

# Non Technical Summary

100 MW Solar PV Plant by Navoi in Uzbekistan

Nur Navoi Solar FE LLC

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## Quality information

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## 1. Introduction

Nur Navoi Solar FE LLC is planning the construction of large solar power station in the Navoi region of Uzbekistan. The new solar power station will produce a maximum of 100MW of electricity, enough to supply approximately 35,607 households<sup>1</sup>, and will form an important part of for the local and national power supply. It is important for Nur Navoi Solar 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 park. This Non-Technical Summary (NTS) presents the key findings of the Environmental and Social Impact Assessment for the solar park, both positive and negative. The ESIA considers the construction and operation of the solar park, 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.

- The Solar Park 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 Park has the potential to cause some level of negative environmental and social impact on one tenant farmer who uses the land to graze his goats. Nur Navoi Solar will help this individual gain access to alternative grazing land.
- The majority of potential environmental impacts are considered to be minor and will be reduced through by the use of simple management controls that will be applied during the construction and operation of the Solar Park.

A description of the Solar Park, the potential impacts of construction and operation, as well as description of the mitigation plans is provided in the following chapters.

### 1.1 The Project Developer

Nur Navoi Solar FE LLC (the "Developer") is a wholly owned by Masdar, a global leader in renewable energy and sustainable urban development. 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. Masdar has its headquarters in Abu Dhabi.

The Government of the Republic of Uzbekistan attaches great importance to the development of renewable energy projects. The country has very many days of strong sunshine which make it suitable for the development of large-scale commercial solar plants. The development of the Solar Park is in-line with the national Economic Development Vision 2030. This project will be developed as a joint venture with the government of Uzbekistan under the International Finance Corporation's (IFC) Scaling Solar program. The IFC is expected to agree to support the project in the autumn of 2020. The anticipated lifespan of the Project is approximately 25 years; however, the Developer may repower the project to extend its operational life. Following Project decommissioning the site will be reinstated back to the current land use (grazing land).

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<sup>1</sup> Based on an average household size of 5.25 and per capita electricity consumption of 1,488.98kWh per annum. From: WorldData.info (2020). Energy consumption in Uzbekistan. Data accessed at: <https://www.worlddata.info/asia/uzbekistan/energy-consumption.php>

## 2. Project Description

### 2.1 Project Location

The proposed project site is located in the Navoi region, approximately 35 kilometres east of Navoi City, 16.2 kilometres west of Navoi International Airport, and 2.5 kilometres to the west of Uzumzor settlement. The village of Uzumzor has about 600 inhabitants. There is also a small group of residential property, with about 100 inhabitants, about 2.2 km to the south.

The Solar Park will occupy about 267 hectares (2.6 km<sup>2</sup>) of land and will be enclosed by a 2.5metre -high fence. The Solar Park will be connected to an existing 220 kV overhead line that runs along the southeast boundary of the proposed site. Any interconnections to the grid will be constructed within the proposed boundary. The location is shown Figure 2-1.

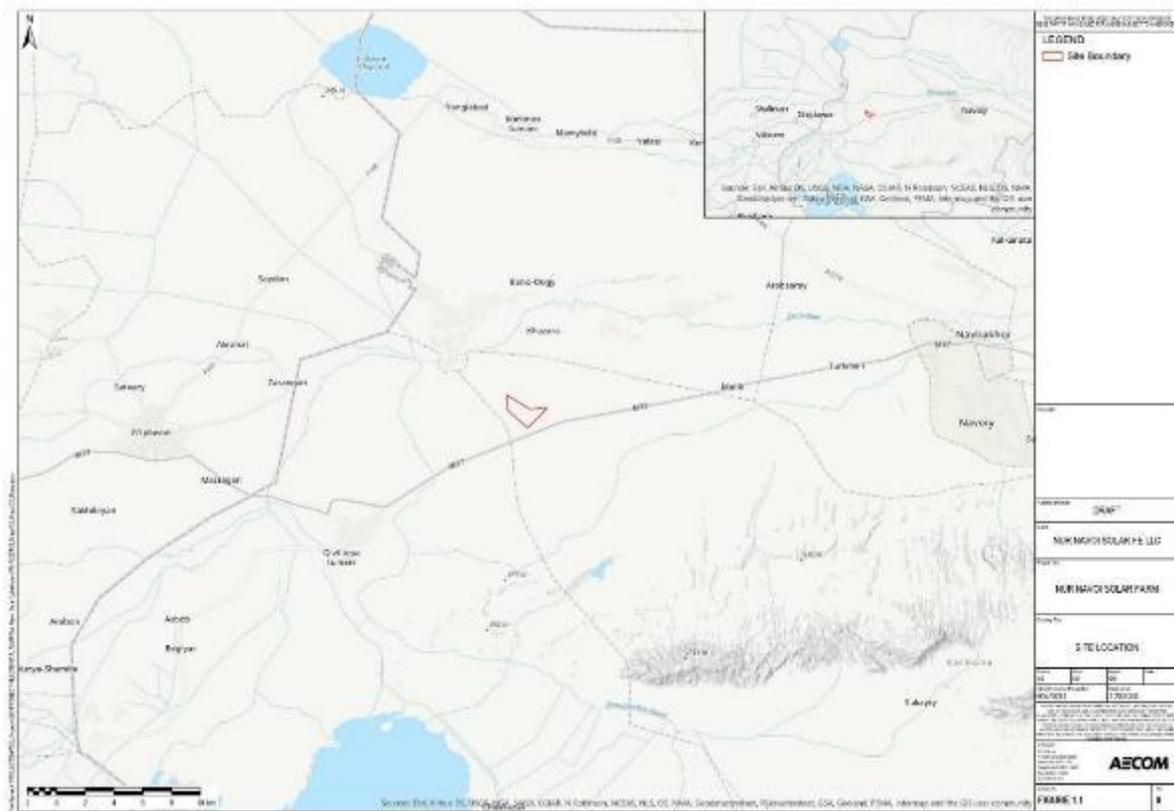


Figure 2-1: Project Geographical Location

## 2.2 Project Location

A view of the centre of the site is shown in Figure 2-2. The site is very open and is generally flat.



**Figure 2-2: General View of the Centre of the Project Site**

The land is currently used for rough grazing of livestock, mainly sheep and goats, see Figure 2-3.



**Figure 2-3: Grazing taking place on site**

Previous attempts to cultivate arable crops on the site failed due to a combination of poor soil quality and lack of water. Irrigation ditches were built but the last attempt at arable cultivation were abandoned about 5 years ago. The irrigation ditches are now in poor condition (Figure 2-4 and Figure 2-5).



**Figure 2-4: Previously cultivated area (outside site boundary)**



**Figure 2-5: Irrigation ditch no longer in use**

The site is adjacent to a secondary road that connects with a national highway (M37) (Figure 2-6). The site will be accessed via a short length of existing secondary road (Figure 2-7).



**Figure 2-6: M37 Highway Adjacent to the Site**



**Figure 2-7: Site access from the M37 Highway**

The natural drainage of the site is slightly inclined towards the west and this will not be changed by the construction of the Solar Park. The site area is bordered on the west and east by two drainage channels (Figure 2-8 and Figure 2-9). The intended purpose of these drainage channels was to capture and direct unused irrigation water back to the Zarafshan River.



**Figure 2-8: Drainage channel on eastern boundary of site**



**Figure 2-9: Drainage channel on western boundary of site**

### 2.3 Overview of Solar Photovoltaic (PV) Technology

The Solar Park will convert the sun’s energy into electricity using a series of solar panels. The Solar Park will comprise about 300,000 photovoltaic (PV) panels that will be connected in groups or strings to produce the required output. The panels convert solar radiation into electricity through the photovoltaic effect in a silent and clean process that has no moving parts.

The solar panels are thin and will be mounted on frames that will follow the sun during the day. These sun-tracking systems are more expensive than fixed modules but can increase the yield of electricity by up to 20 %.

Solar panels are very efficient at collecting the sun’s energy and have a performance ratio of 77 % to 86 %. The efficiency of the panels does reduce over time but they should have a useful life of 25 to 30 years.

The strings of solar panels are then connected to the inverters. The output from a solar panel is direct current (DC) electricity. Inverters convert the DC electricity into AC electricity to allow export to the local grid.

The output from the inverters requires a further step-up in voltage to reach the AC grid voltage level. The step-up transformer takes the output from the inverters to the required grid voltage.

**The grid connection:** This is where the electricity is exported into the grid network. The inverters will be connected to a project substation. This substation will have the required grid interface switchgear such as circuit breakers for the protection and isolation of the power plant, as well as metering equipment. The PV modules and the inverters are all subject to certification, and the units chosen by Nur Navoi Solar will conform to standards set by the International Electrotechnical Commission.

Figure 2-10 shows the key principles and associated structures of this PV facility.

