Environmental and Social Audit of the Green Corridor Project Overhead Lines

Submitted to the National Electric Power Company (NEPCO)

The Water, Energy and Environment Center (WEEC) at the University of Jordan

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1 Executive Summary

The National Electric Power Company (NEPCO) has implemented the Green Corridor Project to reinforce Jordan's high voltage electricity transmission network, improve the reliability of supply, enhance the Country's resilience, and create economic growth opportunities in the renewable energy sector. The Green Corridor overhead lines are divided into the following components:

- LOT 1: Twin bundle double circuit 400 kV overhead lines from New Ma'an substation to Qatrana substation. The construction works of LOT 1 commenced in April 2017 and ended in January, 2019.
- LOT 2: Single conductor double circuit 132 kV overhead lines from Qatrana substation to Queen Alia International Airport (QAIA) substation. The construction works of LOT 2 commenced in March, 2017 and ended in February, 2019.

NEPCO is seeking financing from the Agence Française de Développement (AFD) for the Green Corridor Project overhead lines (herein referred to as the "project"). Projects eligible for AFD financing must meet the national environmental and social standards as well as the World Bank's Environmental and Social (E&S) Framework, and the Health and Safety Guidelines (EHSG). Therefore, NEPCO has appointed the Water, Energy and Environment Center (WEEC) at the University of Jordan (the Consultant) to conduct a comprehensive environmental and social audit for the Green Corridor Project to verify that the Project complies with the relevant Jordanian environmental and social (E&S) legislation, World Bank E&S Framework, and international conventions ratified by the Country. The main objectives of this study are to assess the existing E&S management policy of the Green Corridor Project; identify any potential adverse impacts that may arise as a result of the Project activities; propose reasonable mitigation measures; and consolidate the positive impacts for future gains.

The Green Corridor extends over areas in Amman, Karak, Tafilah, and Ma'an governorates. The overhead transmission lines (OHTL) pass through mostly dry and desert lands with only 5% cropland and herbaceous cover; thus, most of the Project's influenced areas are of low E&S sensitivities. Nonetheless, the Green Corridor runs close or in parallel to several inhibited towns including Al-Jiza, Arainba, Al-Watheeri, Al-Zumailya, Damkhi, Qatrana, Al-Sultani, Al-Hasa, Jurf Al-Darawish, and Al-Hussainyeh. Additionally, the OHTL overlaps with the proposed Abu Rukbeh Nature Reserve location to the south of Qatrana for nearly 19 km.

There are several E&S risks associated with the construction and operation of the Green Corridor Project. These risks vary in magnitude, location, extent, timing, and duration. On the other hand, the Green Corridor Project is expected to bring several local, regional, and national benefits including but not limited to the improved electrical capacity, enhanced electricity supply, employment opportunities, and the increased economic activities regionally and nationally.

The Consultant's team conducted a comprehensive desk review of documents related to the Project including but not limited to prior E&S impact reports for similar projects, official reports on biodiversity and migratory birds in the Project's influenced areas, national and international relevant E&S standards, E&S responsibility policies, employment terms and conditions, health and safety procedures and guidelines, risk assessment procedures, and emergency plans of NEPCO and the Project contractors. Site visits along the Green Corridor OHTL were carried out

to identify any visible environmental, health, and social risks as well as any visual intrusions. The site visits were carried out on August 21, 2019 (LOT 2) and on August 29, 2019 (LOT 1). The Consultant's team made stops in the inhibited areas along the route and interviewed people to collect information and data regarding the E&S impacts of the Project. The Consultant also interviewed NEPCO's personnel including transmission lines engineers and quality control and safety supervisors to collect further information regarding the operation stage of the Green Corridor Project.

The significance of the Project's impacts was determined based on the magnitude of impact and receptor sensitivity. A summary of the Green Corridor E&S risks and impacts is presented in Table 1.1~~Table 1.1~~.

Several mitigation measures and recommendations were proposed to address and mitigate the adverse E&S risks associated with the Project's operation stage in accordance with the national and international standards. Since the construction works are completed, mitigation measures for the construction stage are not relevant. The applicable mitigation measures and recommendations are summarized in Table 1.2~~Table 1.2~~.

Table 1.1: Summary of the Green Corridor risks and the overall impacts

Standard	Risk	Receptor	Stage	Overall Impact
ESS2	Safety and working/labor standards concerns	Direct and indirect labor	Construction	Not significant
			Operation	Not significant
ESS3	Waste generation	Groundwater	Construction	Not significant
			Operation	Not significant
	Waste generation	Soil	Construction	Minor
			Operation	Not significant
	Waste generation	Air	Construction	Minor
			Operation	Not significant
	Noise	Residents (local communities)	Construction	Minor
			Operation	Moderate
	Particulate matter	Air	Construction	Minor
			Operation	Not significant
	Gaseous emissions	Air	Construction	Minor
			Operation	Not significant
ESS4	Traffic accidents	Residents (local communities)	Construction	Minor
			Operation	Minor
	Fires	Residents (local communities)	Construction	Not significant
			Operation	Minor
	Electrocution	Residents (local communities)	Construction	NA
			Operation	Minor
	Falling/injury	Residents (local communities)	Construction	Major
			Operation	Major
	EMF exposure	Residents (local communities)	Construction	NA
			Operation	Moderate
ESS5	Involuntary resettlement	Residents (local communities)	Construction	Not significant
			Operation	Not significant
	Land use restrictions	Land owners/ residents	Construction	Major
			Operation	Major
ESS6	Fatality or destruction of habitat	Fauna	Construction	Minor
			Operation	Not significant
	Fatality or destruction of habitat	Avifauna	Construction	Moderate
			Operation	Moderate
	Fatality or destruction of habitat	Flora	Construction	Minor
			Operation	Not significant
ESS7	Impacts on nomadic groups	Nomadic groups	Construction	Minor
			Operation	Not significant

ESS8	Impacts on cultural heritage sites	Cultural heritage sites	Construction	Not significant
			Operation	Not significant

Table 1.2: Summary of the mitigation measures and recommendations

Standard	Mitigation Measures
ESS2	• Provide the workers with the required personal protective equipment (PPE) and adopt proper inspection and enforcement mechanisms to ensure the effective compliance. • Update the health and safety training programs and repeat the training programs to the employees every 1-2 years. • Apply NEPCO's health, safety, and labor standards to all contractors, subcontractors, and primary suppliers associated with NEPCO. • Encourage the contractors and subcontractors to recruit skilled labor from the local communities after passing the necessary training programs. • In case of chemicals or hazardous materials use, materials safety data sheets (MSDS) must be provided and the involved personnel must have the proper training to safely handle and manage those materials.
ESS3	• Modern and energy efficient vehicles and equipment shall be utilized during the inspection and maintenance activities. A periodic maintenance program shall be applied to ensure that the vehicles and equipment are energy efficient and that the carbon and pollution footprint is minimized to the lowest acceptable levels. • Driving on dirt roads shall be avoided or minimized to avoid dust suspension. In case of unavoidable dirt road usage, driving shall be at very low speeds. • A spill containment plan shall be developed in order to effectively manage leakage or waste spillage incidents. • Solid wastes generated on site shall be collected immediately and transported to a proper storage facility. NEPCO is encouraged to apply the reuse, recycle, and recover principles in their waste management protocols. • In case of chemicals or hazardous materials use, materials safety data sheets (MSDS) must be provided and the involved personnel must have the proper training to safely handle and manage those materials. • Hazardous wastes (if any) shall be managed in accordance with the Ministry of Environment's regulations. • NEPCO shall monitor the noise levels frequently, particularly in areas where the OHTL are in a close proximity to residential units. NEPCO is also required to respond in a timely manner to complaints regarding elevated noise levels by applying the necessary maintenance and cleaning procedures.

	• During inspection and maintenance activities, water use shall be minimized and the generated point source wastewater shall be collected and disposed properly.
ESS4	• The towers' bottoms must be urgently protected against climbing by having fixed metal meshes or any other protection measure at proper height to prevent people from climbing; hence, eliminating the falling/injury risk. Precautionary signs must also be provided. • A community accident record shall be initiated to document community accidents, incidents, or complaints. Such a record needs to be comprehensive taking into consideration several aspects including but not limited to health, safety, environmental, biodiversity, and cultural heritage aspects. • A frequent EMF monitoring plan must be implemented to ensure that the EMF exposure in the residential areas is within the international threshold limits. • The local communities shall be informed on the different aspects of the Project operation, particularly the energization of the OHTL. • In case of chemicals or hazardous materials use, materials safety data sheets (MSDS) must be provided and the involved personnel must have the proper training to safely handle and manage those materials.
ESS5	• NEPCO is required to strictly adhere to the national laws and regulations regarding compensations. However, there needs to be a transparent, professional, and clear a mechanism for the estimation of the property value which shall avoid undermining the real value of the property; thus, avoiding and minimizing conflicts and lengthy legal procedures. • NEPCO may need to acquire the full property as per the owner's request if partial acquisition leaves the remainder of the land unusable. This is applicable to cases where the vertical and horizontal clearances are below the recommended limits and the EMF exposure levels are higher than the international threshold limits. • NEPCO is recommended to provide financial or technical assistance for the affected towns in different sectors such as energy, education, or infrastructure. • Creating employment opportunities for the local workforce is a desired development target for those underdeveloped communities and is expected to increase people's acceptance of NEPCO's projects. • NEPCO should advertise through the local media with sufficient time prior to energizing the Green Corridor OHTL. • NEPCO should attempt to contact the owners of the affected lands and houses by identifying their names. Such a process will require official communication from NEPCO to the Department of Lands and Surveying. Additionally, NEPCO may use other communication methods (e.g. placing

	fliers on the doors of the houses to notify the owners to contact NEPCO). • To mitigate the impacts on communities with tribal ownership claims, NEPCO is required to verify the ownership claims of those tribes and establish proper communication channels with them to provide technical or financial assistance to those communities according to their development needs. One of the significant development needs for such communities is creating employment opportunities for the local workforce.
ESS6	• Coordinate with the RSCN and the involved ministries to shift Abu Rukbeh Nature Reserve location to avoid the overlap between the Green Corridor and the proposed Reserve. • Add-on measures can be applied to mitigate the birds' electrocution risk. For instance, insulating materials can be fitted onto critical components of the structure in order to render those components neutral. Those materials often cover the dangerous components only. • Applying line marking tools and devices such as spheres, swinging plates, spiral vibration dampers, strips, swan flight diverters, bird flappers, aerial maker spheres, ribbons, tapes, flashing floats, and flags. These tools and devices are expected to mitigate the collision impact by making the OHTL more visible to birds during flight. However, the proper tool has to be selected carefully in order to avoid obstructions and risks to maintenance crews.
ESS7	• NEPCO is required to apply strict environmental rules throughout the operation stage to ensure that the areas surrounding the towers are well maintained in order to avoid any adverse impacts on the nomadic groups activities.
ESS10	• Establish proper communication channels with the local communities, especially those directly affected by land use restrictions, and to demonstrate the need and importance of the Project as well as the clear and fair method for compensations. • NEPCO is encouraged to provide technical and financial assistance for development projects in the underdeveloped affected areas. Creating employment opportunities will contribute to the improvement of those areas and will enhance the locals' acceptance of NEPCO's future projects. • NEPCO shall publicly release all relevant information about the Project and this audit's outcomes on their website. • NEPCO shall adhere to its stakeholder complaint procedures and respond in a timely manner to the complaints and concerns raised by the local communities.

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2 Introduction

2.1 Green Growth in Jordan

Jordan is an Arab country in the Middle East with limited natural resources. The country depends almost entirely on imported fossil fuels for its energy supply. Nearly 90% of the Jordanian energy demand is supplied by imported fossil fuels comprising approximately 20% of the Country's GDP. The energy situation has been aggravated recently due to the natural population growth coupled with the massive influx of refugees from neighboring countries resulting in an unprecedented increase of the Jordanian population to over 9 million in 2015. This rapid increase in the population places a magnificent pressure on the Country's old and deteriorating infrastructure, particularly the energy sector. The vulnerability of the energy sector has put a significant pressure on the Government of Jordan (GoJ) and the people over the past few years due to the political instability in the region and the fluctuating oil prices globally. As a result, the GoJ has realized that adopting a resilient green growth path in the energy sector as well as other priority sectors (water, waste, transport, agriculture, and tourism) is the only way forward for development. A National Green Growth Plan (NGGP) was launched in which several potential green projects were proposed. In the energy context, the GoJ has set a target of 10% renewable energy in the overall energy mix by 2020 [1].

2.2 The National Electric Power Company (NEPCO)

The National Electric Power Company (NEPCO) is a Jordanian state-owned public shareholding company and is licensed by the Energy and Minerals Regulatory Commission (EMRC) in accordance with the General Electricity Law No. 64 of the year 2002. NEPCO is responsible for dispatching electric energy from the main generating points to the supply and energy distribution companies in Jordan in addition to some large industrial consumers. NEPCO is therefore responsible for the design, construction, and operation of the national 132 kV and 400 kV transmission lines in Jordan as well as the purchase of power from producers as a single buyer. NEPCO is also responsible for the import and export of power with other neighboring countries such as Egypt and Syria. As of 2015, the installed generation capacity in Jordan is 3.8 GW, one third of which comes from the governmental sector whereas the rest is supplied by private projects. The transmission voltages in Jordan are 132 and 400 kV through around 4,600 km lines while the distribution voltages are 33 and 0.4 kV [2].

2.3 The Green Corridor Project

In view of the Jordanian NGGP, the GoJ has encouraged individuals and enterprises to invest in renewable and clean energy projects where the generated energy will be purchased by NEPCO and will be sold again to the distribution companies and bulk consumers through NEPCO's transmission network. Renewable energy projects have been commissioned under different approaches such as the direct proposal, bidding, and governmental projects. The initial target was to increase the renewable energy share from 1% in 2007 to 10% by 2020 with an estimated investment of $1.7 billion. By the end of 2018, the renewables' share was 11% of the total energy mix and is projected to double by 2021. Most of the existing and planned renewable energy projects in Jordan are located in the south due to the high solar radiation levels and wind energy potentials in this region. Those renewable energy projects ultimately serve the Jordanian goal of increasing the renewables share in the overall energy mix; however, the increase in such

projects adds more pressure on NEPCO to transmit the produced power to the load center in the middle of the country, which will overload the transmission lines and may result in short circuit current [3]. NEPCO has implemented the Green Corridor Project to cope with the increasing pressure on its transmission network, improve the reliability of supply, enhance the Country's economic resilience, and create growth opportunities in the renewable energy sector. This Project runs along the backbone of Jordan between Aqaba and Amman and the construction works are completed as of August, 2019.

2.4 Need for the environmental and social impact assessment

According to the Jordanian Environmental Law No. 6, 2017, development projects are required to conduct a comprehensive environmental impact assessment study to identify the impacts on the environment and human health. The assessment shall be conducted during the planning and design stages and shall cover the implementation, operation and decommissioning phases. Article 4 of the Law states that "No industrial, agricultural, commercial, housing or tourism project or any construction development project or any of the projects specified in Annexes 2 and 3 of these regulations may commence operations with the services relevant thereto, until it obtains the environmental approval required for this purpose from the Ministry". According to the environmental impact assessment (EIA) Regulation No. 35, 2005, all energy projects are classified as category 1 projects which are likely to have adverse impacts and a comprehensive environmental impact assessment is needed to assess and mitigate the adverse impacts. On the other hand, the World Bank set out environmental and social (E&S) framework which determines the requirements for borrowers to address the potential E&S risks and impacts associated with development projects and propose proper and realistic mitigation measures. The World Bank standards aim to support borrowers to achieve good international practice relating to E&S sustainability; assist borrowers in fulfilling their national and international E&S obligations; enhance nondiscrimination, transparency, participation, accountability, and governance; and enhance the sustainable development outcomes of projects through ongoing stakeholder engagement.

Despite the fact that the Green Corridor Project crosses mostly dry and desert lands, an investigation is required to confirm that potential impacts on local communities have been minimized and that proper mitigation measures were provided as necessary. The Project's final design and transmission lines route were selected by taking into consideration the geographical and demographic nature of the region and minimizing the need for acquiring private lands which often results in physical and economic resettlements. Most significant impacts and risks of the Green Corridor Project are anticipated during the construction stage. On the positive side, the Green Corridor Project is expected to bring several local, regional, and national benefits including but not limited to the improved electrical capacity, enhanced electricity supply, employment opportunities, and the increased economic activities regionally and nationally. Potential short-, medium-, and long-term negative impacts of such project may include resettlement of individuals or groups, impacts on existing infrastructure, impacts on land use and access to natural resources, occupational and community health and safety concerns, soil erosion, aesthetic impacts, generation of solid and liquid wastes, noise and vibration levels, water resources contamination, traffic safety concerns, emissions and air pollution, electromagnetic field (EMF) exposure and the associated health concerns, impacts on wild life habitat, and fire risks.

