192248.GLA.R.002

B5

Masdar

Zarafshan Wind Farm

Preliminary Environmental & Social Impact Assessment

16 July 2021

Report Summary

Wood was appointed by Masdar (the Client) to provide an Environmental and Social Impact Assessment (ESIA) for Zarafshan Wind Farm (the Project).

The Project is located to the east of Zarafshan City, in the Tamdy District of the Navoi Region, Uzbekistan.

Currently, there are 111 wind turbine generators (WTGs) proposed with an anticipated capacity of 4.5 MW resulting in a site capacity of up to 500 MW. One substation with two short overhead transmission lines (OHLs) connecting the Project to existing OHLs crossing the site is proposed.

The Preliminary ESIA presents information on the identification and assessment of the likely significant environmental and social effects of the Project and its ancillary infrastructure. The document has been prepared by Wood with specialist ecological and ornithological input from Turnstone Ecology Ltd and social specialist input from Environmental and Social Assessment Services (ESAS). Baseline data collection has been carried out by in-country consultants, Juru Energy and GBI Consulting (the latter also responsible for stakeholder and community consultation activities).

A Final ESIA will be produced at a later stage following appointment of the EPC Contractor which will include further construction and operational information with the assessments and mitigation (as required) updated to take account of the full Project infrastructure and associated facilities.

Report Details

Client:	Masdar
Client Contact:	Morten Sahl
Report Distribution:	
Masdar:	Morten Sahl, Dias Kamaliyev, Ivan Montenegro
Wood:	Vicky McLean, Diane Scott, Jeremy Short, Alistair Billington
Report Classification:	Confidential

Approval Record

	Name	Job Title	Signature
Prepared by:	Vicky McLean	Senior Environmental Consultant	
	Diane Scott	Senior Environmental Consultant	
	David McLaughlin	Principal Noise Consultant	
	Stuart Hume (ESAS)	Social Specialist	SIGNED
	Simon Parker (Turnstone Ecology)	Principal Ecologist	SIGNED
Reviewed by:	Anissa Sfayhi	Senior Environmental Consultant	
Authorised by:	Alistair Billington	Technical Director	SIGNED
	Jeremy Short	Technical Director	SIGNED
Date of issue:	16 July 2021		

Amendment Record

Revision Number	Date	Summary of Amendments	Purpose of Revision
A1	14/12/2020	n/a	First draft
A2	17/12/2020	Minor amendments following review	Internal authorisation
B1	22/12/2020	Minor amendments following authorisation	Client issue
B2	27/05/2021	Amendments to reflect revised layout and Client comments.	Client issue
B3	09/06/2021	Amendments to reflect Client comments.	Client issue.
B4	09/07/2021	Amendments to take account of Lenders' comments.	Client issue.
B5	16/07/2021	Amendments to take account of Lenders' comments.	Client issue.

NOTICE AND DISCLAIMER

1. This document entitled *Preliminary Environmental & Social Impact Assessment* , document number 192248.GLA.R.002 B5 dated *16 July 2021* has been prepared solely for Masdar ("the Client") in connection with the Zarafshan Wind Farm. This document in whole, or in part, may not be used or relied upon by any other person for any other purpose, without the express written permission of Wood Group UK Limited ("the Consultant") and any such approval shall be subject to receipt by the Consultant from the prospective person of a countersigned copy of the Consultant's reliance letter format (available upon written request). Any liability arising out of use of this document by the Client for any purpose not wholly connected with the above shall be the responsibility of the Client who shall indemnify the Consultant against all claims, costs, damages and losses arising out of such use. Any liability arising out of the use of this document by a third party shall be the responsibility of that party who shall indemnify the Consultant against all claims, costs, damages and losses arising out of such use.
2. The Client will indemnify the Consultant from and against any losses, claims, demands, damages, costs, charges, expenses or liabilities (or actions, investigations or other proceedings in respect thereof) which the Consultant may suffer or incur or which may be made against the Consultant relating to or arising directly or indirectly out of a claim by a third party where the Client has disclosed the document or has permitted the document to be disclosed to such third party without the prior written consent of the Consultant, and will reimburse the Consultant for all costs and expenses (including legal and other professional fees) which are incurred by the Consultant in connection with investigating or defending any such claim or proceeding
3. The Consultant accepts no liability whatsoever in relation to:
    a. documents or advice marked as "indicative", "preliminary" or "draft";
    b. non-technical matters, including but not limited to legal, financial and insurance considerations - it is recommended that the Client obtains advice on non-technical matters by suitably qualified parties; and
    c. any omission or inaccuracy arising directly or indirectly from an omission, or error, in the data supplied by the Client, or any other party, to conduct the scope of work.
4. Other than where specifically agreed in writing, data has not been independently verified and is assumed to be accurate and complete at the time of data provision. This applies to any data used in conducting the scope of work, whether or not specifically referenced in this document.
5. Wind speed and energy yield estimations presented in this document are based on the data provided and assumptions made at the time of writing. Wind speed and energy yield estimations are subject to a level of uncertainty and as such actual wind speed and energy yield values may differ from those detailed in this document. A party must use its own skill and judgement in deciding the applicability and appropriateness of the estimation in any given situation.
6. The Consultant accepts no liability in relation to its opinion on construction schedules, financial contingency or predicted operational expenditure, due to inherent uncertainty and unforeseen factors.
7. Any technology and technical design reviews are non-exhaustive. Unless expressly agreed, no design calculations have been checked.
8. Assessment of financial model technical inputs does not include review of any financial statements, either for accuracy or for conformance with relevant accounting standards. Furthermore, the integrity of the computations of the financial model have not been verified.

Contents

Figures

Tables

Glossary

Abbreviation	Definition
ADB	Asia Development Bank
AOI	Area of Influence
AMP	Adaptive Monitoring Plan
CAA	Civil Aviation Authority
CRM	Collision Risk Modelling
EBRD	European Bank for Reconstruction and Development
CLO	Community Liaison Officer
ESAP	Environmental and Social Action Plan
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
EP	Equator Principles
EPC	Engineer, Procure, Contract
GDP	Gross Domestic Product
GLVIA	Guidelines for Landscape and Visual Impact Assessment
GSM	Global System for Mobile Communications
IFC	International Finance Corporation
IBA	Important Bird Area
IUCN	International Union for the Conservation of Nature
LRP	Livelihood Restoration Plan
MW	Megawatt
NDB	Non-Directional Beacon
NSR	Noise Sensitive Receptor
OHL	Overhead line
OVOS	National EIA process
PR	Performance Requirement
PS	Performance Standard
RAP	Resettlement Action Plan
SNH	Scottish Natural Heritage
TMP	Transport Management Plan
ToR	Terms of Reference
UZCAA	Uzbekistan Civil Aviation Administration

Abbreviation	Definition
VEC	Valued Environmental Components
VP	Viewpoint
WTG	Wind Turbine Generator
ZTV	Zone of Theoretical Influence

1 Introduction

1.1 This Document

This Preliminary Environmental and Social Impact Assessment (ESIA) has been prepared for Masdar (the Client) for a proposed 500 MW Wind Farm development (the Project) to be constructed on land within the Tamdy District of the Navoi Region, Uzbekistan.

It is the intention to acquire international funding for the development of the Project and obtain approval from the Local Competent Authority to permit and operate the Project. This document forms the ESIA for the Project, developed alongside the national Environmental Impact Assessment (EIA) (OVOS) to meet national and international standards. The ESIA presents information on the identification and assessment of the likely significant environmental and social effects of the Project and its ancillary infrastructure.

Wood has authored this ESIA report with specialist ecological and ornithological input from Turnstone Ecology Ltd and specialist social input from Environmental and Social Advisory Services (ESAS). GBI Consulting, based in Tashkent, Uzbekistan, have been responsible for baseline gathering, stakeholder and community consultation and conducting of the national OVOS process. Juru Energy have been appointed since early 2020 to carry out the ecological and ornithological survey effort on the Project site.

An initial draft ESIA was produced in late 2020 based on a 92-wind turbine generator (WTG) layout. Key impacts and potential design mitigation identified within this document have informed the revised layout upon which this preliminary ESIA report is based. Section 2.4.5 of this ESIA, relating to the site layout iteration process, provides further detail in this regard.

The Project is considered a Category A Project under the Equator Principles version 4:

"Projects with potential significant adverse environmental and social risks and / or impacts that are diverse, irreversible or unprecedented."

Furthermore, the Project is considered as a Category A for environment impacts, a Category B for involuntary resettlement and Category C for indigenous peoples under the Asian Development Bank (ADB) safeguard categories:[1]. A Category A project is described as:

'A proposed project is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment (EIA), including an environmental management plan (EMP), is required'.

The justification for the categorisation relating to involuntary resettlement and indigenous peoples is described further in Chapter 7 (Social).

Given the Category A status for environmental impacts, the ESIA report will be disclosed to Project stakeholders and the public in compliance with the ADB Category A Project 120-day disclosure requirements and the European Bank for Reconstruction and Development (EBRD) and the International Finance Corporation (IFC)'s 60-day disclosure period. All stakeholder and public comments received to date have been considered when developing the ESIA and included within the Stakeholder Engagement Plan (SEP).

It should be noted that this document forms the Preliminary ESIA with a Final ESIA to be prepared at a later stage following appointment of the EPC Contractor. The Final ESIA will incorporate a more extensive Project description including further construction stage information with the assessment chapters updated accordingly to reflect this.

1.2 Background to the Project

The development of the Project began through initial studies in 2014 with a mesoscale modelling and site assessment carried out to inform the final selection of the most appropriate wind farm development site (as set out further within Section 2.4 – Alternatives). Two sites, Nukus and Zarafshan, were identified through site visits, evaluation of topography, infrastructure GIS analysis and available wind resource.

The Zarafshan wind farm site was chosen due to a more preferable wind resource, relatively straight-forward grid connection (with shorter overhead lines (OHLs) required) and better transportation links.

[1] ADB, Safeguard policy statement, June 2009 available online https://www.adb.org/documents/safeguard-policy-statement?ref=site/safeguards/main

Following the site selection process, discussions began with Government of the Republic of Uzbekistan (Uzbek Government) in late 2018, with a Memorandum of Understanding signed at this time. An installation capacity of 200 MW was agreed with the government in October 2019 which formed the basis of the initial ESIA Scoping phase. Wood undertook ESIA Scoping in late 2019 based on a 36 WTG layout with a total capacity of 150 MW. An agreement was then reached with the Uzbek Government to increase total capacity to 500 MW. An updated Scoping Report was produced in early 2020 by Wood, based on a revised 125 WTG layout. In June 2020, the Power Purchase Agreement (PPA) and Investment Agreement for the Project was signed by the Uzbek Government.

During the EPC Contractor selection process, the Project layout was further refined to a 92 WTG layout and 552 MW total capacity in mid-2020 for which the initial draft ESIA (December 2020) was based. This has since been refined resulting in a project consisting of 111 WTGs with a maximum 500 MW capacity. There is one substation proposed to the south of the Project site with two corresponding overhead lines (OHLs) connecting the Project to the nearest existing OHLs. The longest of the OHLs proposed is around 630 m in length. These are illustrated within Volume 2, Figure 2-1.

It is expected that construction will take place from late 2021 to late 2024 and, once operational, will supply power to the national grid.

1.3 Need for the Project

Rich in natural gas resources, Uzbekistan is the third-largest gas producer in the region, behind Russia and Turkmenistan. The energy sector accounted for around 20% of gross domestic product (GDP) and 15% of industrial output in 2016, and energy exports (predominantly gas) accounted for 17.3% of total commodity exports[2].

Despite being energy self-sufficient, Uzbekistan's ageing electricity infrastructure and network, and underinvestment have led to electricity shortages, inefficiency, high losses, and low reliability. Energy sector development is important for Uzbekistan's long-term goal of becoming an industrialized middle-income economy by 2030 (as part of the national Economic Development Vision 2030).

[2] https://www.eu4energy.iea.org/countries/uzbekistan

The Uzbek Government has ambitious energy transformation plans and the development of renewable energy is of key importance. To expand the use of renewable energy sources, reduce energy intensity of production and implement the Strategy of Actions on Five Priority Directions of Development of the Republic of Uzbekistan in 2017-2021, a presidential Decree No. PP-3012 of 26 May 2017 on the Program of Measures on the Further Development of Renewable Energy and Energy Efficiency in Sectors of the Economy and the Social Sphere for 2017-2021, was adopted.

The Ministry of Energy was established by Presidential Decree No. UP-5646 of 01 February 2019 on Measures to Radically Improve the Management System of the Fuel and Energy Industry of the Republic of Uzbekistan.

Energy sector priorities to 2027 include increasing generating capacity, improving energy efficiency in the energy, transport, and agriculture sectors, and using renewable energy sources more widely.

Uzbekistan has a rich renewable energy potential, particularly for wind, solar PV and hydroelectric development. This Project will assist with the Uzbek Government's aim to increase the renewable energy sector and reduce reliance on non-renewable sources.

1.4 Project Developer

The Project is being developed by Masdar (the Developer) with the PPA and Investment Agreement signed with the Uzbek Government in June 2020.

Masdar was formed in 2006 and is a global leader in renewable energy and sustainable technology, based in Abu Dhabi. Since 2006, Masdar has expanded its footprint around the world through pioneering renewable energy projects. They have projects on-going in over 30 countries, with a strong commitment to sustainability and mitigating climate change.

1.5 Scope and Content of the Environmental Statement

To successfully develop this Project, the following requirements must be met in line with International Standards (as set out in Section 1.6):

- The Project would meet Uzbek national requirements and international lending standards.
- The Project would include all necessary mitigation measures to minimise any significant adverse change in environmental, health and safety and socio-economic conditions.

- Appropriate public consultation and disclosure are undertaken, ensuring all reasonable public opinions are adequately considered prior to a commitment to financing.

To ensure compliance with international lending requirements, the overall scope of this assessment includes:

- Identification of key issues.
- Definition of baseline conditions of key environmental and social resources.
- Assessment of positive and negative impacts of the Project.
- Consultation with people who may be affected by the Project and other stakeholders.
- Development of design and operating practises that are sufficient to avoid, reduce, or compensate for significant adverse environmental and social impacts.
- Development of such monitoring programs as are necessary to verify mitigation is effective in line with accomplishing its goals, and to develop and refine the effectiveness of mitigation measures.

1.6 Environmental Impact Assessment Best Practise

The overall approach for the ESIA, reporting and public and stakeholder consultation activities have been based on the IFC Performance Standards (PSs), EBRD Performance Requirements (PRs) and the ADB Environmental and Social Safeguard Policy Statement.

The following main sources of guidance were utilised together with additional sources as referenced throughout the text:

- IFC Guidelines, including Environmental, Health and Safety (EHS) Guidelines for Wind Energy (IFC, 2015)[3], General EHS Guidelines (IFC, 2007)[4] and Operational Policy 4.01[5].

[3] https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/publications/publications_policy_ehs-wind_energy

[4] https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/policies-standards/ehs-guidelines

[5] https://www.ifc.org/wps/wcm/connect/8fbad499-03f6-4903-a586-d180e34a73f0/OP401_EnvironmentalAssessment.pdf?MOD=AJPERES&CVID=jqeAUET

- European Union Council Directive 85/337/EEC *on the assessment of the effects of certain public and private projects on the environment,* as amended by Council Directive 97/11/EC, Directive 3002/35/EC, Directive 2009/31/EC (Council of the European Union, 1985, 1997, 2003, 2009).
- ADB's Social Protection Strategy, 2018;
- ADB's Access to Information Policy, 2018; and
- ADB's Gender and Development Policy (1998).

Each of the stages listed in Section 1.5 have been completed during the ESIA process following the best practice guidelines as closely as possible.

1.7 Structure of the Document

The remainder of this report is organised as follows:

- Chapter 2 describes the Project, realistic alternatives, proposed layout and an outline of the proposed construction, operational and decommissioning works required.
- Chapter 3 describes the legal and institutional framework and context in which the Project is being proposed and developed.
- Chapter 4 demonstrates the general assessment methodology applied for this ESIA.
- Chapters 5 to 16 describe the baseline environmental and socio-economic conditions of the area, potential impacts that may result from construction, operation, and decommissioning, proposed mitigation measures and residual impacts.
- Chapter 17 provides a summary of impacts that can be expected during construction, operation, and decommissioning of the Project. This includes measures that are needed to prevent, mitigate, or otherwise address potentially significant impacts.
- Chapter 18 sets out the proposed environmental and social management and monitoring measures that will be implemented during construction and / or operation as appropriate.

2 Project Description

2.1 Site Description

The main Project area is located in the Tamdy District of the Navoi Region. It lies within the central part of the Kyzylkum Desert and occupies an area approximately 9,600 hectares in size.

The Project is located approximately 7 km east of the centre of Zarafshan City with elevation rising from 540 m above sea level (asl) at the centre of Zarafshan to 750 m asl on the plateau.

To the north (around 3.5 km away) is Mount Aktau which is an Important Bird and Biodiversity Area (IBA). The plateau measures approximately 6.5 km x 2.5 km in size and is oriented in a west to east direction. The terrain slopes steeply in all directions at the edge.

Figures 2-1 to 2-4 below illustrate the general Project site characteristics.

Figure 2-1: Core Project Site Area

Figure 2-2: Western area of the Project site

Figure 2-3: View from the north-eastern area

Figure 2-4: View from the south-east

There are no permanent waterbodies on the Project site however a number of seasonal drainage channels exist.

The area is largely used for rough grazing of sheep and to a lesser extent, goats and horses, with a number of access tracks crossing the site. Evidence remains of extensive former agricultural use along with a series of man-made parallel lines (assumed to be for irrigation purposes) which are clearly visible on satellite imagery.

A small number of farms were identified in and around the Project site through desk-based studies and on-site consultations in April 2021, two of which are located inside the site boundary. The locations of these farms are shown in Volume 2, Figure 7-1 and also Figure 1-2. These farms are used throughout the year and farmers / herders reside there for various lengths of time (ranging from two to three days to a month or more at a time). The farms and their uses are detailed further in Chapter 7 (Social). Primarily, the animals kept at the farms include sheep, goats and some horses and cattle.

