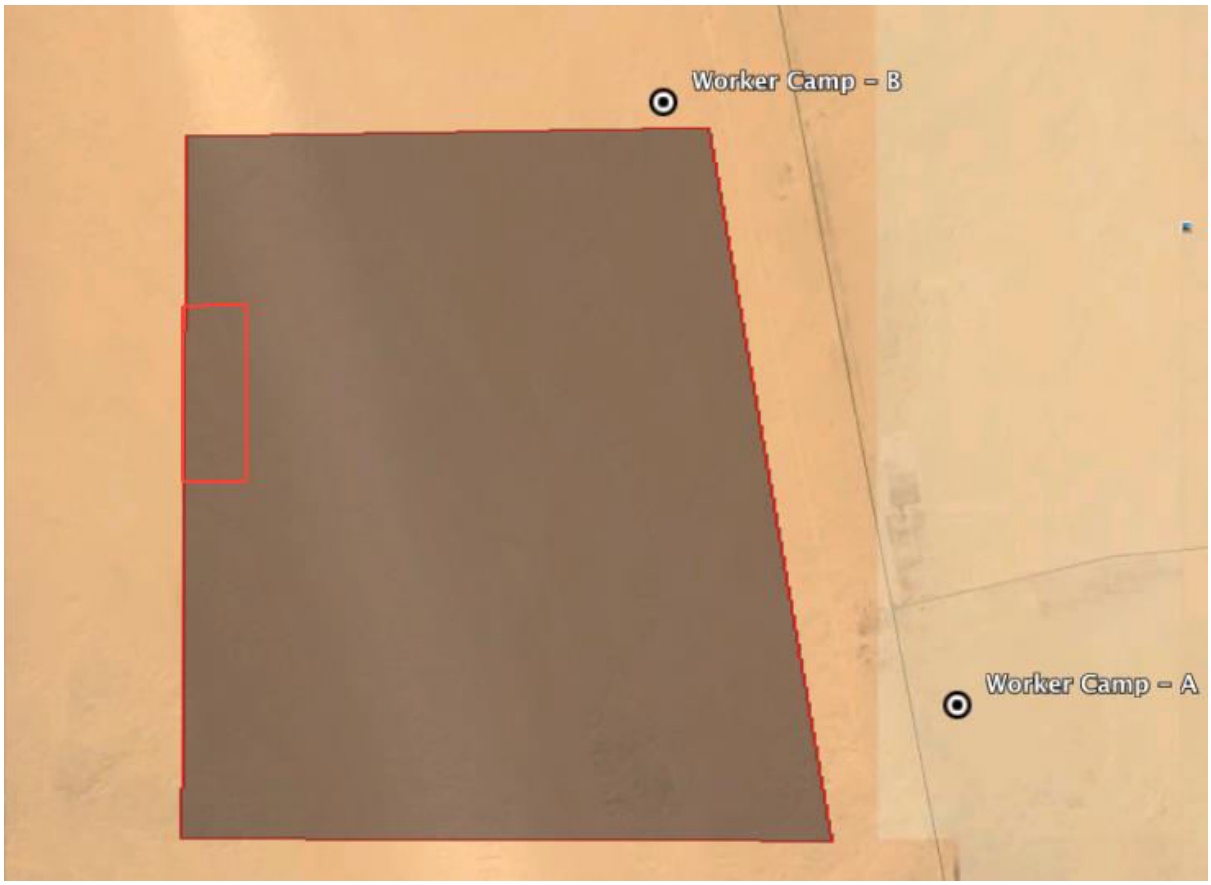
2.2.3.3 Ancillary Buildings

A Control Building, Warehouse and Gatehouse building will be constructed at the Benban PV Power Plant.

2.2.3.4 Work Camp

The final location for the work camp is still under consideration. The following figure shows the locations being considered (Camp A and B).

Figure 7 Potential locations for Workers Accommodation



The design will take into consideration the following features in order to minimize environmental and social impacts associated to the work camp:

- Hiring of local population will be maximized and daily public transport will be provided in order to reduce traffic, CO_2 emissions, habitat destruction for the location of the work camp and provide socioeconomic benefits;
- The work camp will be included on a land with no economic or ecological value, avoiding agricultural, grazing areas, riparian and wadi habitats;
- Work camps will be constructed outside of the existing population centers, to avoid conflicts with local communities, and
- Work camps will be constructed near Aswan-Luxor Highway, and near the PV plant if possible to reduce CO_2 emissions from vehicles and traffic to the site.

2.2.3.5 Water Supply

Potable Water Supply

Potable water will be supplied to the site by an authorized local contractor via portable water tanks, although the storage onsite is unknown at this stage.

Dust Suppression

Water will be supplied to the site via portable water tanks by an authorized subcontractor. The expected consumption rate for this use is 4000m^3/year.

2.2.3.6 Wastewater

A septic tank for wastewater will be installed onsite. Wastewater will be tankered offsite and treated by an authorized local utility following national requirements on wastewater treatment.

2.2.3.7 Solid Waste

The main types of expected waste types are: plastic, paper, cardboard, wood and metal scraps. Waste handling will include storage in separate containers in a dedicated area within the site and transportation by an authorized local subcontractor.

2.2.3.8 Hazardous Waste

Hazardous waste will be disposed at designated areas following the containment measures outlined in the Volume 2. Environmental Management Plan (EMP).

2.2.3.9 Energy

Diesel generators will be the source of electricity during the construction phase.

2.2.3.10 Work Environment

Protective equipment (gloves, glasses, helmets, etc.) will be provided according to local applicable standards and Contractor's policies.

2.2.4 Project Phasing Plan & Schedule

The expected commencement of construction is on 1st September 2016. The expected end of construction is scheduled for October 2017.

ANNEX 3 show a detailed Project Phasing Plan for Benban 50MW.

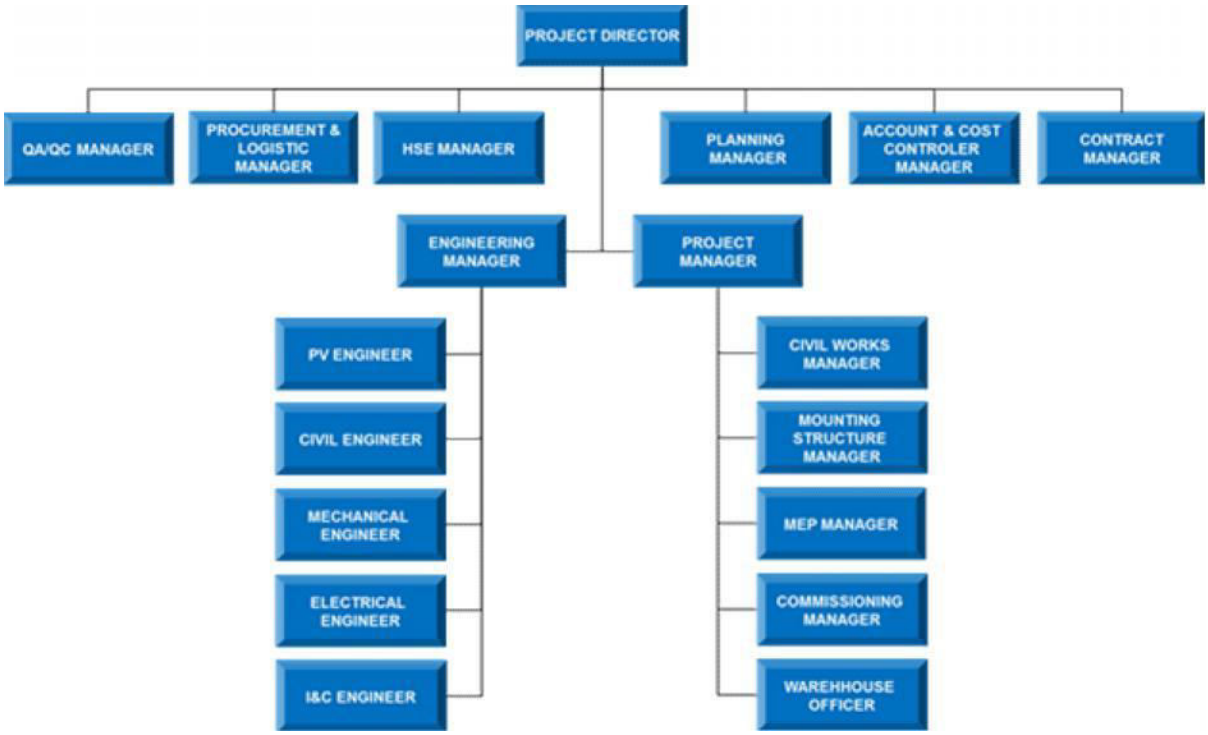
2.2.4.1 Workforce Requirements

The construction phase of a 50 MW Plant requires significantly more staff than the operational phase. The estimated workforce requirements during the construction phase will be approximately 300 workers.

Project Organizational Chart

The figure below summarizes the proposed organizational chart of the EPC contractor during Construction Phase. These key positions will be coordinating the involvement of the various subcontractors or specialized personnel that will be engaged during the construction phase of the project.

Figure 8 Project Organisational Chart



2.3 Project Description. Operation

2.3.1 Associated Facilities

PV Cleaning

ABESO PV will include dry panel-cleaning equipment. This technology will not require water to remove dust and other particles accumulated on the panels.

Potable Water

Potable water will be provided for workers, and sourced from an existing licensed provider. Water consumption rate is expected to be 100m^3/year.

2.3.1.1 Energy

Electricity for the auxiliary consumptions will be sourced from the utility Company by means of a dedicated connection at the MV Switchgear.