2.5 Objectives of the study

The main goal of this study is to assess the existing E&S management policy of the Green Corridor Project; identify any potential adverse impacts that may arise as a result of the Project activities; propose reasonable mitigation measures; and consolidate the positive impacts for future gains. An E&S audit was conducted to verify that the Project complies with the relevant Jordanian E&S legislation, World Bank E&S Framework, as well as the international conventions ratified by the Country. The specific objectives of this study are as follows:

- Review the updated E&S management policy of the Green Corridor Project.
- Identify the gaps and deficiencies in the E&S management policy against national legislation and international framework (World Bank standards).
- Define the significant negative and positive E&S impacts of the Project activities.
- Identify the potential future impacts of the Project.
- Propose proper mitigation measures to address the adverse environmental and social impacts of the Project.
- Capitalize on the positive impacts for future gains.

2.6 The study team

A team from the Water, Energy and Environment Center at the University of Jordan undertook this audit study. The team is composed of:

- Dr. Kamel K. Al Zboon: Team leader and senior E&S specialist.
- Dr. Husam A. Abu Hajar: Senior E&S researcher.
- Dr. Bashar M. Al Smadi: Senior E&S researcher.
- Dr. Khaldoun M. Shatanawi: Senior E&S researcher.

3 Legal and Institutional Framework

3.1 Introduction

An environmental and social audit study shall take into account the nature and scope of the project, potential adverse E&S impacts, timeframe for the development and implementation of the project, the borrower's capacity, and the potential mitigation measures to be implemented within an acceptable timeframe. For projects with existing facilities or activities which do not meet the E&S requirements at the time of the assessment, the borrower is required to develop an E&S commitment plan (ESCP) in which mitigation measures for identified non-compliances and gaps are developed and adopted and an implementation schedule is determined [4].

This E&S audit was conducted in accordance with the Country's national laws, regulations, and policy framework as well as the World Bank's E&S Framework and its associated standards and guidelines such as the Environment, Health, and Safety General Guidelines (EHSG) and other Good International Industry Practice (GIIP). Typically, an E&S audit study takes into consideration the variations in the Country's conditions and the national E&S action plans and studies. In many cases, the borrower may elect to implement less stringent E&S measures if the host Country's requirements in these criteria are more flexible. In such cases, the borrower is required to submit a full justification for adopting such measures such as limited technical and financial capabilities besides other constraints. The justification must demonstrate that the selected measures are consistent with the World Bank's Framework and EHSGs and are not likely to cause any adverse environmental and social impacts [4]. The applicable E&S standards in this study are presented in the sections below.

3.2 National standards

After careful review of the Jordanian laws and regulations in the E&S contexts, the following have been identified as relevant to this audit study:

- Environmental Protection Law No. 6, 2017, according to which the Ministry of Environment is the responsible authority for protecting the environment; promoting the sustainability of water, air, and land; monitoring the wellbeing of the environmental components; coordinating the national efforts in the environmental and sustainable development contexts; authorizing the activities of governmental and nongovernmental bodies from environmental perspectives; and establishing relationships with other countries in terms of environmental issues such as the international transportation of hazardous materials. Several bylaws and regulations for the protection of the different environmental components were issued by virtue of this Law including but not limited to the ecosystems, water, air, marine and coastal environments, public parks, and soil. According to the Jordanian Environmental Protection Law, the Green Corridor Project may be considered a category 1 project requiring a comprehensive environmental impact assessment.
- Renewable Energy and Energy Efficiency Law No. 13, 2012.
- Natural Resources Authority Law No. 19, 2018.
- Public Health Law No. 47, 2008.
- Civil Defense Law No. 18, 1999.

- Traffic Law No. 49, 2008.
- Labor Law No. 8, 1996.
- Organization of the Occupational Work Law No. 11, 2019.
- Air Trafficking Law No. 9, 2009.
- Antiquities Law No. 21, 1988.
- Land Acquisition Law (Decree no. 12 of 1987).
- The General Electricity Law (No. 64, 2002).

Other national regulations and instructions which were found to be relevant to this study include but not limited to:

- EIA Regulation No. 37, 2005.
- Instructions for Allowable Clearances in the Electricity Sector No. 1, 2003.
- Air Quality Protection Regulation No. 28, 2005.
- Soil Protection Regulation No. 25, 2005.
- Solid Waste Management Regulation No. 27, 2005.
- Waste Oil Handling and Management Instructions, 2003.
- Hazardous Waste Handling and Management Instructions, 2003.
- The Natural Reserves and Natural Parks Regulations No. 29, 2005.
- Regulations for the Protection of Birds and Wildlife and Rules Governing the Hunting, 2003.

3.3 Jordan international agreements

Besides the national legal framework, Jordan is a member of several international treaties, conventions and protocols which ultimately aim at protecting the global environment and mitigating the contamination of natural resources. The most relevant international treaties and conventions ratified by Jordan are:

- Paris Agreement (2015).
- The Montreal Protocol (1987).
- The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (1992).
- The United Nations Convention to Combat Desertification (1994).
- Cartagena Protocol on Bio-safety (2003).
- Convention on the Conservation of Migratory Species of Wild Animals (1983).
- Stockholm Protocol on Persistent Organic Pollutants (2001).
- Convention on Biological Diversity (1992).

- Framework Convention on Climate Change (3/21/1994).
- Convention on Biological Diversity (2/10/1994).

3.4 AFD guidelines

As NEPCO is seeking financing from the Agence Française de Développement (AFD), the AFD requires that the Green Corridor Project must meet the national E&S standards as well as the World Bank's E&S Framework, and Health and Safety Guidelines (EHSG). AFD has developed procedures to identify, prevent or mitigate E&S risks and impacts, as well as any human rights violation that could result from AFD-funded activities. The procedures aim to ensure that AFD funded projects are environmentally and socially sustainable, contribute to integrating E&S considerations into the decision-making process of all stakeholders, and provide a strong framework to manage financial and reputational risks run by AFD. AFD's financing is conditional upon the implementation of continuous and systematic assessment procedures to evaluate the E&S impacts, propose appropriate measures to avoid or reduce the negative impacts, monitor the application of such measures, and conduct a post evaluation of the effectiveness of the proposed measures.

AFD classifies projects into high, substantial, moderate, and low environmental and social risks, depending on the extent of the potential risks borne by the operation. AFD classification takes into account the direct, indirect, cumulative and induced risks, the severity of the impact, as well as the client's capacity to manage the impacts. An E&S assessment should be conducted for high and substantial risks projects according to the World Bank's E&S Framework, as well as the prevailing national E&S legislation. Furthermore, stakeholders and the affected groups engagement is of key importance at all development stages.

3.5 World Bank standards

There are several E&S risks and impacts that a development project might impose. Environmental risks are those identified in the World Bank's EHSG; community safety risks (e.g. dams); global and transboundary risks and impacts (e.g. climate change); threats to the protection, conservation, and restoration of biodiversity and natural habitat; and risks to the ecosystem services and living natural resources (e.g. fisheries and forests). Social risks, on the other hand, include risks to human security through escalation of crime, violence, or conflicts; disproportionate impact of the project on groups or individuals, particularly disadvantaged ones; prejudice or discrimination towards individuals or groups in benefiting from the development; involuntary land acquisition or restricted access to land and resources; and health and safety impacts on workers and community [4].

The sustainable development principles and aspirations of the World Bank are converted into a framework composed of E&S standards to be applied on the project level. A project in one of the partner countries must meet the following standards (which address the aforementioned E&S risks) throughout its lifecycle such that the project will be eligible for financing:

- ESS1: Assessment and Management of Environmental and Social Risks and Impacts. This Standard addresses the importance of conducting an integrated and comprehensive evaluation of the existing E&S framework of the project, and how the potential risks and impacts are managed throughout the project's lifecycle. ESS1 also calls for an effective

community engagement by disclosing important information, consultation, and feedback. To satisfy this Standard, the risks and impacts identified in the following Standards (ESS2 through ESS10) shall be carefully reviewed and the borrower needs to set objectives for avoiding, minimizing, and mitigating such risks and impacts as well as compensations in case of significant residual impacts.

- ESS2: Labor and Working Standards and Conditions.
- ESS3: Resource Efficiency, Pollution Prevention and Abatement, and Climate Related Standards.
- ESS4: Occupational and Community Health, Safety, and Security.
- ESS5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement.
- ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources and Ecosystems.
- ESS7: Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities and Vulnerable Groups.
- ESS8: Cultural Heritage.
- ESS9: Financial Intermediaries.
- ESS10: Stakeholder Engagement and Information Disclosure.

4 Project Description

4.1 Need for the project

Given the growth the Jordanian energy sector has witnessed over the last decade and the increased pressure on the transmission lines as a result of the growing renewable energy industry; it is expected that NEPCO's transmission lines will be overloaded in multiple spots in the near future. Therefore, upgrading and reinforcing the existing transmission lines is highly needed to avoid potential overloading and failure scenarios.

To cope with this increasing pressure, NEPCO has implemented the Green Corridor Project to reinforce Jordan's high voltage electricity transmission network, improve the reliability of supply, enhance the Country's resilience, and create economic growth opportunities in the renewable energy sector in the desert areas. The Green Corridor runs along the backbone of Jordan between Aqaba and Amman and the construction works of the substations and the overhead transmission lines (OHTL) are completed as of August, 2019. This project also aims at increasing the renewable energy share in the Jordanian energy mix; thus, contributing to the attainment of the nationally determined contributions in the international conventions and treaties for combating climate change [3].

4.2 Project components

The Green Corridor overhead lines (the project), as shown in Figure 4.1~~Figure 4.1~~, are divided into two parts as follows:

- LOT 1: Twin bundle double circuit 400 kV overhead lines from New Ma'an substation to Qatrana substation. The construction of LOT 1 was contracted to KEC International Limited early 2017 and the works commenced in April 2017 and ended in January, 2019. The activities carried out by the contractor include technical submissions and approvals for different elements such as the conductors, insulators, optical ground wires (OPGW), hardware, joint boxes, space dampers, earthing materials, spheres, and tower lights; towers design, structural drawings, and testing; procurement; civil works including survey, access preparation, soil investigation, excavation works, foundations, earthing, backfilling, and tower erection; stringing and sagging; and testing and commissioning.
- LOT 2: Single conductor double circuit 132 kV overhead lines from Qatrana substation to Queen Alia International Airport (QAIA) substation. The construction of LOT 2 was contracted to Electromontaj S.A. early 2017 and the works commenced in March, 2017 and ended in February, 2019. The activities carried out by the contractor include preliminary works such as mobilization, soil investigation, profiles design and planning, and route handling over; design and engineering for the conductors, OPGW, insulators, hardware, towers, and foundations; tests on the conductors, OPGW, insulators, hardware, towers, and foundations; manufacturing and delivery; civil works including temporary access roads and foundations construction; tower assembly, painting, erection, insulator sets installation, conductors stringing, lighting systems, and OPGW and spheres installation; and testing and commissioning.

Figure 4.1: The Green Corridor Project (the green line is LOT 1 and the red line is LOT 2)

4.3 Location

The Green Corridor OHTL extend over areas in Amman, Karak, Tafilah, and Ma'an governorates (Figure 4.1~~Figure 4.1~~). The OHTL pass through mostly dry and desert lands with only 5% cropland and herbaceous cover; thus, most of the Project's influenced areas are of low E&S sensitivities and it appears from aerial photographs that the OHTL are at sufficient distances from settlements or villages in most locations. The Green Corridor runs close or in parallel to several inhibited towns including Al-Jiza (to the west), Arainba (to the east), Al-Watheeri (to the east), Al-Zumailya (to the west), Damkhi (to the west), Qatrana (to the west), Al-Sultani (to the west), Al-Hasa (to the west), Jurf Al-Darawish (to the east), and Al-Hussainyeh (to the east).

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5 Impact Assessment of the Project

5.1 Methodology

5.1.1 Data collection

The Consultant's team conducted a comprehensive review of open-access relevant documents available on the internet prior to the kickoff meeting. These documents included prior EIA reports on similar projects, official reports on biodiversity and migratory birds in the Project's influenced areas, as well as national and international relevant E&S standards. The Consultant has requested a list of documents from the Promotor (NEPCO) by email on July 21, 2019. The requested documents were listed in the Terms of Reference for this Project to be supplied by the Promotor to facilitate the timely implementation of the Project's tasks. Most of the requested documents were delivered on July 29, 2019 and some documents were received by email on August 7, 2019. Besides the Project's main activities and components, the Consultant collected information and data regarding the Project's associated facilities (in accordance with the World Bank's criteria for projects' associated facilities) to be included in the key informants interviews. However, the extent of the associated facilities audit is restricted by the extent of control NEPCO exercises over the associated facilities.

5.1.2 Site survey

A site visit along the Green Corridor OHTL was carried out to identify any visible environmental, health, and social risks as well as any visual intrusions. Prior to the visit, the Consultant team located areas with potential impacts such as residential areas, croplands, and commercial areas. Google Earth offers the "Historical Imagery" option which provides aerial photos of the selected location over a certain period of time. It was not intended to obtain decisive evidences using Google Earth; instead, the Consultant's team utilized Google Earth to provide useful hints to narrow down the investigation area. The site visits were carried out on August 21, 2019 (LOT 2) and on August 29, 2019 (LOT 1). The team used a 4-wheel vehicle to travel over dirt roads in areas adjacent to the OHTL. The team made stops in the inhibited areas along the route and interviewed people to inquire on their perspective on the Green Corridor Project. Those areas included Al-Jiza, Arainba, Al-Watheeri, Khan Zabib, Um Al-Rasas, Al-Damki, Qatrana, Abu Rukbeh Nature Reserve proposed location, Al-Hasa, Jurf Al Daraweesh, and Al-Hussainya.

5.1.3 Stakeholder Engagement

The Consultant's team interviewed people from the Project's influenced areas during the site survey. Those people were either contacted by phone prior to the visit or selected randomly during the visit. The purpose of the interviews was to collect data and information regarding the local communities' perspectives on the E&S impacts of the Green Corridor Project and the extent of the stakeholder engagement and disclosure of information NEPCO has practiced throughout the Project's lifecycle. The questions were open-ended where respondents were given the opportunity to provide their full perspective on the addressed impacts and risks. The questions were selected to cover the World Bank standards as shown in Table 5.1~~Table 5.1~~. It is worthy to mention that some standards were not covered by the interview questions (e.g. ESS2

and ESS8); as these standards are more relevant to NEPCO and the contractors. The detailed list of the interview questions to people from the local communities is presented in Appendix A and summaries of the key findings of the interviews are presented in Appendix B.

Table 5.1: Summary of interview questions to people from the local communities

Item	Number of questions
General questions on the Project	1
ESS3	2
ESS4	1
ESS5	6
ESS6	1
ESS7	1
ESS10	2
Positive impacts	3
Total	17

To complement the E&S analysis of the Green Corridor Project, the Consultant reviewed NEPCO and the contractors' documents and reports including the E&S responsibility policies, employment terms and conditions, health and safety procedures and guidelines, risk assessment procedures, and emergency plans. The Consultant also interviewed NEPCO's personnel including transmission lines engineers and quality control and safety supervisors to collect further information regarding the operation stage of the Green Corridor Project. The questions were selected to cover the World Bank standards as shown in Table 5.2~~Table 5.2~~. The detailed list of the interview questions to NEPCO's personnel is presented in Appendix A.

Table 5.2: Summary of interview questions to NEPCO's personnel

Item	Number of questions
General questions on the Project	4
ESS2	10
ESS3	11
ESS4	2
ESS5	1
ESS6	1
ESS8	2
ESS10	1
Total	32

5.1.4 Impact assessment

The significance of an impact with respect to the baseline conditions can be determined based on the magnitude of impact and receptor sensitivity. The magnitude can be classified as major, moderate, minor, or negligible based on the spatial extent of the impact (within the site, regional, national, or international); the duration of the impact; reversibility; and the interaction with other proposed developments within the project's geographic area. The following rubrics can be used to determine the magnitude of an impact:

- Major:
  - Regional, national, or international impacts.
  - Irreversible, permanent, or cumulative impacts.
  - Fundamental changes to the prevailing conditions.
  - Requiring significant intervention to restore the baseline conditions.
- Moderate:
  - Local impacts beyond the site boundaries.
  - Temporary impacts with minor permanent impacts.
  - Non-cumulative and reversible with minor irreversible impacts.
  - Partial change to the prevailing conditions.
- Minor:
  - Only within the site boundaries.
  - Duration is not relevant.
  - Impacts are reversible and change is not cumulative.

- Negligible:
    - No loss or alteration of the prevailing conditions.

