Jizzakh Solar PV Project

Non-Technical Summary (NTS)

Disclosure Draft

Masdar

March 2023

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Quality information

Prepared by	Checked by	Verified by	Approved by
Katerina Koscheeva EIA Consultant	Greg McAlister Associate Director	Iain Bell Regional Director	Iain Bell Regional Director

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Prepared for:

Masdar

http://www.masdar.ae

Prepared by:

AECOM Limited
1 Tanfield
Edinburgh EH3 5DA
United Kingdom

T: +44 131 301 8600
aecom.com

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1. Introduction

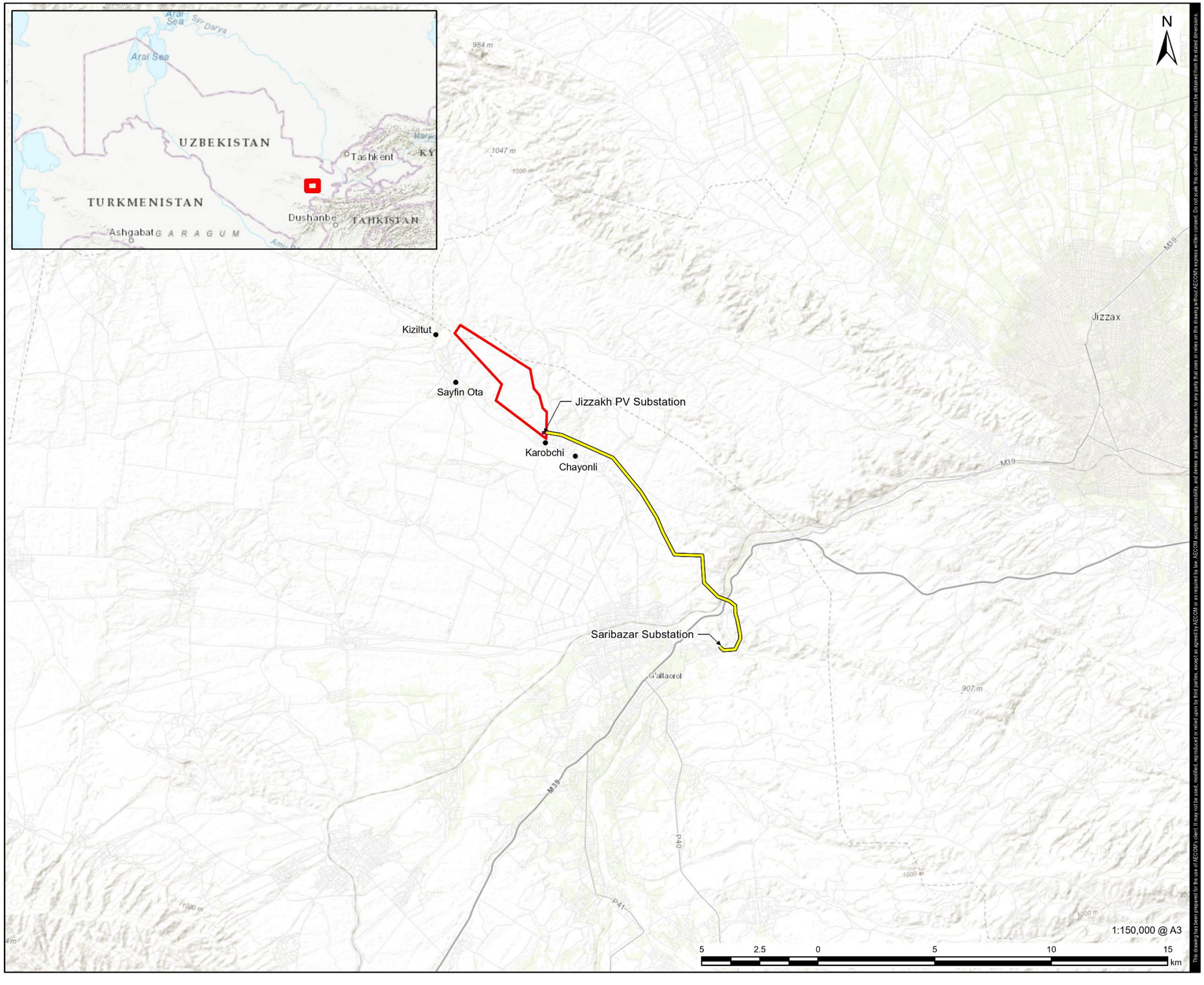
The Government of Uzbekistan (GoU) is planning the construction of large solar power station in the Jizzakh region of Uzbekistan. The new solar power station will produce a maximum of 220 MW of electricity and will form an important part of for the local and national power supply.

It is important for the GoU to understand how the new solar power station could affect the environment and local communities and they asked independent specialists to undertake an Environmental and Social Impact Assessment (ESIA) of the new solar plant. This Non-Technical Summary (NTS) presents the key findings of the ESIA for the solar park, both positive and negative. The ESIA considers the construction and operation of the solar plant, transformers and an overhead power line connection to the national grid.

The aim of the ESIA involved an assessment of the existing environment; review of the relevant legislation; stakeholder engagement including public participation and consultation; identification of potential environment impacts during the pre-construction, construction, operation and decommissioning phases of the Project; and development of an appropriate management framework for the mitigation of negative effects associated with the proposed Project.