Figure 2-5: Herder Shelter within the Project Area

Zarafshan City is the largest settlement in proximity to the Project with other smaller settlements of Tamdybulak and Muruntov along with the villages of Jingildy, Kynyr, Kazbekbi, Rokhat, Ajiriqti and Yangi Tamdy in the wider Project area. Around these smaller settlements, mining, subsistence and small-scale agriculture are the main land uses. Figure 2-6 below illustrates the Muruntau gold mining area to the south-east of the Project site. The mine extends 3.5 km by 3 km with a depth of 600 m and is one of the largest open pit gold mines in the world.[6]

[6] https://www.mining-technology.com/projects/muruntau-gold-mine-uzbekistan/ accessed June 2021.

Figure 2-6: Muruntau Gold Mine[7]

The Project site footprint comprises of access tracks, crane hardstandings, WTG bases, construction compound, temporary workers' accommodation and a substation building. There are two small OHLs from the substation connecting to the existing OHL network.

2.2 Project Area of Influence

The Area of Influence (AoI) is the focus of the environmental and social assessment. As defined within IFC Performance Standard (PS) 1, the project AoI encompasses (as appropriate):

- The area likely to be affected by:
  - the project and the client's activities and facilities that are directly owned, operated or managed (including by contractors) and that are a component of the project.
  - impacts from unplanned by predictable developments caused by the project that may occur later or at a different location.
  - Indirect project impacts on biodiversity or ecosystem services upon which Affected Communities' livelihoods are dependant.

[7] https://www.forbes.com/sites/greatspeculations/2016/06/02/digging-into-the-worlds-top-10-gold-mines/ accessed June 2021.

- Associated facilities – facilities not funded as part of the project and that would not have been constructed if the project did not exist and without which the project would not be viable.
- Cumulative impacts – resulting from the incremental impact on areas or resources used or directly impacted by the project from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted.

The Project's AoI is set out in Table 2-1 below.

Table 2-1: Definition of the AoI by Environmental & Social Topic Area

Impact Receptor Type	Area of Influence by Project Phase	
	Construction	**Operation**
Air quality	100 m either side of the road transport routes to reflect the generation of combustion emissions (PM, SO_2 and NOx) from Project vehicles and from dust.	N/A – there are no significant sources of emissions during operation.
	250 m either side of all construction working areas to reflect the use of mobile construction plant and vehicles and the generation of air emissions and dust.	
Noise	250 m either side of roads used for the transport of materials.	Defined as the area impacted through the generation of noise from rotating WTGs using the results of quantitative modelling (refer to Figure 11-1) (as defined by WHO noise limits).
	250 m either side of all construction working areas to reflect the generation of noise from mobile construction plant and vehicles.	
Ecology, biodiversity and ecosystem services	The physical footprint of the Project from the clearance of vegetation and civil works associated with the installation of access roads, WTGs, construction laydown working areas, cable installation, and similar activities.	The geographical area in which biodiversity may be affected including the length along the transmission line route. This includes the WTG area itself, up to 300 m from each WTG and up to 1 km from wind farm area in relation to bat roost surveys.
	Areas where land use restrictions shall be imposed during construction such as the fencing off of working areas for community H&S.	

Impact Receptor Type	Area of Influence by Project Phase	
	Construction	**Operation**
Visual & landscape services	A 500 m distance from the edges of working areas to reflect the use of artificial lights and physical presence of the workforce and machinery, until the OHLs are developed and WTGs are installed and not yet commissioned or working, upon which time the AOI will expand to the same as the operational phase.	Defined as the Zone of Theoretical Visibility (ZTV) (as shown on Figure 5-1 of the ESIA). The visual change arising from the WTGs may be most noticeable at night from the presence of white flashing lights on the nacelles and from red lights outlining the perimeter of the Project (if lighting is required).
Cultural heritage & archaeology	Archaeological monuments and features located at a minimum of 1 km from the closest WTG. Protection zones set out by the Institute of Archaeology vary however the maximum zone is 250 m from identified monuments.	Indirect impacts on archaeological monuments and features considered at a minimum of 1 km from closest WTG.
Community health, safety & wellbeing	100 m either side of road transport routes to reflect the presence of other road users, the general movement of pedestrians, and potential presence of social sensitivities such as households, schools or places of worship.	100 m either side of the road routes used during operations.
	Defined as the geographical area where workers could interact with local community residents during their employment and, potentially, result in the spread of communicable diseases, cause increase tension, disputes, etc. This should reflect the locations where workers will stay in hotel or other type of accommodation facilities.	Approx. 259 m defined as 1.5 times the highest point (top of a WTG blade as a radial area (footprint) on the ground to reflect the area that could be impacted from blade failure, ice throw[8], sudden collapse of the structure, or material fall-out arising from a fire inside a nacelle. Within this area, future land use restrictions (if not already in force from the agricultural classification of land) may be imposed to prevent the development of residential buildings.

[8] Wind Energy Production in Cold Climate (1997) states that 1.5 * (hub height + rotor diameter) is a safe buffer distance from potential ice throw from a WTG blade. https://www.ge.com/content/dam/gepower-new/global/en_US/downloads/gas-new-site/resources/reference/ger-4262-ice-shedding-ice-throw-risk-mitigation.pdf

Impact Receptor Type	Area of Influence by Project Phase	
	Construction	**Operation**
		Defined as the extent of the shadow flicker limit which is based upon quantitative modelling (Figure 12-1) which has an impact upon community wellbeing (as defined by WHO wellbeing limits).
Land use	Defined as the land that may be temporary/permanently used by the Project. This includes the area of land acquired under a lease agreement for the WTGs, construction of access roads and for installation of the OHLs. Temporary areas may include working areas for the storage of materials, etc. Permanent areas of land include land required for the access roads, WTG installations and transmission lines, etc.	Defined as the area occupied by the WTG foundations and where land-use restrictions will be enforced immediately surrounding the WTGs (if applicable), or along buried cables where the use of agricultural machinery shall not be possible, and land occupied by internal access roads. In additional, land use restrictions shall be in force either side of the OHLs.
Public infrastructure	Defined as the specific locations where modifications to public infrastructure need to be made to ensure the safe passage of the WTGs being transported along the public road network as extra-wide/heavy loads.	Same as construction in the event that WTG components require transportation to the Project site.
Employment & other expectations of the Project.	Defined as the area where nearby communities are present, and residents expect to benefit (in various ways) from the Project. This could include, for example, where preferential access to employment opportunities shall be offered, beneficiaries of a Community Development Plan and other initiatives.	Same as construction.
Procurement & the generation of energy	Defined as the geographical area within which Small Medium Enterprises (SMEs) are based at, who may be used during construction for the procurement of goods and services.	Same as construction.

2.3 Land Leases

All land in Uzbekistan is owned by the government. The farmers who have land leases within the Project area pay an annual tax to Tamdy District for access to the land. Within each land lease agreement, there is a clause which gives the government (represented by Tamdy District) the legal right to make a change to the lease. Further details are set out in Chapter 7 (Social) of this ESIA.

2.4 Main Alternatives Considered

International Best Practise, specifically IFC Performance Standard (PS) 1, ADB's safeguard policy statement and EBRD Performance Requirement (PR) 1, requires an assessment of alternatives as part of a site-specific ESIA. The section below sets out the main alternatives considered during the site selection process and demonstrates the reasoning for the decision to take forward the selected Project site.

2.4.1 Without the Project

This alternative is to maintain the status of the land as it currently stands. The 'without wind farm' alternative would maintain the status quo, which means that the current use of the site (agricultural rough grazing use) continues. From an environmental standpoint, it would also result in Uzbekistan continuing with an overreliance on fossil fuel use thereby increasing the carbon footprint, global warming and climate change.

Failing to proceed with the Project would deny the local population of potential employment opportunities associated with the Project and would compromise the achievement of Uzbekistan's strategy for a transition to a green economy during the period 2019 to 2030.

2.4.2 Site Selection

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

- Wind resource – areas with wind speed equal or greater than 5.5 m/s at 100 m above ground.
- Environmental designations.
- Water bodies – 1 km buffer applied.
- Land use.
- Settlements – 1 km buffer.
- Road access – sites suitable are within 15 km of nearest road.

- Grid connection (overhead line (OHL) / underground cabling) – sites to be within 30 km of the nearest substation.

A mesoscale modelling and site assessment study was carried out in 2014 by GOPA-International Energy Consultants GmbH. The study illustrates that a vast amount of land in Uzbekistan has potential for commercial wind farm development. The regions with the highest wind potential are in the mountain region to the north-east of Tashkent, the mountain ranges to the south and east of Samarkand, and the mountain range between the Jizzax and the Samarkand region. The regions with the second highest wind potentials can be found in the Navoi and Karakalpakstan regions.

In order to identify areas for wind farm development, minimum criteria were defined and applied within the 2014 study (as defined in the bullet points above). The study identified three possible areas for wind farm projects (Nukus, Uchquduq and Zarafshon). These sites were then examined in more detail through a site visit. The data gathered was fed into a ranking system with indicators weighted according to their significance. Key indicators included:

- Wind.
- Soil.
- Terrain.
- Temperature.
- Roads.
- Transmission Lines / Substation.
- Environment.
- Sand / Salt Content.
- GSM Signal.

The rating was performed with a point system of 5, 10, and 15 points for each indicator, where 5 being the lowest number indicates a negative impact and 15 as the highest point a positive impact. Based on the findings of this ranking process, a site at Zarafshan and at Nukus were taken forward with met masts installed. These were the highest-ranking sites, scoring 13.25 (Zarafshan) and 12.00 (Nukus). These sites were recommended due to proximity to load centres, accessible terrain, close to electrical infrastructure with no significant preliminary environmental concerns based on the initial site investigations. Furthermore, the sites were not in the immediate vicinity of mining areas, nor predicted to adversely affect or disturb mining operations.

Following this, the Zarafshan Wind Farm site was progressed by Masdar due to:

- Enhanced wind resource.
- Less complex connection to the grid with short OHLs required.
- Reduced transportation route length required.
- Site was not within a protected area.

2.4.3 Technological Alternatives

The conditions of the Project site are optimal for wind development and unfavourable for the majority of other renewable technologies. The site is not characterised by hydro or geothermal potential. Thermal power could potentially be the only technically suitable alternative, but its carbon footprint and the geographical location would make it both environmentally and economically disadvantageous.

Solar power may be used in either direct heating applications or direct conversion of radiation to electricity by the use of photo-voltaic cells. Solar PV is a relatively new market to Uzbekistan however the Uzbekistan Government has a target of 5 GW of solar capacity by 2030. The Navoi Region has an excellent wind and solar resource however given the site topography and good wind resource, wind technology in this location is considered the most viable option. Variability in elevation and surface orientation can create strong local gradients of insolation thereby reducing the viability of the site for solar PV. Furthermore, there is less land take required for WTGs with farmers / herders still able to access and utilise the land.

2.4.4 Grid Connection

A number of options were considered for connection of the Project to the national grid. These have included:

- Connection to Zarafshan substation (around 25 km from the site).
- Connection to Besapan substation (around 5 km from site).
- Connection to 220kV OHLs that run to the south of the Project site.

The selected option is one substation on the Project site with two corresponding OHLs connecting to the existing OHLs in proximity to the Project. This option is the preferable option from an environmental and social perspective with the maximum OHL length of 630 m.

2.4.5 Site Layout

The proposed layout has been selected with the aim of minimising conflicts with existing roads, residential areas and on-site constraints. The Project initially incorporated a smaller site area with 36 WTGs proposed (see Figure 2-7). Following this, additional land was granted to Masdar by the Uzbek Government to extend the Project site. This allowed for an additional 89 WTGs to be added bringing the total to 125 with a capacity of up to 525 MW (Figure 2-8).

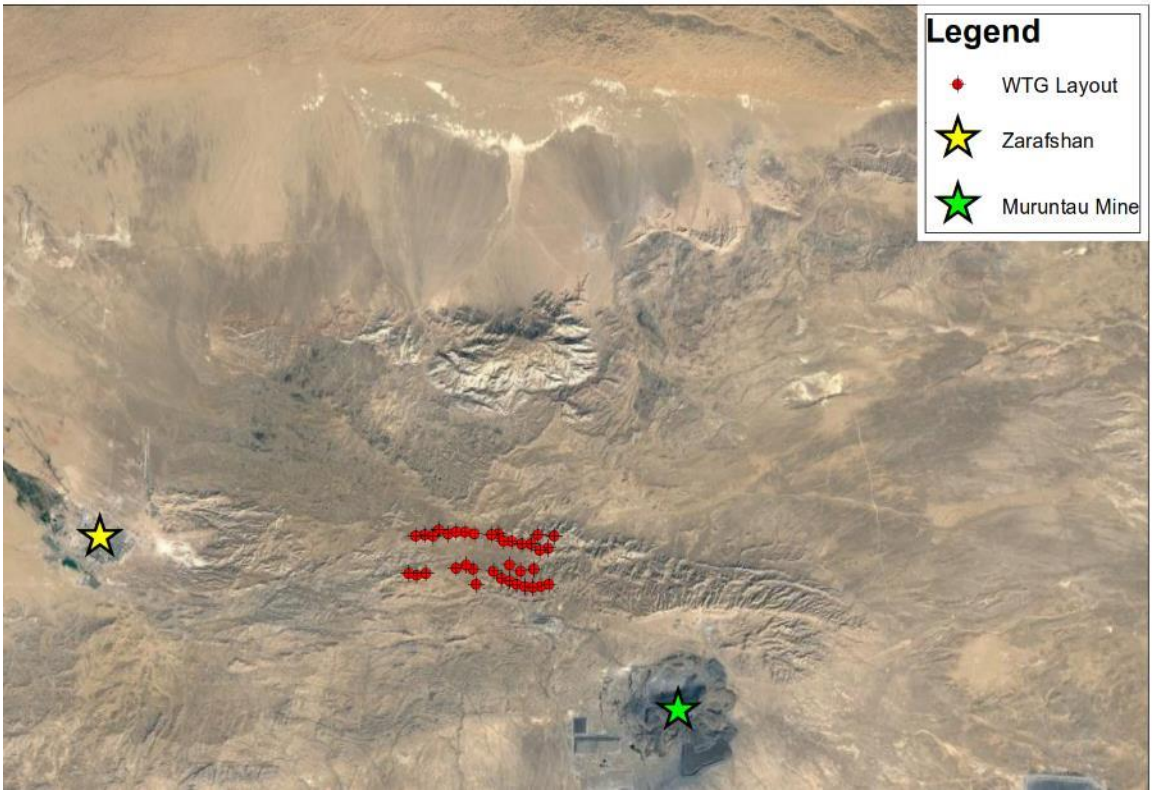


Figure 2-7: Initial 36 WTG Site Layout

Figure 2-8: 125 WTG Scoping Site Layout

A revised Scoping study was then carried out on the 125 WTG layout in early 2020.

As the Project progressed, the layout was refined through initial discussions with potential EPC contractors. An initial draft ESIA was produced in December 2020 based on the same site area with a reduced number of WTGs (92). There were no identified concerns within the stakeholder and community consultation exercises during Scoping or ESIA stage relating to the Project layout (detailed consultation feedback is detailed in Section 7.1.2 and within the SEP).

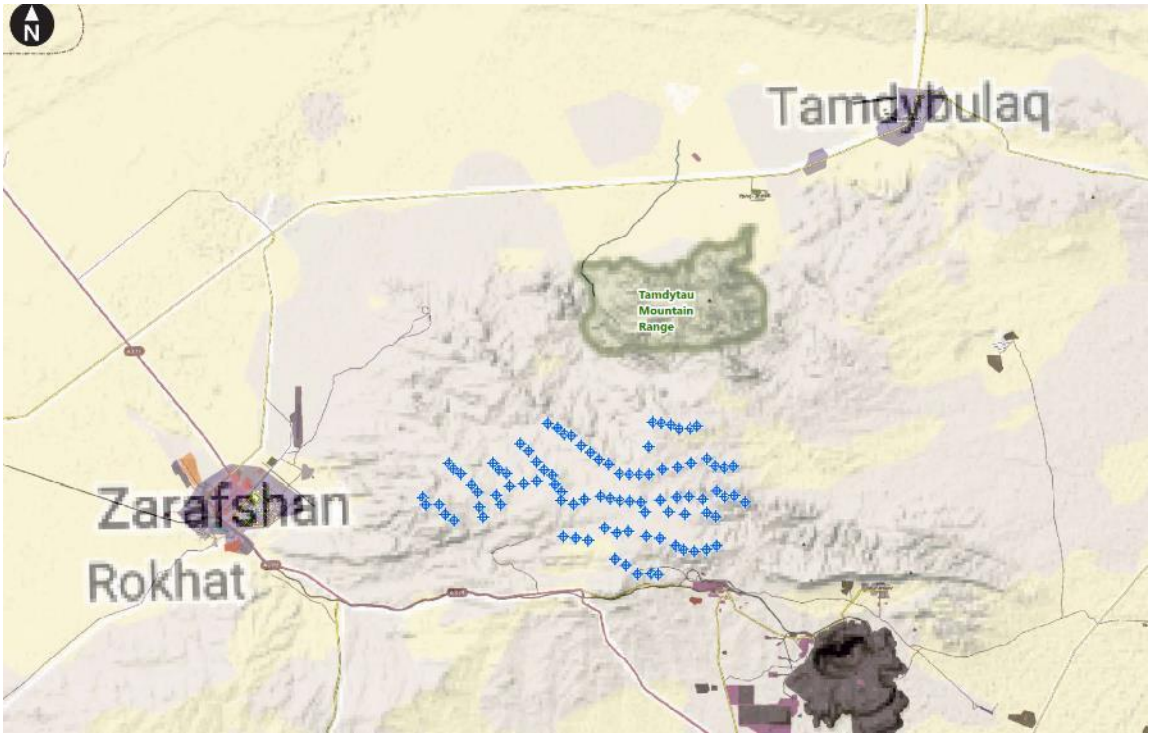


Figure 2-9: Initial ESIA 92 WTG Layout

The findings and key potential impacts of the Project resulting from the initial ESIA process, particularly with regards to ornithological aspects, were incorporated into a further analysis of layout options. This included:

- A 3 km buffer between the International Bird Area (IBA) and the nearest WTG.
- Movement of WTG 64 to south by approximately 150 m to ensure that all proposed WTG locations are located at least 500 m from areas known to be used by feeding and nesting species most at risk.

- Ensuring 3 km buffer from any Golden Eagle or Saker Falcon nest.
- Avoidance of individual farms (closest is 924 m from the nearest WTG) and tourist area (1.8 km from nearest WTG) (distances from all sensitive receptors to the nearest WTG are detailed in Chapter 12: Shadow Flicker).

