

Sustainable Energy and Economic Development Project (SEED)

Jordan

Environmental and Social Impact Assessment Report

for

Kufranjeh Solar PV Power Project

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Acronyms and Abbreviations

AC	Alternating Current
CBOs	Community Based Organizations
CVDB	Cities and Villages Development Bank
CARC	Civil Aviation Regulatory Commission
CPV	Concentrated Photovoltaic
CSP	Concentrated Solar Power
DC	Direct Current
DoA	Department of Antiquities
EE	Energy Efficiency
EHS	Environmental, Health and Safety
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
EMP	Environmental Monitoring Plan
GAC	Global Affairs Canada
GHG	Greenhouse Gas
HSE	Health Safety and Environment
IAA	Impact Assessment Act
IPM	Integrated Pest Management
ITT	Invitation to Tender
IDECO	Irbid District Electricity Distribution Company
km	Kilometer
kV	Kilovolt
kWh	Kilowatt-hour
MoA	Ministry of Agriculture
MoEnv	Ministry of Environment
MoH	Ministry of Health
MoL	Ministry of Labour

MPWH	Ministry of Public Works and Housing
MWI	Ministry of Water and Irrigation
NGO	Non-Government Organizations
OHS	Occupational Health and Safety
O&M	Operation and Maintenance
PPE	Personal Protective Equipment
PV	Photovoltaic
PVHI	Photovoltaic Heat Island Effect
RE	Renewable Energy
SEED	Sustainable Energy and Economic Development
RSCN	The Royal Society of the Conservation of Nature
VEC	Valuable Ecosystem Components
WSMP	Waste and Spoil Management Plan

1. Introduction

1.1 Project Background

The Global Affairs Canada-funded Sustainable Economic Development through Renewable Energy in Jordan (SEED) project, implemented by Cowater International, will promote solar technologies to support sustainable and inclusive economic development in Jordan. The project will help improve livelihoods for women and men in the Jordan Valley and Ajloun region, increase employment opportunities for skilled workers in Jordan's renewable energy and energy efficiency sector, and strengthen the enabling environment for the growth of a robust renewable energy sector.

As part of the project, a Photovoltaic (PV) wheeling system will be established and installed for two selected municipalities in the targeted region. At the inception phase, six locations in four municipalities were investigated. Out of these four municipalities, two were able to secure the required local approvals to allow the installation of wheeling systems; the two municipalities being the Municipality of Greater Ajloun and the Municipality of New Kufranjeh. For more background insights, please refer to Annex I. This report presents the Environmental and Social Impact Assessment (ESIA) for New Kufranjeh Municipality.

The ESIA process for the proposed project was undertaken in fulfilment of the requirements of Canadian procedures. A public registry was published in advance to obtain the public's input. Additionally, this ESIA is in line with the laws and regulations of the Jordan Ministry of Environment (MoEnv). The SEED project consulted with MoEnv through the assigned ESIA's team leader and was advised that for such a project (class C), an ESIA study is not required; the only requirement would be to secure land use approvals from related government agencies. Therefore, all necessary approvals were obtained from the Prime Ministry (the Cabinet), the Ministry of Local Administration, the local publicly elected Administration Council, the Ministry of Agriculture (MoA), and the Land Department. Related letters are attached in Annex II.

This document (ESIA Report) aims to present and discuss the components and activities of the proposed projects, briefly explain applied methods for baseline documentation and for the assessment of anticipated impacts, document current baseline condition for scoped-in valued environmental components, discuss the results of assessment of anticipated impacts, and clarify suggested mitigation and monitoring measures which shall be effectively implemented during the proposed Project's construction and operation phases.

1.2 The ESIA Study Objectives

The study team has assessed the potential environmental and social impacts that might result from the proposed Project as follows:

- Evaluate the project's potential environmental risks and impacts within the areas of influence.
- Identify and recommend actions to avoid and/or prevent, minimize, mitigate, or compensate potential adverse environmental and social impacts that will improve environmental and social performance and be integrated in the project's overall management plan.
- Develop an Environmental and Social Management Plan (ESMP).

2. Project Description

This chapter provides a detailed description of the Project in relation to its location, the key project components and an overview of the proposed activities that are to take place during the planning and construction, operation, and decommissioning phases.

2.1 Project Location

The Project site is located within Ajloun Governorate which consists of five municipalities. Of those, the present Project is located within New Kufranjeh Municipality.

The Municipality allocated a land plot of 20,000 m² for the use of the wheeling system; however, the project will only utilize 10,000 m². To minimize the relocation of trees, a relatively clear area was selected for the construction of the Project. The figure below presents the Project area.

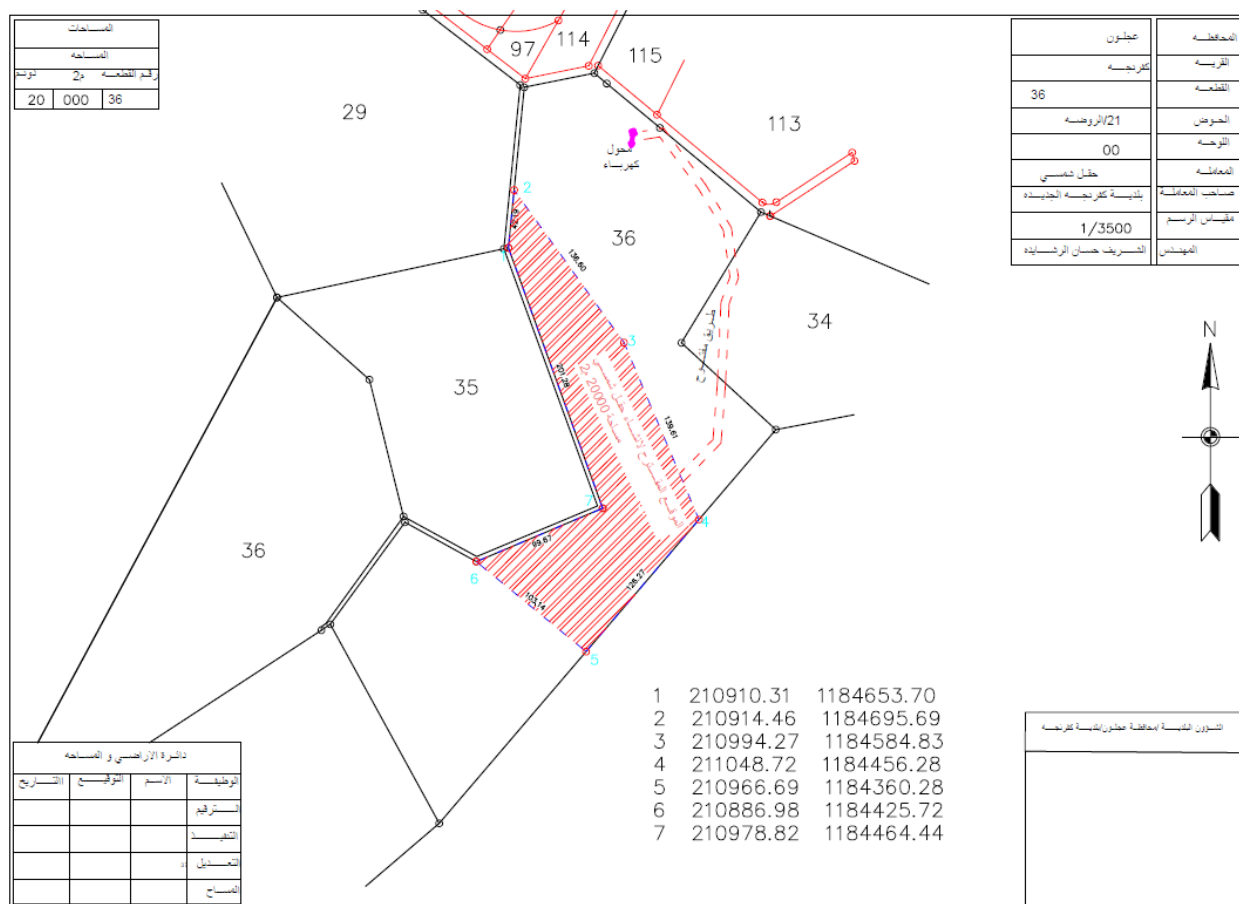


Figure 1: Location of PV wheeling system (10,000 m²) and land plot plan



Figure 2: Aerial view of the project location and its surroundings

The Project is located in a very rural area; no residential buildings are present within a 1 km vicinity of the Project. The Project area will be dedicated for the PV wheeling farm by the Municipality, and it is not formally or informally used.

2.2 Project Components

The Project suggests installing a 0.95 MW PV system. PV systems generate electricity through solar panels, which are composed of a number of solar cells. Such cells convert solar energy (radiation from the sun) into electricity using semiconductors (photovoltaic material that exhibit the photovoltaic effect). Following the exposure of the PV panel to light, a voltage difference is created in the material as photons from sunlight excite electrons into a higher state of energy, allowing them to act as charge carriers for an electric current. Solar cells produce direct current (DC) from sunlight, which can be used for grid connected power generation. However, electricity at the grid is usually in the form of alternating current (AC) and thus inverters are used to convert the DC current to AC current. In addition, the cells produce electricity at a certain voltage which must be matched to the grid it connects to. Therefore, transformers are used to convert the output from the panels to a higher voltage that matches the grid.

The Project has the following components:

- a) PV Arrays

According to the technical team, the Project will be divided into zones, each of which will contain PV arrays. Each array will consist of the following components:

- PV panels: the technical specifications of the panels are under development. However, the approximate surface area of the PV modules without interspace areas will be around 5,500-6,000 m².
- Each array is equipped with a fixed mounting structure, which will hold the arrays to the ground.

b) Infrastructure and Utilities

- The PV modules will be connected to a string inverter through underground cables at an approximate depth of 50 – 70 cm according to the Jordanian Construction Code. This is in accordance with the electrical codes set by the Jordan Building Council (Ministry of Public Works and Housing) and the supervision of the Jordanian Engineers Association. The inverter converts the electricity produced from the panels from DC to AC.
- The string inverters will then connect to a transformer station (4X4 m). The transformer station converts the output from the panels to a higher voltage.
- Internal footpaths will be laid out for ease of access between the arrays for cleaning, maintenance, and operation purposes. The footpaths will be of simple construction and will serve to simply allow operation and maintenance crew (i.e. cleaners and technicians) to walk between the PV arrays when required to, carry any necessary equipment (i.e. water hose, cleaning brushes, or voltmeter testers), or possibly use a small wagon if needed. The goal is to provide a path to allow for operation and maintenance by removing just enough stone to create sufficient leveling topped with local materials (i.e. stone or gravel) to mitigate dust emission. These paths will be kept at minimal length sufficient for cleaning and maintenance purposes. The distance covered will depend on the design, which is yet to be developed by the contractor; however, the distance the footpaths usually cover in similar projects is around 200 m in total. To further demonstrate the type of footpath intended for this project's context and scope, please refer to the following images, which depict similar footpaths at a PV wheeling farm that SEED previously constructed in Deir Alla, Jordan Valley, Jordan.



Footpaths laid out for cleaning and maintenance purposes in Deir Alla PV wheeling farm, which is a similar project that the SEED project previously delivered to Deir Alla Municipality, Jordan Valley

- Fencing around the entire facility and security will be required to ensure safety from criminal activity and trespassing of unauthorized personnel. The security fence will be installed with a minimum of 2.7 m height, topped with barbed wire. The fence will have a close knitted wire mesh of hot dip galvanized type.

- Monitoring system: provides information on the plant performance for operation and maintenance; and
 - Supporting rooms: the project will include the construction of the following rooms: security room, PV system control room, inverter room, meeting room, and storage facility room.
- c) Earth work and preparation of land, which will include cutting, filling, and leveling works.

For a summary of all components and the complete scope of works, please refer to Annex IV. Kindly note that the overall design of the PV wheeling farm and its components such as the PV modules layout and location, as well as the specifications for all components will be provided by the Engineering Procurement and Construction (EPC) company (contractor) and they will follow the environment regulations as stated in the Tender.

2.3 Overview of Project Phases

This section presents the activities likely to take place during Project development, which will include three distinct phases: (i) planning and construction, (ii) operation, and (iii) decommissioning each of which are summarized below.

(i) Planning and Construction Phase

The construction phase will last around three months, where 12 construction staff will be working at the site, Typical activities during the planning and construction phase for the PV wheeling farm will include the following:

- Detailed and final planning and design for the Project and its components.
- Transportation of Project components to the Project site which mainly includes the PV panels.
- Site preparation activities for installation of the PV arrays and the various Project components. Such activities could include excavations, grading, and land clearing activities.
- In addition to the installation of the arrays, there is additional construction work (which could include excavations, land clearing activities, etc.) that must be conducted for the required infrastructure and utilities to include installation and laying of underground transmission cables, string inverters, substation and road network.
- To support the construction activities, the contractor will provide prefab offices at the site, which will be removed right after the completion of construction. Water supply will be provided by the local municipality through pipelines or when needed, tanks. Electricity is available on site during and after the project. Sewage will be collected through tanks and transported by the municipality according to local regulations.

(ii) Operation Phase

PV plants generally require limited operational activities, which mainly includes the following:

- Commissioning tests, which usually involve standard electrical tests for the electrical infrastructure and the panels, as well as inspection of routine civil engineering quality records. Careful testing at this stage is vital if a good quality PV farm is to be delivered and maintained.
- Operation and maintenance (O&M) of the PV wheeling farm. This includes the normal daily operation of the PV farm including its maintenance to optimize the energy yield and the life of the

system. Maintenance can be divided into preventive and corrective maintenance. 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 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, or checks on structural integrity of the mounting structure. Corrective maintenance is carried out in response to failures for example the repair/replacement of damaged equipment or inverter faults.

- It is important to note that the PV modules will be cleaned on a regular basis to prevent dust build-up which could affect their performance. Based on information provided by the Developer (i.e. the contractor which Cowater/SEED will assign to do the design, supply, construction, testing, commissioning and maintenance of solar farm system), priority will be for dry brush cleaning of the panels which does not entail the use of water. However, it is expected that there would still be situations where water will be required to clean the panels (e.g. when dust becomes sticky from rain or humidity).

(iii) Decommissioning Phase

The Project is expected to operate for around 25 years, after which decommissioning activities will take place. Decommissioning activities could include the disconnection of the various Project components (PV arrays, central inverter stations, substation, etc.) for final disposal. In addition, the internal footpath network, gates and fences will be removed.

3. Review of the Legal and Regulatory Framework

This Chapter discusses the regulatory context, which is directly related to environmental compliance and must be adhered to by all parties involved in the Project throughout the planning and construction, operation, and decommissioning phases.

3.1 Jordanian Environmental Clearance Process

The process for obtaining the environmental permit for this Project as required by the MoEnv is stipulated by the “Instructions for Site Selection of Development Projects for the year 2018”, and “Environmental Classification and Licensing Regulation No. 69 for the year 2020”.

The “Environmental Classification and Licensing Regulation No. 69 for the year 2020” classifies solar PV projects that are less than 5MW in capacity as “Category 3” which are of limited environmental risk. Category 3 projects require site approval only and no environmental assessment study in order to obtain an environmental permit. The team contacted the MoEnv and asked for an official letter to confirm approval; however, the Ministry replied stating that they do not issue such letters. However, the approval on the project site from the Cabinet (prime ministry) is provided in Annex II, this approval letter refers to the endorsements and engagement of the ministry of Agriculture and Ministry of Local administration.

Therefore, it should be noted that this ESIA is developed to fulfill the donor’s requirements only. However, it is in line with national Jordanian environmental laws and regulations.

3.2 Summary of Jordanian Environmental and Social Regulatory Context

This section lists the legislations that are directly related to environmental and social compliance that must be adhered to by all parties involved in the Project throughout the planning and construction, operation, and decommissioning phases. These legislations include: (i) those issued by MoEnv (laws, regulations, and instruction), and (ii) the relevant national legislations issued by other line ministries (laws, regulations, instructions, standards).

The table below lists the key legislation and regulator/entity relevant to each of the environmental and social parameters being studied and assessed within this ESIA. Throughout the following Chapters, reference to the requirements set out within legislation is provided under each relevant parameter.

Table 1: Legal requirements related to the Project

Parameter	Responsible Regulator/Entity and Relevant Legislations
Landscape and Visual	Ministry of Environment - Environmental Protection Law No. 6 of 2017 Civil Aviation Regulatory Commission - Civil Aviation Law No. 41 of the year 2007
Land Use	Ministry of Environment: - Environmental Protection Law No. 6 of 2017 Ministry of Agriculture - Agriculture Law No. 13 for the year 2015 Energy and Mineral Regulatory Commission

Geology, Hydrology and Hydrogeology / Waste Management	- General Electricity Law No. (64) for the year 2002
	Ministry of Environment
	- Environmental Protection Law No. 6 of 2017
	- Solid Waste Management Regulation No. (27) of 2005
	- Management, Transportation, & Handling of Harmful & Hazardous Substances Regulation No. (24) of 2005
	- Instruction for Management and Handling of Consumed Oils for 2003,
	- Instruction for Hazardous Waste Management for the year 2003
	Ministry of Water and Irrigation
	- Water Authority Law No. 18 for 1988 and it's amendments thereof
	- Groundwater Control Regulation No. 85 for 2002 and its amendments thereof
	Ministry of Health
	- Public Health Law No. 47 for 2008
	Jordan Institution for Standards and Metrology (JISM)
	- Jordanian Standard 431/1985 – General Precautionary Requirements for Storage of Hazardous Materials
Biodiversity	Ministry of Environment
	- Environmental Protection Law No. 6 of 2017
	Ministry of Agriculture
	- Agriculture Law No. 13 for the year 2015
	- Regulation for Categorizing Wild Birds and Animals Banded from Hunting No.43 of 2008
Archaeology	Department of Antiquities
	- Antiquities Law No. 21 of 1988 and its amendments No. 23 for 2004
Air Quality and Noise	Ministry of Environment
	- Environmental Protection Law No. 6 of 2017
	- Air Protection Regulation No. 28 for 2005
	- Instruction for Reduction and Prevention of Noise for 2003
	Jordan Institution for Standards and Metrology (JISM)
	- JS 1140-2006 Ambient Air Quality
Infrastructure and Utilities	Ministry of Water and Irrigation
	- Water Authority Law No. 18 for 1988 and it's amendments thereof
	- Groundwater Control Regulation No. 85 for 2002 and its amendments thereof
	- Instructions for the Protection of Water Resources Allocated for Drinking Purposes for 2006
	Ministry of Local Administration (MOLA)
	- Municipalities Law No. 22 of year 2021
	Ministry of Environment:
	- Environmental Protection Law No. 6 of 2017
	- Instruction for Hazardous Waste Management for the year 2003
	Ministry of Transport
	- Traffic Law No. 49 for 2008 - Regulations for the Registration and Licensing of Vehicles No. 104 for 2008

		<ul style="list-style-type: none"> - Regulation for Maximum Dimensions, Weights, and Total Engine Power for Vehicles No. 42 of 2002, - Instructions for Allowable Speed Limits for 2002.
Occupational Health and Safety	Ministry of Labor (MoL)	<ul style="list-style-type: none"> - Labor Law No. 8 for the year 1996 and its amendments - Regulation of Protection and Safety from Industrial Tools and Machines and Work Sites No. 43 for 1998 and its amendment thereof - Formation of Committees and Supervisors of Occupational Health and Safety Regulation No. 7 for 1998 - Instructions for the Protection of Workers against the Risks of the Work Environment - Regulation for Preventive and Curative Health Care for Workers in Establishments No. 42 for 1998 and its amendments thereof - Regulation for the Fees of Work Permits for Non-Jordanians No. 67 for 2014 and its amendments thereof - Regulation for Labor Inspectors No. 56 of 1996 - Decision for the Works and Times prohibiting the employment of Women 2010 - Decision for the Hazardous or Exhaustive or Harmful Works on Health for under 18 years of age 2011
	Ministry of Health (MoH)	<ul style="list-style-type: none"> - Public Health Law No. 47 for 2008 - Crafts and industries Law No.16 for the year 1953 and its amendments thereof - Instructions for Prevention of Health Nuisances from Workers Accommodation No. (1) for the year 2013 - Health General Conditions for Crafts and Industries for the Year 2013
Community Health, Safety, and Security	Ministry of Environment	<ul style="list-style-type: none"> - Environmental Protection Law No. 6 of 2017
	Ministry of Health	<ul style="list-style-type: none"> - Public Health Law No. 47 for 2008
	Ministry of Labor (MoL)	<ul style="list-style-type: none"> - Preliminary Medical Examination of Workers within Facilities and Instructions for the Medical Examination for the Year 1999 - - Instructions for the Routine Medical Examination of Workers for the Year 1999
Socio-economic	National Building Council – Ministry of Public Works and Housing (MPWH)	<ul style="list-style-type: none"> - Regulation for Obligatory Employment of Jordanian Workforce from Surrounding Communities in Development Projects No. (131) for the year 2016

3.3 Canadian Environmental Regulatory Context

The Impact Assessment Act (IAA) defines the requirements and processes related to environmental effects determinations for projects on federal lands and outside Canada.

According to section 86 of the IAA, which requires a public notice to be posted on the Registry before and after making a determination:

- Prior to making a determination under section 82 or 83, an authority must post a Notice of Intent (as per subsection 86(1)) indicating that the authority intends to make such a determination and inviting the public to provide comments regarding that determination; and
- No sooner than 30 days after the day on which it posts the Notice of Intent, the authority must post a Notice of Determination, including any mitigation measures taken into account in making the determination.

It should be noted that for the proposed project a Public Registry was posted, and no feedback was received.

Additionally, the IAA differentiates between projects on federal lands and projects outside Canada. The IAA states that projects outside Canada are not subject to an impact assessment as they are not included in the definition of “designated projects” under the IAA. However, a determination of whether or not the carrying out of a project is likely to cause significant adverse environmental effects would be required under section 83 of the IAA. In addition, the project would need to comply with local environmental laws and regulations of the jurisdiction outside of Canada where it would be carried out. Under local environmental laws, a requirement to assess the "environmental effects" of the project may also apply.

An ESIA was conducted, even though it is not required according to Jordanian laws and regulations, to ensure that the proposed Project is considering the environmental impact at early stages of the Project.

4. Analysis of Project Alternatives

4.1 Site Selection Alternative

As discussed earlier, under the “Renewable Energy and Energy Efficiency Law No. (13) of the year 2012 and its Amendment No. (33) for the year 2014”, Electric Power Wheeling projects are permitted. Under this procedure, electric power generated by renewable energy systems may be developed by a consumer in order to connect to a transmission and/or distribution electricity network, in order to offset the electric power consumed by the same consumer during a billing period.

Given the substantial impact of electricity costs on New Kufrankeh Municipality, the municipality was determined to seize the opportunity and develop a solar PV wheeling Project under the wheeling mechanism to supply electricity in a sustainable and cost-efficient manner.

Furthermore, it should be noted that an “Environmental Site Selection Report” was developed at the inception phase of the project. The report investigated five locations from an environmental perspective and provided recommendations for site selection. It should also be noted that along with the environmental aspect, a separate technical site selection report has been developed.

Several environmental criteria were used for the assessment:

- Land use and cover,
- Agrological capacity,
- Proximity to urban areas,
- Proximity to main roads,
- Proximity to historical areas,
- Future capacity expansion,
- Watercourses and streams,

The proposed site in New Kufrankeh Municipality was evaluated and ranked the second-best proposed location from an environmental perspective.

Additionally, the SEED Project team conducted a comprehensive assessment of the land plots that were proposed by the municipalities for the construction of the SEED solar farms.

Please refer to Annex I for the detailed technical report, which includes a detailed description of the steps and conditions that the SEED team implemented/considered during the selection of the Ajloun Governorate municipalities that would receive a SEED solar farm (referred to as receiving a SEED solar farms grant/SEED grant). Interested municipalities nominated multiple plots of land on which the solar farms could potentially be constructed. The SEED technical team shortlisted municipalities based on set criteria and over multiple assessment phases.

4.2 Technological Alternatives

Other solar technology alternatives that could be applicable and suitable for the Project site area in general include Concentrated Solar Power (CSP) and Concentrated Photovoltaic (CPV). CSP technology uses mirrors to concentrate (focus) the sunlight energy and convert it into heat to create steam to drive a turbine

that generates electrical power. On the other hand, CPV technology uses optics such as lenses or curved mirrors to concentrate a large amount of sunlight onto a small area of solar photovoltaic (PV) cells to generate electricity.

Such alternatives may be compared based on three (3) main criteria which also take into account environmental considerations, and include: (i) technical performance, (ii) commercial-technical maturity, and (iii) production cost. When comparing PV technology with CSP and CPV based on a qualitative analysis, PV technology is favorable. The table below summarizes the technical attributes investigated and compared between these technologies.

Table 2: Summary of qualitative analysis of PV, CSP, and CPV

Attribute	PV	CSP	CPV
Power density (land area)	✓		✓
Operation and Maintenance (O&M) Cost	✓		
Suitability to Jordan’s solar resources	✓	✓	✓
Ease of siting and permitting	✓		
Modularity and scalability	✓		
Peak load following capability	✓	✓	✓
Suitability for storage		✓	
Simplicity of design and operation	✓		
Capacity factor		✓	
Balance of plant requirements	✓		
Total	8	4	3

4.3 The ‘No Project’ Alternatives

The ‘no project’ alternative assumes that the 0.95 MW Project will not be developed. Should this be the case, then the Project site would remain the same. The Project site would remain with their current characteristics – vacant and not utilized with no specific value of land use.

Should the Project not move forward, then the Project-related negative environmental impacts discussed throughout this ESIA would be averted. However, as noted throughout the ESIA, generally such impacts do not pose any issues of concern and can be adequately controlled and mitigated through the implementation of general best practice management measures. Nevertheless, should the Project not move forward, then the significant and crucial positive economic and environmental benefits would not be realized. Such benefits include the following:

- Contribute to increasing energy security through development of local energy resources and reducing dependency on external energy sources.
- The development will have an overall positive economic impact on New Kufranjeh Municipality as it will contribute to reducing huge financial burdens from electricity bills.
- The clean energy produced is expected to significantly reduce (if not eliminate) New Kufranjeh Municipality’s consumption of electricity from the grid, which is mainly from fossil fuel-based power plants. This in turn will help in reducing greenhouse gas emissions as well as air pollutant emissions.

- To some extent, the Project is expected during the construction and operation phases, to generate local employment.

In conclusion, an ESIA must investigate all potential positive and negative impacts from a project development. In the case of this Project, it is important to weigh the significant positive economic and environmental impacts incurred from the Project development, against the negative environment impacts anticipated at the site-specific level – in which this ESIA concludes to be minor in nature and can be adequately mitigated. The comparison in this chapter clearly concludes that the ‘no project’ alternative is not a preferable option.

5. Stakeholders Identification and Engagement

Stakeholder engagement is an integral part of ESIA good practice and is a requirement of the national EIA legal framework in Jordan. It is also a requirement of GAC that sets out certain recommendations for stakeholder engagement, to ensure that they are appropriately informed and engaged on environmental and social issues that could potentially affect them through a process of information disclosure and meaningful consultation.

5.1 Identification of Stakeholders

To define a communication process with stakeholders, several stakeholder groups that may be interested and/or affected by the Project development and implementation have been identified. There are a number of groups of people and social groups who are interested in the Project on different levels. These may be described as:

1. People and social groups who will be directly or indirectly affected by the project (such as local communities);
2. People and social groups who may participate in the implementation of the project (such as lenders); and
3. People and social groups who are not affected by the project development per se but could potentially influence and make decisions affecting Project implementation and/or may have an interest in the Project.

The main groups of stakeholders identified so far are listed in the table below.