Based on the ESIA findings, the following conclusions have been reached and recommendations made:

- Jizzakh solar PV plant will produce local, clean energy which will reduce Uzbekistan's use of fossil fuels required to drive thermal power plants. Thermal power plants are costly and release carbon dioxide into the air, making a significant contribution to changes in the global climate. The Project contributes directly to Uzbekistan's low carbon pathway strategies.
- Positive impacts of the proposed Project are expected due to the financial contribution the project will make to the regional and national economy during construction and operation. It is also hoped that the project will increase local employment and training during construction and operation.
- The Solar Plant has the potential to cause some level of negative environmental and social impact as it is described in the Section 4.
- The majority of potential environmental impacts are considered to be of a standard nature and will be reduced through by the use of simple management controls that will be applied during the construction and operation of the solar plant.



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PROJECT

Masdar Solar PV ESIA
- VO1 LRP

CLIENT

Masdar
A MUBADALA COMPANY

CONSULTANT

AECOM Limited
Aldgate Tower,
2 Leman St,
London E1 8FA
www.aecom.com

LEGEND

- Overhead Line
- Jizzakh PV Area
- Jizzakh PV Substation
- Saribazar Substation
- Settlement

NOTES

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ISSUE PURPOSE

REPORTING

PROJECT NUMBER

60667132

FIGURE TITLE

Jizzakh -
Site Context

FIGURE NUMBER

Figure 1

Figure 1. Project Location

1.1 Project Background

The Government of Uzbekistan aims to develop up to 5 gigawatts (GW) of solar power by 2030 through the development of privately financed and operated renewable energy projects. Scaling Solar is a World Bank Group program that assists governments to procure and develop large solar projects with private financing.

World Bank Group's Scaling Solar Uzbekistan Round 2 program aims to add over 400 MW of clean and renewable PV energy to the country's energy mix. As part of this round, two sites — in Samarkand and Jizzakh regions have been identified for development.

This report covers the development of a 220 MWac solar PV project in Gallaorol District, Jizzakh region of Uzbekistan, referred to as "the Project". The Project site area is 562 ha. The Project will also comprise a 14.77 km overhead transmission line from the on-site substation to the existing Saribazar substation.

Table 1-1. Key Project characteristics

Location	Gallaorol District, Jizzakh region, Republic of Uzbekistan
Installed capacity	220 MWac
Solar PV Site area	562 ha
Overhead grid connection line	14.77 km 220 kV Steel lattice towers
National grid substation	Saribazar

2. The Project

2.1 Project Location

The proposed Project Site is located in Gallaorol District, Jizzakh region, in the south-east of the Republic of Uzbekistan. Nearest communities (makhallas) are Chayonly (also referred to as Chayli on some maps), Kiziltut, Karobchi (also referred to as Karakchi on some maps), and Sayfin Ota. The Makhallas identified correspond to the four settlements located within a radius of 2 km of the project site boundary. The estimated total population of the settlements within 2 km of the site boundary is 4,860 people.

The Project site is approximately 10 km north of the city of Gallaorol and 25 km west of the city of Jizzakh, the regional capital. The site can be accessed via road R-42 off motorway M39.

The project site will occupy about 562 ha of land and the perimeter of the PV power plant will be fenced with an approximate 2.5 m high welded wire fabric fence. The solar PV plant will be connected to an existing national grid substation at Saribazar via the overhead transmission line route which is 14.77 km in length.

The site is very open and is generally flat. The land is currently used for grazing and growing wheat. Land along the transmission line is primarily used for farmland. The proposed access route to site passes close to a number of residential properties in Karakchi and it may require some level of land take and physical resettlement. A Social Compliance Audit and Livelihood Restoration Plan have been prepared.


Figure 2: Project Site Area (left) and Route of Overhead Line (right)

2.2 Overview of Solar Photovoltaic (PV) Technology

In general terms, solar PV technology converts the sun's energy into electricity using a series of solar panels, inverters and transformers to connect to the electricity grid.

The performance of a PV module will decrease over time due to degradation. Degradation rate depends on the environmental conditions in the local area and the technology of the module.

Modules are either mounted on fixed-angle frames or on sun-tracking frames. Fixed frames are simpler to install, cheaper and require less maintenance. However, tracking systems can increase yield by up to 20%. Tracking, particularly for areas with a high direct/diffuse irradiation ratio, also enables a smoother power output.

PV modules and inverters are all subject to certification, predominantly by the International Electrotechnical Commission (IEC). New standards are currently under development for evaluating PV module components and materials.

The performance ratio of a well-designed PV power plant will typically be in the region of 77% to 86% (with an annual average performance ratio of 82%), degrading over the lifetime of the plant. In general, good quality PV modules may be expected to have a useful life of 25 to 30 years.

The main components of the solar PV Project are:

- Solar PV modules: These convert solar radiation directly into electricity.
- Inverters: These are required to convert the DC electricity to alternating current (AC) for connection to the utility grid.
- Module mounting (or tracking) systems: These allow PV modules to be securely attached to the ground at a fixed tilt angle, or on sun-tracking frames.
- Step-up transformers: The output from the inverters requires a further step-up in voltage to reach the AC grid voltage level.
- The grid connection: where the electricity is exported into the grid network.

2.3 Project Team

2.3.1 Developer

The Project is being developed by Masdar (Abu Dhabi Future Energy Company PJSC). Masdar has been selected through a competitive tender set up by the Ministry of Investment and Foreign Trade, the Ministry of Finance, and the Ministry of Energy with assistance from the International Finance Corporation (IFC).

Masdar
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Masdar is a global leader in renewable energy and sustainable urban development, with headquarters in Abu Dhabi. Over the past decade, Masdar have pioneered commercially viable solutions in clean energy, sustainable real estate and clean technology in the UAE and around the world.

2.3.2 ESIA Consultants

The Developer has commissioned AECOM to lead the Project ESIA study, ESIA consultation and ESIA reporting.