The revised and final optimal Project layout consists of 111 WTGs each with an individual capacity of 4.5 MW and a 500 MW total capacity. The indicative WTG layout is shown within Volume 2, Figure 1-2.

2.5 Project Components

2.5.1 Summary of Key Components

The proposal for the construction, operation and decommissioning of the Project comprises the following elements:

- Temporary construction compound incorporating workers' accommodation.
- Control centre compound including permanent workers' accommodation for the operational phase (as required) and site office.
- One access road (around 3 km in length) from paved highway (A379) to the Project site.
- On-site access roads (approximately 80 km total length) from the control centre to the WTGs and underground cables to carry electricity from the WTGs to the sub-station.
- 111 X 4.5 MW WTGs.
- Two 220 kV OHLs (longest spanning around 630 m) connecting the substation to existing OHLs and then to the National grid.

2.6 Cumulative Considerations

Other existing and foreseeable developments and associated environmental and social drivers, which would have potential impacts on Valued Environmental and Social Components (VECs), have been identified based on field survey findings and consultation.

This Project is one of the first wind farms proposed to be constructed in Zarafshan. No other proposed wind farms have been identified within a 60 km radius of the Project as of May 2021.

There are OHL upgrade works from Navoi to Besapan underway at present. Construction of this project is due to be completed in 2025 and therefore this project has been considered in the cumulative assessment detailed within each individual assessment chapter.

Muruntau mine is located around 2 km from the nearest WTG to the south-east of the Project. The operational mine is one of the largest gold mines in the world with an estimated 71.4 million ounces of gold. This site has been considered within the individual topic cumulative assessments as appropriate.

No further projects have been identified as operational, planned or under construction at the time of writing this ESIA. The cumulative sites will be reviewed once more for the Final ESIA stage. The methodology for assessment of cumulative impacts is detailed in Chapter 4 of this document.

2.7 Construction Works

2.7.1 Wind Turbine Generators (WTGs)

The proposed Project will comprise of up to 111 WTGs, each with a capacity of up to 4.5 MW. The candidate WTG is the Goldwind 155-4500 model with a hub height of 95 m and a rotor diameter of 155 m. The WTGs will be three bladed horizontal axis machines. All WTG components will be transported to the Project site via the road network from Port Aktau in Kazakhstan.

The location coordinates for the WTGs are set out in Appendix 2 of this ESIA.

The WTGs are expected to have a design life of 20 to 25 years and the normal operating life of the Project would be expected to be 20 to 25 years.

2.7.1.1 WTG foundation

The gravity foundation is the most common foundation type for a WTG. These foundations consist of a reinforced steel cage (constructed by assembly of forming bar and reinforcing bar according to the WTG manufacturer instructions), which is then shrouded by a pouring template into which concrete is poured. The principle of gravity foundation design is to transfer the loads from the structure of the WTG to the subgrade. In addition, the foundation acts as a counterweight to the forces and moments from the WTG and the supporting structures and systems.

WTG foundations are typically in the region of 300 m^2, with a somewhat larger area disturbed during construction (2,500 m^2). Construction of the WTG foundations would involve excavating to a depth of approximately 3 m to 4 m. Around 1,200 m^3 of concrete will be required per foundation. It is assumed that a concrete batching plant will be located on the Project site during construction. The source of cement has not been established at this stage and therefore it has been assumed to be transported to the Project site via the transport route identified in Chapter 8 (Transport).

Before each WTG foundation is excavated, topsoil and subsoil will be salvaged and stored nearby. The topsoil will be stripped and stockpiled separately and protected from wind and water erosion. Following WTG foundation construction, soil will be backfilled in the same stratigraphic sequence and native plant species will be re-established, except for the adjacent road and a small parking area at the base of the tower.

2.7.1.2 WTG blades

Typical commercial-scale WTGs comprise a three-bladed rotor. Each blade is typically constructed from fiberglass reinforced epoxy resin. Lightning protection is generally incorporated into the blades, with receptors located at multiple points along the blade length. Each blade would be transported to the Project site separately and the rotor assembled on site before being lifted and attached to the nacelle using a crane, or the hub could be installed prior to the lifting and fitting of individual blades.

2.7.1.3 WTG tower

A WTG tower typically comprises a number of tubular steel or concrete sections. Each section would be transported to site separately and then assembled on site using a crane. In principle, increasing the WTG tower height will result in the WTG being exposed to higher wind speeds and will therefore result in increased energy generation. A tower under construction is shown in Figure 2-10.

Figure 2-10: Typical WTG tower

2.7.1.4 Installation process

Typically, a crane is transported to the site by truck and assembled at the first WTG location. The WTG tower section components are placed on a crane platform adjacent to the WTG foundation, then the nacelle, hub, rotors, and blades are offloaded and placed. Following installation of the WTGs, any disturbed areas outside the roadway and hardstanding areas will be reclaimed and re-vegetated with native plant species.

Volume 2, Figure 2-2 sets out a typical WTG hardstanding area.

2.7.2 Grid Connection and Substation

There will be one substation located within the Project area connecting the wind farm to existing 220 kV OHLs that run across the Project site via two short 220 kV OHLs (around 510 m and 630 m in length).

The substation will incorporate an area of around 19,000 m^2 incorporating the substation building, protection equipment, gantries etc. The whole area will be fenced to prevent unauthorised access.

All power cabling on site from and between the WTGs to the sub-station (control) building will be buried in trenches approximately 1 m wide by 1 m deep and will follow access track routing wherever possible.

2.7.3 Anemometer Masts

There are four anemometer masts installed on the Project site, all of which are 100 m in height. The masts were installed in September 2020. These are detailed within Figure 2-11 below.

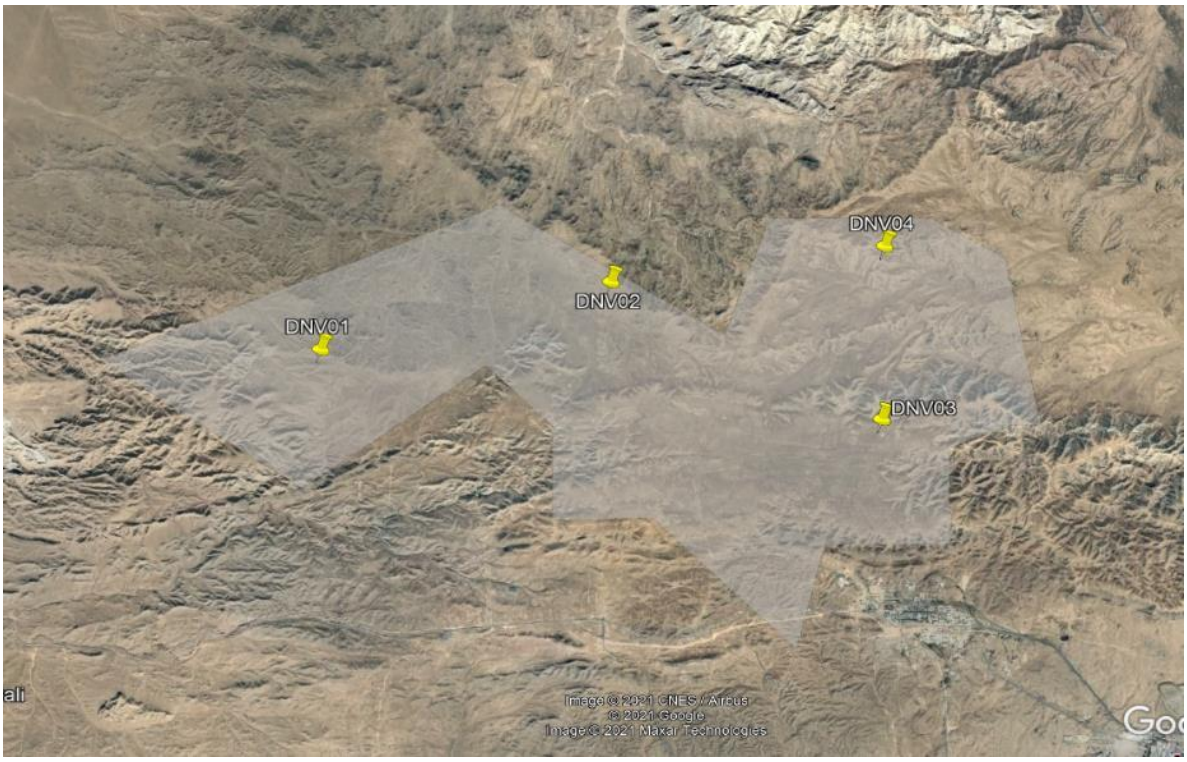


Figure 2-11: Anemometer Mast Locations

2.7.4 Borrow Pits

Borrow pits are often developed at wind farm sites when suitable material exists near the ground surface to be used as an engineering fill or road building material. The benefit is that it removes the need to purchase stone from an external quarry and reduces transport costs.

The initial information known about the ground at the Project site suggest that suitable material is likely to be found less than 1 m below ground at the shallowest points. This is considered to be appropriate but will require excavation and storage of a large amount of overburden. Further investigations are required to establish if shallower material may be suitable as a more economically viable option. The potential use of borrow pits will be confirmed on appointment of the EPC contractor with further information detailed in the Final ESIA document.

Upon completion of extraction of stone, the unused stockpiled material will be used to reinstate the borrow pit area and landscaped and finished to complement the surrounding area as best as possible.

All construction material extraction that occurs during the construction, operational and decommissioning phases will be carried out following the ESMP management plans developed by EPC contractor. The relevant management plans must be developed considering IFC EHS Guidelines for Construction Materials Extraction [9] .

2.7.5 Water Supply

All water required for construction purposes will likely be imported to the site via tankers, potentially from Zarafshan City. It not proposed at this stage that groundwater will be utilized during the construction process. The identified water supply location will be determined on selection of the EPC Contractor and included into the Final ESIA.

[9] IFC (2007) Environmental, Health, and Safety Guidelines for Construction Materials Extraction. Available online https://www.ifc.org/wps/wcm/connect/dad17995-66be-4280-86da-b438cf9fbefc/Final%2B-%2BConstruction%2BMaterials%2BExtraction.pdf?MOD=AJPERES&CVID=jkC-EN.&id=1323162191491

2.7.5.1 On-Site Personnel Water Requirements

Construction workers must have easy access to a source of clean potable water. Drinking water must meet local or World Health Organisation (WHO) drinking water standards and water quality must be monitored regularly[10]. IFC / EBRD workers' accommodation guidance states that (dependant on weather conditions and accommodation standards), 80 to 180 litres of water per person per day should be made available. The workers' drinking water supply will be provided from an external source to be confirmed prior to construction.

2.7.5.2 Wind Farm Construction Water Requirements

The main water requirement during construction would be water for concrete production. We have assumed 0.2 m^3 of water for every 1 m^3 of concrete. The water requirement will be calculated on confirmation of all foundation and substation requirements following EPC detailed design and will feed into the development of a water resource assessment / management plan. See Chapter 13 (Hydrology) for further information.

A concrete batching plant will be located on the Project site.

2.7.6 Access Roads

The external access road leading to the WTG area will be approximately 4 m to 6 m wide and around 3 km in length. There is one access point to the Project off the A739 (as shown within Volume 2, Figure 1-2). The road construction details will be fully established once the EPC Contractor has been appointed. This information will be provided in the Final ESIA.

Typical road construction specifications include excavating topsoil and subsoil, grading to desired slope and grade using cut-and-fill methods, placement and compaction of gravel where needed, excavation of a drainage ditch along uphill sides where appropriate, and placement of low berms on downhill sides where necessary. Any surplus topsoil will be stockpiled and protected from erosion, for use in future reinstatement.

10 http://documents.worldbank.org/curated/en/604561468170043490/pdf/602530WP0worke10Box358316B01PUBLIC1.pdf

All off-road areas disturbed by construction equipment will be reclaimed where appropriate by planting seeds taking account of any land users' requirements. In addition, after the road is complete, native plant species will be established in any soil-based channels that are constructed alongside the road.

Further details regarding roads construction and the final length of the access road will be set out in the Final ESIA.

2.7.7 On-Site Roads and Underground Cabling

On-site roads are required to connect the WTGs to each other and to the substation (control) building and compound. The total length of on-site roads will be approximately 80 km with some existing tracks utilised (some upgrading works will be required). It is noted that the track layout would be subject to final micro-siting of the WTGs.

The roads will be constructed with specifications similar to the access road, including roadway preparation, storm water controls, and placing gravel where needed. Roads connecting the compound to the WTGs will be approximately 5 m wide, again similar to the access road. Volume 2, Figure 2-3 illustrates a typical section of road on formation.

Cranes will be used to erect the WTGs. The cranes will need to travel from one WTG location to the next and so will require a suitably sized access road.

Underground transmission line cabling will be buried in trenches approximately 1 m wide by 1 m deep and will follow access track routing wherever possible. There will be concrete or plastic plates on top of the cables to protect them in accordance with the Uzbek standards. Excavated material will be used to backfill the trenches, with stockpiled topsoil and subsoil placed on the surface. Re-seeding will occur to restore these areas to their previous condition Grazing will be limited in the restoration areas until vegetation has established (or improved). It is likely that a phased approach to restoration will be taken so that only some areas have restricted grazing at any one time.

2.7.7.1 Water Crossings

There are no permanent watercourses on-site which would be required to be crossed by access roads. A number of dry water channels have been observed during the Scoping site visit (October 2019) and during the social mapping site visit in April 2021 which should be avoided where possible. Where tracks cross such channels, appropriately sized culverts shall be installed to maintain water flow during rainfall events.

2.7.8 Construction Compound and Work Areas

Temporary works to be used during construction will consist of a temporary construction compound and staging area located near the future control centre and sub-station. The size and location of this compound are not confirmed at present however this will be determined once the EPC contractor has been appointed.

The main compound will include:

- Client and EPC contractor offices.
- Meeting rooms.
- Accommodation area.
- Doctor's office.
- First aid room and infirmary.
- Public toilets.
- Dining area.
- Kitchen.
- Water tank and purifier.
- Septic tank.
- Hazardous materials and wastes storage area.
- Tool storage room.
- Generator.
- Car parking.

Internal roads within the compound will be 1.2 m wide with two separate access gates and fencing around the complex. Laydown areas will be provided for storing plant, equipment and supplies.

During construction, the number of workers at site will vary according to the activities that are being undertaken. Construction worker numbers are still to be determined however at a worst case; it is expected there will be up to 1,050 workers on site.

Details of worker accommodation will be incorporated into a Worker Accommodation Plan prior to construction. Given the large number of construction workers required on the Project site, there will be a strong focus on developing a robust management plan developed in strict accordance with EBRD and IFC guidance: Workers' accommodation: processes and standards (2009)[11] and all recent COVID 19 advice including:

[11] https://www.ebrd.com/downloads/about/sustainability/Workers_accomodation.pdf

- Interim Advice for IFC Clients on Supporting Workers in the Context of COVID-19 (April 2020).[12]
- Interim Advice for IFC and EBRD Clients on Migrant Workers and COVID-19 (July 2020).[13]
- ADB Interim Advisory Note: Protecting the Safety and Well-Being of Workers and Communities from COVID-19 (2020).[14]

Labor Influx Guidance Note: Managing the Risks of Adverse Impacts on Communities from Temporary Project Induced Labor Influx (2016) [15] A worker accommodation will be incorporated into the Project ESMP for use during construction and updated for the operational phase.

2.7.9 Waste Management

The development of the Project will result in the production of both municipal / general waste from the site offices and possibly hazardous wastes from the items of machinery on site. Hazardous wastes that may be produced as a result of the construction phase include engine, hydraulic and transmission oils along with oil filters and absorbents.

Given the extent of workers on-site during peak construction (up to 1,050 workers), there will be a significant amount of wastewater generated. Re-use of wastewater is not envisaged at this stage. Wastewater will be transferred to the permitted wastewater treatment plant(s) in Uzbekistan. This is also discussed in Section 2.7.10.

[12] https://www.ifc.org/wps/wcm/connect/b27193d8-b024-4830-83cf-f93e931b240a/Tip+Sheet_Interim+Advice_Supporting+Workers_COVID19_April2020.pdf?MOD=AJPERES&CVID=n9s.6RO

[13] https://www.ifc.org/wps/wcm/connect/193e0b19-d92e-4846-85e0-dbf17da093be/Tip+Sheet_Interim+Advice_Migrant+Workers_COVID19_July2020.pdf?MOD=AJPERES&CVID=ncKNfgb

[14] https://www.adb.org/sites/default/files/publication/614811/safety-well-being-workers-communities-covid-19.pdf

[15] https://thedocs.worldbank.org/en/doc/497851495202591233-0290022017/original/ManagingRiskofAdverseimpactfromprojectlaborinflux.pdf

A hazardous and non-hazardous waste management plan will be developed as a sub-plan to the ESMP for use during construction and updated for the operational phase. The plan will include that solid and sanitary wastes will be stored on the Project site in licensed designated areas prior to transportation to a suitable licensed disposal site. The waste will be disposed at a location agreed with the regional respective officer or environmental officer. The plan will analyse and confirm of the suitability of the proposed sites to accept particular waste types is required.

2.7.10 Re-use of Materials

Where possible, materials will be recycled. Recycling of rock excavated during construction will be carried out to provide fill for the WTG bases and road embankments and to produce road base aggregate.

The sanitary waste from employees will likely be stored then transported off the Project site to a suitably licensed disposal facility as described above. This will be described further in a hazardous and non-hazardous waste management plan which will form a sub-plan to the ESMP.

Packaging material may be returned to the supplier when that service is offered. Separate segregation bins shall be used for smaller items of plastic waste. Empty plastic drink bottles shall be placed into the appropriate bins and collected regularly for recycling purposes by the site personnel. Plastic wrapping of materials such as pallets of blocks or precast units will be collected, stored and recycled.

2.7.10.1 Waste oil storage

A small amount of diesel fuel will be stored in an above-ground tank, as will hydraulic oils and lubricating oils. Used oil will be stored in barrels placed in the containment area around the tanks and will be removed from the site and transported to the nearest location that accepts used oil for proper disposal or recycling.

Control measures such as secondary containment and storage tank and piping leak detection will be included in the hazardous and non-hazardous waste management plan.

2.7.10.2 Hazardous waste storage

Moderate quantities of the following types of hazardous wastes may be produced during the construction works:

- Spent solvent and lubricating oil from the workshop.
- Rags contaminated with solvent and lubricants from the workshop.
- Spillage / leakage.