Table 3: Identified stakeholder groups

Stakeholder	Relevance
Central government	
Ministry of Environment (MoEnv)	<ul style="list-style-type: none"> - Responsible for providing the environmental permit for the Project - Responsible for overall management of hazardous waste landfills - Responsible for overall management of areas of critical environmental concern
Ministry of Agriculture (MoA)	<ul style="list-style-type: none"> - Responsible for overall management of grazing reserves and forest areas and trees
Ministry of Labor (MoL)	<ul style="list-style-type: none"> - Overall responsibility for worker health and safety as well as providing proper working conditions
Ministry of Health (MoH)	<ul style="list-style-type: none"> - They provide the health services and facilities to the local districts and have overall responsibility for public health and safety
Ministry of Public Works and Housing (MPWH)	<ul style="list-style-type: none"> - Overall responsibility for implementing regulations aiming to maximize the involvement of local communities (especially through employment of local people) in development projects
Ministry of Water and Irrigation (MWI)	<ul style="list-style-type: none"> - Overall responsibility for providing the Project's water needs and wastewater disposal requirements

Department of Antiquities (DoA)	- Responsible for the protection, conservation, and preservation of antiquities in Jordan
Civil Aviation Regulatory Commission (CARC)	- Responsible for overall management of civil aviation in Jordan
The Cities and Villages Development Bank (CVDB)	- Responsible for providing financial support to the municipalities if/as needed.
Local Governmental Agencies	
Ajloun Governorate	- Involved in the implementation of regulations aiming to maximize employment of local communities in development projects
Kufranjeh municipality	- Overall responsibility for roads and streets construction, development, and rehabilitation - Overall responsibility for solid waste management to include collection and disposal - Overall responsibility for land zoning and designating allowable uses within each area
IDECO	- Distributor for electricity in the North of the Jordan, including Ajloun governorate
Non-Governmental Organizations (NGOs) and Other Organizations	
The Royal Society for the Conservation of Nature (RSCN)	- The most active environmental NGO in Jordan and is also mandated by the MoEnv to manage areas of critical environmental concern in Jordan including the Ajloun Reserve
Cities & Villages Development Bank (CVDB)	- Provides long-term financing to establish both, services, and economic activities/projects, through the local councils. The bank administrates and guarantees loans assessed by the councils from any other party, with the aim to support and provide the councils with essential services.
Community Groups	
Greater Ajloun municipality population including youth and women	- The population of Greater Ajloun Municipality will be positively affected by the enhanced municipal service delivery (indirect beneficiaries from the project)

5.2 Stakeholder Consultation and Engagement

The public consultation process took a multidimensional approach as follows, noting that the following is aligned with the local Jordanian laws and bylaws:

1. Public consultation with both the publicly elected municipal council at project site, Kufranjeh municipality, and the local governorate administration council, which oversees the municipal councils across the governorate of Ajloun. Combined, these councils implement informed decision making on behalf of the government and the majority of electors (i.e. local community) in the geographic area of the municipalities, in which the Project is located.

At the public consultation events that SEED organized, the subjects covered were to explain what solar farms are, what are their components and requirements (of installations and operations), the various stakeholders involved, the environmental and social impact anticipated, and the benefits.

All local councils and residents were invited to participate, express their views, and learn more about the project.

The views of participants reflected acceptance and positive enthusiasm; they praised the savings that will positively impact the budgets of the benefiting municipalities. They showed their excitement and commitment to invest as needed in the solar farm, and their willingness to develop and execute a local development plan that will utilize the savings that result from the solar farms to provide better services to the local community. It is worth noting that Kufranjah Municipality also engaged with talks, and will continue to develop the conversation with the local communities to co-develop together, a community-development-driven plan to best utilize the projected savings into providing better services to the local community.

2. SEED and the local council representatives also went to the field to meet and talk with local residents and local community-based organizations that reside in the proximity of the project. Around 10 field visits were conducted for each site, since the area of the project is remote and has very few local residents, who are mainly shepherds.
 - Local shepherds were pleased to learn that the area, which lacks lighting at night, will be lit and have guards, which increases the overall security level at the site. Moreover, they showed the project experts their cattle and livestock passages, requesting not to disturb them. This preference was reflected in the project requirements.
 - local CBOs also praised the project and welcomed the opportunity to participate in deciding how the savings from the project will be used by the municipality.
3. Locally conducted consultation sessions were held through the project local CBO partners to inform and guide the decision-making process at an early stage. Over the past seven years, the SEED project had been building the EE&RE capacity of these CBOs technically, administratively, and financially. The project relies on partner CBOs as one of the main communication channels with the local community, and a channel for disseminating information and receiving feedback. Recently, as part of the local public consultation, SEED also directed the CBOs to conduct additional public awareness raising sessions. In these sessions the local community learned more about the long- and short-term impact on a municipality level. The attendees expressed their appreciation of the proposed project concept. Additionally, they regularly checked in with CBOs to learn about progress and ask when will this project start, in anticipation of its benefits.
4. Consultations with Ministry of Environment (MoEnv) took place where the Ministry representative explained the EIA regulation in general and that an EIA for the proposed project is not required. However, site approval is required from different governmental organizations. Based on the Ministry's request, all necessary approvals were obtained. It is noteworthy to mention that the requirement of the Ministry of Environment in Jordan for this type of project have been met. For more insights, please refer to Annex II - Approval Letters.

According to local regulations relevant to the subject of allocating and authorizing land use, the Cabinet of Jordan (Prime Ministry) is the ultimate decision maker and has the agency to issue approvals and allocations. The Cabinet issues approvals after consultation with all relevant ministries, local communities, and related entities as the Jordanian laws and regulations and the local context require. Accordingly, the Cabinet directed the MoA to inspect the sites from an environmental perspective, which they did and issued a letter to report their approval of the selected site. Accordingly, the Cabinet allocated the public land to the specified use of the PV wheeling farms.

The table below presents the stakeholder consultation and engagement activities undertaken during the ESIA process.

Table 4: Stakeholder consultations conducted so far

No	Entity	Date	Participants	Areas of Discussion
1	Ajloun Governorate Council	24.04.2022	- Head of Governorate Council / Mr. Omar Al-Momani	- PV system benefits - General requirement - Timeline - Terms & conditions
2	Kufranja Municipality	24.04.2022	- Mayors / Dr. Fozat	- Land requirements - Benefits in general - Environmental requirements - Landscape
3	Kufranja Municipality	12.05.2022	- Head of Engineering / Senior Engineer	- Land inspection
4	Kufranja Municipality	16.05.2022	- Head of Engineering / Senior Engineer	- Discussion of detail lands
5	Ajloun Governorate Municipalities	18.05.2022	- Mayors - Executive managers	- Financial grant - Land requirement - Components of the solar system - Electricity consumption - Application requirements - Timeline
6	Kufranja Municipality	07.06.2022	- Executive manager	- Land environmental inspection
7	Municipality representatives and SEED project representatives meeting with IDECO	08.08.2022	- Mayor / Dr. Fozat - Mayor / Mr. Hamzeh Zghoul	- Preliminary approval of the project - Facilitating transactions
8	IDECO	18.08.2022	- The CEO, Eng. Bashar Al Tamimi - The VP for planning and technical / Eng. Alaa Qarawi - The head of renewable energy department, Eng. Saddam Tamimi	- Utility grid challenges - Possible capacity - Technical requirements - Costs - Engagement with contractors and commissioning

9	Community groups especially women and youth	19.09.2022	<p>- Various groups of key local entities such as CBOs located near the project and youth/households in the surrounding neighborhood.</p>	<ul style="list-style-type: none"> - Communicating the community/governorate benefits. - Communicating that the project will not disturb the environment or daily activities of residents nearby. - Communicating that there is no need for any type of resettlement (residential or economic or otherwise).
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6. Environmental and Social Baseline Information

6.1 Physical Environment

6.1.1 Climate and Meteorology

New Kufranfeh Municipality lies within the Mediterranean biogeographical region. Rainfall season extends from October to May, and the average annual rainfall ranges between 150 and 250 mm. According to data available, the project location falls within the Mediterranean region which is characterized by rainy winter season and pleasant in the summertime. A snow event could happen in the site; however, it is not an extreme event that could affect the project and its operation. Moreover, part of the Invitation to Tender (ITT) dictates for the potential contractor to submit a design that adheres to the Jordanian code, especially in relevance to climate. The SEED Project's assigned experts will validate and approve this submitted design.

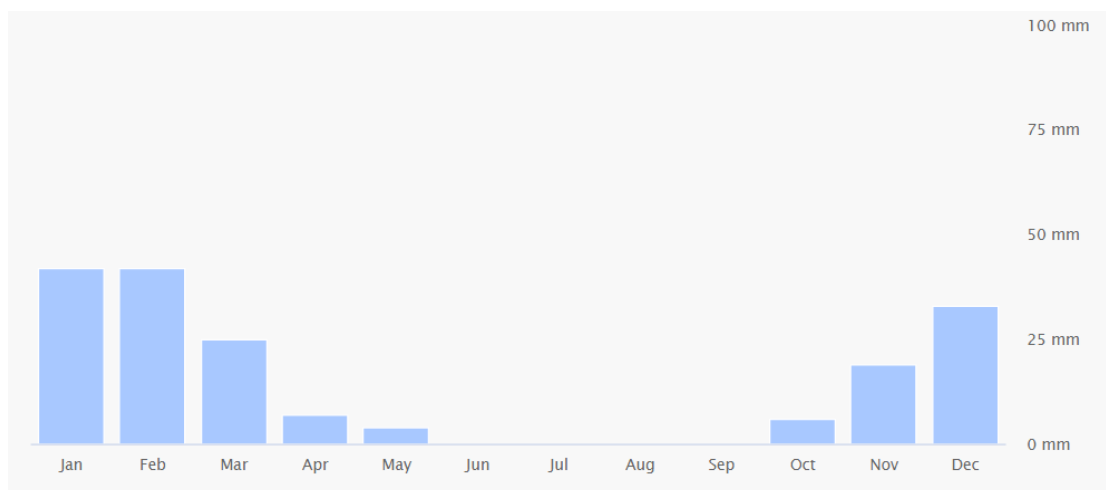


Figure 3: Average annual precipitation

During summer, from June to September, the weather is hot. The highest temperatures average between 28 and 32°C. During winter, from December to February, the climate is considerably moderate to cold with mid-day temperatures ranging from 8 to 14°C.

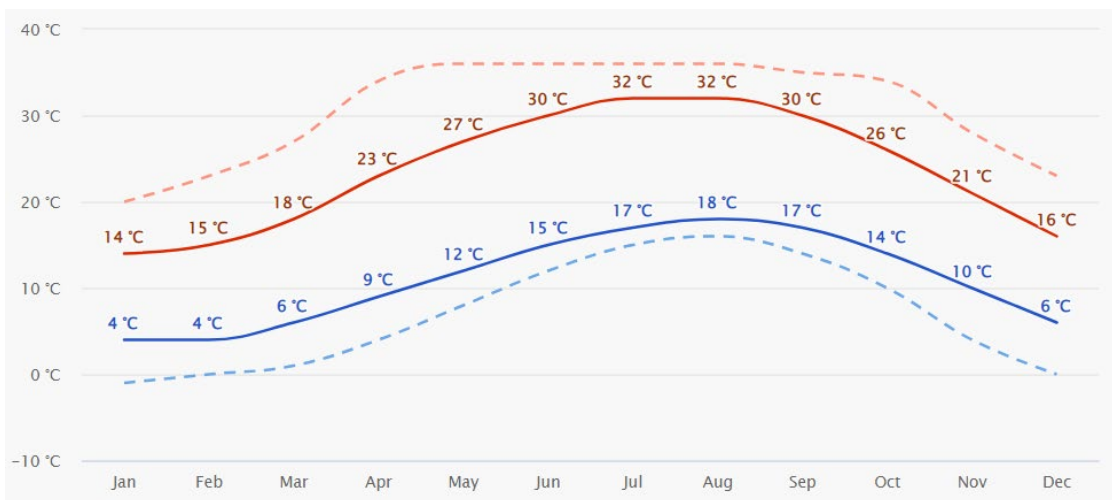


Figure 4: Average annual temperature

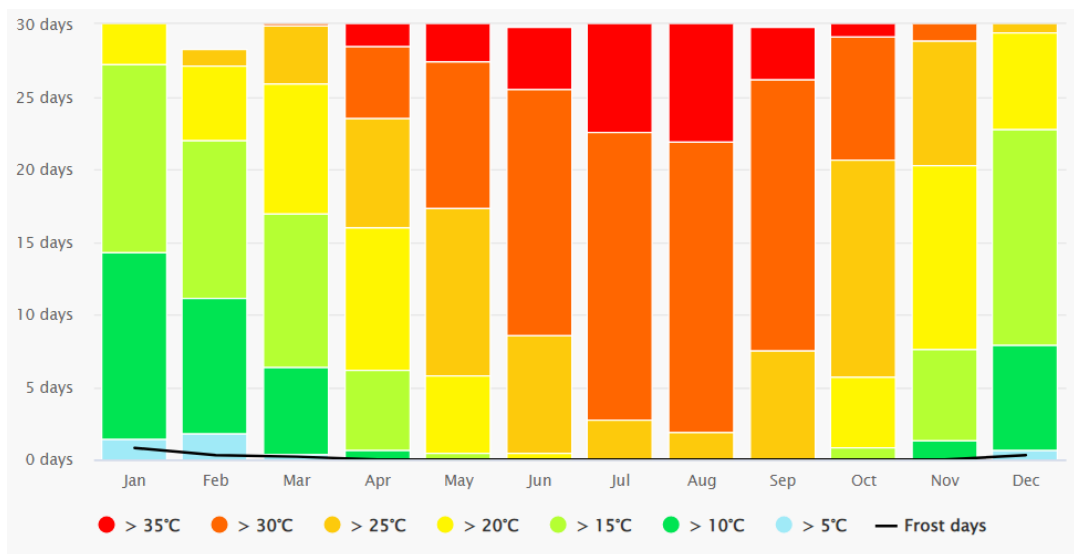


Figure 5: Maximum temperatures

The project area is influenced by regional winds with an average wind speed reaching 10m/s. The prevailing wind direction is west-east.

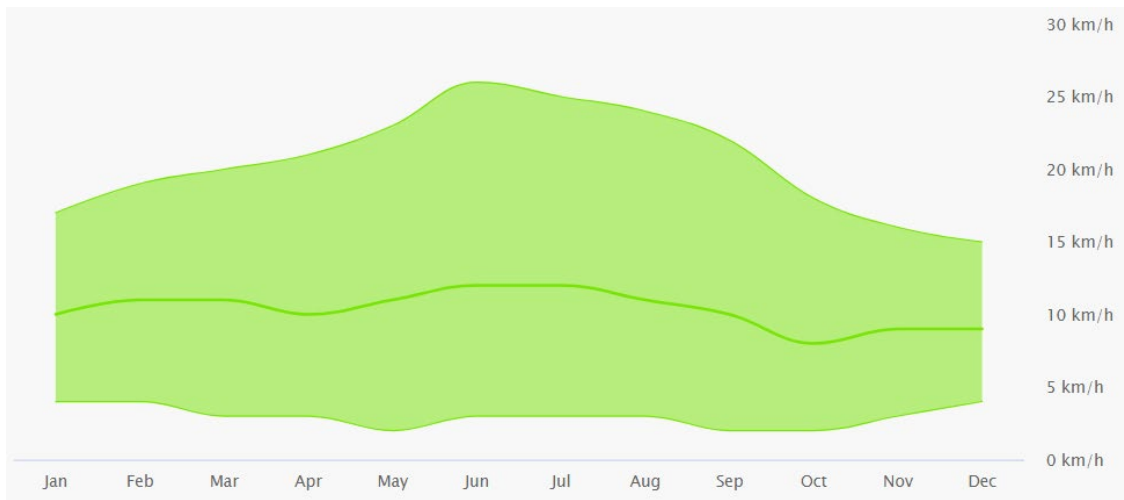


Figure 6: Average annual wind speed

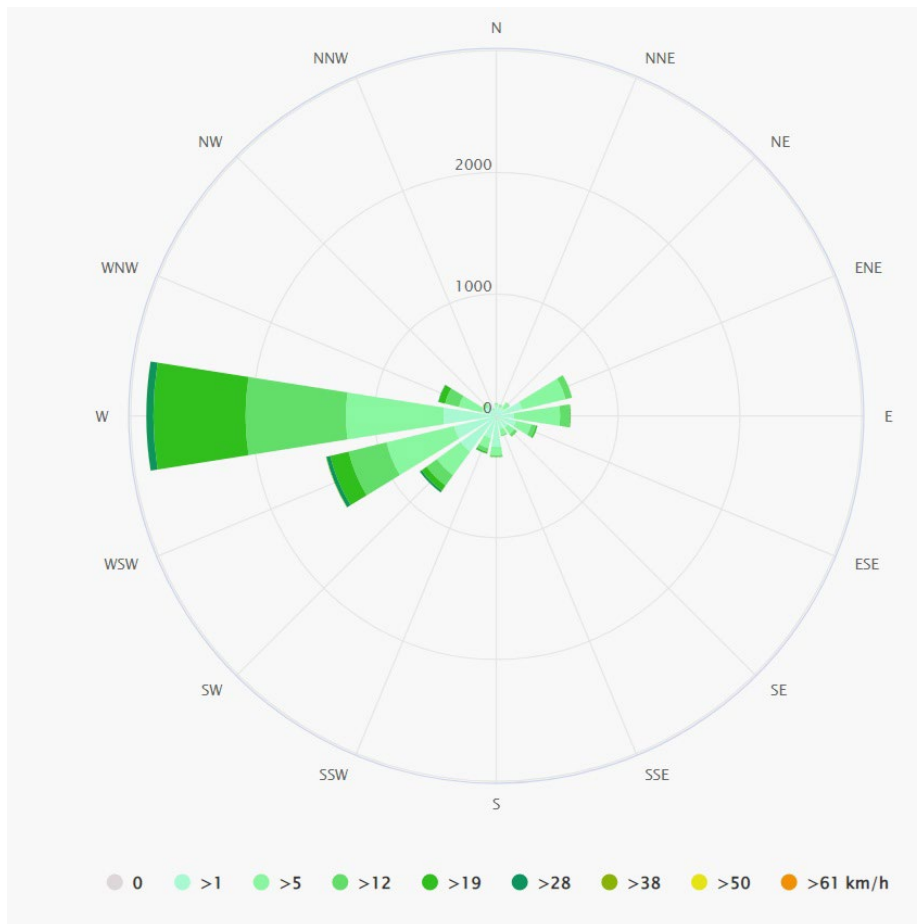


Figure 7: Wind rose

The project location receives sun all year round, with an average of 245 sunny days per year.

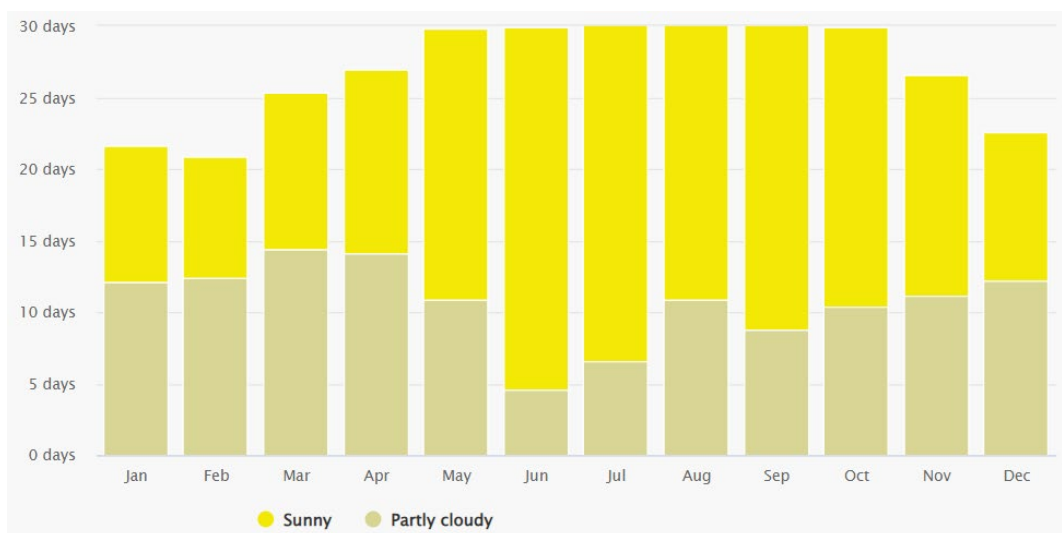


Figure 8: Average annual sunny days

6.1.2 Geology and Topography

The Kurnub Sandstone Group is overlain unconformably by a thick sequence of carbonate rocks of Cenomanian Turionage, the Ajloun Group. Extensive exposures of this group can be seen in the Ajloun District, mainly along the deeply eroded westward-draining wadis and along the rift margins. Rocks related to this group can be traced southwards along the major east-west trending wadis; Mujib, Al-Hisa, Tafila to Wadi El-Naqab.

The Ajloun Group is overlain unconformably by chalk, limestone and phosphates of the Balqa Group which includes sandstone and dolomite lithology in southern Jordan. The glauconitic, marine siliciclastic at the base of the group mark the early Cenomanian marine transgression over the dominantly continental Kurnub Group. This resulted in the deposition of platform carbonates within lagoonal, tidal, and open marine environments.

The name Ajloun Series was given to the Cenomanian to Turonian carbonates by Quennel (1951) and Burdon (1959). This equivalent to the carbonate Judea Group (Shaw, 1948; Arkin and Braun, 1965; Bartove et al. 1972) in the West Bank of Jordan River and the Negev (Powell, 1989). The names of the five formations constituting the Ajloun Group, were first introduced by Masri (1963) and comprise in upwards sequence: Naur, Fuheis, Hummar, Shuayb and Wadi Es-Sir Formations. This scheme was later adopted by Parker (1970) and the 1:50,000 National Geological Mapping Project. In north Jordan, the group is dominated by carbonate sediments, limestone, marl and dolomite with subordinate amounts of gypsum, mudstone and chert.

The topography of the project area is characterized as a sloped area with elevation ranging between 600-640m above sea level with a slope towards the South.



Figure 9: General topography of the site

6.1.3 Soil Conditions

Soil in the project site belongs to Xerochrepts group. These soils have an ochric epipedon and calcic subsurface horizon under a xeric soil moisture regime, which prevails in the rainfed and mountainous areas. They are developed on both upper and lower slopes. The Xerochrepts of Jordan are well represented by subgroups such as Vertic Xerochrepts, on the lower gentle slopes, and Lithic and Calcixerollic Xerochrepts on the upper, slightly convex slopes. These are generally productive soils. The main limiting factors for their utilization in agricultural production are the effective soil depth to bedrock and the content of rock stones and gravel in the profile and on the surface.

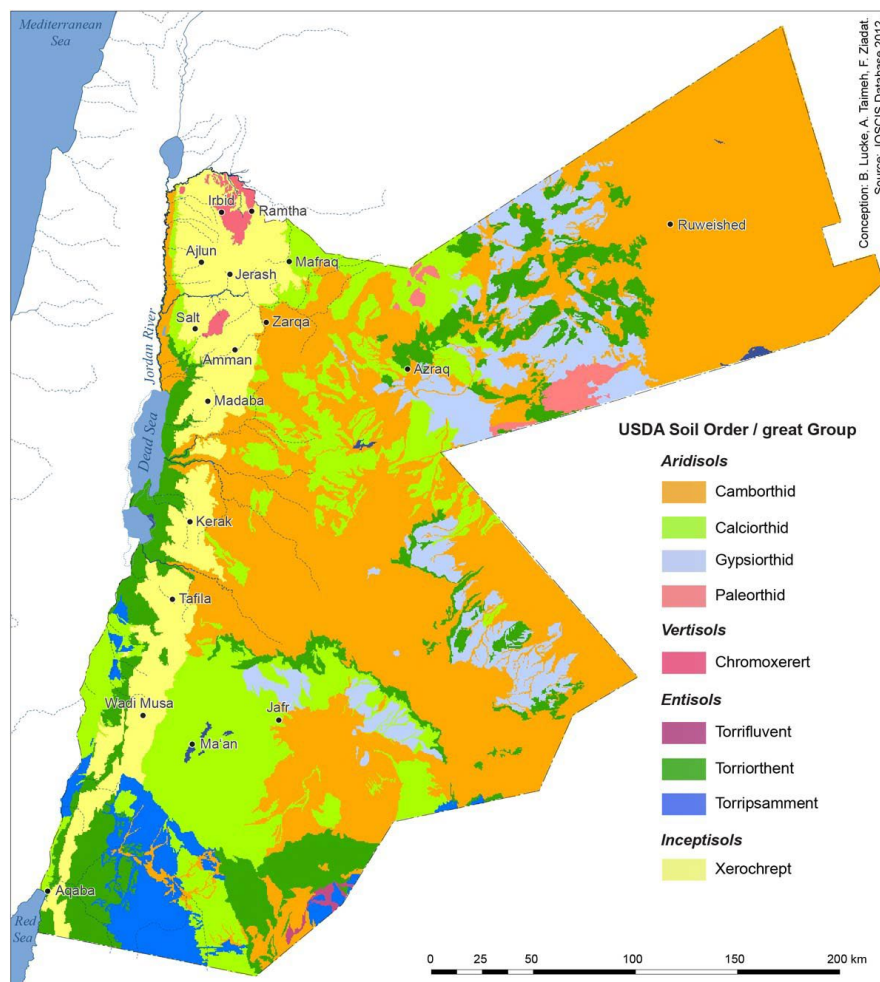


Figure 10: Soil types at project sites

6.1.4 Air Quality

The project area has no historical data on air quality mainly due to the fact it is not developed, and no industries are in the project area.

6.1.5 Noise Level

The project site along the proposed road alignment is considered not easily accessible and is not developed at the moment, therefore, there is no traffic flow or noise data available for the site. However, there are no indications of significant noise sources in the area.

6.2 Socio-Economic Conditions

Kufranjeh Municipality is located on the western side of Ajloun Governorate, and it is linked to its borders with the governorates of Irbid and Balqa.



Figure 11: Kufranjeh municipality map

According to the latest data from the Department of Statistics (DoS), New Kufranjeh Municipality consists of 10 localities with a total population of 41,330 inhabitants, 7.5% of which are refugees and non-Jordanian.

Table 5: Population of Kufranjeh municipality

locality	Non-Jordanian	Jordanian	Population	Female	Male
Kufranjah	2929	30576	33505	16204	17301
Rajeb	62	2177	2239	1115	1124
Ballas	3	1927	1930	937	993
Safienh	36	1675	1711	857	854
Harth	81	750	831	363	468
Thagret Zebaid	2	420	422	206	216
Berkeh	13	185	198	104	94
Um Erramel	0	43	43	21	22
Oqdeh	0	68	68	28	40
Ka'b El-Malol	2	381	383	195	188
Total	3128	38202	41330	20030	21300

According to the available data, the population of New Kufranjeh Municipality consists of 51.5% males and 48.5% of females. The total number of families in the municipality is 8460 families. Thus, the average household size is 4.8 persons, which is a little higher than the national average of 4.5.

The administrative area of New Kufranfeh Municipality is around 86.5 km². Thus, the population density of the municipality is around 4207 individuals/km².

The main income generation within the municipality is agriculture and public sector employment.

6.3 Archaeology and Cultural Heritage

Inspection of the project site and the surrounding area shows the absence of any evidence of any archaeological sites.

The assessment of archaeological resources is basically dependent on inspection of the project area, after having completed desktop research on the presence of archaeological sites (largely facilitated by “MEGA JORDAN”, a computerized data base of archaeological sites).

Furthermore, the desktop investigation of the Department of Antiquities “DOA” database gave the same conclusion.

6.4 Biological Environment

The study area lies within the Mediterranean biogeographic zone as the following map shows.