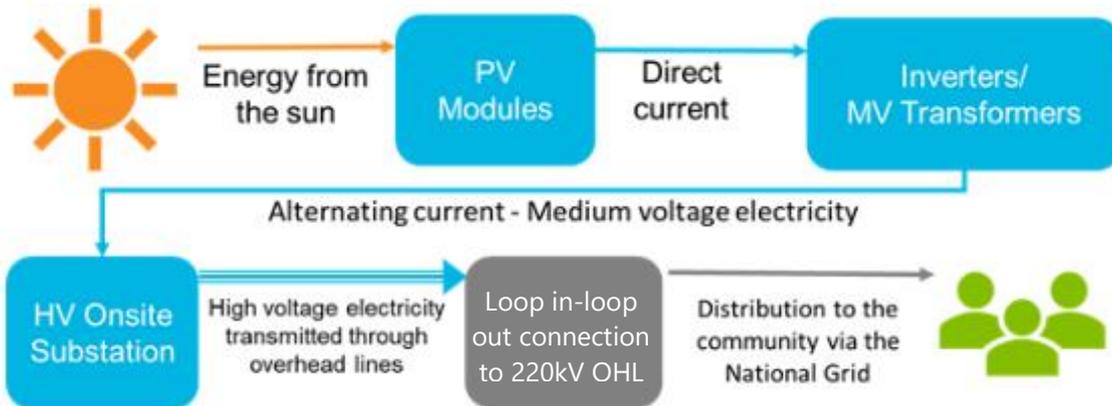


Figure 2-10: PV Power Plant Overview

#### 2.3.1 PV Power Plant Layout

The proposed layout of the Project is shown in Figure 2-11.



Nu Navoi Solar plan to start construction towards the end of 2020. The construction period is expected to be about 15 months. However, these dates may change due to the impact of the Coronavirus pandemic and the severity of the winter.

## 2.5 Project Staffing

The construction workforce is expected to consist of a combination of nationals and expatriate workers, with the majority being locals preferentially sourced from the surrounding towns and villages. However, the Coronavirus pandemic may change this.

The number of local people that might be employed during construction is not yet known. It is hoped that several hundred Uzbek nationals could be employed. Those individuals employed locally will receive appropriate training before starting work on the project. This includes health and safety, and, where required, job specific or vocational training.

## 3. Project Alternatives

As part of the development process, Nur Navoi considered a number of alternatives to the development of the Solar Park.. This section describes the reasoning behind the site selection process and the decision to take this Project site forward as the preferred development option.

### 3.1.1 Uzbekistan's Green Economy Strategy

At the national level, Uzbekistan has enacted a strategy for transition to a green economy in the period of 2019-2030. This was approved and implements an Action Strategy for five priority areas of development between 2017 and 2021. The priority areas focus on the implementation of measures in various sectors of economy, including electricity, heat, oil and gas, renewable energy, construction and transportation. The Solar Park would meet the objectives of the Green Economy Strategy.

### 3.1.2 Without the Project

Uzbekistan is one of the few countries which are fully self-sufficient in energy resources. It is the second largest of the Caspian gas producers (after Turkmenistan) and its abundant natural gas resources are used both for domestic consumption and export.<sup>2</sup>

Oil and natural gas comprise 97% of the country's energy balance. Primary energy shares consist of 86.3% gas, 1.9% hydro, 2.5% coal and peat, and 9.3% crude oil.

Uzbekistan is the largest electricity producer in Central Asia. Total national electricity capacity is 12.6 GW (as of 2007), of which 88.5% is provided by thermal power plants and 11.5% by hydropower plants.

100% of the population have access to electricity, but electrical supply to rural areas is unreliable and of low quality. There are often power blackouts that last many hours per day. Renovating the power transmission networks is one of the energy sectors priorities.

A 'without project alternative' would place ongoing reliance on generating additional power from fossil fuel sources and would fail to address Uzbekistan's Green Economy Strategy. A 'With Project Alternative' is therefore recommended.

### 3.1.3 Site Selection

In identifying a suitable site for solar energy developments, various elements need to be considered. These include factors such as:

- Solar resource.
- Environmental designations.
- Residential properties.

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<sup>2</sup> IEA (2009): World Energy Outlook.

- Potential access.
- Grid connection.

The site was presented to potential bidders as part of the Scaling Solar program, a joint cooperation between the Government of Uzbekistan and IFC and as a result there was no opportunity for Nur Navoi to influence site selection.

As far as possible, various project alternatives in terms of site for the Solar Park, the technology that might be used, and grid connection options were assessed. The study found that although the 'without Solar Park alternative would maintain the status quo, which means that the current use of the site (livestock grazing) continues. In addition, the site has good solar resource, has generally flat profile and ease of access, and has few environmental or social risks. The most efficient technology was chosen based on the specific conditions on-site.

### 3.1.4 Review of Site Considerations

The project site alternatives were screened as part of the Scaling Solar program based on availability of suitable land, access to the grid network, solar irradiation and project appraisal following the Lenders' requirements regarding environmental and social aspects.

Although the site was not subjected to a full assessment of alternatives process by Nur Navoi, it is considered that the site selection process carried out by Scaling Solar was appropriate and the site location meets the above criteria.

## 4. Legal and Policy Framework

### 4.1 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.

#### 4.1.1 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:

- 1) Law of the Republic of Uzbekistan No 754-XII dated 09.12.1992 "On Environment Protection";
- 2) Law of the Republic of Uzbekistan No 73-II dated 25.05.2000 "On Environmental Impact Audit";
- 3) 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.

A series of EIA documents are required to be developed for designed facilities in accordance with the given requirements:

The Project is required to take all reasonable measures in accordance with these laws and standards in order to minimize any potential violations of general balance of environment, including, but not limited to, land surface, subsoils, air, lakes, rivers, flora and fauna, crops and other natural resources. The hierarchy of protection is determined in the following order: life protection, environmental protection and property protection.

### 4.2 International Best Practice Guidelines

International lenders who are signatories to the Equator Principles (EPs) require projects that they finance to meet international standards. Beyond Uzbek legal requirements, the following international guidelines, regulations and policies will be followed and applied to the Project development and implementation:

- IFC Performance Standards (IFC, 2012).

- Environmental, Health & 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, 2007a).
- EHS Guidelines for Electric Power Transmission and Distribution (IFC, 2007b).
- Asian Development Bank (ADB) Safeguard Policy Statement (ADB, 2009).

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. Many of the mitigation measures described in the ESIA are based on these requirements.

## 5. Environmental and Social Assessment Methodology

An initial assessment of impacts was carried out as part of the ESIA. A number of criteria were used to determine whether or not a potential impact of the Solar Park 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 specialist 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 Park 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.

The impact assessment will be developed further as part of ongoing ESIA studies being carried out at the pre-construction phase.

## 6. Stakeholder Engagement Programme

As part of the ESIA study, AECOM carried out a stakeholder engagement programme which is documented in more detail in the ESIA Report and Stakeholder Engagement Plan (SEP). The SEP identifies the different groups or individuals that might be affected or concerned about the new Solar Park and describes how the project team will consult with each group or individual.

The aim of the consultation meetings or discussions was to:

- Build and maintain stakeholder relationships;
- Gather information on the local environmental and social issues;
- Disclose Project information (including any access restrictions, employment and procurement opportunities, and community health and safety issues);

- Provide stakeholders the opportunity to provide feedback to Nur Navoi; and
- Manage grievances through the Grievance Mechanism.

The SEP (and the engagement programme) will be updated with the Project moving to the construction stage, as well as upon commencing the operations.

## 6.1 Previous Stakeholder Engagement Activities: Scoping and ESIA Phases

The first official round of stakeholder engagement activities (from an E&S perspective) took place in Navoi (city) and in Uzumzor on the 5<sup>th</sup> and 6<sup>th</sup> of March 2019.

Further stakeholder engagement took place in March 2020 as part of the Preliminary ESIA.

The stakeholder's comments and the outcomes of the meetings are described in more detail in the ESIA and SEP.

## 6.2 Future Stakeholder Engagement Activities

The future planned engagement methods are divided into the following categories:

- Information notices: Used to inform the identified stakeholders and the general population of the SEP activities and the project development process;
- Sharing information and consulting with local stakeholders: Used to provide information to stakeholders or to engage in a two-way dialogue by which information is shared with the stakeholders and these in turn can express their views and concerns about the project, and
- Community Grievance Mechanism: System to receive and facilitate resolution of the stakeholder's concerns and grievances about project-related issues.

The draft SEP will be updated to account for ongoing engagement during construction and operational phases.

# 7. Environmental and Social Baseline

## 7.1 Field Surveys

The initial reconnaissance exercise was undertaken in October 2018 and involved a walkover of the Project site, as well as the area immediately surrounding the Site. Further site walkovers and intrusive investigations were carried out during January 2019, March 2019, March 2020 and June 2020 visits to the Project area.

**Table 7-1: Record of Field Reconnaissance**

Date	Description and purpose
30 October 2018	The first reconnaissance was undertaken on October 30th, 2018 by a team of three consultants, two consultants from Typsa and one consultant from the local E&S subcontractor.
9-26 January 2019	Ground investigations were carried out from January 9 to 26 by ELLIPS, and a geotechnical expert from TYPASA was on site supervising the ground investigations, including the procedures and the collection of samples. A chemical analysis of the water quality of adjacent drainage canals was performed.
5-6 March 2019	The other two trips were done on March 5th and 6th 2019 by one consultant from Typsa, one consultant from 5 Capitals and one consultant from the local E&S subcontractor. The information provided in the baseline section is based on satellite imagery, information provided by an Uzbekistani environmental consultancy, information captured during a site visit undertaken by the 5 Capitals' team on the 5th and 6th of March 2019, and information provided by administrative, interest and affected based stakeholders during consultation meetings. The first official round of stakeholder engagement activities (from an E&S perspective) took place in Navoi (city) and in Uzumzor on the 5th and 6th of March 2019.