- Spent batteries (from temporary traffic-management schemes).

A hazardous waste management plan will be developed prior to construction by the EPC contractor. The plan will specify that all hazardous wastes generated by the construction works are to be properly labelled, packaged, and temporarily stored at a designated chemical waste storage area within the construction site. In addition, the chemical waste handling and storage requirements shall be in accordance with Uzbek law, the IFC EHS General Guidelines on Hazardous Materials Management[16] and Good International Industry Practice (GIIP). These requirements will also be considered when determining chemical waste handling and storage requirements.

2.8 Operations

It is anticipated that technicians will visit each WTG on at least a weekly basis for routine inspection and maintenance. In addition, WTGs will require other periodic maintenance, including changes of lubricating oils. The control building will accommodate workshop / storage facilities for the operations and maintenance (O&M) contractor.

Routine road maintenance will include blading and smoothing as necessary to maintain the road surface, as well as inspecting and repairing storm water controls as necessary to ensure their proper functioning to control erosion.

Any diesel fuel required will be stored in an above ground tank, as will hydraulic oils and lubricating oils. Used oil will be stored in barrels placed in a containment area around the tanks and will be removed from the site and transported to the nearest licensed location that accepts used oil for proper disposal or recycling.

[16] IFC General EHS Guidelines, Hazardous Materials Management (2007) https://www.ifc.org/wps/wcm/connect/90231ba8-5bb3-40f4-9255-eaf723d89c32/1-5%2BHazardous%2BMaterials%2BManagement.pdf?MOD=AJPERES&CVID=ls4XLqS

2.9 Decommissioning

Following the 20-to-25-year life of the Project, repowering (replacing the WTGs with newer and likely more efficient models) or decommissioning will take place.

If repowering does not occur, the Project site will be decommissioned with the WTGs dismantled. Steel and other useful materials will be recycled where possible. One or more buildings may continue to be occupied however, where they are not required, they will be dismantled, and metals recycled. Inert materials that cannot be re-used or recycled will be taken to a suitable landfill. Any contaminated material such as oil storage tanks will be taken to a suitable disposal site. On-site roads that will no longer be used will be reclaimed and vegetated with native plant species where appropriate.

3 Legal and Institutional Framework

3.1 Introduction

The ESIA has been carried out within the framework of local, national and international environmental regulations and guidelines. This chapter outlines different policy and legislative requirements pertinent to the Project including national and regional legislation and polices as well as international conventions triggered by the Project.

3.2 Environmental Regulatory Bodies

According to regulations of the Republic of Uzbekistan, the Cabinet of Ministries, the State Committee of the Republic of Uzbekistan for Ecology and Environmental Protection (Goscomecology) and local government bodies are mandated to implement state laws on environment protection and management and the use of natural resources.

The Goscomecology is the primary environmental regulator who reports directly to the Parliament and is responsible at national, regional and local levels for the development and enforcement of the national environmental and conservation policy, overseeing environmental compliance, the integrated environmental management across various sectors, and securing healthy environment conditions across the country. The Goscomecology mandate is set forth in the Regulation on the State Committee for Nature Protection of the Republic of Uzbekistan enacted by the Parliament in 1996.

The main departments of Goscomecology and their responsibilities are: Department for Control over the Protection and Use of Land and Water Resources, Department for Air Protection and Department for Nature Use Economics and Management have inspectorate responsibilities.

At the central level, there are also a number of specialized units and institutes that are responsible for prevention, monitoring and detection and for taking action to correct non-compliance with environmental requirements:

- State Specialized Inspectorate for Analytical Control.
- Department for Air Protection.
- Department for Control over the Protection and Use of Land and Water Resources.
- State Inspectorate for the Protection and Rational Use of Flora and Fauna and Nature Reserves.

The most recent unit is the Eco-Energy Science and Implementation Centre, which was established in 2005 to carry out both research and projects on renewable energy.

Other ministries and agencies also have responsibilities regarding environment protection and control such as: facilitation in setting up and maintaining a robust system of state environmental control, development and implementation of environmental programs, strategies, and action plans to address conservation and sustainability issues.

The main other institutions dealing with environment related issues are:

- Parliament of Uzbekistan - Oily Majlis (National Level).
- Cabinet of Ministers (National Level).
- Local governments (Local level).
- Ministry of Agriculture and Water Resources.
- State Committee for Land Resources, Surveys, Cartography and the State Cadaster.
- State Committee for Geology and Mineral Resources.
- Centre of Hydro-meteorological Service (Uzhydromet).
- Ministry of Health.
- State Inspectorate for Exploration Supervision, Operations Safety Supervision of Industry, Mining and Utilities Sector.
- Ministry of Internal Affairs.

3.3 National EIA Main Legal Basis

Uzbekistan is an independent democratic republic based on the 1992 Constitution (as amended on 28 December 1993; 24 April 2003; 11 April 2007; and 18 April 2011). The Uzbekistan national environmental policy is based on the provisions of the country's Constitution. Particularly, the following articles address environment conservation and protection within the Constitution:

- Article 50: All citizens shall protect the environment.
- Article 54: Any property shall not inflict harm to the environment.
- Article 55: Land, subsoil, flora and fauna and other natural resources are protected by the state and considered to be resources of national wealth subject to sustainable use.
- Article 100: As one of their duties, local authorities shall protect the environment.

The EIA procedure is regulated by:

- Law on Environmental Expertise (2000).
- Regulation on State Environmental Expertise (SEE) approved by Decree No. 491 of the Cabinet of Ministers on 31 December 2001 and amended in 2005 and 2009.

3.3.1 Manual on Assessment of Environmental Impacts

This is a guidance document issued in 2002 in order to support project developers in their efforts in conducting the environmental impacts assessments and getting the required permissions before launching the implementation of the projects.

3.3.2 National EIA Requirements

The Uzbekistan EIA requirements include the development of an EIA process (known as OVOS) in a staged approach. From September 2020, this has included a requirement for public hearings to be conducted following the Resolution №541 of the Cabinet of Ministers on further improvement of the environmental impact assessment mechanism (07 September 2020).

In the case of this Project, the following process is being followed:

1. Summary ZVOS submission in letter form to the local Goscomecology (Tamdy District for this Project). Communications (in the case of this Project) have taken place with the Tamdy Khokimiyat for organisation of public hearings (20-day notice period prior to any hearings). Public hearing process lasts for one month.
2. Development of PZVOS (draft Concept Statement for Environmental Impact) for electronic submission to Tamdy District Goscomecology (for this Project). Public hearings are now required prior to submission of the PZVOS to inform people about the project. A conclusion of the PZVOS is received four weeks following submission. The advice received will determine if a ZVOS is required.
3. ZVOS development (Concept Statement for Environmental Impact) to include any additional information / research as requested by the specialist appointed by Goscomecology for the Project.
4. ZEP – Developed during the construction phase of the Project. This is the Statement on Environmental Consequences which represents the final stage to be conducted prior to Project commissioning. The report details modifications to the project design that have been made since the Goscomecology specialist review of the PZVOS and (as applicable) ZVOS stage of the OVOS process, comments received through public consultation, environmental norms applicable to the project and environmental monitoring requirements.

3.4 Legislation Applicable to the Project

Table 3-1 provides a summary of key environmental and social legislation applicable to the Project including the main laws relating to the energy sector in Uzbekistan.

Laws in Uzbekistan, including environmental, are often relatively short, with many reference rules that envisage that respective issues are to be addressed through subsidiary legislation. Decrees and resolutions of the President and resolutions of the Cabinet of Ministers are acts of subsidiary legislation that are extremely important in the context of Uzbekistan. They are adopted and amended much more dynamically than laws and often include not only the legal rules but also key policy directions and major institutional changes[17].

The legislation of Uzbekistan prioritises a number of international agreements above the national legislation. For example, Article 53 of Law of Uzbekistan "On nature protection" requires that "in cases, when international agreement, concluded by Uzbekistan, states rules other than that contained in the present Law or other legislative act of Uzbekistan on nature protection, the rules of international agreement are applied, excluding cases when legislation of Uzbekistan established more strict requirements".

Table 3-1: Key Laws applicable to and regulating the Project[18]

Law Title	Year	Description
Key environmental legislation		
Law on Environmental Expertise	2000	Details the mandatory process required for an expert assessment of impacts on the environment and human health, as well as the legal basis.
Law on Nature Protection	1992 (amended 2017).	Law created legal, economic, and organizational bases for conservation of the environment and rational use of natural resources. It aims at ensuring a balanced harmonic development of relations between the human and the nature, protection of ecosystems, natural complexes and separate objects, to guarantee rights of citizens to enjoy a favourable environment. It also sets normative, economic and organizational basis for environmental protection ensuring sustainable development and determining principles, including conducting environmental impact assessments. The law fixed power of government authorities in sphere of regulation of legal relationships on nature protection.

[17] https://unece.org/DAM/env/epr/epr_studies/ECE.CEP.188/ECE.CEP.188.ENG.02.Part_I.ENG.pdf

[18] Sources of information:
- https://www.jdsupra.com/legalnews/uzbekistan-enacts-law-on-environmental-5089779
- FAOLEX database: http://www.fao.org/faolex/country-profiles/general-profile/en/?iso3=UZB

Law Title	Year	Description
Law on Environmental Control	2013	Provides an overarching legal framework regulating various types and forms of control in the area of environment. It covers state environmental control, internal control (when the legality of inspections, permits or SEE conclusions is being checked by a higher governmental body), self-monitoring and public environmental control.
Law on Environmental Audit	2021	This law was adopted in March 2021 and comes into force in March 2022. The law sets out the main features and requirements of environmental audit. The Law also defines the rights and obligations of an environmental audit organization, auditor, customer and the subject of environmental audit, the responsibility of an audit organization, and the restrictions on carrying out environmental audits.
Law on Environmental Review	2000	This law specifies the purposes, objectives, and types of environmental expertise. The law defines the qualifications, duties, and obligations of environmental experts. The SNPC has overall responsibility for implementing this legislation through The Departments of Environmental Expertise (Glavgosekoexpertiza and Gosexpertisa which are both under the SNPC) and the Provincial branches of SNPC.
Cabinet's Regulation No. 491/2001	2001	Cabinet of Ministers' Decree No. 491, from December 2001, confirms regulation of governmental environmental expertise in the Republic of Uzbekistan.
Law on Protection and Use of Flora	1997 (updated 2016)	This law regulates the protection and the use of flora growing in natural condition, as well as in cultivation and its reproduction and conservation of gene pool of wild plants. SNCP and Head Department of Forestry under Ministry for Agricultural and Water Resources Management are the special authorized agencies in flora protection and its use.
Law on Protection and Use of Animals	1997	This law states the legal basis for regulating relations in the protection, use, restoration and reproduction of fauna in order to ensure the conditions of its existence, preservation of species diversity, the integrity of natural communities and habitat. The law specifically regulates relations in the field of protection and usage of the wild animals living in conditions of natural freedom on land, in water, atmosphere and in soil, which are permanently or temporarily present on the territory of Uzbekistan, as well as contained in semi-free conditions or artificially established habitats for scientific or nature protection purposes.

Law Title	Year	Description
		The selection of development projects sites; projects planning, design and project implementation that will eventually impact wildlife or its habitat, is subject to the state environmental assessment.
Law on Wastes	2002	This law prevents negative effects of solid wastes on populations' lives and public health as well as on the environment, reduces wastes generations and encourages rational use of waste reduction techniques. The law regulates the procedures for treating solid wastes and defines the authorities involved in solid wastes management. The law also stipulates the rules for transporting solid wastes and provides market base incentives for efficient treatment of solid wastes.
Law on Water and its Use	1993	Law to regulate water relations, the rational water use for the needs of the population and the national economy, and the protection of water from pollution and exhaustion. The prevention and abatement of the harmful effects of water, the improvement of the conditions of water objects, and the protection of the rights of enterprises, institutions, organizations, farms and individuals in the sphere of water relations.
Law on Atmosphere Protection	1996	This law sets the rules on atmosphere protection, standards, quality and deleterious effect norms, requirements on fuels and lubricants, production and operation of vehicles and other transport means and equipment, ozone layer protection requirements, obligations of enterprises, institutions and organizations toward atmospheric protection, and compensations for damages from atmospheric pollutions.
Land code	1998 (amended 2020)	This law sets the rules for land legislation. It sets out the regulation of land for the purpose of providing for the benefit of the present and future generations, evidence-based, rational use and protection of lands, reproduction and increase in fertility of soils, preserving and improvements of the environment, creation of conditions for equal development of all forms of managing, protection of the rights of legal entities and physical persons to the parcels of land, and also strengthening of legality in this sphere, including by the prevention of corruption offenses.

Law Title	Year	Description
Aviation Legislation		
Air Code for the Republic of Uzbekistan		Article 18 of the Air Code of the Republic of Uzbekistan details procedures to obtain permission to carry out activities that may pose a threat to flight safety. Chapter III sets out a list of necessary documents to obtain from the Developer for constructing an object located near civil aviation aerodromes.
Aviation Regulations (АП РУЗ-150) Registered under No. 73 of 31.07.2006	2006	This document regulates the marking and equipment of facilities located near civil aviation airfields. According to AP RUz-150, stationary objects with a height of 50 m or more, regardless of their location, must be marked (Chapter IV, clause d, clause 11). Chapter V, clauses 12- to 23 states that "White lights operating in flashing mode can be used to illuminate freestanding obstacles located outside the airfield zones that do not have extraneous lights around them. The flash strength of the obstruction light must be at least 10 candelas (cd) and the flash rate must be at least 60 per minute." Other requirements for equipping objects with light-shielding lights will be provided when the CAA specialists study the coordinates of the objects (in the WGS-84 system) and their technical characteristics. After receiving the data in the required format, specialists will hold meetings with the Developer or their representative to determine additional requirements or change the conditions of requirements, depending on the initial data.
Social legislation		
Constitution of the Republic of Uzbekistan	2017	Article 105 recognises makhallas as self-governing bodies. Their chairman and advisors are elected by communities for a term of 2.5 years and are an important channel for decision making within local communities.
The Labour Code of the Republic of Uzbekistan	1996 (amended 2010)	Of relevance is: Chapter VI – Employment contract. Article 7 – prohibits forced labour. Article 77 – permitted age of employment (Age 16). Articles 211 & 212 – establish requirements on labour protection and duties of the employee to comply with the norms, rules and regulations on labour protection.

Law Title	Year	Description
		Article 213 – establishes the rights of the worker to information on occupational health and safety. Article 239 – states all persons under 18 years old will be employed only after a preliminary medical examination is carried out and subject to annual examinations until age 18.
Cultural Heritage and Archaeological Legislation		
Constitution of the Republic of Uzbekistan	2017	States that it is the duty of every citizen to protect the historical, spiritual and cultural heritage of the people of Uzbekistan. Furthermore, cultural monuments are to be protected by the state.
Criminal Code of the Republic of Uzbekistan	1994 (amended 2002)	Article 132 – fines for intentional destruction or damage of objects of tangible cultural heritage under state protection causing significant or major damage.
Code of the Republic of Uzbekistan on Administrative Responsibility	1994 (amended 2021)	Article 64 – states fines will be imposed for violation of rules for protection and use of objects of tangible cultural heritage.
Law on the protection and use of Cultural Heritage Sites	2001	Regulates the use and protection of cultural heritage objects which are national property of the people of Uzbekistan. Protects ensembles, sites, monuments, objects of tangible and intangible cultural heritage.
Law on Protection and Use of Objects of Archaeological Heritage	2009	Regulates the protection and use of the objects of archaeological heritage. The state has exclusive right of ownership of the objects of archaeological heritage. Objects of archaeological heritage are subject to compulsory state registration. The Ministry of Culture issues field investigation permits and approves the scientific report for each permit issued.
Energy Laws		
Law on Electricity	2009	Details regulations relating to the field of electricity.
Law on Efficient Use of Power Energy	1997	Forms a general legal framework to ensure the conservation of national energy resources, efficient use of energy and production potential.
Regulations on Provision of Energy Services	2017	Determines the rules for the provision of services related to ensuring energy efficiency by the state-owned monopolist the National Energy Saving Company under energy services contracts that have to be entered into by state agencies and state-owned enterprises.

Law Title	Year	Description
Rules for Using Power Energy	2018	Sets rules regulating relations between utility providers and purchaser of power energy.
Presidential Degrees and Strategies		
Presidential Decree No. UP-6024 validating the Concept for the development of water sector of the Republic of Uzbekistan for the period of 2020-2030	2019	The Concept envisages measures for: (a) preservation and quality assurance of environmental objects (atmospheric air, water, land, soil, subsoil, biodiversity, protected natural areas) from anthropogenic impact and other negative impact; (b) priority use of materials, products, production sites and other facilities that pose the least environmental hazard; (c) expansion of protected natural areas; (d) ensuring the environmentally sound use of toxic chemical and radioactive substances; € improving the environmentally safe waste management; and (f) formation of the ecological culture of the population, increasing the level of transparency of the activities of state bodies in the field of protection of the environment and strengthening the role of civil society.
Presidential Decree No. UP-5863 validating the Concept of environmental protection in the Republic of Uzbekistan until 2030.	2019	The Concept envisages measures for: (a) preservation and quality assurance of environmental objects (atmospheric air, water, land, soil, subsoil, biodiversity, protected natural areas) from anthropogenic impact and other negative impact; (b) priority use of materials, products, production sites and other facilities that pose the least environmental hazard; (c) expansion of protected natural areas; (d) ensuring the environmentally sound use of toxic chemical and radioactive substance€(e) improving the environmentally safe waste management; and (f) formation of the ecological culture of the population, increasing the level of transparency of the activities of state bodies in the field of protection of the environment and strengthening the role of civil society.
Strategy for biodiversity conservation in the Republic of Uzbekistan for the period of 2019-2028	2019	The strategy is aimed at identifying priority areas, goals and objectives, planning, ways to achieve them effectively, as well as stages of implementation of the state policy in the field of formation and development of a sustainable system in the field of biodiversity conservation and use for the long-term period.
Presidential Decree no. PP-4068 Concerning measures on preservation of objects of cultural and archaeological heritage	2018	Includes a 'Road Map' to radically improve the protection, conservation, scientific research, propaganda and rational use of tangible cultural heritage objects for 2019-2021.