Sensitive receptors are habitats, species, residential areas, hospitals or other ecological and human receptors. Examples of sensitive receptors include biodiversity protection areas (or reserves), important bird habitat areas, important wildlife habitat areas, important plant areas, wetlands, groundwater, marine environment, surface water, natural drainage channels, areas for native or migratory species, and residential areas. The degree of receptor sensitivity can be determined based on the following rubrics:

- High:
    - Important and rare receptors internationally with limited to no-potential substitution.
    - Receptor reached the carrying capacity; thus, any additional impact will likely result in excessive damages.
    - Highly vulnerable locations, populations, or communities.
- Moderate:
    - Important and rare on a national scale with limited potential for substitution.
    - Receptor is close to the carrying capacity.
    - Particularly vulnerable locations, populations, or communities.
- Low:
    - Important and rare on a regional scale with limited potential for substitution.
    - Receptor is impacted but it is not near its carrying capacity.
    - Relatively vulnerable locations, populations, or communities.
- Negligible:
    - Receptor is not impacted or has a high carrying capacity.
    - Locations, populations, or communities with low vulnerability.

The overall impact can then be determined based on the combination of the impact magnitude and receptor sensitivity as shown in the matrix in Table 5.3~~Table 5.3~~.

Table 5.3: Overall impact assessment matrix

Magnitude	Receptor sensitivity			
	High	Moderate	Low	Negligible
Major	Major	Major	Moderate	Minor
Moderate	Major	Moderate	Minor	Not significant
Minor	Moderate	Minor	Minor	Not significant
Negligible	Minor	Not significant	Not significant	Not significant

The overall impacts identified in the above matrix have implications on the mitigation measures needed. For instance, mitigation measures are unlikely to eliminate the major impacts while some of the moderate impacts (typically on the local scale) can be eliminated with proper design and mitigation measures. Minor impacts can be reversed considerably with proper mitigation measures whereas no mitigation measures are required for the "Not significant" category.

5.2 The impacted areas

The Green Corridor's 132 kV OHTL leave Queen Alia International Airport (QAIA) substation towards Qatrana substation. The lines travel in parallel to the Desert Highway and the towers locations were selected such that the crossing of populated areas is avoided or minimized. However, there are several areas where the OHTL cross residential areas. The most affected areas are described below:

- Al-Jiza Town, Amman

Al Jiza Town shown in Figure 5.1~~Figure 5.1~~ is located 1 km to the southwest of QAIA substation and the 132 kV OHTL run in close proximity to the residential units. The distance between the OHTL and some of the buildings is less than 15 m (the southwestern point). Hence, this might be concerning to people living in those units (assuming they are inhibited) due to the electromagnetic field exposure. Additionally, a considerable reduction in the economic value of the lands through which the OHTL pass is expected. The OHTL pass through mostly flat areas with few hills in Al-Jiza and the soil is clay. The OHTL cross some privately owned lands (e.g. land No. 1889, Al-Hujrah Basin) and run in close proximity to some houses between 31° 42' 29.67" N, 35° 56' 31.97" E and 31° 41' 42.06" N, 35° 56' 27.54" E. There are desert plants (shrubs) with very low density, in addition to a small farm (31° 41' 54.13" N, 35° 56' 14.15" E), and few fodder crops (mainly barley). In summary, Al Jiza Town is one of the Green Corridor Project's affected areas and the impacts in this Town are anticipated to be moderate. The Consultant team made several stops in this Town and interviewed people from residential and commercial areas. Selected photographs for Al-Jiza Town from the site visit are presented in Figure 5.2~~Figure 5.2~~. More detailed photographs and discussions are provided in Appendix B (Site Survey Report).

Figure 5.1: Al Jiza Town

Figure 5.2: Selected photographs from Al-Jiza

- Arainbah Town, Amman

This is a flat area with clay cultivated soil where the Green Corridor's OHTL pass over privately owned lands and cultivated areas in addition to nomadic people tents. Moreover, there are groundwater-irrigated fruit trees and seasonal crops farms. Selected photographs for Arainba Town from the site visit are presented in Figure 5.3~~Figure 5.3~~. More detailed photographs and discussions are provided in Appendix B (Site Survey Report).

Figure 5.3: Selected photographs from Arainba

- Al-Watheeri, Amman

This is a small town with a rocky terrain, limited cultivated cover (irrigated vegetables) to the north, and few scattered built houses. The Green Corridor's OHTL pass near populated areas and over privately-owned lands. Several people from this Town reported that the OHTL pass in the middle of their lands and it was observed during the site visit that the OHTL are at close distance to some houses in this town. Figure 5.4~~Figure 5.4~~ shows a house in Al-Watheeri. More detailed discussions are provided in Appendix B (Site Survey Report).

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Figure 5.4: House in Al-Watheeri

- Dhaba'a, Amman

Dhaba'a is a small village located to the east of the OHTL, with rocky hills and very limited vegetation cover. The OHTL pass through uninhabited dry lands to the east of the Jordanian Carbonate Factory at a 50 m distance and then crosses a deep valley at the point (31° 37' 3.47" N, 35° 58' 25.97" E). Selected photographs for Dhaba'a Town from the site visit are presented in Figure 5.5~~Figure 5.5~~. More detailed photographs and discussions are provided in Appendix B (Site Survey Report).

- Khan Zabib, Amman

This is a small town where the minimum distance between the OHTL and the residential units is around 50 m. This town has low vegetation cover density but there is an olive and maize farmland 21 km southeast of QAIA substation which has an approximate area of 9,000 m^2. The Green Corridor OHTL as well as the existing OHTL cross through this farmland as shown in Figure 5.6~~Figure 5.6~~. More detailed photographs and discussions are provided in Appendix B (Site Survey Report).

Figure 5.5: Dhaba'a

Figure 5.6: Farmland in Khan Zabib (near Um Al-Rasas Interchange)

- Qatrana, Al-Karak

The 132 kV OHTL then travels parallel to the Desert Highway through dry lands with no residential or commercial activities. The closest distance to the Desert Highway is 150 m. The next populated area that the OHTL run in proximity to is Qatrana Town, in which the lands are residential, commercial, and palm and vegetation agricultural lands (Figure 5.7~~Figure 5.7~~). The OHTL is at 200 m or greater distances from the residential units. However, The OHTL cross privately owned lands and croplands.

Figure 5.7: Qatrana Town

- Al-Sultani, Al-Karak

This is a populated area that is located approximately 13 km to the south of Qatrana Substation. The OHTL is at a distance of 900 m to the west of this Town (Figure 5.8~~Figure 5.8~~). It is therefore expected that the OHTL will not have any direct impact on this Town. There are scattered croplands along the Desert Highway but these lands are located at distances greater than 200 m from the 400 kV OHTL; thus, there will be no direct impact of the Green Corridor on these lands. More detailed discussion is provided in Appendix B (Site Survey Report).

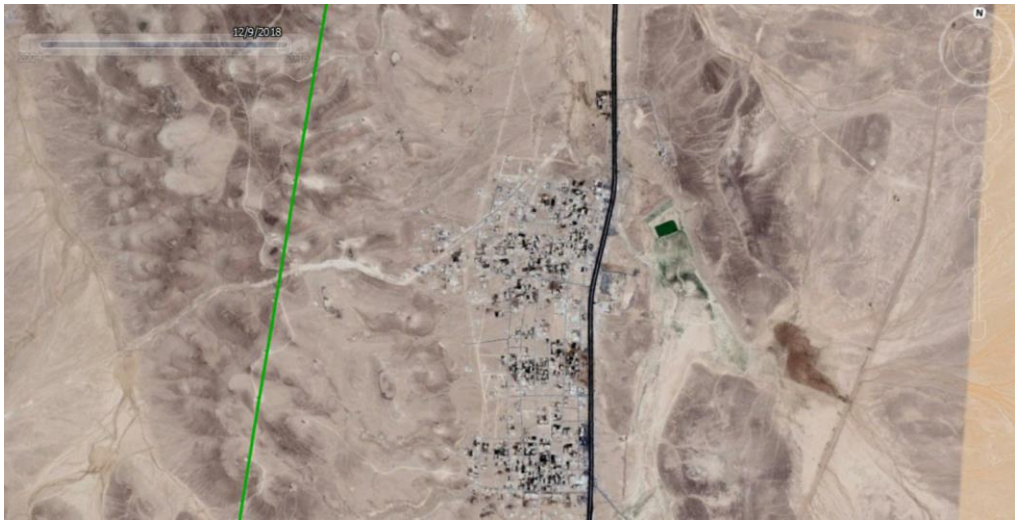


Figure 5.8: Al-Sultani Town

- Abu Rukbeh Proposed Nature Reserve, Al-Karak

The Consultant has acquired the coordinates of the proposed Abu Rukbeh Nature Reserve site from the Royal Society for the Conservation of Nature (RSCN) prior to the site survey. The corners based on the provided coordinates are depicted in Figure 5.9~~Figure 5.9~~. The proposed Reserve has a total area of 327 km^2 (based on the provided coordinates) and is located to the south of Qatrana substation and to the west of Al-Sultani Town. The Reserve area is composed of chains of hills and valleys with altitudes ranging from 700 to 1,060 m above mean sea level. It is clear that the Green Corridor crosses the proposed Reserve for almost 19 km, but it can be observed also that the entire Al-Sultani Town is within the Reserve's boundaries and that the Desert Highway crosses the southeastern end of the Reserve. A selected photograph for Abu Rukbeh proposed location from the site visit is presented in Figure 5.10~~Figure 5.10~~. More detailed photographs and discussions are provided in Appendix B (Site Survey Report).

Figure 5.9: Location of the proposed Abu Rukbeh Nature Reserve (yellow lines: Reserve borders; green line: 400 kV OHTL)

Figure 5.10: Abu Rukbeh Nature Reserve location

- Al Hasa, Tafilah

The distance between this town and the OHTL is more than 2 km. The 400 kV OHTL cross mostly dry lands as shown in Figure 5.11~~Figure 5.11~~.

Figure 5.11: Al-Hasa Town

- Jurf Al Daraweesh, Tafilah

The OHTL continues in desert and empty lands but then intersects the Desert Highway in Jurf Al Daraweesh at the point shown in Figure 5.12~~Figure 5.12~~. The distance between the OHTL and the nearest house is about 400 m.

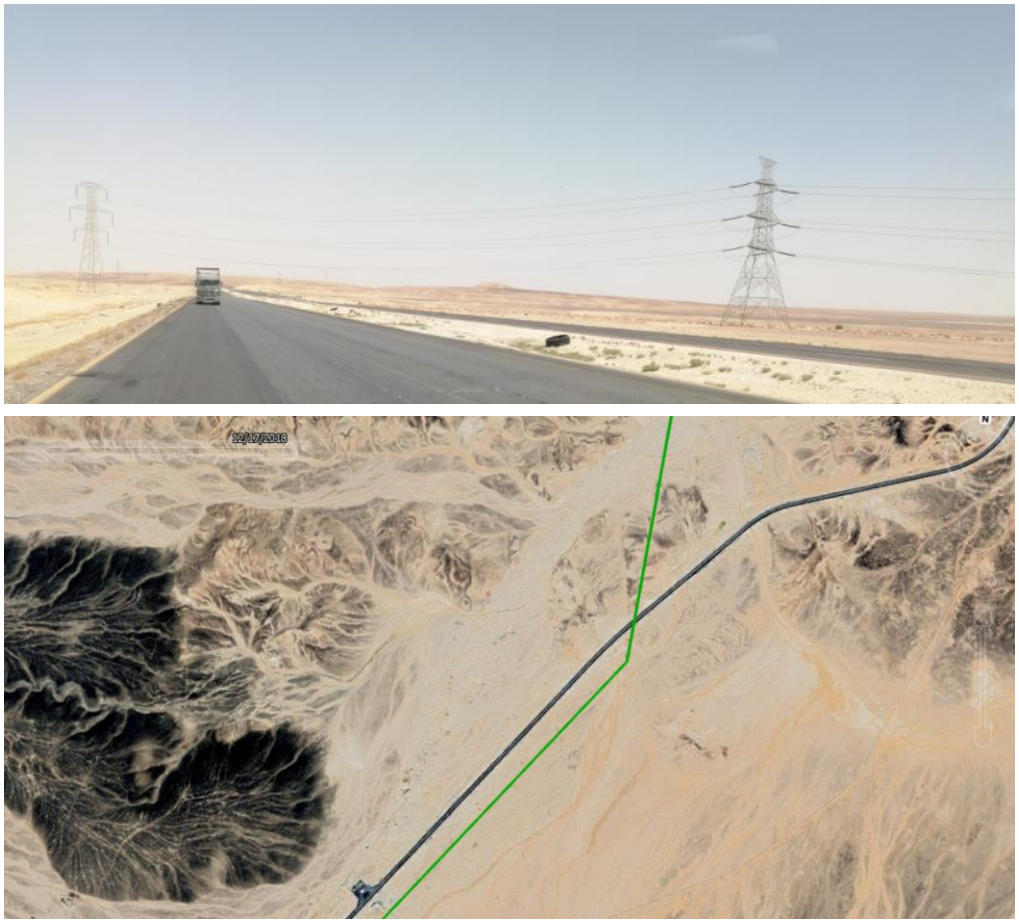


Figure 5.12: Jurf Al-Daraweesh

- Al-Husainya, Ma'an

The next populated area in the vicinity of the 400 kV OHTL is Al-Husainya, Ma'an Governorate. The minimum distance between this Town's boundaries and the OHTL is 600 m; however, the distance between the OHTL and some croplands is as low as 50 m. Selected photographs for Al-Husainya from the site visit are presented in Figure 5.13~~Figure 5.13~~. More detailed photographs and discussions are provided in Appendix B (Site Survey Report).

Figure 5.13: Al-Husainya

- Al-Hashemeyeh, Ma’an

Al-Hashemeyeh is the next populated Town but the 400 kV OHTL is 1.5 km far from the Town’s boundaries.

6 Environmental and Social Impacts of the Green Corridor Project

6.1 Overview

There are several E&S risks associated with the construction and operation of the Green Corridor Project. These risks vary in magnitude, location, extent, timing, and duration. Such risks can be identified by detailed impact prediction methods, key informant interviews, and stakeholder engagement and consultations. A summary of the potential adverse impacts of the Green Corridor Project is as follows:

- Occupational health and safety risks during the regular maintenance activities such as the physical injuries from tools and equipment, dust inhalation, electrocution, fires, etc.
- Solid and liquid wastes including wastewater, packaging materials, unwanted pieces and materials, oil spills, metal containers, hazardous waste, etc.
- Noise and vibration.
- Electromagnetic field exposure.
- Impacts on fauna, avifauna, and flora.
- Impacts on wildlife habitat.
- Impacts on communities and individuals, particularly vulnerable groups (e.g. non-title holders, refugees).

According to the World Bank's E&S Framework, a comprehensive E&S audit is necessary to evaluate the sustainability of the proposed project and its associated facilities throughout the project's lifecycle and to provide proper mitigation measures to inform decision makers. The Consultant has conducted a comprehensive E&S audit in accordance with the Jordanian laws and regulations, and the World Bank's E&S Framework. There are 10 E&S standards (ESSs) in the World Bank's Framework. The first standard (ESS1) addresses the need for the comprehensive E&S impact assessment and management of potential risks. This ESS aims to utilize nationally available regulations, procedures, laws, institutions, and systems whenever applicable to characterize the E&S impacts and risk of projects in accordance with the national legal framework and the World Bank and other relevant standards and guidelines; develop a mitigation hierarchy approach for risks avoidance, minimization to acceptable levels, or compensation in case of unavoidable residual impacts; engage stakeholders in the different stages of the assessment and in accordance with ESS10; conduct frequent monitoring as necessary to ensure the requirements of the ESS's are met; and capitalize on the potential positive impacts of the project [4].

To accomplish the tasks in ESS1, there are several tools that can be deployed as a stand-alone or in combination with other tools including the environmental and social impact assessment (ESIA), environmental and social audit, hazard or risk assessment, cumulative impact assessment, environmental and social management framework (ESMF), regional ESIA, sectoral ESIA, strategic environmental and social assessment (SESA), in addition to other tools which are dependent on the specific features of the project such the resettlement plan, livelihood restoration plan, indigenous peoples plan, cultural heritage management plan, and biodiversity action plan. [4]. In this study, an environmental and social audit was carried out to characterize the E&S impacts of the Green Corridor Project.

In the sections below, the E&S impacts of the Green Corridor Project are analyzed against the relevant World Bank E&S Standards.

6.2 ESS2: Labor and Working Standards and Conditions

This Standard is concerned with the employment and income generation opportunities as a result of the project, and promoting healthy worker-management relationships and safe working conditions without discrimination and inequalities. ESS2 applies to direct labor, contractor labor, primary suppliers labor, and community labor with the aim to protect all workers' categories and prevent forced and child labor [4].

This ESS has been assessed by reviewing the relevant documents and policies provided by NEPCO and the Green Corridor Project contractors including the Equal Opportunities Policy, Social Responsibility Policy, Health and Safety manuals, Health, Safety and Welfare Policies, and Recruitment Protocols. An interview with relevant NEPCO employees was conducted to collect further information and data that are nonexistent in the previously mentioned reports and policies. Additionally, the Chief of the Civil Defense Department at Qatrana was interviewed and he was asked about reports of incidents or accidents during the construction stage of the Green Corridor Project.