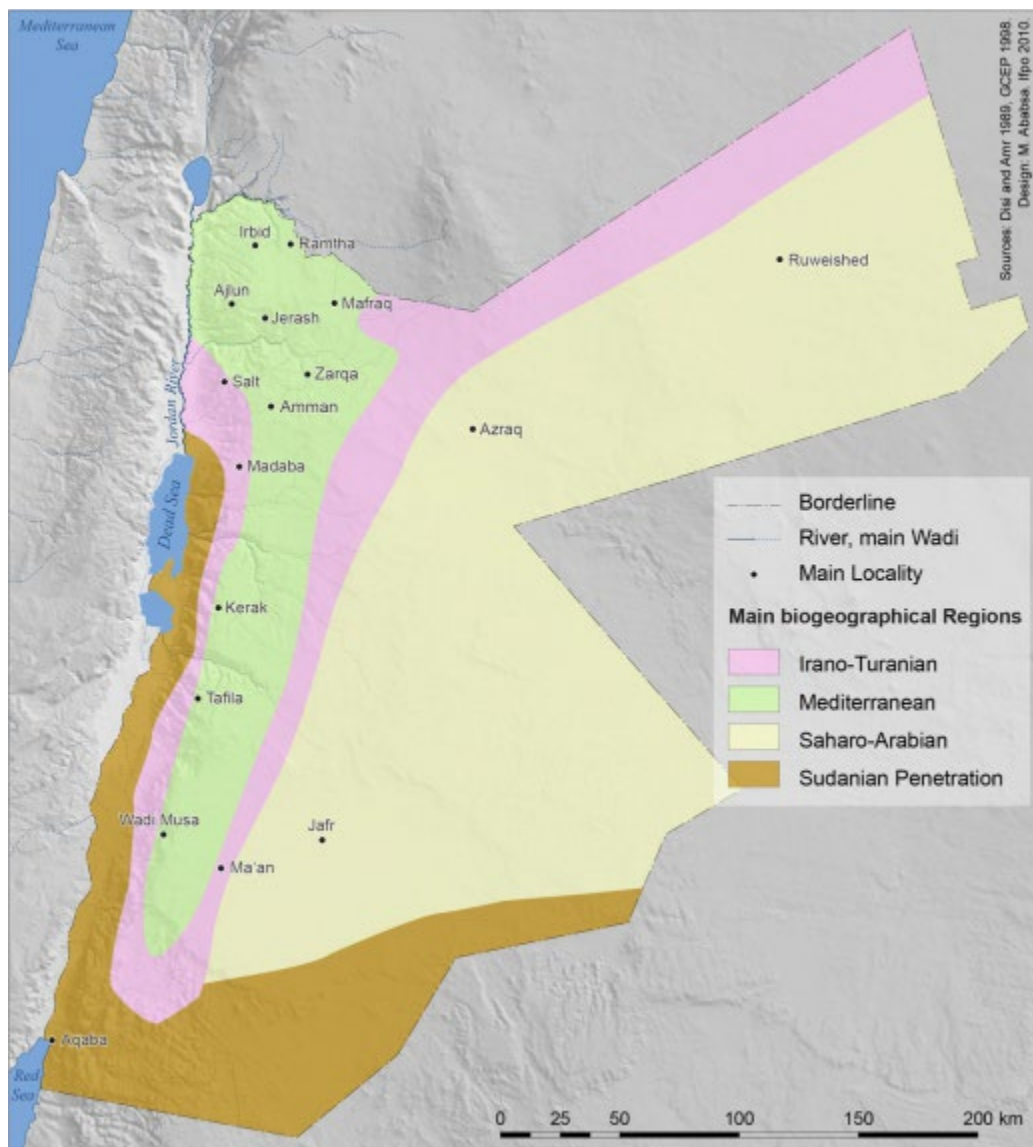


Figure 12: Biogeographical region of the project

According to the literature review, several faunal species were recorded to inhabit the general area of northern Jordan. Some of these species are typical for the Mediterranean region such as the Stone Marten, the Blind Mole Rat, the Levant Green Lizard and the Blue Tit. Detailed lists of each species groups are provided in below tables. The available literature review covers Jordan’s wide northern areas in general, however, there is lack of existing studies that cover the specific project’s location proximity are lacking. Nonetheless, even though the project area is small and barren, the SEED project took extra steps and consulted with several local experts and residents to confirm there is a low biodiversity related risk for the selected site. The following consulted parties confirmed that there are no issues in proceeding since the selected location is barren, and that according to their regular field observations and long experience locally, there are no observed faunal species within the project area:

- Ajloun Forest Reserve Manager at the Royal Society for Nature Conservation of Jordan.
- Local shepherds that regularly pass by and live nearby the selected project site

- The Forestry Department field rangers, who regularly and constantly scout the fields across the areas surrounding the project location.
- The local municipality staff including the Executive Manager of the Municipality, the lead technical engineer, and the agricultural expert.

Desk review shows that no written record exists of any animals living in the sectors surrounding the site. Furthermore, SEED Project’s assigned environmental experts observed none during any of the numerous visits to the site and surrounding areas either during site selection or during site reconnaissance. Moreover, when consulting the local residents and experts listed above (being the Ajloun Forest Reserve Manager, the forestry rangers, shepherds and municipality staff), none recalled seeing any.

It is to be highlighted here that the selected site - although in the buffer zone of the Ajloun Reserve - is within proximity of human activities, which prevent the existence of such animals. These activities mainly consist of a nearby operational center for the Forestry Department – Ministry of Agriculture, with regular movement by trucks and forest rangers using the unpaved road that the selected project site resides on. Shepherds’ activity was also noted in the area. An aerial photo (Figure 13) shows the distance between the project site and the Ajloun reserve.

Table 6: The carnivore species with their Arabic and English names recorded in the area

Species	Common Name	Arabic Name
Canis aureus	Asiatic Jackal	Wawee
Canis lupus	Grey Wolf	Deeb
Vulpes vulpes	Red Fox	Tha’lab
Hyaena hyaena	Striped Hyaena	Dabe’
Felis silvestris	Wild Cat	Qet Barry
Martes foina	Stone Marten	Sammor, Dalaq Sakhry
Meles meles	Common Badger	Ghraery
Vormela peregusna	Marbled Polecat	Fassai

Table 7: The rodent species recorded in the area with their Arabic and English names

Species	Common Name	Arabic Name
Hystrix indica	Indian crested Porcupine	Nees
Nannospalax leucodon	Blind Mole rat	Khold
Sciurus anomalus	Persian or Syrian Squirrel	Senjab Faresy
Apodemus mystacinus	Brood-toothed Mouse	
Apodemus hermonensis	Wood Mouse	

Microtus guentheri	Levant Vole
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Table 8: List of reptile species recorded in the area

Species Name	Common Name
Leptotyphlops macrorhynchus	Hookbilled Blind Snake
Vipera palaestina	Palestinian Viper
Coluber jugularis	Large Whip Snake
Coluber rubriceps	Red-headed Whip Snake
Laudakia stellio	Starred Agama
Hemidactylus turcicus	Turkish Gecko
Ptyodactylus guttatus	Fan-footed Gecko
Ptyodactylus puiseuxi	Northern Fan-footed Agama
Lacerta media	Levant Green Lizard
Lacerta laevis	Syrische Eidechse
Ophisops elegans	Menetries's Lizard
Eumeces schneideri	Gold or Orange-tailed Skink
Ablepharus ruepelli	Festa's Skink
Mabuya vittata	Bridled Skink
Chamaeleo chameleon	European Chameleon

Table 9: List of bird species recorded in the area

Scientific Name	Common Name
Alectoris chukar	Chukar
Troglodytes troglodytes	Wren
Turdus merula	Blackbird
Sylvia curruca	Lesser Whitethroat
Parus caeruleus	Blue Tit
Parus major	Great Tit
Garrulus glandarius	Jay

As shown in Figure 13, the Project site is 16 km away from the Ajloun Woodland Nature Reserve. The below aerial photo shows the project site and Ajloun reserve.



Figure 13: Location of Ajloun reserve, aerial distance being around 16 km away from the proposed project location

Ajloun Woodland reserve has a special importance due to the fact that it comprises of the Evergreen Oak vegetation type, which is one of the few remaining forests in Jordan, given that the total forest area in Jordan does not exceed 1% of the country's area.

At the same time Ajloun hosts some species that have a special importance. *Testudo graeca* and *Chamaeleo chamaeleon* are both listed on CITES appendices and considered as nationally threatened species. The record of *Cyrtopodion kotschy* represents the third record for Jordan. It is also considered as a rare species as well as the *Lacerta media*. However, the site investigation shows that none of the plants listed in Table 10 are present on the site.

According to the literature, a total of 172 plant species were recorded in Ajloun Woodland Nature Reserve. Those species belong to 49 families, 14 of the species recorded were found to have either an international or national status, see below table.

During the site investigation, the SEED project's assigned environmental experts looked in specific for animals and plants registered in the area of northern Jordan (listed in Tables 6-11). They confirmed that none of the listed animals/plants were observed at the project site. Moreover, when consulting the local residents and experts listed above (being the Ajloun Forest Reserve Manager, the forestry rangers,

shepherds and municipality staff), none recalled seeing any of the inhabitants registered in literature (listed in Tables 6-11) at the project location.

Table 10: List of plant species that have a national or global status in Ajloun Woodland Reserve

Species	Status
<i>Cephalanthera longifolia</i>	CITES
<i>Ophrys transhyrcana</i>	CITES
<i>Orchis anatolica</i>	CITES
<i>Orchis tridentata</i>	CITES
<i>Cyclamen persicum</i>	CITES
<i>Saxifraga hederacea</i>	Extremely rare (nationally)
<i>Arisarium vulgare</i>	Rare (nationally)
<i>Galium aparine</i>	Rare (nationally)
<i>Hesperis pendulus</i>	Rare (nationally)
<i>Fritellaria libanotica</i>	Rare (nationally)
<i>Cheilanthes pterioides</i>	Rare (nationally), decreasing
<i>Tulipa agenensis</i>	Rare (nationally), decreasing
<i>Valantia hispida</i>	Rare
<i>Ceterach officinarum</i>	Decreasing

The table below provides a list of the recorded flora in Ajloun Woodland Nature Reserve.

Table 11: Plant list of Ajloun Woodland Reserve

Family	Species
Acanthaceae	<i>Acanthus syriacus</i> Boiss.
Anacardiaceae	<i>Rhus coriaria</i> L.
Araceae	<i>Arisarium vulgare</i> Torg.-Tozz.
	<i>Arum hygrophyllum</i> Boiss.
	<i>Arum palaestinum</i> Boiss.
Aspleniaceae	<i>Ceterach officinarum</i> DC.

Boraginaceae	<p><i>Alkanna strigosa</i> Boiss. et Hohen.</p> <p><i>Anchusa aegyptiaca</i> (L.) DC.</p> <p><i>Anchusa hybrida</i> Ten.</p> <p><i>Cynoglossum creticum</i> Miller</p> <p><i>Cyrinthe palaestina</i> Eig & Sam.</p> <p><i>Echium judaeum</i> Lacaita</p> <p><i>Myositis</i> sp.</p> <p><i>Nonea obtusifolia</i> (willd.) DC.</p>
Family	Species
Campanulaceae	<p><i>Symphetum brachycalyx</i> Boiss.</p> <p><i>Campanula rapunculus</i> L.</p>
Caprifoliaceae	<p><i>Lonicera etrusca</i> Santi</p>
Caryophyllaceae	<p><i>Paronychia argentea</i> Lam.</p> <p><i>Silene aegyptiaca</i> (L.) L. fil.</p> <p><i>Silene conoidea</i> L.</p> <p><i>Stellaria media</i> (L.) Vill.</p>
Cistaceae	<p><i>Cistus creticus</i> L.</p> <p><i>Cistus salviifolius</i> L.</p>
Compositae	<p><i>Achillea biebersteinii</i> Afan.</p> <p><i>Anthemis pseudo-cotula</i> Boiss.</p> <p><i>Anthemis tinctoria</i> L.</p> <p><i>Calendula arvensis</i> L.</p> <p><i>Carduus argentatus</i> L.</p> <p><i>Crepis sancta</i> (L.) Bornm.</p> <p><i>Geropogon hybridus</i> (L.) Schultz Bip.</p> <p><i>Helichrysum sanguinium</i> (L.) Kostel</p> <p><i>Inula viscosa</i> (L.) Aiton</p> <p><i>Lactuca serriola</i> L.</p>

	<p><i>Notobasis syriaca (L.) Cass.</i></p> <p><i>Onopordum ambiguum Fresen.</i></p> <p><i>Phagnalon rupestre (L.) DC.</i></p> <p><i>Rhaponticum pusillum (Labill.) Boiss.</i></p> <p><i>Scorzonera papposa DC.</i></p> <p><i>Senecio vernalis Waldst. & Kit.</i></p> <p><i>Silybum marianum (L.) Gaertner</i></p> <p><i>Tanacetum santolinoides (DC.) Feinbr. & Fertig.</i></p>
Family	Species
Crassulaceae	<p><i>Tolpis virigata (desf.) Bertol.</i></p> <p><i>Tragopogon coelesyriacus Boiss.</i></p> <p><i>Sedum palaestinum Boiss.</i></p> <p><i>Telmissa microcarpa (Sm.) Boiss.</i></p> <p><i>Umbilicus intermedius Boiss.</i></p>
Cruciferae	<p><i>Alyssum sp.</i></p> <p><i>Biscutella didyma L.</i></p> <p><i>Capsella bursa-pastoris (L.) Medikus</i></p> <p><i>Cardaria draba (L.) Desv.</i></p> <p><i>Clypeola jonthlaspi L.</i></p> <p><i>Fibigia clypeata (L.) Medikus</i></p> <p><i>Hesperis pendula DC.</i></p> <p><i>Neslia apiculata Fischer, C. A. Meyer & Ave'-Lall.</i></p> <p><i>Sinapis arvensis L.</i></p> <p><i>Thlaspi perfoliatum L.</i></p>
Cucurbitaceae	<p><i>Bryonia cretica L.</i></p> <p><i>Bryonia syriaca Boiss.</i></p>
Dioscoreaceae	<p><i>Tamus communis L.</i></p>

Ephedraceae	<i>Ephedra sp.</i>
Ericaceae	<i>Arbutus andrachne L.</i>
Euphorbiaceae	<i>Euphorbia helioscopia L.</i> <i>Euphorbia hierosolymitana Boiss.</i> <i>Mercurialis annua L.</i>
Fagaceae	<i>Quercus calliprinos Webb.</i> <i>Quercus infectoria Olivier</i>
Fumariaceae	<i>Ceratocapnos turbinata (DC.) Liden.</i>
Family	Species
Geraniaceae	<i>Fumaria sp.</i> <i>Erodium acaule (L.) Becherer & Thell.</i> <i>Erodium cicutarium (L.) L'Her.</i> <i>Erodium gruinum (L.) L'Her.</i> <i>Erodium malacoides (L.) L'Her.</i> <i>Geranium lucidum L.</i> <i>Geranium molle L.</i> <i>Geranium purpureum Vill.</i> <i>Geranium rotundifolium L.</i> <i>Geranium tuberosum L.</i>
Graminae	<i>Avena sterilis L.</i> <i>Bromus sp.</i> <i>Brumus fasciculatus Presl.</i> <i>Hordum bulbosum L.</i>
Guttiferae	<i>Hypericum sp</i>
Iridaceae	<i>Gynindriris sisyrinchium (L.) Parl.</i>
Labiatae	<i>Ajuga chia Schreber</i> <i>Ajuga orientalis L.</i> <i>Lamium amplexicaule L.</i>

	<p><i>Lamium moschatum</i> Miller</p> <p><i>Majorana syriaca</i> (L.) Rafin.</p> <p><i>Mellisa officinalis</i> L.</p> <p><i>Micromeria myrtifolia</i> Boiss. & Hohen.</p> <p><i>Phlomis viscosa</i> Poiret</p> <p><i>Prasium majus</i> L.</p> <p><i>Salvia hierosolymitana</i> Boiss.</p> <p><i>Teucrium polium</i> L.</p>
Family	Species
Leguminosae	<p><i>Astragalus tribuloides</i> Delile</p> <p><i>Ceratonia siliqua</i> L.</p> <p><i>Cercis ciliquastrum</i> L.</p> <p><i>Cicer pinnatifidum</i> Jaub et Sapch</p> <p><i>Hippocrepis unisiliquosa</i> L.</p> <p><i>Lathyrus aphaca</i> L.</p> <p><i>Lathyrus blepharicarpus</i> Boiss.</p> <p><i>Lathyrus cicera</i> L.</p> <p><i>Lathyrus pseudo-cicera</i> Pamp.</p> <p><i>Lotus collinus</i> (Boiss.) Heldr.</p> <p><i>Ononis</i> sp.</p> <p><i>Psoralea</i> sp.</p> <p><i>Scorpiurus muricata</i> L.</p> <p><i>Trifolium purpureum</i> Loisel.</p> <p><i>Trifolium resupinatum</i> L.</p> <p><i>Vicia galilaea</i> Plitmann et Zohary</p> <p><i>Vicia hierosolymitana</i></p>
Liliaceae	<p><i>Allium neapolitanum</i> Cyr.</p> <p><i>Asparagus</i> sp.</p>

	<p><i>Asphodeline lutea (L.) Reichenb.</i> <i>Asphodelus aestivus Brot.</i> <i>Fritellaria libanotica (Boiss.) Baker</i> <i>Gagea commutata C. Koch</i> <i>Leopoldia sp.</i> <i>Muscari parviflorum Desf.</i> <i>Ornithogalum montanum Cyr.</i> <i>Ornithogalum narbonense L.</i></p>
Family	Species
	<p><i>Tulipa agenensis DC.</i> <i>Urginea maritima (L.) Baker</i> <i>Linum pubescens Banks & Sol.</i></p>
Linaceae	
Malvaceae	<i>Malva parviflora L.</i>
Oleaceae	<p><i>Olea europaea L.</i> <i>Phillyria latifolia L.</i></p>
Orchidaceae	<p><i>Cephalanthera longifolia (L.) Fritsch.</i> <i>Limodorum abortivum (L.) Swartz</i> <i>Ophrys transhyrcana Czernjak.</i> <i>Orchis anatolica Boiss.</i> <i>Orchis tridentata Scop.</i></p>
Papaveraceae	<p><i>Hypecoum imberbe Sibth. & Sm.</i> <i>Papaver subpiriforme Fedde</i></p>
Plantaginaceae	<i>Plantago cretica L.</i>
Primulaceae	<p><i>Anagalis arvensis L.</i> <i>Cyclamen persicum Miller</i></p>
Ranunculaceae	<p><i>Adonis dentata Delile</i> <i>Adonis palaestina Boiss.</i> <i>Anemone coronaria L.</i></p>

	<i>Clematis cirrhosa L.</i>
	<i>Ranunculus asiaticus L.</i>
	<i>Ranunculus ficaria L.</i>
Resedaceae	<i>Reseda luteola L.</i>
Rhamnaceae	<i>Rhamnus palaestinus Boiss.</i>
Rosaceae	<i>Crataegus aronia (L.) Bosc. ex DC.</i>
	<i>Crataegus azarolus L.</i>
	<i>Pyrus syriaca Boiss.</i>
Family	Species
	<i>Sarcopoterium spinosum (L.) Spach</i>
	<i>Sanguisorba minor Scop.</i>
Rubiaceae	<i>Cruciata coronata (Sm.) Ehrend.</i>
	<i>Galium aparine L.</i>
	<i>Rubia tenuifolia D'Urv.</i>
	<i>Valantia hispida L.</i>
Rutaceae	<i>Ruta chalepensis L.</i>
Santalaceae	<i>Osyris alba L.</i>
Saxifragaceae	<i>Saxifraga hederacea L.</i>
Scrophulariaceae	<i>Scrophularia xanthoglossa Boiss.</i>
	<i>Veronica cymbalaria Bodard</i>
	<i>Veronica syriaca Roemer & Schultes</i>
Sinopteridaceae	<i>Cheilanthes pteridioides (Reichard) C. Chr.</i>
Smilacaceae	<i>Smilax aspera L.</i>
Solanaceae	<i>Mandragora autumnalis Bertol.</i>
Styracaceae	<i>Styrax officinalis L.</i>
Umbellifereae	<i>Artedia squamata L.</i>
	<i>Eryngium creticum Lam.</i>
	<i>Eryngium glomeratum Lam.</i>

Urticaceae	<p><i>Lecockia cretica (Lam.) DC.</i></p> <p><i>Scandix stellata Banks & Sol.</i></p> <p><i>Parietaria alsinifolia Delile</i></p> <p><i>Urtica sp.</i></p>
Valerianaceae	<p><i>Valeriana dioscorides Sm.</i></p>

The Project location has no trees, however, at the north-east side of the project site there are some Evergreen Oak trees, which will not be removed. These trees are 50 meters away from the project site’s outer boundary. Additionally, there is an elevation difference between the project site (lower), and the trees (higher), thus project activities will not interfere with these trees. The following photo shows these Evergreen Oak trees in the distance.



Figure 14: Evergreen Oak trees outside the Project’s boundaries



Figure 15: Natural vegetation within the project location

7. Assessment of Environmental and Social Impacts and Proposed Mitigation Measures

7.1 Methodology of Environmental and Social Impact Assessment

Anticipated impacts of the project were identified, assessed, and consolidated based on information available from all sources. Based on the assessment criteria discussed hereunder, each impact was assessed for significance and given a significance rating. Impacts with high significance were further studied, described and quantified where applicable, including positive and negative, direct, indirect and cumulative impacts.

7.1.1 Impact Assessment Methodology

The adopted methodology for impacts assessment is based on a significance rating. The rating is based on the integrated results of three components which include the extent, intensity/severity and likelihood/duration of the impact. This overall significance rating provides judgment on the importance of the gains and losses for the natural and human components of the environment related to the proposed activities. The below figure graphically presents the main process allowing the impact evaluation.

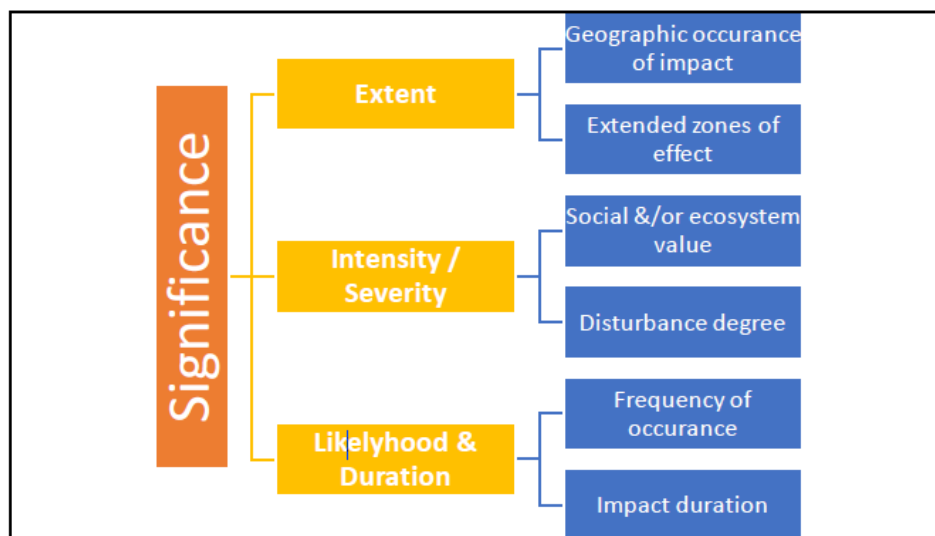


Figure 16: Procedure of impact evaluation

The identification and listing of anticipated impacts for the scoped-in valuable ecosystem components (VEC)s (e.g. species diversity), should consider the activities likely to cause the impacts and affect environmentally sensitive receptors and areas.

Anticipated impacts are listed against each aspect/VEC and then followed by aspect's evaluation on a risk basis, taking into consideration both the severity of the aspect (mainly as extent and intensity) and its likelihood of occurrence (mainly as duration of impact occurrence potential) as explained in the figure below. From this, each aspect is assigned a significance ranking of High, Medium, or Low based on relative risk, as outlined in Environmental Aspect Relative Risk and Significance Matrix.

I. Extent

The impact extent stands for the range, or the spatial coverage of the effects generated by the intervention on the site. This concept refers either a distance or a surface over which the observed modifications felt by a component or else by the proportion of population being touched by these modifications. The three levels, being considered in quantifying the impact extent are:

- Regional extent, when the impact affects a wide space or many components, being located within a close proximity of the project or being felt by the whole population or by a large proportion of the population of the study area;
- Local extent, when the impact affects a relatively limited space, or a certain number of components located inside, nearby or at a certain distance from the project site, or when it is felt by a limited proportion of the population in the study area (i.e. a village);
- Site specific, when the impact affects only a very limited space, or a component being located inside or nearby the project site, or it is felt only by a limited number of individuals in the project area.

II. Intensity / Severity

The impact intensity and severity show the relative significance of the consequences attributable to the observed alteration of a component. It compiles the social and the ecosystem value of the component along with the anticipated disturbance degree of this component. The combination of the disturbance degree and

the value assigned to the component allows obtaining five levels of impact intensity: very high, high, moderate, low, and negligible.

- Very High, when the impact severely and near completely modifies the quality or significantly limits the usage of a component presenting a main interest and exceptional qualities, whose conservation or protection are subject to a formal legislation or a general consensus. It involves severe negative impact on the environment with potential long-term effects.
- High, when the impact highly modifies the quality or significantly limits the usage of a component presenting a main interest and exceptional qualities, whose conservation or protection are subject to formal legislation or a general consensus. High negative impact on environment with potential long-term effects.
- Moderate, when the impact reduces the quality or the usage of the component having a certain social value and/or recognizable qualities without necessarily compromising its integrity. Moderate negative impact on environment with short term effects.
- Slight / Low, when the impact modifies only in a little manner the quality, the usage, or the integrity of an environmental component whose interest and quality do not constitute any growing concern. Minor negative impact on environment without any noticeable effects.
- Negligible, when there is no negative impact or when the impact modifies only in a very little manner the quality, the usage or the integrity of an environmental component whose interest and quality do not constitute any growing concern and as long as there is immediate recovery of the affected VEC. No negative impact on the environment or almost immediate recovery.

III. Likelihood and Duration

Likelihood of an impact is referred to the occurrence potential of the respective impact as a direct or indirect result of the project/development or one of its components/activities, the frequency of occurrence of similar impacts during a period of a year or five years from similar projects/developments/technology. Likelihood scoring of environmental aspects and impacts is to be arranged as follow:

- Very Unlikely, occurred or heard in similar projects but never occurred in Jordan or in Project managed by the Project Owner.
- Unlikely, has occurred in project(s) managed by the Project Owner but not more than once in 10 years.
- Possible, has occurred in project(s) managed by the Project Owner not more than once in 5 years.
- Likely, has occurred in project(s) managed by the Project Owner not more than once per year.
- Very Likely, has occurred more than once per year in project(s) managed by the Project Owner.

The impact duration indicates its time extent, defined as being the period during which the imposed modifications will be felt by a component. The used method distinguishes the following impacts:

- Permanent, whose effects are felt in a continuous manner during the service life of the equipment or even beyond.
- Temporary, whose effects are felt during a limited time period.

IV. Significance

The interaction between the severity/intensity and likelihood allows us to define the significance level of the impact affecting a component by the project. Figure 15 presents the environmental aspect relative impact matrix adopted to evaluate the significance of anticipated impacts. As it can be noted from the table the significance value shown between the two brackets is the result from multiplying the severity score with the likelihood score. When the significance score exceeds 6 it becomes medium, when it exceeds 12 then it is high. Exception to this is the impacts which are considered/assessed to have very high severity which

is assessed to be of medium significance if the likelihood is very unlikely or unlikely, and considered high if it is possible and above. This conservative approach is important when the affected receptors are of higher sensitivity to impacts and to implement sufficient and effective mitigation plans (mainly avoidance/prevention) to avoid high severity impacts (e.g. fatality or loss of endangered species).

It should be noted that the “extent” is not included in this matrix as it is related to the area of influence. This is required to explain the affected receptors and inform where the mitigation actions will be implemented.

		Severity				
		Negligible (1)	Slight (2)	Moderate (3)	High (4)	Very high (5)
Likelihood Score	Very Unlikely (1)	LOW (1)	LOW (2)	LOW (3)	LOW (4)	MEDIUM (5)
	Unlikely (2)	LOW (2)	LOW (4)	LOW (6)	MEDIUM (8)	MEDIUM (10)
	Possible (3)	LOW (3)	LOW (6)	MEDIUM (9)	MEDIUM (12)	HIGH (15)
	Likely (4)	LOW (4)	MEDIUM (8)	MEDIUM (12)	HIGH (16)	HIGH (20)
	Very Likely (5)	LOW (5)	MEDIUM (10)	HIGH (15)	HIGH (20)	HIGH (25)

Figure 17: Environmental aspects relative impact matrix

7.2 Expected Impacts and Mitigation Measures during the Construction/ Installation Phase

7.2.1 Impacts on the Physical Environment

- **Polluting Soil**

Soil pollution may result during the construction phase of the project due to the accidental spillage of the fluid wastes that will result from this phase of the project and might include any construction fluid materials such the spillage of oil/fuel from construction machinery (trucks, excavators, cranes, and loaders). Its impacts on the soil are expected to be minimal, especially if the spillage or the leakage was cleaned immediately or within a short time interval. Also, soil pollution may occur from inappropriate management of generated fluid and solid waste by the workforce.

Such impact is evaluated to be of low intensity, temporary, and with site specific extent, thus, the overall significance of the said impact is very low.