Date	Description and purpose
3-6 March 2020	Ecology, social, archaeological site surveys carried out by AECOM with one specialist from Green Business Innovation and an ecologist from Navoi. Social surveys took place at Uzumzor and stakeholder meetings were held in Navoi and Uzumzor.
22-26 June 2020	Additional ecology and social site surveys carried out by Green Business Innovation and an social specialist and ecologist from Navoi..

## 7.2 Physical characteristics

### 7.2.1 Climate and Meteorology

The average annual precipitation for 2010-2017, according to weather stations<sup>3</sup> varies from 74.0 mm to 284.2 mm per year. The annual amount of precipitation for several years (2010-2017) within the irrigated area varies from 97.0 mm to 284.2 mm. Most of the precipitation (70-90%) occurs in the winter and spring. In summer rainfall is rarely observed. Average annual air temperature in the area of Navoi city equals to 15.87 °C. The coldest month is January (average temperature is 2.77°C), the hottest one is July (average temperature is 28.78 °C). Absolute minimal air temperatures in a cold period of a year reach – 17.4°C. Absolute maximum value is observed during the period of time from May to August and is more than 40°C (43.8 °C in 2007).

### 7.2.2 Geology and Soils

The solar plant will be located on an extensive plain that forms part of the terrace of the Zarafshan river, about 20 to 25 meters above the flood plain of the river. The terrace is mainly made up of sandy gravel to a depth of (8.8 meters on the PV plant site), though a superficial sandy silt layer has been detected on the surface.

The gravel is made up of rounded quartzite pebbles less than 10cm in diameter, immersed in a silty sandy matrix and interbedded with sand layers.

This gravelly body is part of the old deposits of the Zarafshan river, that are now above the river elevation due to the subsequent erosion.

The ground is intensely salty, and the high salt enrichment makes the area unsuitable for arable farming.

No groundwater was identified in surveys carried out to a depth of 8.8 meters. The Khokimiyat suggests groundwater is encountered at 80 m below ground level. It can therefore be concluded that no groundwater would be encountered during construction works which would take place to around 3 m depth.

### 7.2.3 Hydrology and hydrogeology

The water bodies close to the proposed project site are:

- Zarafshan River – ~5km North of the proposed site
- Skurkulshoe Reservoir – ~25km North of the proposed site
- Navoi Canal – ~9km South East of the proposed site.

The Zarafshan is the third largest river of Uzbekistan. It originates at 2,750 m above sea level and is glacier fed. The total river basin covers an area of 4,000 km<sup>2</sup> and the river length is 781 km. The other water bodies are manmade canals or reservoir.

<sup>3</sup> Data from nearest weather station: Samarkand, Uzbekistan (146.0 KM).



**Figure 7-1: Zarafshan River north of the Project site**

Two man-made canals form the eastern and western boundary of the site. Based on information gathered during consultation, the canals are for drainage purposes only (i.e. they collect water from upstream agricultural fields at the south), there are no other additions (e.g. treated or untreated industrial, domestic or other streams) and there are no downstream users of the canal.

The water quality in the river has deteriorated in recent years due to the impact of the return water from irrigation and waste waters from towns, such as Samarkand, Kattakurgan and Navoi. Water salinity in the river increases from 0.27 g/l at its source to 2.4 g/l at its mouth. The highest pollution level is downstream of the towns Kattakurgan and Navoi, and the maximum allowable levels of oil, phenols, copper, and pesticides are usually considerably exceeded. The river water is classified as having a medium level of pollution.

No groundwater was found in the surveys carried out. As shown in the Hydrogeological map of Uzbekistan (scale 1:500.000) edited in 1998, the groundwater level is located at about 290m ASL; with the plot altitude between 310 and 320 m ASL, it is concluded that the water table is located more than 20 metres below the plot surface. The Khokimiyat suggested that groundwater is present at a depth of 80m below ground level but that the groundwater is non potable and would require some form of treatment prior to use.

A full hydrologic and hydraulic study<sup>4</sup> was carried out by TYPASA and according to the available data there is no flooding risk in the site of the project related to extreme flows of the Zarafshan River. This conclusion is consistent with the geographical information (distance and elevation difference between the project site and the river).

Although there is no risk of flooding related to the increase of flowrates of the natural drainage systems where the site is located, an appropriate drainage network should be developed by the EPC Contractor to properly drain runoff generated inside the site of the project.

#### **7.2.4 Utilities**

In addition to the water channels, there is a drinking water pipeline to the west of the site. Discussion with the Khokimiyat suggests the pipe is a water pipe constructed around 2015 or 2016. It was also suggested that responsibility for the pipe did not reside with the Navoi Khokimiyat but with Samarkand. An additional survey was

<sup>4</sup> Typsa (2019). Scaling Solar Uzbekistan: Hydrology and Hydraulic Report. Ref. SP5331-RP-HE-HydrologyReport-00-D02

completed by AECOM which confirmed the route of the pipe and also confirmed that the official drawings were substantially inaccurate. The water pipeline is operational.

### 7.2.5 Air Quality

Current sources of air pollution in the vicinity of the Project site include the burning of fuels in surrounding communities and vehicular traffic along neighbouring roads. No stationary emitting sources were identified in the surrounding areas of the proposed site. The closest emitting sources were the vehicles using the M37 road. The operational coal fired power station is 28km to the east of the Project. The main source of air pollution will be dust during construction works and the receptors will be the two farms identified as well as the settlement of Uzumor, 2km to the east.

Dust conditions were low (not discernible) at the proposed site on the days of the site visits. The likelihood of dust storms is low as reported by the Environmental Department during the consultation meetings.

### 7.2.6 Noise, Vibration and Light

Current noise in the vicinity of the Project site comes from agricultural and domestic activities, as well as traffic using the M37 road to the south of the site. Natural noise sources include noise from birds and insects. There were no significant sources of vibration noted during the site visits. The area is also generally not illuminated at night.

## 7.3 Landscape and Visual

The area around the Solar Park is generally flat and, with the exception of the overhead power lines, the majority of the engineering structures will be low to the ground. The assessment considered the potential visual impact of the development on people who might see it from local settlements, higher ground, or from the road passing the site. The specialists considered that the Solar Park would not be seen from a distance of 10km and this radius was used for the study.

### 7.3.1 Current Landscape Condition

The region is semi-arid and the site is predominantly covered by scrub grassland. Local settlements are small, comprising villages and isolated farmhouses, connected by the M37 highway and an informal network of smaller tracks. The settlements are surrounded by agricultural land. The largest nearby settlement, the village of Uzumzor, is 2.8 km east of the Project. Land surrounding the village is irrigated agricultural farmland and rough grazing. Existing electrical infrastructure including three overhead lines are located immediately east of the Site.

#### 7.3.1.1 Landscape Character Areas

Desk based analysis identified four areas within the 10 km study area that were subject to careful assessment, see Table 7-2.

**Table 7-2. Project Landscape Character Areas**

LCA	Description
Area 1 Zarafshan River	Like much of this region the land along the Zarafshan has been changed by human activity. The river valley now includes a number of irrigation canals, buildings, roads and bridges. Much of this infrastructure has been in a state of decay for some years. There are few vertical features within this area other than overhead lines and pylons. Residential properties tend to be single storey with a small number extending the two stories. Overall, the landscape value of Area 1 is considered to be <b>low</b> .
Area 2 Semi Arid Plains	This is a large area of steppe. The city of Navoi can clearly be seen to the east and this dominates the landscape. The area includes many industrial developments, widespread pylons and overhead lines result in an overall landscape value which is considered to be <b>low</b> .
Area 3 Uzumzor and Agricultural Farmlands	This Area forms a transition zone between the steppe and the more industrial area around Navoi. The area is characterised by medium sized agricultural fields and irrigation channels associated with the residential edge of Uzumzor and surrounding villages. Views towards the industrial facilities including Navoi Cement Plant (26km east south east) and Navoiyskiy Elektro-Khimicheskiy Zavod (22km east south east) and overhead lines crossing this area LCA have a big impact on the skyline. As such, the landscape value in this LCA is <b>low</b> .
Area 4 Around Navoi	This Area includes the main settlement of Navoi and the industrial developments surrounding the city. This includes a coal fired power station (28km east south east), visible flaring (>30km east south east)

and Navoi Cement Plant emitting yellow/brown smoke from the main stack (26km east south east). In addition, there are significant amounts of pylons, overhead lines and pipelines visible above ground. The setting is almost completely industrial and as a result the landscape value is **low**.

### 7.3.2 Representative Viewpoints

A total of seven representative viewpoints have been selected for assessment, see Table 7-3 below.