2.3.1.2 Wastewater

A septic tank will be used as a temporary storage method for domestic wastewater. It will be transported offsite and treated by an authorized service provider following national requirements.

There will be no other wastewater sources.

2.3.1.3 Solid Waste

The main types of expected waste types are: plastic, paper, and cardboard. Waste handling will include storage in separate containers in a dedicated area within the site and truck transportations.

2.3.1.4 Hazardous Waste

Small amounts of hazardous waste will be generated as a result of maintenance operations. This waste will be storaged in adequate containers and taken offsite by an authorized hazardous waste management company.

2.3.1.5 Work Environment

Protective equipment (gloves, glasses, helmets, etc.) will be provided according to national applicable standards and Contractor's policies.

2.3.2 Worker Force and Local Employment

For the operational phase less staff will be required as the functioning of the plant will be automated and only maintenance, security and module cleaning will be required. Approximately a total of 11 O&M workers (including security) will be required.

2.4 Analysis of Alternatives

High-level alternatives (e.g. no project alternative, alternative locations of the Solar PV Development) have been assessed in the SESA. On a project-specific level, the analysis of alternatives was focused on alternative panel cleaning options to minimise water use, and alternative locations for project ancillary facilities (e.g. worker accommodation) in order to avoid economic displacement and minimise social impacts while ensuring worker welfare.

The selected alternatives (i.e. dry cleaning for PV panels and the areas being consider for the worker accommodation) have minimum environmental and social impacts.

3 Legal Framework, Standards and Guidelines

The following national and international laws and policies applies to the proposed PV project and are described as follows:

3.1 National Requirements

3.1.1 Constitution of The Arab Republic of Egypt 2014

The Constitution of the Arab Republic of Egypt in article 46 states that every person has the right to a healthy environment. 'The State shall take necessary measures to protect and ensure not to harm the environment; ensure a rational use of natural resources so as to achieve sustainable development; and guarantee the right of future generations thereto'.

3.1.2 Environmental Framework

3.1.2.1 The Egyptian Environmental Affairs Agency (EEAA) Guidelines of Principles and Procedures for Environmental Impact Assessment

EEAA Guidelines for EIA studies, January 2009 define the EIA scoping and different procedures, requirements and tools of the EIA process and to ensure fulfill application as well as emphasize the role of involved parties in the EIA process. The guideline aims to:

- Describe the objective of the EIA process and its legal requirements;
- Identify the projects for which EIAs are required;
- Indicate the criteria for classification and the different levels of assessment;
- Describe the requirements for EIA of different categories; and
- Describe the requirements for public consultation.

3.1.2.2 Egyptian Environmental law No. 4 of year 1994

The Egyptian environmental law No. 4 of year 1994 that was amended by law No. 9 of 2009, and its executive amendment no. 338 of 1995 modified by ministerial decrees no. 1741 of 2005, no. 1095 of 2011 and no. 964 of 2015.

The Statute provides tools for environmental management including EIAs. It imposes a mandatory duty on project developers to have an EIA conducted and approved for new establishments/projects and for expansions/renovations of existing establishments before construction. The law considers the EIA as a main condition for licensing and thus the project that does not prepare an EIA or does not abide by the EIA conditions could be subjected to its license being revoked.

The National Environment Management Policy, 1994, aims to promote sustainable economic and social development taking into consideration the needs of future generations. EIA is one of the tools it considers necessary to ensure environmental quality on long-term basis. The

policy requires that projects likely to have significant adverse ecological or social impacts undertake an EIA before their implementation.

Law Number 4 provides environmental standards. It includes standards for hazardous materials and waste, air quality, noise, water quality, and soil quality. A number of supporting articles have been developed in order to protect workers environment with regards to safe and security standards.

3.1.2.3 Protected Areas

Law No 102 of 1983 for Nature Protectorates. This statute provides information about the actions that are forbidden, permitted and penalties within a Nature Protectorate in Egypt, defining a Nature Protectorate as any area of Land, or coastal or inland water characterized by flora, fauna, and natural features having cultural, scientific, touristic or esthetic value.

This law is not applicable onsite, as no direct or impacts on protected areas are expected at this stage.

3.1.2.4 Wastewater

For wastewater and groundwater contamination the following legislation is applicable:

- Law No. 93 of 1962 on industrial wastewater disposal;
- Law 48 of 1982 regulates discharge into underground reservoirs and branches or canals of the Nile, to the main stream of the Nile, and to municipal and industrial drains.

Measures to prevent groundwater contamination are provided in the EMP and no wastewater discharges to the environment will be allowed in the project. All wastewater will be tankered away by licensed contractors.

3.1.2.5 Solid Waste

For solid waste the following legislation is applicable in Egypt

- Law 38/1967, and Law 31/1976, which amended law 38/1967 which addresses public cleanliness, regulates the collection and disposal of solid wastes from houses, public places, commercial, and industrial establishments.
- Ministry of Housing, Utilities and Urban Communities (MHUUC) decree No. 134 of 1968, which provides guideline from domestic and industrial sources, including specifications for collection, transportation, composting, incineration and land disposal.

3.1.2.6 Hazardous Materials

Law 4/1994 includes information regarding control of hazardous materials and waste. Articles 29 and 33 of the law make it mandatory for those who produce or handle dangerous materials in gaseous, liquid or solid form, to take precautions to ensure that no environmental damage shall occur. Articles 25, 31 and 32 of the executive regulations (Decree 338/1995) specify the necessary precautions for handling hazardous materials. Article 33 of the

executive regulations (Decree 338/1995) specifies that the owner of an establishment whose activity results in hazardous waste shall hold an environmental register of such waste and the method of disposal.

3.1.2.7 Noise

Noise is regulated by article 42 of law 4/1994.

3.1.3 Social and Economic Framework

3.1.3.1 Law No 204 of 2014 regarding the Stimulation of Producing Electricity from Renewable Energy Sources

This law was established in order to secure the provision of the electric energy and encouragement of investment, research, development upgrading and protection of competition, preserving the environment and strengthening the cooperation with the other states in the field of electricity.

3.1.3.2 Cultural Heritage

- Law No. 117of year 1983 on antiquities and cultural heritage.
- New Building Law No. 119/2008

3.1.3.3 Labor Law and Public Participation

- Labor Law No. 12/2003
- Public participation is included within a declaration in the Constitution of The Arab Republic of Egypt 2014.

3.1.3.4 Human Rights

- Law No. 94/2003 on the establishment of the National Council for Human Rights (NCHR).

3.1.3.5 Traffic and Transportation

- Law no. 142 of 2014 on Traffic (modifying some provisions of Law no. 66 of 1973).

3.2 International Treaties and agreements signed by Egypt

Egypt has signed and /or ratified several international agreements relating to the environment. Those that can potentially be applicable are outlined below:

Table 3-1 International Agreements signed and/or Ratified by Egypt.

Category	Name of Multilateral Environmental Agreement	Date of Ratification	Date of Entry Into Force	Date of Signature
Biodiversity and Natural Resources	Convention on Wetlands of International Importance Especially as Water Fowl Habitat (RAMSAR)	09/09/88	09/09/88	
	Convention Relative to the Preservation of Fauna and Flora in their Natural State	21/02/35	14/01/36	
	International Plant Protection Convention	22/07/53		
	African Convention on the Conservation of Nature and Natural Resources	16/03/72		
	Protocol to Amend the Convention on Wetlands of International Importance Especially as Water Fowl Habitat	09/09/88		
	Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES)	04/01/78	04/04/78	
	Convention on the Conservation of Migratory Species of Wild Animals (Bonn)	11/02/82	01/11/83	
	Convention on Biological Diversity (CBD)	02/06/94		
	Agreement for the Establishment of the Near East Plant Protection Organization	13/04/95		
	Convention Concerning the Protection of the World Cultural and Natural Heritage	07/02/74		
	United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa	07/07/95		
	Agreement for the Establishment of a Commission for Controlling the Desert Locust in the Near East	06/07/67	21/04/69	
	International Tropical Timber Agreement	16/01/86		

Category	Name of Multilateral Environmental Agreement	Date of Ratification	Date of Entry Into Force	Date of Signature
	International Tropical Timber Agreement, 1994			08/11/94
	Protocol Concerning Mediterranean Specially Protected Areas	08/07/83		
	Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean			10/06/95
Hazardous Materials and Chemicals	Convention Concerning Prevention and Control of Occupational Hazards Caused by Carcinogenic Substances and Agents	25/03/82	25/03/83	
	Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and Their Disposal	08/01/93	05/05/92	13/02/92
	Amendment to the Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and Their Disposal	13/12/03		22/09/95
	Bamako Convention on the Ban of the Import into Africa and the Control of Trans-boundary Movement and Management of Hazardous Wastes within Africa	15/05/04	12/05/94	30/01/91
	Stockholm Convention on Persistent Organic Pollutants (POPs)	02/05/03	17/05/04	17/05/02
Atmosphere and Air Pollution	United Nations Framework Convention on Climate Change	05/12/94	05/03/95	09/06/92
	Kyoto Protocol	12/01/05	16/02/05	15/03/99
	Vienna Convention for the Protection of the Ozone Layer	09/05/88		
	Montreal Protocol on Substances that Deplete the Ozone Layer	02/08/88		
	(London) Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer	13/01/93		
	(Copenhagen) Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer	28/06/94		
Health and Worker Safety	Convention Concerning the Protection of Workers Against Occupational Hazards in the Working Environment due to Air Pollution, Noise and Vibration		04/05/88	
	Convention Concerning the Protection of Workers Against Ionizing Radiation	18/03/64		
Human Rights	Convention on the Elimination of All Forms of Discrimination against Women	18/09/81		16/07/80

Category	Name of Multilateral Environmental Agreement	Date of Ratification	Date of Entry Into Force	Date of Signature
	Protocol to the African Charter on Human and Peoples' Rights on the Rights of Women in Africa	Not Ratified		Not Signed
	International Convention on the Elimination of All Forms of Racial Discrimination	01/05/67		28/09/66
	Convention on the Rights of the Child	05/02/90		06/07/90
	Convention concerning the Prohibition and Immediate Action for the Elimination of the Worst Forms of Child Labour	Ratified		Signed
	Abolition of Forced Labour Convention	Ratified		Signed
	Right to Organize and Collective Bargaining Convention	03/07/54		

Source: Arab Republic of Egypt. Ministry of Foreign Affairs.