The following mitigation measures needs to be implemented:

- Lubricants will be stored in dedicated enclosures with a sealed floor/base.
- Solid waste from construction activities will not be thrown randomly and shall be disposed of as per the solid waste management plan.
- Construction storage/stockpiles shall be provided with bunds to prevent silted run-off.
- Stockpiled materials will be covered to reduce run-off.
- Minimize footprint and working width required for the project's camps and offices.
- Existing tracks will be used wherever possible.
- Main tracks will be constructed to a minimum standard to ensure use and discourage creation of new tracks. This issue should be part of the safety briefing that needs to be provided for the workforce before starting the operations.
- Access tracks will be used efficiently (i.e., minimize vehicle travel, tracked vehicles, low pressure tires) to minimize compaction and erosion.
- All access routes across wadis in sensitive areas will be as direct as possible to ensure minimum damage.
- Off-road driving will be minimized in sensitive areas wherever possible.

- **Polluting Natural Water Resources**

Natural surface water runoff may occur in high-intensity rainy season, which in turn are of low frequency. Therefore, it is not considered as a sensitive receptor to possible pollution from the construction activities.

As for groundwater, contamination might result (similar to soil) from inappropriate management of fluid and solid wastes generated by the workforce in the project area and inappropriate management of the project generated fluid and solid waste during daily operations.

In general, such impacts on the groundwater resources are expected to be minimal. Only up to four machineries are expected to be used at the project site, which will take place over a limited time span (few weeks). Still, the Project will ensure to apply the mitigation measures below. Thus, this impact is expected

to be of low intensity especially if the spillage or the leakage is cleaned immediately or within a short time interval. Also, this impact is limited to the sites and temporary as it is related to the implementation phase of the Project. Accordingly, such impacts are of very low significance.

The following mitigation measures will be implemented:

- Lubricants will be stored in dedicated enclosures with a sealed floor/base.
- Construction storage/stockpiles shall be provided with bunds to prevent silted run-off.
- Access tracks will be used efficiently (i.e., minimize vehicle travel, tracked vehicles, low pressure tires) to minimize compaction and erosion.
- Off-road driving will be minimized in sensitive areas wherever possible.
- Domestic liquid waste that will result from the daily operation of the project facilities should be collected and emptied on regular basis and transferred through an authorized contractor to the designated liquid wastes collection site/wastewater treatment plant. Any resulting non-domestic liquid wastes should be collected and transferred through an authorized contractor to the appropriate “non- domestic” liquid wastes dumping site.

- **Solid Waste**

Potential waste streams to be generated during this phase of the project comprise:

- a) Non-hazardous solid waste and include:
 - Domestic solid wastes from camp users. To calculate the expected maximum volume of the said wastes, the following scenario is applied:
 - The figure 0.9 kg/capita/day as the overall daily solid waste produced per capita, and;
 - 10 persons as the maximum number of project workers who will be using the site per day.
 - Accordingly, the maximum estimated volume of solid waste that will be produced on a weekly bases is 9 Kg from the site, noting that the construction phase is expected to take less than two months, and no more than three months.
 - Non-combustible & combustible waste: generated due to the di various construction works at the project area, and might include debris, bricks, concrete aggregates and scrap metal, wasted paper, wood, plastic and cardboard.
- b) Hazardous waste: this type of wastes includes mainly empty containers of used chemicals, oils, and paint cans. There will be very minimum, or no use of such chemicals at the site during construction, especially that offsite-ready prefabricated structures will be used and only few machineries will be used for limited time during the construction phase. Still, in case of the possibility that small quantities happen to be required (for insulation, finishing, or other purposes), the empty containers will be accounted for through the mitigation measures below.

The absence of or noncompliance with appropriate solid waste management measures, and the accumulation of the above defined types of solid waste will have a direct negative impact on the surrounding environment, especially blocking water ways and wadis, and on workers and public health. If not avoided (i.e. occurrence of mismanagement), the impact is likely to occur with moderate intensity, with local extent and temporary duration. Thus, the said impact will be of medium significance.

Following are the recommended mitigation measures that need to be implemented to manage produced solid waste during this phase of the project:

- The Waste and Spoil Management Plan (WSMP) shall include instructions and guidelines for daily implementation by the site works. These guidelines will be required to ensure waste from construction is managed properly, and will include consideration of the following:
 - Locations and quantities of waste arising from the construction works.
 - Agreed locations for the temporary disposal before transporting it to its final dumping sites. Hazardous waste should be transported to Swaqa Hazardous Waste Treatment Facility and construction waste to Zarqa dumpsite.
 - Methods of transportation that minimize interference with normal traffic.
 - Waste disposal will be monitored by the project’s Health, Safety and Environment (HSE) team and recorded using a written chain of custody (trip-ticket) system to the designated disposal sites.
- The project contractor and their sub-contractors shall implement the SWMPs with maximum care and in full compliance with this ESIA and other applicable regulations, instruction and decisions by the client and the related municipalities.
- It is important to implement a precautionary approach to avoid unnecessary and prolonged solid waste accumulation at the camp site and in the nearby areas resulting from the daily operations of the project camps.
- Any resulting surplus soil should be evaluated to be reused (in other local infrastructure projects) or disposed of waste in the designated disposal site for such types of materials.
- The resulting types of solid waste should be collected in an area designated as a temporary solid waste dumping area. They then should be transferred by an authorized contractor to the designated solid waste dumping site, in full coordination with the responsible authorities.
- The different types of resulting solid waste should be segregated according to type, and collected in proper collection containers, then transferred through an authorized contractor to the designated solid waste dumping site.
- The project’s Environmental and Social Management Plan should ensure the efficiency of waste collection and transport system so that no waste is being mismanaged or accumulated.
- It is highly recommended to implement the principle of the 5Rs subject to local environmental regulations and availability of resources to handle waste. These “5 Rs” are as follows:
 - Reduce: generating less waste in their original form.
 - Reuse: reusing materials in their original form.
 - Recycle: converting waste back into a usable material.
 - Recover: extracting materials or energy from waste for other uses.
 - Residue: an unavoidable waste residue which requires a waste disposal method e.g. licensed landfill, incineration etc.

The above methods are usually used in combination by reduction and reprocessing or recovery and reuse. Selection of disposal methods is based on the following factors:

- Waste category;
- Waste volume;
- Waste property;

- Environmental impacts;
- Logistics; and
- Availability of acceptable disposal methods.

- **Fluid Waste**

During this phase, the expected resulting fluid waste stream includes:

- Domestic fluid waste generated by the work force (around 12 persons for three months).
- Hazardous fluid waste, such as used oils and lubricants that result from regular maintenance and operation of Project machinery and vehicles.

The absence of an appropriate fluid waste management system will increase the possibility of occurrence of negative impacts on the surrounding environment and to public health. In conclusion, this impact is possible to occur with moderate intensity, with site specific extent and temporary duration. It is thus considered of low significance.

The following are the mitigation measures that should be applied during this phase:

Domestic Liquid Waste

Domestic liquid waste that will result from the daily operations of the project facilities (latrines) should be collected and emptied on regular basis and transferred through an authorized contractor to the designated liquid waste collection site/wastewater treatment plant. While the resulting non-domestic liquid waste should be collected and transferred through an authorized contractor to the appropriate “non- domestic” liquid waste dumping site.

Hazardous Waste

Following are the recommended mitigation measures that need to be implemented to manage the resulting hazardous waste during the construction phase:

- Segregate hazardous wastes (oily waste, used batteries, fuel drums) and ensure that storage, transport, and disposal shall not cause pollution and shall be undertaken consistent with national and local regulations.
- The engine oils, the hydraulic oils and gears lubricants which result from the systematic maintenance of the equipment and engines will be stored in metallic containers and delivered to an authorized contractor for regeneration. A register will be maintained by the contractor to facilitate the traceability of these waste products.
- Ensure that safe storage of fuel, other hazardous substances and bulk materials are agreed and have the necessary approval/permit from the local authorities.
- Hydrocarbon, toxic material will be stored in adequately protected sites consistent with national and local regulations to prevent soil and water contamination.
- Equipment/vehicle maintenance and refueling areas will be confined to areas in construction sites designed to contain spilled lubricants and fuels. Such areas shall be provided with drainage leading to an oil-water separator that will be regularly skimmed of oil and maintained to ensure efficiency.

- Hazardous substances shall be stored in areas provided with roof, impervious flooring, and bund/containment wall to protect these from the elements and to readily contain spilled fuel/lubricant.
- Ensure all storage containers are in good condition with proper labelling and undertake necessary repair or replacement.
- Ensure availability of spill clean-up materials (e.g., absorbent pads, etc.) specifically designed for petroleum products and other hazardous substances where such materials are being stored.
- All areas intended for storage of hazardous materials will be quarantined and provided with adequate facilities to combat emergency situations complying with all the applicable statutory stipulations.
- Liquid wastes management guidelines should be prepared and will include consideration of all matters related to solid and liquid waste, and include the following:
 - Expected types of waste and quantities of waste arising.
 - Methods of transportation to minimize interference with normal traffic.
 - Establishment of regular disposal schedule and constraints for hazardous waste, program for disposal of general waste, and chain of custody for hazardous waste.
 - Waste disposal should be done in the designated dumping sites (Swaqa site).

- **Hydrology - Surface Runoff**

During the construction phase, water will mostly be used during soil moving works for dust control during grading and leveling the site, as well as for the already-existing unpaved road traffic that reside nearby outside the project and lead to it. The quantity of water used for construction activities will be relatively small and will not cause any changes to existing drainage patterns. This is an underdeveloped land; water is most likely to come from precipitation with existing slope. Furthermore, there are no extreme weather events recorded for the site.

Construction activities for the proposed development can have minor impact on hydrology. Grading associated with earthworks could cause runoff to be directed away from the project site. Overall, the impacts on surface water resources are related to the project footprint (e.g., land disturbance, erosion, changes in runoff patterns, and hydrological alterations, etc.).

Additionally, it is considered that there is likely to be a low impact to the soil from flooding; considering the low level of site preparation expected and nature of the project.

The following mitigation measures needs to be implemented:

- Construction storage/stockpiles shall be provided with bunds to prevent silted run-off.
- Stockpiled materials will be covered to reduce run-off.
- Minimize footprint and working width required for the project's area.
- Existing tracks will be used wherever possible.

- **Air Quality**

Dust and gaseous emissions from trucks and vehicles are the main sources of air pollution during construction phase. Fugitive dust emission is anticipated to produce during construction phase from the following sources:

- Dust entrained during onsite travel on paved and unpaved surfaces.
- Dust entrained during aggregate and soil loading and unloading operations; and
- Wind erosion of areas disturbed during construction activities.

Around 1 kg/day of dust emissions in the form of PM10 and 0.3 kg/day in the form of PM2.5 are anticipated to be produced during construction activities. Table 12 summarizes anticipated volumes of dust emissions.

Table 12: Calculations of anticipated dust emissions during construction phase

Emission Factors:	PM10: 8.14E-05 kg/m ² -day
	PM2.5: 3.26E-05 kg/m ² -day
Area:	10,000 m ²
Wind erosion of active demolition area	PM10: 8.14E-05 kg/m ² -day x 10,000 m ² = 0.814 kg/day
	PM2.5: 3.26E-05 kg/m ² -day x 10,000 m ² = 0.326 kg/day

* Based on the American Emission Inventory (Source: AP-42, p. 13.2.4-3)

While combustion emissions will result from mobile equipment such as trucks, bulldozers and asphalting machine, the internal combustion engines of heavy equipment are expected to generate emissions of PM10, VOCs, NOx, SOx and CO. Particulate and gaseous emissions from construction vehicles are presented in the table below.

Table 13: Estimated daily fugitive dust emissions from the project construction equipment*

Equipment	Number of Units	VOC kg/day	CO kg/day	NOx kg/day	SO2 kg/day	PM10 kg/day	PM2.5 kg/day
Water Truck	1	1.07	5.05	13.40	18.08	1.00	0.98
Dump Truck	1	0.807	3.78	10.1	13.53	0.75	0.731
Excavator	1	0.10	0.40	1.40	2.23	0.10	0.09
Cranes	1	1.25	3.70	16.29	20.77	0.97	0.94
Front End Loaders	1	0.69	2.84	9.15	13.54	0.64	0.62
Total Emissions		2.787	15.77	50.34	68.15	3.46	3.361

Source: EPA Non- Road Engine and Vehicle Emission Study, EPA 460/3-91-02, November 1991.

As this project will be conducted within a non-residential area, the construction works are not anticipated to have significant impact there. Anticipated impacts of the dust and other gaseous emissions from construction machinery are anticipated to be very low. The project contractor will ensure that equipment is fit to purpose, in good condition and well maintained to minimize atmospheric emissions. In addition, the combined effects of the wind and the high temperature of exhaust gases will facilitate a rapid dispersion of atmospheric pollutants.

Hence, this impact is possible to occur with low intensity, with site regional extent and temporary duration. Thus, the said impact will be of very low significance.

The following typical mitigation measures are proposed to control exhaust emissions from the heavy equipment and potential emissions of fugitive dust:

- Disturbed areas in the project construction site will be watered as frequently as necessary to prevent fugitive dust plumes.
- The vehicle speed limit will be 25 km/h within the construction site.
- The construction site entrances shall be posted with visible speed limit signs.
- Unpaved exits from the construction site will be graveled or treated to prevent track out to public roadways.
- Footpaths within construction site will be swept at least twice daily to prevent the accumulation of dirt and debris.
- At least the first 200 m of any public roadway exiting from the construction site shall be swept at least twice daily (or less during periods of precipitation).
- Soil storage piles and disturbed areas that remain inactive for longer than 10 days will be covered or treated with appropriate dust suppressant compounds.
- Vehicles used to transport solid bulk material on public roadways and having the potential to cause visible emissions will be provided with a cover.

• **Noise**

Machinery movements and construction works will be the main sources of noise during construction. Powered mechanical equipment such as generators, excavators, bulldozers, drills, graders and concrete-mixing plants will generate noise and vibration. Whereas various modern machines are acoustically designed to generate low noise levels and acoustically insulated plant may be available, it is the expectation that the project contractor will make sure that all equipment is well maintained and fitted with the manufacturer’s noise and emission abatement equipment.

In order to quantify the anticipated level of noise which will be produced from using different construction machines, equipment’s that are normally used for construction purposes are listed in the table below with associated sound power levels and sound pressure levels at 1 m from the source. Each type of equipment is classified from A to D according to the sound power level.

Table 14: Construction equipment noise sources, sound power and sound pressure levels

Equipment	Sound Power, L _w [db(A)] (maximum value)	SPL at 1 m from Source [db(A)]	Category
Excavator	91	75-80	B
Dozer	91	75-80	B
Loader	91	75-80	B
Dump truck	91	75-80	B

Source: U.S. Environmental Protection Agency.

As this project will be conducted within an area that is characterized by low residential and commercial establishments, the construction works are not anticipated to have significant impacts on increasing noise levels, however, high noise levels are anticipated in the project specific site, which will have impacts on the workers.

Based on the above, the expected noise level during the construction phase will result in increasing the current noise levels within the project specific site. Hence, the impact is possible to occur with low intensity, with site specific extent and temporary duration and thus is considered to be of very low significance.

The following mitigation measures need to be implemented by the project contractor under the supervision of the SEED project:

- Implement all possible measures to minimize disturbance related to noise levels through optimizing suitable time zone to have required operations there and optimize suitable work time to avoid disturbance to the urban areas, taking into consideration public holidays and weekends;
- Use of machinery and equipment in good operating conditions fitted with silencers;
- - Switching off engines when not in use; and Best available working practices will be used on-site to minimize occupational noise levels.

7.2.2 Impacts on the Biological Environment

The following are the anticipated impacts on the biological environment during the construction phase. It's important to mention that these impacts are permanent and hence, they are anticipated to continue during the operation phase:

- Loss and decline in natural vegetation and trees due to development activities.
- Loss of microhabitats due to loss of natural vegetation.
- The risk of killing animals (by construction workers on site) such as wolves, jackals, hyenas, foxes, and badgers. The reason behind killing these animals is usually because of ignorance and traditional beliefs that they should be removed. It's worth noting that none of these animals were spotted by the consulted locals mentioned in Section 6.4 Biological Environment (being the Ajloun Forest Reserve Manager, the forestry rangers, shepherds and relevant municipality relevant staff); nonetheless, this point and relevant contingency measures are put in place as an extra precaution.

The Project location has no trees, however, at the northern side of the project location there are some Evergreen Oak trees that will not be removed. However, during the construction phase and as a result of site preparation activities, these trees could be affected by fugitive dust. However, this impact is expected to be short term and the trees will be washed during the rainy season.

Overall, the said impact is considered medium with local extent and permeant duration, thus, its significance is considered low. Especially considering that the project will not require any tree removal.

The following mitigation measures should be implemented during construction and operation phase of the Project:

- Minimize habitat alteration as much as possible.
- Avoid unnecessary removal of native plant species to conserve microhabitats.
- Avoid deliberate firewood collection.
- Avoid removal of rare plant species.

- Provide necessary training and awareness for project employee.
- Minimize disturbance through limited access to the area.
- Avoid direct persecution of animal species.
- Avoid removal of trees as much as possible. No tree removal is expected to take place at the project site, nonetheless, in case of the need for tree removal from the site, trees should be relocated in consultation with and supervision of the Ministry of Agricultural and Ministry of Environment. Trees relocation success rate is expected to be reasonable, and will be associated with the following mitigation measures:
 - The relocation will be conducted in coordination with and by the Forestry Department, which is part of the Ministry of Agriculture. They will be accountable for the relocation process.
 - The local municipality, in coordination with the Forestry Department, will be accountable for ensuring that the relocated trees will be looked after and irrigated, with extra attention during the first few years, to increase the relocation success rate. Since the relocation of the trees is anticipated to take place in the proximity of the project, as indicated by the forestry department through their site visit, taking care of the relocated trees will be handled through the local municipality staff that will assigned by the municipality to be present 24/7 to guard the PV wheeling farm project and constantly monitor it long-term (i.e. over the lifespan of the solar form which is expected to be around 25 years).
 - The present trees age/size is relatively small which will increase their survival rate, especially when accompanied by the care that will be given by the assigned local municipality staff, who will be supported by the Forestry Department.
 - The SEED project will plant two trees (the trees will be provided and planted by the Forestry Department, from the nursery of the local forest), for each relocated tree regardless of the success of the reallocation. These newly planted trees will also be part of the local municipality responsibility in coordination with the Forestry Department.
- Provide necessary training and awareness raising for project employees and locals. The SEED project will raise awareness on the importance of biodiversity and indicate that the killing of animals is forbidden on site.
- The fence surrounding the project site will prevent any animals from entering the site. As an extra measure, a sign forbidding the killing of animals will be installed at the site to provide instructions and precautions to local residents and workers in case they encounter any animals (which is highly unlikely as per local consultations that the Project did, more on these consultations is provided in Section 6.4 Biological Environment).
- Minimize habitat alteration and land leveling as much as possible, especially the areas with natural vegetation.

In addition to the mitigation measures taken, the SEED project did proper due diligence with relevant key stakeholders. Representatives from the Forestry Department (under the Ministry of Agriculture), the local municipality, and the Project (through the assigned environmental and technical experts) did several site visits toward the end of 2022 and beginning of 2023. They carried out these inspection visits in collaboration with each other, and on some occasions, separately, in order to inspect the site. These site visits resulted in securing the necessary approval and support from the Forestry Department, Ministry of Agriculture, and the local municipality on the chosen project location. Additionally, GAC's assigned local environmental expert and assigned project coordinator also visited the site to ensure there are no issues.

7.2.3 Impacts on the Socio-economic Conditions

- **Contributing to Traffic Congestion**

The existing roads surrounding the project area are rural, unpaved roads (1 lane) with limited traffic or pedestrian movement, which mainly come from the Ministry of Agriculture rangers and trucks as they have an office nearby. Therefore, coordination with the Ministry of Agriculture ahead of commencing the construction works at the project sites will avoid any possible traffic issues.

As a result, there is little possibility for the occurrence of vehicle accidents and pedestrian-car accidents for those who are using the roads system within the project's work areas. Such impact is evaluated to be of low severity, temporary, and of regional extent, thus, the overall significance of the said impact is low.

The Project's contractor in coordination with the local authority, and existing locals, should prepare a traffic management plan for the movement of the different types of project machinery. The required plan should focus on defining the following major issues of concern:

- Follow up on and coordinate the implementation of the subject traffic plan.
- The routes that the construction machinery will use during its movement from one working site to another within the open areas.
- For the movement of the project machinery that will transfer solid waste from the construction site to the final dumping sites, the following points needs to be arranged and defined:
 - The routes that will be used to reach the dumping site.
 - A weekly time frame for the movement of said machinery to the dumping site.
 - Avoiding peak traffic hours for movement purposes of heavy machinery.
 - Taking into consideration school hours, especially for schools that may be sharing the route of any vehicles commuting to the project site.

- **Providing Temporary Work Opportunities**

The Project is expected to have a positive impact on creating temporary job opportunities for the local community during the construction phase. The Project is expected to provide around 12 job opportunities for around three months including: specialists, skilled and unskilled labor.

Accordingly, such impact is evaluated to be possible, of slight severity, temporary, and of local extent, thus, the overall significance of the impact is medium, but positive.

No mitigation measures are required.

- **Impacts on Businesses**

The construction phase of this project will have a positive impact on the construction materials and equipment sector. Also, small size construction contractors will have a good chance to do small assignments (as subcontractors) within this project. Moreover, the construction phase of this project will participate in activating the service and light commercial sectors at the area.

The solar panels utilized in the project will be either imported or sourced locally from one of the two factories that produce PV modules. The contractor will decide where to source the solar panels from and will be responsible for guaranteeing their performance and productivity.

Accordingly, such impact is evaluated to be possible, of slight moderate (considering the size of the project), temporary, and of local extent, thus, the overall significance of the said impact is medium but positive.

No mitigation measures are required.

- **Occupational Health & Safety**

Under this title all potential impacts related to the occupational health and safety (OHS) of the project working team and the public's safety are discussed and evaluated below.

Workers Health and Safety

During this phase of the project, the following threats to the occupational health and safety of the project workers and locals might occur in the absence of a comprehensive "OHS" plan include:

- Wrong usage of electro-mechanical equipment due to lack of experience and/or lack of training
- Traffic accidents. Potential hazard can include having a collision with the other vehicles used by the project team or any passing by private vehicles, especially when the project vehicles are moving from/to the project site.
- Incidents related to low hygiene level in the project facilities such as food poisoning.
- Conducting different types of hot works (i.e. welding) at the project's workshops and at the project sites.
- Working in hot and/or dusty conditions (bad weather conditions): Workers can be subjected to heat strokes during long work periods under the sun without wearing appropriate Personal Protection Equipment (PPEs) and without keeping hydrated. As for dust, dusty winds may occur during the summer period, in which cases, site operation should be suspended.
- Use of dangerous equipment and tools by the workers. This issue should be taken into consideration for the local workforce who will be hired locally to participate in the Project.
- Fire incidents at the project facilities (offices & workshops).
- The possibility for any of the working team to be subjected to "Run over" accidents by the project machinery or private vehicles while working at the construction site or moving from one place to another within the project's "working zones".

As an overall evaluation, the possibility of the occurrence of any of the above listed hazards is medium. However, the severity of such hazards is considered high since many of these hazards can cause human fatality, while the extent is considered local and the duration temporary. Thus, such issues are considered of medium significance.

Public Health and Safety

Without implementing the appropriate safety measures regarding the people passing within or close to the work zones, there is a major possibility for:

- Impacting the safety of people who are using the surrounding roads network as a result of possible collisions between their personal vehicles and the project vehicles and equipment.

- Entering the project site/s by unauthorized personnel and/or vehicles. This issue might threaten the safety of such people through falling in open trenches at the site, collision with any of the project vehicles or equipment.

Overall, the said impact is considered of high intensity with local extent and temporary duration, thus, its significance is considered medium.

Mitigation measures to be implemented by contractors to ensure health and safety of workers are as follows:

- Before construction commences, the Contractor will conduct training for all workers on safety and environmental hygiene. The contractor will instruct workers in health and safety matters as required by law and by good engineering practice and provide first aid facilities.
- The Contractor will instruct and induct all workers in health and safety matters (induction course) before they start work and site agents/foremen will follow up with follow-on talks on a weekly basis. Workforce training for all workers starting on site will include safety and environmental hygiene.
- Fencing shall be installed on all areas of excavation greater than 1m deep and at sides of temporary works.
- Workers shall be provided (before they start work) with appropriate personnel safety equipment such as safety boots, helmets, gloves, protective clothes, breathing mask, goggles, and ear protection at no cost to the workers. Site agents/foremen will follow up to see that the safety equipment is used and not sold on.
- Ensure audible reversing signals are installed on all construction vehicles.

Public safety, particularly of pedestrians and children, can be threatened by the construction works. The following mitigation measures will be implemented by the contractors:

- Fencing will be installed prior to excavation work on all sides of temporary and permanent excavations. The guidelines will include provisions for site security and guards, trench barriers and covers to other holes and any other safety measures as necessary.
- The contractor will provide warning signs at the periphery of the site warning the public not to enter and define this in the ESMP.
- The contractor will restrict the speed of project vehicles and control traffic by contra-flow and provide flag men and warning signs at either side/end of the works areas where the traveling lanes must be temporarily reduced.
- The safety measures for the public in the Worker and Public Safety Guidelines will include:
 - Barriers (e.g., temporary fence), shall be installed at construction areas to deter pedestrian access to the roadway except at designated crossing points.
 - The general public/local residents shall not be allowed in high-risk areas, such as excavation sites and areas where heavy equipment is in operation and these sites will have a watchman at the entrance to keep public out.
 - Speed restrictions shall be imposed on Project vehicles and equipment traveling within 50m of sensitive receptors (e.g., residential, schools, etc.).
 - Provisions for site security, trench barriers and covers to other holes and any other safety measures as necessary.

- Provision of warning signs at the periphery of the site warning the public not to enter and defining this in the ESMP.
- Strict imposition of speed limits along residential areas and where other sensitive receptors such as schools, hospitals, and other populated areas are located.
- Educating drivers on safe driving practices to minimize accidents and to prevent spill of hazardous substances (fuel and oil) and other construction materials during transport.

7.2.4 Impacts on Archaeology and Cultural Heritage

According to the analysis of the baseline conditions, the location of the proposed Project does not include any archaeological or cultural heritage sites. Therefore, construction of the proposed project is not expected to have any direct impact on this component.

However, in the case where any archaeological remains are found during construction, construction activities must be ceased, and the Department of Antiquities (DoA) shall be contacted so that the necessary measures are taken.

7.3 Expected Impacts and Mitigation Measures during the Operation Phase

7.3.1 Impacts on the Physical Environment

- **Landscape and Visual Amenities**

The project will alter the visual landscape as installation of PV system will be a distinct dominant feature in the environment. The magnitude of the impact is considered moderate considering the size of the system.

There will be minimal loss of vegetation covered by the project, due to the relatively small size of the project. However, there will be impacts on the landscape fabric due to the PV system, albeit not considered as a significant change in character. Access footpaths within the PV system plot area will be constructed as part of the project, whilst stockpiling of materials and storage of construction equipment will have an impact on the landscape fabric. It is anticipated that the impact will be insignificant as there are no immediate sensitive receptors at the project location and surroundings. Taking into consideration that necessary cleaning and maintenance footpaths will be developed and submitted as part of the prospect contractor's design, the SEED project will request and make sure not to have any receptors along the footpaths designed ahead of approving the design.

The sensitivity of the landscape fabric is low to negligible and the magnitude of impact during operation is also low. Therefore, the significance of the impact is considered to be minor.

- **Glare Effect**

Another issue associated with the Project is the potential for glare caused by sunlight reflected off the PV panel modules.

Panels work on the concept of absorbing sunlight rather than reflecting it as in the case of other technologies (e.g. Concentrated Solar Panels CSP). Therefore, it is very important to distinguish between both technologies as misperception surrounding solar reflections is likely due to confusion between solar PV and CSP, which use a system of large mirrors to direct sunlight.

Not all of the incoming sunlight is absorbed by a PV panel and a very small and minimal amount of incoming sunlight is reflected (as little as 2% of incoming sunlight). Therefore, PV panels could be associated with minimal potential for glare caused by sunlight reflected off the modules. This depends on several factors such as the amount of sunlight hitting the surface, surface reflectivity, geographic location, time of year, cloud cover, and solar panel orientation. However generally, glare is likely to occur when the sun moves away from being perpendicular to the panel and when the sun is low on the horizon (toward sunrise and sunset), because the solar panel is absorbing much less of the incoming light.