Law Title	Year	Description
Presidential Decree No. R-5181 "On improving the protection and use of objects of tangible cultural and archaeological heritage	2018	Requires the creation of a national digital inventory, used as the basis for developing comprehensive measures to radically improve the protection, conservation, scientific study, promotion and use of objects of tangible cultural and archaeological heritage in 2018-2023.
Presidential Decree providing for unbound Privatization and attraction of foreign investment.	2019	Proposes the cessation of JSC Uzbekenergo, replaced with three joint-stock companies.
Decree No. 6012 of the President of Uzbekistan on Approval of the National strategy of Uzbekistan on Human Rights	2020	For the purpose of further enhancement of the mechanism of protection of human rights and freedoms within Uzbekistan.

3.5 Renewable Energy Legislation

The existing Uzbekistan legal and regulatory framework for energy considers specific provisions for the use of renewable energy. Uzbekistan has been implementing large-scale reforms in recent years to strengthen the energy industry with further emphasis on renewable energy sources.

JSC Uzbekenergo is a central state-owned holding company responsibly for power generation, transmission, distribution and dispatch management. JSC Uzbekenergo is proposed to be restructured under the Presidential Decree providing for unbundling, privatisation and attraction of foreign investment (2019). The majority of relevant powers is now with the Ministry of Energy established in February 2019.

The Ministry of Energy functions include the regulation and function of renewable energy industries (amongst others) and the monitoring of the energy consumption efficiency and implementation of projects under production share agreements.

3.5.1 Law on Renewable Energy Sources

The Renewable Energy Sources Law came into force on 22 May 2019. The purpose of the Renewable Energy Law is to help diversify Uzbekistan's economy and to lessen its reliance on fossil fuel-based energy by developing and regulating a renewable energy sector. The Law focuses both on the use of renewable sources of energy and on the production of equipment used in the renewable energy sector. Under the Law, the term "Renewables" includes naturally replenished energy sources, such as sunlight, wind, geothermal heat, natural water waves and biomass.

3.5.2 Presidential Decrees and Strategies

3.5.2.1 Green Energy Strategy

The 2019 Strategy includes for the transition of the Republic of Uzbekistan to a Green economy in the period of 2019-2030. The main objectives include:

- Improving energy efficiency of the economy and rational consumption of natural resources through technological modernization and development of financial mechanisms.
- Inclusion in priority areas of public investment and spending of green criteria based on international best practices.
- Assistance in the implementation of pilot projects in the areas of transition to Green economy through the development of mechanisms of state incentives, public-private partnership and cooperation with international financial institutions.
- Development of a system of training and retraining of personnel related to labour market in green economy.
- Taking measures to mitigate the negative impact of environmental disaster in the Aral Sea region.
- Strengthening international cooperation in the field of green economy, also through the conclusion of bilateral and multilateral agreement.

Target indicators for the implementation of the Strategy are identified as:

- Reduction of specific greenhouse gas emissions per unit of gross domestic product by 10% from the 2010 level.
- Doubling energy efficiency indicator and reducing carbon intensity of gross domestic product.

- Further development of renewable energy sources with their share up to more than 25% of the total electricity generation.
- Providing access to modern, affordable and reliable power supply to 100% of the population and sectors of the economy.[19]

Further details of the Strategy can be found within Chapter 16 (Climate Change) of this ESIA.

3.5.2.2 Presidential Decree on measures to further promote the development of renewable energy sources

The presidential degree (2013) aims at promoting the exploitation of renewable energy resources and further deploying renewable energy technologies, with the overall aim of founding the basis of a sound absorptive capacity for renewable energy technologies, and technical expertise related to renewable energy.

3.5.2.3 Governmental Decree No. 841 on measures for the implementation of goals and tasks in the field of sustainable development for the period until 2030

The decree enacted in 2018 includes for national goals and objectives for sustainable development for the period up to 2030 which are as follows:

- Countrywide reduction in low-income population.
- Strengthening food security, improving rational nutrition and assistance to sustainable agricultural development.
- Ensuring a healthy way of life and assistance to wellbeing for everyone in any age.
- Ensuring gender equality, empowerment and opportunities for all women.
- Conservation and rational use of water resources in the interests of sustainable development, ensuring availability for everyone.
- Ensuring access to low cost, reliable and modern energy sources for all.
- Promotion of sustainable and inclusive economic growth based on raising productive employment and decent work for men and women.
- Reduction of inequalities in all its manifestations inside the country.
- Ensuring openness, security, resilience and ecological sustainability of cities and populated areas.
- Taking urgent action to fight against climate change and its consequences.

[19] http://www.fao.org/faolex/results/details/en/c/LEX-FAOC197240

- Protection and recovery of terrestrial ecosystems and promoting their rational use, rational forest management, combating desertification, stopping and turning back land degradation.

3.6 International and Regional Ratified Conventions

The following table reports the list of the main international and regional conventions which Uzbekistan has ratified over years. Many of the international ones are incorporated into the Equator Principles, International Finance Corporation (IFC) Performance Standards, the European Bank for Reconstruction and Development (EBRD) Performance Requirements (PRs) and associated guidance.

From 2019 to 2021, Uzbekistan plans to consider accession to a number of treaties, including the Minamata Convention on Mercury, the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade and several United Nations Economic Commission for Europe (UNECE) multilateral environmental agreements, in particular: the Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters; the Convention on Long-range Transboundary Air Pollution (Air Convention); the Convention on the Transboundary Effects of Industrial Accidents; and the Espoo Convention on Environmental Impact Assessment in a Transboundary Context.[20]

Table 3-2: Uzbekistan International and Regional Conventions

International and Regional Convention	Year of Ratification
International Labour Organization (Fundamental)[21]	
C029 - Forced Labour Convention, 1930	1992
C087 - Freedom of Association and Protection of the Right to Organise Convention, 1948	2016
C098 - Right to Organise and Collective Bargaining Convention, 1949	1992

[20] UNECE (November 2019) https://unece.org/environment/news/uzbekistan-names-priorities-international-support-implement-recommendations-its (accessed April 2021).

[21] International Labour Organisation (ILO): Ratifications for Uzbekistan. Webiste: https://www.ilo.org/dyn/normlex/en/f?p=1000:11200:0::NO:11200:P11200_COUNTRY_ID:103538

International and Regional Convention	Year of Ratification
C100 - Equal Remuneration Convention, 1951	1992
C105 - Abolition of Forced Labour Convention, 1957	1997
C111 - Discrimination (Employment and Occupation) Convention, 1958	1992
C138 - Minimum Age Convention, 1973 *Minimum age specified: 16 years*	2009
C182 - Worst Forms of Child Labour Convention, 1999	1992
Pollution Prevention	
Stockholm Convention on Persistent Organic Pollutants	2019
Kyoto Protocol, 1997	1999
UN Convention on the Protection of the Ozone Layer (Vienna Convention)	1993
Montreal Protocol on Substances that Deplete the Ozone Layer, 1987	1993
United Nations Framework Convention on Climate Change, 1992	1993
UN Convention on Control of Transboundary Movements of Hazardous Wastes and their Disposals	1996
International Carriage of Dangerous Goods by Road*	2020
Biodiversity Protection	
UNESCO Convention on Wetlands of International Importance especially as Waterfowl Habitat / RAMSAR Convention	2001
UN Convention on Biological Diversity, 1992	1995
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	1997
Convention on the Conservation of Migratory Species of Wild Fauna and Flora.	1997
Agreement on The Conservation of African-Eurasian Migratory Waterbirds	2004
Water Resources	
Agreement on The Use of Water and Energy Resources of The Syr Darya Basin	1999

International and Regional Convention	Year of Ratification
Agreement between the Government of Kazakhstan, the Government of Kyrgyzstan and the Government of Uzbekistan on management of water resources in Central Asia	1996
Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa	1996
Statute of the Interstate Commission for Water Coordination of Central Asia	1992
Convention on The Protection and Use of Transboundary Watercourses and International Lakes	2007
Agreement on Cooperation in The Field of Joint Water Resources Management and Conservation of Interstate Sources	1992
Cultural Heritage	
Convention for the Safeguarding of the Intangible Cultural Heritage. Paris 2003	2008
Convention concerning the Protection of the World Cultural and Natural Heritage. Paris, 16 November 1972.	1993
Human Rights	
UN Convention on the Elimination of All Forms of Discrimination against Women	1995
UN International Covenant on Economic, Social and Cultural Rights	1995
UN Convention on the Rights of the Child / Protocol Faculty in connection with the participation of children in armed conflicts	2008
UN Convention on the Elimination of All Forms of Racial Discrimination	1995
UN Convention on the Rights of Persons with Disabilities	2009
UN International Covenant on Civil and Political Rights	1995
*UNECE agreement; Uzbekistan became a member of the UNECE in 1993. The major aim of the UNECE is to promote pan-European integration through the establishment of norms, standards and conventions.	

3.7 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 and policies will be followed and applied to the Project development and implementation:

- Equator Principles version 4 (2020).
- International Finance Corporation (IFC) General Performance Standards (PS) (2012).
- European Bank for Reconstruction and Development (EBRD) Performance Requirements (PR) (2019).
- European Bank for Reconstruction and Development (EBRD)/IFC Workers' Accommodation Processes and Standards (2009)
- Asian Development Bank (ADB) Safeguard Policy Statement (2009).
- Asian Development Bank (ADB) Protection Strategy (2018).
- Asian Development Bank (ADB) Access to Information Policy (2018).
- Asian Development Bank (ADB) Gender and Development Policy (1998).
- Environmental, Health & Safety (EHS) 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 Wind Energy (IFC, 2015).
- EHS Guidelines for Electric Power Transmission and Distribution (IFC, 2007b).
- EHS Guidelines on Construction Materials Extraction (IFC, 2007)

European Union Environmental Impact Assessment Directive 85/337/EEC (as amended).These are all specific policies, procedures and strategies 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 later sections of this report are based on these requirements.

Of particular relevance is Principle 1 of the Rio Declaration of Environment and Development (United Nations, 1992c) states that "Human beings are entitled to a healthy and productive life in harmony with nature". Principle 18 requires that an impact assessment be undertaken.

3.7.1 International Standards

3.7.1.1 Equator Principles

The EPs apply to all new project financings with total capital costs of USD10 million or more across all industry sectors globally. On 18 November 2019, the Equator Principles Association published version four of the Equator Principles (EP4). The changes, which came into effect on 01 July 2020 are to be implemented on any new Projects signed on/after 01 October 2020, include substantive new requirements in relation to human rights, climate change and impacts on Indigenous Peoples.

The EPs represent a framework for project financing, which is underpinned by the IFC PSs. The extent to which the EPs has generally be applied to a project depends on whether the country in which the project is located is "Designated" or "Non-Designated". While EP4 retains the concept of 'Designated Countries' and requires projects in those countries to be evaluated for compliance against host country laws, it no longer assumes that those laws will necessarily meet relevant requirements in relation to environmental and social assessments, management systems and plans, stakeholder engagement or grievance mechanisms. EP4 retains the language of its predecessor, making clear that host country laws represent the minimum standard, and require lenders to evaluate specific risks of the Project to determine whether the IFC PSs could be used as guidance to address those risks, in addition to host country laws.

3.7.1.2 IFC Performance Standards

Projects within Non-Designated countries such as Uzbekistan are required to follow the standards and guidelines as set out in the IFC PSs and Environmental Health and Safety Guidelines. The IFC PS are detailed below:

- IFC PS1 – Assessment and management of environmental and social risks and impacts.
- IFC PS2 – Labour and working conditions.
- IFC PS3 – Resource efficiency and pollution prevention.
- IFC PS4 – Community health, safety, and security.
- IFC PS5 – Land acquisition and involuntary resettlement.

- IFC PS6 – Biodiversity conservation and sustainable management of Living natural resources.
- IFC PS7 – Indigenous peoples.
- IFC PS8 – Cultural heritage.

PS 1 establishes the importance of assessment to identify the environmental and social impacts associated with development, effective community engagement and project information disclosure and consultation with local Project affected communities and environmental and social management measures. This ESIA has therefore been carried out to meet the requirements of IFC PS1.

The remaining IFC PSs set out objectives and requirements to avoid and minimize potential environmental and social adverse effects on the environment and to offset/compensate any residual effects. PS 2 to 8 have therefore been considered as part of the assessment process and discussed where relevant within the topic specific sections of the ESIA.

3.7.1.3 EBRD Performance Requirements

EBRD-financed projects are expected to be designed and operated in compliance with good international practices relating to sustainable development. As a signatory to the EPs, EBRD is committed to ensuring that projects meet EU environmental principles, practises and substantive standards where these can be applied at project level, regardless of the geographic location[22]. To assist projects with achieving this, EBRD have defined 10 performance requirements covering the key areas of environmental and social issues and impacts. These include:

- EBRD PR1 – Assessment and management of environmental and social risks and impacts.
- EBRD PR2 – Labour and working conditions.
- EBRD PR3 – Resource efficiency and pollution prevention and control.
- EBRD PR4 – Health, safety and security.
- EBRD PR5 – Land acquisition, restrictions on land use and involuntary resettlement.

[22] EBRD, Environmental and Social Policy (2019), https://www.ebrd.com/news/publications/policies/environmental-and-social-policy-esp.html

- EBRD PR6 – Biodiversity conservation and sustainable management of living natural resources.
- EBRD PR7 – Indigenous peoples.
- EBRD PR8 – Cultural heritage.
- EBRD PR9 – Financial intermediaries.
- EBRD PR10 – Information disclosure and stakeholder engagement.

3.7.1.4 ADB Safeguard Policy Statement

ADB's Safeguard Policy Statement (SPS) (2009) builds on three previous safeguard policies on the environment, involuntary resettlement and indigenous peoples, brining them into one policy to more comprehensively address environmental and social impacts and risks.

The SPS aims to promote sustainability of project outcomes by protecting the environment and people from projects' potential adverse impacts by avoiding adverse impacts of projects on the environment and affected people, where possible; minimizing, mitigating, and/or compensating for adverse project impacts on the environment and affected people when avoidance is not possible; and helping borrowers/clients to strengthen their safeguard systems and develop the capacity to manage environmental and social risks[23].

[23] https://www.adb.org/documents/safeguard-policy-statement (2009)

4 Assessment Methodology

4.1 Assessment of Impacts

Several criteria were used to determine whether or not a potential impact of the Project could be considered 'significant'. These are outlined with reference to specific environmental and social issues in the subsequent topic chapters of this ESIA. Wherever possible, a quantitative assessment of the impacts was undertaken. Where this was not possible, a qualitative assessment of impacts was carried out, based on existing information available for the site and the surrounding study area, and experience with other wind farm developments.

The ESIA covers the direct impacts and any indirect, secondary, cumulative, short-, medium- and long-term, permanent and temporary, reversible and irreversible, beneficial and adverse impacts of the Project.

Where relevant, the anticipated impact was compared against appropriate legal requirements and standards. Where no such standards exist, assessment methods involving interpretation and the application of professional judgement were employed. The assessment of significance in all cases took into account the impact's deviation from the established baseline conditions and the sensitivity of the environment.

4.2 Methodology for Assessing Environmental Impacts

A general method for grading of the significance of environmental impacts was adopted to ensure consistency in the terminology of significance, whether for a beneficial or an adverse impact. The two principal criteria determining significance are the sensitivity of the receptor and the magnitude of the change arising from the Project, as shown in Table 4-1. A number of best practise sources of guidance were used to inform the assessment process.[24,25,26,27]

[24] Carroll and Turpin (2009) Environmental Impact Assessment Handbook: A Practical Guide for Developers and Communities 2nd Edition.

[25] IEMA (2004) Guidelines for Environmental Impact Assessment

[26] European Union (2017) https://ec.europa.eu/environment/eia/pdf/EIA_guidance_EIA_report_final.pdf

[27] Scottish Natural Heritage (2018) https://www.nature.scot/handbook-environmental-impact-assessment-guidance-competent-authorities-consultees-and-others

Table 4-1: Determination of Environmental Impact Significance

Magnitude of Change	Sensitivity of Receptor		
	High (e.g. international or national protection)	**Medium** (e.g. regional or local protection)	**Low** (e.g. no protection)
High (e.g. >75% of area or receptor affected)	Major (H, H)	Major (H, M)	Moderate (H, L)
Medium (e.g. 25-75% of area or receptor affected)	Major (M, H)	Moderate (M, M)	Minor (M, M)
Low (e.g. 5 to 25% of area or receptor affected)	Moderate (L, H)	Minor (L, M)	Negligible (L, L)
Very Low (e.g. >0, but <5% of area or receptor affected)	Minor (VL, H)	Negligible (VL, M)	Negligible (VL, L)
No Change	None (NC, H)	None (NC, M)	None (NC, L)

Table 4-1 shows that the significance of impacts was classed as major, moderate, minor, negligible or none; and either positive (beneficial) or negative (adverse). This categorization is widely recognised and accepted in the field of EIA. Where appropriate, topic-specific assessment methods and criteria for determining significance are utilised. Potentially significant effects can then be identified for further analysis. Effects are 'significant' where the assessment indicates a moderate effect or higher. Any alternative approaches are described in Chapters 5 to 16.

Another consideration was the duration of the impact, whether the impact would be temporary or permanent, and if they were temporary whether they would be short-, medium-, or-long term. Defining the duration of the impact can be subjective, depending on the receptor. For instance, following temporary use of land during construction, it may then take many years for the area of grassland to re-establish, particularly in arid environments. Similarly, although in ecological terms this period may not be a long time, for the people who use the land for pasture, this period could be significant in relation to their lifetime and could therefore be considered permanent.

Table 4-2 defines the criteria for assessing the duration of impact.

Table 4-2: Duration of Impacts

Nature of Change	Duration	Definition / Description
Temporary	Short-term	Impact continues during construction (1-2 years) and up to 1 year following construction.
	Medium-term	Impact continues 2-5 years following construction.
	Long-term	Impact continues 5-10 years after construction.
Permanent		Due to the length of time period for human beings, impacts over 10 years can subjectively be defined as permanent.

4.3 Scope and Methodology for Assessing Social Impacts

The objective of the social impact assessment was to identify major risks to social and economic conditions in the area of the proposed action and to assess impacts of the construction and operation on socioeconomics following recognised good practise guidance[28,29,30]. The impacts can be direct and indirect, intended and unintended, positive and negative. For significant impacts, the developer must implement a variety of mitigation measures, and these are discussed within Chapter 7 (Social) and Chapter 18 (Environmental Management and Monitoring).