3.3 International Requirements

3.3.1 The World Bank / IFC Environmental Safeguard Policies and Performance Standards

The World Bank Group / International Finance Corporation (IFC) Environmental, Health and Safety (EHS) General Guidelines of April 2007 superseded the World Bank EHS Handbook issue of 1998.

In addition, a number of sector specific guidelines have been revised or are undergoing peer review. Both the IFC Sustainability Framework (which defines the IFC approach towards sustainability and the environment) and the IFC/WBG performance Standards (which define the clients' responsibilities for managing their environmental and social risks) have been updated in 2012.

The updated EHS Guidelines serve as a technical reference source to support the implementation of the Performance Standards. The Performance Standards are outlined below.

Performance Standard 1 covers several types of Environmental Assessment instruments, including ESIAs. These standards require the Environmental Assessment to be undertaken to a high standard and compliant with International Best Practice. Specifically, the objectives of PS1 are:

- To identify and evaluate environmental and social risks and impacts of the project;
- To adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, and, where residual impacts remain, compensate/offset for risks and impacts to workers, Affected Communities, and the environment;
- To promote improved environmental and social performance of clients through the effective use of management systems;
- To ensure that grievances from Affected Communities and external communications from other stakeholders are responded to and managed appropriately;
- To 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 relevant environmental and social information is disclosed and disseminated.

Performance Standard 2: Labor and Working Conditions aims to promote the fair treatment, non-discrimination, and equal opportunity of workers; to establish, maintain, and improve the worker-management relationship; to promote compliance with national employment and labor laws; to protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in the client's supply chain; to promote safe and healthy working conditions, and the health of workers and to avoid the use of forced labor.

Performance Standard 3: Resource Efficiency and Pollution Prevention, aims to avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities, to promote more sustainable use of resources, including energy and water and to reduce project-related GHG emissions.

Performance Standard 4: Community Health, Safety, and Security aims to anticipate and avoid adverse impacts on the health and safety of the Affected Community during the project life from both routine and non-routine circumstances and to ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the Affected Communities.

Performance Standard 5: recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. Involuntary resettlement refers both to physical displacement (relocation or loss of shelter) and to economic displacement (loss of assets or access to assets that leads to loss of income sources or other means of livelihood) as a result of project-related land acquisition and/or restrictions on land use.

Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources. This standard aims to:

- Protect and conserve biodiversity;
- Maintain the benefits from ecosystem services; and
- Promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities.

Performance Standard 7: Indigenous People. This PS includes requirements in terms of establishing and maintaining an on-going relationship based on Informed Consultation and Participation (ICP) with the local communities affected by a project throughout the project's life-cycle that will be complied with.

Performance Standard 8: Cultural Heritage. The PS aims to Protect cultural heritage from the adverse impacts of project activities and support its preservation and to promote the equitable sharing of benefits from the use of cultural heritage.

3.3.2 European Bank for Reconstruction and Development (EBRD)

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 are presented in the table below.

Table 3-2 EBRD Performance Requirements (PRs)

EBDR Performance Requirements (PRs)	Objective of PR s
PR1: Assessment and Management of Environmental and Social Impacts and Issues	The objectives of this PR are to: • Identify and evaluate environmental and social impacts and issues of the project • Adopt a mitigation hierarchy approach to address adverse environmental or social impacts and issues to workers, affected communities, and the environment from project activities • 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. **PR 1 is applicable to the project.**
PR2: Labor and Working Conditions	The objectives of this PR are to: • Respect and protect the fundamental principles and rights of workers • Promote the decent work agenda, including fair treatment, non-discrimination and equal opportunities of workers • Establish, maintain and improve a sound worker- management relationship • Promote compliance with any collective agreements to which the client is a party, national labor and employment laws • Protect and promote the safety and health of workers, especially by promoting safe and healthy working conditions **PR 2 is applicable to the project.**
PR3: Resource Efficiency and Pollution Prevention and Control	The objectives of this PR are to: • 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.

EBDR Performance Requirements (PRs)	Objective of PR s
	PR 3 is applicable to the project.
PR4: Health and Safety	The objectives of this PR are to: • 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 minimize 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. **PR 4 is applicable to the project**
PR5: Land Acquisition, Involuntary Resettlement and Economic Displacement	The objectives of this PR are to: • Avoid or, when unavoidable, minimize, 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. **PR 5 is not applicable to the project. Land acquisition onsite has been covered by the SESA. Temporary land acquisition for the worker accommodation does not trigger the safeguards of this PR.**
PR6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	The objectives of this PR are to: • Protect and conserve biodiversity using a precautionary approach

EBDR Performance Requirements (PRs)	Objective of PR s
	• 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. **The requirements on this PR in relation to the project area have been assessed in the SESA. The project design and the location of the worker accommodation does not trigger additional safeguards.**
PR7: Indigenous Peoples	There are no Indigenous Peoples in the Project area. **PR 7 is not applicable.**
PR8: Cultural Heritage	The objectives of this PR are to: • 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 from the use of cultural heritage in business activities • Promote the awareness and appreciation of cultural heritage where possible. **PR 8 was addressed in the SESA. Additional requirements are applicable at a project level, namely a chance find procedure.**
PR9: Financial Intermediaries	This project does not involve Financial Intermediaries **PR 9 is not applicable.**
PR10: Information Disclosure and Stakeholder Engagement	The objectives of this PR are to: • 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

EBDR Performance Requirements (PRs)	Objective of PR s
	• Ensure that grievances from affected communities and other stakeholders are responded to and managed appropriately. **PR 10 will be addressed mostly by the developers association, but there will be some requirements for project level disclosure, project level grievance mechanism, etc.**

3.3.3 Relevant EU Regulations

European Union (UN) Commission Directives are applied on a case-by-case basis to EBRD Projects. The following directives are considered to be applicable.

- **Directive 2011/92/EU** of the European Parliament and of the Council of 13 December 2011on 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 2014/52/EU** amends the above directive in Article 3, requiring the EIA to "identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project on the following factors: a) Population and human health b) Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC c) Land, soil, water, air and climate d) Material assets, cultural heritage and the landscape e) The interaction between the factors referred to in points a) to d).

3.4 Applicable Standards, guidelines and requirements

The standards included in the laws, regulations and procedures mentioned in the previous section, which have to be complied with during the project lifecycle.

This section specifies the most relevant standards that will need to be taken into consideration.

3.4.1 Soil and Groundwater Standards

3.4.1.1 National Standards

Egypt has no specific standards soil and groundwater contamination.

3.4.1.2 International Standards

The IFC EHS regulations do not specify pollutant standards for soils or groundwater. Therefore, sector-specific guidance documents on pollution prevention and good practices produced by the IFC (e.g. IFC 'Environmental Health and Safety Guidelines (EHS) Guidelines: Contaminated Land' (2007) will be referred to in the assessment. Such guidance includes the following:

- The General EHS guidelines detail that the '…Transfer of pollutants to another phase, such as air, soil, or the sub-surface, should be minimized through process and engineering controls.'
- Section 1.8 of the IFC's General Guidelines details the specific requirements with regards to contaminated land. It notes that: " *Contamination of land should be avoided by preventing or controlling the release of hazardous materials, hazardous wastes, or oil to the environment. When contamination of land is suspected or confirmed during any project phase, the cause of the uncontrolled release should be identified and corrected to avoid further releases and associated adverse impacts*."

As specific standards and guidelines for soil protection are currently unavailable, internationally recognized assessment values for soil contamination set by the Dutch Ministry of Housing, Spatial Planning and Environment have been applied. Table 3-5 provides a list of the Dutch Soil and Groundwater standards regarding heavy metals.

The use of the Dutch standards (ESDAT, 2000) is common practice for the analysis of soils and groundwater, as they are viewed as international best practice.

In the Netherlands, environmental quality values have been established based on the philosophy of protecting ecosystems, environmental functions and ensuring the multi-functionality of soil and groundwater quality. These are discussed below:

- **Target Value**: average background concentration or detection limit; exceeding this value indicates a possible diminishing of the functional abilities of the soil for humans, plants or animals.
- **Intervention Value**: concentration level above, which there is a serious or threatening diminishing of the functional abilities of the soil for humans, plants or animals.

With reference to these standard values, the target values for soil represent the level at which environmental sustainable soil quality is present. For shallow groundwater (<10 m), the environmental quality objectives for soil and water have been adopted as target values.

