SEIA for RES projects in Egypt. Benban Solar power station

Workshop on Life Cycle Assessment and GIS Tools for Energy planning (TW3-TW4)

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• 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.

• Egypt started the Benban project, which it will be the world's largest solar PV Park, at an estimated total cost of between 3.5 and 4 billion USD.

• This presentation presents the SEIA study of the project at its different life cycles
Environmental Impact Assessment (EIA) in Egypt

The ministry of the Environment in Egypt has defined the purpose of the EIA studies as follow:

The purpose:
To ensure the protection and conservation of the environment and natural resources including human health aspects against uncontrolled development.

The long-term objective: is to ensure a sustainable economic development that meets present needs without compromising future generations ability to meet their own needs.
EIA, RES in Egypt
Ministry of Environment (MOE)
Egyptian Environmental Affairs Agency (EEAA)

• **Law No. 4** states that the environmental impact of certain establishments or projects must be **evaluated before** any construction works are initiated or a license is issued by the competent administrative authority or **licensing authority**.
EIA Project’s classification according to the EEAA

The Executive Regulations relating to Law No. 4 identifies establishments or projects which must be subjected to an EIA based upon the following main principles:

• Type of activity performed by the establishment.
• Extent of natural resources exploitation.
• Location of the establishment.
• Type of energy used to operate the establishment.
RES Projects, EIA (EEAA)

• As a general rule, the environmental permitting requirements for RES Projects 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.
BENBAN SOLAR POWER STATION, ASWAN, EGYPT
SEIA STUDY

NEW AND RENEWABLE ENERGY AUTHORITY
(NREA)

Email: genena@ecoconserv.com
http://www.ecoconserv.com

BENBAN 1.8GW PV SOLAR PARK, EGYPT
STRATEGIC ENVIRONMENTAL & SOCIAL ASSESSMENT
FINAL REPORT

February 2016

Zewail City for Science and Technology
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 km² available to developers who will construct individual solar PV electricity generating facilities.

Figure 27: Schematic of the components of a solar PV system (source: OST Energy)
The Benban PV site is located approximately 15 kms west of the River Nile and approximately 1 km west of Aswan.

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 (Zewailcity for Science and Technology).
The entire area west of the River Nile is an empty desert land. We 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.

Figure 4: Project location near Benban village

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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.
BENBAN SOLAR POWER STATION, ASWAN, EGYPT  
SEIA STUDY

Figure 12: Farmland near Benban

River Nile near Benban village
BENBAN SOLAR POWER STATION, ASWAN, EGYPT

SEIA STUDY

- Benban is located within a high solar radiation area
- 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.

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

5.2.1.2 Precipitation

Figure 31: solar radiation potential in Egypt

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BENBAN SOLAR POWER STATION
LIFE CYCLE ASSESSMENT (EIA STUDY)

• 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.
**REQUARED PERMITS**

<table>
<thead>
<tr>
<th>Key required permit</th>
<th>Applicability of the permit</th>
<th>Yes/ NA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PV Power Plant</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Associated Facilities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Substations / Trans. lines</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Water intake</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Pipeline</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td><strong>Buildings construction permit:</strong> 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</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td><strong>Environmental permit:</strong> 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</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Water abstraction license:</strong> 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</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Operation permit:</strong> 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</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Height construction permit:</strong> according to the Ministry of Defense and civil aviation authority.</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

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National Legislation Pertinent to the Benban Project and subprojects

Egyptian legislation related to environmental aspects:

- EEAA guidelines and requirement for Environmental Impact Assessment; Articles 19 (1), 20 (2), 21, 22 (2) and 23 in law 4/1994 amended by law 9/2009
- 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:
- 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
International Legislation Pertinent to the Benban Project and subprojects

- **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.

BASE LINE INFORMATION
BENBAN SEIA STUDY

PHYSICAL ENVIRONMENT
Meteorological Conditions
Geomorphology
Topography
Geology of the Region
Seismic Activity
Hydrogeology
Hydrology
Ambient Noise and Air Quality

ARCHAEOLOGY AND CULTURAL HERITAGE
Socioeconomic Characteristics
Basic information about the project site
Administrative divisions
Site-neighbouring settlements
Urbanization trends
History and Cultural Heritage
Demographic characteristics and human development profile
Living Conditions
Access to potable water and sanitation
Dwelling characteristics
Human Development Profile
Corporate Social Responsibility and Community Benefits

BIOLOGICAL ENVIRONMENT
Natural Habitats
Flora
Fauna

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The 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.