AECOM is a global leading engineering and environmental consultancy providing professional technical and management support services to a broad range of markets including power and renewables, with experience supporting more than 15 gigawatts in solar power around the world.

AECOM has partnered with Green Business Innovation, a leading environmental consultancy based in Uzbekistan, who will lead the field surveys and stakeholder engagement for the ESIA.

2.4 Overview of Project Construction and Commissioning Activities

2.4.1 Construction

The construction is planned to start in 2023 and is expected to last approximately 18 months, with first power targeted in 2024. The key stages of construction, from mobilisation of workforce to commercial operation date.

Construction activities will comprise:

1. Site preparation:
    - Temporary fencing of the Site
    - Vegetation clearance
    - Earthworks, including ground levelling (cut and fill), installation of drainage ditches, trenching for cables, construction of internal site tracks. Excavated material will be re-used within the Site for backfilling as much as possible (subject to geotechnical suitability) in order to reduce the need for aggregate to be brought to Site from elsewhere
2. Project infrastructure:
    - Construction of temporary storage areas, administration building, security
    - Construction of transmission line
    - Construction of accommodation camps
3. PV power plant installation:
    - Import of components to Site
    - Installation of foundations and mounting structures
    - Installation of solar panels
    - Installation of other equipment (inverters, substation)
    - Installation of lattice steel towers for the connection to the national grid substation
    - Installation of export cables
    - Connection to national grid substation
4. Commissioning of the PV plant:
    - Mechanical and visual inspection
    - Electrical and equipment testing
    - Commencement of electricity supply into the grid
5. Site clean-up and reinstatement.

2.4.2 Operation

Masdar will be responsible for the design, build, finance, operate, maintain and transfer (DBFOMT) of the solar PV power plant. During the operational phase, JSC National Electric Grid of Uzbekistan will purchase the generated electricity as per the Power Purchase Agreement (PPA).

After commissioning, the transmission line will be transferred to JSC National Electric Grid of Uzbekistan for operations and maintenance. JSC National Electric Grid of Uzbekistan will be responsible for the maintenance of the safety protection zone under the transmission line including vegetation management and land use close to the line.

Operation and maintenance of the facility will include:

- Replacement of faulty PV modules
- Repair of inverters and other ancillary equipment
- Periodic cleaning of PV modules depending on soiling and sand/silt accumulation
- Delivery of water and emptying the septic tank
- General upkeep of the territory within the Solar PV Site

A preventive maintenance program will be established for maintenance of the inverters; mounting structures; surge arresters, cables and PV junction boxes; meteorological station; security, fencing and gates; ditches and drainage culverts; and all sub-station components, including services and septic tank.

2.4.3 Project Staffing

AECOM estimate that the typical workforce during the peak construction period is 535 workers for a solar PV plant of this size. During the early stages of construction, the worker numbers will be low (under 100) but will rise quickly from month 5 when the civils work begins. After the peak level has been reached, the local workforce will gradually be reduced leading up to the start of operations. This will be confirmed by the EPC contractor.

The workforce will comprise a mix of highly qualified specialists, technicians and low-skilled personnel. Low-skilled construction workers will receive job-appropriate training before starting work on the Project. This includes basic training on health, safety and environment (HSE), labour management and, where required for specific job profiles, vocational training.

Ideally, the workforce will be sourced locally. Qualified specialists will be sourced both nationally and internationally, depending on the skills availability.

2.4.4 Decommissioning

A typical design life of a solar PV facility is 20–30 years. The Project components will be continuously maintained throughout the lifetime of the Project. The condition of equipment will be reviewed at the end of the design life to determine whether it remains in a viable condition to continue operation after that time. The facilities may be upgraded or renewed based on the cost-benefit analysis.

The Project will be dismantled once it is no longer economical, and the land plot reinstated to its current state (albeit not reprofiled). Decommissioning of the PV power plant is expected to require 6–8 months to complete.

During decommissioning, all above ground infrastructure will be removed. It is anticipated that the redundant solar PV panels will be either recycled or sold for reuse, depending on market conditions at the time.

Below ground infrastructure such as buried cables will be removed to a depth of 0.5 m and backfilled with topsoil.

The site will be re-seeded with plants consistent with surrounding areas. The success of bio-restoration will be monitored for two dry seasons following decommissioning, and remedial actions will be taken at locations where rates of restoration are below the expected levels.

The decommissioning will abide by the relevant legislation and regulations that are applicable at the time and decommissioning will be planned at least six months in advance.

2.5 Legal and Policy Framework

2.5.1 Uzbekistan's Green Economy Strategy

Uzbekistan's strategy for transition to a green economy in the period of 2019–2030 was approved by the Resolution of the President of the Republic of Uzbekistan dated 04.10.2019 No. PP-4477 (the "Resolution"). This Resolution was adopted to ensure fulfilment of obligations under the Paris Agreement on climate change signed by Uzbekistan on April 19, 2017, as well as the implementation of the Action Strategy for five priority areas of development of the Republic of Uzbekistan in 2017–2021.

2.5.2 Requirements of the National EIA Procedure

There are specific requirements as to the content, development procedure and examination of Environment Impact Assessment (EIA) documents. These are governed by the following legislative acts of the Republic of Uzbekistan:

- Law of the Republic of Uzbekistan No 754-XII dated 09.12.1992 "On Environment Protection"
- Law of the Republic of Uzbekistan No 73-II dated 25.05.2000 "On Environmental Impact Audit"
- Regulation "On State Ecological Expertise in the Republic of Uzbekistan", approved by the Decree of the Cabinet of Ministers of the Republic of Uzbekistan No 491 dated 31.12.2001.