Generally, the social impact assessment process involves the following major tasks:

- Identifying types of adverse and beneficial impacts of the proposed action.
- Assessing the level of socioeconomic risks in terms of frequency (how likely is it to happen) and consequences.
- Assessing the acceptability of the risks.
- Introducing mitigation measures to reduce risks to acceptable level.

[28] Centre for Good Governance (2006)

[29] World Bank (2003)

[30] Mackenzie Valley Environmental Impact Review Board (2007)

The social impact assessment typically addresses the following issues:

- **Demographics:** Changes in local population size, emigration/immigration in the area, migration of people in search of work, and other issues.
- **Economic issues:** Supply chain impacts, local sourcing opportunities, potential impacts on local markets for goods and services, employment opportunities for construction, operation, and decommissioning phases of the Project.
- **Health issues:** Risks of new diseases to indigenous communities, impacts on health of operations personnel and local communities, impact of local diseases on workers.
- **Social infrastructure**: Adequacy of health care and education facilities, transport and roads, power supply, fresh water supply to support project activities and personnel as well as the local communities.
- **Resources**: Land use changes, increased access to rural or remote areas, use of natural resources.
- **Psychological and community aspects**: Changes from traditional lifestyles, community cohesion, attitudes and behaviour, perception of risk.
- **Cultural**: Issues associated with sites that have archaeological, historical, religious, cultural, or aesthetic values.
- **Social equity**: Local social groups who will gain or lose as a result of the Project or operation.

As with environmental impacts, a general method for grading the significance of socio-economic impacts was adopted to ensure consistency in the terminology of significance, whether for a beneficial or an adverse impact. The two principal criteria used were the nature of the impact and the magnitude of the change arising from the Project, as shown in Table 4-3.

Table 4-3: Determination of Social Impact Significance

Magnitude of Change	Nature of Impact		
	Avoidance	*Disruption / Habituation*	*Permanence*
Negligible	No avoidance needed.	Not noticeable under normal conditions.	Not noticeable.
Minor	Mitigation of design change prevents impact(s).	No effect on daily life or routine of affected party.	Ephemeral: <1 year.
Moderate	Mitigation or design change reduces impact.	Possible initial change on daily life/routine, rapid habituation reduces to below nuisance level.	Temporary: recovery to pre-existing conditions after one or a few years (e.g., after construction).
High	Mitigation or design change cannot significantly reduce impact(s).	Requires change to daily life or routine activities.	Permanent: life of wind farm, or beyond.

Further specific details relating to the social assessment methodology and baseline gathering are set out in Chapter 7, Section 7.3.

4.4 Environmental Mitigation and Enhancement

Where significant impacts are identified, mitigation measures are then developed. These measures are intended to avoid, reduce, compensate, and/or remediate adverse impacts, or to enhance potentially beneficial impacts. Wherever possible, this is undertaken as part of the Project design, so the measures will feed back into impact assessment. An example of this would be to include erosion control measures into the design of roads.

The mitigation and enhancement which should be undertaken as part of the Project are set out within relevant sections of Chapters 5 to 16 and within Chapter 18 (Environmental Management and Monitoring). These measures can then be applied in order to manage different phases of the Project.

4.5 Cumulative Impact Assessment

From an international perspective, cumulative impacts are defined within the IFC Good Practise Handbook on Cumulative Impact Assessment (CIA) as "*those that result from the successive, incremental, and / or combined effects of an action, project or activity when added to other existing, planned and / or reasonably anticipated future ones*". While a single activity may itself result in an insignificant impact, when combined with other impacts (significant or insignificant) in the same geographical area and occurring at the same time, it may result in a significant cumulative impact.

The potential for cumulative impacts are likely to arise where:

- Two or more projects are visible from the same locations.
- Delivery of construction materials takes place at the same time using the same roads for two or more projects.
- Two or more projects take place in nearby locations resulting in increased pressure on services.
- Two or more projects take place in nearby locations resulting in increased number of construction workers required from the local area or where larger numbers of workers are brought in from outside the local area.
- Two or more projects could interfere with migratory routes or wildlife movement.
- Two or more projects take place in the same area which both put pressure on the availability of alternative land.
- As noise and dust impacts are generally localised, only projects that are in very close proximity are considered to contribute to any cumulative effect.

Those considerations have been taken into account when developing the ESIA.

4.5.1 CIA Approach

The CIA process is defined by IFC as (i) analysing the potential impacts and risks of proposed developments in the context of the potential effects of other human activities and environmental and social drivers on the chosen Valued Environmental and Social Components (VECs) over time, and (ii) proposing concrete measures to avoid, reduce, or mitigate such cumulative impacts and risk to the extent possible.

Cumulative impacts can occur (a) when there is "spatial crowding" as a result of overlapping impacts from various actions on the same VEC in a limited area, (e.g., increased noise levels in a community from industrial developments, existing roads, and a new highway; or landscape fragmentation caused by the installation of several transmission lines in the same area) or (b) when there is "temporal crowding" as impacts on a VEC from different actions occur in a shorter period of time than the VEC needs to recover (e.g., impaired health of a fish's downstream migration when subjected to several cascading hydropower plants).

The process needs to identify the overall impacts which may arise from a group of projects and distinguish the contribution of each individual project to these. The identification and management of cumulative impacts have been limited to those effects generally recognized as relevant based on expected potential impacts and/ or concerns of affected stakeholders. To this end, the existing and future developments located in the Project's AoI have been considered as defined at the time the impacts identification process is conducted. These projects are detailed further within Chapter 2 and within each individual assessment chapter as appropriate.

4.6 Assessment of Residual Impacts

Following the identification of mitigation measures to address significant adverse effects, an assessment of the significance of any residual impacts (i.e. those remaining after mitigation) was completed.

4.7 Environmental Monitoring

Where there is uncertainty over the potential significance of an impact, mitigation may include monitoring of that impact to determine whether additional measures are required. It is recommended that Project monitoring be described in a corresponding Environmental and Social Management Plan (ESMP) (Chapter 18).

4.8 Scope of ESIA

4.8.1 Air Quality

The Zarafshan Wind Farm ESIA Scoping Report confirmed that air quality impacts would be scoped out of the ESIA due the fact that the Project will have negligible emissions during normal operation. There has therefore been no requirement to carry out ambient air quality baseline monitoring for the purpose of this ESIA. Air quality issues such as dust emissions during construction will be considered as part of the assessment of construction impacts and managed as part of the ESMP and its sub-plans.

5 Ornithology

5.1 Introduction

This chapter describes the findings of the ornithological surveys completed between October 2019 and March 2021 and subsequent assessment in relation to the proposed Project. It sets out the potential impacts on birds during construction, operation and decommissioning, and means by which to mitigate any impacts identified.

Wind farms present three main potential direct risks to birds:

1. Direct habitat loss through construction of wind farm infrastructure.
2. Displacement (sometimes called indirect habitat loss) if birds avoid the wind farm and its surrounding area due to WTG construction and operation. Displacement may also include barrier effects in which birds are deterred from using normal routes to feeding or roosting grounds.
3. Death through collision or interaction with WTG blades and other infrastructure (i.e. collision risk).

For each of these three risks, detailed knowledge of bird distribution and flight activity is necessary in order to predict the potential effects of the Project on birds. The survey methodology is primarily intended to allow a prediction of the likely ornithological impacts as well as ensuring the ability to allow a robust assessment of likely impacts of collision and operational impacts to key species.

OHLs can affect birds in similar ways to operational WTGs (collision and displacement impacts) however mortality through electrocution from power lines or supporting structures is a further concern. Birds that perch or nest on pylons can be electrocuted by causing a short circuit between two live wires or a live and an earthed component.

5.1 Survey Methodology

5.1.1 General

Survey methodologies described in this section were designed to allow data to be gathered across all of the important bird activity periods within Uzbekistan.

The surveys included a scoping visit completed by Turnstone Ecology in October 2019 (with two days of initial site survey undertaken) followed by more comprehensive surveys that were completed from March to November 2020 by Juru Energy, the in-country team, based in Tashkent.

5.1.2 Survey Methods

Surveys were completed in accordance with the agreed protocols which are based on available guidelines, predominantly those detailed in Scottish Natural Heritage (2017)[31]. A summary of the 2020/21 surveys including methods and timings is given below. Additional surveys have been completed in Spring 2021 to give further data from the migration and breeding periods along with carcass searches along the ground beneath existing OHLs. The results of these additional surveys will be fully incorporated into the Final ESIA document.

For the purpose of survey design and reporting, the survey seasons (based on broad activity periods and based mostly around the more regular migration periods) encompassed the following periods:

- Spring Migration Vantage Point (VP) Surveys – 11 March to 26 May 2020. A total of 37 hours/VP completed over this period resulting in a total of 1,038-man hours observation spread over a total of 62 days.
- Raptor Nest Search Transects – transects were chosen across the Project area and into areas of adjacent habitat which included the Mount Aktau Important Bird Area (IBA). These were surveyed between 08 and 12 August 2020 and surveys are ongoing in the breeding period in 2021.
- Summer VP Surveys – 01 June to 17 August 2020. A total of 36 hours/VP resulting in a total of 1,008-man hours observation spread over a total of 56 days.
- Autumn Migration VP Surveys – 01 September to 14 November 2020. A total of 36 hours/VP resulting in a total of 1,008 hours observation spread over a total of 56 days.
- Winter VP surveys – 16 November 2020 to 10 March 2021. A total of 36 hours / VP resulting in a total of 1,008 hours observation spread over a total of 84 days.

[31] Scottish Natural Heritage (2017) Recommended bird survey methods to inform impact assessment of onshore wind farms. Version 2. SNH, Perth

A total of 14 360° VPs (with each VP split in half and manned by two observers) were chosen by the in-country team to provide adequate viewsheds of the whole wind farm area and up to a 500 m buffer outside of all proposed WTG locations. The size of each viewshed was 2 km or less for the majority of VPs, however half of the viewing areas of VP's 3 and 4 were increased to give coverage up to 3 km to reach the site boundary (Figure 5-2). Other species recorded during these surveys were also noted when encountered. The survey schedule for passage periods was designed so that the viewsheds cover as much of the width of the site as possible on each survey day, in order to capture main movements of birds flying north to south (or vice versa). Daily coverage of the site was deemed the most important focus, with personnel being present on site between 20 and 28 days per month throughout the survey period.

Surveyors used binoculars (10x magnification) and field telescopes whilst undertaking the surveys, along with cameras capable of up to 50 x zoom. Recordings of each target species registration were made on survey forms, detailing the species, flight height and direction and time spent at each height. In addition, the flight lines were mapped in the field and digitised to allow inclusion in a collision risk model.

The location of the VPs based on the original site boundary and the selected transects are shown in Figures 5-1, 5-2 and 5-3.

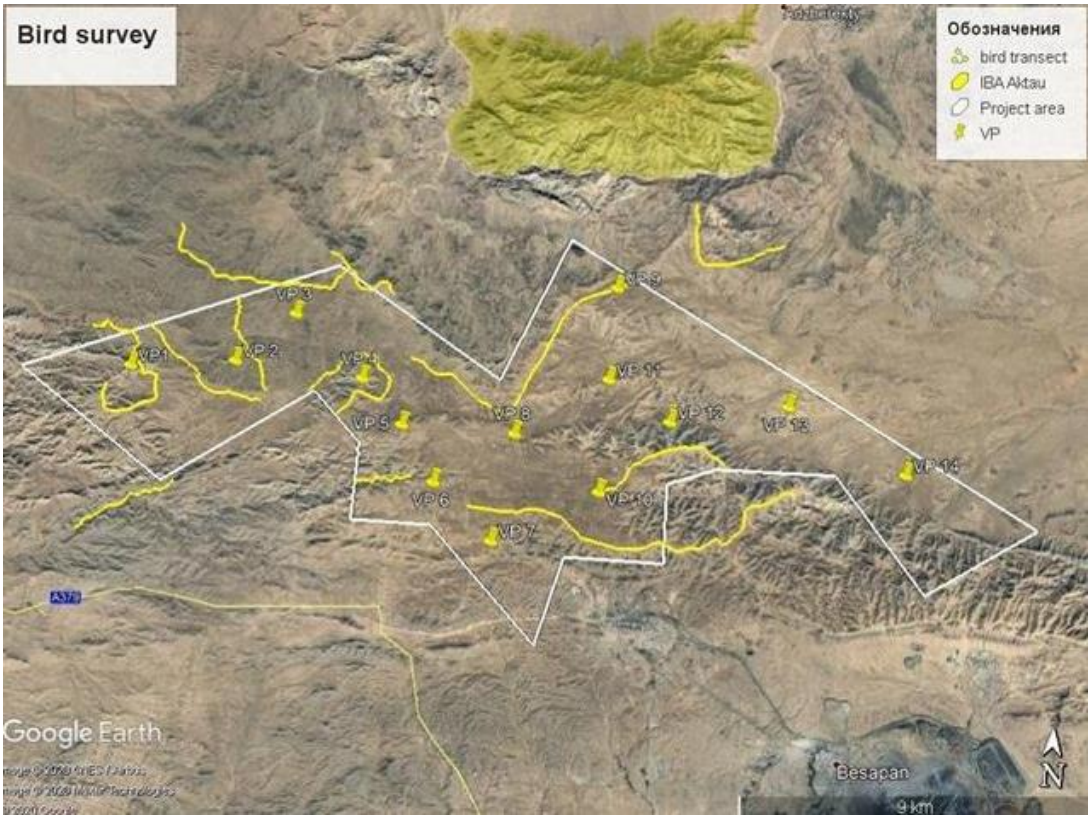


Figure 5-1: Location of Vantage Points and Transect Routes

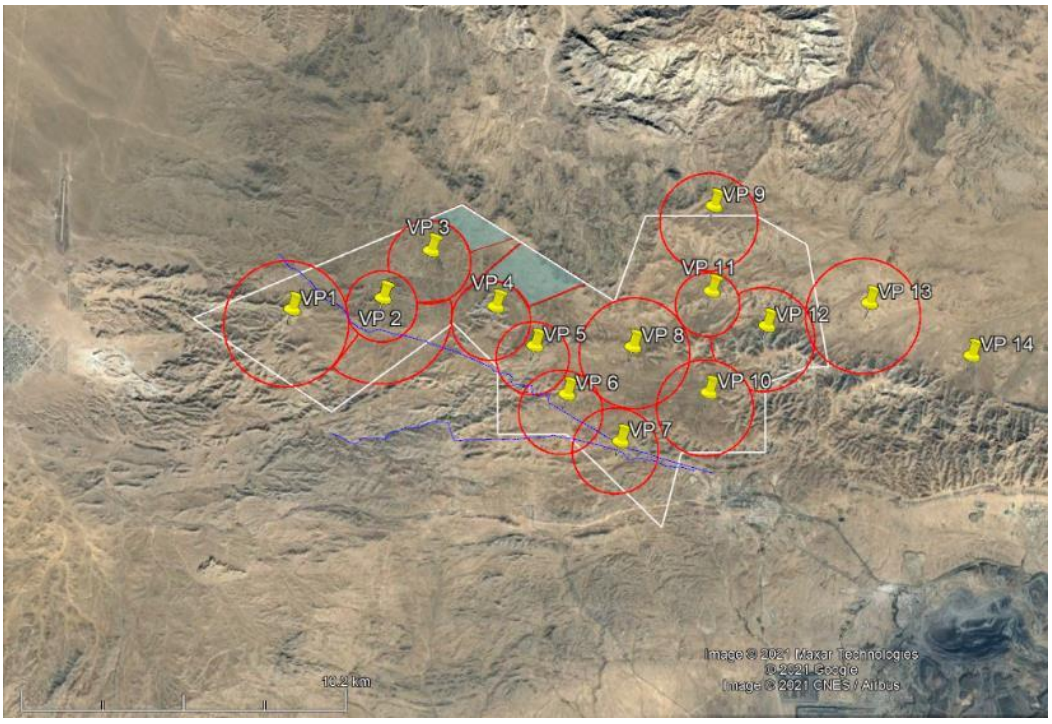


Figure 5-2: VP Viewsheds showing extended areas from VP3 and VP4 & OHL Transects (blue lines)

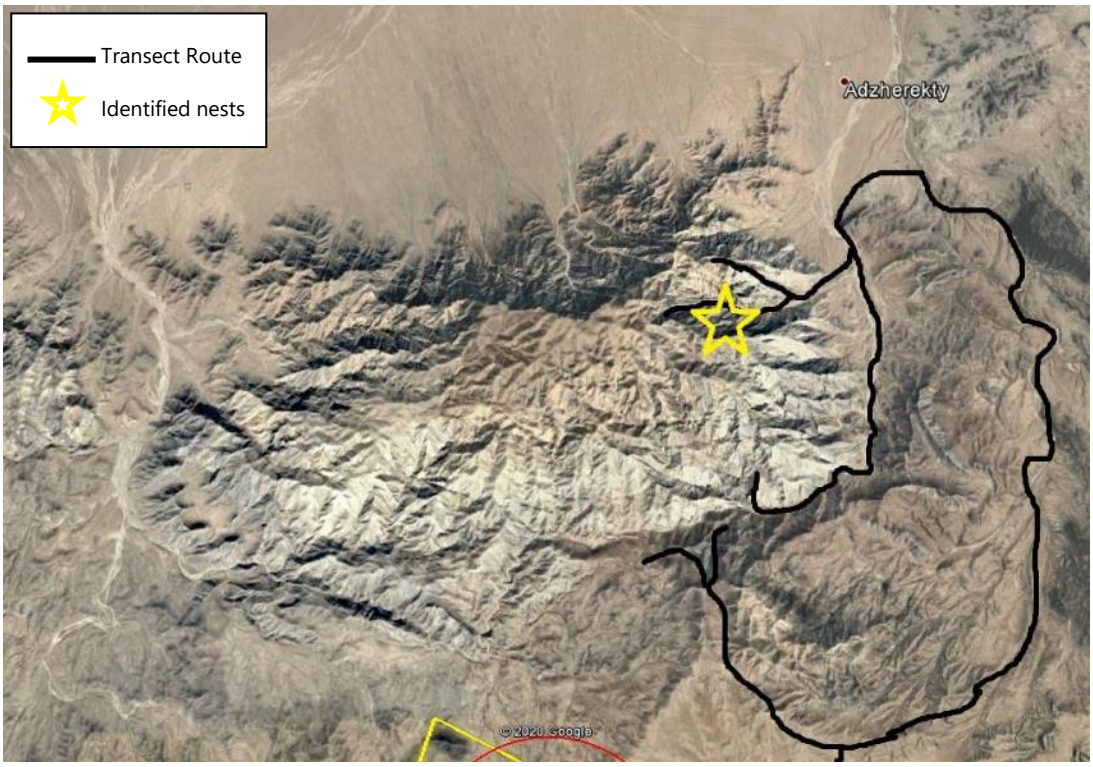


Figure 5-3: Location of Transect Routes in Mount Aktau Bird Area

5.1.3 VP Survey Hours

The following hours of VP survey were completed at all VP locations:

- Spring 2020 – average of 37 hours per VP (min 33, max 39) (14 VPs = 1,036 total man hours).
- Summer 2020 – 36 hours (14 VPs = 1,008 total man hours).
- Autumn 2020 – 36 hours (14 VPs = 1,008 total man hours).
- Winter 2020 – 2021 – 36 hours (14 VPs = 1,008 total man hours).