**Table 7-3. Viewpoint Descriptions**

Viewpoint ID	Location	Representative Receptors	Description
Viewpoint 1	1.5 km north of the nearest part of the Project Site boundary	Access road	This view would be seen by people travelling from Khazara to the M37 highway and potentially visitors to the ruined fort or Deggaroni. The foreground of the view includes a 2 m high earth mound formed by the excavation of the drainage canal running parallel with the road. The earth mound effectively limits views to the road and immediate foreground. The electrical cables and transmission pylons form the predominant vertical features of this view. As the viewer approaches the M37 road the pylons become the dominant feature of the view. As noted, views of residents will be partially restricted by the topography, vegetation and earth wall and therefore the visual value is considered to be <b>low</b> .
Viewpoint 2	1 km south east of the nearest part of the Project Site boundary	Highways receptors	This viewpoint is similar to VP 1 and would be seen by people travelling to Khazara from the M37 highway and potentially visitors to the Deggaroni mosque. The view of the Solar Park is dominated by existing overhead lines and pylons. The views would only be seen in passing as there are no residential properties in this area. As noted, views of residents will be partially restricted by the topography, vegetation and earth mound and therefore the visual value is considered to be <b>low</b> .
Viewpoint 3	2.5 km east of the closest part of the Project Site boundary	Residential receptors	The view, looking from the south west of the Solar Park, would be seen by residents in the Uzumzor area. The foreground is comprised of cultivated ground and the main M37 highway (the main route between Samarkand, Navoi and Bukhara). The middle ground is largely comprised of the earth wall on the edge of the drainage canal and the minor road, that runs across the majority of the view, along with a mix of scattered electrical pylons. Long distance views of the existing transmission pylons can be seen creating vertical lines on the skyline. There is considerable screening provided by the existing topography therefore the visual value is considered to be <b>low</b> .
Viewpoint 4	2.5 km south of the Project Site boundary	Residential receptors	This view is representative of residential receptors in a small cluster of dwellings, illustrates views to the south of the Solar Park. The view is flat, with expansive panoramic views, comprising of cultivated fields in the foreground. The vast landscape is disturbed by human influence and there is a line of farm buildings which distinguish between the foreground and middle ground. A few scattered remnants of low-level structures/ materials and field boundaries can be seen in the background. Transmission towers create vertical lines in the skyline. Due to the distracting elements of the view, the visual value is considered to be <b>low</b> .
Viewpoint 5	1 km south west of the Project Site boundary	Highways Receptors	This viewpoint is similar to VP 1 and 2 in that it would be seen by people travelling on M37 highway. Views would only be experience by people travelling east from the direction of Bukhara. The foreground of the view is generally screened by a central reservation and bridge/fencing on the road verge. In keeping with other VPs, views are fairly open towards the Solar Park but the view is dominated by the existing overhead lines and pylons. The number of electrical cables and pylons forms the predominant vertical features of this view. The Solar Park will only be seen in passing as there are no residential properties in this area. At this location distant views of

Viewpoint ID	Location	Representative Receptors	Description
			the oil refinery and industrial facilities become visible in an east to southeast direction. The visual value is considered to be <b>low</b> .
Viewpoint 6	<1 km west of the Project Site boundary	Residential receptors	The view is looking east towards the Solar Park along a dirt track and includes a single farm property and road users who are likely to be resident of the nearest villages further to the west. The foreground of the view is flat and open steppe, with areas of small shrubs. Again, the existing electricity pylons and overhead lines dominate the view. The middle ground comprises of a continuation of steppe rising to a higher point in the middle ground before dropping down the M37 and becoming hidden from view at this VP. The background of this view is framed by distant hills. The pylons and overhead lines are the primary focus of the view due its contrasting colours and vertical height with the surrounding flat, open landscape and therefore the visual value is considered to be <b>low</b> .
Viewpoint 7	5 km north of the Project Site boundary	Residential / recreational receptors	The view is representative of residents of Khazara and tourists visiting the Deggaroni mosque along a minor tarmac road which is in poor condition. The foreground of the view is relatively flat, open and rising in elevation, comprising of overgrazed steppe vegetation. The elevated ground creates a ridge in middle ground which effectively screens views of the Solar Park. The key features at this location are the pylons and overhead lines. With the screening effect of the topography the visual value is considered to be <b>low</b> . Views of cultural sites are in the opposite direction of the Project therefore the Project would not alter the views experienced of those sites.

## 7.4 Biodiversity

### 7.4.1 Overview

The Project Site is dry steppe but is surrounded by irrigation canals and watercourses which have the potential to attract a wide range of species. The closest lake is approximately 20 km to the southwest of the Solar Park. This section describes the ecological importance of the Solar Park site and identifies species or habitats that may be subject to further mitigation during construction, operation and decommissioning of the Solar Park.

### 7.4.2 Site Survey Methodology

The ecological baseline (habitat identification, floral survey, terrestrial fauna and avifauna survey) was established AECOM ecologists during site surveys on 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup> and 6<sup>th</sup> March 2020. The land area that would be occupied by the Solar Park is relatively small in ecological terms site footprint (being relatively small) was surveyed on foot along a several lines from east to west and north to south directions. The area was traversed in a regular pattern in order to reduce the chances of missing anything important.

The surveys included:

- Walkover surveys for birds, reptiles, mammals and rare and endemic species of plants within the proposed project site;
- Walkover survey for habitat assessment categorization within the proposed project site;
- Drive-over and more detailed surveys for the ecological features next to the proposed project site.

A further ecological survey is programmed for the week commencing 22 June 2020.

#### 7.4.2.1 Vegetation Study

The aims of the March 2020 vegetation study were to:

- Identify the plant species present in or around the proposed Project site and confirm if any locally protected or are IUCN Red Data listed species.
- Identify any non-native or potentially invasive plant species.

- Describe the potential impact on the current vegetation or protected species as a result of the construction and operation of the proposed Project.
- Suggest feasible mitigation strategies as counter measures for the potential impacts.

Plant species were identified, and distributions were checked using relevant literature. The conservation status of each of the plant species documented was researched using the IUCN data bases. This was cross checked against the Uzbek Red List to determine the presence of species of conservation importance.

#### 7.4.2.2 Terrestrial Animal Study

The aims of the faunal study were to:

- Carry out field work to identify the animals that may live in or roam across the region of the proposed Project.
- Provide detailed lists of the mammal, reptile, and amphibian fauna in the region.
- Provide the IUCN Red Data rating and protected status in Uzbekistan for each of the fauna species determined to be present or potentially occurring at the site.
- Identification of any direct or indirect impacts, whether they are beneficial, adverse or neutral, on the current terrestrial biodiversity and provide relevant mitigation measures.

Considering that the activity patterns of many terrestrial species are hugely variable (i.e. many are nocturnal), it is possible that certain small species (particularly small mammals, reptiles and amphibians) could have been overlooked during the daily site surveys.

#### 7.4.2.3 Bird Survey

The aims of the March 2020 avifauna survey were to:

- Carry out field work to identify the micro-habitats within the proposed Project's footprint and identify the birds that may live in or forage for food in the area.
- Provide a detailed list of birds that occur in the region.
- Provide the IUCN rating for each of the bird species determined to be present and protected status in Uzbekistan for each of the bird species that are present or could be present at the Project site.
- Identify direct or indirect impacts to the local and migratory bird populations that could be due to the construction and operation of the proposed Project.
- Determine relevant mitigation measures.

There are numerous factors that could influence the presence of bird species within the region such as season, weather conditions, and food availability. Whilst not an area of great ecological value, the site is used by some native species and may be used as a stopover site for migrating birds. The breeding and migratory movement of birds were researched using Bird Life International databases to create the species lists. Birds that could potentially frequent the proposed Project site have been classified according to their migratory, breeding and resident status.

#### 7.4.3 Protected Areas

There are several Key Biodiversity Areas (KBAs) within 50km buffer surrounding the project site. The closest of which is the Tudakul and Kumazar Reservoirs located 20km to the southwest of the project site.

- Tudakul and Kuymazar Reservoirs – ~20km SW of the proposed site
- Kagan Fish Farm – ~45km SW of the proposed site (adjoined to Tudakul KBA)
- Dzheiran Ecocentre – ~45km SW of the proposed site (adjoined to Tudakul KBA and Kagan Fish Farm KBA).
- Karnabchul Steppe – ~50km SE of the proposed site.
- Vardanzi IBA – ~45km W of the proposed site.
- Sarmish Nature Park – ~60km NE of the proposed site

Given the distance from the Protected Sites to the Solar Park it is considered that only the species using the Tudakul and Kuymazar Reservoirs may potentially be impacted by the Solar Park. It is considered that this impact would be a result of species listed in the KBA using habitats on site for breeding or feeding. No such species were encountered during the survey work completed to date. Other sites are considered to be too far from the Solar Park to experience any impact.

#### 7.4.4 Habitats

The March 2020 AECOM surveys confirmed that the area in and around the proposed Project site is a wormwood steppe (*Artemisia*). Wormwood steppe is commonplace within the arid zones of Uzbekistan. Other plant species recorded within wormwood steppe include isirik (*Peganum harmala*), broad-leaved grasses (e.g. *Poa* spp.), occasional thistles (*Asteraceae*) and occasional tulip (*Tulipa buhseana*). The wormwood steppe within and adjacent to the site is heavily modified due to over-grazing by sheep and goats. The local habitat is considered to be degraded Natural Habitat.

The wet irrigation ditches which border the proposed Project site support the growth of the common reed (*Phragmites australis*).

The proposed Project site and adjacent areas do not fall into Critical Habitat category and are not assessed to be important habitats.