It was concluded that NEPCO and the contractors alike successfully address ESS2. Employees are provided with access to the basic requirements and necessary training. Employment procedures are transparent and fair and in accordance with the Jordanian Labor Law. Additionally, several people from the local communities have stated that KEC International (LOT 1 contractor) hired many people from their communities. However, none was hired by Electromontaj S.A. (LOT 2 contractor) from the local communities.

NEPCO and the contractors have emergency plans to facilitate the quick response to workplace incidents and mitigate the injuries and adverse consequences. As a result, there were no records of incidents or accidents during the construction stage as per the contractors' reports, Qatrana's Civil Department Chief's statement, and the interviews with people from the local communities. It is likely that a safe working environment will prevail during the operation stage should NEPCO strictly adhere to its health and safety procedures. In fact, NEPCO's field workers must attend extensive training courses at the Company's Training Center for two years prior to enrollment in field works. Similarly, both contractors have professional training programs for their workers prior to engagement in site works. There are detailed health and safety procedures addressing all potential hazards associated with the work activities and providing monitoring and control measures to eliminate and minimize the associated risks. Also, there exist written labor procedures to define how project workers are managed, employment terms and conditions, job's description, and employee's rights and in accordance with the Jordanian Labor Law.

In summary, it can be concluded that ESS2 has been fully met by NEPCO and the contractors and risks associated with the labor and working standards and conditions are not significant. The key findings related to ESS2 for NEPCO and the contractors based on the documents and policies review as well as the site visits and interviews are summarized in Appendix C.

6.3 ESS3: Resource Efficiency, Pollution Prevention and Abatement, and Climate Related Standards

ESS3's main concern is that urbanization and economic activities often lead to pollution and consumption of finite resources; thus, threatening people, environment, and ecosystem services locally or globally. ESS3 aims to promote the sustainable consumption of resources including raw materials, energy, and water; minimize or avoid adverse impacts on human health and the environment; minimize or avoid project emissions, generation of waste, and hazardous waste; and manage the risks associated with pesticide use [4]. This ESS was assessed by reviewing the environmental policies and relevant documents by NEPCO and the contractors. NEPCO employees were then interviewed to collect further information and data on the operational activities of the Green Corridor Project. Additionally, local residents in the Project's influenced areas were interviewed during the site visits to collect further information on the environmental commitment of NEPCO and the contractors.

The most significant environmental issues of the Green Corridor Project pertaining to ESS3 are waste, emissions, and noise. These can impact different receptors such as groundwater, surface water, soil, air, and residential areas.

Waste can entail any byproduct of the construction activities such as earth materials, steel trimmings, metals, wood, concrete spills, cutoff cables, sand, gravel, and everyday garbage. Additionally, hazardous materials such as spent oil and waste from conductors and insulators can be generated during the operation stage. Solid wastes were often accumulated beside the OHTL route and were collected and disposed of frequently during the construction stage. Based on the inspection of the towers locations and interviews with people from the influenced areas, the contractors were fully committed to the safe management and disposal of waste and there was no visual evidence of waste accumulation at the time of the site visit. Also, all interviewees confirmed that there were no incidents of waste spillage during the construction stage.

There are no surface water bodies in the vicinity of the Green Corridor Project. Depths of groundwater along the Green Corridor Project are relatively high (>30 m). However, there are very few aquifers between Al-Karak and Tafilah where the depth to water table is below 10 m [6]. Thus, the sensitivity of groundwater is considered moderate; however, the construction works are temporary, and there was no evidence of contamination and spillage during the construction stage; as a result, the overall impact of waste accumulation during construction on groundwater is considered not significant. A major impact on soil contamination can be expected if hazardous substances such as spent oil are not contained and collected properly. However, there was no evidence based on the submitted reports by NEPCO and the contractors that there were any major spillage events during the construction stage. Hence, the soil contamination impacts during construction are not significant. Other construction activities which could have an impact on soil and groundwater include excavation, backfilling, and compaction. Such activities may increase soil erosion and result in soil and groundwater contamination. These activities are temporary during the construction stage and their impact on soil and groundwater is considered minor. Waste generated during the operation stage often include materials that are left over after the maintenance and replacement activities such as waste cables (some may be covered with PVC insulators), scrap fittings, insulators, conductors, cross arms, and everyday garbage. Such materials are inert and pose little to no risk if handled and disposed properly or ultimately recycled. However, waste cables covered with PVC insulators may be of high risk if burned due to the potential carcinogenic emissions. NEPCO personnel confirmed that waste materials

generated during inspection and maintenance activities are collected immediately and stored in special warehouses for further sorting and recycling. Unusable and unrecyclable nonhazardous materials are disposed of in landfills and designated dumpsites and waste burning is strictly prohibited. As a result, the waste impacts on groundwater, soil, and air during the operation stage are not significant.

Noise originates from activities related to construction equipment operation, hammering and drilling works, and the traffic associated with the Project. The conventional equipment used in the construction are bulldozers, road graders, heavy trucks, backhoes, and cranes. These equipment and their associated activities would generate noise that is higher than the background noise levels; however, due to the large distance to populated areas in most of the Project areas, and due to the fact that such noise is temporary, the noise impact during construction is considered minor. The noise impact can be considered major for construction if not monitored and managed properly (exposure times, personal protective gear); however, both contractors provided the workers with the necessary safety gear as per the reviewed documents. According to interviews with people from the Project's influenced areas, the noise was not significant during the construction stage and it was temporary and limited inside the workplace. During the operation stage, an audible noise can be generated due to the corona effect under rainy and foggy weather conditions. The magnitude of noise depends on the voltage, line configuration, altitude, and the number of transmission lines. The corona noise is of concern for high voltages (400 – 800 kV). NEPCO has conducted a noise assessment for several 132 kV and 400 kV substations in 2019. It was found that the noise levels at the substations' gates ranged from 50 – 69 dBA. These values are higher than the Jordanian noise threshold in urban residential areas (day: 60 dBA, night: 50 dBA). It is worthy to mention that the ground level noise underneath the OHTL is expected to be considerably lower than those values witnessed at the substations' gates due to the vertical distance as well as the horizontal clearance between the lines and the nearest receptor. Furthermore, the Green Corridor's 400 kV OHTL, which is expected to produce the high noise levels compared to the 132 kV OHTL, pass through bare and unpopulated lands and the OHTL are at relatively large distances from populated areas. Nevertheless, it is necessary to inspect the Green Corridor at points where the OHTL are in close proximity to residential units. The Green Corridor Project is not in the operation stage yet, so no noise complaints were recorded yet. Nevertheless, NEPCO's personnel reported that they occasionally receive complaints from residents all over the country regarding the high noise levels near the OHTL (of other projects) and they respond promptly by sending maintenance crews to inspect and wash the insulators and this has proven to be an effective solution. In summary, the noise impacts during construction are minor while operation stage impacts are moderate at locations where the OHTL run in close proximity to residential units.

Several sources of air emissions are present throughout the construction stage such as the excavation, filling, loading, transport, operation of vehicles on dirt roads, and unloading of earth materials which may result in the suspension of dust and fine suspended particles in the ambient air. Large dust particles (> 30 microns) are the predominant proportion in the construction works dust and are often deposited within 100-200 m of the work area. Smaller particles are likely to travel up to 500 m distance from the work area. Particle deposition rate is primarily a function of the meteorological conditions during the construction time, moisture content of the soil, and the construction activity. Given the lower sensitivity of the ambient air environment, and the temporary earthworks required for the construction of towers, dust generation during the construction stage is of minor impact. This was in fact verified by interviewing local residents

from the Project's influenced areas who indicated that dust generation was not significant during the construction stage and was only temporary. During operation, dust generation will only be limited to vehicles travelling over undeveloped dirt roads towards the towers for inspection and maintenance activities. Since such activities are temporary with negligible magnitude, the dust generation impact during operation is not significant.

In addition to the particulate matter suspension, air emissions result from exhaust emissions from machinery and vehicles, and the degree of this pollution depends on the number and types of such machinery and vehicles, efficiency of engines, and meteorological conditions [7]. Gaseous emissions from such processes include nitrogen oxides, volatile organic compounds, sulfur oxides, and carbon monoxide. Similar to the particulate matter, the extent of air emissions during the construction stage cannot be assessed accurately by the Consultant due to the fact that the construction activities of the Green Corridor Project are completed. However, given the fact that the construction works were conducted over 21 months, the impact of gaseous emissions was temporary. Furthermore, the works were conducted sequentially over the linear distance of the Green Corridor, which means that the gaseous pollutants will be dispersed over a wide area leaving minor impacts. Thus, the impact of gaseous emissions during the construction stage is minor. During operation, transmission of electricity through high voltage OHTLs may result in minor generation of ozone and nitrogen oxide under humid conditions due to the corona effect. These gases are often dispersed depending on the wind speed and direction and will dissipate rapidly leaving little to no impacts. As a result, it can be concluded that the operation stage's gaseous emissions impact is not significant.

In summary, the pollution impacts on the different receptors are not significant or minor during the construction and operation stages except the noise impact during the operation stage which is anticipated to be of moderate impact, particularly where the distance between the OHTL and the residential units is short. A summary of the key findings pertaining to ESS3 through interviews with NEPCO's personnel and the review of the relevant environmental policies and reports by the contractors is presented in Appendix D.

6.4 ESS4: Occupational and Community Health, Safety, and Security

This Standard recognizes that the project's infrastructure, equipment, and activities may pose incremental risks to the community. ESS4 aims to identity health and safety risks on communities such as hazardous materials, road safety, traffic risks, and diseases caused by the project over its lifecycle and avoid or minimize the exposure of the community to these risks. The health and safety risks on affected communities shall be identified and proper mitigation measures be proposed. This shall take into consideration accidents or natural hazards such as the safety of the infrastructure and equipment, safety of services, traffic and road safety, exposure to health risks (e.g. waterborne, water related, and vector-borne diseases), and emergency preparedness and response (risk hazard assessment) [4].

The most significant concerns pertaining to this Standard are electromagnetic field (EMF) exposure, traffic accidents, fire risks, electrocution, and falling risks. This ESS was assessed by reviewing the environmental policies, health and safety manuals, and emergency plans of the contractors and NEPCO as well as interviewing NEPCO's personnel. Furthermore, people from the local communities were interviewed during the site visits regarding accidents and safety

concerns during the construction stage of the Green Corridor Project, amongst the interviewees was the Qatrana's Civil Defense Department Chief.

Most of the Green Corridor's impacts on the occupational and community health are minor. In fact, all interviewees from the local communities complemented the contractors and NEPCO for the safety measures undertaken throughout the construction stage. Qatrana's Civil Defense Department Chief confirmed that there were no reports of incidents or accidents during the construction stage. The design of the towers and OHTL with respect to the internal and external clearances as well as the swing was carried out in accordance with the international standards to minimize electrocution and fire risks. Moreover, NEPCO's manuals and procedures for the operation and maintenance of OHTL clearly address fire, electrocution, and falling risks and presents precautionary and safety measures to avoid and minimize such risks. The construction and installation works may have had an impact on the traffic during peak construction activities. However, such impact could easily be minimized by proper traffic monitoring and regulation as well as precautionary signage. NEPCO and the contractors have specified regulations regarding driving in the workplace, training, and maintenance of equipment. Nevertheless, it was observed during the site survey that the bottom of the towers was not well protected making them easily accessible by children in particular, and many of the local interviewees expressed their concerns that the towers setup is not safe against climbing (Figure 6.1~~Figure 6.1~~). Hence, the falling and injury risk is major which requires proper mitigation measures.

Another significant community health and safety concern is the EMF exposure, especially in those locations were the OHTL run in very close proximity to houses and residential areas. Many people along the 132 kV OHTL (LOT 2) have exhibited their concerns regarding the risks of EMF exposure. With respect to EMF exposure, the World Bank EHSG state that the evidence of adverse health effects from exposure to transmission lines EMF is not strong; however, EMF exposure is concerning and it is recommended to maintain a certain clearance from residential units. The national standard for the safe distance from power lines (Electricity Law No. 64, 2002) states that the minimum horizontal distance from 132 kV OHTL is 4.6 while it is 5 m for 400 kV OHTL. The right of way (RoW) for the 132 kV and the 400 kV OHTL satisfies the minimum clearance in most locations such that the EMF exposure risk is not significant. NEPCO has conducted a study in 2012 to evaluate the EMF levels near 400 kV double circuit OHTL and it was found that the recorded values are significantly below the International Commission on Non-Ionizing Radiation Protection (ICNIRP) limits. There are few locations along LOT 2 which might be of concern due to the short distance to the houses and residential units; however, it is not expected that the EMF levels are going to exceed the ICNIRP limits due to the lower voltage (132 kV). Example of the residential units where the distance to the 132 kV OHTL is less than 15 m is shown in Figure 6.2~~Figure 6.2~~ (Al-Jiza Town). The consultant stopped by this house and interviewed the owners who exhibited their concerns regarding the potential health impacts of the newly constructed OHTL. They stated that the OHTL will also limit their ability to add more stories. In fact, adding more stories will minimize the vertical distance between the structure and the lines; thus, imposing health risks to potential future residents. Another example in Arainba is shown in Figure 6.3~~Figure 6.3~~. It is worth mentioning that the house shown in Figure 6.3~~Figure 6.3~~ is newly constructed and the consultant stopped by but there was no one present at the time of the visit. The 400 kV OHTL pass through dry and bare lands and the distance between the OHTL and the residential units is considerably higher than the national standard. A detailed list of the affected houses identified during the site survey is presented in Appendix B.

In summary, the impacts pertaining to ESS4 during the construction stage are not significant or minor. The impacts related to ESS4 during the operation stage are major for towers climbing and falling risk, moderate for the EMF exposure in locations where the distance between the towers and the residential units is below 15 m, and minor to not significant for other risks associated with ESS4.

Figure 6.1: Bottom of the tower is not protected against climbing

Figure 6.2: OHTL in close proximity to a house in Al-Jiza

Figure 6.3: OHTL in close proximity to a house in Arainba

6.5 ESS5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement

ESS5 recognizes the negative impacts caused by project related land acquisition and land use restrictions on the affected communities. Land acquisition is a term used to describe all methods to obtain a land for project purposes including outright purchase, expropriation of property, access rights acquisition, acquisition of unoccupied or unutilized land (whether the land is being used by its owner for income or livelihood purposes or not), repossession of public land being occupied or used by individuals or households, project activities rendering the land unusable, inaccessible, or submerged. Land use restriction refers to prohibitions or limitations on the agricultural, residential, or commercial use of lands as a result of project activities and can extend to access restrictions to designated parks, protected areas, common property resources, and safety zones [4].

Land acquisition and land use restrictions may result in what is called the "involuntary resettlement" which can either be physical displacement, economic displacement, or both, and people do not have the rights to refuse such displacements. Physical displacement is when people are relocated due to land loss while economic displacement occurs as a result of income source or livelihood means loss. Due to the fact the involuntary displacements often cause severe socioeconomic and environmental risks, this Standard aims to avoid or minimize forced eviction; mitigate the adverse socioeconomic impacts of land acquisition and land use restrictions through timely compensation and assistance to people in restoring and improving their livelihoods and living standards to levels prevailing prior to the project commencement; provide adequate housing and access to facilities and services to physically displaced vulnerable or poor groups; and plan and execute resettlement activities with meaningful consultation and transparent disclosure of information. ESS5 does not apply to individuals voluntarily selling their lands in a legally recorded market transaction while being informed on the opportunity to retain the land; however, ESS5 will apply to people (other than the seller) who will be affected by such a transaction [4].

The borrower must demonstrate that involuntary land acquisition and land use restrictions are minimized at the project design stage and are limited to the project's direct requirements within a specified timeframe. The borrower should consider feasible alternatives with an acceptable tradeoff between minimizing physical and economic displacements and the social, environmental, and financial costs and benefits. Affected persons can be classified as those with formal legal rights to land or assets; those who do not have formal legal rights but have a recognizable claim to the land or assets under the national law; or those with no recognizable legal right or claim to the land they occupy or assets they use. Affected communities, particularly vulnerable groups, shall be engaged in the design stage to receive their input and feedback on the proposed alternatives. If displacements are unavoidable, the borrower shall conduct a census to establish an inventory of eligible affected owners and to discourage ineligible opportunistic settlers from claiming benefits [4].

There are different types of land acquisition and land use restrictions [4]:

- Land or land use rights acquired or restricted through negotiated settlements with the owners of property or those with legal rights to the property.
- Land or land use rights acquired or restricted through expropriation or other compulsory procedures according to the national law after failure to reach settlements.

- Restrictions to land use and access to natural resources preventing affected people from their traditional or customary recognizable usage rights. Such areas include buffer zones, biodiversity areas, and designated protected areas.
- Relocation of people occupying or utilizing the land with no formal, traditional, or recognizable rights to land use.
- Displacement of people as a result of the project activities leaving their lands inaccessible or unusable.
- Restriction on access to land or resources including communal property and natural resources such as timber and non-timber forest products, freshwater, marine and aquatic resources, hunting activities, grazing and cropping areas, and medicinal plants.
- Land rights or claims to lands or resources renounced without full compensation payment.
- Land acquisition and land use restrictions prior to the project but were initiated in preparation for the project.