Table 3-3: Dutch Soil and Groundwater Heavy Metal Guidelines

Contaminant	Dutch Soil Sediment		Dutch Groundwater	
	(mg/kg dry weight)		(µg/l)	
	Target	Intervention	Target	Intervention
Antimonium	3	15		20
Arsenic	0.9 L	55	10	60
Barium	160	625	50	625
Beryllium	1.1	30 S		
Bromine	20			
Cadmium	0.8	12	0.4	6
Chromium^{III}	<0.38 L	220 L		
Chromium^{VI}	<0.38 L	220 L		
Chromium (total)	100 L	380 L	1	30
Cobalt	2.4 L	120 L	20	100
Copper	3.4	96	15	75
Cyanide (total complex)	5	50 (pH>5)		
Cyanide (total free)	1	20		

Contaminant	Dutch Soil Sediment		Dutch Groundwater	
	(mg/kg dry weight)		(µg/l)	
	Target	Intervention	Target	Intervention
Fluorine	500			
Lead	55 L	530	15	75
Mercury (Methyl)	0.037 L	4 L		
Mercury	0.3	10	0.05	0.3
Molybdenum	3	190 L		
Nickel	0.26 L	100 L	15	75
Selenium	0.7 L	100 S		
Silver		15 S		
Tellurium		600		
Thallium	1	15 S		
Tin	19 background	900 S		
Tin as triphenyltin		<2.5		
Vanadium	42	250 S		
Zinc	16 L	350 L	65	800
L: Environmental Risk Limits				
S: Serious Contamination Level				

Constituent levels greater than the target value indicate that the soil has lost some of its multi-functional properties and can be considered as contaminated soil. If the contamination level is exceeding the target value, further investigation should be carried out. The soil intervention values indicate when the functional properties of the soil are seriously impaired or threatened.

It should be noted that Dutch Soil standards are specific for each specific site, and therefore values will need to be adjusted for the specific soil conditions at the project site according to the referred Guidance Note (ESDAT, 2000).

Finally target values are not specific clean up criteria. They represent targeted objectives. Also, in the latest (2009) version of the Dutch Standard, Target values for soils have been removed for all compounds except Metals.

3.4.2 Waste Water Standards

3.4.2.1 National Standards

Law No. 93 of 1962 on industrial wastewater disposal: Limits for pollutants in wastewater vary depending on the type of receiving water body. The parameters that should be monitored

and/or inspected are BOD, COD, pH, temperature, total phosphorous, phosphates, nitrates, fluorides, ammonia, sulphates, nickel, iron, zinc, nitrogen, TSS, TDS, Oil and Grease.

The following Table shows the permissible limits for discharges to the different recipients (sea, Nile, canals, agricultural drains, public sewer) according to the different relevant laws.

Table 3-4: Egyptian Environmental Legal Requirements for Industrial Wastewater

Parameter (mg/1 unless otherwise noted)	Law 48/82:			
	Discharge into :			
	Nile		Drains	
	Underground Reservoir & Nile Branches/Canals	(Main Stream)	Municipal	Industrial
BOD (5day,20 deg.)	20	30	60	60
COD	30	40	80	100
pH	6-9	6-9	6-9	6-9
Oil & Grease	5	5	10	10
Temperature (deg.)	35	35	35	35
Total Suspended Solids	30	30	50	60
Settable Solids	__	20	__	__
PO_4	__	1	__	10
Total phosphorus	__	__	__	__
Fluoride	0.5	0.5	__	0.5
Total Dissolved Solids	800	1200	2000	2000
Ammonia	__	__	__	__
Nitrates	30	30	50	40
Sulphides	1	1	1	1
Nitrogen	__	__	__	__
Iron	1	1	__	__
Zinc	1	1	__	__
Nickel	0.1	0.1	__	__

3.4.2.2 International Standards

According to IFC Environmental, health and Safety Guidelines (IFC, 2007), sanitary wastewater from industrial facilities may include effluents from domestic sewage, food service, and laundry facilities serving site employees. Miscellaneous wastewater from laboratories, medical infirmaries, water softening etc. may also be discharged to the sanitary wastewater treatment system. Recommended sanitary wastewater management strategies include:

- Segregation of wastewater streams to ensure compatibility with selected treatment option (e.g. septic system which can only accept domestic sewage); (
- Segregation and pretreatment of oil and grease containing effluents (e.g. use of a grease trap) prior to discharge into sewer systems; (
- If sewage from the industrial facility is to be discharged to surface water, treatment to meet national or local standards for sanitary wastewater discharges or, in their absence, the indicative guideline values applicable to sanitary wastewater discharges shown in Table 3-7.
- If sewage from the industrial facility is to be discharged to either a septic system, or where land is used as part of the treatment system, treatment to meet applicable national or local standards for sanitary wastewater discharges is required. (
- Sludge from sanitary wastewater treatment systems should be disposed in compliance with local regulatory requirements, in the absence of which disposal has to be consistent with protection of public health and safety , and conservation and long term sustainability of water and land resources. (

Table 3-5: Indicative Values for Treated Sanitary Sewage Discharges (IFC, 2007)

Pollutants	Units	Guideline Value
pH	pH	6–9
BOD	mg/l	30
COD	mg/l	125
Total nitrogen	mg/l	10
Total phosphorus	mg/l	2
Oil and grease	mg/l	10
Total suspended solids	mg/l	50
Total coliform bacteria	MPN[b] / 100 ml	400[a]
Notes:		
a Not applicable to centralized, municipal, wastewater treatment systems which are included in EHS Guidelines for Water and Sanitation.		
b MPN = Most Probable Number		

When National regulations and IFC Guidelines differ, the project is expected to achieve whichever is more stringent.

3.4.3 Noise and Vibration Standards

3.4.3.1 National Standards

With regards to heavy machinery, noise is regulated by article 42 of Law 4/1994, article 44 of the executive regulations and table (1) in annex (7).

Table 3-6: Maximum Permissible Noise Levels (law 4/1994)

No	Type of Place and Activity	Maximum Permissible Noise Decibel (A)
1	Work place with up to 8 hour and aiming to limit noise hazards on sense of hearing	90 dB
2	Work place where acoustic signals and good audibility are required	80 dB
3	Work rooms for the follow up, measurement and adjustment of high performance operations	65 dB
4	Work rooms for computers, typewriters or similar equipment	70 dB
5	Work rooms for activities requiring routine mental concentration	60 dB

The value given hereafter is indicated on the basis of not affecting the sense of hearing.

- Intensity of noise shall not exceed 90 decibels (A) during a daily 8-hour work shift.
- In case of increasing noise level intensity over 90 dB (A), the period of exposure must be reduced according to the following table:

Table 3-7: Noise intensity Level Related to the Exposure Period

Noise Intensity Level Decibel (A)	95	100	105	110	115
Period of Exposure (hour)	4	2	1	½	¼

Table 3-8: Noise intensity Levels in Intermittent Knocking Places

Noise Intensity dB	Max Allowable Knocks During Daily Work Period
135	300
130	1000
125	3000
120	10000
115	30000

3.4.3.2 International Standards

According to IFC Environmental, health and Safety Guidelines (IFC, 2007), noise impacts should not exceed the levels presented in the following Table or result in a maximum increase in background levels of 3 dB at the nearest receptor location off-site:

Table 3-9 IFC standards for noise levels (IFC, 2007)

Noise levels				
	Workplace dB	Outdoor* dB		
			Daytime	Nighttime
Limit	90	Residential, Institutional and educational	55	45
		Industrial and commercial	70	70
Standard/ Guideline	Occupational Safety and Health Administration (OSHA)	IFC Environmental, Health, and Safety (EHS) Guidelines, General EHS Guidelines: Environmental Noise Management		
* Noise impacts should not exceed the levels presented, or result in a maximum increase in background levels of 3 dB at the nearest receptor location off-site.				

When National regulations and IFC Guidelines differ, the project is expected to achieve whichever is more stringent.

3.4.4 Waste Minimisation Standards

3.4.4.1 National Standards

Law No. 4 of 1994 for the Protection of the Environment, and the Executive Regulation Decree 338 of 1995, Part I – Chapter II Hazardous Materials and Waste provide the policies and mechanisms for ensuring that solid wastes are appropriately handled and disposed.

Law No.4 defines Hazardous Substances as "substances having dangerous properties which are hazardous to human health, or which adversely affect the environment, such as contagious, toxic, explosive or flammable substances or those with ionising radiation"; and hazardous waste are defined as "waste of activities and processes or its ashes which retain the properties of hazardous substances and have no subsequent original or alternative uses, such as clinical waste from medical treatments or the waste resulting from the manufacture of any pharmaceutical products, drugs, organic solvents, printing fluid, dyes and painting materials".

The handling and disposal procedures for waste streams must also comply with the guidelines of Law 38/1976 on Municipal Waste Management.

Finally, Decree No. 673 (1999), issued by the Ministry of Petroleum, has defined hazardous substances in the petroleum sector. The Guidelines specify that the handling and transportation of hazardous waste is prohibited unless carried out by an authorized

hazardous waste treatment/disposal contractor or authority. Authorisation is also required for the temporary and permanent storage of hazardous wastes.

3.4.4.2 International standards

Hazardous Materials Management

Section 1.5 of IFC General EHS Guidelines (IFC, 2007); describe recommended management for Hazardous Materials.

The overall objective of hazardous materials management is to avoid or, when avoidance is not feasible, minimize uncontrolled releases of hazardous materials or accidents (including explosion and fire) during their production, handling, storage and use. This objective can be achieved by:

- Establishing hazardous materials management priorities based on hazard analysis of risky operations identified through Social and Environmental Assessment; (
- Where practicable, avoiding or minimizing the use of hazardous materials. For example, non-hazardous materials have been found to substitute asbestos in building materials, PCBs in electrical equipment, persistent organic pollutants (POPs) in pesticides formulations, and ozone depleting substances in refrigeration systems; (
- Preventing uncontrolled releases of hazardous materials to the environment or uncontrolled reactions that might result in fire or explosion; (
- Using engineering controls (containment, automatic alarms, and shut-off systems) commensurate with the nature of hazard; (
- Implementing management controls (procedures, inspections, communications, training, and drills) to address residual risks that have not been prevented or controlled through engineering measures. (

Waste Management

Section 1.6 of "the IFC General EHS Guidelines" is entitled Waste Management and is applicable to all projects that generate, store or handle any quantity of waste.