Further botanical and habitat surveys have been undertaken late June 2020 and the results will be reported in the next update of the ESIA report. A key aim of these further surveys was to identify any plant species listed on the Uzbekistan Red List and invasive non-native species.

#### 7.4.5 Birds

Uzbekistan has a total of 352 bird species with 19 listed as globally threatened. 297 species are migratory with 55 resident species. No species are listed as being native to Uzbekistan

One bird species that is considered to Critically Endangered has been identified - *Vanellus gregarius*. The Tallymerjan area on the Uzbekistan/Turkmenistan border (approx. 140km south of the project area) has been highlighted as a key stopover site for the eastern flyway, with all birds monitored on the eastern flyway using this site as a stopover site during their migration. It is possible that these birds fly over the proposed project site and could use the area surrounding the Project as stopover sites during migration.

The following species of concern identified from desk-based review and initial site surveys:

- Sociable lapwing – *Vanellus gregarius*
- Steppe Eagle - *Aquila nipalensis*
- Saker Falcon - *Falco cherrug*
- Houbara Bustard - *Chlamydotis macqueenii*

##### 7.4.5.1 Migratory Routes or Flyways

A number of important flyways cross Uzbekistan. The Central Asian Flyway (CAF) covers a large continental area of Eurasia between the Arctic and Indian Oceans and the associated island chains. The Flyway comprises several important migration routes of waterbirds, most of which extend from the northernmost breeding grounds in the Russian Federation (Siberia) to the southernmost non-breeding (wintering) grounds in West and South Asia, the Maldives and the British Indian Ocean Territory. The birds on their annual migration cross the borders of several countries. Notable migratory species potentially using the flyway in the vicinity of the Project area include the White-headed Duck and Sociable Lapwing (see further information under 'Species of Concern' below). Furthermore, the Asian–East African Flyway starts from the northern breeding grounds of water birds in Siberia and leads across Asia to East Africa. The larger African-Eurasian flyway covers a wider range of geographies starting from breeding grounds in Europe and Asia to wintering grounds in Africa.

##### 7.4.5.2 Survey Results for Breeding and non-breeding (migratory) birds

There are several Eurasian species that over-winter in Uzbekistan or migrate through the country as part of the African-Eurasian flyway on route to neighbouring countries. Data has shown that there have been successive

declines in populations of many Afro-Palaeartic migrant birds (BirdLife International, 2018). Other species may not breed in Uzbekistan but may migrate to other regions within Africa to breed.

A single species of conservation concern was observed during the March 2020 field surveys: steppe eagle (*Aquila nipalensis*) [IUCN Endangered]. A total of eleven birds were observed flying in a northerly direction over and immediately adjacent to the eastern boundary of the proposed Project site on 3<sup>rd</sup> March. These birds are migrating on a broad front as the proposed project site is not located on a major bottle neck or geographical feature that would concentrate migrating species. As a result, there is no reasonable likelihood that the site supports or witnesses exceptionally high numbers of migratory or congregatory species. Additional survey work that took place in June 2020 will identify whether the site is important for breeding or migrating species.

Migratory species recorded during the field surveys, which may also breed within the proposed project area, are desert wheatear (*Oenanthe deserti*) and isabelline wheatear (*Oenanthe isabellina*). These species are not of global conservation concern.



**Figure 7-2. Desert wheatear on site**  
Source: McAlister (2020). Site visit photos March 2020.



**Figure 7-3. Steppe eagle migrating over site**  
Source: McAlister (2020). Site visit photos March 2020.

#### 7.4.5.3 Survey Results for Resident and Over-wintering Species

No resident species of global conservation concern were observed during the March 2020 field survey. A single species which may be sensitive to collision with powerlines was recorded: black-bellied sandgrouse (*Pterocles orientalis*) [a pair were recorded utilising the proposed project site for resting/foraging]. Crested lark (*Galerida cristata*) was commonly recorded within the proposed project site.

Possible prey remnants of Saker falcon (*Falco cherrug*) [feral pigeon feathers] were noted during the field survey, however this species was not observed during the field survey visit.

#### 7.4.6 Flora

The vegetation was found to be in a desiccated form in line with the weather conditions following the summer and many species of annual plants were in an early growth stage (seedling).

##### 7.4.6.1 Terrestrial Mammals

No mammal species were observed during the March 2020 field visit; however, several burrows were observed. It is thought that these burrows were made by small rodents.

Yellow ground squirrel (*Spermophilus fulvus*) [IUCN Least Concern] was recorded adjacent to the proposed Project site, to the south of the M37 carriageway.

#### 7.4.6.2 Bats

Bats species are nocturnal by nature and as the site surveys were conducted during the day no bats or evidence of bat roosts were observed during site surveys.

The two farm complexes which are located immediately adjacent to the proposed Project site were assessed as having low potential for roosting bats during the March 2020 field surveys and no evidence of roosting was observed.

#### 7.4.6.3 Reptiles

During the field survey, two reptile species were found: Central Asian tortoise (*Testudo horsfieldii*) and Sunwatcher toad-headed agama (*Phrynocephalus helioscopus*).

##### *Central Asian tortoise*

Listed as Vulnerable by the IUCN, the species is threatened by habitat loss (e.g. due to agricultural development) and long-term collection for the pet trade. This species is widely distributed in Uzbekistan and is widespread in semi-desert of the central Kyzylkum e.g. north-central Bukhara and southern Navoi.

Two individuals were seen during the field surveys; an adult and a juvenile which were emerging from winter hibernation burrows. This species is active between March and May and from late May onwards it hides in burrows. The field survey was undertaken in the early stage of the active season and therefore the population within the proposed Study Area may have been under-recorded. Suitable burrows for sheltering tortoises were noted within the Study Area.

Further survey work and mitigation will be focused on this species and will be designed to ensure no not loss in biodiversity as it relates to Central Asian tortoise.

##### *Sunwatcher toad-headed agama*

Listed as Least Concern by the IUCN. At least two individuals were observed during the field surveys.



**Figure 7-4. Central Asian Tortoise**

Source: McAlister (2020). Site visit photos March 2020.



**Figure 7-5. Sunwatcher toad-headed agama**

Source: McAlister (2020). Site visit photos March 2020.

##### *Other reptiles*

Burrows which have the potential to support reptiles (for example lizards, snakes) were observed during the field visit, however the survey was not undertaken in the active season for many reptile species. Further survey and further information are proposed to be undertaken as part of the detailed ESIA study to confirm the status of reptiles within the Study Area.

## 7.5 Archaeology and Cultural Heritage

### 7.5.1 Desktop Study Methodology

The aim of the desktop study was to determine the nature, extent and significance of the archaeological, historic and cultural heritage within the Study Area.

### 7.5.2 Site Location, Palaeontology and Palaeoclimate

The Site is located immediately north of part of the Silk Roads trading route between Bukhara and Samarkand, which broadly followed the course of the M37 road.

Prior to the construction of large-scale irrigation canals in the 20th century, the sedentary population cultivated fertile land close to the river or oases at Bukhara, c.60km to the west and Samarkand, c.175km to the east. Historically, intermediate areas of desert and semi-desert, such as the Site, were used by pastoral nomads.

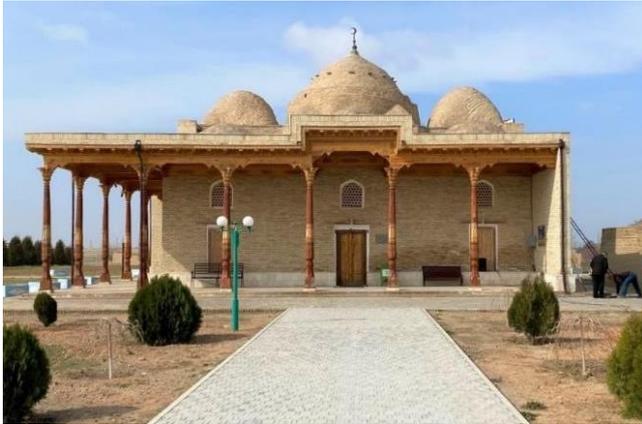
A number of archaeological or cultural sites were recorded close to the Project. These are summarised below.

The **11th century Deggaron Mosque** (Navoi Region State Register Architectural Monument No. 44) is one of the one of the earliest preserved Islamic religious buildings, which may have been converted into a mosque from a Zoroastrian temple. The **Deggaron Complex** (State Register Architectural Monument No. 45) includes the *khanaka* (monastery/inn) and mausoleum of Shaykh Malono Orif Deggaroni (1313–1376) which has recently been restored. Deggaroni was a mentor of Bohauddin Naqshband (1318–1389), the founder of what would become one of the largest Sufi orders. The complex is a pilgrimage site and includes a museum, garden, wells, a cooking and dining area and a chillahona (prayer area).

The **Sardoba Malik (Royal Well)**, an underground well under a domed structure, is located on the south side of the M37 highway immediately south of the caravanserai (State Registered Archaeological Monument, Navoi Region No. 42). It was built in the 11<sup>th</sup> to 12<sup>th</sup> century, supplied by the underground Narpai canal and irrigation channels from the Zaravshan River.