2.5.3 International Best Practice Guidelines

The International lenders involved with the Project require projects that they finance to meet the following international standards:

1. The Equator Principles (Equator Principles Association, 2020)
2. IFC Performance Standards (IFC, 2012)
3. IFC Environmental, Health and Safety (EHS) General Guidelines, including wastewater and ambient water quality, waste management and hazardous materials management, noise management, occupational health and safety, and construction and decommissioning guidelines (IFC, 2007)
4. IFC EHS Guidelines for Electric Power Transmission and Distribution (IFC, 2007)
5. Asian Development Bank (ADB) Safeguard Policy Statement (ADB, 2009)
6. European Bank for Reconstruction and Development (EBRD) Environmental and Social Policy, including Performance Requirements (EBRD, 2019)
7. European Investment Bank (EIB) Environmental and Social Standards (EIB, 2022)

These are all specific policies, procedures, strategies and regulations designed for promoting sustainable development. These procedures include a detailed environmental review process prior to final approval of financing for the Project, detailed environmental guidelines, detailed health and safety requirements, procedures for social impact assessment and public consultation and information disclosure and many other issues, associated with project construction, operation and decommissioning.

3. Environmental and Social Assessment Methodology

A number of criteria were used to determine whether or not a potential impact of the Project could be considered 'significant'. Wherever possible, a quantitative assessment of the impacts was undertaken. Where this was not possible, a qualitative assessment of impacts was made by technical specialist, based on existing information available for the site and the surrounding study area, and their experience with other solar PV developments.

The technical specialists who undertook the ESIA study used a number of steps as follows:

- Baseline study: The collection of relevant information on the current status of the environment. This study provides a baseline against which change due to the development is measured.

- Impact prediction and Assessment: Impact prediction involves forecasting the likely changes in the environment that will occur as a result of the development. Impact Assessment requires interpretation of the importance or significance of the impacts to provide a conclusion or recommendation to the decision-makers who will impose conditions that must be satisfied before the solar plant can be built.
- Assessment of cumulative impacts: This assessment will identify those combined impacts which may arise from other existing or planned developments in the area.
- Mitigation: Mitigation involves taking measures to reduce or remove environmental impacts.
- Assessment of residual impacts. This will be the impacts remaining following the application of mitigation measures.
- Monitoring: Follow up monitoring has been described in ESIA Report and includes the monitoring of impacts once the mitigations have been put in place.

3.1 Stakeholder Engagement Programme

- As part of the ESIA study, AECOM carried out a stakeholder engagement programme. The programme comprises several stakeholder engagement activities which aim to:
- Build and maintain stakeholder relationships
- Gather information on the local environmental and social issues
- Continue to disclose Project information (including any access restrictions, employment and procurement opportunities, and community health and safety issues)
- Monitor and evaluate stakeholder engagement
- Provide stakeholders the opportunity to provide feedback
- Manage grievances from the community and workers.

The details of the stakeholder engagement programme as well as the applicable regulatory framework, the stakeholder identification and analysis process, and details of the Grievance Mechanism (GM), are documented in the Stakeholder Engagement Plan (SEP). The SEP (and the engagement programme) is a ‘live’ document that will be updated as the Project progresses.

Issues identified during the stakeholder engagement process have been recorded in the assessment of impacts and appropriate mitigation has been developed where appropriate.

4. Environmental and Social Impacts

Following the identification of the main environmental and social baseline features, the likely impacts have been predicted. In all cases an assessment was carried out which measured the extent of the impact as a change to the existing conditions. The significance of each impact was categorised and for significant impacts, further mitigation measures have been proposed.

4.1 Key Impacts

4.1.1 Air Quality

Air pollution may arise as a result of dust emanating from vehicle movements and other construction activity. However, this will be a temporary effect that can be mitigated by restricting vehicles to sealed access tracks and the use of dust suppression measures. The Project impacts may include:

- Dust and engine emissions created by construction activities (i.e. earthworks, demolition and operation of machinery) could influence the local ambient air quality.
- The release of exhaust emissions to the atmosphere could have an effect on the local ambient air quality.

The rural nature of the site, the expansiveness of the landscape and the limited amount of traffic present mean that vehicle emissions are not predicted to be significant. As a result, the air quality assessment considers only dust emissions.

The potential impact during construction is considered to be Medium adverse, on the basis that residential receptors are within 200m of the site boundary, but construction vehicles may pass closer to and from site. Mitigation measures detailed in the ESIA are predicted to reduce the impact to negligible. Key measures include:

- Identifying strategies to manage dust on the road during the execution of the Project.
- Provision of designated wash down area to spray and wash wheel spokes, tires and around the wheel opening of all vehicles entering and exiting the construction compound.
- Use of properly maintained vehicles and construction equipment with emission controls.
- Communicate project risk to local communities and address concerns accordingly. Monitor any complaints filed (via grievance mechanism) from local stakeholders as an additional tool to monitor dust management measures.

4.1.2 Archaeology and Cultural Heritage

The Project is not deemed to have a direct adverse impact on any international or nationally recognised cultural heritage. No significant archaeology or cultural heritage assets are currently known from within the Solar Array area. It is not located in an area of known archaeological potential –although it has a south-facing aspect, there are no presently identified remains from this upland valley. Known remains in the surrounding region focus on river valleys, prominent strategic positions, caves and rock shelters. The area has been subject to previous ploughing, which may have levelled any earthworks and resulted in minor damage to any underlying archaeological deposits.