5.1.4 Weather Conditions

Weather conditions were recorded during all surveys to understand if there is any correlation between weather conditions and activity and to ensure that survey effort is carried out during conditions suitable for that survey type. Surveys were undertaken under suitable survey conditions with no constraints to surveys. The full details of survey conditions will be included within the Surveyor (Juru Energy) Reports which will form an Appendix to the Final ESIA.

5.2 Collision Risk Assessment Methodology

5.2.1 Collision Risk Modelling

Collision Risk Modelling (CRM) is ultimately completed to further inform the magnitude (extent) of collision impacts on bird populations recorded flying within the proposed Wind Farm area. The collision risk model used in this assessment has been developed by Scottish Natural Heritage (SNH) and the British Wind Energy Association (BWEA) and has been accepted as representative of industry best practise.[32,33,34] In depth details of the model are given in the cited publications but a brief description is provided below.

The model runs as a two-stage process. Firstly, the risk is calculated assuming that flight patterns and behaviours are unaffected by the presence of the WTGs i.e. that no avoidance action is taken. This is essentially a mechanistic calculation, with the collision risk calculated as the product of (i) the probability of a bird flying through the rotor swept area, and (ii) the probability of a bird colliding if it does so. This probability is then multiplied by the estimated numbers of bird movements through the WTG rotors at the risk height (i.e. the height of the rotating rotor blades) in order to estimate the theoretical numbers at risk of collision if they take no avoiding action.

[32] Percival *et al.* (1999)

[33] Band *et al.* (2005) Developing field and analytical methods to assess avian collision risk at wind farms. In De Lucas, M., Janss, G. and Ferrer, M., eds. *Birds and Wind Power*. www.quercus.pt

[34] Scottish Natural Heritage (2014) https://www.nature.scot/wind-farm-impacts-birds-flight-speeds-and-biometrics-collision-risk-modelling

A bird is simplified in shape to a flying cross with length, wingspan, and speed, and always flying perpendicularly towards the rotor. A bird may be 'gliding' i.e. with the arms of the cross fixed, or 'flapping' i.e. with the arms of the cross flapping so as to occupy a space similar to that of a spinning top, with the length of the bird being the axis of spin. 'Gliding' flight has a marginally lower collision risk than 'flapping' flight – notably for passage at points level with the rotor hub, where the wings lie parallel with potentially colliding blades. However, the difference is rarely sufficient to warrant detailed consideration of different bird behaviours. As a 'worst case' scenario, all flight data entered into the collision risk model is set to 'flapping' flight.

The second stage of the collision risk model incorporates the probability that the birds, rather than flying blindly into the WTGs, will actually take a degree of avoiding action. The most recent guidelines[35] based on research at operational wind farms in the UK and Europe, advise that the default avoidance rates for all species is 98% with the exception of a small number of species, including Common Kestrel, Lesser Kestrel and vulture species which are considered to have an avoidance rate of 95%.

Once the avoidance rate is incorporated, the model then predicts the likely number of annual collisions of each particular species.

The number of predicted collisions (i.e. the extent) is then assessed against the total local, national or international populations as appropriate to ascertain the magnitude and hence significance of any impacts along with fatality thresholds for these priority species as appropriate.

5.2.2 Collision Risk Model Input Data

5.2.2.1 General

The Collision Risk Model requires data relating to the species of birds occurring at the proposed Project and data on the type and specification of the proposed WTGs.

Collision Risk Modelling (CRM) (and subsequent Collision Risk Assessment (CRA)) has been completed based on the 111 WTG layout presented in Chapter 2 and Figure 1-1.

[35] Avoidance Rates for the onshore SNH Wind Farm Collision Risk Model: SNH (July 2017)

At the time of reporting, the proposed scheme is to construct and operate 111 Goldwind GW155 4.5 MW WTGs with a hub height of 95 m (height to tip 172.5 m) and the parameters associated with the WTG include rotor radius, rotational speed, blade pitch, rotor depth, number of blades and rotation period. The blade rotation period is variable dependent upon wind speed and its rated speed is taken from its technical specification brochure.

Parameters specific to the Project and survey include the area of the Project, the mean day length during the survey period and the number of day's activity over the length of the survey period. For the CRM, the 'Days of Activity' were inputted as between 76 and 115 days for each season. All input data for the CRM is described below.

5.2.2.2 Bird Size and Flight Speed

The biometric data, including body size, wing length, as well as flight speed used in the collision risk model has been taken from various sources[36] [37] [38] [39]and was populated with correct data prior to running the CRM.

5.2.2.3 Bird Flight Activity and Flight Height

Data on bird flight activity through the proposed Project area and on the proportion of those birds flying at rotor height are taken from the field surveys completed by in-country ornithologists between March 2020 and March 2021.

Data relating to birds flying above or below the blade swept area was not included in the collision risk analysis. It is important to note that, to ensure a precautionary approach to the assessment, buffers around the blade tip reach were implemented – 7.5 m below and 17.5 m above. Therefore, the flight data that was entered into the Collision Risk Model included all flights that were recorded between 10 m and 190 m.

5.2.2.4 Project Parameters

The following information has been used to run the CRM (Table 5-1).

[36] Bird body size data from: The complete birds of the Western Palearctic Cramp (1998)

[37] Flight speed data from: A dictionary of birds. Campbell and Lack (1985)

[38] Bird Guide: Collins (2001)

[39] Birds of the western palearctic / BTO fact sheets

Table 5-1: Project and WTG Information

Elements	Details
WTG Details	
Rotor radius – r	77.5 m
Rotor Diameter	155 m
Area swept by rotors	18,869 m^2
Number of turbines	111
Rotor depth (estimated)	3.2 m
K: [1D or [3D] (0 or 1)	1
Number of Blades	3
Max Chord (m)	4.2 m
Pitch (degrees)	0-90
Rotation Period (sec) (estimated)	6.32

Elements	Details
Wind Farm Details	
Wind farm height (rotor diameter)	155 m
Wind farm area (500 m buffer around WTGs)	108,433,832 m^2
Survey Details	
Hours of surveying Spring 2020	1,038 (37/VP)
Hours of surveying Summer 2020	1,008 (36/VP)
Hours of surveying Autumn 2020	1,008 (36/VP)
Hours of surveying in Winter 2020/21	1,008 (36/VP)
Mean day length Spring 2020	12.3
Mean day length Summer 2020	13.5
Mean day length Autumn 2020	10.25
Mean day length Winter 2020/21	9
Days of activity in Spring 2020	82
Days of activity in Summer 2020	92
Days of activity in Autumn 2020	76
Days of activity in Winter 2020/21	115

5.3 Impact Assessment Methodology

5.3.1 General

The impact assessment process is adapted from the Chartered Institute of Ecology and Environmental Management (CIEEM) "*Guidelines for Ecological Impact Assessment in the UK and Ireland*" 2018.

There are a number of approaches for determining the significance of effects on ornithological features. This includes methods for scoring and ranking impacts on the basis of subjective criteria. Results are often presented in the form of a matrix in which ornithological value/importance and magnitude of impact are combined into a significance score. A matrix approach is commonly used in Environmental Impact Assessment (EIA) by disciplines other than ecology to assign significant residual effects to categories (e.g. major, moderate, minor).

When using a matrix approach within ecology chapters, it can be less easy to make a clear distinction between evidence-based and value-based judgements in order that decision makers and other stakeholders are aware of the level of subjective evaluation that has been used. Accordingly, the CIEEM Guidelines avoid and discourage use of the matrix approach and categorisation and make it clear that the suggested approach should be used only where categorisation has been specifically required. Spurious quantification can be avoided using the recommended methods where numerical scores or significance rankings/categories without a clear definition of the criteria and thresholds that underpin them are not used.

Further details on the approach used for assessing ornithological and ecological impacts are provided in Chapter 6: Terrestrial Ecology, Section 6.2.

5.4 Important Receptors

5.4.1.1 Target Species and Secondary Species

When assessing the possible impacts of WTGs on bird species, attention should be made to those species that are potentially more susceptible to significant or adverse impacts (SNH 2006[40]). Therefore, the species considered in this report are those that are:

- Species at particular risk from the introduction of WTGs.
- Species of special conservation concern (international or national species of conservation importance).
- Any species present at locally important levels otherwise outside inclusion of target species.

[40] SNH, 2016: Assessing significance of impacts from onshore windfarms on birds outwith designated areas.

Target species (shown below) represent the species of greatest sensitivity and/or conservation concern and are therefore focus of the VP surveys. Observations of target species always took priority over completion of secondary species activity summaries.

List of Bird Families that include Target Species are:

- *Anseriformes* – Swans, Geese and Ducks.
- *Otidiformes* – Bustards.
- *Gruidae* – Cranes.
- *Rallidae* – Crakes and Rails.
- *Phalacrocoracidae* – Cormorants.
- *Pelecanidae* – Pelicans.
- *Ardeidae* – Herons, Egrets and Bitterns.
- *Threskiornithidae* – Ibis and Spoonbill.
- *Ciconiidae* – Storks.
- *Charadriiformes* – Waders.
- *Accipitriformes* – Osprey, Eagles, Vultures, Hawks, Buzzards etc.
- *Falconidae* – Falcons.
- *Strigiformes* – Owls.

List of Bird Families that include Secondary Species are:

- *Laridae* – Gulls and Terns.
- *Strisores* – Nightjars and Swifts.
- *Coraciiformes* – Bee-eaters and Rollers.
- *Sturnidae* – Starlings.
- *Alaudidae* – Larks.
- *Hirundinidae* – Swallows and Martins.

5.4.1.2 Notable Species in Uzbekistan

As well as the target species, special consideration has been given to notable species during surveys and subsequent assessment. Notable species for this Project include those listed as on the International Union for Conservation of Nature (IUCN) Red List as Near Threatened or above and those bird species that are listed in the Red Book of Uzbekistan (Table 5-2), which are nationally threatened species.

Table 5-2: Notable Species According to their International and National Conservation Status

Common Name	Scientific Name	IUCN Status	National Red Book Status
Priority Species			
Steppe Eagle	*Aquila nipalensis*	EN	VU
Tawny Eagle	*Aquila rapax*	VU	Not Listed
Golden Eagle	*Aquila chrysaetos*	LC	VU
Imperial Eagle	*Aquila heliaca*	VU	VU
Egyptian Vulture	*Neophron percnopterus*	EN	VU
Houbara (MacQueen's) Bustard	*Chlamydotis macqueenii*	VU	VU
Sociable Plover	*Vanellus gregarius*	CR	VU
Secondary Species			
Cinerous Vulture	*Aegypius monachus*	NT	NT
Eurasian Griffon Vulture	*Gyps fulvus*	NT	VU
Bearded Vulture	*Gypaetus barbatus*	NT	VU
Short-toed Snake Eagle	*Circaetus gallicus*	LC	VU
Booted Eagle	*Hieraaetus pennatus*	LC	VU
Western Marsh Harrier	*Circus aeruginosus*	LC	Not Listed
Hen Harrier	*Circus cyaneus*	LC	Not Listed
Pallid Harrier	*Circus macrourus*	NT	NT
Montagu's Harrier	*Circus pygargus*	LC	Not Listed
Shikra	*Accipiter badius*	LC	Not Listed
Eurasian Sparrowhawk	*Accipiter nisus*	LC	Not Listed
Long-legged Buzzard	*Buteo rufinus*	LC	Not Listed
Common Buzzard	*Buteo buteo*	LC	Not Listed
Black Kite	*Milvus migrans*	LC	Not Listed

Common Name	Scientific Name	IUCN Status	National Red Book Status
Saker Falcon	*Falco cherrug*	EN	NT
Common Kestrel	*Falco tinnunculus*	LC	Not Listed
Lesser Kestrel	*Falco naumanni*	LC	Not Listed
Demoiselle Crane	*Anthropoides virgo*	LC	Not Listed
Common Crane	*Grus grus*	LC	Not Listed
White-headed Duck	*Oxyura leucocephala*	EN	EN
Lesser White-fronted Goose	*Anser erythropus*	VU	VU
Red-breasted Goose	*Branta ruficolis*	VU	VU
Marbled Teal	*Marmaronetta angustirostris*	VU	EN
Common Pochard	*Aythya ferina*	VU	Not Listed
Slavonian Grebe	*Podiceps auritus*	VU	Not Listed

It should be noted that additional species were moved to the Notable Species List for the Autumn 2020 surveys, with all species of vulture and Lesser Kestrel added.

5.4.2 Important Sites in Uzbekistan

Areas recognised as Important Bird and Biodiversity Areas (IBA) have been identified using an internationally agreed set of criteria as being globally important for the conservation of bird populations. IBA was developed and sites are identified by BirdLife International. Currently there are over 12,000 IBAs worldwide with 52 in Uzbekistan which cover an area of 2,462,782 ha. The nearest IBA to the proposed site is Mount Aktau IBA which is approximately 3.5 km north of the site and measures roughly 3,870 ha.

5.5 Baseline Conditions

5.5.1 Ecological Context

The proposed site is located within the Kyzylkum Desert region of Uzbekistan.

The site is located approximately 7 km east of Zarafshan City from the closest WTG and situated between the Muruntau gold mine and the Mount Aktau IBA.

The site is all situated at over 600 m above sea level (ASL), with the higher sections reaching nearly 800 m ASL. The site consists of three main habitat types, with shallow sloping plains covered with ephemeroid-sagebrush vegetation types, steep and rocky slopes, and stony slopes with ephemeral-black saltwort-sagebrush vegetation.

The Project consists of 111 WTGs and associated access tracks and buildings. Two short OHLs will be constructed in order to connect the wind farm (via one substation) to the main national grid via existing OHLs that cross the Project site, and these are to be constructed within the Project footprint itself.

Uzbekistan is located on the Asia-East Africa migration route and migratory species of bird are likely to move over the country in broad fronts on passage (rather than through bottleneck areas such as the Bosphoros in Turkey or Batumi in Georgia) between breeding sites in Asia and wintering sites in East Africa.

A Preliminary site visit was completed by Turnstone Ecology in October 2019, where the site and surroundings were surveyed to determine vantage points and give some level of initial site information. During this survey the following birds were observed although it was noted that there may be peaks of activity associated with movements of birds at other times of year:

- Golden Eagle – one individual seen which is likely to be a resident all year.
- Imperial Eagle – two individuals seen – one adult and one juvenile. These were possibly on migration but resident birds are also possible.
- Steppe Eagle – one individual seen and suspected to be on migration.
- Saker Falcon – two birds together at a nest site close to the Project site (41°33'20.56"N, 64°22'33.86"E). These were likely to be resident but the region does also have migrating individuals.
- Common Kestrel – several probable resident birds observed foraging on and adjacent to site.
- Cinereous Vulture – no sightings recorded during the scoping survey but evidence of local use of the Project site with feathers and feeding remains found at 41°34'36.63"N, 64°29'22.18"E – listed as resident on IBA citation but some birds also likely to be migratory.
- Common Crane – a flock of approximately 90 birds flew south directly overhead whilst survey teams were on the southern plateau area of the site.

5.5.2 Designated Sites

There is one IBA located within 50 km of the Project site which supports breeding and resident populations of raptors which are of international and national conservation status.

5.5.2.1 Mount Akatu IBA

Mount Akatu[41] (974 m) is located in the Tamditau mountains in the central part of the Kyzylkum desert. It is the highest point in the desert area between the Amudariya and Sirdariya rivers. Steep slopes, cut by gorges, make it inaccessible for people and cattle. Therefore, despite its proximity to large settlements it is seldom visited by people. The northeast foothills are 6-8 km from the regional centre, Tamdi city. In the western foothills is a winter hut which is sometimes visited by shepherds. The mountain is occasionally visited by hunters after Chukka (*Alectoris chukar*) and Argali (*Ovis ammon*). The gorges of the mountain have well-developed shrubby vegetation, and there are some springs and rain pits. Aktau is located in the centre of the 70 km long Tamditau mountain chain and has a concentration of the main representatives of mountain fauna. Being a very ancient formation, Aktau Mountain is a habitat for many partly endemic species of flora and invertebrates. Although only a few sites have been formally proposed under the A3 biome-restricted criteria (for biome CA04b Eurasian Desert and Semi-desert), many of the IBAs in the Kyzylkum Desert region support populations of biome-restricted species and, effectively, form a network of sites throughout the area.

Apart from the rare species that the site supports, Aktau has a unique ornithological value because of the presence of isolated populations of several species nesting to the south in the Pamiro-Alay mountains and found in the Kyzylkum only here including Eastern Rock Nuthatch (*Sitta tephronota*), Western Orphean Warbler (*Sylvia hortensis*) and Grey-necked Bunting (*Emberiza buchanani*). Additionally, Eurasian Crimson-winged Finch (*Rhodopechys sanguineus*) and White-winged Snowfinch (*Montifringilla nivalis*) have been recorded outside the breeding season. The complex of nesting birds at Aktau is the most representative of the birds of the desert low mountains of the Central Kyzylkum.

[41] BirdLife International (2021) Important Bird Areas factsheet: Mount Aktau. Downloaded from http://www.birdlife.org on 13/01/2021.

Table 5-3: Populations of IBA Trigger Species for Mount Akatu

Species	Scientific Name	IUCN Category†	Season	Year(s) of estimate	Population estimate*	IBA Criteria
Egyptian Vulture	*Neophron percnopterus*	EN	Breeding	1971 - 2007	Present	A1
Cinereous Vulture	*Aegypius monachus*	NT	Resident	1970 – 2006	8 – 24 individuals	A1
Lesser Kestrel	*Falco naumanni*	LC	Breeding	1971 – 2006	17 – 33 individuals	A1
Saker Falcon	*Falco cherrug*	EN	Resident	1971 - 2006	2 – 10 individuals	A1

†EN = Endangered, NT = Near Threatened, LC = Least Concern.