The **Rabati Malik (Royal Fortress) Caravanserai**, a State Registered Architectural Monument (Navoi Region No. 43) and Tentative WHS List site (Ref.: 5308), is located c. 12 km east of the Project, north of the M37 highway. Built in the late 11th century, and reconstructed in the 12th century, it was a palatial residence and headquarters of the Karakhanids. Following the Mongol invasions in the 13th century, it gradually became a roadside caravanserai on the main road from Samarkand to Bukhara. The caravanserai remained in use until the 18th century. The main facade was largely demolished in the 1940s and 1950s. With the exception of the 18m high portal, the caravanserai flanking walls were demolished by the earthquake of 1968. Archaeological investigations were carried out in the 1970s and 1997-2001; clarifying its layout and recording the caravanserai's cemetery. This is one of the largest caravanserais in Central Asia. Its building techniques are analogous with those noted in the contemporary Sulton-Saodat religious complex in Termez (Surxondaryo Region), the Samanid Mausoleum and Namazgoh Mosque in Bukhara (Bukhara Region) and buildings in the Karakhanid capital, Uzgen (Osh Region, Kyrgyzstan).

In the 17<sup>th</sup> century, a fortress was built in the village of Deggaron (Hazora). Parts of the remains of the fortress wall survive.



**Figure 7-6: Deggaron Mosque**  
Source: McAlister (2020). Site visit photos March 2020



**Figure 7-7: Sardoba Malik**  
Source: McAlister (2020). Site visit photos March 2020.



**Figure 7-8: Rabati Malik Caravanserai entrance**  
Source: McAlister (2020). Site visit photos March 2020.



**Figure 7-9: Rabati Malik Caravanserai inside**  
Source: McAlister (2020). Site visit photos March 2020.



**Figure 7-10: Computer Generated Image of Rabati Malik Caravanserai**



**Figure 7-11: Remains of Fortress at Hazora**  
Source: McAlister (2020). Site visit photos March 2020.

A review of the known archaeology and history of the wider Project area indicates that there is low potential for the presence of Palaeolithic, Mesolithic and Neolithic material. Throughout the later prehistoric, antique and medieval periods, it is likely that this semi-arid desert area was populated by mobile herders. There is some potential for the presence of stray finds (casual losses), travellers' campsites and for burial mounds (*kurgan*).

Any terrestrial archaeological remains within the Project Area are likely to comprise:

- Fragments of pottery or other material identified on bare ground.
- Surface scatters identified in areas of disturbed ground or excavated soils from groundworks.
- Buried features, which may have moderate depth and complexity.

The visibility of sites may be hampered by burial under wind-blown sands.

The Project site itself does not contain any internationally recognized or legally protected cultural heritage areas. Immediately south of the Project, the M37 road broadly follows the course of the Silk Roads, a Tentative List World Heritage Site (Ref. 5500). About 5km northeast of the Project site is the village of Hazora, site of the Malono Orif Deggaroni Mosque and Complex, associated with the mentor of the founder of the Sufi Naqshband order and the site of pilgrimages.

## 7.6 Socio-economic Conditions

The proposed Solar Park is located in the Navoi Region, the largest of Uzbekistan's 12 regions (111.09 km<sup>2</sup>), situated in the central north/northwest of the country. The Project is located about 30 km west from the town of Navoi, the administrative capital in the Navoi District (also called Karmana). Navoi District is one of the eight districts forming the Navoi Region. It lies south of the region and is directly bordering the districts of Kyzyltepa, Navbakhor, Kanimekh, Khatyrchi, and Nurata. Navoi District is also adjacent to the region of Samarkand and within it, to Pakhtachi District.

The closest residential areas identified around the Project are the village of Uzumzor (2.6 km east from the site boundary), and a small residential cluster (2.2 km south from the site boundary). The area is characterised by desert conditions, with irrigated land and the Zarafshan river located approximately 4.3 km north from the site.

According to the IMF, in 2019, the Gross Domestic Product (GDP) of Uzbekistan was at \$60.490 billion USD<sup>5</sup>. Navoi Region has the fourth largest GDP of Uzbekistan (36,685.2 billion UZS or 7.2%) and the largest GDP per capita, at 37,119.5 thousand UZS.

The national GDP is split between agriculture (28.1%), industry (36.4%) and services (35.5%). When comparing the changes in the structure of the economy between 2017 and 2019 this shows a 30% increase in the share of the industrial sector and a decrease of 28.1% in the share of agricultural sector. Navoi Region is characterised by its large industrial sector relative to other regions and the country. In 2019, Navoi Region held the largest share for industry (66.8%) within the sectoral structure of the regional GDP – or GRP. Correspondingly, it also held the smallest share recorded for agriculture (16.7%) and services (12%). Navoi Region is important in terms of industrial contribution to the economy of the country, estimating it at 10% of the total industrial production.

The soil of Navoi Region is rich in precious metal and is home to important mining, chemical and energy industries. Navoi International Airport is also the largest air cargo terminal in Central Asia. The entire Navoi Region was designated as a free economic zone (FEZ) following the enactment of a Presidential Decree. The main goals of this decree are to attract direct investment to create innovative, high-tech, export-oriented and import-substituting enterprises producing high value-added products, as well as to develop transport and other infrastructure of the region to turn it into a major logistics centre.

There is little data available at the Navoi/Karmana District level. According to the Navoi Region website, large industrial enterprises based in the district include CJSC Navoi TPP (electricity and isotope energy generation) and spare parts, THAEL POLYMER Synthesis JV (polymer products), JV "Kar-Rig trans" (transport services), JV "Gypsum Products" (production of building materials). A large proportion of eggs, poultry and vegetables produced regionally originate from the district.

During the meeting organised with local institutional stakeholders, the representative from the local Council of Uzumzor reported that the local economy, relies mostly on agricultural activities, in particular cotton and wheat. Further research and site visits will confirm this information and will need to further investigate the weight of the industrial sector and its composition.

Preliminary work has identified that land in the Solar Park was predominantly used for grazing. The visit has also revealed the existence of two farms within the Project area: the Hamraqul Baraka farm ("Farm A") and the Mehriqiyo farm ("Farm B"). Following consultation with the State Cadaster in March 2020 it is understood that the Government initiated the process of acquiring the land for the Project. The two owners of these farms surrendered their lease of the land identified for the Project Both leaseholders have now had some of their land reduced. It was noted that one leaseholder had subleased the farming land to a tenant who was continuing to use the land for grazing at the time of the March and June 2020 site visits.

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<sup>5</sup> International Monetary Fund (2019). World Economic Outlook Database October 2019. [online] Imf.org. Available at: <https://www.imf.org/external/pubs/ft/weo/2019/02/weodata/index.aspx> [Accessed 5 Mar. 2020].

## 7.7 Transportation and Access

It is currently expected that the Solar PV components will be transported to site over land from a manufacturing plant in China, via Kazakhstan. There is a second option to transport goods by rail; all goods would be sent from the Xi'an Xinzhu Railway Port to the Project site. Both options are described in more detail below.

### 7.7.1 Road Transportation Route

The transportation study has considered a route from China where the parts will be delivered up to the Project site utilising the main transport network and avoiding built-up areas where possible.

The Chinese border crossing is located over 1,000 km east of the Solar Park and it is understood to be key for importing and exporting goods in and out of inland central Asian countries, including Uzbekistan. The EPC Contractor will confirm the suitability of the route and border crossing for delivering and handling the Project materials and, if necessary, propose an alternative route.

The Project site can be accessed directly from the M37 via a short dirt road thereby reducing the need for use of local, unpaved roads.

Given the importance of the route for trade between China and Central Asian countries, and review of satellite images, the road infrastructure between the border and the site will be of good quality and should not present any significant technical difficulties.

A more detailed assessment would be required to confirm the suitability of this route and/or to identify alternatives however, a potentially suitable access route has been identified for the purposes of this assessment.

The proposed route comprises the following key roads (distances noted are estimates):

- From border crossing at Khorgas leave the G312 from China and join the A535 in Kazakhstan.
- Continue west on the A353 to Saryokez – 250km.
- Take the route to the south of Saryozek and join the A3 at Dos – 5km
- Continue of the A3 to Almaty – 100km
- Before reaching Almaty turn right onto the P-19 and continue to Chapayevo.
- Turn right staying on the P-19 to Mezhdurechenskoye.
- Join the M-36 to Shamalgan, turn left then right and follow the M-37 to Kaskelen.
- Turn right on the A-2 and continue on the A-2 via Taraz and Shymkent to the Uzbek border at Yallama – 700km.
- Cross into Uzbekistan and turn right at Chinaz to join the M39.
- Continue west for 5km, bearing right to continue on the M-39.
- Continue on the M-39 crossing back into Kazakhstan for 10km before reaching Samarkand – 150km.
- On reaching Samarkand turn right onto the M37 and continue to Navoi – 200km
- Continue on the M37 from Navoi to the junction to the unmarked road to Uzumzor.
- After 1 km take a right on the next junction on the unmarked road to the site entrance.

### 7.7.2 Rail Transport

The railway shipments are all containerized. Goods will be loaded at the Xi'an Xinzhu Railway Station warehouse, China and the arrival point will be Tashkent Chukursay Station. The containers are then transported to the project site using customs supervision vehicles. The empty containers are returned to Tashkent.