The glare associated with PV panels will be of long-term duration throughout the entire operation of the Project and of low magnitude given that such impacts are not an issue of concern. As there are no sensitive visual receptors within a 5km radius from the project (i.e. there are no people living around the project area), the receiving environment is determined to be of a medium sensitivity. Given all of the above, such an impact is considered to be of minor significance.

- **Hazardous, Solid and Liquid Waste**

Of particular importance is the disposal of malfunctioned panels during maintenance or at the end of their lifetime. Based on discussions with the “Hazardous Substances and Waste Management Directorate” of the MoEnv, the panels are classified as electronic waste and must be disposed of at the Swaqa Hazardous Waste Treatment Facility.

Therefore, during the decommissioning phase of the Project – and assuming as a worst-case scenario that the panels will be disposed of at a landfill– it is important to ensure that the Swaqa Hazardous Waste Treatment Facility would be able to accept and handle the panels and the quantities to be disposed.

However, this issue in itself is unclear at this stage. The prospects of hazardous waste management are not clear, taking into account the Project timeline of 25 years. Based on discussions with the “Hazardous Substances and Waste Management Directorate” of the MoEnv, the only hazardous landfill in Jordan is the Swaqa Hazardous Waste Treatment Facility and there are no plans to establish or construct new hazardous waste disposal facilities. At Swaqa, currently, stabilized and inert hazardous waste is land-filled, while other types of hazardous waste which require physical-chemical treatment or incineration are stored in safe storage spaces. However, there is a second phase development plan for Swaqa which involves physical, chemical treatment and incineration facilities to improve handling and management of hazardous waste and which is expected to significantly improve the capacity of the landfill. More importantly there is currently a pilot project for disposal and management of electronic waste at Swaqa. Electronic waste is currently collected and stored at the landfill, and there are plans for collaborating with private entities for implementing recycling programs for such electronic waste streams.

Taking all of the above into account, the anticipated impacts on hazardous waste disposal facilities are considered of long-term duration, of a negative nature, and are expected to be of medium magnitude and of low sensitivity. Given the above such an impact is considered of minor significance.

Solid and liquid waste is expected to be generated by the operational staff. It is expected that two staff members (guard and technical operator) are required during the operation phase. The amount of solid waste

that is expected to be produced is around 1.8 kg (based on the average generation rate of the country which is 0.9 kg per day per capita). For wastewater, the amount expected to be generated is around 30 liters per day from using the toilet.

The anticipated impacts from solid and liquid waste generated by the operation are considered to be of long-term duration, of a negative nature, and are expected to be of low magnitude and of low sensitivity considering the small amount. Given the above such an impact is considered of minor significance.

The following mitigation measures are to be implemented in relation to hazardous waste:

- Coordinate with the MoEnv and hire a private contractor for the collection of hazardous waste from the site and transfer to the Swaqa Hazardous Waste Treatment Facility;
- Follow the requirements for management and storage as per the ‘Instructions for Hazardous Waste Management and Handling of the Year 2003’ of the MoEnv;
- Prohibit illegal disposal of hazardous waste to the land;
- Maintain records and manifests that indicate volume of hazardous waste generated onsite, collected by contractor, and disposed of at the Swaqa Facility. The numbers within the records are to be consistent to ensure no illegal discharge at the site or other areas.

The following mitigation measures are to be implemented in relation to solid and liquid waste:

- Sewage will be collected and transported through septic tanks by the municipality according to the relevant regulations.
- Provide waste collection bins with the project facilities and rooms,
- Provide municipal waste collection containers around the entrance that can be collected by the Solid Waste Management (SWM) vehicles,
- The municipality, through its waste collection services should ensure that waste is collected and transported to the closest sanitary landfill (Al Ekadier landfill) at least three times a week.

- **Climate Change**

Electricity generation from solar PV power plants is environmentally friendly as it does not use any fossil fuels. It thereby reduces the greenhouse gas emissions (GHG) associated with fossil fuel-based electricity generation systems. The availability and reliability of solar power depends largely on current and future climate conditions, which may vary in the context of climate change.

There is no record in the past for any extreme weather events/conditions at the project site and surrounding area.

The comparison of the GHGs emission caused by solar PV power plants with the GHGs emission that would have been caused by fossil fuels burned to make the same amount of electricity has been conducted. Thus, the purpose of the project activity is to generate power from zero emissions solar PV-based power generation and thereby reduce the emissions associated with the grid.

Below is a very rough estimate, based on a 1-MW solar power system replacing natural gas. We will assume the following conditions:

- The solar array has a service life of 25 years.
- The electricity output decreases gradually over time, and the solar panels still have 80% of their original output after 25 years.

In a site with favorable sunshine, each megawatt of solar panels can produce over 1,500 MWh per year. With a capacity of 1 MW, the solar PV system produces around 1,500 MWh in its first year of operation. By year 25 the annual production will have reduced to 1,200 MWh, and the accumulated generation will be 33,750 MWh.

Based on the 40g CO₂ eq/kWh value from EPA, this project will accumulate 1,350 tons of saved emissions.

The sensitivity of the climate change topic is very high therefore, the magnitude of impact during operation is also high and positive. Accordingly, the significance of the impact is considered to be significant.

7.3.2 Impacts on the Biological Environment

Another aspect is the potential ecological impacts of solar PV installations. However, the literature shows that this impact is poorly understood and there is a lack of coherent guidance worldwide for planning authorities, statutory bodies, charities, non-governmental organizations, commercial enterprises and ecological consultancies to make informed decisions or provide advice on the potential ecological effects of new and existing solar PV developments.

To date there are no experimental studies in the peer reviewed scientific literature that attempt to quantify the impact of PV systems on birds purely from an ecological perspective. DeVault et al. (2014) conducted a study that examined habitat use by birds at PV solar installations versus adjacent habitats in order to assess whether PV installations at airports increase the risk of aircraft bird strike.

The attraction of birds to solar PV installations was recognized as a concern by a focus group held to determine the potential hazards of large-scale PV development at airports (Wybo, 2013). The main attractant for birds recognized by Wybo (2013) was the potential for solar arrays to be used as nesting grounds; however, this claim was not supported with evidence. DeVault et al. (2014) examined whether birds were more likely to use habitat at PV installations than nearby airfield grassland.

The literature suggests, in the case of the sites being considered, there are no features nearby that would suggest that the habitat is particularly sensitive or attractive to migrating birds. Similarly, there are no water bodies close by that would attract polarotactic insect species and hence attract insectivorous bird species. As a result, no features have been identified that could potentially increase the collision risk of migrating species colliding with the solar panels.

Project activity will be limited within the existing project site and there will be no construction outside the project site and will not cause further habitat fragmentation. Therefore, anticipated environmental impacts during project operations or long-term negative impacts in this context are insignificant.

7.3.3 Impacts on the Socio-economic Conditions

- **Providing Work Opportunities**

The Project is expected to have a positive impact in this regard where it shall create two long-term job opportunities during the operation phase including guard and technical operator.

Accordingly, such impact is evaluated to be long term, of slight severity, permanent, and of local extent; thus, the overall significance of the said impact is low, but= positive.

- **Potential Impacts from Vandalism**

The impacts from any potential vandalism activities of the solar system components are evaluated to be long-term, of a negative nature, and of high severity. Accordingly, such an impact is considered of medium significance.

The following mitigation measures are proposed in relation to site security:

- A security fence shall be installed around the site,
- A guard/security officer shall be hired for the project during the operation phase,
- Security cameras should be installed within the project site.

- **Potential Impacts from Heat**

Increasing heat levels due to radiation emitted from solar panels could be witnessed. In general, all studies and work available on Photovoltaic Heat Island Effect (PVHI) has mostly been theoretical or based upon simulated models; therefore, there is a remarkable lack of data as to whether or not the PVHI effect is real or not. However, based on desktop review, several key studies were found that involved examining PVHI empirically with experiments. In general, even research and experimental studies provide conflicting results of various magnitudes.

A study that was conducted in Arizona, United States of America study finds that temperatures over a PV power plant were regularly 3-4 degrees Celsius warmer than the nearby wildlands at night. While the PVHI effect was detectable in the day, real significant warming was found in the evening hours (Barron-Gafford, G. A. et al, 2016).

Another study showed that the maximum daytime temperature increased by 1.38 °C at a height of 1.5 m, while there was no significant difference in the night-time temperature (Broadbent, A.M.; Krayenhoff, E.S.; Georgescu, M.; Sailor, D.J, 2019).

Taking into consideration the lack of concrete data of potential impacts from heat and the fact that the suggested project is located in a non-residential area, such impacts are considered to be insignificant.

- **Improved Municipal Services**

The proposed project will decrease New Kufranjeh Municipality's electricity bill. These savings will help the municipality to increase its budget for development projects and public entertainment initiatives. This will improve municipal services and will increase public satisfaction.

Considering that around 40,000 inhabitants within New Kufranjeh Municipality will witness improved services during the operation of the Project, the impact of the Project is considered medium and significant.

It is worth noting that New Kufranjeh Municipality is committed to local development and will continue its engagement with the local communities to co-develop a community-development-driven plan to best utilize the projected savings into providing better services to the local community.

7.3.4 Impacts on Archaeology and Cultural Heritage

Operation of the proposed project is not expected to have any direct impact on this component. However, in the case where any archaeological remains are found, the DoA must be contacted so that the necessary measures are taken.

8. Environmental and Social Management Plan (ESMP)

The development of an Environmental and Social Management Plan (ESMP) is in fulfillment of applicable environmental regulations. This chapter presents the following two major elements of the environmental management plan:

- i. Proposed mitigation measures required to be implemented during the different phases of the project including the preparation phase.
- ii. Recommended monitoring plans required to be implemented to ensure correct implementation of the aforementioned mitigation measures.

The key principle behind ESMP formulation is ensuring proper, wise and conscious implementation of the proposed mitigation and monitoring measures to ensure environmentally sound development. Therefore, the ESMP constitutes the following:

- i. Recommended mitigation measures during
 - a. Construction phase.
 - b. Operation phase.
- ii. Outlines of the project occupational OHS plan.
- iii. Recommended monitoring plan.
- iv. Management Responsibilities
- v. Control and Reporting

This ESMP is developed at the project level, and it shall be implemented by all participating organizations and companies including the project owner, SEED project/Supervision Engineer, Project Contractor and its sub-contractors and employees, in addition to coordination and collaboration with other related stakeholders.

8.1 Proposed Mitigation Measures

Based on the environmental and social risks and impacts that are identified and assessed in the above sections, both for the construction and operation phase of the proposed project, mitigation and management measures are presented in the following table.

These mitigation measures are proposed in order to avoid or minimize potential adverse impacts.

Table 15: Recommended measures for mitigating the potential negative environmental impacts and residual impact rating after mitigation

Impact topic	Impact description	Recommended Mitigation Measures	Residual impact Rating after Mitigation	Responsibility of implementing the mitigation measures
Construction phase				
Soil and Groundwater Conservation	<ul style="list-style-type: none"> - Spillage or improper disposal of materials (e.g., lubricants, coatings and cleaning solvents) used during construction activities and installation - Leakage or improper disposal of vehicle fuels and lubricating oils - Other impacts from the off-site construction materials 	<p>The following mitigation measures are required to be implemented by the Project contractor:</p> <ul style="list-style-type: none"> - Lubricants will be stored in dedicated enclosures with a sealed floor/base. - Solid waste from construction activities will be disposed of as per the solid waste management plan. - Construction storage/stockpiles shall be provided with bunds to prevent silted run-off. - Stockpiled materials will be covered to reduce run-off. - Minimized footprint and working width will be required for the project’s camps and offices. - Existing tracks will be used wherever possible. - Main tracks will be constructed to a minimum standard to ensure use and discourage creation of new tracks and will be discussed with the workforce before starting the operations. - Access tracks will be used efficiently (i.e. minimize vehicle travel, tracked vehicles, low pressure tires) to minimize compaction and erosion. - Bulldozing will be kept to a minimum with no sharp turns by bulldozers. - All access routes across wadis in sensitive areas will be as direct as possible to ensure minimum damage. 	Minor significance	The Contractor

		- Off-road driving will be minimized in sensitive areas wherever possible.		
Managing the Resulted Solid-wastes	- Solid and liquid waste generated from construction activities	<p>Following are the recommended mitigation measures that need to be implemented to manage the resulted solid wastes during this phase of the Project:</p> <ul style="list-style-type: none"> - The Waste and Spoil Management Plan (WSMP) shall include instructions and guidelines for daily implementation by the site works. These guidelines will be required to ensure waste from construction is managed properly, and will include considerations for the following: <ul style="list-style-type: none"> ▪ Locations and quantities of waste arising from the construction works. ▪ Agreed locations for the temporary disposal of waste before transporting it to its final dumping site. Hazardous waste should be transported to Swaqa dumpsite and construction waste to Zarqa dumpsite. ▪ Methods of transportation to minimize interference with normal traffic. ▪ Waste disposal will be monitored by the project's HSE team and recorded using a written chain of custody (trip-ticket) system to the designated disposal sites. - The Project contractor and its sub-contractors shall implement the SWMP with maximum care and in full compliance with this ESIA and other applicable regulations, instruction and decisions by the client and the related municipalities. 	Minor significance	The Contractor

		<ul style="list-style-type: none"> - It is important for the SEED project to implement a precautionary approach through the assigned contractor to avoid unnecessary and prolonged solid waste accumulation at the project site and in the nearby areas resulted from the daily operations of the project camps. - Any extra soil should be evaluated to be reused (in other local infrastructure projects) or disposed of as waste elsewhere. It should be disposed of in the designated disposal site for such type of materials. - The resulted types of solid wastes should be collected in an area designated as a temporary solid waste dumping area. The said wastes should be transferred by an authorized contractor to the designated solid waste dumping site, in full coordination with the responsible authorities. - The different types of resulted solid wastes should be segregated according to its type and collected in proper collection containers, then transferred through an authorized contractor to the designated solid waste dumping site. - The project’s ESMP should ensure the efficiency of waste collection and transport system to ensure no waste is being mismanaged or accumulated. - It is highly recommended to implement the principle of the 5Rs subject to local environmental regulations and availability of resources to handle waste. These “5 Rs” are as follows: <ul style="list-style-type: none"> ▪ Reduce: generating less waste in their original form. 		
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		<ul style="list-style-type: none"> ▪ Reuse: reusing materials in their original form. ▪ Recycle: converting waste back into a usable material. ▪ Recover: extracting materials or energy from waste for other uses. ▪ Residue: an unavoidable waste residue which requires a waste disposal method e.g., licensed landfill, incineration etc. <p>The above methods are usually used in combination by reduction and reprocessing or recovery and reuse. Selection of disposal methods is based on the following factors:</p> <ul style="list-style-type: none"> ▪ Waste category ▪ Waste volume ▪ Waste property ▪ Environmental impacts ▪ Logistics ▪ Availability of acceptable disposal methods. 		
Managing the Resulted Liquid Wastes	<ul style="list-style-type: none"> - Potential pollution of surface and ground water through runoff of pollutants e.g., lubricating oil, diesel fuel etc. from workshop areas etc. - Water pollution due to seepage from tanks (diesel, sanitary wastes etc.) - Lack of water for sanitation or toilet facilities 	<p>Uncontrolled waste disposal operations can cause significant impacts on the surrounding environment. Mitigation measures will seek to reduce, recycle, and reuse waste as far as practicable. The project's HSE team will be responsible for monitoring the contractor's progress and the implementation of mitigation measures, to minimize such impacts. The following are the recommended mitigation measures that needs to be implemented to manage the resulted liquid wastes during this phase of the project:</p> <p><u>Domestic liquid waste</u></p>	Minor significance	The Contractor

		<p>Domestic liquid waste that will result from the daily operation of the project facilities (toilets) should be collected and emptied on a regular basis and transferred through an authorized contractor to the designated liquid wastes collection site/wastewater treatment plant. Any non-domestic liquid waste should be collected and transferred through an authorized contractor to the appropriate “non- domestic” liquid waste dumping site.</p> <p><u>Hazardous Waste</u> The following are the recommended mitigation measures that need to be implemented to manage any hazardous waste produced during the construction phase:</p> <ul style="list-style-type: none"> - Segregate hazardous wastes (oil-based waste, used batteries, fuel drums) and ensure that storage, transport and disposal will not cause pollution and shall be undertaken in a manner consistent with national and local regulations. - Any engine oils, hydraulic oils and gear lubricants which result from the systematic maintenance of the equipment and engines will be stored in metallic containers and delivered to an authorized contractor for regeneration. A register will be maintained by the contractor to facilitate the traceability of these waste products. - Ensure that safe storage of fuel, other hazardous substances and bulk materials have the necessary approval/permits from the local authorities. - Hydrocarbon and toxic material will be stored in adequately protected sites consistent with 		
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		<p>national and local regulations to prevent soil and water contamination.</p> <ul style="list-style-type: none"> - Equipment/vehicle maintenance and refueling areas will be confined to areas in construction sites designed to contain spilled lubricants and fuels. Such areas shall be provided with drainage leading to an oil-water separator that will be regularly skimmed of oil and maintained to ensure efficiency. - Hazardous substances shall be stored in areas with a roof, impervious flooring and a bund/containment wall to protect from the elements and to readily contain spilled fuel/lubricant. - Ensure all storage containers are in good condition with proper labelling and undertake necessary repair or replacement of all containers. - Ensure availability of spill clean-up materials (e.g., absorbent pads, etc.) specifically designed for petroleum products and other hazardous substances where such materials are being stored. - All areas intended for storage of hazardous materials will be quarantined and provided with adequate facilities to prevent emergency situations complying with all the applicable statutory stipulations. - Liquid waste management guidelines should be prepared and will include consideration of all matters related to solid and liquid wastes, and include the following: <ul style="list-style-type: none"> ▪ Expected types of waste and quantities of waste arising. ▪ Methods of transportation to minimize interference with normal traffic. 		
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		<ul style="list-style-type: none"> ▪ Establishment of a regular disposal schedule and constraints for hazardous waste. ▪ Program for disposal of general waste. ▪ Chain of custody for hazardous waste. ▪ Waste disposal designated dumping sites (Swaqa site). 		
Mitigating Emissions to Air	<ul style="list-style-type: none"> - Potential increase of emission of pollutants from mobile (vehicles) and stationary (mixers, etc.) sources released to the atmosphere - Potential increase in fugitive dust and greenhouse gases released to the atmosphere 	<p>Fugitive emissions from construction activities should be mitigated by using best practices. Access roads within the PV system plot should be kept wet, and any dirt that is spilled on nearby paved roads by vehicles should be removed from the roads and returned to the site or an appropriate disposal area. To control emissions of fugitive dust, the construction contractor would be required to have a water truck on site as needed during dry and windy weather for the purpose of dust suppression and reducing the emissions of PM10 and PM2.5.</p> <p>The following typical mitigation measures are proposed to control exhaust emissions from the heavy equipment and potential emissions of fugitive dust:</p> <ul style="list-style-type: none"> - Unpaved roads and disturbed areas in the project construction site will be watered as frequently as necessary to prevent fugitive dust plumes. - The vehicle speed limit will be 25 km/h within the construction site. - The construction site entrances shall be posted with visible speed limit signs. - Unpaved exits from the construction site will be graveled or treated to prevent track out to public roadways. 	Minor significance	The Contractor

		<ul style="list-style-type: none"> - At least the first 200 m of any public roadway exiting from the construction site shall be swept at least twice daily (or less during periods of precipitation). - Soil storage piles and disturbed areas that remain inactive for longer than 10 days will be covered or treated with appropriate dust suppressant compounds. - Vehicles used to transport solid bulk material on public roadways and having the potential to cause visible emissions will be provided with a cover. 		
<p>Mitigating Increase of Noise Levels</p>	<ul style="list-style-type: none"> - Discontinuous intensive noise emission due to construction works - Potential impact on houses and wellbeing of people - Employees and communities exposed to high noise level 	<p>The following mitigation measures need to be implemented by the project contractor under the supervision of the SEED project:</p> <ul style="list-style-type: none"> - Implement all possible measures to minimize disturbances related to noise levels through optimizing suitable work times to avoid disturbance to the urban areas, taking into consideration as much as possible public holidays and weekends; - Use of machinery and equipment in good operating conditions fitted with silencers; - Switching off engines when not in use; and - Best available working practices will be used on-site to minimize occupational noise levels. 	Minor significance	The Contractor

<p>Biological Environment</p>	<ul style="list-style-type: none"> - Loss of habitats for animals and plants - Pollution of animal habitats - Noise disturbance (birds, bats) 	<p>The following mitigation measures should be implemented during construction and the operation phase of the project:</p> <ul style="list-style-type: none"> - Minimize habitat alteration as much as possible. - Avoid unnecessary removal of native plant species to conserve microhabitats. - Avoid deliberate firewood collection. - Provide necessary training and awareness for project employees. - Minimize disturbances through limited access to the project site. - Avoid direct harm to animals. - Avoid removal of trees - as much as possible. In the case that tree removal from the site is necessary, the trees shall be relocated by the local Forestry Department, in consultation with and under the supervision of the Ministry of Agricultural and Ministry of Environment. Furthermore, the Forestry Department, with SEED and the local municipality support, shall plant two trees for each relocated tree regardless of the success of the relocation. - Provide necessary training and awareness for project employees. - Minimize habitat alteration and land leveling as much as possible, especially the areas with natural vegetation. - Apply control measures to minimize the presence of pests through the use of anticoagulants. Apply pest control measures though employing Integrated Pest Management (IPM), after consulting a pest control specialist. 	<p>Minor significance</p>	<p>The Contractor</p>
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<p>Mitigation of Traffic Congestion</p>	<ul style="list-style-type: none"> - Risk of accidents and injuries 	<p>The Project’s contractor in coordination with the local authority should prepare a traffic management plan for the movement of the different types of project machinery. The required plan should focus on defining the following major issues of concern:</p> <ul style="list-style-type: none"> - The routes that the traffic machinery will use during its movement from one working site to another within the open areas. - For the movement of the Project machinery that will transfer the resulted solid wastes from the construction site operations to the final dumping sites, the following points need to be arranged and defined: <ul style="list-style-type: none"> ▪ The routes that will be used to reach the dumping site. ▪ A weekly time frame for the movement of the machinery to the dumping site. ▪ Avoiding peak traffic hours for movement of heavy machinery. ▪ It is very important to take into consideration the schedule’s of nearby schools when the work is done in the residential areas. 	<p>Minor significance</p>	<p>The Contractor</p>
<p>Implement the Project’s “OHS” Plan and the Relevant Procedures</p>	<ul style="list-style-type: none"> - Risk of traffic related accidents and injuries involving workers - Potential effects from human exposure to fugitive dust emissions - Potential noise related health effects, such as from nuisance - Potential human exposure to hazardous 	<p>A Worker and Public Safety Guidelines will be submitted by the contractor in the ESMP to establish routine safety measures as required by good engineering practice as well as to provide first aid facilities.</p> <p>Mitigation measures to be implemented by contractors to ensure health and safety of workers are as follows:</p> <ul style="list-style-type: none"> - Before construction commences, the contractor will conduct training for all 	<p>Minor significance</p>	<p>The Contractor</p>

	<p>materials from contaminated soil and water</p>	<p>workers on safety and environmental hygiene. The contractor will instruct workers in health and safety matters as required by law and by good engineering practice and provide first aid facilities.</p> <ul style="list-style-type: none"> - The Contractor will instruct and induct all workers in health and safety matters (induction course) before they start work and site agents/foremen will follow up with meetings on a weekly basis. Workforce training for all workers starting on site will include safety and environmental hygiene. - Fencing shall be installed on all areas of excavation greater than 1m deep and at sides of temporary works. - Workers shall be provided (before they start work) with appropriate personnel safety equipment such as safety boots, helmets, gloves, protective clothes, mask, goggles, and ear protection at no cost to the workers. Site agents/foremen will follow up to see that the safety equipment is used. - Ensure audible reversing signals are installed on all construction vehicles. <p>The contractor will include provisions in the Worker Safety section of the Worker and Public Safety Guidelines in the ESMP for:</p> <ul style="list-style-type: none"> - Instruction of all workers in health and safety matters. - Provision of potable water supply in all work locations. - Establishment of safety measures as required by law and by good engineering practice - Provide first aid facilities. 		
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		<ul style="list-style-type: none"> - Fencing around all excavation, borrow pits and sides of temporary bridges - Providing appropriate personal protective equipment (PPE) to all workers such as safety shoes, hard hats, safety glasses, ear plugs, gloves, etc. - Scheduling of regular (meetings to orient the workers on health and safety issues related to their activities as well as on proper use of PPE. - Where worker exposure to traffic cannot be completely eliminated, protective barriers shall be provided to shield workers from traffic vehicles. Alternatively, another measure is to install channeling devices (e.g., traffic cones and barrels) to delineate the work zone. <p>Project facilities shall be provided with toilets/sanitation facilities in accordance with local regulations to prevent any hazard to public health or contamination of land, surface or groundwater. These facilities shall be well maintained to allow effective operation. Complaints will be monitored and investigated, and mitigation measures will be revised and the ESMP will be updated as necessary if unexpected impacts occur. All measures related to workers' safety and health protection shall be free of charge to workers. The worker occupational health and safety guidelines will be submitted by the contractor before construction commences.</p>		
Public Health & Safety	- Risk of traffic related accidents and injuries involving workers	Public safety, particularly of pedestrians and children, can be threatened by the construction works.	Minor significance	The Contractor

	<ul style="list-style-type: none"> - Potential effects from human exposure to fugitive dust emissions - Potential noise related health effects, ranging from nuisance to risk of hearing loss - Potential human exposure to hazardous materials from contaminated soils and water 	<ul style="list-style-type: none"> - Fencing will be installed prior to excavation work commencing on all sides of temporary and permanent excavations. The guidelines will include provisions for site security and guards, trench barriers and covers to other holes and any other safety measures as necessary. - The contractor will provide warning signs at the periphery of the site warning the public not to enter and define this in the ESMP. - The contractor will restrict the speed of project vehicles and control traffic by contra-flow and provide flag men and warning signs at either side/end of the works areas where the traveling lanes must be temporarily reduced. - The safety measures for the public in the Worker and Public Safety Guidelines will include: <ul style="list-style-type: none"> ▪ Barriers (e.g., temporary fence), shall be installed at construction areas to deter pedestrian access to the roadway except at designated crossing points. ▪ The general public/local residents shall not be allowed in high-risk areas, such as excavation sites and areas where heavy equipment is in operation and these sites will have a watchman at the entrance to keep the public out. ▪ Speed restrictions shall be imposed on Project vehicles and equipment traveling within 50m of sensitive receptors (e.g., residential, schools, etc.). ▪ Provisions for site security, trench barriers and covers to other holes and any other safety measures as necessary. 		
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		<ul style="list-style-type: none"> ▪ Provide warning signs at the periphery of the site warning the public not to enter and define this in the ESMP. ▪ Strict imposition of speed limits along residential areas and where other sensitive receptors such as schools, hospitals, and other populated areas are located. ▪ Educate drivers on safe driving practices to minimize accidents and to prevent spill of hazardous substances (fuel and oil) and other construction materials during transport. - The Public Safety section of the Worker and Public Safety Guidelines will include but not necessarily be limited to the following: <ul style="list-style-type: none"> ▪ Statement of contractor's safety policy for workers and the public. ▪ Legal requirements. ▪ Works safety issues and public safety issues. ▪ Training the workforce and informing the public on works safety issues. ▪ Establishment and monitoring of acceptable working practices to protect safety. ▪ Overlap with traffic and road safety (e.g., traffic flow/delay requirements). ▪ Establishment of complaints management system for duration of the works ▪ Agreement on publicity/public consultation requirements. ▪ Reporting of accidents. ▪ Complaints management 		
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Operational phase				
<p>Hazardous waste and domestic waste</p>	<p>- Hazardous waste generation from the operational and maintenance activities</p>	<p>The following mitigation measures to be implemented in relation to hazardous waste:</p> <ul style="list-style-type: none"> - Coordinate with the MoEnv and hire a private contractor for the collection of hazardous waste from the site and transportation to the Swaqa Hazardous Waste Treatment Facility; - Follow the requirements for management and storage as per the ‘Instructions for Hazardous Waste Management and Handling of the Year 2003’ of the MoEnv; - Prohibit illegal disposal of hazardous waste to the land; - Maintain records and manifests that indicate volume of hazardous waste generated onsite, collected by the contractor, and disposed of at the Swaqa Facility. The records are to be consistent to ensure no illegal discharge at the site or other areas. <p>The following mitigation measures to be implemented in relation to solid and liquid waste:</p> <ul style="list-style-type: none"> - Sewage will be collected and transported through septic tanks by the municipality according to the local laws requirements. - Waste collection bins will be provided within the project facilities and rooms; - Provide municipal waste collection containers around the entrance that can be collected by the SWM vehicles; - The municipality, through its waste collection services should ensure that waste is collected and transported to the closest sanitary landfill 	<p>Minor significance</p>	<p>Kufranjeh municipality</p>

		(Al Ekadier landfill) at least three times a week.		
Related to Occupational/Public Health & Safety	- Risk of accidents and injuries	<p>During this stage an “OHS” unit needs to be established to supervise the correct implementation for all “OHS” related issues. This unit will be responsible for preparing a comprehensive “OHS” plan supported by relevant procedures. The objective of the plan and its procedures will be to ensure that the project will be a safe place for the employees and the visitors.</p> <p>An “OHS” plan needs to be prepared supported by relevant procedures that cover all conducted activities within the facilities. The required procedures should cover the following issues:</p> <ul style="list-style-type: none"> - Fire prevention - HSE Training - “OHS” and incidents reporting - First Aid - Heat Stress 	Minor significance	Kufranjeh municipality
Potential Impacts from vandalism	- Risk of vandalism - Risk of theft	<p>The following mitigation measures are proposed in relation to site security:</p> <ul style="list-style-type: none"> - A security fence shall be installed around the site; - A guard/security officer should be hired for the project during the operation phase; - Security cameras should be installed within the project site. 	Minor significance	Kufranjeh municipality

8.2 Environmental Monitoring Plan

Environmental monitoring is necessary to gauge the impact of operations on the site. By implementing appropriate plans with sufficient detail, it is possible to minimize and control waste generation, limit physical disturbances, and operate in a responsible manner. The Environmental Monitoring Plan (EMP) will be implemented by the SEED project - HSE team in association with the project owner – Environmental division team, consistent with the requirements of the EMP presents in detail the proposed monitoring Plan for all sectors of the project.