The waste management guidelines state that facilities that generate and store wastes should practice the following:

- Establish waste management priorities at the outset of activities based on an understanding of potential;
- Identify EHS risks and impacts and consider waste generation and its consequences;
- Establish a waste management hierarchy that considers prevention, reduction, reuse, recovery, recycling, removal and finally disposal of wastes;
- Avoid or minimize the generation of waste materials, as far as practicable;
- Identify where waste generation cannot be avoided but can be minimized or where opportunities exist for, recovering and reusing waste; and
- Where waste cannot be recovered or reused, identify means of treating, destroying, and disposing of it in an environmentally sound manner.

4 Biophysical and Socio-economic Baseline

This description is based on a combination of desktop research, analysis of maps and aerial photography and an initial site inspection.

It should be noted that the SESA has provided detailed baseline information for the Benban site and area. This section complements the information of the SESA where necessary.

4.1 Biophysical Baseline

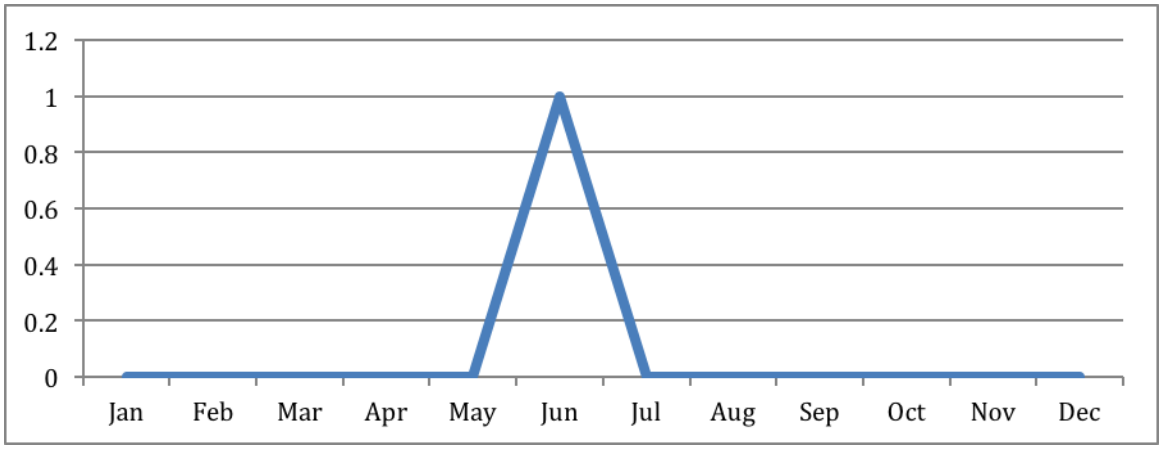
4.1.1 Climate

Aswan region occupies a portion of the extremely arid belt of Egypt where the rainfall is negligible only with exception of the occasional heavy torrential rainfall on the eastern height lands. 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 dominantly from NW to SE.

4.1.1.1 Rainfall

Rainfall in Aswan region normally ranges from 0.0mm to 1mm coming in spring (April and May). There is normally a long dry spell between May and December. The figure below shows the monthly and long-term average rainfall for Aswan.

Figure 9 Aswan 2015 monthly rainfall



Source: Climatemps statistical abstract 2015.

4.1.1.2 Temperature, Humidity, Wind and Evapotranspiration

Aswan region generally records a mean annual maximum temperature of around 34.2° C and a mean minimum of around 19.3°C. Its extreme highest temperatures are in the month of August when it records approximately 41.9°C. Relative humidity ranges from 15% in April

and May to 37% in December. Relative humidity, temperature, humidity and Wind speed are presented in the table below.

Table 4-1 Mean values for climate parameters at Aswan Region

Month	Air Temperature		Relative Humidity	Wind Speed
	Mean (max)	Mean (min)	%	(knots)
Jan	23.7	9.9	35	5.6
Feb	25.9	11.0	24	6.5
Mar	30.4	14.3	16	7.0
Apr	35.5	16.9	15	7.4
May	39.6	23.4	15	7.2
Jun	41.7	25.6	13	7.7
Jul	41.5	26.3	19	7.1
Aug	41.9	26.4	19	7.1
Sep	39.6	24.0	21	7.1
Oct	36.9	24.0	23	7.3
Nov	30.8	21.6	32	6.2
Dec	25.5	16.4	37	6.6

Source: Climatemps statistical abstract 2015.

No information on monthly temperature is available for the Project Site; however, similar characteristics to Aswan regions are expected.

4.1.2 Topography and Landscape

Aswan Governorate embraces the Nile River floodplain, and immediately adjacent territories. The sandstone, granite, and diorite hills flanking the Nile are dissected by ancient, long-dried-up streams.

The area proposed for the development is mainly flat with hard sandy and gravel ground. Ground levels vary from 145m to 150m with an average of 147m.

4.1.3 Soil and Geology

In the Aswan region, the sedimentary succession is differentiated into the following lithostratigraphic units; these are described from the younger to the older units. This description also applies to the proposed Project Site for Benban 50MW PV Plant, located approximately 43 km 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).
- Clay deposits of the present Nile flood plain, outwash deposits of the desert wadis, etc. (Holocene - Pleistocene), (thickness < 50 m).
- Graded sand and gravel containing the main aquifer, (thickness < 200 m).

- Mixed clay sand and gravel containing a secondary aquifer, (thickness < 100 m).
- Main clay layer with inter-beds of sand (Paleocene) (thickness >50m).

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

Precambrian Rock Unit, highly fractured igneous and metamorphic rocks, with 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.

Sand drifts. The predominant north winds drive fine sand southward, drifting across roads and into agricultural areas. In some places, the sand drifts form long, narrow windrows in the lee of fixed objects. Such windrows can extend for hundreds, even thousands of meters, downwind from the fixed objects.

Sand can also accumulate in croissant-shaped "barchan" dunes, which can be hundreds of meters across and tens of meters high, and which can move several m per year in the direction of the prevailing wind. A barchan dune is an arc- shaped sand ridge, comprised of well-sorted sand. This type of dune possesses two "horns" that face downwind, with the slip face (the downwind slope) at the angle of repose, or approximately 34 degrees. The upwind side is packed by the wind, and stands at about 15 degrees. Simple barchan dunes may stretch from meters to a hundred meters or so between the tips of the horns.

Sheets of yellow sand and gravel cover most of the area within the project footprint. A darker area comprised by old alluvial plains is located in the eastern side of the site. These areas are comprised by medium gravel, mainly quartz.

No signs of ground contamination was located onsite during the preliminarily assessment.

4.1.4 Seismic activity

Some areas such as Kalabsha (southern Aswan) in Aswan Governorate are known to be active in terms of seism activity. Kalabsha population is located approximately 55km to the south of the proposed development.

In general, the rate of seismicity and tectonic activity is considered to be low at the Project Site.

4.1.5 Hydrology and Hydrogeology

The Western Dessert habitat on which the project is located (see Section 4.1.6.2) is formed by the following hydrological systems: irrigation canals, River Nile and wadis. Wadis are dry ephemeral riverbeds that contains water only during short periods of time when heavy rain occur.

The River Nile is located approximately 18km to the east of the site. The nearest wadi is located approximately 12km to the south of the proposed development.

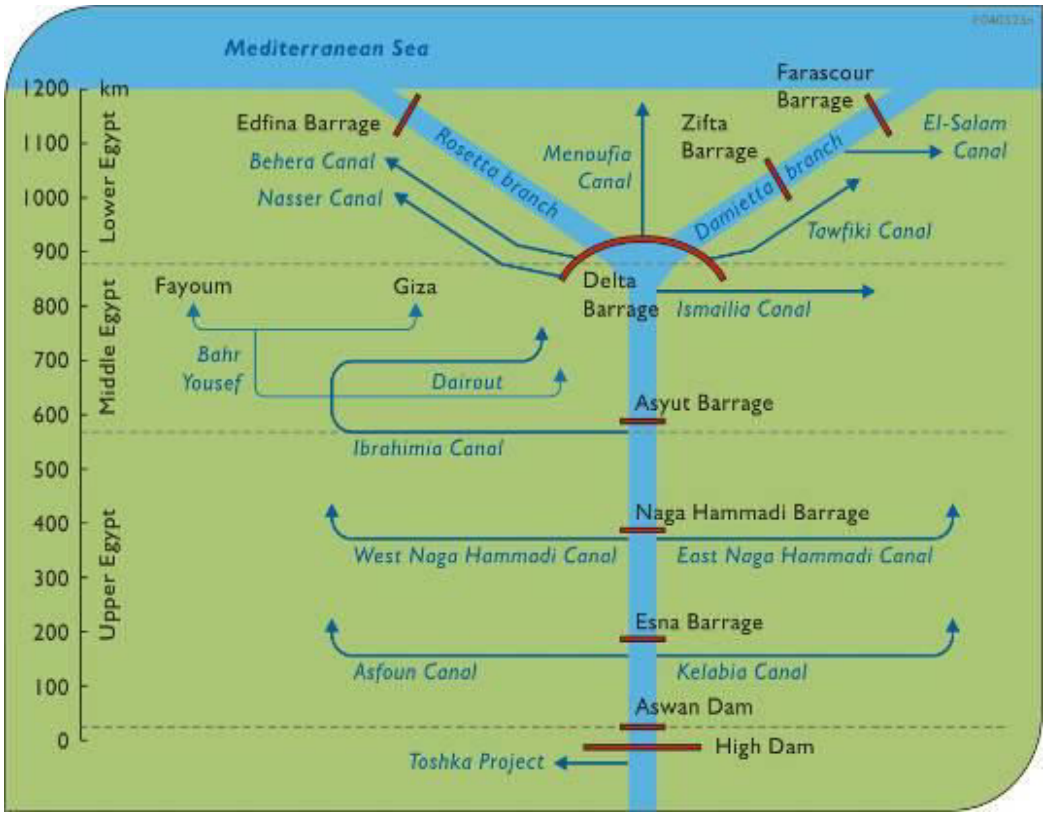
The Nubian sandstone aquifer underlies a large part of Egypt and neighboring Sudan, Chad and Libya, covering about 1.65 million km^2. The aquifer is up to 4000 m thick, and extends downward to 2000 m below sea level in the Kharga Oasis, which is located 251,3 km

northwest of the proposed development. Groundwater modeling indicates that the aquifer contains about 135,000 billion m^3 of water.