The "Chang'an" train runs from Xi'an to Horgos Port, covering a total distance of 3,200km. It passes through three railway bureaus and 10 marshalling stations and arrives at Horgos Port within three days.

On leaving China, the railway transportation route is 1,600km in total, passing through four marshalling stations, the Kazakhstan Railway and Uzbekistan Railway - Almaty, Shimkent, and Tashkent. After reloading at Altynkol Station, the train reaches Chukursay station in Tashkent, where materials are then transferred to the Project site.

## 8. Preliminary Impact Assessment

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 deviation from the baseline conditions. The significance of each impact was categorised and for significant impacts, further mitigation measures have been proposed.

### 8.1 Surface and Ground Water

There are two permanent surface water bodies on the eastern and western boundaries of the Project site. These are both man-made canals intercepting run-off from agricultural areas. The Zarafshan River provides the main source of irrigation across the region.

Surface water may be subject to reduction in quality due to chemical spills should proper mitigation not be implemented. The irrigation canals adjacent to the site currently provide drinking water for livestock and are used to supply irrigation water for smallholder vegetable farming for local farmers.

The use of heavy vehicles during construction could alter surface drainage within the Solar Park and create ponding of surface water. Earth banks would prevent the direct discharge of surface water to the irrigation canals. Compaction of soils will reduce the amount and rate of water that soaks into the ground and surface ponding will increase. The risk is greatest during periods of heavy rain in December. There is unlikely to be an increased volume of water flowing into drainage channels due to the earth banks running adjacent to the irrigation canals and hence there is unlikely to be additional soil erosion. Surface run-off will also contain higher concentrations of suspended sediments during construction than would otherwise be the case but as discharge to the irrigation canals is limited, surface water will pond in the small depressions on site. Other potential sources of pollution during construction comprise leaks and spills of oils from machinery. There is no proposed discharge of sanitary waste and wastewater as waste will be collected in a septic tank for disposal.

As a result, the significance of the impact is assessed as very low. The extent of reduced groundwater quality due to construction activities is considered local, and the duration assessed as being temporary and short-term. However, the depth of groundwater at 80 m below ground level result in a negligible magnitude of impact. In both cases a low significance of impact is predicted which does not require additional mitigation measures to be implemented. Nevertheless, mitigation in this case will be implemented through the implementation of Good International Industry Practise pollution prevention measures.

As no physical works will take place on site during operation, it is anticipated that the level of impact during operation is significantly less than during construction.

### 8.2 Landscape and Visual

The Solar Park will be only visible to a small number of people who live locally or are travelling through the area on the main highway. The equipment used to build the Park is not large, but it is expected that the construction compound and worker accommodation will be visible from nearby settlements.

The completed Solar Park will include larger structures such as inverters, electrical substations, transformers and the Control Building. In all cases it is expected that on-site structures are no higher than the boundary fence which will be 2.5 m in height. The exception will be the substation connecting the Solar Park to the national grid. In all cases the height of the Solar Park will be significantly less than the height of the existing electricity pylons running in a west to east direction to the south of the Solar Park. The main impact to the LCTs during operation are the solar PV panels, boundary fence, and associated inverters and substation.

The finished height of the Solar Park is low and it will only be visible to the nearby settlements. The majority of people will see the Park against the industrialised landscape of the Navoi region.

The impact of the Park on the visual landscape is considered to be low and no specific mitigation is required.

#### 8.2.1 Glare and Glint

Related to the visual impact of the Solar Park is the potential for the panels to result in glare and glint. The potential for glare and glint from the Project during operation is low. It is important to note that the PV panels work on the concept of absorbing sunlight rather than reflecting it as compared to other technologies that concentrate solar energy. The PV panels that will be used for the Project have very limited levels of either glint or glare and are

substantially less reflective than most surfaces such as still water, glass or steel. Glint will be substantially reduced by the anti-reflective coating of the modules that is incorporated to maximise the light capture of the solar cells. Previous studies have been undertaken to compare the reflectivity of solar panels with other materials. The most commonly referenced source is a USA Federal Aviation study focusing on solar panels located at airports. This study states that modern solar panels reflect as little as 2% of the incoming sunlight. Solar PV panels have a lower level of reflectivity than many commonly occurring features such as bare soil and vegetation.

## 8.3 Biodiversity

### 8.3.1 Birds

Construction impacts are likely to include habitat loss as well as disturbance impacts in the Project and adjacent areas. However, the degraded nature of the Project site and the relatively small number of birds found on site mean that the impact on resident bird species is expected to be very low..

There are no large trees in the immediate area and the site is not expected to affect successful breeding of local large bird species (such as raptors).

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.

Operational impacts are deemed to be similar with the key impact being the loss of habitat associated with the installation of solar panels. The impact significant is therefore unchanged from construction phase.

### 8.3.2 Terrestrial Ecology

Potential impacts on plants and animals during construction include:

- Permanent loss of vegetation and habitat (including food sources) beneath the built structures.
- Direct impacts associated with pollution from fuel spills.
- Indirect impacts due to the displacement of species from the Solar Park.
- Temporary loss of vegetation and habitat due to the presence of people, earthworks, machinery, traffic, and noise, both within and outside of the Project area.

The natural vegetation at the Project site has been substantially altered by human activities and it is therefore not considered a sensitive area.

It is expected that limited vegetation will be required during construction as it mainly consists of low growing species. Individual higher growing species may need to be removed to minimise shading and improve energy yield.

There are very few animals living on the site. A single species of conservation concern was recorded: Central Asian tortoise (IUCN VU). However, the tortoise population on the site is not of regional importance. The sensitivity of the terrestrial habitat has been assigned as Medium and this assessment is based on the IUCN (VU) status of Central Asian tortoise. Other plant and animal species recorded during the AECOM surveys are not of conservation concern however this will be confirmed following the further ecological surveys which are programmed for late June 2020.

As a precautionary measurer the impact of the Solar Park on the site has been as Medium and significant. This means that the developer will adopt a number of general and species specific mitigation measures to ensure impacts are reduced to Low significance or below. Operational impacts on this species are deemed to be Low as no ground disturbance would take place. It is recommended that enhancement works take place during operations to ensure no net impact on the Central Asian tortoise. The extent of such works have yet to be finalised.

## 8.4 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 the loss of the limited vegetation present increases in the soils' vulnerability to erosion. Soils will be particularly vulnerable during higher periods of rainfall, when vehicle

traffic is likely to cause the greatest damage. As noted above, surface water is likely to pond on site rather than discharging to the irrigation canals.

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. To mitigate this impact, tracks will be constructed and vehicles will be prohibited from driving off-road,

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.

The following types of construction activity could lead to potential soil compaction or erosion depending on the level of rainfall experienced at that time:

- Vehicle traffic along dirt tracks used during construction of on- and off-site roads, power lines, control centre and solar panels.
- Off-road vehicle traffic will damage vegetation.
- Any vegetation and some soil will be removed for the control centre, solar panel foundations, transmission towers, and both on- and off-site roads.
- The use of heavy equipment if used outside designated roads.
- Soil erosion from increased water run-off.

The importance of soils in the Solar Park is assessed as Low and as a result it is expected that development can take place on site without impacting on other off-site users. Whilst it is recognised that soils will be most vulnerable during periods of higher rainfall, the similar soil conditions in the wider local and regional area does not require any more detailed consideration of on-site resources. The magnitude of the effect is predicted to be Low, given that there is potential for construction activities to notably change the soil resource, particularly during rainy season but impacts are deemed to be highly localised. As a result, the significance of the impact is assessed as Low.

During operation the impact on geology and soils is deemed to be negligible as very little maintenance work is scheduled to take place and at a significantly lower scale that during construction.

## 8.5 Archaeology and Cultural Heritage

There are no significant cultural resources within the Project site and the Project is not considered to have a direct adverse impact on any international or nationally recognised cultural heritage feature

As a result of the absence of known archaeological, religious and aesthetic sites, the site sensitivity is assessed to be negligible.

There is the potential for the discovery of unrecorded buried archaeological remains during the construction phase as the Project will involve ground clearance activities such as levelling, grading and excavation works. These works have the potential to directly impact on unrecorded buried archaeological remains which may be present within the site boundary and may be of archaeological importance.

It should be noted that although there are no known archaeological or religious sites located within the Project footprint, the Rabat Malik Caravanserai and other Silk Road sites are located to the east of the Project adjacent to the M37. It was noted that the Caravanserai has been rebuilt to the extent possible and bears little resemblance to its original structure. Nevertheless, this site is of cultural significance. It is imperative that these sites are not disturbed further by the Project activities, such as transportation, or by the workforce. Given the distance from the site it is considered unlikely to be directly impacted by the Project.

During the operational phase there will be no new impacts on existing cultural sites. The lack of visibility of the Project from these sites and the absence of a construction workforce will mean that no impact is predicted.

## 8.6 Noise and Air Pollution

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.

Levels of dust may increase locally as a result of dust 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 construction of the substation building / transformers and inverters are expected to be the noisiest activities. Typically, associated construction activities within a 200 m distance from noise sensitive receptors have the potential to result in increased levels of noise at people's houses. The closest house to the Project is around 1km away. The Project layout includes a number of inverter and transformer locations toward the centre of the site which again are at a distance of over 1 km from the closest house.