ESS5 was assessed by interviewing NEPCO personnel to collect the necessary information such as the stakeholder engagement protocols, advertisements to land owners, and negotiations. The Consultant also interviewed a sample of the affected people (face-to-face during the site survey and by phone). A detailed list of interviewed people is presented in Appendix B. A summary of the key findings pertaining to ESS5 is as follows:

- There have been no involuntary physical or economic resettlements as a result of the Green Corridor Project.
- Nomadic groups often reside along the Green Corridor's influenced areas at different times of the year. According to the interviews with locals, there has been little to no impact on the presence of these groups and their agricultural and animal farming activities in the region. As a result, the impact on nomadic people is not significant.
- The 132 kV OHTL cross several privately-owned lands, and according to the owners, this will cause restrictions on the land use or will leave their lands unusable in the future. Furthermore, the 132 kV OHTL run in close proximity to several houses and the owners of those houses stated that this will limit their ability to add more stories to their existing buildings. According to the Jordanian Electricity Law, the owners of those lands shall be compensated only when the OHTL is energized (operation stage). Compensation values are 55% and 75% of the land value if 132 kV and 400 kV OHTL pass through the property, respectively. If a tower is placed in the land, the owner shall receive a 100% compensation.
- NEPCO may have to acquire the entire property upon the request of the owners in some cases such as those discussed under ESS4 where the OHTL run in very close proximity to the existing houses; thus, limiting the residents' ability to add more stories. This is in accordance with the World Bank E&S Framework which states that if partial acquisition would leave the remainder of the land unsafe, inaccessible, or economically unviable, the acquisition of the entire property upon the request of the owner might become necessary.

- NEPCO did not communicate properly with the owners of the lands through which the OHTL pass. According to some of the owners, the works commenced in their lands without them knowing the purpose and scope of this Project. They added that NEPCO often offers little compensation values and if the parties do not reach a mutual agreement, the case is settled at court. Nonetheless, the Consultant obtained copies of newspaper advertisements which were posted 15 days prior to the commencement of the Green Corridor Project (in July and November, 2017). A full list of the lands through which the Green Corridor Project passes was presented in the advertisements and the sole purpose of this communication was to notify the owners of the imminent commencement of the construction works and not to initiate compensation or negotiation procedures. The Consultant also obtained copies of more recent newspaper advertisements (January, 2019) through which NEPCO communicated with the land owners to notify them that upon the energization of the Green Corridor, the owners of the listed lands are eligible for compensation. It is worthy to mention that none of the advertisements included the owners' names. According to NEPCO's personnel, they were unable to identify the owners of these lands; hence, the advertisements were posted without names.
- A clear basis for compensation protocols shall be documented, disclosed transparently, and applied consistently by NEPCO; however, compensation rates may be subjected to adjustment if negotiation strategies are applicable. There are clear compensation criteria for land owners whose properties have been affected by power transmission projects according to the Jordanian Electricity Law, Article 44. The monetary compensation shall be paid by NEPCO to the owner for damages or land value acquired for substations. Such a monetary value will be determined either by agreement or through specialized court. Beginning on the day of energizing the OHTL, land owners can claim damages from NEPCO by providing a valid land registry document. The application will be reviewed to verify the land ownership and the passage of the OHTL through the property. NEPCO will offer compensation values based on preliminary estimates by the Department of Land and Survey or its in-house experts. If the proposed amount is not approved by the land owner, they can register the case at court, who will then assign two experts (lawyer and electrical expert) to assess the actual damages caused by the Project. A final compensation value is determined by the court based on the land's estimated prices as well as the experts' opinion. NEPCO adheres to the compensation procedures as per the Jordanian Electricity Law; however, several property owners expressed their concerns regarding the low compensation values initially offered by NEPCO which considerably undermines the real value of the property.
- The 400 kV pass through mostly government-owned lands. According to the Jordanian regulations, there shall be no compensations. However, many of those lands are recognizable tribal properties (as stated by several interviewees from the local communities) and according to the World Bank E&S Framework, those tribes may be eligible for compensation. However, it is not clear how the mechanism for this compensation will be due to the absence of local legislation on this matter, lack of data regarding the price of those lands, weakness or disagreement on ownership and property rights, as well as the shared ownership amongst the tribe members. To overcome these challenges, it is recommended that NEPCO verifies the ownership claims of those tribes and establishes direct communication channels with the municipalities in the affected

towns in order to identify potential development needs of those communities and provide financial or technical assistance in different sectors such as energy, education, or infrastructure.

In summary, there have been no involuntary physical or economic displacements along the Green Corridor route. However, the OHTL pass through privately-owned lands at several locations between QAIA and Qatrana (LOT 2) and very few lands between Qatrana and New Ma'an (LOT 1). The fact that the Green Corridor OHTL cross privately owned lands and run in very close proximity to few houses indicates that the land use restrictions and the reduction in the value of property impact is major. On the other hand, the Green Corridor 400 kV OHTL pass though government-owned lands along most of its route. Some of those lands are recognizable tribal properties (according to the statement of the local people). Those lands are mostly dry uninhabited lands with little to no vegetative cover. The receptor within the context of ESS5 is the local residents (tribes claiming ownership of the lands), and these are relatively vulnerable groups; hence, the receptor sensitivity is minor and the magnitude of impact is moderate. As a result, the overall land use restriction impact on the recognizable tribal properties is minor.

6.6 ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources and Ecosystems

This standard recognizes the significance of conserving and protecting biodiversity and living natural resources as well as maintaining the core ecological functions of habitats in the sustainable development discourse. This Standard also addresses the sustainable primary production and harvesting of living natural resources. ESS6 applies to projects with potential direct, indirect, or cumulative impacts on habitats and biodiversity and requires the borrower to prevent or minimize associated threats and risks such as habitat loss, invasive species, overexploitation, hydrological changes, nutrient loading, and pollution [4].

ESS6 was assessed via site visits, biodiversity literature review, review of similar projects' reports within the Green Corridor influenced areas, interviews with locals, and interviews with experts from RSCN to identify the impacts of the Green Corridor Project on flora, fauna, and avifauna.

There are four bio-geographic regions in Jordan as shown in Figure 6.4~~Figure 6.4~~: The Mediterranean region, the Irano-Turanian region, the Saharo-Arabian region, and the Sudanian region. These topographic variations resulted in rich flora and fauna diversifications. Each comprises thirteen vegetation types which provide the natural habitats for over 4,000 species of fauna and flora from the terrestrial, marine and fresh water environments in addition to genetic resources. Jordan's 2,622 species of vascular plants represent 1% of the world flora, 100 species of which are endemic including *Iris nigricans*, Jordan's floral emblem, *Plantagomaris-mortui*, *Crucianella transjordanica*, *Centaurea procurrens*, *Scrophularia nabataerum*, *Tamarix tetragyn*, and *T. palaestina*. There are 644 animal species of which, 83 are mammal species, including the globally threatened *Capra nubiana*, *Gazella dorcus*, *Gazella subgutturosa*, *Gazella gazelle* and *Oryx leucoryx*. Avifauna composition is especially rich in Jordan because of its geographical location associated with the Great Rift Valley and lying on a major migratory birds' route. There are 436 species of birds, the key species are *Geronticus eremita*, *Chlamydotis macqueenii*, *Nephron percnopterus*, *Serinus syriacus*, and *Vanellus gregarius* [8, 9, 10]

Jordan is also rich in agro-biodiversity, including a wealth of native and endemic species and varieties, of particular importance are the medicinal and aromatic plants, herbs, and spices distributed all over the Country from the eastern desert to the western highlands and from the semi-arid north to the extremely arid south. However, this biodiversity is under threat as habitat is lost due to over grazing, ploughing for rain fed cultivation of barley, and subsequent accelerated soil loss and degradation [8, 9, 10].

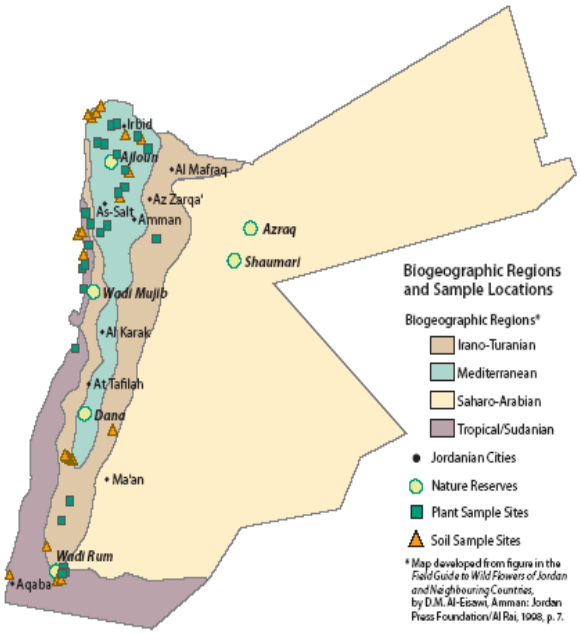


Figure 6.4: Bio-geographic regions of Jordan

The Green Corridor OHTL pass through the Saharo-Arabian bio-geographic region. This is the eastern desert or Badia and comprises the largest part of Jordan encompassing almost 80% of its total area. It is flat except for a few hills or small mountains (the result of volcanic eruptions). The mean annual rainfall ranges from 50 to 200 mm, mean annual minimum temperatures range from 2 to 15º C and mean annual maxima range from 25 to 40º C. Soil is mostly poor, either clay, hamada, saline, sandy, or calcareous. Small shrubs and small annuals in the wadi beds dominate the vegetative cover [8, 9, 10].

During the site survey, the Consultant's team noticed that the majority of land is dry desert land with little to no vegetative cover. According to the interviews with people from local communities, grazing activities often take place during spring time in the Project's influenced areas (LOT 2, and Al-Sultani Town from LOT 1). They also reported the existence of wolfs and

foxes (as described by the interviewees) which travel for long distances in search for food, and in some instances, those wild animals attack sheep in their respective towns. The team also interviewed RSCN experts in the fields of flora, fauna, and avifauna who provided the team with valuable resources to characterize the biodiversity in the Project's influenced areas and identify the Green Corridor adverse impacts on biodiversity.

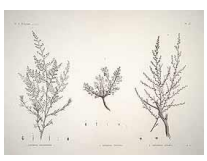
The Project's areas have roughly 200 plant species, the most prominent are listed in Table 6.1~~Table 6.1~~. The most common fauna and avifauna in the Project's areas are shown in Table 6.2~~Table 6.2~~ and Table 6.3~~Table 6.3~~, respectively [8, 9, 10, 11].

Due to the fact that the habitats are not unique in the dry and desert Project's influenced areas and are common and widespread in the neighboring areas, alternative habitats can easily be provided for the sympatric faunal species. Furthermore, the construction stage is a temporary and localized one; hence, the overall impact on faunal species during the construction stage is minor. Similarly, no significant impacts on the faunal or flora species are anticipated during the operation stage, according to the RSCN expert. The only concern is on the avifauna, particularly due to the size and flying altitude which may result in birds' fatalities due to electrocution or collision with the overhead wires. Electrocution occurs when a bird bridges the gap between two energized components or an energized and a grounded component of the pole structure; hence, short circuiting occurs which kills the bird and may result in power supply outage. Therefore, the impact on avifauna is moderate during the operation stage which requires proper mitigation measures. Nonetheless, it is expected that the collision and electrocution risks are reduced because the newly constructed OHTL are in parallel to the existing OHTL. This is in fact called "grouping with other infrastructure" and is considered a design mitigation measure; as birds will be able to identify the combined obstruction. In particular, birds tend to perch on the higher existing towers which indicates that the risk due to the Green Corridor Project is minimized. Nonetheless, the risk due to the other existing towers is not eliminated. The RSCN officials recognize the OHTL risks on avifauna and have recently acquired funding from the European Union for the conservation of migratory birds and the mitigation of collision and electrocution with OHTL through mitigation measures such as insolation and signs to the existing towers and lines. It is expected that the combined RSCN and NEPCO efforts will considerably reduce the avifauna risks to acceptable levels.

Another biodiversity concern is the overlap between the Green Corridor OHTL and the proposed Abu Rukbeh Nature Reserve. Prior to the site survey, an inquiry was sent to the RSCN regarding the proposed Nature Reserve in Abu Rukbeh, Al-Karak. The coordinates of the four corners of the proposed location were sent by email as shown in Table 6.4~~Table 6.4~~. The Consultant's team visited the proposed Reserve location and it was observed that the Reserve area is composed of chains of hills and valleys with altitudes ranging from 700 to 1,060 m above mean sea level with a total area of 327 km^2. As demonstrated in the previous Chapter, not only the Green Corridor intersects the proposed Reserve location, the entirety of Al-Sultani Town falls within the borders of the proposed Reserve. Additionally, the Desert Highway intersects the southeastern end of the Reserve. Additionally, there is a local outrage of Al-Sultani residents (Al-Hajaya tribe) against the establishment of this Nature Reserve, because the proposed location is their tribal

recognizable properties (according to the interviewees statements). This is in fact a key point which was discussed with the RSCN specialist who indicated that they will not enforce the establishment of this Reserve if the local communities will oppose it. This has happened in the past when the RSCN acquired funding to establish Jabal Mas'odeh Nature Reserve; however, the locals opposed this project and the RSCN abandoned the plan. Furthermore, the RSCN is highly flexible to shift the location of the proposed Nature Reserve (in case it will be implemented) in order to avoid any potential adverse impacts on the wild life. According to the Ministry of Environment report on the national network for nature reserves, nine locations were proposed for the establishment of nature reserves in Jordan, and the proposed sites were ranked for their priorities based on the value of the biodiversity in the site and the ability of implementation and sustainability. The Abu Rukbeh proposed site ranked 8th out of 9 proposed sites. In terms of the biodiversity criterion, Abu Rukbeh proposed site ranked the lowest among the other proposed sites [11]. As a result, the impact on the proposed Abu Rukbeh Nature Reserve is minor.

Table 6.1: The most common plant species in the Project's influenced areas

Scientific name	Picture
Artemisa herba-alba (medical herb – endemic)	
Hammada salicornica (common – endemic)	
Anabasis articulate (medical – endemic)	
Atraphaxis spinose (threatened – endemic)	
Retama raetam (common – endemic)	
Artemisia inculta (medical – endemic)	

Thymus bovei (medical – rare)	
Atriplex halimu (common – endemic)	

Table 6.2: The most common fauna in the Project's influenced areas

Scientific name	Picture
Hyaena hyaena (IUCN: endangered – near threatened; CITES: Appendix III)	
Canis lupus (IUCN: least concern; CITES: Appendices I and II)	
Felis syvestris (IUCN: least concern; CITES: Appendix II)	
Vulpes cana (IUCN: least concern; CITES: Appendix II)	
Vulpes reupellii (IUCN: data deficient 2001)	
Caracal caracal (IUCN: least concern; CITES: Appendix I)	
Chmaleo chameleon (IUCN: least concern; CITES: Appendix II)	

Table 6.3: The most common avifauna in the Project's influenced areas

Scientific name	Picture
Buteo buteo (IUCN: least concern)	
Aquila nipalensis (IUCN: endangered)	
Circus macrourus (IUCN: near threatened)	
Sylvia atricapilla (IUCN: least concern)	

Table 6.4: Coordinates for the corners of the proposed Abu Rukbeh Nature Reserve

Corner	Longitude	Latitude
1	35.9973856	31.21349946
2	35.8293163	31.20763363
3	35.84264459	31.02629726
4	36.01221316	31.03057055

6.7 ESS7: Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities and Vulnerable Groups

This Standard applies to social and cultural groups identified as indigenous people, Sub-Saharan African Historically Underserved Traditional Local Communities, aboriginals, vulnerable and marginalized groups, scheduled tribes, minority nationalities, or other terms used to describe such groups within the context of the different countries. ESS7 requires that projects contribute to poverty reduction and enhancing opportunities and livelihood for such groups to benefit from the development process without threatening their cultural identities and well-being (which are typically different from mainstream groups). Additionally, this Standard aims to recognize, respect, and preserve the cultural heritage and practices of these vulnerable groups and assist them in adapting to changing conditions [4].

There are several criteria that qualify a group of people to be amongst this segment such as the self-identification and recognition by others as being members of distinct social and cultural groups; collective attachment to distinct habitats, areas, or ancestral territories and the natural resources of these areas; institutions that are culturally, economically, socially, or politically distinct from the mainstream; a language or dialect that is different from the country's or region's main languages; or groups who lost attachment to land or territory in the project area due to government resettlement programs, forced severance, conflicts, natural disasters, dispossession of their lands, or incorporation of the lands into an urban area. These groups are given special emphasis because they are economically marginalized and their social, economic, and legal status vulnerability often limits their capacity to defend their rights and to participate and benefit from the development. Development may affect those groups by directly impacting their access to lands and resources, cultural practices, religious beliefs, or institutional arrangements. To address these concerns, the borrower shall inform and consult the affected groups via stakeholder analysis and engagement planning and develop proper mitigation measures with timely execution schedule to address the project risks on these groups [4].