Hydrogeological data from the Project Site was obtained due to the construction of wells drilled onsite. The information obtained onsite includes groundwater levels. Results obtained during the study suggest that groundwater is located more that 150m deep and the extracted water is brackish.

No surface water was identified in the Project Site.

Table 4-2 Hydrology control structures along the Nile River



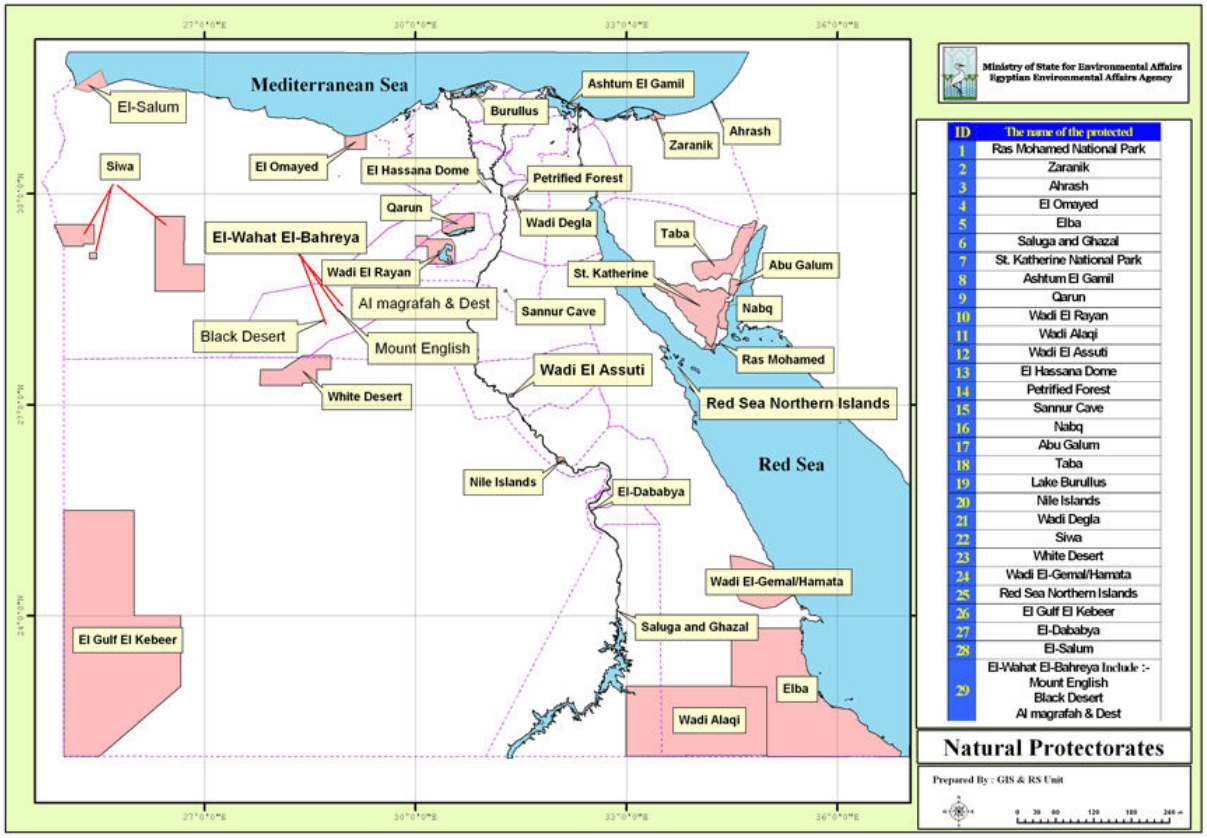
4.1.6 Ecology and Biodiversity

4.1.6.1 Protectorates and other Protected Areas

The 50MW PV footprint does not have any special features to qualify as a protected area. The nearest Protectorate is located about 41km to the proposed Project Site. Wadi Allaqi is located more than 186 km to the south of the proposed development and is also listed as a Biosphere reserve.

The Following Protectorates are located in Egypt:

Figure 10 Protectorates in Egypt



Source: Egyptian Ministry of Environment, EEAA.

The following Protectorates are located in Aswan Governorate.

Table 4-3 Protectorates within Aswan Governorate and distance to Benban 50 MW PV.

Protectorate	Declaration	Area (km2)	PM Decree	Coordinates		Distance to project (km)
				Latitude	Longitude	
Saluga and Ghazal	1986	0.5	928/1986	22°50'16.22"N	33°11'58.91"E	41 S
Wadi Allaqi	1989	30000	945/1989 and 2378/1996	24° 5'37.00"N	32°53'13.00"E	186 S

Source: Egyptian Ministry of Environment, EEAA.

No Ramsar Sites are located in Aswan Governorate.

The nearest Important Bird Area (IBA, BirdLife, 2015) Aswan Reservoir, is located approximately 53km to the south of the proposed development.

4.1.6.2 Habitats

A single habitat was identified within the proposed polygon for the 50 MW PV Plant according to the Egyptian Biodiversity Monitoring Project (BioMap 2005-2007) and this is Sand and Dunes of the Western Dessert.

Sand and Dunes of the Western Dessert

Although the Western Desert is essentially a flat rocky plateau, much of its vast expanse is covered by wind blown sand and the Great Sand Sea of Egypt is part of one of the largest sand-covered areas on earth.

The Sand Dunes cover a large part of the Western Desert; have a variety of forms and complexity that depend on the wind regime and sand abundance. In the north, longitudinal dunes known as *seif* (sword) or *irq* predominate, while to the south barchan or crescent-shaped dunes are more common. Some other forms, such as parallel wavy dune complexes are found but are less common. Dunes move at a more or less fixed rate in the direction of the prevailing wind. Thus, the southernmost fingers of the Great Sand Sea are encroaching on the wadis of Gilf Kebir.

The proposed 50MW PV Plant was composed of desert sandy and rocky plains characterised by a variable layer of gravel and small plateaus mainly comprised by boulders and conglomerates. No vegetation nor flora was found onsite.

4.1.6.3 Flora

Typical Flora within Sand and Dunes of the Western Dessert habitats

Between large longitudinal *seif* dunes there are often inter-dune valleys that can support a wealth of plant and animal life. Mobile dune types are less well supplied with wildlife. Phytogenic mounds that form round such plants as *Nitraria retusa*, *Calligonum comosum* or *Tamarix* spp. add greatly to this habitat's diversity and create niches for animals and birds.

Flora Species in the Project Site

No flora species were found at the proposed project site.

4.1.6.4 Fauna

Typical Fauna within Sand and Dunes of the Western Dessert habitats

The waterless expanse of this desert is home to an assemblage of animals that are well adapted to living without water. Fauna species have evolved behavioral or morphological features that enable them to survive the extreme climate. The Lesser Sand Viper, *Cerastes vipera*, is only found in sandy habitats. Another denizen of the sands is the Sandfish, *Scincus scincus*.

Mammals of the region include the extremely rare Slender-horned Gazelle, *Gazella leptoceros*. This animal lives largely on such plants as *Nitraria retusa*, *Cornulaca monacantha* and *Calligonum comosum*. An immensely appealing animal of the sands is the tiny Fennec Fox, *Vulpes zerda*, which may be one of the most well adapted desert carnivores in the

world. They dig rather deep burrows so that exposure to heat during the day is reduced to a minimum and appear to be the only desert carnivores that can live entirely without direct water.

Fauna Species in the Project Site

No fauna species nor burrows were found within the proposed project site.

However, it is important to note that migratory soaring birds use the site as a migratory path.

4.1.6.5 Ecosystem services

No ecosystem services were identified onsite. The site is characterized by the lack of water resources, vegetation and wildlife.

4.1.7 Resource Efficiency and Pollution Prevention

4.1.7.1 Air Quality

No sources of air pollution were identified on the proposed area for the 50MW PV Plant.

The available data from Aswan Governorate indicate that the air in Aswan city comply with the national air quality standards as indicated in law 4/1994. However, air pollution problems may occur locally at the KIMA factory in Aswan city.

Air pollution is a big problem in connection with the sugar factories in Kom Ombo and Edfu and the ferrosilicon factory in Edfu. The air in Kom Ombo and Edfu is polluted in the surrounding areas around the factories. The quality standards for small particles (PM_{10}) are severely violated as indicated in law 4/1994 limits.

4.1.7.2 Water quality

No sources of water pollution were identified on the proposed area for the 50MW PV Plant.

Aswan Governorate is fortunate in having water of good quality of Lake Nasser and the Nile, the water quality generally meeting the water quality standards stipulated by Law 48/1982. The following drains have lower water quality and suffer from pollution;

- El Sail (KIMA canal) in Aswan City,
- Ganayen drain, and
- El Berba drain.

There are problems with high bacterial counts in many of the agricultural drains indicating that drain water may be a potentially health hazard to the public.