Magnitude of change is anticipated to be Very low as there is unlikely to be any increase noise levels and increased dust / emissions to air associated with construction of the Project at nearby residential receptors. The impact is assessed as Negligible and not significant pre mitigation. Although no specific mitigation is required, standard good construction practice will be maintained to ensure no increase in predicted impacts during construction.

During operation, solar PV panels do not produce any noise, however equipment within the site (typically inverter stations and transformers) will emit low levels of noise. While the Project will only be operational during daylight hours, the transformers are permanently energised and emit a low hum during the night-time. However, the distance between the substation transformers and the nearest residential properties is about 1 km and a breach of the lower 45 dB limit is highly unlikely and as a result no significant impact has been predicted.

## **8.7 Social Impacts**

### **8.7.1 Interaction between employment and capacity building**

The Project will require both skilled and unskilled labour during the construction and operational phase. Labour may be sought from the local community and training provided for selected individuals, thereby creating direct and indirect employment opportunities.

The total number of people that will be employed during construction is expected to reach a peak of 900 personnel. This includes technicians and low-skilled personnel (approximately 600) who will receive various levels of training before starting work on the Project. The training incorporates basic training on HSE, labour management and, where required for specific job profiles, vocational training.

The construction workforce is expected to consist of a combination of nationals and expatriate workers, with the majority being local economically active population, preferentially sourced from the surrounding communities living close to the project. A Local Hiring Plan will be developed to maximise the number of local employees on the Project.

The total number of the local workforce is expected to increase as site preparation activities commence. After the peak level has been reached, the local workforce will gradually be reduced leading up to the start of operations.

The individuals employed during the construction stage, and their household members, will benefit from increased income. Similarly, the Project represents an opportunity for young people to increase their skills through vocational training that will be of use to them after their involvement in this Project is completed. Individuals who receive such training should be able to seek alternative work within the growing construction sector in the future.

### **8.7.2 Interaction with local communities**

The Project has been located away from individual houses and local settlements and therefore there will be no requirement to re-settle any individual. However, the Project will be required to lease an area currently used for grazing (Farm B) and as such there may be a negative impact on the ability of local people to maintain the same level of income and access to the area. To address this, an area of alternative land will be made available to the sub-tenants for Farm B. The Project will facilitate discussions with the Khokimiyat to ensure alternate access locations are identified during the ESIA study and will be based on engagement discussions with the previously mentioned sub-tenants.

### **8.7.3 Interactions with the workers' camp and migrant workforce**

- Migrant workforce from outside of the local Project area resulting in conflicts with the local communities.

- The presence of workers close to the Project and the money they earn and spend may cause changes to local customs and norms causing social tensions and impacting on social institutions. Additionally, it may cause increased pressure on services due to a significant influx of workers from outside the local area.
- The presence of workers in the Project area could have an impact on local social amenities and possibly saturate existing public services (water, electricity, roads, schools, health centres).
- Increased presence of local and migrant workers looking for work opportunities near the Project– The presence of workers in the locality of the Project could have the potential to increase the incidence of communicable diseases, including Covid-19 (see below).

#### 8.7.4 Interactions with Community H&S and Security

- Disruption during construction and reduced access to roads around the Project site during road upgrade work.
- Increased traffic and the use of the M37 road by large construction vehicles could pose a H&S risk to members of the local communities.
- Loss of public access to footpaths inside the Project site.
- Dust and engine emissions created by construction activities could impact air quality and hence community health.
- Equipment and activities will create noise and vibration during construction and demolition
- Movement of materials and workers during construction could impact public safety.

#### 8.7.5 Interactions with Occupational Health and Safety

Further to impacts identified above, construction activities pose a variety of OHS risks to the workforce arising from general construction works within the Project site, during the upgrade to the access roads, and during the interconnection to the existing transmission line poles.

- Working at height during the installation of transmission line cabling;
- Heavy lifting during installation of the solar panels by the workforce;
- Working with live electrical components during construction and operation; and
- Noise, dust and emission levels on the workforce during construction activities.

#### 8.7.6 Key Impacts

It is assessed that main impacts related to the land requirement for the project and the migrant workforce creating additional COVID -19 risks. The impact is assessed as Moderate pre mitigation, on the basis that Farm B has a high reliance on land inside the Project area for livelihood. Post-mitigation assessment may take the impact significance to Moderate if Farm B tenants are engaged to participate in their alternative land provision.

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. 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. Interactions with local community members and women has the potential to increase the incidence of communicable diseases.

It is fundamentally important that the Project fully considers the COVID-19 risks as communicable respiratory diseases will most likely be the most significant concern for potential interactions between the workforce and community members. A more thorough process to prevent and minimise exposure to COVID-19 risks will be included in the next iteration of the ESIA report. 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. A detailed assessment will be undertaken once the EPC has been appointed and their plans can be scrutinised in detail. While the full details of the workers' camp have not been provided yet, the mitigation measures to avoid and reduce risk exposure will be implemented, as detailed in the Interim Advice for IFC Clients on Preventing and Managing Health Risks of COVID-19 in the Workplace (IFC, 2020).

Further to this the ESIA will consider the potential impact on local hospitals and medical facilities in the event of an outbreak of COVID -19 at the worker's accommodation.

## 8.8 Traffic and Transportation

The Project will result in additional vehicles travelling to and from the site during construction. These will include heavy goods vehicles (HGVs) and light goods vehicles (LGVs).

The construction phase is expected to generate the traffic volumes of 6,030 HGV movements and 1,400 LGV movements. 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. It is also likely that a larger bus would be provided for construction workers thereby reducing the number of vehicle movements.

Construction times can be arranged to avoid local peak times and routing arrangements, particularly for HGVs to minimise potential impacts

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, it is considered that the magnitude of change associated with Project generated traffic would likely to be Low. Considering that the majority of the road network is of low sensitivity and the likelihood that the magnitude of change small, the overall impact is likely to be Negligible during the construction process.

The main transport impacts will occur during the construction phase. The number of vehicles during operation is likely to be very low, with access required only for maintenance and servicing. The majority of these will be light vehicles and, at the worst case, an HGV trip may be required to transport a replacement transformer to site. The effects of traffic movements stemming from the operational phase are therefore considered Negligible and so insignificant.

## 8.9 Decommissioning Phase Impacts

Decommissioning impacts are considered to be similar to construction phase impacts. The assessments outlined for construction should therefore be referred to.

# 9. Mitigation and Enhancement Measures

The proposed mitigation measures outlined below will be further developed during the ESIA process. Those required for the Project based on the information available to date and have been developed in line with IFC Performance Standards and Guidance. The developer will prepare an Environmental and Social Management and Monitoring Plan (ESMMP) which includes all required mitigation. This will be implemented for the duration of the project.

## 9.1 Environment and Social Management and Monitoring Plan

An ESMMP will be prepared which describes the proposed management system. Taking into account the relevant findings of the Project ESIA and the result of consultation with affected communities, AECOM will establish a plan of mitigation and performance improvement measures and actions that address the identified significant social and environmental risks and impacts.

Management plans consist of a combination of operational policies, procedures and practices. The measures and actions to address identified impacts and risks will favour the avoidance and prevention of impacts over minimization, mitigation, or compensation, wherever technically and financially feasible. Where risks and impacts cannot be avoided or prevented, mitigation measures and actions will be identified so that the Project operates in compliance with applicable laws and regulations and meets the requirements of Performance Standards 1 to 8.

The management system will clearly define the desired outcomes or targets and provide the means to meet those targets. The performance of the management system will be tracked through a suite of performance indicators that can be tracked over defined reporting periods, and if necessary, further mitigation would be implemented if targets fail to be met.

The ESMMP will constitute an overarching document, referring to a number of sub-plans required for the Project that will be developed by the EPC Contractor.

Plans required for this type of Project include:

- Waste management plan
- Transport management plan
- Hazardous materials management plan
- Occupational health and safety / labour conditions plan
- Emergency response plan
- Community health and safety plan
- Stakeholder engagement plan
- Grievance redress mechanism
- Community development plan
- Any other management plans required to address risks identified in the project ESIA.

AECOM will also incorporate measures to monitor and evaluate the implementation of the proposed mitigation.

## 10. Next Steps

The general recommendation from the ESIA study is that the proposed 100 MW Nur Navoi Solar Plant Project should proceed but in order to ensure the environmental and social sustainability of the proposed Project, it is recommended that the developer implements the following:

- Further environmental and social surveys will be undertaken as part of the detailed ESIA phase. This will include further ecology survey effort, stakeholder engagement and household socio-economic surveys. The most recent surveys took place during the week of 22 June 2020 and will be reported in the next iteration on the ESIA report. These will determine the need for further surveys prior to construction.
- Assess residual effects of the Project and further develop mitigation measures.
- Monitor discussions with tenant farmer to confirm that like for like compensation has been provided. The Project should facilitate negotiations with relevant members of the Khokimiyat.
- Develop and implement a Project ESMP to mitigate negative impacts and enhance the positive impacts. The ESMP requires that the proposed Project follows the recommended mitigation measures; and livelihood and community benefit enhancement strategies.
- Confirm the need for worker accommodation and if necessary, develop a Workers Accommodation Plan. Given current COVID-19 restrictions, the Project is planning to install workers camp.
- 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).