ESS7 was assessed by interviewing NEPCO employees and people from the local communities during the site surveys. It was concluded that there are nomadic groups who reside in the Project's influenced areas at different times of the year for grazing and farming purposes (Figure 6.5~~Figure 6.5~~). Those groups have livestock and they cultivate the surrounding lands with fodder crops. Their presence has not been affected by the Green Corridor Project. The impact is therefore not significant during the operation stage. The impact during the construction

stage is minor due to the temporary nature of the construction works. Further information is provided in Appendix B.

Figure 6.5: Nomadic people living in the vicinity of the Green Corridor OHTL

6.8 ESS8: Cultural Heritage

This Standard provides measures for the protection of cultural heritage throughout the project's lifecycle. Examples of projects with potential risks/impacts to the cultural heritage are those involving excavations; demolition; changes in the physical environment; or projects located within a legally protected area, a buffer zone, or in the vicinity of a cultural heritage site. Potential mitigation measures include modifying the physical footprint of a project, relocation, in situ conservation or rehabilitation, relocation of cultural heritage, strengthening the capacity of relevant institutions, and establishment of a monitoring system [4].

ESS8 was assessed by interviewing NEPCO employees' as well as the site visits and data collection from locals, Ministry of Tourism and Antiquities, and the Ministry of Culture. It was concluded that the Green Corridor was constructed in areas with low cultural heritage sensitivity and no evidence of valuable materials or sites has been found during the construction stage. There were no cultural heritage sites along the Green Corridor route or its RoW. Therefore, the impacts on cultural heritage are not significant.

6.9 ESS10: Stakeholder Engagement and Information Disclosure

This Standard acknowledges the importance of open and transparent engagement of project stakeholders which shall enhance the project's acceptance and contribute to the successful design and implementation. A record of stakeholder engagement, including description of those consulted, a brief description of the methodology, and a summary of the feedback, shall be kept and disclosed as necessary in the ESIA [4].

ESS10 was assessed by interviewing NEPCO employees and people from the local communities during the site survey. It was found that NEPCO has not conducted any stakeholder engagement or information disclosure practices. In fact, some of the residents reported that they were surprised one day by the commencement of the excavation works in their properties and not knowing what the project was, despite the fact that NEPCO communicated through newspaper advertisements to notify the owners 15 days prior to the commencement of the construction works. Therefore, NEPCO is required to establish proper communication channels with the local communities, especially those directly affected by land use restrictions, and to demonstrate the need and importance of the Project as well as the clear and fair method for compensations. Furthermore, NEPCO is encouraged to provide technical and financial assistance for development projects in the underdeveloped affected areas. Creating employment opportunities will contribute to the development of those areas and will enhance the locals' acceptance of NEPCO's future projects.

6.10 Positive impacts

Prior to this audit, the Consultant anticipated that the Green Corridor Project will bring several benefits to the local communities such as the enhancement of the power supply in the affected areas, job creation opportunities, and improvement of the economic activities in those areas. This is particularly true on the macroscale; because the Green Corridor will open opportunities for investments in the renewable energy sector which will ultimately enhance the power supply in Jordan, create investment opportunities, create employment opportunities in the renewable energy sector, and increase the national GDP. Given that the Green Corridor has not been electrified yet, the microscale (community-level) enhancement of the power supply is not relevant. On the other hand, people from the local communities were interviewed and asked on the employment opportunities created as a result of the construction of the Green Corridor Project. Those residing between QAIA and Qatrana reported that LOT 2 contractor (Electromontaj) did not hire locals despite multiple requests from people to be recruited by the contractor. This can potentially be one of the reasons for the locals' opposition to the Project. In fact, one of the desired development outcomes as per the World Bank E&S Standards is the ability of local communities to benefit from development. On the other hand, many of the

interviewed people between Qatrana and New Ma'an reported that LOT 1 contractor (KEC International) hired many locals after passing the necessary training. People were in fact satisfied with KEC International. As a result, it is recommended that future projects shall hire a certain percentage of workforce from local communities. This will not only benefit locals from development but will also establish smooth communication channels between NEPCO and the local communities and will increase the acceptance of its projects.

6.11 Summary of the environmental and social impacts

A summary of the Green Corridor risks and the overall impacts is presented in Table 6.5~~Table 6.5~~.

Table 6.5: Summary of the Green Corridor risks and the overall impacts.

Standard	Risk	Receptor	Stage	Overall Impact
ESS2	Safety and working/labor standards concerns	Direct and indirect labor	Construction	Not significant
			Operation	Not significant
ESS3	Waste generation	Groundwater	Construction	Not significant
			Operation	Not significant
	Waste generation	Soil	Construction	Minor
			Operation	Not significant
	Waste generation	Air	Construction	Minor
			Operation	Not significant
	Noise	Residents (local communities)	Construction	Minor
			Operation	Moderate
	Particulate matter	Air	Construction	Minor
			Operation	Not significant
	Gaseous emissions	Air	Construction	Minor
			Operation	Not significant
ESS4	Traffic accidents	Residents (local communities)	Construction	Minor
			Operation	Minor
	Fires	Residents (local communities)	Construction	Not significant
			Operation	Minor
	Electrocution	Residents (local communities)	Construction	NA
			Operation	Minor
	Falling/injury	Residents (local communities)	Construction	Major
			Operation	Major
	EMF exposure	Residents (local communities)	Construction	NA
			Operation	Moderate
ESS5	Involuntary resettlement	Residents (local communities)	Construction	Not significant
			Operation	Not significant

	Land use restrictions	Land owners/ residents	Construction	Major
			Operation	Major
ESS6	Fatality or destruction of habitat	Fauna	Construction	Minor
			Operation	Not significant
	Fatality or destruction of habitat	Avifauna	Construction	Moderate
			Operation	Moderate
	Fatality or destruction of habitat	Flora	Construction	Minor
			Operation	Not significant
ESS7	Impacts on nomadic groups	Nomadic groups	Construction	Minor
			Operation	Not significant
ESS8	Impacts on cultural heritage sites	Cultural heritage sites	Construction	Not significant
			Operation	Not significant

7 Mitigation Measures and Recommendations

Mitigation measures and recommendations are provided to address and mitigate the adverse environmental and social risks associated with the Project in accordance with the national and international standards. Mitigation measures for the construction stage are not relevant; due to the fact that the Green Corridor construction works are completed. Therefore, the mitigation measures and recommendations provided in this Chapter are applicable to the operation stage which shall begin upon the energization of the Green Corridor.

7.1 Mitigation measures for ESS2

ESS2 aims to promote the fair treatment, nondiscrimination, equal opportunity of project workers, and health and safety at work. It was concluded that NEPCO strictly complies with ESS2 principles and the impacts are anticipated to be not significant. However, to maintain safe and healthy workplace conditions and standards, NEPCO is encouraged to take into consideration the following recommendations throughout the operation stage:

- Provide the workers with the required personal protective equipment (PPE) and adopt proper inspection and enforcement mechanisms to ensure the effective compliance.
- Update the health and safety training programs and repeat the training programs to the employees every 1-2 years.
- Apply NEPCO's health, safety, and labor standards to all contractors, subcontractors, and primary suppliers associated with NEPCO.
- Encourage the contractors and subcontractors to recruit skilled labor from the local communities after passing the necessary training programs.
- In case of chemicals or hazardous materials use, materials safety data sheets (MSDS) must be provided and the involved personnel must have the proper training to safely handle and manage those materials.

7.2 Mitigation measures for ESS3

ESS3 addresses resource efficiency, pollution prevention and abatement, and climate related standards. It has been demonstrated that most ESS3 impacts are not significant or minor. However, noise impact during the operation stage is moderate in certain locations. Thus, NEPCO is encouraged to adopt the following mitigation measures and recommendations to eliminate or minimize such impacts to the lowest levels:

- Modern and energy efficient vehicles and equipment shall be utilized during the inspection and maintenance activities. A periodic maintenance program shall be applied to ensure that the vehicles and equipment are energy efficient and that the carbon and pollution footprint is minimized to the lowest acceptable levels.
- Driving on dirt roads shall be avoided or minimized to avoid dust suspension. In case of unavoidable dirt road usage, driving shall be at very low speeds.
- A spill containment plan shall be developed in order to effectively manage leakage or waste spillage incidents.

- Solid wastes generated on site shall be collected immediately and transported to a proper storage facility. NEPCO is encouraged to apply the reuse, recycle, and recover principles in their waste management protocols.
- In case of chemicals or hazardous materials use, materials safety data sheets (MSDS) must be provided and the involved personnel must have the proper training to safely handle and manage those materials.
- Hazardous wastes (if any) shall be managed in accordance with the Ministry of Environment's regulations.
- NEPCO shall monitor the noise levels frequently, particularly in areas where the OHTL are in a close proximity to residential units. NEPCO is also required to respond in a timely manner to complaints regarding elevated noise levels by applying the necessary maintenance and cleaning procedures.
- During inspection and maintenance activities, water use shall be minimized and the generated point source wastewater shall be collected and disposed properly.

7.3 Mitigation measures for ESS4

ESS4 addresses the occupational and community health impacts. It was concluded that most ESS4 impacts of the Green Corridor Project are not significant or minor expect the EMF exposure which is moderate and the falling/injury which is major. Therefore, NEPCO is required to apply the following mitigation measures and recommendations:

- The towers' bottoms must be urgently protected against climbing by having fixed metal meshes or any other protection measure at proper height to prevent people from climbing; hence, eliminating the falling/injury risk. Precautionary signs must also be provided.
- A community accident record shall be initiated to document community accidents, incidents, or complaints. Such a record needs to be comprehensive taking into consideration several aspects including but not limited to health, safety, environmental, biodiversity, and cultural heritage aspects.
- A frequent EMF monitoring plan must be implemented to ensure that the EMF exposure in the residential areas is within the international threshold limits.
- The local communities shall be informed on the different aspects of the Project operation, particularly the energization of the OHTL.
- In case of chemicals or hazardous materials use, materials safety data sheets (MSDS) must be provided and the involved personnel must have the proper training to safely handle and manage those materials.

7.4 Mitigation measures for ESS5

ESS5 is one of the key standards within the Green Corridor context. This standard addresses land acquisition, restrictions on land use, and involuntary resettlement. ESS5 impacts can be experienced during the construction and operation stages. It was demonstrated that there were no involuntary resettlement issues in the Project's influenced areas; however, the land use restriction impacts are minor to major. As a result, the following mitigation measures and recommendations are necessary to mitigate the adverse impacts of the Project:

- NEPCO is required to strictly adhere to the national laws and regulations regarding compensations. However, there needs to be a transparent, professional, and clear mechanism for the estimation of the property value which shall avoid undermining the real value of the property; thus, avoiding and minimizing conflicts and lengthy legal procedures.
- NEPCO may need to acquire the full property as per the owner's request if partial acquisition leaves the remainder of the land unusable. This is applicable to cases where the vertical and horizontal clearances are below the recommended limits and the EMF exposure levels are higher than the international threshold limits.
- NEPCO is recommended to provide financial or technical assistance for the affected towns in different sectors such as energy, education, or infrastructure.
- Creating employment opportunities for the local workforce is a desired development target for those underdeveloped communities and is expected to increase people's acceptance of NEPCO's projects.
- NEPCO should advertise through the local media with sufficient time prior to energizing the Green Corridor OHTL.
- NEPCO should attempt to contact the owners of the affected lands and houses by identifying their names. Such a process will require official communication from NEPCO to the Department of Lands and Surveying. Additionally, NEPCO may use other communication methods (e.g. placing fliers on the doors of the houses to notify the owners to contact NEPCO).
- To mitigate the impacts on communities with tribal ownership claims, NEPCO is required to verify the ownership claims of those tribes by an independent third party and establish proper communication channels with them to provide technical or financial assistance to those communities according to their development needs. One of the significant development needs for such communities is creating employment opportunities for the local workforce.

7.5 Mitigation measures for ESS6

ESS6 recognizes the significance of conserving and protecting biodiversity and living natural resources as well as maintaining the core ecological functions of habitats in the sustainable development discourse. Most impacts on biodiversity and living natural resources are expected during the construction stage; however, the collision and electrocution impacts on avifauna during the operation stage are moderate. Additionally, it was found that the Green Corridor crosses the proposed Abu Rukbeh Nature Reserve location. However, Al-Sultani Municipality falls entirely within the borders of the proposed location. Local people from Al-Sultani expressed

that they are against the establishment of this Reserve; because the proposed location is their recognizable tribal land. The RSCN officials demonstrated that the proposed location can be shifted to avoid the interference with the OHTL and to avoid the locals' outrage.

It is of great importance to state that the RSCN has recently acquired funding from the European Union for the conservation of migratory birds, particularly near OHTL and is looking forward to working with NEPCO on marking the OHTL and providing add-on devices to mitigate the electrocution risk. Thus, even though the impacts on avifauna are moderate, there is a great opportunity to mitigate such impacts at low cost by the cooperation between NEPCO and RSCN. The following are recommended mitigation measures pertaining to ESS6 which shall be considered by NEPCO and RSCN:

- Coordinate with the RSCN and the involved ministries to shift Abu Rukbeh Nature Reserve location to avoid the overlap between the Green Corridor and the proposed Reserve.
- Add-on measures can be applied to mitigate the birds' electrocution risk. For instance, insulating materials as shown in Figure 7.1~~Figure 7.1~~ can be fitted onto critical components of the structure in order to render those components neutral. Those materials often cover the dangerous components only.

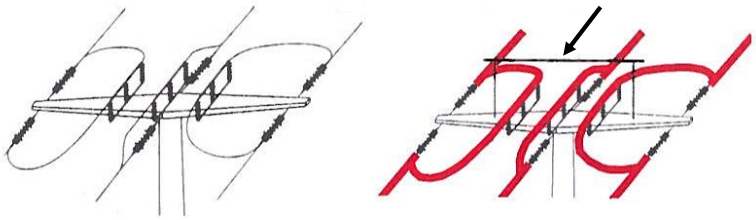


Figure 7.1: Left: Medium voltage pole with switchgear dangerous to perching birds because of short distances between energized parts. Right: Same pole after insulation of all energized wires close to the cross-arm (in red) and installing insulated safe perch (see arrow).

- Applying line marking tools and devices such as spheres, swinging plates, spiral vibration dampers, strips, swan flight diverters, bird flappers, aerial maker spheres, ribbons, tapes, flashing floats, and flags. These tools and devices are expected to mitigate the collision impact by making the OHTL more visible to birds during flight. However, the proper tool has to be selected carefully in order to avoid obstructions and risks to maintenance crews.

7.6 Mitigation measures for ESS7

ESS7 applies to social and cultural groups identified as indigenous people, Sub-Saharan African Historically Underserved Traditional Local Communities, aboriginals, vulnerable and marginalized groups, scheduled tribes, minority nationalities, or other terms used to describe such groups within the context of the different countries. It was concluded that there are nomadic groups in the Project's influenced areas and their presence might have been affected slightly

during the construction stage; however, it is not anticipated that the Green Corridor will have any significant impacts on the presence of those groups during the operation stage. ~~Therefore, no mitigation measures are required.~~Nonetheless, NEPCO is required to apply strict environmental rules throughout the operation stage to ensure that the areas surrounding the towers are well maintained in order to avoid any adverse impacts on the nomadic groups activities.

7.7 Mitigation measures for ESS8

This Standard provides measures for the protection of cultural heritage throughout the project's lifecycle. Most impacts on the cultural heritage are expected during the construction stage. Based on the reports and the interviews with NEPCO's personnel and local communities, there was no impact on the cultural heritage sites during the construction stage. No significant impacts on the cultural heritage are expected during the operation stage. Thus, no mitigation measures are required.

7.8 Mitigation measures for ESS10

ESS10 acknowledges the importance of open and transparent engagement of project stakeholders which shall enhance the project's acceptance and contribute to the successful design and implementation. It was concluded that NEPCO did not practice proper stakeholder engagement procedures and did not communicate effectively with the local communities. NEPCO is required to apply the following recommendations to address this standard:

- Establish proper communication channels with the local communities, especially those directly affected by land use restrictions, and to demonstrate the need and importance of the Project as well as the clear and fair method for compensations.
- NEPCO is encouraged to provide technical and financial assistance for development projects in the underdeveloped affected areas. Creating employment opportunities will contribute to the improvement of those areas and will enhance the locals' acceptance of NEPCO's future projects.
- NEPCO shall publicly release all relevant information about the Project and this audit's outcomes on their website.
- NEPCO shall adhere to its stakeholder complaint procedures and respond in a timely manner to the complaints and concerns raised by the local communities.