Within the SEED project scope, Cowater's role is monitoring the implementation, and ensuring corrective action is taken where needed. Cowater reports on the successful implementation and any possible shortcoming and how they were dealt with through the semi-annual operational report.

The EMP is provided by Cowater as part of the contractor's responsibilities to commit to. To ensure that is taking place, Cowater assigned local experts in EE&RE to act as representative engineer and continuously audit the contractor's performance. Any violation is considered a breach of the contractor's contract, and accordingly Cowater issues a formal warning followed by escalation or acceptance of contractor's corrective action.

Implementation process is divided into five stages. After the conclusion of each stage, Cowater will audit the outputs of the phase activities, as well as how the environment, health, and safety plans were adhered to. Successful implementation is conditional to release any payments and moving to the next phase. This phased and continuous approach can facilitate early recognition of any violation and the immediate execution of corrective actions.

Table 16: Environmental monitoring plan

Item for Monitoring	Responsibility of Project Team	Other Stakeholders	Frequency of Monitoring	Indicator & Parameter
The Construction Phase				
The implementation of the appropriate “HSE” training program according to the project’s “HSE” Plan	Members from the SEED project – assigned technical experts- and the contractor’s HSE team (i.e. the contractor which Cowater/SEED will assign to do the design, supply, construction, testing, commissioning and maintenance of solar farm system), referred to collectively as the HSE team, should be selected to follow up and implement a continuous training program for all the project team members (each in their respective field). The training program should be prepared and implemented on monthly basis and should be mandatory for all the team members.	New Kufranjeh Municipality Representatives	Monthly through reviewing the relevant HSE documentation and attending some of the provided training activities	Training Records
The availability and implementation of a correct Traffic Management Plan.	Specific members of the HSE team should be responsible (on a day-to-day basis) for ensuring and monitoring the correct implementation of the project traffic plan all live aspects at the project facilities and its computability with the project’s HSE plan.	<ul style="list-style-type: none"> – Follow up by the SEED Project – Traffic department. 	On weekly basis	<ul style="list-style-type: none"> – The installation of signs and applyingprecautionary measures are at site. – The complaints record – The incidents log.
The correct usage of traffic signs at the project’s construction sites.	Members from the HSE team should be responsible on a daily basis for the availability and the correct usage of the traffic signs at the project working sites.	<ul style="list-style-type: none"> – Follow up by the SEED project. – Follow up by the– Traffic Department. 	On daily basis	

Item for Monitoring	Responsibility of Project Team	Other Stakeholders	Frequency of Monitoring	Indicator & Parameter
The movement of the project machinery within the project areas.	Daily presence for members of the Project's HSE team to follow the daily work operations.	Traffic department	On weekly basis	<ul style="list-style-type: none"> - The complaints record - The incidents log.
The isolation barriers are in the correct place to separate the construction sites from the surrounding area	Members from the HSE team should be responsible on a daily basis for the availability and the correct usage of the traffic signs at the project working sites during the nighttime.	<ul style="list-style-type: none"> - Follow up by the SEED project. - Follow up by the Traffic Department. 	On weekly basis and whenever needed	<ul style="list-style-type: none"> - Isolation barriers are in the correct place
Fluid and solid wastes management system in the project camps	The HSE team to prepare and follow up on a schedule and the relevant records to ensure the correct implementation of the project's wastes management system.	<ul style="list-style-type: none"> - Follow up by the SEED project. - Kufranjeh municipality representatives 	Monthly to ensure the correct implementation of the project's fluid and solid wastes management plans	<ul style="list-style-type: none"> - The solid and fluid wastes records and logs
The transportation of the resulted fluid and solid wastes to its final destination at the designated solid wastes dumping site	Daily presence for members of the project's HSE team during the subject operations to ensure the correct implementation of the relevant HSE procedures.	<ul style="list-style-type: none"> - Follow up by the SEED project. - Kufranjeh municipality representatives 	Weekly to ensure that negative impacts have not occurred during the operation	<ul style="list-style-type: none"> - Wastes records and logs
The implementation of noise control measures	<ul style="list-style-type: none"> - Follow up on the status of the project machinery. - Ensure that the contractor is conducting the required monthly noise level measurements. - Ensure that the contractor is not conducting any work at the nighttime or during the weekends and the public holidays. 	<ul style="list-style-type: none"> - Follow up by the SEED project 	On a monthly bases or when needed based on any complain from the locals	<ul style="list-style-type: none"> - Monthly Noise level measurement records. - The project's complaints record.

Item for Monitoring	Responsibility of Project Team	Other Stakeholders	Frequency of Monitoring	Indicator & Parameter
The implementation of air emissions control measures within the project sites.	<ul style="list-style-type: none"> – Follow up on the status of the project machinery. – Ensure that, the contractor is spraying water at the project sites to control dust levels. – Ensure that the contractor is not conducting any excavation work during windy days. 	– Follow up by the SEED project	on a monthly basis	<ul style="list-style-type: none"> – Site visual inspection – The project's complaints record.
The implementation of soil and groundwater conservation measures.	– Members from the HSE team should be responsible for ensuring proper implementation of proposed mitigation measures for soil and groundwater conservation	– Follow up by the SEED project.	Weekly basis	– Correct implementation of proposed mitigation measures
The Operation Stage				
The implementation of the appropriate "HSE" Plan	– HSE officer from the operating company	HSE officer in Kufranjeh municipality	Daily bases	– HSE plan in place
Hazardous waste generation	HSE officer from the operating company	HSE officer in Kufranjeh municipality	When maintenance or replacing PV panels	– Wastes records and logs

8.3 Training and Institutional Strengthening

This plan will explain how the project contractor will train its employees on the health & safety aspects (under the SEED project supervision) and ensure that they are aware of the aspects of protection and preservation of natural resources. Training is divided into technical, theoretical, and practical components as per the Environmental and Social Management Plan. The major topics that need to be provided to the project staff during the course of the project and the training frequency are presented in the table below.

Table 17: Training topics and frequency

Subject	Target Audience
“EHS Induction	All team members
Usage of PPEs	All team members
Fire prevention	All team members
“OHS” Reporting	Senior Staff members & including the “EHS” team
First Aid	<ul style="list-style-type: none"> - Preliminary training for all team members - Advanced training for the emergency response team
Heat Stress	All team members
Safe Driving & traffic management	For users of the project vehicles
Communicating with governmental agencies	Senior staff members
Communicating with local communities	All team members
Work management under bad weather conditions	Team members working at site.
Operating mechanical equipment (each in his field)	The technical team of the project
Operating Electrical equipment (each in his field)	The technical team of the project
Managing Resulted Wastes	<ul style="list-style-type: none"> - Preliminary training for all team members. - Advanced training for the senior staff members

9. Conclusion

The GAC-funded Jordan SEED project, implemented by Cowater International, promotes solar technologies to support sustainable and inclusive economic development in Jordan. The project will help improve livelihoods for women and men in the Jordan Valley and Ajloun region, increase employment opportunities for skilled workers in Jordan’s renewable energy and energy efficiency sector, and strengthen the enabling environment for the growth of a robust renewable energy sector.

This document presents the findings of the Environmental and Social Impact Assessment (ESIA) for the installation of the proposed PV wheeling system.

The following table provides a summary of the identified impacts associated with the project installation and operation stages.

Table 18: Summary of the project impacts

Aspect	Impact assessed	Assessment		
		Slight	Moderate	Significant
Construction/Installation Stages				
Physical Environment	Polluting soil	✓		
	Polluting water resources	✓		
	Solid wastes generation		✓	
	Liquid wastes generation	✓		
	Air quality	✓		
	Noise	✓		
Socio-Economic	Providing temporary work opportunities		✓	
	Provide business opportunities		✓	
	Temporary traffic congestions	✓		
Health and Safety	Threats to the work force due to the weak implementation of the Project “OHSE” Plan		✓	
	Threats to public health and safety		✓	
Biological Environment	Vegetation removal and stripping topsoil	✓		
Archaeology	Damaging archaeological sites	✓		
Operational Stage				
Physical Environment	Increased hazardous and domestic waste, water leakage from sanitary facilities	✓		
	Landscape and visual amenities	✓		
	Glare effects	✓		
	Climate change mitigation			✓
Socio-economic Health and Safety	Improved municipal services			✓
	Increased micro-climate temperature	✓		
	Potential impacts from vandalism		✓	
	Jobs creation	✓		

Biological Environment	Habitat fragmentation	✓		
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It is investigated that the project impact on the environment will be minimal (the biodiversity impact will be low); mostly short-term construction-related impacts, which can be mitigated by implementing the project EMP. The contractor will be responsible for the implementation of EMP. There is no need for any type of resettlement (residential or economic or otherwise).

Annex I: Technical Report

Technical Report Context Note:

The Project aims to support Ajloun Governorate, in the north of Jordan. Within Ajloun Governorate there are five municipalities. From the top-ranked-environmental locations across the municipalities, two municipalities, being the municipality of Kufranjah, and Greater Municipality of Ajloun, could dedicate required land, pass the environmental check, and secure all the required approvals (i.e., being the combined approvals from: the prime ministry, ministry of agriculture - department of forestry, Ministry of Local Administration, and the utility electricity distribution grid company).

At the time of developing this report all of the municipalities were in the process of allocating the prospect lands for the project intended use, and securing required approvals. This technical report, and environmental ranking included all prospect-benefiting municipalities lands, thus it included ones that did not secure the required approvals. The main outstanding required approval was the electricity distribution utility company approval - this was due to lack of grid infrastructure capacity to accommodate the intended solar farm. Aiming to serve these municipalities, their shortlisted lands were assessed, to serve as a future reference for when/if the utility company manages to upgrade the grid in these locations, and when/if these municipalities will manage to secure required approvals and funding.

Solar Farms Technical Report

This document was developed at an early stage of project preparation to reflect updates on the status of the plots of land nominated by the municipalities for the construction of the SEED solar farms.

This report contains a detailed description of the steps and conditions that the SEED team implemented during the selection of the Ajloun Governorate municipalities that would receive a SEED solar farm (referred to as receiving a SEED solar farms grant/SEED grant). Interested municipalities nominated multiple plots of land on which the solar farms could potentially be constructed. The SEED technical team shortlisted municipalities based on set criteria and over multiple assessment phases.

This report contains the following:

1. Conditions and criteria for selecting municipalities to benefit from the solar farm grant.
2. List of municipalities that expressed interest in benefiting from the grant.
3. Technical assessment of the plots of land offered by the municipalities for the construction of the solar farms.
4. Summary table of the technical assessment of the plots of land.
5. Environmental assessment of the plots of land.
6. Summary table of the environmental assessment of the shortlisted plots of land.
7. Summary table of the final evaluation for the four shortlisted plots of land.
8. Next steps and necessary follow up for the allocation of the grant.

The selection of the municipalities that will benefit from the SEED grant is based on specific criteria, including:

1. The cumulative electricity consumption of the municipality is not less than 1,500,000 kWh/year (taking into account all municipality electricity meters).
2. The area of the suggested plot of land is not less than 15,000 m².
3. The distance between the plot of land and the connection point (on the 33 kV line) is at maximum 1 km along the street leading to the plot of land.
4. The plot of land satisfies the following:
 - a. The plot should have proper access i.e., paved roads leading to it;
 - b. The plot should be flat (not sloped if possible) or up to a maximum slope of 15 degrees and should face south, southeast, or southwest directions.
 - c. The soil should be cohesive (not silt), the percentage of surface rocks should not exceed 20% of the plot area, and the soil salinity should not be high (as high salinity could corrode/degrade the steel structure).
 - d. There must not be any shading from nearby buildings or mountains.
 - e. The plot of land must be a single piece of land or composed of multiple adjacent pieces of land, owned by the municipality or allocated to the municipality; and
 - f. The plot of land should not be part of a nature reserve.

The Ajloun Governorate is composed of five municipalities:

1. Greater Ajloun Municipality;
2. Kufranja Municipality;
3. Alouion Municipality;
4. Al-Junaid Municipality;
5. Alshafa Municipality.

Initially, all five of Ajloun's municipalities expressed interest in being considered for the SEED solar farms grant and consequently, nominated plots of land to be assessed and evaluated for suitability by the SEED technical team. Below is a list of the nominated plots of land by each municipality:

1. Greater Ajloun Municipality
 - Al Nahel land - Abu Al Ghizlan 77
 - Health Center land 1
 - Health Center land 2
 - Shkara Farm land
 - Khalet Salem land
2. Kufranja Municipality
 - Marai Rajeb land
 - Al Kasara land
 - Al Qamh land
3. Alouion Municipality
 - Civil Defense land

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- Wadi Al Rayyan land
- Alouion Municipality land
- 4. Al-Junaid Municipality
 - Khirbat Abdeh land
 - Sakhra (Civil Defense) land
 - Bayader Abeen land
 - Al Makate' land
- 5. Alshafa Municipality
 - Khirbat Al Wahadneh land 387
 - Khirbat Al Wahadneh land 384
 - Halawet Al Aren land 173
 - Ghor Fara 13
 - Halawet Al Deir land 266
 - Halawet Al Deir land 297

The SEED technical team visited all plots of land nominated by the municipalities.

Greater Ajloun Municipality

The cost of electricity consumption at the Great Ajloun Municipality is estimated at 526 thousand Jordanian Dinars annually.

The Greater Ajloun Municipality's nominated plots of land were visited by the SEED technical team on Tuesday, May 17, 2022. As mentioned previously, the following lands were proposed by the Greater Ajloun Municipality:

1. Al Nahel land - Abu Al Ghizlan 77
2. Health Center land 1
3. Health Center land 2
4. Shkara Farm land
5. Khalet Salem land

The following will describe the specifications pertaining to each nominated plot of land.

1. Al Nahel land - Abu Al Ghizlan 77
 - Characterized by cohesive soil (not mound).
 - Rocky up to 40%.
 - Has a sharp slope.
 - The connection point to the 33 kV voltage line is approximately 10 km away.
 - 250 m away from the nearest road access.
 - Contains a dense amount of trees.
 - Coordinates: 32°19'37.47"N 35°45'15.59"E
2. Health Center land 1
 - Characterized by cohesive soil.
 - Rocky up to 70%.

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- Has a slope of about 30° towards the west.
 - The connection point to the 33 kV voltage line is on the land itself.
 - Trees planted on the land.
 - Canteen and Shefa Health Center are both under construction in the proximity of the plot of land;
 - No shading present;
 - Coordinates: 32°13'59.50"N 35°44'13.27"E.
3. Health Center land 2
- Characterized by cohesive soil;
 - Rocky up to 20%;
 - Has a slight slope of about 10°;
 - The connection point to the 33 kV voltage line is on the land itself;
 - Abandoned, illegally built house and concrete bases present on the land;
 - Some forest trees present;
 - Farms and a health center present in the proximity of the plot of land;
 - Coordinates: 32°13'58.97"N 35°44'3.67"E.
4. Shkara Farm land
- Characterized by cohesive soil;
 - Rocky up to 75%;
 - Has a slope of about 50°;
 - The connection point to the 33 kV voltage line is approximately 200 m away;
 - Abandoned, illegally built house and concrete bases present on the land;
 - Some forest trees present;
 - Farms present in the proximity of the plot of land;
 - Coordinates: 32°14'37.9"N 35°44'29.2"E.
5. Khalet Salem land
- Characterized by cohesive soil;
 - Rocky up to 20%;
 - Has a slope of about 10° towards the south;
 - The connection point to the 33 kV voltage line is approximately 100 m away;
 - Some houses present in the proximity of the plot of land;
 - Some forest trees present;
 - 100 m away from the main road;
 - Coordinates: 32°13'59.50"N 35°44'13.27"E.

Kufranja Municipality

The cost of electricity consumption at Kufranja Municipality is estimated at 350 thousand Jordanian Dinars annually.

Kufranja Municipality's nominated plots of land were visited by the SEED technical team on Thursday, May 12, 2022. As mentioned previously, the following lands were proposed by Kufranja Municipality:

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1. Marai Rajeb land
2. Al Kasara land
3. Al Qamh land

The following will describe the specifications pertaining to each nominated plot of land.

1. Marai Rajeb land
 - Characterized by cohesive soil (not mound);
 - Rocky up to 15%;
 - Has a slope towards the south that is suitable for the installation of the photovoltaic system;
 - The connection point to the 33 kV voltage line is approximately 150-200 m away;
 - 250 m away from the nearest road access;
 - No shading present;
 - Surrounded by a water station;
 - Some forest trees present;
 - Coordinates: 32°15'10.1"N 35°38'38.3"E.
2. Al Kasara land
 - Characterized by cohesive soil;
 - Rocky up to 70%;
 - Flat land with no slope;
 - No access to a 33 kV voltage line connection point, but it is expected that one will be constructed on the main road, about 800-1000 m away from the land;
 - Contains military trenches and is surrounded by empty land;
 - No shading present;
 - Coordinates: 32°15'46.4"N 35°37'43.1"E.
3. Al Qamh land
 - Characterized by cohesive soil;
 - Not rocky;
 - Flat land with no slope;
 - The connection point to the 33 kV voltage line is approximately 5 km away;
 - Abandoned house and concrete bases present on the land;
 - Some trees present;
 - Farms and landfill in the proximity of the land;
 - Coordinates: 32°17'24.1"N 35°39'30.9"E.

Alouion Municipality

The cost of electricity consumption at Alouion Municipality is estimated at 157 thousand Jordanian Dinars annually.

Alouion Municipality's nominated plots of land were visited by the SEED technical team on Tuesday, May 17, 2022. As mentioned previously, the following lands were proposed by Alouion Municipality:

1. Civil Defense land

2. Wadi Al Rayyan land
3. Alouion Municipality land

The following will describe the specifications pertaining to each nominated plot of land.

1. Civil Defense land
 - Characterized by cohesive soil;
 - Slight slope;
 - Contains the Civil Defense's main building and a retired factory building;
 - Dense forest trees present;
 - Inadequate space to construct the photovoltaic system;
 - House and school in the proximity of the land;
 - No nearby connection point to the 33 kV voltage line;
 - Coordinates: 32°22'42.8" N 35°41'39.0"E.
2. Wadi Al Rayyan land
 - Characterized by cohesive soil;
 - Rocky up to 60%;
 - Upper section of the plot of land is sloped, whereas the lower section has no slope; slope is toward the west;
 - Some trees present (about 30);
 - Medium voltage line is located on the plot of land;
 - Houses and a factory present in the lower portion of the plot;
 - Coordinates: 32°23'12.58"N 35°42'44.19"E.
3. Alouion Municipality land
 - Characterized by cohesive soil;
 - Rocky up to 70%;
 - Divided into an upper section (14 dunums) and a lower section (7 dunums) separated by a road;
 - Sloped towards the west;
 - Municipal buildings and retired factory present on the land;
 - The connection point to the 33 kV voltage line is approximately 200 m away;
 - Coordinates: 32°22'42.36"N 35°41'38.40" E.

Al-Junaid Municipality

The cost of electricity consumption at Al-Junaid Municipality is estimated at 336 thousand Jordanian Dinars annually.

Al-Junaid Municipality's nominated plots of land were visited by the SEED technical team on Tuesday, May 24, 2022. As mentioned previously, the following lands were proposed by Al-Junaid Municipality:

1. Khirbat Abdeh land
2. Sakhra (Civil Defense) land
3. Bayader Abeen land

4. Al Makate' land

The following will describe the specifications pertaining to each nominated plot of land.

1. Khirbat Abdeh land

- Characterized by cohesive soil;
- Rocky up to 5%;
- Sloped towards the north;
- Contains mound, which can be removed;
- No trees present;
- Some military trenches present on the land;
- The connection point to the 33 kV voltage line is approximately 250-300 m away;
- Ancient houses buried in the land;
- Coordinates: 32°22'37.29"N 35°49'48.98" E.

2. Sakhra (Civil Defense) land

- Characterized by cohesive soil;
- Rocky to a small extent;
- Sloped towards the northwest;
- Contains mound, which can be removed;
- Trees present (about 250-300);
- The connection point to the 33 kV voltage line is approximately 200 m away;
- Houses and Civil Defense building present in the proximity of the plot of land;
- Coordinates: 32°22'23.36"N 35°49'50.70" E.

3. Bayader Abeen land

- Characterized by cohesive soil;
- Not rocky;
- Completely flat land;
- Houses and commercial building present in the proximity of the plot of land;
- Medium voltage line is located on the plot of land;
- No trees;
- Considered ideal for the installation of a photovoltaic system;
- Access roads present from all four directions;
- Coordinates: 32°21'42.78"N 35°48'34.96" E.

4. Al Makate' land

- Characterized by cohesive soil;
- Rocky up to 70%;
- Contains dense trees;
- Some signs of archeological monuments present on the land;
- Flat land;
- Farms and archeological sites in the proximity of the land;
- The connection point to the 33 kV voltage line is approximately 500 m away;
- Coordinates: 32°22'13.24"N 35°47'58.41" E.

Alshafa Municipality

The cost of electricity consumption at Alshafa Municipality is estimated at 336 thousand Jordanian Dinars annually.

Alshafa Municipality's nominated plots of land were visited by the SEED technical team on Thursday, June 6, 2022. As mentioned previously, the following lands were proposed by Alshafa Municipality:

1. Khirbat Al Wahadneh land 387
2. Khirbat Al Wahadneh land 384
3. Halawet Al Aren land 173
4. Ghor Fara 13
5. Halawet Al Deir land 266
6. Halawet Al Deir land 297

The following will describe the specifications pertaining to each nominated plot of land.

1. Khirbat Al Wahadneh land 387
 - Characterized by cohesive soil;
 - Rocky up to 15%;
 - Sloped towards the south;
 - Houses and commercial buildings in the proximity of the land;
 - Medium voltage line is located on the plot of land;
 - No trees
 - Considered ideal for the installation of a photovoltaic system;
 - Access roads present from all four directions;
 - Coordinates: 32°19'20.60"N 35°38'53.41" E.
2. Khirbat Al Wahadneh land 384
 - Characterized by cohesive soil;
 - Rocky up to 40%;
 - Sloped towards the southwest direction;
 - Houses, commercial buildings, school, and community based organization in the proximity of the land;
 - The connection point to the 33 kV voltage line is approximately 10 m away;
 - No trees present;
 - One access road to the land;
 - Land area: 12 dunum;
 - Coordinates: 32°19'22.54"N 35°38'54.29" E.
3. Halawet Al Aren land 173
 - Characterized by cohesive soil;
 - Rocky up to 40%;
 - Sloped towards the west direction;
 - Houses and farms in the proximity of the land;
 - The connection point to the 33 kV voltage line is approximately 10 m away;

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- Dense olive trees planted on the land;
 - Unpaved access road present;
 - Land area: 14 dunum;
 - Private property leased land;
 - Coordinates: 32°23'7.72"N 35°38'21.45" E.
4. Ghor Fara 13
- Characterized by cohesive soil;
 - Not rocky;
 - Flat land;
 - Farms in the proximity of the land;
 - The connection point to the 33 kV voltage line is approximately 250 m away;
 - No trees present;
 - Access road to the land present;
 - Land area: 16 dunum;
 - Private property leased land;
 - Coordinates: 32°22'41.37"N 35°36'52.14" E.
5. Halawet Al Deir land 266
- Characterized by cohesive soil;
 - Not rocky;
 - Flat land;
 - Farms in the proximity of the land;
 - The connection point to the 33 kV voltage line is approximately 500 m away;
 - Dense olive trees present;
 - Unpaved access road to the land;
 - Land area is 20 dunum;
 - Private property leased land;
 - Coordinates: 32°22'41.37"N 35°36'52.14" E.
6. Halawet Al Deir land 297
- Characterized by cohesive soil;
 - Rocky;
 - Sloped towards south;
 - Farms in the proximity of the land;
 - The connection point to the 33 kV voltage line is approximately 2 km away;
 - Dense olive trees present;
 - Unpaved access road to the land;
 - Land area is 20 dunum;
 - Private property;
 - Coordinates: 32°23'45.44"N 35°39'47.71" E.

The data collected during the site visits to the nominated lands was summarized in “Summary Table of the Lands’ Technical Assessment”. Out of the 21 inspected lands, only six plots of land passed the SEED

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team's technical assessment, out of which one plot of land (Bayader Abeen land) was withdrawn by Al-Junaid Municipality and another plot (Health Center land 2) by the Greater Ajloun Municipality. The latter nominated two additional plots of land (Shkara Farm land and Khalet Salem land), which the SEED technical team inspected on September 19, 2022. The plots of land that ultimately passed the technical assessment subsequently underwent an environmental screening.