The potential impact is assessed as Low and not significant prior to mitigation. Mitigation measures detailed in the ESIA can reduce the residual impact to Negligible. Key measures include:

- Training workers on the importance of archaeological and cultural resources and how to deal with them through toolbox talks.
- In case of chance find, the work should be halted and the area protected and the matter reported immediately to the Department of Culture for appropriate action.
- Microsite overhead transmission line towers with the supervision of an archaeology expert during any intrusive works to prevent impact on existing archaeology/cultural heritage.

4.1.3 Biodiversity

4.1.3.1 Avifauna

The proposed project site is not located on a major flyway or in a geographical feature that would concentrate migrating species. Survey work has confirmed that the Project site is not important for breeding or migrating species, including raptor species of international and national conservation concern, however, registrations of the (endangered) single Egyptian vulture, (vulnerable) eastern imperial eagle and (vulnerable) greater spotted eagle were recorded overflying in spring. Small numbers of (endangered) steppe eagle were recorded potentially over-wintering within the Sanzar river valley (in vicinity of Overhead Line route) and small numbers of several species of large raptors of national nature conservation concern (on the Uzbekistan Red List) use the Project site for foraging/hunting. In addition, large numbers of overwintering Great bustard (critically endangered in Uzbekistan) have been recorded in areas to the north and south of the Project. It has been identified that there may be a risk in some winters of Great bustard flying through the Project area and colliding with the Overhead Line. These species are defined as Priority Biodiversity Features (PBF)[1] .

Construction impacts are likely to include habitat loss as well as disturbance impacts in the Project and adjacent areas. The existing habitat within the Solar PV and most of the Overhead Line route is Modified Habitat as defined in IFC Performance Standard 6. The degraded nature of the project site and the relatively small number of birds encountered mean that there is not likely to be a significant impact on resident bird species.

Habitat loss associated with construction is unlikely to result in a significant impact to migrating birds as no major attractant features (e.g. lakes / wetlands) will be lost. As a result, there are not anticipated to be any impacts on resting or stopover sites for migrating birds.

[1] PBF is a term used in the EBRD's Performance Requirement 6 relating to biodiversity conservation, and includes species classed against specific criteria including those identified as Vulnerable, Endangered or Critically Endangered on the IUCN Red List, or at the national/regional level.

The main impacts are expected from operation, in particular from the proposed overhead transmission line including:

- Displacement of birds by the presence of new infrastructure
- Permanent habitat loss, fragmentation or degradation from construction of new infrastructure
- Increased bird mortality from operational overhead line infrastructure
- Disturbance of birds from people and traffic during operational maintenance.

The impacts were therefore assessed for the critically endangered Great Bustard in operation, and was considered High and significant for the overhead transmission line and Low and not significant for the Solar PV site. There is a requirement for the project to achieve net gain in biodiversity for Great Bustard since the area is defined as critical habitat for this species. The impacts considered for all other bird species were considered as Low and not significant. Mitigation measures detailed in the ESIA will be implemented therefore the predicted residual impacts on ornithology is expected to be Low and not significant. These measures include:

- Environmental toolbox talks prior to, and during, construction to raise awareness, limit conflict and reduce additional disturbance to fauna and avifauna.
- Bird divertors installed along entire extent of overhead lines.
- Initial site preparation and clearance to be undertaken outside of the bird breeding season, where possible.
- All mitigation and monitoring should be included in a Biodiversity Action Plan which will also need to include a robust Adaptive Management Strategy if monitoring indicates impacts on Great Bustard or other species of global conservation concern. This should include an outline Off-setting plan to achieve a net gain.
- A local specialist will be employed to monitor great bustard overwintering patterns and to engage with local residents to help reduce hunting.

4.1.3.2 Terrestrial Ecology

Construction will cause the loss of habitat as well as disturbance in the adjacent areas. However, the natural vegetation at the Project site has been substantially altered by farming and irrigation.

The existing habitat within the Solar PV site and the majority of the extent of the Overhead Line is Modified Habitat as defined in IFC Performance Standard 6. Degraded Natural Habitat occurs near the south-eastern end of the Overhead Line between the Sanzar river valley and the existing sub-station terminus, however areas impacted by the construction of the pylons will be small. For the Solar PV it is expected that there will be limited removal of vegetation during construction as it mainly consists of low growing species. The total extent of site levelling work will be determined by the EPC Contractor. No vegetation removal is planned outside this area. For the construction of the Overhead Line the removal of the intensively cultivated habitat will be very localised at the locations of the respective pylon locations.

Direct impacts may occur in relation to Central Asian tortoise populations within the Solar PV site, mainly during site stripping activities. As stated above the total extent of site levelling work will be determined by the EPC Contractor but is expected to cover a significant percentage of the overall area of the Solar PV site area. It is within this area where direct impacts may be encountered. Based on the results of the precautionary assessment of population density it is expected that 175 tortoises may be present in this area. The number of tortoises found during the pre-construction reptile translocation works undertaken in 2022, in accordance with regional government permitting requirements, will be detailed in future ecology reports.

As a result, the potential impact on terrestrial species is assessed as Low and not significant. A suite of both standard mitigation measures and species-specific mitigation measures are detailed in the ESIA that will ensure impacts remain as Low significance. The Project should achieve No Net Loss for any species defined as a PBF. Key measures include:

- Implement robust management measures to ensure good construction practice within the proposed project site.
- Preparation of a Biodiversity Management Plan (BMP) and employment of an ecologist during construction to oversee implementation of the BMP.
- Environmental toolbox talks prior to, and during, construction to raise awareness, limit conflict and reduce additional disturbance to fauna and avifauna.