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Appendix A: Key Informants Interview Questions

A.1 Interview questions to people from the local communities

- Have you witnessed any incidents during the construction of the Green Corridor Project?
- Did the Green Corridor Project pose any health and safety threats to the local communities during the construction (e.g. traffic accidents, pollution)?
- Were there any noticeable environmental concerns during the construction stage or other everyday activities? Examples of such concerns include dust, noise, disposal of solid waste, oil leakage, and gaseous emission.
- Have you observed any evidence on any impacts of the Green Corridor Project on biodiversity and ecosystems in the Project's influenced areas? Example: migratory birds.
- Did the Green Corridor Project result in any land acquisition?
- Were there any involuntary settlements as a result of the Green Corridor Project? Involuntary resettlement is defined as people leaving their houses, abandoning their businesses, or both primarily due to the Project and without reaching a mutual agreement with the promotor.
- Did the Green Corridor Project limit the local communities access to natural resources or caused restrictions to designated parks, protected areas, hunting zones, or other activities in the region?
- Was there any impact on the economic activities in the Project's influenced areas as a result of the construction and operation of the Green Corridor Project? Examples of the economic activities include agricultural, commercial, and industrial activities.
- Are there any indirect impacts on lands in the Project's influenced areas? Examples of indirect impacts include Project activities that leave a land inaccessible or unusable.
- Are there any nomadic, Bedouin, or indigenous groups in your community? These groups may not have legal rights or claims to the land they occupy. If yes, have these groups been affected by the Green Corridor Project?
- In case you are one of those affected by resettlement/land use restriction, what arrangements and services did NEPCO offer and when were these offered?
- Have you or anyone of your community been informed and consulted on the Green Corridor Project, its objectives, components, construction activities, operation, and impacts?
- Have you or anyone of your community raised any concerns regarding the Green Corridor Project? Have these concerns been taken into consideration?
- Did the Project enhance the economic activities in the local communities?
- Did the Project improve the energy supply in the local communities?
- Did the Project result in employment opportunities for locals?
- Are there any other positive impacts of the Green Corridor Project?

A.2 Interview questions to NEPCO's personnel

- Are there sufficient training programs to build capacity of NEPCO employees to carry out future monitoring and mitigation plans?
- How many preliminary design alternatives were considered for the Green Corridor OHTL?
- What is the selection criteria amongst the preliminary design alternatives for the OHTL?
- Are there any Project's associated facilities? Those are not funded by the same funding agency but their existence is dependent on the Project.
- Were there any ESIA studies conducted on the Project's associated facilities?
- Was there an effective engagement of the local communities during the preliminary stages of the Project (design phase and alternatives screening)? If yes, please provide the consultant with supporting documents.
- Are there any facilities or units within the Project which depend on fuels combustion? If yes, please describe the type (generator, turbine, boiler, furnace, heater, cooling, etc.), fuel (gas or liquid), capacity, number of hours operated per year, and any other relevant information.
- What are the chemicals, liquids, oil, and lubricants often used in the regular operating and maintenance of the Project and its associated facilities? What are the precautions to limit the leakage and contamination by these substances?
- Are there any activities throughout the Project's operation which involve the use of mixing or storage tanks for chemicals? If yes, please describe these activities and the safety precautions followed to manage the accidental release of gaseous pollutants.
- Are there any existing or proposed methods to mitigate the Project's air pollution (if any)? Such methods include scrubbing, cyclones, bag filters, etc.
- During the design and construction phases of the Project, were there any arrangements for the cultural heritage preservation in the Project's areas (if any)? If yes, please provide the Consultant with supporting documents.
- Were there any impacts of the Project's activities (mainly civil works such as excavations) on the cultural heritage sites?
- During the design and construction stages of the Project, were there any arrangements for the biodiversity and ecosystems preservation? If yes, please provide the Consultant with supporting documents.
- What are the categories and quantities of solid wastes produced throughout the operation and maintenance activities of the Project? How is the solid waste managed and are there any waste burning activities? Examples of solid waste: metal, aluminum, plastic, paper/cardboard, batteries, and hazardous waste.
- Are there any concerns regarding the fittings and connections? Examples of such concerns: fires, electricity shocks, pollutants release, etc.
- How does NEPCO work towards improving the energy conversion efficiency of its activities and equipment and mitigate losses in energy transmission and distribution lines?

- Are there adequate supplies of drinking water to workers?
- Does the Project or any of its associated facilities require the use of water and the production of wastewater of any type (toilettes or washing water)? If yes, please specify the sources, use, quantities, and disposal methods.
- Is there any use of hazardous materials during the normal operation and maintenance of the Project? Examples of such materials include toxic gases, flammable gases, flammable liquids, flammable solids, oxidants, toxic materials (e.g. asbestos), radioactive materials, and corrosive substances.
- If hazardous materials are present, what are the protocols for the purchase, transport, storage, pumping, containment, and disposal of these materials?
- Is there an emergency plan in place for potential contamination, leakage, spillage, fires, or injuries? If yes, please provide the Consultant with a copy.
- Do employees have access to first aid?
- What are the potential occupational risks workers may face during their involvement in the Project's operating and maintenance activities (e.g. falling from heights, electric shocks, etc.)?
- Do employees receive an occupational health and safety orientation? If so, please provide the Consultant with a copy of the training material.
- Is there any noise concern on workers and local communities beyond the Project's boundaries? If yes, what are the mitigation measures taken by NEPCO?
- What are the precautions taken at the workplace to prevent fires?
- What are the PPE that NEPCO provides to its employees? Is there an enforcement mechanism to ensure that employees use the PPE during work activities?
- Has the Project caused any road safety risks and concerns in the influenced areas? What are NEPCO's standards to ensure that its employees comply with the traffic regulations?
- Are there written labor management procedures which shall cover employment terms and conditions? Such terms and conductions include different aspects such as the regular payment, equal opportunities, workers' rights to participate in organizations or activities, employment age, etc.
- Are there any grievance mechanisms for employees to demonstrate their work-related concerns?
- Describe the procedures followed by NEPCO to notify and compensate land owners.

Appendix B: Site Survey Report

The Consultant's team conducted site visits along the Green Corridor OHTL over two days. The team visited LOT 2 (132 kV OHTL from QAIA substation to Qatrana substation) on the first day and LOT 1 (400 kV from Qatrana substation to New Ma'an substation) on the second day.

B.1 Day 1 (QAIA to Qatrana)

A team composed of Dr. Kamel Al Zboon and Dr. Husam Abu Hajar carried out the first site visit on Wednesday August 21, 2019. The team departed the University of Jordan at 8:45 am and headed towards QAIA substation, where they noticed multiple substations, some were still under construction. The team met NEPCO engineers at the site who demonstrated that the substation under construction will connect to the OHTL from Al-Attarat substation to the south of QAIA substation. The engineers also pointed out that an extension to the existing QAIA substation was completed to connect with the Green Corridor OHTL. Figure B. 1 shows the QAIA substation extension. Notice that the part in front of the wall in Figure B. 1 is the QAIA extension whereas the part behind is the existing substation (prior to the construction of the Green Corridor Project).

The team then began the trip from QAIA substation along the Green Corridor OHTL as shown in Figure B. 2 and Figure B. 3. One can identify several parallel OHTL routes. The Green Corridor route can easily be identified as the one where the top of the tower is painted in white and red.

Figure B. 1: QAIA substation extension

Figure B. 2: The Green Corridor OHTL leaving QAIA substation

Figure B. 3: Green Corridor route leaving QAIA substation and the surrounding landscape

The team noticed the existence of nomadic tribes in the vicinity of the OHTL as shown in Figure B. 4.

Figure B. 4: Nomadic people living in the vicinity of the Green Corridor OHTL

The team continued along the Green Corridor throughout Al-Hujra town in Al-Jiza district (approximately 1 km to the south of QAIA substation) as shown Figure B. 5.

Figure B. 5: The Green Corridor OHTL passing though Al-Hujra, Al-Jiza district

The team made the first stop at a house in Al-Hujra town which is approximately 80 m far from the Green Corridor OHTL. The owner of the house, Mr. Mousa Abdel Kareem Erzaigat, was interviewed and the key points of his response are summarized as follows:

- There have been no accidents or concerns regarding the safety and environmental commitment of the contractor throughout the construction stage. In his perspective, the contractor was very professional.
- Mr. Erzaigat is unaware of any involuntary resettlements, land acquisitions, or land use restrictions as a result of the Green Corridor Project.
- Mr. Erzaigat pointed out that nomadic people often reside in the area in the summer and leave in winter.
- Mr. Erzaigat reported that children often play around the tower areas.
- Mr. Erzaigat stated that he has not experienced any adverse impacts as a result of the Green Corridor Project; however, he was concerned regarding the close distance between the residential areas and the OHTL.
- Finally, Mr. Erzaigat indicated that there was no public information disclosure or stakeholder engagement processes by NEPCO regarding the Green Corridor Project.

The team made another stop in the same town (Al-Hujra) where they found a house next to the OHTL with a "for sale" announcement written on its wall (Figure B. 6). The house belongs to Mr. Ahmad Abu Hassan who was contacted by phone using the number on the wall and he informed the team that he no longer wants to sell the house (old announcement). However, he was concerned by the existence of the newly constructed OHTL at a very close distance to his house and that those lines may affect his ability to expand vertically. The team interviewed his wife (Fatima) who was present at the house. She was asked several questions regarding the Green Corridor Project and its impacts and a summary of the key points of the interview with Fatima are as follows:

- The contractor was professional and did not impact the area negatively (regarding safety or environmental aspects).
- Grazing activities were more common in the region prior to the construction of the Green Corridor OHTL.
- Fatima insisted that they need a compensation from NEPCO due to the considerable loss in the value of their properties.
- There was no public information disclosure or stakeholder engagement processes by NEPCO.

Figure B. 6: Houses in Al-Hujra (owners were interviewed)

The team continued the trip along the Green Corridor and found newly constructed houses adjacent to the OHTL as shown in Figure B. 7. The team knocked the doors of these houses in an attempt to interview the owners but no one was present at the time of the visit.

Figure B. 7: Newly constructed houses in Al-Hujra (owners were not interviewed)

The team then resumed their trip along the Green Corridor through mostly dry and bare lands as shown in Figure B. 8. The Green Corridor also crosses through agricultural lands as shown in Figure B. 9.

Figure B. 8: Green Corridor OHTL leaving Al-Hujra

Figure B. 9: Green Corridor towers in agricultural lands

During the trip, the team noticed that there are towers still under construction (near the Modern Aluminum Company in Arainba). The workers stated that these towers are for the OHTL from Al-Attarat. Therefore, those towers were not considered further in our study.

The Green Corridor OHTL then cross through a private crop land (Trad Methqal Alfayez farm, Arainba) which is cultivated with corn, and the height of crops is approximately 2 – 2.5 m Figure

B. 10). Nonetheless, the existing OHTL also pass through this farm. The team did not find any people to interview in the farm.

Figure B. 10: One of the Green Corridor towers constructed in a private farm

The team then ran into nomadic people living in tents in Arainba. One of the residents, a man who identified himself as “Abu Khaled” was interviewed (Figure B. 11). He is a Syrian refugee from Quneitra, south west Syria and has moved to Arainba. He was asked several questions regarding the Green Corridor Project and a summary of the key points is presented below:

- There were no accidents, safety, or environmental concerns during the construction of the Green Corridor OHTL.
- Mr. Abu Khaled is not concerned with any resettlement or land acquisition issues since he is not a land owner.
- Mr. Abu Khaled and his family are nomadic people (constantly moving) and they make a living from agricultural and livestock farming. So they have not been affected by the newly constructed Green Corridor Project.



Figure B. 11: Interviewing nomadic people in Arainba

Another interview was made with a household owner in Arainba, Mr. Mahmoud Mustafa Baibars, who and his family lived in the house for almost five years. They also own the adjacent lands through which the Green Corridor OHTL pass (Figure B. 12). Mr. Baibars was asked several questions and the key points are summarized as follows:

- The contractors were professional during the construction stage and there were no accidents or environmental concerns.
- The Green Corridor OHTL run in close proximity to Mr. Baibars' house and through his land.
- Mr. Baibars has not been consulted or contacted by NEPCO. Instead, he referred to a lawyer who will handle his case against NEPCO.
- There were nomadic people in the region who often come around summer time and their presence might have been affected by the Green Corridor Project.

Figure B. 12: Affected house in Arainba

The team resumed their trip to the south and they observed that the OHTL cross through croplands near Al-Shahbaa town as shown in Figure B. 13.

Figure B. 13: Green Corridor OHTL passing through crop lands near Al-Shahbaa area

The team continued the trip through Al-Shahbaa village, Al-Watheeri. The house shown in Figure B. 14 is owned by Mr. Ibrahim Jayez Alwatheeri, and the OHTL run in close proximity to the house and in fact passes through a land owned by his great grandfather (they refer to him as Al-Oud). The man was interviewed in the presence of his wife and children and below are the key findings:

- The contractor was highly professional and there were no environmental or safety concerns during the construction stage.
- Mr. Alwatheeri is concerned with the Green Corridor Project. Initially, the planned route was crossing the middle of his property, but based on their demand and discussions with the engineers at the site, the line's position was shifted a bit towards the edges.
- Mr. Alwatheeri and his family are concerned that the towers will pose considerable risks to the community such as children potentially climbing up the towers and the exposure to EMF.
- Mr. Alwatheeri expressed his grievance regarding the loss of value of properties through which the Green Corridor OHTL pass.
- Mr. Alwatheeri indicated that one of the owners of the adjacent properties was planning to build a house but now due to the construction of the Green Corridor Project, he decided not to proceed.
- There was no communication by NEPCO, information disclosure, or stakeholder engagement throughout the Project's lifecycle.

Figure B. 14: Affected house in Al-Shahbaa

Mr. Alwatheeri also guided the team to another person in the same town, Mr. Awwad Mohammad Al-Watheeri, who owns several lands in Al-Shahbaa area and the Green Corridor OHTL pass through many of those lands. Mr. Al-Watheeri was interviewed at his house and the following is a summary of the key points:

- In general, the contractor was professional during the construction stage despite the loud noise during the excavation activities and the dust which interfered with the agricultural activities.
- There are no nomadic tribes in the region.
- There were no land acquisition procedures and the construction works commenced without consulting the owners or the local communities.
- Mr. Al-Watheeri was unaware of any employment opportunities of the local workforce during the construction stage.
- Mr. Al-Watheeri indicated that he was not informed nor consulted prior to the construction of the towers.
- Mr. Al-Watheeri stated that the future land use may have been affected due to the fact that the OHTL cross the middle of some of his lands.
- Mr. Al-Watheeri negotiated with NEPCO and the contractor engineers the potential to shift the locations of the towers but due to technical and financial reasons, his proposal was not taken into consideration.
- Mr. Al-Watheeri also demonstrated that the existence of the towers and OHTL interferes with the functions of several electrical appliances such as TV and cellphones besides the risk of exposure to EMF.
- Mr. Al-Watheeri contacted NEPCO after the works commenced in his lands to inquire on the compensations but he was informed that he cannot claim any compensation until the line is operated, after which NEPCO will make an announcement to those affected and will offer a monetary compensation. However, if no agreement is reached, the conflict can be resolved at court.

The team then resumed the trip to the south. The following pictures (Figure B. 15) were taken in Dhaba'a town.

Figure B. 15: Green Corridor OHTL through Dhaba'a town

The Green Corridor continues through mostly bare and dry lands as shown in Figure B. 16.

Figure B. 16: Um Al-Rasas

The OHTL cross through a farm near Um Al-Rasas interchange (next to Mashhour Methqal Alfayez Mosque). The farm is planted mostly with olive trees. Besides the Green Corridor towers, the existing OHTL (prior to the Green Corridor Project) also pass through this farm (Figure B. 17).

Figure B. 17: Farm in Um Al-Rasas

The Green Corridor continues through Al-Damkhi region as shown in Figure B. 18.

Figure B. 18: Al-Damkhi town

Finally, the OHTL reach Qatrana substation as shown in Figure B. 19.

Figure B. 19: Qatrana substation

In Qatrana Town, the team interviewed Mr. Tareq Al-Hajaya who is a resident of Qatrana district and is the Chief of Qatrana's Civil Defense Department. His contact information was obtained

through an advertisement on an e-commerce website. He was interviewed and the following is a summary of the key points:

- Both contractors (the Indian company and the Romanian company as he referred to them) were fully committed to the health, environment, and safety standards, and based on his work in the Civil Defense Department, they have not received a single report of an accident or incident from both contractors.
- His tribe does not own any land to the north of Qatrana substation (132 kV). However, the land to the south of Qatrana substation is recognized as a tribal property belonging to his relatives (although not officially registered). Therefore, he believes that they cannot claim compensations for the properties through which the 400 kV OHTL pass (pictures of the lands are shown in Figure B. 20).
- People from his local community asked the contractor (KEC Limited) to hire locals, and the contractor indeed hired around 12 of the local workforce. As a result, Mr. Al-Hajaya stated that people were happy with the contractor.