Aswan Governorate tap water considered good quality and exceeds the Egyptian recommended standard (109-140%). Tap water in rural areas including Daraw, KomOmbo, and Edfu city don´t reach national recommended standards and is not considered of good quality (60-73% of the recommended standard).

Households in Aswan Governorate discharge an estimated amount of wastewater of about 130,000m^3/day. Approximately one third of this water is treated and the other two thirds is

discharged as raw wastewater. The level of domestic wastewater treatment is poor in rural areas. However, treatment in large cities is considered of good quality.

Industries following are considered major sources of water pollution: KIMA factory in Aswan, the sugar cane and integrated industries in Edfu and Kom Ombo. Other sources of water pollution are the resultant from farmland and, agricultural wastewater and wastewater from Nile cruisers.

4.1.7.3 Waste and Hazardous waste

No sources of waste or hazardous waste were identified at the project site.

Households in Aswan Governorate generate an estimated 665 tones of waste /day. Only 35% of this waste is collected by public waste collection systems. Public waste collection systems in villages are almost non-existent. Aswan City has the best coverage of waste collection, followed by Edfu -, Daraw - and Kom Ombo City.

An estimated amount of hazardous waste of 650 kg/day is generated in Hospital in Aswan region. No source separation of hazardous and non-hazardous fractions is available and a single waste incinerator is available (Aswan Fever Hospital).

4.1.7.4 Noise

Noise is 'unwanted sound' and can be considered a nuisance, particularly when sensitive receptors are exposed to it at high magnitudes or unusual frequencies. Vibration can also cause a nuisance, whilst potentially causing damage to structures.

Noise levels are expressed as micro Pascal (μPa). The human ear can detect sound levels from 20 μPa to 100,000,000 μPa. A special logarithmic scale is used to represent this enormous range, namely decibels (dB), which in most cases is A-weighed to correspond to a similar range of human hearing sensitivity. The corresponding unit is dB (A).

During the preliminarily site visit it was noted that the main source of noise at the site and the project vicinity is:

- Traffic on the Luxor-Aswan Highway and;
- Prevailing wind.

No sensitive receptors were identified during the site visit. In general, sound levels were low and it is not expected that potential issues could appear due to existing noise levels.

4.2 Socio-Economic Baseline

This section describes the social and economic baseline in the Project Site and the neighbor areas.

4.2.1 Administrative structure

Aswan is one of the Governorates of the Upper Egypt Region that also includes Sohag, Qena, Red Sea, and Luxor City.

Benban village and New Benban village are the nearest localities within the project's area, both belongs to Daraw Markaz district, one of the five Aswan's Governorate districts. Benban Al Gdeeda is located 18km to the East of the proposed Benban 50MW PV Plant.

No households are located within the Project Site or the nearby.

Agriculture and tourism are the main activities in Aswan region. The total area of cultivated land covers 646 km^2 where sugar-cane cultivation covers 50.0% of this area, followed by palm trees, and hibiscus.

Aswan also comprises some industrial activities such as sugar refining, chemical fertilizers, phosphate, and fishery activities. These are mainly situated in the industrial zone of El Shalal.

4.2.2 Economic Status

In 2010 Aswan region labour force represents 29.4% of the total population where 21.9% of are females. Agriculture workers represent 30.3% of the total labour force while those who work in services activities represent 43.0%. The industry has a less relevant economical position with a 26,7% of the total labour force.

Unemployment rate recorded in Aswan Governorate is approximately 12.9% among which 34.5% are females, and it is higher in rural areas.

Population with education degrees below secondary and university education do not suffer from severe unemployment, whereas, those with up to secondary education face severe unemployment rates of approximately 85.7% (United Nations, 2010).

4.2.2.1 Sources of water

Aswan Governorate depends almost entirely on the Nile River as a water source. In general, accessibility to potable water is high, where almost all households in Benban Al Gdeeda have access to potable water.

Access to a proper Sewage System is not common in Aswan Governorate, where the connectivity rate is about 27.1% in both Daraw and Kom Ombo districts.

4.2.2.2 Land Use

No land uses were identified on the proposed area for the 50MW PV Plant, no natural resources were identified and the land located on the proposed area is considered unsuitable for any agricultural, or grazing use.

Agriculture is the main land use in Aswan Governorate. Aswan Governorate has a cultivated area of about 150,000 feddans in the Nile Valley. Furthermore an area of between 15,000 and 23,000 feddans are cultivated on the shores of Lake Nasser and an additional 3,000 feddans are cultivated in the upland areas at Abu Simbel. Agriculture depends on irrigation by pumping water from the Nile and Lake Nasser. The saline nature of the cultivated soils requires efficient drainage networks. Drainage is usually by gravity through lateral drains ended by main drains, but in some cases drainage water is pumped back through pump station to the Nile.

Sugarcane is the most important cash crop, covering 57% of the cultivated area. Wheat covers 15 %. Other crops include bersim, clover, barley, maize, onion, garlic, beans, chickpeas, sesame, karkade and henna. The main crops around Lake Nasser are tomatoes and watermelon. Cultivation of sugarcane mainly takes place in Edfu and Kom Ombo markaz, followed by Nasr El Nuba.

The average farm size in the Nile Valley is generally less than two feddans and cropping patterns are intensive. Farmers are using traditional surface water irrigation rather than sprinkler or drip irrigation, which result in severe water losses. In the lake area the Lake Nasser Development Authority distributes five feddans per farmer. The farming system is intensive but not sustainable. Crop rotation is hardly ever practiced, few livestock are kept and the soil is supplied with very little organic matter.

Date is considered the second crop in Aswan Governorate. The number of fruitful Balm trees is 1735000. The average productivity increased from 35kg/tree per year in 1987 to 82kg/tree per year in 2002.

4.2.2.3 Sources of Energy

Access to electricity in Upper Egypt is estimated at 99% (EHDR 2010). Scattered areas also have access to electricity regardless of their formality and legality. This indicates the stability of infrastructure in most areas.

4.2.2.4 Education

Aswan Governorate has a total of 1119 pre-university schools.

There is a number of schools in Daraw district including: kindergarten, primary and secondary schools, agriculture and vocational schools, etc.

Table 4-4 Schools located in Aswan Governorate and Daraw Markazs.

Educational level	Aswan Governorate	Daraw District
Pre schooling (kindergarten)	268	24

Educational level	Aswan Governorate	Daraw District
One class schools	60	10
Primary	456	36
Preparatory	272	19
Public Secondary	39	3
Vocational 3-5 years	39	3
Commercial and hotels schools	16	1
Agriculture schools	5	1
Special needs	35	1
Total	1119	98

- No information available

No schools are located within the proposed Project Site.

4.2.2.5 Health facilities and status

There is a single Public Hospital in Daraw district with a total of 63 doctors and 161 nurses.

Many of the health care problems in Aswan Governorate are attributed to poor standards of sanitation and hygiene. Registrations from the Ministry of Health Aswan show, that the most frequent registered diseases among population in the Governorate are the water borne deceases Hepatitis and Typhoid.

4.2.3 Social Status

4.2.3.1 Vulnerable groups and Gender

Vulnerable people are people who due to any specific characteristic, such as gender, age, ethnicity, disabilities, economic situation or social status, may be more adversely affected by the land acquisition process or have a more limited ability to take advantage of compensation or livelihood restoration measures than others.

In the context of the project, we can identify the following potentially vulnerable groups:

- Women. In 2013, the UNDP´s Gender Inequality Index (Human development reports) rated Egypt 110th out of 187 countries, with an overall value of 0.58, where 1.0 is a perfect score. These indicators suggest strong gender-based disparities in areas of reproductive health, economic functioning, and overall empowerment. Reasons for inequalities are numerous; social norms and attitudes, economic pressures, religious beliefs, and structural forces all help maintain the status. Furthermore, the relatively low representation of women in parliament, gender disparities in labour force participation, and other factors combine to place the region near the bottom of the Gender Inequality Index.

- Illiterate people, as they have difficulties accessing information and participation mechanisms;
- Disabled people, seriously ill people or the elderly, particularly when living alone;
- Households that have very limited resources;

There are no ethnic minorities, indigenous peoples or internally displaced people in the Project Site.

4.2.3.2 Demographics

The total population of Aswan Governorate was estimated at 1,323,315 in 2014, females represent 48.1% of the total population. A total of 54,8 % of the population lives in rural areas.

Daraw Markaz district had a population of 109,400 in 2014, in 24,488 households. The population in Benban Al Gdeeda is estimated in 8,806 people, representing a 8,3% of Daraw's total population. New Benban Al Gdeeda includes 100 households, five of them are inhabited.

Main tribes in this district are El Ansar and El Ababda. Most of the inhabitants are Muslims, with a small percentage of Christians (3%).

The age-distribution of the population in Aswan Governorate is represented by a majority of young community, with nearly 80% between 0 and 15. Only a 6,4% of the population is over 60 (CAPMAS census 2006).

4.2.4 Cultural Heritage and Archaeology

There are numerous sites of archaeological and cultural importance within Egypt of which the preservation and protection of such resources is vital in maintaining the culture and heritage associated with the nation.

The nearest cultural and archaeological site is Temple of Kom Ombo, and this is located 23,5km to the east of the proposed development, on the eastern side of the Nile River. Temple of Kom Ombo was an important crossroad site between the caravan routes from Nubia to the eastern desert and was built during the Ptolemaic dynasty 180-47 BC.

Figure 11 Temple of Kom Ombo

Although considered unlikely, it is prudent to consider the possibility of archaeologically or culturally important artifacts, features, or landscapes to be present and/or affected by the Project construction and operation.

During the site investigations undertaken, no signs or visual evidence of cultural/archaeological facets were identified on the site itself or in the surrounding areas.