- Tortoises will be removed to a permanent receptor area within the Solar PV area.
- Tortoise holes cut in selected parts of the perimeter fence to enable free movement.

4.1.4 Geology and Soils

The main impact on soils during construction will be the potential for soil contamination from spills and leaks and increase in vulnerability to erosion. Soil compaction and loss of limited vegetation present increases in the soils' vulnerability to erosion. Soils will be particularly vulnerable when wet (i.e. during snowmelt or heavy rain), when vehicle traffic is likely to cause the greatest damage.

Where roads are un-surfaced, rutting and gully erosion eventually make the roads impassable so that vehicles drive off the track and the area affected by erosion continually widens. Soil compaction and loss of limited vegetation present increases in the soils' vulnerability to erosion. Soils will be particularly vulnerable during the rainy seasons, when vehicle traffic is likely to cause the greatest damage.

Electrical equipment (transformers, inverters, electrical switchgear) heavy duty equipment and ancillary buildings (office building, meteorological towers) are usually earthed by means of surface mats. The existence of a very low strength layer of soil up to a depth of around 2.10 meters, suggests the likely existence of partial collapsible areas that could develop until reaching the surface. It is considered that collapse behaviour can take place within this superficial unit in different areas of the PV parcel. Consequently, it is not advisable to rely on the strength of this soil to support any foundation but to go through it and lay foundations on underlying sandy and gravelly layers. This will be confirmed during future studies by the EPC.

As a result, the significance of the potential impact is assessed as Low. The extent of reduced soil quality due to construction activities is considered local, and the duration assessed as being temporary and short-term. Mitigation measures detailed in the ESIA can reduce residual impact to Negligible. Key measures include:

- Run-off and erosion control features included in all civil designs by contractor.
- Demarcate storage and staging areas and store all materials, equipment and vehicles in these areas to reduce soil damage.
- Vehicles confined to demarcated roadways.
- Store all materials within designated areas of temporary storage facilities and provide supplies to clean-up of minor spills.

4.1.5 Hydrology and Hydrogeology

4.1.5.1 Surface Water

There are no permanent waterbodies within the Solar PV Site. Gullies, running through the site in west to east direction, have been caused by surface run-off. There are two permanent watercourses near the Solar PV Site boundary.

Surface water may be subject to reduction in quality should proper mitigation not be implemented. The watercourses adjacent to the site currently provide drinking water for livestock.

During construction, earthworks, road construction and use of heavy vehicles could alter surface drainage patterns. The removal of vegetation and compaction of soils will reduce infiltration and surface run-off will increase. The risk is greatest during severe precipitation events, which are most likely to occur in spring. The increased volume of water flowing into drainage channels is likely to cause additional soil erosion. Surface run-off will also contain higher concentrations of suspended sediments during construction than would otherwise be the case. Other potential sources of pollution during construction comprise leaks and spills of oils from machinery and discharge of sanitary waste and wastewater.

As a result, the potential impact is assessed as Low. The extent of reduced surface water quality due to construction activities is considered local, and the duration assessed as being temporary and short-term. Nevertheless, Good International Industry Practise pollution prevention measures will be implemented as detailed in the ESIA, to reduce the impact to Negligible. Key measures include:

- Buffer distance of 25m applied to the seasonal watercourses and irrigation channels.
- Routes of roads to be selected to avoid existing drainage channels or depressions where possible.

- Culverts or other drainage control features should be installed where crossings of drainage routes are unavoidable and to prevent ponding of surface water on the upstream side.

4.1.5.2 Groundwater

The source of water required for construction has not yet been determined but it is recommended that water is delivered by tanker and not from a groundwater well. Potential sources of pollution to groundwater during construction comprise leaks and spills of oils from machinery and discharge of sanitary waste and wastewater. During construction, sanitary waste will be collected in containers below portable toilets and transported to a registered waste disposal facility for disposal. Storage and handling procedures for oils and other chemicals will be required to minimize risk of pollution.

Potential impacts on groundwater include:

- Accident/ unplanned event: Groundwater could be contaminated through accidental fuel spills.
- Accident/ unplanned event: Depending on the method of waste disposal, impacts could be felt on surface or groundwater, flora and fauna and/ or local communities.

The potential impact on groundwater during construction is considered to be Moderate adverse, on the basis that local communities abstract groundwater for domestic use. Mitigation measures detailed in the ESIA, including the implementation of Good International Industry Practise pollution prevention measures is considered to make the contamination of groundward very unlikely, and the impact would be reduced to Negligible.

4.1.6 Labour and Working Conditions

During the construction phase, there may be occupational health and safety risks to workers from the various operation and maintenance activities expected to take place for the Project. Key risks could include, *inter alia*, collision with vehicles and plant and exposure to a variety of hazards such as electric shock from exposed cables and thermal burn hazards and exposure to chemicals, hazardous or flammable materials.

Labour and working conditions, including occupational health and safety impacts, are considered to be of medium-term duration throughout the construction phase and are expected to be of potential high magnitude and high sensitivity as in extreme cases they could entail permanent impacts (e.g. death or permanent disability). As such, the potential impacts are considered to be High and significant. Appropriate mitigation will therefore be developed. Mitigation measures detailed in the ESIA reduce residual impact to Low. Key measures include:

- Comply with 'governing regulations' and international best practise.
- Establish a permit to work system for all high-risk activities (i.e. hot works, confident space, working at high etc.)
- Train employees on the importance of occupational health and safety requirements and develop work instruction.
- Strictly enforce the use of the Personal Protective Equipment to minimise the accidents.