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Summary Table of the Lands' Technical Assessment

No.	Municipality	Name of Plot of Land	Cost of Annual Electricity Consumption	Minimum Electricity Consumption Satisfied (Yes/No)	Land Area	Soil Type	Ownership of Land*	Trees Present (Yes/No)	Land Slope	Proximity to 33 kV line	Paved Access Road (Yes/No)	Archeological Sites Present (Yes/No)	Signs of old Military Camp (Yes/No)
1	Greater Ajloun Municipality	Al Nahel land - Abu Al Ghizlan 77	\$ 526,215	Yes	Larger than 15 dunum	Rocky	Unallocated	Dense	Steep slope	No	No	No	No
2		Health Center land 1			Larger than 15 dunum	Rocky	Unallocated	Yes	North	On land	Yes	No	No
3		Health Center land 2			10+2 dunum	Rocky	Unallocated	Yes	South	On land	Yes	No	No
4		Shkara Farm land			Larger than 15 dunum	Highly Rocky	Unallocated	Yes	South	200 m	Yes	No	No
5		Khalet Salem land			Larger than 15 dunum	Rocky	Unallocated	8 trees	10°	70 m	Yes	No	No
6	Kufranja Municipality	Marai Rajeb land	\$ 350,725	Yes	Larger than 15 dunum	Rocky	Unallocated	No	South	150-200	Unpaved	No	No
7		Al Kasara land			Larger than 15 dunum	Highly Rocky	Unallocated	No	Multiple directions	2 km	Yes	No	Yes
8		Al Qamh land			Larger than 15 dunum	Rocky	Unallocated	5 trees	Flat	5 km	Yes	No	No
9	Alouion Municipality	Civil Defense land	\$ 157,419	No	Not large enough	Rocky	Unallocated	Yes	South west	1 km	Yes	No	No
10		Wadi Al Rayyan land			Larger than 15 dunum	Rocky	Unallocated	Yes	West	On land	Yes	No	No
11		Alouion Municipality land			7 dunum lower + 14 dunum upper	Rocky	Unallocated	No	Steep slope	200 m	Yes	No	No
12	Al-Junaid Municipality	Khirbat Abdeh land	\$ 335,000	Yes	Larger than 15 dunum	Rocky	Unallocated	No	South east and west	300 m	Yes	Yes (uncategorized)	Yes
13		Sakhra (Civil Defense) land			Larger than 15 dunum	Rocky	Unallocated	Yes	South west	200 m	Yes	No	No
14		Bayader Abeen land			15 dunum	Not rocky	Allocated	No	Flat	On land	Yes	No	No
15		Al Makate' land			Larger than 15 dunum	Rocky	Unallocated	Yes	West	500 m	Yes	Yes (uncategorized)	No
16	Alshafa Municipality	Khirbat Al Wahadneh land 387	\$ 220,623	Yes	Larger than 15 dunum	Rocky	Unallocated	No	south west	On land	Yes	No	No
17		Khirbat Al Wahadneh land 384			12 dunum	Rocky	Allocated	No	South west	10 m	Yes	No	No
18		Halawet Al Aren land 173			14 dunum	Rocky	Allocated	Dense	West	On land	No	No	No
19		Ghor Fara			Larger	Not	Allocated	No	Flat	200 m	Yes	No	No

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		13			than 15 dunum	rocky							
20		Halawet Al Deir land 266			Larger than 15 dunum	Not rocky	Allocated	Dense	Flat	500 m	No	No	No
21		Halawet Al Deir land 297			Larger than 15 dunum	Rocky	Allocated	Dense	North	2 km	No	No	No

* allocated: means that it's governmental land and it's officially allocated to the targeted municipality

* unallocated: means that the land is governmentally owned but it's not officially allocated to the municipality or the allocation procedures is not finalized yet

Technical Evaluation

No.	Municipality	Name of Plot of Land	Cost of Annual Electricity Consumption	Minimum Electricity Consumption Satisfied (Yes/No)	Land Area	Soil Type	Ownership of Land	Trees Present (Yes/No)	Land Slope	Proximity to 33 kV line	Paved Access Road (Yes/No)	Archeological Sites Present (Yes/No)	Signs of old Military Camp (Yes/No)	Total Points
1	Greater Ajloun Municipality	Al Nahel land - Abu Al Ghizlan 77	\$ 526,215	Yes	15	9	5	3	6	0	5	5	5	53
2		Health Center land 1			15	9	5	9	9	15	5	5	5	77
3		Health Center land 2			10	12	5	8	15	15	5	5	5	80
4		Shkara Farm land			15	6	5	3	6	8	5	5	5	58
5		Khalet Salem land			15	12	5	12	15	12	5	5	5	86
6	Kufranja Municipality	Marai Rajeb land	\$ 350,725	Yes	15	12	5	15	15	12	3	5	5	87
7		Al Kasara land			15	6	5	15	12	3	5	5	4	70
8		Al Qamh land			15	12	5	12	12	0	5	5	5	71
9	Alouion Municipality	Civil Defense land	\$ 157,419	No	3	9	5	6	9	12	5	5	5	59
10		Wadi Al Rayyan land			15	9	5	9	12	12	5	5	5	77
11		Alouion Municipality land			5	9	5	12	6	12	5	5	5	64
12	Al-Junaid Municipality	Khirbat Abdeh land	\$ 335,000	Yes	15	11	5	15	11	10	5	4	4	80
13		Sakhra (Civil Defense) land			15	9	5	9	9	12	5	5	5	74
14		Bayader Abeen land			15	14	10	15	15	15	5	5	5	99
15		Al Makate' land			15	9	5	9	9	6	5	3	5	66
16	Alshafa Municipality	Khirbat Al Wahadne land 387	\$ 220,623	Yes	15	9	5	15	12	15	5	5	5	86
17		Khirbat Al Wahadne land 384			7	9	5	15	6	15	3	5	5	70
18		Halawet Al Aren land 173			15	9	5	6	6	15	3	5	5	69
19		Ghor Fara 13			15	15	5	15	15	10	5	5	5	90
20		Halawet Al Deir land 266			15	15	5	3	12	10	0	5	5	70

21		Halawet Al Deir land 297			15	9	5	9	12	3	0	5	5	63
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Environmental Assessment of the Plots of Land

The plots of land of the four municipalities that passed the technical assessment were visited by both SEED's technical and environmental teams. The plots of land that passed the technical assessment were:

1. Greater Ajloun Municipality
 - Health Center land 2
 - Khalet Salem land
2. Kufranja Municipality
 - Marai Rajeb land
3. Al-Junaid Municipality
 - Khirbat Abdeh land
4. Alshafa Municipality
 - Khirbat Al Wahadneh land 387
 - Ghor Fara 13

Environmental Screening and Conclusion							
Criteria		Greater Ajloun Municipality (Health Center land 2)	Greater Ajloun Municipality (Khalet Salem land)	Kufranja Municipality (Marai Rajeb land)	Al-Junaid Municipality (Khirbat Abdeh land)	Alshafa Municipality (Khirbat Al Wahadneh land 387)	Alshafa Municipality (Ghor Fara 13)
1	Land use and cover	0	20	20	20	20	0
2	Vegetation/trees removal	0	15	20	20	20	0
3	Proximity to urban areas	8	4	8	4	2	8
4	Proximity to main roads	2	4	0	8	8	4
5	Proximity to historical areas	15	9	12	6	12	9
6	Future capacity expansion	0	1	4	4	4	0
7	Watercourses and streams	16	16	16	16	16	16
8	Displacement of people	0	25	20	20	20	20
	Total	41	94	100	98	102	57

Summary Table of the Final Evaluation for the Four Shortlisted Plots of Land

Municipality	Name of Plot of Land	Cost of Annual Electricity Consumption	Minimum Electricity Consumption Satisfied (Yes/No)	Total Points	Total
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1	Kufranja Municipality	Marai Rajeb land	\$ 350,725	Yes	187	94%
2	Greater Ajloun Municipality	Khalet Salem land	\$ 526,215	Yes	180	90%
2	Al-Junaid Municipality	Khirbat Abdeh land	\$ 335,000	Yes	178	89%
3	Alshafa Municipality	Khirbat Al Wahadneh land 387	\$ 220,623	Yes	188	94%

Next Steps and Necessary Follow up for the Allocation of the SEED Grant

1. Secure preliminary approval from the electricity utility company;
2. Allocate grant;
3. Carry out an economic feasibility study for the project;
4. Sign agreements between the selected municipalities and SEED to confirm conditions and responsibilities;
5. Carry out environmental and social impact assessment (ESIA) of the solar farms for the selected municipalities and deliver the report to the concerned authorities (Ministry of Environment and Energy and Minerals Regulatory Commission);
6. Deliver the ESIA report to GAC;
7. Obtain the required approvals from all parties related to the location and nature of land use, including Ministry of Environment, Ministry of Agriculture, Ministry of Antiquities (in case of proximity to archaeological sites);
8. Complete the preparation of the technical, financial and contractual tender documents;
9. Conduct tendering procedures: announcing the tender, receiving offers, and evaluating the financial and technical offers;
10. Tender award: the winning contractor will be selected based on the terms of the bid;
11. Sign a memorandum of understanding between the municipalities and the Cities and Villages Development Bank (CVDB) so that the municipalities secure funding from CVDB to cover the additional solar farm costs that are beyond the value of the SEED grant. These costs are mainly associated with the costs of connecting to the electricity distribution grid and settlement of outstanding electricity bills;
12. Sign the bid assignment and the agreement between SEED, the municipalities, and the contractor, as well as the receipt of guarantees and issuance of the first payment;
13. Prepare electricity utility company application requirements;
14. Begin on-site works;
15. Contractor to submit detailed solar farm design to SEED for approval;
16. Submit an application for approval to the electricity utility company by the contractor;
17. Issuance of approval for the implementation of the project by the electricity utility company with an indication of the implementation period of the project, which is subject to extension;

18. Medium voltage agreement: develop a medium voltage equipment tender or sign an agreement for the supply and installation of medium voltage equipment between the municipalities and the electricity utility company;
19. Commence civil, mechanical, and electrical works;
 - a. Prepare the project site to receive equipment and system components;
 - b. Supply of system components by the contractor and ensure their compliance with the specifications; the contractor shall provide the SEED team with the necessary requirements to show compliance of equipment to standards as dictated in tender terms;
 - c. Install mounting structure;
 - d. Install photovoltaic panels;
 - e. Construction of trenches for the extension of DC cables and earthing cables;
 - f. Conduct electrical works;
 - g. Construct required rooms (inverter, control, and security rooms);
 - h. Install MD inverters and connect AC and DC sides;
 - i. Complete of the electrical work required by the electricity company to connect the system;
 - j. Examination of the system by a third party and in the presence of the companies of the electrical transformers, panels, and metal structure, and the costs of that shall be borne by the contractor;
20. Handing over the solar farms to the municipalities and training select municipal personnel according to the terms of the tender;
21. System testing and commissioning:
 - a. After completing all the works of the medium voltage side, the contractor shall submit a request to the electricity utility company to inspect and commission the system after the completion of all works in accordance with the instructions in force at the time by the Energy and Minerals Regulatory Commission (a work completion certificate from an engineering office approved by the Jordanian Engineers Association);
 - b. The Municipality is to settle all outstanding utility invoices;
 - c. Testing of the system by the electricity utility company according to governing instructions and requirements in the presence of the contractor and the SEED team, and the fees are paid by the contractor;
 - d. The Contractor shall, at its own expense, implement any requirements from the electricity utility company resulting from the testing;
 - e. After the successful completion of the system inspection by the electricity company, a request to connect and commission the system to the grid is submitted by the contractor;
 - f. Signing of the connection agreement between the municipality and the electricity utility company;
 - g. The final handover of the project, which includes all components of the solar farm, including civil, electrical and mechanical works, according to the specifications of the tender and the contract with the contractor.

الحقول الشمسية

محافظة عجلون

❖ يحتوي التقرير على شرح مفصل لشروط والمراحل التي قام فريق SEED باتباعها اثناء تنفيذ المنحة .

❖ يتضمن التقرير على ما يلي :

1. الشروط والمعايير المتبعة لاختيار البلديات .
2. البلديات المهتمه بالمنحة .
3. الدراسة التقنيه لاراضي البلديات المهتمه بالمنحة .
4. المصفوفة التقنيه .
5. الدراسة البيئية .
6. المصفوفة البيئية .
7. المصفوفة النهائية .
8. المراحل اللاحقة واللازمة لمتابعة تنفيذ المنحة .

❖ يتم اختيار البلديات المنتفعه بالمنحه عن طريق شروط ومعايير SEEDمنها:

1. ان لا يقل استهلاك الكهرباء السنوي لمجموع العدادات التابعة للبلدية عن (1,500,000 kwh/year) .
2. ان لا تقل مساحة الارض الخاصة بالمشروع عن (15 دونم) (15,000 متر مربع) .
3. ان لا تزيد المسافة بين الارض و نقطة الربط (خط الجهد المتوسط 33 KV) عن 1 كلم على طول مسار الشارع من الارض و حتى خط الجهد المتوسط.
4. ان تتوفر في الارض الخصائص التالية:
 - وجود طرق منظمة ومعبدة واصلة للارض .
 - ان تكون الارض مستوية او ان لا تزيد درجة ميلان الارض عن 15° درجة نحو الجنوب , او الجنوب الشرقي او الجنوب الغربي .
 - ان تكون طبيعة تربة الارض متماسكة (ليست طمم) , و ان لا تزيد نسبة توزيع الصخور السطحية عن 20% من مساحة الارض .
 - ان لا تكون نسبة الملوحة في التربة مرتفعة بما يؤثر على القواعد المعدنية.
 - عدم وجود ظلال من الجبال محيطه او من المباني المحيطه في حال وجودها .
 - ان تكون الارض قطعه واحده او قطع متجاورة و ان تكون مملوكة باسم البلدية او مخصصة للبلدية .
 - عدم وجود اثار او منابع مياه او اشجار حرجية او زراعية .
 - ان لاتكون الارض جزء من محمية طبيعية .

❖ تضم محافظة عجلون خمس بلديات :

1. بلدية عجلون الكبرى
2. بلدية كفرنجة
3. بلدية العيون
4. بلدية الجنيد
5. بلدية الشفا

❖ قامت البلديات الخمسة في محافظة عجلون بتزويد SEED بكتاب اهتمام بالاستفادة من المنحه و باراضي للكشف عليها منها :

1. بلدية كفرنجة :
 - أرض مراعي راجب
 - أرض الكسارة -قرب سد كفرنجة -
 - أرض القمح
2. بلدية عجلون الكبرى :
 - أرض النحل
 - أرض المركز الصحي (1)
 - أرض المركز الصحي (2)
 - أرض مزرعة الشكاره
 - أرض خلة سالم
3. بلدية العيون :
 - أرض الدفاع المدني
 - أرض وادي الريان
 - أرض بلدية العيون
4. بلدية الجنيد :
 - أرض خربة عابده
 - أرض صخرة (الدفاع المدني)
 - أرض ببادر عبين
 - أرض المقاطع
5. بلدية الشفا :
 - أرض خربة الوهاندنة 387
 - أرض خربة الوهاندنة 384
 - أرض حلاوة العرن 173
 - غور فارة 13
 - أرض حلاوة الدير 266
 - أرض حلاوة الدير 297

❖ قام الفريق التقني ل **SEED** بزيارة جميع الاراضي التي تم ترشيحها من قبل البلديات .

بلدية كفرنجة

❖ يقدر متوسط استهلاك الكهرباء لبلدية كفرنجة السنوي (350 الف) دينار .
❖ تمت زيارة لواء كفرنجة من قبل الفريق التقني ل (**SEED**) يوم الخميس الموافق 2022-5-12 بزيارة الأراضي المرشحة من قبل البلدية لبناء مشروع الطاقة الشمسية عليها .

❖ تم ترشيح ثلاث مواقع منها :

1. أرض مراعي راجب
2. أرض الكسارة – قرب سد كفرنجة
3. أرض القمح -ابو الصوان -

● أرض مراعي راجب

❖ مواصفات الارض :

1. تتميز الارض بان تربتها متماسكة (ليست طمم) .
2. صخرية بنسبة تصل الى 15% وميلان مقبول باتجاه الجنوب مناسب لتركيب النظام .
3. قربها من نقطة التوصيل الجهد المتوسط (33 كيلو فولت) بمسافة تقدر (150-200 متر) .
4. تبعد الارض عن اقرب طريق معبد (250 متر) .
5. لا تحتوي على اي ظلال .
6. يحيط بالارض محطة مياه (محطة مراعي راجب) .
7. يوجد بعض الاشجار الحرجية .
8. تقع الارض على خط طول وعرض ($32^{\circ}15'10.1''N$ $35^{\circ}38'38.3''E$) (قطعة 36 حوض 21 الروضه) .

● أرض الكسارة – قرب سد كفرنجة

❖ مواصفات الارض :

1. تتميز الارض بان تربتها متماسكة .
2. بانها صخرية بنسبة تتجاوز 70% .
3. مبسطة لاتحتوي على ميلان .
4. لا يوجد خط ضغط متوسط (33 كيلو فولت) ولكن من المتوقع تركيب محطة بالقرب من الطريق الرئيسي يبعد عن الارض مسافة (800-1000 متر) .
5. تحتوي الارض على خنادق عسكرية و محاطة بارضي فارغة .
6. لا يوجد ظلال عليها من اي جبال .

7. تقع الارض على خط طول وعرض . (32°15'46.4"N 35°37'43.1"E)

● أرض القمح-ابو الصوان-

❖ مواصفات الارض :

1. تتميز الارض بان تربتها متماسكة .
2. غير صخرية .
3. مبسطة لاتحتوي على ميلان .
4. تبعد عن خط الضغط المتوسط (33 كيلو فولت) مسافة بعيدة جدا تقدر ب (5 كم) .
5. يوجد بيت مهجور وبعض القواعد الاسمنتية .
6. يوجد بعض الاشجار .
7. يحد الارض مزارع ومكب نفايات سابق للبلدية .
8. تقع الارض على خط طول وعرض . (32°17'24.1"N 35°39'30.9"E)

بلدية عجلون الكبرى

❖ يقدر استهلاك بلدية عجلون الكبرى السنوي (526 الف) دينار .

❖ تمت زيارة بلدية عجلون الكبرى من قبل الفريق التقني ل (SEED) يوم الثلاثاء الموافق 17-5-2022 بزيارة الأراضي المرشحة من قبل البلدية لبناء مشروع الطاقة الشمسية عليها .

❖ تم ترشيح خمس مواقع منها :

1. أرض النحل - ابو الغزلان 77 -
2. أرض المركز الصحي 1
3. أرض المركز الصحي 2
4. أرض مزرعة الشكارة
5. أرض خلة سالم

● أرض النحل - ابو الغزلان 77-

❖ مواصفات الارض:

1. تتميز الارض بان تربتها متماسكة (ليست طمم) .
2. بانها صخرية بنسبة تصل الى 40% .
3. تحتوي على ميلان حاد .
4. تبعد عن نقطة التوصيل الجهد المتوسط (33 كيلو فولت) بمسافة تقدر (10 كم) .
5. تبعد الارض عن اقرب طريق معبد (250متر) .
6. تحتوي على اشجار كثيفة .
7. تقع الارض على خط طول وعرض (N 35°45'15.59"E"37.47'19°32)

● أرض المركز الصحي 1

❖ مواصفات الارض :

1. تتميز الارض بان تربتها متماسكة .
2. صخرية بنسبة تتجاوز 70% .
3. تحتوي على ميلان يصل الى 30% باتجاه الغرب .
4. يوجد خط ضغط متوسط (33 كيلو فولت) في الارض .
5. بالاضافة يوجد اشجار .
6. يحد الارض ملعب قيد الانشاء ومركز صحي الشفا .
7. لا يوجد ظلال عليها من اي جبال .
8. تقع الارض على خط طول وعرض (N 35°44'13.27"E"59.50'13°32).

● أرض المركز الصحي 2

❖ مواصفات الارض :

1. تتميز الارض بان تربتها متماسكة .
2. صخرية بنسبة 20% .
3. ميلان بسيط 10 درجات .
4. تحتوي على خط الضغط المتوسط (33 كيلو فولت) في الارض .
5. يوجد بيت مهجور غير قانوني وبعض القواعد الاسمنتية .
6. يوجد بعض الاشجار الحرجية .
7. يحد الارض مزارع و مركز صحي .
8. تقع الارض على خط طول وعرض (N 35°44'3.67"E"58.97'13°32).

● أرض مزرعة الشكارة

❖ مواصفات الارض :

1. تتميز الارض بان تربتها متماسكة .
2. صخرية بنسبة 75% .
3. ميلان 50 درجه .
4. تبعد عن خط الضغط المتوسط (33 كيلو فولت) مسافة (200) م .
5. يوجد بيت مهجور غير قانوني وبعض القواعد الاسمنتية .
6. يوجد بعض الاشجار الحرجية .
7. يحد الارض مزارع .
8. تقع الارض على خط طول وعرض (N 35°44'29.2"E"32°14'37.9").

● أرض خلة سالم

❖ مواصفات الارض :

1. تتميز الارض بان تربتها متماسكة .
2. صخرية بنسبة 20% .
3. ميلان 10 درجة باتجاه الجنوب.
4. تبعد عن خط الضغط المتوسط (33 كيلو فولت) مسافة (100) م.
5. يحد الارض بعض البيوت.
6. يوجد بعض الاشجار الحرجية .
7. تبعد عن الشارع الرئيسي مسافة 100 م.
8. تقع الارض على خط طول و عرض (32°13'59.50"N 35°44'13.27"E)

بلدية العيون

- ❖ يقدر استهلاك الكهرباء السنوي (157 الف) دينار .
- ❖ تمت زيارة لواء العيون من قبل الفريق التقني ل (SEED) يوم الثلاثاء الموافق 2022-5-17, بزيارة الاراضي المرشحة من قبل البلدية لبناء مشروع الطاقة الشمسية عليها.

❖ تم ترشيح ثلاث مواقع منها :

1. أرض الدفاع المدني .
2. أرض وادي الريان .
3. أرض بلدية العيون .

● أرض الدفاع المدني

❖ مواصفات الارض :

1. تتميز الارض بتربتها المتماسكة .
2. تحتوي الارض على مبنى لدفاع المدني ومصنع مغلق بالاضافة .
3. تحتوي على اشجار حرجية كثيفة .
4. لا يوجد مساحة كافية لبناء المشروع .
5. يحد الارض منزل ومدرسة عرجان .
6. لا يوجد خط ضغط متوسط قريب للارض .
9. يوجد في الارض ميلان بسيط .
10. تقع الارض على خط طول و عرض 32°22'42.8" E 35°41'39.0" N

● أرض وادي الريان

❖ مواصفات الارض :

1. تتميز الارض بان تربتها متماسكة .

2. صخرية بنسبة 60% .
3. تحتوي على ميلان من الجزء العلوي من الارض بالمقابل الجزء السفلي لايوجد على ميلان .
4. تحتوي الارض على اشجار (30 شجرة) .
5. يوجد خط ضغط متوسط بالارض .
6. يحد الجزء السفلي من الارض مصنع وبيوت .
7. تحتوي الارض على ميلان بسيط باتجاه الجنوب الغربي .
8. تقع الارض على خط طول و عرض ((32°23'12.58"N 35°42'44.19"E))

● أرض بلدية العيون

❖ مواصفات الارض :

1. تتميز الارض بتربتها المتماسكة.
2. صخرية بنسبة تصل الى 70% .
3. مقسومة الى جزء علوي 14 دونم وسفلي 7 دونم يفصلهم شارع .
4. تحتوي على ميلان عالي باتجاه الغرب .
5. تحتوي الارض على مباني لبلدية العيون بالاضافة الى مصنع مغلق .
6. تبعد عن خط الضغط المتوسط 200 متر .
7. تقع الارض على خط طول و عرض ((32°22'42.36"N 35°41'38.40"E))

بلدية الجنيد

- ❖ يقدر استهلاك البلدية للكهرباء السنوي (336 الف) دينار .
- ❖ تمت زيارة لواء الجنيد من قبل الفريق التقني ل (SEED) يوم الثلاثاء الموافق 2022-5-24 , بزيارة الاراضي المرشحة من قبل البلدية لبناء مشروع الطاقة الشمسية عليها .

❖ تم ترشيح أربع مواقع منها :

1. أرض خربة عابده
2. أرض صخرة (الدفاع المدني)
3. أرض بيادر عيين
4. أرض المقاطع

● أرض خربة عابده

❖ مواصفات الارض :

1. تتميز الارض بان تربتها متماسكة .
2. تعتبر صخرية بنسبة 5% .
3. يوجد فيها ميلان باتجاه الشمال .

4. تحتوي الارض على طمم قابل للازالة من قبل البلدية .
5. لا توجد اشجار.
6. يوجد بالارض بعض الخنادق العسكرية وبعض من الاثار .
7. يبعد خط ضغط متوسط عن (250-300) متر .
8. يحد الارض بعض من البيوت الاثرية المدفونه بالارض .
9. تقع الارض على خط طول و عرض ((32°22'37.29"N 35°49'48.98"E))

● أرض صخرة (الدفاع المدني)

❖ مواصفات الارض :

1. تتميز الارض بان تربتها متماسكة .
2. صخرية بنسبة بسيطة .
3. تحنوي على ميلان باتجاه الشمال الغربي .
4. تحتوي على طمم بسيط بالاضافة .
5. تحتوي الارض على اشجار تقدر ب (250-300) شجرة .
6. يبعد خط ضغط متوسط عن الارض مسافة (200) متر .
7. يحد الارض بعض البيوت بالاضافة الى الدفاع المدني .
8. تقع الارض على خط طول و عرض ((32°22'23.36"N 35°49'50.70"E))

● أرض بيادر عيين

❖ مواصفات الارض :

1. تتميز الارض بتربتها المتماسكة .
2. غير صخرية .
3. ارضها مبسطه بشكل كامل .
4. يحد الارض البيوت والمحال التجاريه .
5. يوجد خط ضغط متوسط بالارض .
6. لا يوجد فيها اشجار .
7. تعتبر مثالية لتركيب النظام .
8. يوجد طريق واصل للارض من اربع جهات .
9. تقع الارض على خط طول و عرض ((32°21'42.78"N 35°48'34.96"E))

● أرض المقاطع

❖ مواصفات الارض :

1. تتميز الارض بترتبتها المتماسكه .
2. صخرية بشكل كبير بنسبة تصل الى 70% .
3. تحتوي على اشجار كثيفة .
4. يوجد بالارض بعض المعالم التي قد تعتبر اثرية .
5. تعتبر الارض مسطحة.
6. يحد الارض المزارع ومناطق اثرية .
7. تبعد الارض عن خط الضغط المتوسط مسافة (500) متر.
8. تقع الارض على خط طول وعرض ((32°22'13.34"N 35°47'58.41"E))

بلدية الشفا

❖ يقدر استهلاك البلدية للكهرباء السنوي (336 الف) دينار .

❖ تمت زيارة لواء الجنييد من قبل الفريق التقني ل (SEED) يوم الخميس الموافق 2-6-2022, بزيارة الاراضي المرشحة من قبل البلدية لبناء مشروع الطاقة الشمسية عليها .

❖ تم ترشيح خمسة مواقع منها :

1. أرض خربة الوهادنة 387
2. أرض خربة الوهادنة 384
3. أرض حلاوة العرن 173
4. أرض غور فاره 13
5. أرض حلاوة الدير 266
6. أرض حلاوة الدير 297

● خربة الوهادنة 387

❖ مواصفات الارض :

1. تتميز الارض بترتبتها المتماسكة .
2. صخرية بنسبة 15% .
3. يوجد ميلان في الارض باتجاه الجنوب.
4. يحد الارض البيوت والمحال التجارية .
5. يوجد خط ضغط متوسط بالارض .
6. لا يوجد فيها اشجار .
7. تعتبر مثالية لتركيب النظام .

8. يوجد طريق واصل للارض من اربع جهات .
9. تقع الارض على خط طول وعرض (N 35°38'53.41"E"20.60'19°32) .

● خربة الوهادنه 384

❖ مواصفات الارض :

1. تتميز الارض بتربتها المتماسكة .
2. صخرية بنسبة 40% .
3. يوجد ميلان في الارض باتجاه الجنوب الغربي.
4. يحد الارض البيوت والمحال التجاريه .
5. يوجد خط ضغط متوسط على بعد 10 متر من الارض .
6. لا يوجد فيها اشجار .
7. يوجد طريق واحد للارض.
8. مساحة الارض 12 دونم .
9. يحد الارض مدرسة وجمعية .
10. تقع الارض على خط طول وعرض ((N 35°38'54.29"E"32°19'22.54"N))

● حلاوة العرن 173

❖ مواصفات الارض :

1. تتميز الارض بتربتها المتماسكة .
2. صخرية بنسبة 40% .
3. يوجد ميلان في الارض باتجاه الغرب.
4. يحد الارض البيوت والمزارع .
5. يوجد خط ضغط متوسط على بعد 10 متر من الارض .
6. يوجد فيها اشجار زيتون كثيفة .
7. يوجد طريق واحد للارض غير معبد .
8. مساحة الارض 14 دونم .
9. طبيعة الارض ملك خاص (استئجار).
10. تقع الارض على خط طول وعرض ((N 35°38'21.45"E"32°23'7.72"N))

● غور فاره 13

❖ مواصفات الارض :

1. تتميز الارض بتربتها المتماسكة .
2. غير صخرية .
3. تعتبر الارض مسطحة .
4. يحد الارض المزارع بالاضافة الى خربة .
5. يوجد خط ضغط متوسط على بعد 250 متر من الارض .