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### SEIA (EXAMPLES): BENBAN SOLAR POWER PROJECT

**Table 34:**

<table>
<thead>
<tr>
<th>Context</th>
<th>Landscape, visual impact</th>
<th>Land use, ground water</th>
<th>Biodiversity</th>
<th>Archaeological/cultural heritage</th>
<th>Noise Quality</th>
</tr>
</thead>
</table>

**Figure 44:** Tamarix passeroides  
**Figure 45:** Tamarix amplexicaulis  
**Figure 46:** Hyphaene thebaica  
**Figure 47:** Calotropis procera  
**Figure 48:** Alhagi graecorum  
**Figure 52:** Kom Ombo Temple

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# SEIA (Examples) Benban Solar Power Project

## 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

## 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

### Water
- Significant volumes of water are required for sanitary services (estimated 50 litres per worker per day).
- Negative
- Local
- Short term
- Yes

### 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

### 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

## 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
There is a potential for disorientation of birds from dense arrays of panels which may resemble water bodies. With 37.2 km², Benban will be the worldís largest solar park.
SEIA (EXAMPLES) BENBAN SOLAR POWER PROJECT

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

Figure 81: Trial panels at Benban

Figure 82: Fixed installed brush (dry) cleaning system

Figure 83: Wet cleaning
### SEIA (Examples) BENBAN SOLAR POWER PROJECT

#### Table 36: Potential Social Impacts during Construction Phase

<table>
<thead>
<tr>
<th>Component</th>
<th>Impact</th>
<th>Positive/Negative</th>
<th>Location</th>
<th>Duration</th>
<th>Mitigation available</th>
<th>Significance (after mitigation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Socioeconomic impacts</td>
<td><strong>Job creation:</strong> Creation of direct and indirect temporary jobs</td>
<td>Positive</td>
<td>Local/Regional</td>
<td>Temporary</td>
<td>Yes</td>
<td>Major</td>
</tr>
<tr>
<td></td>
<td><strong>Worker influx:</strong> The risks and impacts of influx of skilled and unskilled workers, opportunists and others requires robust mitigation and monitoring</td>
<td>Negative</td>
<td>Local/Regional</td>
<td>Temporary</td>
<td>Yes</td>
<td>Minor</td>
</tr>
<tr>
<td>Community health and safety</td>
<td>Influx of workers and vehicles may have adverse impacts on community health and road safety</td>
<td>Negative</td>
<td>Local</td>
<td>Temporary</td>
<td>Yes</td>
<td>Minor</td>
</tr>
<tr>
<td>Land use, acquisition and involuntary resettlement</td>
<td><strong>Land needed for the project:</strong> 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</td>
<td>No impacts</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>
### SEIA (Examples) BENBAN SOLAR POWER PROJECT

<table>
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<th>Significance (after mitigation)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Infrastructure related impacts</strong></td>
<td>Transport — vehicle traffic will be low. That will affect the income of small vehicles drivers</td>
<td>Negative</td>
<td>Local</td>
<td>Temporary</td>
<td>Yes</td>
<td>Minor</td>
</tr>
<tr>
<td></td>
<td>Electricity supply — it is assumed that generators will be utilized. Therefore, load on electricity grid is not applicable</td>
<td>No impacts</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Water — river water supply. Solar panels cleaning and domestic usage by workers</td>
<td>Negative</td>
<td>Local</td>
<td>Temporary</td>
<td>Yes</td>
<td>Minor</td>
</tr>
<tr>
<td></td>
<td>Water — groundwater abstraction</td>
<td>No impacts</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Sanitary installations and waste water — Sanitary water to be evacuated by private vehicles. That will generate income to the owners and workers of vehicles</td>
<td>Positive</td>
<td>Local</td>
<td>Temporary</td>
<td>Yes</td>
<td>Minor</td>
</tr>
</tbody>
</table>
# SEIA (Examples) Benban Solar Power Project

## Table 37: Potential Social Impacts during Operation Phase

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

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