4.1.7 Landscape and Visual

The sensitivity of the site as a landscape receptor is considered to be low. The landscape is not protected and is not considered to be important in a local context. Existing man-made features (including power lines) further detract from the already low landscape quality. Owing to the arid nature of the environment and the fragility the soil often remains un-vegetated, detracting from the landscape character at the local scale.

Visual receptors are considered to be of medium sensitivity. This is because the land at which the Project is located is flat, with very few trees, hedges or fences to obscure visibility, and as such visibility can extend for several kilometres.

As a result, the potential significance of the impact on landscape character is assessed as Low. Although impacts will be visible in places, the surrounding features are often of a larger scale in height and extent. Therefore, changes can be easily accommodated. Additionally, the potential significance of the impact on visual amenity is assessed as Low. Although impacts will be visible in places, the surrounding features are often of a larger scale in height and extent. Therefore, changes can be easily accommodated. Therefore, the impacts on landscape character and visual amenity are expected to remain as Low after mitigation.

4.1.8 Noise

Noise pollution may result from the large workforce and construction activities, particularly the movement of trucks used to carry material to the site and removal of debris. Some heavy earth moving, and compacting machinery may be required for brief periods during construction but it is expected that much of the civil work will involve manual labour. Work will not take place at night.

The Project impacts may include:

- Truck and vehicle traffic along main transport/access routes will create noise and vibration that may increase ambient noise levels.
- Construction equipment and machinery could create noise and vibrations that may increase ambient noise levels.

The construction of the substation building / transformers and inverters are considered a worst-case construction noise scenario. Typically, associated construction activities within a 200 m distance from noise sensitive receptors have the potential to result in increased construction noise at receptor locations. The southern boundary of the site is within 250 m of residential receptors providing a suitable buffer to ensure that construction noise will not exceed noise limits at this location.

The potential impact on noise during construction is considered to be Medium adverse, on the basis that no residential receptors are within 200m of the site boundary. Mitigation measures detailed in the ESIA, including the implementation of Good International Industry Practice pollution prevention measures, can reduce the impact to Low adverse. Key mitigation measures include:

- Adopt and follow best practicable means to ensure that the quietest available plant and construction techniques are used.
- Where appropriate, micro-siting is to be undertaken to ensure construction noise impacts are minimised and equipment is located as far as possible from noise sensitive receptors (NSRs). NSRs include on-site accommodation.
- Restrict all construction activities to daytime during normal working hours.

4.1.9 Socio-economic Impacts

The following potential impacts were deemed to be the most relevant for the AoI and the socio-economic receptors:

- The land along the transmission line is used for arable farming and the land users will experience a small loss of land and disturbance however this will be compensated as detailed in the LRP. The current proposed access road will require an additional assessment of impacts prior to construction. Any physical or economic displacement will be as a result of the access road will be avoided, or if this is not possible will be included in an updated LRP. The potential impact of economic displacement is Medium and the residual impact post mitigation is predicted to be Low.
- Local communities and the local economically active population may develop high expectations of the direct or indirect benefits of the Project, specifically regarding the number of work opportunities available. High expectations for jobs for the local communities will need to be continually managed from the early stages to avoid unrealistic Project expectations. The overall impact significance on community expectations of the Project is Low. This is an adverse impact and the ongoing consultation and dissemination of Project information through the SCA and LRP process will be included in the Stakeholder Engagement Plan. This impact will be continuously managed throughout the construction phase (and ongoing operation phase) to ensure the impact remains Low, by applying the following mitigation measures:
    - Develop Local Recruitment and Employment Plan to encourage & maximize local workers, vulnerable persons and women in the workforce including retention and promotion.
    - Communicate employment estimates, timeframes and skills requirements clearly to the community.
- A boundary fence line shall be installed at the start of construction activities to prevent the entry of unauthorised personnel into working areas to maintain public health and safety. From the moment the fences are erected, local people from the AoI will lose access to footpaths inside the Project site. This shall result in longer time periods being required to move between locations when the footpaths are generally used. The

impact from a loss of public access to footpaths inside the project area is assessed as Medium significance, primarily because the local farm users will need to adapt and readjust to their new timings and distances compared to baseline conditions, however this will only impact one herder that uses the path regularly. This is assessed further as part of the LRP. This impact will be continuously managed throughout the construction phase (and ongoing operation phase), to reduce the impact to Low, by applying the following mitigation measures:

  - Implement measures to ensure access to local villages is not adversely affected by the fencing of the Project area. Appropriate signage should be erected around the site.
  - Provide detailed and regular information to local community members about Project activity to mitigate community concerns as a result of misinformation.