Figure B. 20: Tribal recognizable properties of Al-Hajaya tribe (not officially registered)

B.2 Day 2 (Qatrana to New Ma'an)

A team composed of Dr. Bashar Al-Smadi and Dr. Husam Abu Hajar carried out the second site visit to the Green Corridor LOT 1 on Thursday August 29, 2019. The team departed the University of Jordan at 8:15 am and headed towards Qatrana substation where the first site visit concluded. Prior to the visit, an inquiry was sent to the Royal Society for the Conservation of Nature (RSCN) regarding the proposed Nature Reserve in Abu Rukbeh, Al-Karak. A response was received via email for the coordinates of the four corners of the proposed location as shown in Table B. 1.

Table B. 1: Coordinates of the proposed Abu Rukbeh Nature Reserve

Corner	Longitude	Latitude
1	35.9973856	31.21349946
2	35.8293163	31.20763363
3	35.84264459	31.02629726
4	36.01221316	31.03057055

The first stop in the trip was near the northwestern point (corner 2). There is a composting plant just outside the borders of the proposed Reserve location which belongs to Al-Karak Municipality (Figure B. 21). According to the guard, Mr. Abu Emad, the area to the southeast of the composting plant is a protected one and only occasional grazing takes place there (Figure B. 22). The Reserve area is composed of chains of hills and valleys with altitudes ranging from 700 to 1,060 m above mean sea level with a total area of 327 km^2.

Figure B. 21: Composting plant to the northwest of the proposed Abu Rukbeh Reserve

Figure B. 22: Abu Rukbeh Reserve from the northwestern corner

The team then drove to the northeastern corner (corner 1) and it was observed that the OHTL run in close proximity to the proposed Reserve site as shown in Figure B.23 (although not overlapping at this corner).

Figure B. 23: Abu Rukbeh proposed location taken from Corner 1 (facing south)

The team then stopped at Al-Sultani Municipality to inquire on the status of the proposed Abu Rukbeh Reserve. This is due to the fact that corner 4 coordinates are on the eastern side of the Desert Highway as shown in Figure B.24. It can be concluded that the 400 kV OHTL cross through the proposed Reserve for almost 19 km. However, the Desert Highway also intersects the proposed location, and in fact, the entirety of Al-Sultani town falls within the boundaries of the proposed Reserve. The team interviewed Al-Sultani Municipality Mayor, Mr. Da'san Alhajaya at his office and asked him several questions related to the Green Corridor Project (Figure B. 25). A summary of the key points of the interview is as follows:

- In general, the contractor was professional during the construction stage with no health, environmental, or accidents concerns.
- There are nomadic people in the region, especially in winter and the Green Corridor Project has not impacted them.
- There are no land acquisition or compensation procedures; as the land is officially government land (tribal recognizable property).
- There has been no communication or stakeholder engagement procedures undertaken by NEPCO prior or after the construction of the Green Corridor Project.
- The contractor has hired few locals during the construction stage on a temporary basis.
- Al-Sultani town suffers sometimes from occasional power outage due to the lack of maintenance services in the town.
- People of Al-Sultani are aware of the proposed Abu Rukbeh Reserve but they are entirely against it because it will be established on their tribal recognizable properties.

Figure B. 24: Location of the proposed Abu Rukbeh Nature Reserve (yellow lines: Reserve borders; green line: 400 kV OHTL)

Figure B. 25: Meeting with Al-Sultani Municipality Mayor

The team then interviewed Mr. Firas Alhajaya who is a resident of Al-Sultani town. A summary of the points raised during the interview is as follows:

- There are no land acquisition or compensation procedures because the land is government-owned.
- There were no concerns (environmental, health, accidents) during the construction stage.
- There are nomadic people in the region who head west in the summer, and the Green Corridor Project has not affected their presence.
- Mr. Firas knows of three people from his relatives who were hired by the contractor during the construction stage.

The following pictures were taken in Al-Sultani town. Notice that the towers and the OHTL shown in Figure B.26 are the existing transmission lines (prior to the construction of the Green Corridor Project).

Figure B. 26: Old transmission lines passing through Al-Sultani town

The team then travelled on dirt roads to the west of Al-Sultani Municipality (approaching the proposed Reserve location). As shown in Figure B.27, there were several contractor employees who were conducting maintenance works on one of the towers. The supervisor provided the team with the contact information for the project manager, Mr. Shahir Shaik. He was called and interviewed over the phone and a summary of the key points is as follows:

- One of the contractor's priorities is hiring locals after they undergo sufficient training.
- The contractor is fully committed towards the environmental, health, and safety standards. There are daily and weekly reports produced at the site and there were no reports of any accidents or incidents throughout the construction stage.

Figure B. 27: Contractor employees working on one of the towers to the west of Al-Sultani town

The team then continued their trip through Al-Hasa, Tafilah and made a stop near a drilled water well as shown in Figure B.28. It can be seen that the Green Corridor OHTL run in parallel to the old OHTL (both are going through dry lands).

Figure B. 28: Al-Hasa, Tafilah

The Green Corridor OHTL then cross the Desert Highway in Jurf Al-Daraweesh, Tafilah as shown in Figure B.29.

Figure B. 29: Green Corridor OHTL crossing the Desert Highway in Jurf Al-Daraweesh

The team stopped at Lumi Market in Jurf Al-Daraweesh and interviewed Mr. Amjad Al-R'oud from the market's administration. The summary of the interview is as follows:

- There were no environmental, health, or safety concerns by the contractor during the construction stage.
- Mr. Al-R'oud does not believe that compensations are relevant because the land is government-owned.
- There were no impacts during the construction stage on the economic activities in the region (the location of the towers is far from existing economic activities).
- Nomadic people are mostly present in the spring and their presence has not been affected by the Green Corridor Project.
- There has been no communication or stakeholder engagement processes by NEPCO prior, during, or after the construction of the Green Corridor Project.

The team then contacted Mr. Abu Osama Aloweidhat. His contact information was obtained from an ecommerce website, where he posted an advertisement to sell a property in Al-Hasa area. He stated few days prior to the visit that the newly constructed lines pass through his property in Al-Hasa. The team met him near Al-Qadisyah, Tafilah and found out that he was referring to high voltage power lines which are not a component of the Green Corridor Project. Therefore, his case is not relevant to our study.

The team then continued through Ma'an and made a stop in Al-Hussainyeh, where the Green Corridor OHTL pass mostly in dry bare lands except in few locations where it runs in parallel to a vegetated land. However, the existing OHTL also run in close proximity to this land as shown in Figure B. 30.

Figure B. 30: Al-Hussainyeh, Ma’an

Finally, the team arrived at the New Ma’an substation and met the guard who stated that the construction works for this substation are almost completed (Figure B.31).

Figure B. 31: New Ma’an substation

Appendix C: Summary of the Key Findings Related to ESS2

C.1 NEPCO's commitment to ESS2

- There exist written labor procedures to define how project workers are managed, employment terms and conditions, job's description, and employee's rights and in accordance with the Jordanian Labor Law.
- Workers' wages are paid regularly and deductions are made according to the companies' regulations and policies.
- In case of termination, the employee receives the social security benefits and other entitlements in accordance with the national laws and regulations.
- The Company strictly adheres to equal opportunities and nondiscrimination in employment, treatment of workers, hiring, compensations, terms and conditions of employment, access to training, promotions, and disciplinary practices. A special emphasis is given to vulnerable group workers such as disabled people and migrant workers.
- Workers have the right to participate and engage in workers' organizations and legitimate workers' representatives. In fact, NEPCO employees are officially registered in an association for the energy sector labor. Worker's participation in such activities are respected by NEPCO and does not influence the employees.
- The Company strictly adheres to the national regulations regarding the employment age and the avoidance of forced labor (e.g. indentured labor).
- There is a proper grievance mechanism for employees to address work-related concerns in a way that shall not interfere or obstruct their right to access other administrative or judicial remedies as per the Jordanian Labor Law.
- A detailed health and safety procedure exists which addresses all potential hazards associated with the work activities and provides monitoring and control measures to eliminate and minimize the associated risks.
- NEPCO provides adequate health care services for its employees.
- An emergency plan exists to facilitate the quick response to workplace incidents.

C.2 Electromontaj S.A (LOT 2 contractor) commitment to ESS2 [12, 13, 14, 15, 16]

- Electromontaj S.A. is highly committed to providing equal opportunities to their current and future employees with respect to recruitment, training, promotion and disciplinary actions without any discrimination based on gender, color, race, age, religion, ethnic origins, disability, sexual orientation, marital status, or any other considerations. Physical disability will only be of concern if the work of disabled individuals would pose safety threats to them or others in the field. Additionally, the privacy of their own employees and personnel is always protected and appropriately used.

- Employment requirements of Electromontaj S.A. are compliant with the local and international legislation. Employment is often accomplished by advertising the job vacancies via proper platforms to ensure the effective communication to a wider community.
- A proper grievance mechanism is in place for Electromontaj S.A. with a particular interest to vulnerable groups.
- Electromontaj S.A. employees are provided with the necessary information, training, instructions, and supervision to undertake their tasks in a safe work environment. There is a detailed safety training program which is mandatory for all Electromontaj S.A. employees prior to entering the site. Appropriate preventive and protective measures are always addressed to respond to workplace hazards and risks.
- Electromontaj S.A. strictly adheres to safety procedures and provides their employees with safety equipment such as firefighting extinguishers, first aid kits, personal protective equipment, and safe rigging tools, and these are periodically inspected.
- There is a documented risk management procedure to identify and evaluate hazards related to Electromontaj S.A. activities.
- There is a documented risk register table among Electomontaj S.A. records to identify the list of potential hazards and control measures. These risks are specific to the construction activities of towers platforms, access roads, drilling works, steel reinforcement cage construction, pile cap concreting, tower transportation, towers loading/unloading, towers assembly, tower erection, scaffolding installation and removal, conductor stringing, conductor sagging/clamping, and other associated activities. A detailed list of hazards is defined along with the potential injuries which may result. The risk is evaluated and a set of recommended control measures are provided to reduce the risk to acceptable levels.
- In case of a workplace accident, Electromontaj S.A. accepts their own responsibility for those affected in accordance with the Approved Codes of Practice and Guidance for the local authorities. There is a document titled “Procedures in case of emergencies” in Electromontaj S.A. documents which addresses all potential risks and other relevant procedures in such cases. This document covers procedures related to medical emergencies, fire emergencies, chemical spills, severe weather and natural disasters, and electric shocks.
- There is a procedure titled “Incident Investigation Procedure” amongst the Health, Safety and Environment Management System (HSEMS) to deal with incidents in the workplace. Expert advice will be acquired as necessary to address health and safety risks and propose measures to mitigate and eliminate those risks and hazards.
- There is a competent internal HSE team at Electromontaj S.A. to follow up the relevant issues as per the Jordanian Labor Law.
- Electromontaj S.A. has weekly site inspection checklist and monthly checklist for auditing purposes and assuring the compliance with the health, safety, and environmental (HSE) standards.
- Safe and clean drinking water is available in sufficient quantities to all Electromontaj S.A. employees.

- Sufficient rest areas, shelters, clean toilets, and washing basins are provided to the Electromontaj S.A. workforce taking into consideration the gender issues and these facilities are maintained and cleaned frequently in accordance with the requirements.
- Sufficient HSE notice boards are provided in all places in the construction sites such that these are easily accessible by all workers and visitors.
- All lifting equipment and vehicles are operated by competent and certified personnel and inspection of these vehicles and equipment is carried by a third party inspection company.

C.3 KEC International (LOT 1 contractor) commitment to ESS2 [17, 18]

- According to a monthly progress report submitted by KEC International on September 30, 2018, the cumulative number of manpower employed in LOT 1 site were 1,864 with an average man-hr of 403,408. Training sessions were conducted during the Project duration with a total number of 1,095 employees receiving training.
- Regarding health issues, no single case of first aid, medical treatment, lost time injury (LTI), serious injury, occupational illness, or fatality accidents was recorded. There were also no vehicle accidents, property damages, or fire incidents. However, a total of 45 near miss cases were reported. These are unplanned events or conditions which do not result in any injury, illness or environmental damage but they have the potential to do so. Also, there were no environmental incidents reported until the date of this report [18].
- The Company's health, safety and environment plan (HSEP) was prepared in accordance with NEPCO's HSE requirements, Jordanian Labor Law, the Jordanian Environmental Protection Law, and the Jordanian Civil Defense Law.
- There exists an integrated risk assessment procedure within the HSEP to identify and characterize the different possible workplace hazards and present proper control measures to eliminate and reduce the injuries, illness, or disease likelihood.
- There exist strict procedures for deploying workmen in site works including criteria for physical ability, experience, and competency which are to be assessed by specialized HSE officers and the site engineers.
- All new workmen are required to attend a safety induction training which includes but not limited to general site rules and regulations, personnel and subcontractors' responsibilities, safety expectations from the workers, first aid facilities, accidents reporting, hazards and risks involved in the different project activities, handling the different risks and hazards, personal protective equipment, and general health education. Such training is repeated every six months to ensure that the personnel are refreshed and updated.
- There is a site HSE officer/manager whose responsibilities include daily safety inspection of workplace, identifying the safety requirements, investigating accidents and reporting to the regional and corporate HSE department, recommending appropriate safety measures, inspecting the PPE, facilitating the screening of workmen prior to enrollment in site works, maintaining all HSE documentation, and preparing and implementing onsite emergency plans as needed.

- The safety procedures and protocols followed by KEC International are also applicable to the subcontractors and their workers involved in the Project.
- The general welfare requirements such as drinking water, proper toilets, labor accommodation, and other requirements are addressed in the HSEP.

Appendix D: Summary of the Key Findings Related to ESS3

D.1 NEPCO's commitment to ESS3

NEPCO is fully committed to the protection of the environmental protection and mitigation pollution. Throughout the inspection and maintenance activities of the OHTL, NEPCO's personnel avoid the use of hazardous chemicals. Waste is collected and disposed of properly with an emphasis on the recycling and recovery concepts if possible. Regular vehicles are used during the inspection and maintenance activities and there are no other units depending on fuels combustion (e.g. generators, boilers, heaters, and furnaces). Deionized water is often used at minimum quantities to clean the insulators.

The concepts of environmental protection are strengthened by the health, safety, and environmental policy of NEPCO and the training programs which are mandatory to all field workers.

D.2 Electromontaj S.A (LOT 2 contractor) commitment to ESS3 [13, 14]

Electromontaj S.A. is fully committed to protect the environment and enhance the wellbeing of the environment and ecosystem. This is apparent in the Company's Environmental Responsibility Policy which states that the Company's environmental responsibility extends over the management, activities, and operation of their business as well as advising their clients on the best practices in the renewable energy related industries. According to the Environmental Policy, Electromontaj S.A. is fully committed to all the legal requirements and the applicable local and international standards. Additionally, Electromontaj S.A. avoids the use of unrecyclable materials whenever possible, promotes sustainable and energy efficient designs through life-cycle costing and cost-in-use studies, takes into consideration the surrounding environment for their designs and installation activities, emphasizes the importance of their H&S Policy in their own activities, and provides advice to designers regarding undesirable products such as asbestos, polyisocyanurate foam, etc. [13]. The contractor through a competent HSE team has weekly site inspection checklist and monthly checklist for auditing purposes and assuring the compliance with the HSE standards.

There is a documented procedure titled "Environmental Monitoring and Performance Measurement" within the HSE Plan (part of the HSEMS Plan) which addresses the types of wastes produced in-situ including but not limited to solid waste, construction waste, and hazardous waste. According to this document, the contractor will ensure that all waste materials are managed properly and in accordance with the local legislation and rules. Waste materials are identified and stored separately (timber, plastic, carton, general, etc.) until properly disposed. Waste shall be reused or recycled whenever applicable and landfilling is the last resort for waste management if other practices are not applicable.

D.3 KEC International (LOT 1 contractor) commitment to ESS3 [17, 18]

According to a monthly progress report submitted by KEC International on September 30, 2018, there were no environmental incidents reported until the date of this report [18]. There is a site HSE officer/manager whose responsibilities include daily safety inspection of workplace,

identifying the safety requirements, investigating accidents and reporting to the regional and corporate HSE department, recommending appropriate safety measures, inspecting PPE, facilitating the screening of workmen prior to enrollment in site works, maintaining all HSE documentation, and preparing and implementing onsite emergency plans as needed. There is also an HSE monitoring plan which determines the frequency of monitoring activities to ensure compliance with the relevant national and international standards and guidelines. Some of the environmental issues which are addressed in the HSE monitoring plan include air quality, noise, spillage, water quality, waste management, soil erosion, land degradation, and road traffic safety. For example, the objectives associated with the "Air Quality" issue include minimizing dust pollution, emissions control, minimizing health impacts, and minimizing impacts to public health. To accomplish these objectives, several measures were proposed in the HSEP such as the daily inspection of sites, dust suppression procedures (e.g. watering), inspection and maintenance of vehicles, inspection of the PPE, and covering materials properly. Objectives and measures have been determined for the other environmental issues. Furthermore, there is a waste management procedure which addresses the need to remove waste materials such as cable drums (to be reused), empty cement bags (for disposal), leftover metal pieces (for reuse or to be sold as scrap metal), non-reusable oil (to be placed in drums and transported to a proper storage site), concrete leftover (to be removed), and dugouts (to be buried).