6. لا يوجد فيها اشجار.
7. يوجد طريق واصل للارض.
8. مساحة الارض 16 دونم .
9. طبيعة الارض ملك خاص (استئجار).
10. تقع الارض على خط طول وعرض ((32°22'41.37"N 35°36'52.14"E))

● حلاوة الدبير 266

❖ مواصفات الارض :

1. تتميز الارض بتربتها المتماسكة .
2. غير صخرية .
3. تعتبر الارض مسطحة .
4. يحد الارض المزارع.
5. يوجد خط ضغط متوسط على بعد 500 متر من الارض .
6. يوجد فيها اشجار زيتون كثيفة.
7. الطريق الواصل للارض غير معبد.
8. مساحة الارض 20 دونم .
9. طبيعة الارض ملك خاص (استئجار).
10. تقع الارض على خط طول وعرض ((32°22'41.37"N 35°36'52.14"E))

● حلاوة الدبير 297

❖ مواصفات الارض :

11. تتميز الارض بتربتها المتماسكة .
12. صخرية .
13. تعتبر الارض مائلة باتجاه الشمال .
14. يحد الارض المزارع.
15. يوجد خط ضغط متوسط على بعد 2 كلم من الارض .
16. يوجد فيها اشجار زيتون كثيفة.
17. الطريق الواصل للارض غير معبد.
18. مساحة الارض 20 دونم .
19. طبيعة الارض ملك خاص (استئجار).
20. تقع الارض على خط طول وعرض ((N 32°23'45.44"E"35.39'47°71))

❖ بعد الانتهاء من زيارة الاراضي المرشحة من قبل البلديات ؛ تم ادخال بيانات الاراضي الى المصفوفة التقنية .

❖ تجاوزت 6 أراضي المرحلة الاولى من الدراسة التقنية و بناءاً عليه تم الانتقال الى المرحلة الثانية من الدراسة (الدراسة البيئية) .

- ❖ تم استثناء أرض بلدية الجنيد (بيادر عيين) من قبل البلدية عن طريق كتاب موجه ل(SEED).
- ❖ أصبحت عدد الاراضي التي انتقلت الى المرحلة الثانية من التقييم هي (5) اراضي ل (4) بلديات .
- ❖ قامت بلدية عجلون بارسال كتاب استثناء لأرض المركز الصحي 2 وذلك لاسباب التخصيص موجه للمشروع وقامت البلدية بطلب بترشيح اراضي بديلة .
- ❖ تم ترشيح ارضين من قبل بلدية عجلون:1-أرض مزرعة شكاره 2- أرض خلة سالم وتمت زيارة الاراضي المرشحة من قبل المشروع يوم الاثنين الموافق 2022/9/19 .

المصفوفة التتقنية لاراضي بلدية عجلون

	البلديات	الاراضي	استهلاك الكهرباء سنوي	شرط تحقق الحد الادنى من استهلاك الكهرباء	مساحة الارض (15)	طبيعة التربة (15)	طبيعة ملكية الارض (10)	الاشجار (15)	ميلان الارض (15)	قربها لنقطة الربط (15)
1	كفرنجة	مراعي راجب	\$ 350,725	نعم	اكبر من 15 دونم	صخرية	غير مخصصة	لا يوجد	باتجاه الجنوب	150-200
2		الكسارة			اكبر من 15 دونم	صخرية عالية	غير مخصصة	لا يوجد	عدة اتجاهات	2 km
3		ارض القمح			اكبر من 15 دونم	صخرية	غير مخصصة	5 اشجار	مسطحة	5 km
4	عجلون الكبرى	النحل	\$ 526,215	نعم	اكبر من 15 دونم	صخرية	غير مخصصة	بكتافة	ميلان عالي	لا يوجد
5		المركز الصحي 1			اكبر من 15 دونم	صخرية	غير مخصصة	يوجد	باتجاه الشمال	موجود بالارض
6		المركز الصحي 2			2+10 دونم	صخرية	غير مخصصة	يوجد	باتجاه الجنوب	موجود بالارض
7		مزرعة الشكاره			اكبر من 15 دونم	صخرية عالية	غير مخصصة	يوجد	باتجاه الجنوب	200 m
8		خلة سالم			اكبر من 15 دونم	صخرية	غير مخصصة	8 اشجار	ميلان 10 درجة	70 m
9	العيون	الدفاع المدني	\$ 157,419	لا تحقق	لا توجد مساحة كافية	صخرية	غير مخصصة	يوجد	جنوب غرب	1 km
10		وادي الريان			اكبر من 15 دونم	صخرية	غير مخصصة	يوجد	ميلان غرب	موجود بالارض
11		بلدية العيون			مقسومة (7 سفلي-14 علوي)	صخرية	غير مخصصة	لا يوجد	ميلان عالي	200 متر
12	الجنيد	ارض الخربة	\$ 335,000	نعم	اكبر من 15 دونم	صخرية	غير مخصصة	لا يوجد	جنوب شرق و غرب	300 متر
13		ارض صخرة (دفاع المدني)			اكبر من 15 دونم	صخرية	غير مخصصة	يوجد	جنوب غربي	200 متر
14		ارض يبادر عين			15 دونم	غير صخرية	للبلدية	لا يوجد	مسطحة	موجود بالارض
15		ارض المقاطع			اكبر من 15 دونم	صخرية	غير مخصصة	يوجد	باتجاه الغرب	500 متر

SEED COWATER

16	الشفافا	خربة الوهادنه(3) (87)	\$ 220,623	نعم	اكبر من 15 دونم	صخرية	غير مخصصة	لايوجد	باتجاه جنوبي غربي	موجود بالارض
17		خربة الوهادنه(3) (84)			اقل من 15 دونم(12)	صخرية	مخصص لمركز الاميره بسمة	لايوجد	جنوب غرب	10 متر
18		حلاوة العرن (173)			14 دونم	صخرية	خاص(است نُجار)	شجر زيتون كثيف	باتجاه الغرب	بالارض
19		غور فاره (13)			اكبر من 15 دونم	غير صخرية	خاص(است نُجار)	لايوجد	ارض مستويه	200 متر
20		حلاوه الدير 26+266 (7)			اكبر من 15 دونم	غير صخرية	خاص(است نُجار)	اشجار زيتون كثيفة	منبسطة	500 متر
21		حلاوه الدير (297)			اكبر من 15 دونم	صخرية	خاص(است نُجار)	اشجار زيتون كثيفة	باتجاه الشمال	2 km

SEED COWATER

	البلديات	الاراضي	استهلاك الكهرباء سنوي	شرط تحقق الحد الأدنى من استهلاك الكهرباء	مساحة الارض (15)	طبيعة التربة (15)	طبيعة ملكية الارض (10)	الاشجار (15)	ميلان الارض (15)	قربها لنقطة الربط (15)	وجود طريق معبد للارض (5)
1	كفرنجة	مراعي راجب	\$ 350,725	نعم	15	12	5	15	15	12	3
2		الكسارة			15	6	5	15	12	3	5
3		ارض القمح			15	12	5	12	12	0	5
4	عجلون الكبرى	النحل	\$ 526,215	نعم	15	9	5	3	6	0	5
5		المركز الصحي 1			15	9	5	9	9	15	5
6		المركز الصحي 2			10	12	5	8	15	15	5
7		مزرعة الشكاره			15	6	5	3	6	8	5
8		خلة سالم			15	12	5	12	15	12	5
9	العيون	الدفاع المدني	\$ 157,419	لا تحقق	3	9	5	6	9	12	5
10		وادي الريان			15	9	5	9	12	12	5
11		بلدية العيون			5	9	5	12	6	12	5
12	الجنيد	ارض الخربة	\$ 335,000	نعم	15	11	5	15	11	10	5
13		ارض صخرة (دفاع المدني)			15	9	5	9	9	12	5
14		ارض بيبادر عبين			15	14	10	15	15	15	5
15		ارض المقاطع			15	9	5	9	9	6	5
16	الشفاء	خربة الوهادنه (3) (87)	\$ 220,623	نعم	15	9	5	15	12	15	5
17		خربة الوهادنه (3) (84)			7	9	5	15	6	15	3
18		حلاوة العرن (173)			15	9	5	6	6	15	3

19		غور فاره (13)			15	15	5	15	15	10	5
20		حلاوه الدير 26+266 (7)			15	15	5	3	12	10	0
21		حلاوه الدير (297)			15	9	5	9	12	3	0

الدراسة البيئية

➤ تمت زيارة اراضي البلديات الاربعه من قبل الفريق التقني ل(SEED) والفريق البيئي وذلك يوم الثلاثاء الموافق 2022/6/7

➤ تمت زيارة الاراضي التي تجاوزت المرحلة الاولى من التقييم وهي التالي :

1. بلدية عجلون 1- أرض المركز الصحي 2- أرض خلة سالم .
2. بلدية كفرنجة: أرض راجب .
3. بلدية الجنيد : أرض الخربة .
4. بلدية الشفا : أرض الوهادنة 387 و أرض غور فاره 13 .

Environmental Screening and Conclusion

	Criteria	AJLOUN(Health Center)	JUNAID	KUFRANJI H	Alshafa (Wahadneh)	Al
1	Land use and cover	0	20	20	20	
2	Vegetation/trees removal	0	20	20	20	
3	Proximity to urban areas	8	4	8	2	
4	Proximity to main roads	2	8	0	8	
5	Proximity to historical areas	15	6	12	12	
6	Future capacity expansion	0	4	4	4	
7	Watercourses and streams	16	16	16	16	
8	Displacement of people	0	20	20	20	
	Total	41	98	100	102	

Final Matrix

وع النقاط	شرط تحقق الحد الأدنى من استهلاك الكهرباء	استهلاك الكهرباء سنوي	الاراضي	البلديات	
187	نعم	\$ 350,725	مراعي راجب	كفرنجة	1
180	نعم	\$ 526,215	خلة سالم	عجلون الكبرى	2
178	نعم	\$ 335,000	ارض الخربة	الجنيد	2
188	نعم	\$ 220,623	خربة الوهادنه(387)	الشفا	3

المراحل اللاحقة واللازمة

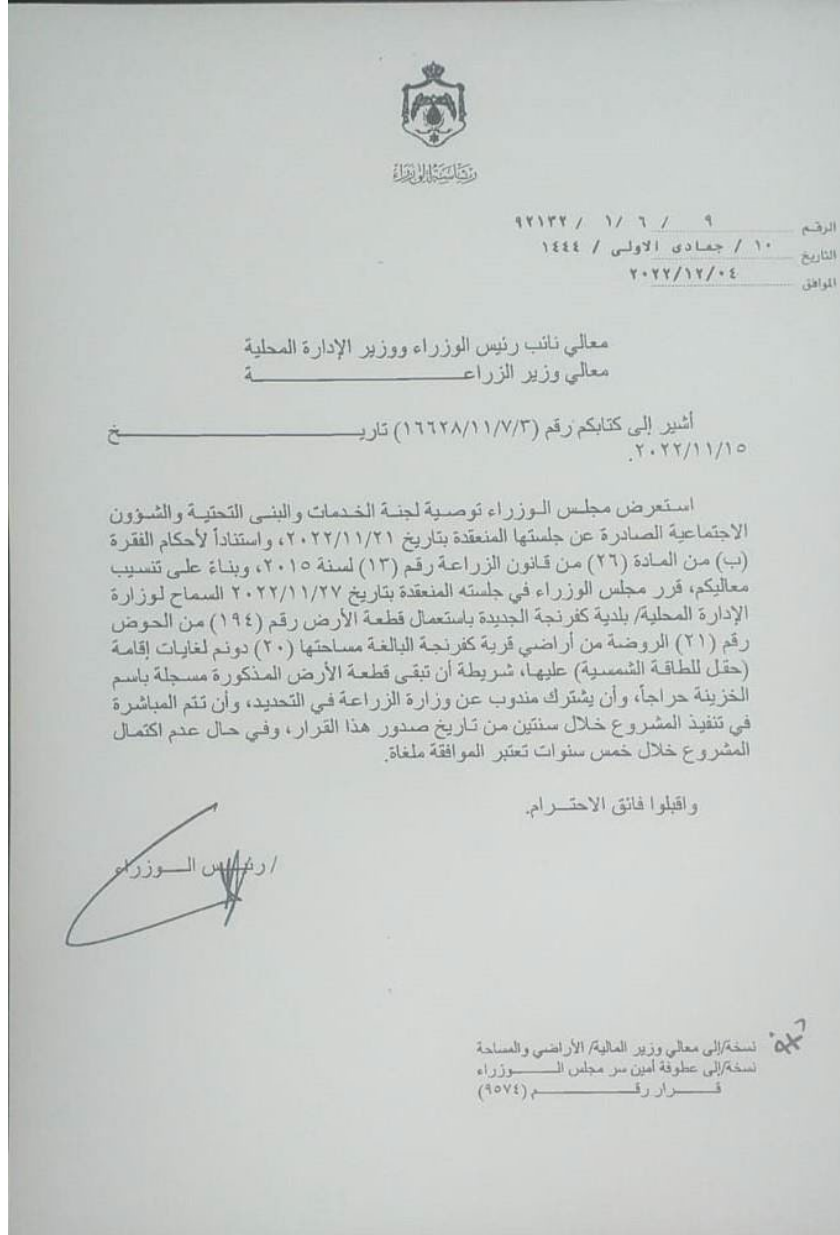
1. موافقة شركة الكهرباء الاولى
2. تخصيص المنح
3. القيام بدراسة الجدوى الاقتصادية للمشروع.
4. توقيع الاتفاقيات والالتزامات بين البلدية و مشروع SEED للتأكيد على تحقيق الالتزامات والشروط
5. يتم اجراء دراسة الاثر البيئي و الاجتماعي للمشروع في البلدية المختارة و تسليمها للجهات المعنية (وزارة البيئة و هيئة تنظيم قطاع الطاقة)
6. تسليم تقرير دراسة الاثر البيئي والاجتماعي ل (GAC)
7. الحصول على الموافقات المطلوبة من جميع الجهات ذات العلاقة بموقع وطبيعة استخدام الارض. مثل: وزارة البيئة, وزارة الزراعة ، وزارة الاثار (في حال القرب من المواقع الأثرية)
8. يقوم فريق SEED من الانتهاء من اعداد وثائق العطاء الفنية والمالية والتعاقدية .
9. السير باجراءات طرح العطاء : الاعلان عن العطاء و استلام العروض و مراحل التقييم المالي و الفني
10. اختيار المقاول : يتم اختيار المقاول الفائز بشروط العطاء
11. مذكرة التفاهم بين البلدية و بنك التنمية و القرى: توقيع اتفاقية التمويل مع البلدية لتغطية التكاليف التي لا تغطيها المنحة والتي تكون على الغالب من تكلفة الربط بشبكة توزيع الكهرباء و التسوية مع شركة توزيع الكهرباء بخصوص الذمم السابقة و أية كلف من نظام الحقل الشمسي تزيد عن سقف تمويل المشروع).

12. توقيع احالة العطاء و الاتفاقية بين SEED و البلديات والمقاول : استلام الكفالات و اصدار الدفعة الاولى.
13. اعداد متطلبات الموافقة لشركة الكهرباء
14. استلام الموقع و اصدار امر المباشرة للمقاول
15. تقديم التصاميم التفصيلية و الموافقة عليها من فريق SEED.
16. تقديم طلب الموافقة لشركة الكهرباء من قبل المقاول
17. اصدار الموافقة على تنفيذ المشروع من قبل شركة الكهرباء مع بيان مهلة التنفيذ للمشروع و هي قابلة للتمديد
18. اتفاقية الجهد المتوسط: طرح عطاء الجهد المتوسط او توقيع اتفاقية توريد و تركيب لمعدات الجهد المتوسط بين البلديات و شركة كهرباء اربد , ويتم وضع التصاميم و احتساب الكميات و التكلفة من قبل شركة الكهرباء وذلك حسب المسافات بين خط الضغط المتوسط والمحطة
19. بدء تنفيذ الاعمال المدنية و الميكانيكية و الكهربائية .
 - (a) اعداد و تهيئة موقع المشروع لاستقبال المعدات و مكونات النظام و بدء الاعمال
 - (b) توريد مكونات النظام من قبل المقاول و التأكد من مطابقتها للمواصفات , و قيام المقاول بتزويد فريق SEED بمتطلبات مطابقة المواصفات وفق شروط العطاء
 - (c) بدء تركيب الهيكل المعدني
 - (d) تركيب و تجميع الخلايا الشمسية
 - (e) انشاء خنادق من اجل تمديد كوابل DC و كوابل التاريز
 - (f) بدء الاعمال الكهربائيه
 - (g) البدء بانشاء الغرف المطلوبة (inverter room , control room, security room)
 - (h) تركيب ال INVERTERS MD , والانتهاه من ربط AC side , DC side
 - (i) الانتهاء الاعمال الكهربائيه المطلوبة من شركة الكهرباء لربط النظام
 - (j) فحص النظام من قبل طرف ثالث و بحضور شركة او وكيل كل من المحولات الكهربائيه والخلايا والهيكل المعدني و تكون تكاليف ذلك على المقاول
20. تسليم المشروع للبلديات و تدريب الكوادر المعنية من طرف البلديات و وفق شروط العطاء
21. فحص و تشغيل النظام على الشبكة
 - (a) بعد الانتهاء من تنفيذ كافة اعمال شبكة الجهد المتوسط , يقدم المقاول طلب فحص و تشغيل النظام لشركة الكهرباء بعد انتهاء كافة الاعمال وفق التعليمات السارية في حينه من قبل EMRC (شهادة انتهاء اعمال من مكتب هندسي معتمد من نقابة المهندسين)
 - (b) تقوم البلدية بتسديد كافة الذمم المالية المترتبة لصالح شركة الكهرباء
 - (c) فحص النظام من طرف شركة الكهرباء وفق التعليمات و الشروط المحددة بحضور المقاول و فريق SEED و تدفع الرسوم من قبل المقاول
 - (d) يقوم المقاول و على نفقته بتنفيذ اي متطلبات من قبل شركة الكهرباء ناتجة عن الفحوصات
 - (e) بعد الانتهاء من فحص النظام من طرف شركة الكهرباء بنجاح , يتم تقديم طلب ربط و تشغيل النظام بالشبكة من قبل المقاول .
 - (f) توقيع اتفاقية الربط بين البلدية و شركة الكهرباء
 - (g) الاستلام النهائي للمشروع ويشمل كافة مكونات محطة الحقل الشمسي من اعمال مدنية و كهربائية و ميكانيكية حسب مواصفات العطاء و العقد مع المقاول

Annex II: Site Approval Letters

This annex contains various approval and endorsement letters from the local community represented by the publicly elected local council, and all government entities that are relevant to the project according to the Jordanian laws and bylaws.

The following letter was issued by the Cabinet (Prime Ministry) of the Government of Jordan to both the Minister of Local Administration/Deputy Prime Minister and the Minister of Agriculture. The letter was signed by the Prime Minister. The letter states that the Prime Ministry Cabinet, reviewed the endorsement from the Committee of Services, Infrastructure, and Social Services that took place on 21 Nov 2022, and that based on Article 26 of the Agricultural Law Number 13 of the year 2015, and based on the endorsement of the Minister of Agriculture, and the Minister of Local Administration Deputy Prime Minister), the ministry Cabinet authorizes for the Ministry of Local Administration/Municipality of Kufranjeh to use the land (details of lands mentioned) to the use of constructing the solar PV wheeling farm with the condition to liaison with the Ministry of Agriculture. Please contact Cowater International in case a formal translation or additional references might be needed.




Approval letter from the Cabinet (Prime Ministry)



[Faint, illegible text, likely bleed-through from the reverse side of the page]

[Handwritten signatures in blue ink]

Continued - Approval letter from the Cabinet (Prime Ministry)


 وزارة الزراعة

رقم 11/7/3
 التاريخ 2022/11/
 الموافق

دولة رئيس الوزراء

إشارة إلى كتاب مساعدة رئيس بلدية كفرنجة الجديدة رقم 8/زراعة/2650 تاريخ 2022/11/2 والمتضمن طلب الموافقة على استعمال القطعة رقم (194) من الحوض رقم (21) الروضة من أراضي قرية كفرنجة والمفرزة من القطعة رقم (36) من نفس الحوض والقرية لصالح البلدية وذلك لغايات إقامة حقل الطاقة الشمسية عليها .

أرجو دولتكم التظلم بالموافقة على السماح لوزارة الإدارة المحلية / بلدية كفرنجة الجديدة على استعمال القطعة رقم (194) من الحوض رقم (21) الروضة من أراضي قرية كفرنجة إقامة حقل الطاقة الشمسية عليها والبالغ مساحتها (20) دونم وذلك حسب ما جاء بكتاب دولتكم رقم (32414/1) تاريخ 2013/11/12 بموجب قرار رقم (2156) والمتضمن الشروط والتعليمات الخاصة بإقامة المشاريع العامة على الأراضي الحرجية وإي أغراض حكومية أخرى يحددها مجلسكم الموقر ، شريطة أن تبقى القطعة مسجلة خزينة / حراج وأن يشترك مندوب عن هذه الوزارة بالتحديد وأن يبدأ تنفيذ المشروع خلال سنتين وأن يكتمل تنفيذ المشروع خلال خمس سنوات من تاريخ الموافقة ولا تعتبر الموافقة لاغية ، علماً بأن نسبة كثافة الأشجار لكامل القطعة الحرجية المذكورة أعلاه هي (1%) .

وتفضلوا بقبول فائق الاحترام

وزير الزراعة
 المهندس خالد الحنيفات

نائب رئيس الوزراء
 وزير الإدارة المحلية
 توفيق كريشان

نسخة/ عطوفة الأمين العام
 نسخة/ مساعد الأمين العام للحراج والبراض
 نسخة/ مدير مديرية الحراج
 نسخة/ مدير وحدة الرقابة الناظمية
 نسخة/ مديرية الشؤون القانونية
 نسخة/ مدير مديرية زراعة محافظة عجلون
 نسخة/ رئيس قسم المساحة والأراضي الحرجية
 نسخة/ الحفظ البيئي
 ل ق 2022/11/8

المملكتة الأردنية الهاشمية
 عمان ٢٠٩٩ - ١١١٨١ - الأردن. البريد الإلكتروني @moa.gov.jo

فاكس: +٩٦٦ ٦٥٦٨٦٣١٠ ص.ب: ٢٠٩٩ عمان ١١١٨١ - الأردن. البريد الإلكتروني @moa.gov.jo

Ministry of Agriculture Approval Letter

THE HASHEMITE KINGDOM
OF JORDAN

Ministry Of Local Administration
Kufranjeh AL-Jadedah
municipality
Ajloun Mayer – Kufranjeh District



المملكة الأردنية الهاشمية
وزارة الادارة المحلية
بلدية كفرنجة الجديدة
محافظة عجلون – لواء كفرنجة

٧٤٨:
٧٤٧:

الرقم: جلسة رقم ٤٨ بند ١٠
التاريخ: ٢٠٢٢/١٠/٢٢

وقائع اجتماع لجنة بلدية كفرنجة الجديدة

٤٨ اليوم: السبت التاريخ: ٢٠٢٢/١٠/٢٢ ابتدأت الجلسة الساعة: الواحدة بعد الظهر
ترأس الجلسة: المحامي الدكتور فوزات فريجات /رئيس بلدية كفرنجة الجديدة
الأعضاء السادة: طلال الشويبات، مصطفى الفقعاع، فارس عنانزة، ربحي الجبالي، مصطفى فريجات، محمد زريقات، أحمد عنانية، نهى طشطوش، ماجدولين فريجات.

الغياب بعذر: لا يوجد
الغياب بدون عذر: لا يوجد

بند ١٠

اطلع المجلس البلدي على البند الثالث من جدول الأعمال والمتضمن البريد وبعد الاطلاع على كتاب مدير مشروع التنمية الاقتصادية والطاقة المستدامة في الأردن رقم ص/م خ / ٢٠٢٢/١٢٥ تاريخ ٢٠٢٢/١٠/١٦ بخصوص موافقة شركة كهرباء اربد على انشاء حقل شمسي بالبلدية وبعد التداول والمناقشة يقرر المجلس البلدي الموافقة على استخدام قطعة الأرض رقم ٣٦ حوض ٢١ الروضة من أراضي كفرنجة لأغراض انشاء حقل طاقة شمسية عليها.
ويقرر المجلس البلدي تكليف الرئيس لتنفيذ القرار حسب الأصول.

رئيس بلدية كفرنجة الجديدة
أ.د. فوزات فريجات

عضو
ربحي الجبالي

عضو
فارس عنانزة

عضو
مصطفى الفقعاع

عضو
طلال الشويبات

عضو
أحمد عنانية

عضو
محمد زريقات


عضو
ماجدولين فريجات

عضو
مصطفى فريجات

عضو
نهى طشطوش

كفرنجة – تلفاكس ٠٢/٦٤٥٥٩٢١ - ٠٢/٦٤٥٤٠٠٣
Kufranjeh – Telfax ٠٢/٦٤٥٥٩٢١ - ٠٢/٦٤٥٤٠٠٣

Local Administrative Council approval, signed by all members of the council


المملكة الأردنية الهاشمية
صورة قيد تسجيل الأموال غير المنقولة

يحتوي هذا القيد على 1 (صفحة)

رقم الحسي: 0	المشروع: لأغراض المشاريع الحكومية فقط	رقم المخطط: 194
رقم اللوحة: 61	المستخدم القيد: 2022-AJ-27393	رقم الجداول: 21
مجموع الحصص:	الحصص الحوض: الروفة	رقم الوثيقة: 000
مقياس الرسم: 1/2500	نوع الأرض: ملك خارج حدود البلديات	القيمة التقديرية: 0,001
		رقم بيان التغيير: 722/2022

المساحة المسجلة: 0.000 متر مربع	رقم وطني/متكامل: 0000000100 *
المساحة كتابية: 0.000 متر مربع	اسم المالك: هزينة الملكة الأردنية الهاشمية
المساحة كتالوج: 0.000 متر مربع	الجنسية: الأردنية
	الحصص: كاملا

يوجد وثوق عتق

منظم سند التسجيل: خالد عبد الرحمن حسن علقم
REGNO00995127AJ---DLS0606-11:43:05-19/12/2022

Land Registration Certificate

Annex III: ESIA Team

Position	Name	Experience
Team Leader	Dr. Mohammed Shafie	<p>With a track record of over 20 years, Dr. Alshafie is a strategist advisor and an inspiring manager. He is an experienced senior consultant and project manager on engineering projects related to the environment and infrastructure from a sustainable scheme. Over the years, he assumed positions that accumulated to a skillful rich experience focused on:</p> <ul style="list-style-type: none"> - Strategic and Business Development Management - Infrastructure and Environmental Project Management - Team Building and Capacity Building - Stakeholders, Clients, and Donors Management/Engagement - Organizational Operations and Control including Finances, and Compliances - Environmental Impact Assessment
Environmental Specialist/Physical Environment Expert	Eng. Islam Daoud	<p>Eng. Islam Daoud holds a B.Sc. in Environmental Engineering and Master's degree in Integrated Water Resources Management and has an intense experience in performing environmental design in Jordan and the region, which includes demonstrated experience in Environmental Impact Assessment, Environmental Management Plan, Environmental Audit Compliance, Health & Safety Inspection, Solid Waste Management, Environmental Planning.</p>

Annex IV: Project Components

The following is a table that represents a summary of project components and work that the contractor will provide under the SEED project's supervision and according to SEED's set requirements. For more information on any particular part, please refer to the Statement of Work (SOW) attachments for each of the sites. Due to the large size each SOWs were uploaded to be accessible online if needed:

- [Please click here to access the SOW for Kufranjah Municipality.](#)
- [Please click here to access the SOW for Ajloun Greater Municipality](#)

Components Category	Main Sub-components
Earth works and preparation of land	Cut and Fill works
	Land levelling
Building the footpaths, fence, gates etc.	Internal roads
	Land Fence
	Main gate
	Storm water mitigation system
Civil works – buildings	Security room

SEED COWATER

	PV system control room
	Inverter room
	Meeting room
	Storage facility room
PV mechanical assembly and DC connection	PV mechanical assembly and DC connection
Erection of PV mounting structure	Drilling post holes
	Post concrete foundation
	Assembly of mounting structure
Installation of inverters	Inverter placement
	PV strings-inverter connection
	Inverters programing and monitoring system ready

SEED COWATER

	Internet connection
Wiring and connections	DC trenches work
	Low voltage AC trenches work
	DC wiring from PV to Inverters completed
	Low voltage AC wiring completed
	DC and AC Earthing cables and rods completed
	Communication cables work completed
	As-built drawings completed
Auxiliary systems	Water storage tanks
	PV Cleaning system

SEED COWATER

	Indoor and outdoor Lighting system
	Camera monitoring hardware and software system
	Air conditioning units in required buildings
	Firefighting system
	Cold and hot water systems
	Mechanical Sanitary connections and system
Other requirements	System cold commissioning
	All Documentation work and as-built drawings and design
	Training on PV operation and maintenance
	Spare parts

	Weather station installation
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