- The impact from reduced access to grazing and pastoral land will commence at the start of construction as working areas are fenced off to prevent unauthorised entry inside the site boundary. The change in land use in the Project area may result in change in local livelihoods mainly as a result of the reduction in available grazing area, however there is an abundant amount of alternative grazing land to the north and south of the site. Site clearing and grading may affect farming activities in the area. Solar PV area will be fenced, removing grazing land and cutting off access to grazing lands to the northeast of the Solar PV area. Transportation of waste from the site and materials and equipment by road may disrupt local livelihoods. No physical resettlement will be required therefore there is no need to undertake a Resettlement Action Plan. Therefore, the impact of reduced access to grazing and pastoral land is assessed as Medium significance, primarily because the local farm users will need to adapt and readjust to their new timings and distances to access grazing land compared to baseline conditions. This is assessed further as part of the LRP and local herders will be given access to livelihood restoration initiatives. Following on from this process, the residual impact from reduced access to grazing and pastoral land is expected to be Low.
- Community H&S may be at risk from worker migration and the presence of workers in the Project area, resulting in a potential change in the disease profile of the local population. A more robust social baseline study will expand on communicable disease morbidity, crime incidence and risks of sexual exploitation. Additionally, local workers may be exposed to potential COVID-19 risks where they are employed on the workers' camp. In turn this could result in further spread of COVID-19 back to the local community. The potential impact during construction due to increased presence of workers and interaction with local communities is considered to be Medium pre-mitigation, and Low post-mitigation. This impact will be continuously managed throughout the construction phase (and ongoing operation phase) applying the following mitigation measures:
  - Workers accommodation designed in compliance with the IFC/ EBRD Guide for Workers Accommodation and will not be based on site but rather use existing accommodation available
  - Health screening and quarantine if necessary, carried out in accordance with Covid-19 MP.
  - Identify opportunities to support local public health campaigns that focus on prevention of communicable diseases.
- In addition to the expected workforce, during the construction phase, private security personal shall be used to provide general security at construction working areas to ensure that there is no entry of unauthorised personnel and that construction equipment is safe and secure. There is the potential for security personnel to use excessive force that results in intimidation or even physical damage, acting as a trigger event to further potential conflicts and Human Rights risks. The potential impact from increased presence of security personnel during construction is considered to be Medium adverse, pre-mitigation, and Low post-mitigation. This impact will be continuously managed throughout the construction phase (and ongoing operation phase) applying the following mitigation measures:
  - Ensure that Project security is aware of the Project's goals to establish good relationships with local stakeholders.
  - Include policy requirements to prevent Gender Based Violence and Harassment (GBVH) of community members by the construction workforce
- Furthermore, based on the prevalence of HIV in the transportation and construction industries, due to employment of low skilled, mainly young male workers and numerous other factors detailed in the ESIA, women (including vulnerable young girls) may be particularly at risk from the increased presence of local and

migrant men looking for work opportunities near the Project. Pre-mitigation, the expected impact of increased levels of gender-based violence, sexual exploitation and harassment is considered High adverse, and following specific measures introduced, this will be reduced to Low. Specific mitigation measures include a Worker Code of Conduct which has key requirements including but not limited to:

- Direct Project Workers on appropriate behaviours to help avoid negative interactions with local communities and promote a positive working environment.
- Prohibit violence, discrimination, sexual exploitation, harassment, bullying and promote equal opportunity.
- Prohibit intimation, offensive language and behaviour, prostitution, or sexual harassment when carrying out project activities.

4.1.10 Traffic and Transportation

The construction phase is expected to generate over 10,000 vehicle movements of construction vehicles. It should be noted that these traffic volumes are based on previous solar PV project experience and are to be confirmed once a construction strategy is available from the Project Developer. This assessment is limited to the expected amount of HGV movements and construction staff transportation requirements. The magnitude of change in traffic numbers cannot be quantified accurately at this stage for the majority of the roads due to the lack of traffic count data for the affected roads along the route. However, the routes are major roads and it is envisaged that there is adequate capacity to accommodate the additional construction traffic. Therefore, due to the size of the Project and the length of the construction period, the construction traffic on a daily basis is unlikely to be significant. The impact is assessed as Negligible and not significant. Although no specific mitigation is required, standard good construction practice, as detailed in the ESIA, will be applied to ensure no increase in predicted impacts during construction. Key measures include:

- The Transport and Road Safety Management Plan must aim to reduce risks to drivers, communities along the transport route, as well as components being transported.
- Provide appropriate traffic safety training to all drivers (employees and contractors) as part of their induction and on an ongoing basis.
- As part of pre-construction engagement activities, ensure that traffic safety and “rules of the road” are discussed with local communities. Discuss and address community concerns.

5. Mitigation and Enhancement Measures

The developer will prepare an Environmental and Social Management Plan (ESMP) which includes all required mitigation. This will be implemented for the duration of the project. Mitigation measures will be further developed during the preparation of the ESMP, in line with National Environmental and Social Legislation, and International Standards and Guidance.

The impacts of the construction and operation activities of a Solar PV on air quality, noise, biodiversity, soil and ground/surface water quality, socio-economic profile can be mitigated through the adoption of best-practice construction methodologies, effective environmental management (e.g. control plans and emergency response procedures) and routine monitoring (e.g. environmental site audits, air quality and noise monitoring).

The mitigation measures presented will, for the most part, reduce potential and residual impacts to within acceptable or negligible impacts levels for all environmental and social parameters. There are only a few significant residual impacts related to socio-economic profile in the construction an operational phase that cannot be mitigated to negligible/low levels such as public access to footpaths, reduced access to grazing and pastoral land, physical and economic displacement and impacts on land and livelihoods. However, adhering to international best practice and guidance can minimise the potentially adverse impacts of the project. Furthermore, a SCA and LRP are currently being undertaken and the results would reduce the residual impact.

6. Next Steps

Following completion of the ESIA study, it is recommended that the developer implements the following:

- Further detailed design to be completed by the EPC Contractor and this may require further assessment of impacts.
- Implement the Project ESMS and Construction ESMP to mitigate negative impacts and enhance the positive impacts. The Construction ESMP requires that the proposed Project follows the recommended mitigation measures, and livelihood and community benefit enhancement strategies.
- Project will carry out a skills audit and develop a Local Hiring Policy that would identify and prioritise local community employment opportunities to ensure gender equity in human resource recruitment.
- Implement the Stakeholder Engagement Plan and commit to a pro-active and continuous stakeholder engagement process to address emerging project issues and to continue the enlightenment of the community on Project benefits. Community engagement should be undertaken in close collaboration with the local administration (local representatives and the county leadership).

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