4.2.5 Traffic and Transportation

The Project Site is not directly linked to any road. However the nearest town, Benban Al Gdeeda is linked to the rest of the country, Aswan and Luxor, through Luxor-Aswan Highway, running from Luxor to Aswan. Daraw district is also linked to the Red Sea and the Eastern part of Egypt via Edfu - Marsa Alam Road and connected to the Western part of Egypt via Luxor – Al Kharga Road.

5 Potential Impacts

The following section describes potentially significant impacts based on the site visit, desk studies, project design, and available information on the environmental impacts of similar solar energy developments. These impacts are addressed through the implementation of appropriate mitigation and management measures, as described in the Environmental Management Plan (EMS) in volume 2.

5.1.1 Biophysical

5.1.1.1 Soil

Construction Phase

Trenches will need to be excavated in order to install the PV structures, and cables/pipes, potentially increasing risk of erosion. However, this will be temporary and trenches will be rapidly covered. Therefore, negligible impacts are expected at this stage.

Soils will be susceptible to contamination from various sources during the construction phase of the project, especially when considering accidental interactions of soils with hazardous substances.

There are various construction activities that could potentially cause one of these impacts:

Spillage or leakage of hazardous materials: from inadequate handling or improper methods of storing or transferring chemical products, paints, oils, fuels, lubricants, vehicle oil changing or refueling, sanitary wastewater from worker compounds and cleaning agents used during construction.

Inadequate waste management: from improper temporary storage and handling of solid and hazardous waste and liquid wastes generated during the activities that involve the construction of the proposed project.

Operational Phase

Soil contamination could be expected only from the inadequate handling or improper methods of storing or transferring fuels, vehicle oil, or cleaning agents during maintenance activities, or improperly management of leaking oil from transformers.

5.1.1.2 Hydrology and Hydrogeology

No hydrological systems were identified on the Project Site. Results obtained during the study suggest that groundwater is located more that 100 m deep, therefore no impacts on the hydrological/hydrogeological systems are expected.

5.1.1.3 Ecology and Biodiversity

Construction Phase

The project area and the locations being considered for ancillary facilities show a low biodiversity and its footprint should not cause a significant impact. Risks to fauna and flora could come from hunting, fauna entering the project area, vehicles running animals over, and the introduction of invasive species.

Operational Phase

Minor impacts on biodiversity could be expected during operational phase, mainly due to direct mortality as a result of increased traffic levels and hunting.

An additional risk during the operational phase is mortality of migratory soaring birds due to the collisions with panels. This impact has been reported by the US EPA for PV plants located in desert areas.

5.1.1.4 Air Quality

Construction Phase

During construction, the ambient air quality may potentially be affected by:

- Increased dust,
- Gaseous and particulate emissions,
- Emissions of VOCs and other hazardous volatiles,

Dust is a significant concern due to the desert environment, and sensitive receptors include workers, nearby PV projects and road users. The cumulative impact of a large number of project being developed concurrently can be very significant. The main sources of these emissions and dust during construction will be:

- Excavations and earthworks, such as ground breaking, cutting, filling and levelling;
- Truck movements on unpaved, or compacted surfaces;
- Particulate dispersion from uncovered truckloads, and
- Stored VOCs and other volatile hazardous materials.

Some GHG emissions are to be expected during construction, and these will be due to vehicle and machinery use. There will also be minor emissions of SO_2 and NO_2 but these will dissipate quickly. VOCs can be a localised risk due to the use of certain hazardous materials during construction.

Operational Phase

During operational phase negligible impacts are expected in the form of dust and gaseous and particulate emissions generated by vehicle movements.

5.1.1.5 Water pollution

Construction Phase

There is no surface water onsite or around the site area. During construction the main issues regarding water contamination are:

- Sanitary and domestic wastewater generation; and
- Storm water runoff events on site.

Sanitary and domestic wastewater generation: A septic tank for wastewater will be installed onsite. The wastewater will be tankered offsite and treated by an authorized local utility following national requirements on wastewater treatment.

Storm water has the potential to run off into areas containing hazardous materials and either leach these into the soil or carry these offsite. Any storm water pollution will most likely result in soil contamination.

Operational Phase

During operation, the main issues regarding wastewater would be the same as during construction phase, but even less hazardous materials will be stored onsite.

5.1.1.6 Waste and Hazardous Waste

Construction Phase

Waste from construction activities may arise from a range of sources, including the following:

- Excavated material (e.g. rock and soil);
- Waste from construction workers; and
- Waste from packaging and other materials.

Although the hazardous fraction of construction waste represents a relatively small portion of the total amount of construction waste likely to be generated, its disposal requires careful consideration. Typical hazardous waste streams that may arise during construction include, but are not limited to: solvents, used oil, hydraulic fluid, resins and paints, etc.

The hazardous fraction of the construction waste could potentially cause significant adverse impacts on human health and the environment if managed improperly. Inappropriate handling through lack of personnel training on site may lead to accidental spills or leaks to the soil or groundwater may lead to a contamination event, resulting in a potential health risk to workers and environmental impacts.

Operational Phase

Waste generation during the operational phase will be minimal. Waste from the operation activities may arise from a range of sources, including the following: Waste from workers; and waste from equipment or packaging materials.

5.1.1.7 Noise and Vibration

Construction Phase

Activities related to construction phase could potentially lead into an increase of noise and vibration levels.

Noise levels are very likely to be affected by the following work activities during construction phase:

Site preparation - Back filling, levelling and grading and excavations in areas where foundations are to be constructed. It is assumed that these activities will require the use of dozers, excavators and muck-away lorries.

Civil Works – Piling may be required for some of the building foundations during this phase.

Construction and Installation – PV Support structures will be rammed into the sandy soil.

Drainage and road construction – construction will comprise of several operations that will likely include excavation for and laying of drainage pipes and road surfacing, to include use of planers, dozers and pavers.

Certain construction processes, particularly those involved with site preparation and civil works, e.g. ground breaking and excavations, have the potential to create **vibrations** within the vicinity of the works. Vibrations are also anticipated to occur sporadically around the construction site due to the movement of materials and equipment.

Key receptors for noise and vibration will be workers and nearby projects.

Operational Phase

Negligible noise impacts are expected during operational phase, mainly generated by vehicles movement and maintenance works.

5.1.2 Socio-Economic

5.1.2.1 Socioeconomic Status

Construction Phase

The following positive socio-economic impacts are likely to occur during construction:

- Employment creation, and
- Dissemination of skills.

The primary economic impact during construction is likely to result from employment creation during this phase, whereby money earned on the project will be expended locally and re-circulate within the local economy.

In addition to the above, there also exists the potential for the project to promote the dissemination of construction and construction support skills from expatriate workers into the local labour force.

A further secondary impact is likely to arise from spending on local and foreign goods and services during the construction process. The nature of the development, and specialised nature of required materials, suggests that these will be sourced internationally, apart from construction materials (e.g. concrete, cabling, etc.).

Traffic impacts could cause secondary negative socioeconomic impacts to the nearer local residents, such as depreciation of houses, along the high way.

Negative socioeconomic impacts may result from the interaction between the local population and expatriate workers, the potential proliferation of informal settlements around the site of people looking for work, social conflict resulting from the discrimination against particular social groups in the share of the project benefits (employment or CSR) or the interaction between the local population and the security forces protecting the site.

Social impacts will be addressed through management plans, most of them at the common level by the Developer's Association.

Operational Phase

A lack of available local experts for the PV Plant management could lead on the importation of qualified workers and a reduction in the benefit to the local economy.

5.1.2.2 Traffic and Transportation

Construction Phase

The transportation of materials for the construction of the 50MW PV Plant will result into an increase of traffic and transportation levels at Luxor-Aswan Highway.

Potential impacts relating to the increase of vehicles may include congestion, increased journey times and higher accident risks, or higher fear of accidents. The cumulative impact from all the projects that will be built simultaneously is a key risk.

Operational Phase

Negligible impacts are expected at this stage as the operational phase of the proposed PV plant is not expected to have a significant increase of traffic onsite.

5.1.2.3 Topography and Landscape

Construction Phase

One of the first stages of construction activities will result in the leveling, grading and preparation of the site, ahead of construction beginning.

The movement of heavy construction vehicles and earthworks on sandy surfaces result in visual impacts and changes to the landscape character.

Impacts to landscape character and the visual envelope of surrounding receptors will also occur at night where the addition of lighting during construction will illuminate this area that has previously been free of any light sources. The addition of light and eventual widespread use of lighting across the 50MW PV construction site will result in a night-time light haze being emitted in the air above the general site area.

The nearest visual receptor (Luxor-Aswan Highway) is located 5,7km to the proposed PV Plant, and drivers on the road will be able to notice the changes outlined above.

Operational Phase

Negligible impacts over visual receptors are expected at this stage, the nearest visual receptor is located 5,7km to the proposed PV Plant, however due to the nature of this type of infrastructure it will have minimal landscape and visual impacts during operational phase.

5.1.2.4 Cultural Heritage and Archaeology

Construction Phase

The baseline study comprising site observations and consultation has not identified any specific cultural or archaeological features at the proposed 50MW PV site. However, there is always potential for unknown buried artifacts to be disturbed or unearthed during earthworks. Should such an impact occur, this might result in the damage or destruction of such items, with resulting losses in the value of such features.

Operational Phase

Negligible impacts over archaeological receptors are expected during this phase as no receptors were identified onsite and no excavation processes are expected during maintenance works.

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ANNEX 1: EEAA Approval of the integrated EIA of the development

ANNEX 2: 50MW PV Plant Layout and Location

ANNEX 3: Project Phasing Plan

ANNEX 4: (LV and MV) Single Line Diagrams (SLDs)