5.6 2020/21 Bird Survey Results

5.6.1 General

A total of 19 priority and secondary species were recorded during the vantage point surveys completed between March 2020 and March 2021.

5.6.2 Target and Notable Species during VP Surveys

There were 19 priority and secondary species recorded during VP surveys throughout the surveys completed in 2020/21. All of the Target and Notable species recorded during the VP surveys are shown in Table 5-4 below.

Table 5-4: Species recorded during the VP surveys (IUCN Red List / Uzbekistan Red Book species highlighted in grey)

Common Name	Scientific Name	IUCN Red List Status (Least Concern = LC)	Uzbek Red Book*	Spring	Summer	Autumn	Winter
Cinerous Vulture	*Aegypius monachus*	NT	NT	Y	Y	Y	Y
Eurasian Griffon Vulture	*Gyps fulvus*	LC	VU:D	Y	Y	Y	Y
Egyptian Vulture	*Neophron percnopterus*	EN	VU:D	Y	Y	Y	
Bearded Vulture	*Gypaetus barbatus*	NT	VU:R	Y		Y	Y
Golden Eagle	*Aquila chrysaetos*	LC	VU:R	Y			Y
Steppe Eagle	*Aquila nipalensis*	EN	VU:D	Y	Y	Y	Y
Tawny Eagle	*Aquila rapax*	VU	-	Y		Y	
Booted Eagle	*Hieraaetus pennatus*	LC	VU:D	Y			
White-tailed Eagle	*Haliaeetus albicila*	LC	VU:R				Y
Saker Falcon	*Falco cherrug*	EN	EN				Y
Macqueens Bustard	*Chlamydotis maqueenii*	VU	VU:D				Y
Long-legged Buzzard	*Buteo rufinus*	LC	-	Y		Y	Y
Common Buzzard	*Buteo buteo*	LC	-			Y	Y

Common Name	Scientific Name	IUCN Red List Status (Least Concern = LC)	Uzbek Red Book*	Spring	Summer	Autumn	Winter
Hen Harrier	*Circus cyaneus*	LC	-	Y		Y	Y
Common Kestrel	*Falco tinnunculus*	LC	-	Y		Y	Y
Lesser Kestrel	*Falco naumanni*	LC	NT			Y	
Little Owl	*Athene noctula*	LC	-			Y	Y
Common Crane	*Grus grus*	LC		Y			
Eurasian Sparrowhawk	*Accipiter nisus*	LC		Y			

*NT = Near Threatened, VU:D = Vulnerable: Declining, VU:R = Vulnerable: Rare

5.7 Spring 2020 Vantage Point Surveys

Seven Target or Secondary bird species (that may be at higher risk of impacts through collision or displacement) were recorded during the spring VP surveys and all of these species are Near-Threatened, Vulnerable or Endangered on the IUCN Red List as well as six being included in the Uzbekistan Red Book of threatened species.

During the Spring 2020 VP surveys, a total of 176 flight line recordings were made from all the VP locations with 176 birds observed and 27,255 at-risk flight seconds recorded as shown in Table 5-5 below.

Table 5-5: Summary of Spring Flight Lines Recorded & CRM Data (IUCN Red List / Uzbekistan Red Book species highlighted in grey)

Common Name	Scientific Name	No. of flight lines	No. of flight lines in the windfarm area at risk height	Total Number of birds recorded	Total number of at-risk seconds used in CRM
Cinerous Vulture	*Aegypius monachus*	13	13	13	2,685
Eurasian Griffon Vulture	*Gyps fulvus*	23	23	23	3,915
Egyptian Vulture	*Neophron percnopterus*	55	55	55	8,085
Golden Eagle	*Aquila chrysaetos*	30	30	30	4,215
Steppe Eagle	*Aquila nipalensis*	41	41	41	6,270
Tawny Eagle	*Aquila rapax*	1	1	1	120
Booted Eagle	*Hieraaetus pennatus*	13	13	13	1,965

5.8 Summer 2020 Vantage Point Surveys

Four Target or Secondary bird species (that may be at higher risk of impacts through collision or displacement) were recorded during the summer VP surveys with all of these species included in the Uzbekistan Red Book of threatened species in Table 5-6.

During the summer 2020 VP surveys, a total of 148 flight line recordings were made from all the VP locations with 149 birds observed and 24,570 at-risk flight seconds recorded as shown in Table 5-6 below.

Table 5-6: Summary of Summer Species Flight Lines Recorded & CRM Data (IUCN Red List / Uzbekistan Red Book species highlighted in grey)

Common Name	Scientific Name	No. of flight lines	No. of flight lines in the windfarm area at risk height	Total number of birds recorded	Total number of at-risk seconds used in CRM
Cinerous Vulture	*Aegypius monachus*	10	10	10	1,725
Eurasian Griffon Vulture	*Gyps fulvus*	20	20	20	30,75
Egyptian Vulture	*Neophron percnopterus*	70	70	71	12,045
Steppe Eagle	*Aquila nipalensis*	48	47	48	7,725

5.8.1 Autumn 2020 Vantage Point Surveys

Eleven Target or Secondary bird species (that may be at higher risk of impacts through collision or displacement) were recorded during the autumn VP surveys with five of these species (Cinereous Vulture, Eurasian Griffon Vulture, Egyptian Vulture, Bearded Vulture and Steppe Eagle) listed as Near-Threatened or above on the IUCN Red List and Uzbekistan Red Book of threatened species.

During the Autumn migration 2020 VP surveys, a total of 128 flight line recordings were made from all the VP locations with 128 birds observed and 14,855 at-risk flight seconds recorded as shown in Table 5-7 below.

Table 5-7: Summary of Autumn 2020 Species Flight Lines Recorded & CRM Data (IUCN Red List / Uzbekistan Red Book species highlighted in grey)

Common Name	Scientific Name	No. of flight lines	No. of flight lines in the windfarm area at risk height	Total Number of birds recorded	Total number of at-risk seconds used in CRM
Cinerous Vulture	*Aegypius monachus*	10	10	10	1,665
Eurasian Griffon Vulture	*Gyps fulvus*	16	16	16	2,295
Egyptian Vulture	*Neophron percnopterus*	19	19	19	3,020
Bearded Vulture	*Gypaetus barbatus*	2	2	2	285
Steppe Eagle	*Aquila nipalensis*	30	30	30	4,890
Long-legged Buzzard	*Buteo rufinus*	9	9	9	1,410
Common Buzzard	*Buteo buteo*	2	2	2	195
Hen Harrier	*Circus cyaneus*	7	7	7	945
Common Kestrel	*Falco tinnunculus*	17	17	17	2,280
Lesser Kestrel	*Falco naumanni*	4	4	4	570
Little Owl	*Athene noctula*	12	3	12	165

5.8.2 Winter 2020/21 Vantage Point Surveys

Thirteen Target or Secondary bird species (that may be at higher risk of impacts through collision or displacement) were recorded during the winter VP surveys with eight of these species (Cinereous Vulture, Eurasian Griffon Vulture, Bearded Vulture, Golden Eagle, Steppe Eagle, White-tailed Eagle, Saker Falcon, and MacQueen's Bustard) listed as Near-Threatened or above on the IUCN Red List and/or the Uzbekistan Red Book of threatened species.

During the Winter 2020/21 VP surveys, a total of 168 flight line recordings were made from all the VP locations with 168 birds observed and 19,194 at-risk flight seconds recorded as shown in Table 5-8 below.

Table 5-8: Summary of Winter 2020/21 Species Flight Lines Recorded & CRM Data (IUCN Red List / Uzbekistan Red Book species highlighted in grey)

Common Name	Scientific Name	No. of flight lines	No. of flight lines in the windfarm area at risk height	Total Number of birds recorded	Total number of at-risk seconds used in CRM
Cinerous Vulture	*Aegypius monachus*	9	7	9	1,065
Eurasian Griffon Vulture	*Gyps fulvus*	10	10	10	1,485
Bearded Vulture	*Gypaetus barbatus*	2	2	2	285
Steppe Eagle	*Aquila nipalensis*	14	14	14	1,950
Golden Eagle	*Aquila chrysaetos*	31	30	31	4,785
White-tailed Eagle	*Haliaeetus albicilla*	10	10	10	1,380
Saker Falcon	*Falco cherrug*	7	7	7	645
MacQueen's Bustard	*Chlamydotis macqueenii*	1	0	1	0

Common Name	Scientific Name	No. of flight lines	No. of flight lines in the windfarm area at risk height	Total Number of birds recorded	Total number of at-risk seconds used in CRM
Long-legged Buzzard	*Buteo rufinus*	19	19	19	2,724
Common Buzzard	*Buteo buteo*	5	5	5	705
Hen Harrier	*Circus cyaneus*	4	4	4	450
Common Kestrel	*Falco tinnunculus*	40	39	40	3,720
Little Owl	*Athene noctula*	16	0	16	0

5.8.3 Discussion of Collision Risk Species

The collision risk model outputs are shown below as per each season that species were recorded. If they were recorded in more than one season, an overall total number of collisions per annum is expressed for that species. Where a species was only recorded in one season the predicted number of collisions is simply stated as per the survey period. Surveys are also still being completed in Spring 2021; as such, any updated ESIA will also include predicted collisions based on these results.

Following on from Collision risk model outputs, guidelines on threshold setting for species of conservation concern are set out in the IFC Tafila Region Wind Power Projects Cumulative Effects Assessment document (2017)[42]. The methods detailed within the document are used to define thresholds for loss of individuals that would not have a negative impact at populations. However, given the presence of the four IBA citation species listed above, each of which are estimated to be present in the area in numbers less than 20 birds, it is considered that zero fatalities is the appropriate threshold in accordance with the guidance. This threshold will instigate the higher mitigation recommendations detailed in 5.10 and accordingly no further threshold setting is required.

[42] https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/publications/tafila+region+wind+power+projects+-+cumulative+effects+assessment

5.8.3.1 Species of Conservation Concern

Cinereous Vulture (*Aegypius monachus*) - IUCN Near Threatened

Cinereous Vulture are a resident species within Uzbekistan and were recorded on each of the survey seasons.

Recorded activity of this species was fairly consistent throughout the survey period with between nine and 13 registrations observed.

In spring there were 13 registrations concerning 13 individuals all of which were at risk height. A total of 2,685 at risk flight seconds was recorded.

During the Summer 2020 surveys, there was a total of 10 registrations concerning 10 individual birds, all of which were at risk height. A total of 1,725 at risk flight seconds were recorded.

In Autumn 2020, there was a total of 10 registrations concerning 10 individual birds, all of which were at risk height. A total of 1,665 at risk flight seconds were recorded.

During winter 2020/21 there were nine registrations concerning nine individual birds, of which seven were at risk height. A total of 1,065 at risk flight seconds were recorded.

There were no nests of Cinereous Vulture recorded within the Project area, however large nests were recorded outside of the Project area in the mountains to the north.

The results of the CRM are shown below (Table 5-9) which indicate the Project would result in a combined 2.062 collisions per annum based on 95% avoidance.

Table 5-9: Predicted Collisions Per annum – Cinereous Vulture

Season	Predicted Collisions
Collisions Spring 2020	15.145
Collisions Spring 2020 with 95% Avoidance	0.757
Collisions Summer 2020	12.314
Collisions Summer 2020 with 95% Avoidance	0.616
Collisions Autumn 2020	7.455
Collisions Autumn 2020 with 95% Avoidance	0.373

Season	Predicted Collisions
Collisions Winter 2020/21	6.336
Collisions Winter 2020/21 with 95% Avoidance	0.317
Total Collisions per annum	**41.25**
Total Collisions per annum with 95% Avoidance	**2.062**

Eurasian Griffon Vulture (*Gyps fulvus*) – Uzbek Red Data Book Vulnerable: Declining

Eurasian Griffon Vulture are a resident species throughout the lower and middle belts of all of the mountain ranges in Uzbekistan. Eurasian Griffon Vultures are a colonial nesting species however no such colonies are present within the Project site although they almost certainly breed within the IBA to the north of the site. A group of 34 individual birds were noted roosting on rocks in the eastern part of the IBA on the August raptor nest search survey. This species was recorded flying through the Project area in all survey seasons.

In Spring 2020, there were 23 registrations of 23 birds resulting in a total of 3,915 at risk flight seconds.

During the Summer 2020 surveys there was a total of 20 registrations concerning 20 individual birds, all of which were at risk height. A total of 3,075 at risk flight seconds were recorded.

In Autumn 2020, there was a total of 16 registrations concerning 16 individual birds, all of which were at risk height. A total of 2,295 at risk flight seconds were recorded.

In Winter 2020/21, there was a total of 10 registrations concerning 10 individual birds, all of which were at risk height. A total of 1,485 at risk flight seconds were recorded.

The results of the CRM are shown below (Table 5-10) which indicate the Project would result in combined 3.128 collisions per annum based on 95% avoidance.

Table 5-10: Predicted Collisions Per annum – Eurasian Griffon Vulture

Season	Predicted Collisions
Collisions Spring 2020	27.282
Collisions Spring 2020 with 95% Avoidance	1.364
Collisions Summer 2020	24.835
Collisions Summer 2020 with 95% Avoidance	1.242
Collisions Autumn 2020	13.412
Collisions Autumn 2020 with 95% Avoidance	0.671
Collisions Winter 2020/21	8.753
Collisions Winter 2020/21 with 95% Avoidance	0.438
Total Collisions Per annum	**62.56**
Total Collisions Per annum with 95% Avoidance	**3.128**

Egyptian Vulture (*Neophron percnopterus*) – IUCN Endangered

Egyptian Vulture are a widespread summer breeding species within Uzbekistan. This species migrates in the spring and autumn and does not overwinter in Uzbekistan. No nests of this species were noted within the Project area although nesting of this species is likely within the IBA to the north of the Project site. During the raptor search completed in August, 12 individuals were noted on a rock face in the eastern side of the IBA in proximity to large, but unoccupied nests. Due to the number of registrations of this species during the Summer 2020 surveys it is considered likely that this species does breed within the vicinity of the Project.

Egyptian Vulture were recorded in all three of the survey seasons. In Spring, there was a total of 55 registrations of 55 individual birds, all of which were at collision risk height. A total of 8,085 at risk flight seconds were recorded.

During the Summer 2020 surveys, there was a total of 70 registrations concerning 71 individual birds, all of which were at risk height. A total of 11,895 at risk flight seconds were recorded.

In Autumn 2020, there was a total of 19 registrations concerning 19 individual birds, all of which were at risk height. A total of 3,020 at risk flight seconds were recorded.

The results of the CRM are shown below (Table 5-11) which indicate the project would result in combined 5.859 collisions between spring and autumn, based on 95% avoidance.

Table 5-11: Predicted Collisions March to November – Egyptian Vulture

Season	Predicted Collisions
Collisions Spring 2020	36.826
Collisions Spring 2020 with 95% Avoidance	1.841
Collisions Summer 2020	69.436
Collisions Summer 2020 with 95% Avoidance	3.472
Collisions Autumn 2020	10.919
Collisions Autumn 2020 with 95% Avoidance	0.546
Total Collisions Per annum	**117.2**
Total Collisions Per annum with 95% Avoidance	**5.859**

Bearded Vulture (*Gypaetus barbatus*) – IUCN Near Threatened

Bearded Vulture are widely distributed throughout Uzbekistan however are not considered to breed within the Project area and nests indicative of this species were not recorded on the raptor nest search, although adults were noted resting on a rock face close to nests of Eurasian Griffon and Egyptian Vultures within the IBA to the north of the site.

Bearded Vulture were recorded within the Autumn and Winter VP surveys. They were sighted during Spring VP surveys however at that point were only considered a secondary species due to not being of conservation concern. As a result of this, detailed flight lines where not recorded. Bearded Vulture were not recorded during the Summer VP surveys but two birds were sighted twice in August 2020 during nest searches within the Project boundary and within the adjacent IBA.

In Autumn 2020, there was two registrations concerning two individual birds, both of which were at risk height. A total of 285 at risk flight seconds were recorded.

In Winter 2020/21, there were also two registrations concerning two individual birds, again, both of which were at risk height. A total of 285 at risk flight seconds were recorded.

The results of the CRM are shown below (Table 5-12) and indicate the Project would result in a combined 0.151 collisions per annum based on 95% avoidance.

Table 5-12: Predicted Collisions– Bearded Vulture

Season	Predicted Collisions
Collisions Autumn 2020	1.293
Collisions Autumn 2020 with 95% Avoidance	0.064
Collisions Winter 2020/21	1.719
Collisions Winter 2020/21 with 95% Avoidance	0.086
Total Collisions Per annum	**3.012**
Total Collisions Per annum with 95% Avoidance	**0.151***

* - estimated as likely to occur in the wind farm area in other seasons but this species was not included in the primary list of species until Summer 2020 surveys.

Steppe Eagle (*Aquila nipalensis*) – IUCN Endangered

Steppe Eagle are widespread throughout Uzbekistan and are known to breed in the northern part of Karakalpak Ustyurt, however, do not breed within or adjacent to the Project area. This species also migrates through Uzbekistan in Spring and Autumn.

Steppe Eagle were recorded in all survey seasons. In Spring, there were 41 registrations of 41 birds, all of which were at collision risk height. A total of 6,270 at risk flight seconds were recorded.

During the Summer 2020 surveys, there was a total of 48 registrations concerning 48 individual birds, all of which were at risk height. A total of 7,845 at risk flight seconds were recorded.

In Autumn 2020, there was a total of 30 registrations concerning 30 individual birds, all of which were at risk height. A total of 4,890 at risk flight seconds were recorded.

In Winter 2020/21, there were a total of 14 registrations concerning 14 individual birds, all of which were at risk height. A total of 1,950 at risk flight seconds were recorded.

The results of the CRM are shown below (Table 5-13) which indicate the Project would result in a combined total of 2.088 collisions per annum based on 98% avoidance.

Table 5-13: Predicted Collisions March to November – Steppe Eagle

Season	Predicted Collisions
Collisions Spring 2020	29.564
Collisions Spring 2020 with 98% Avoidance	0.591
Collisions Summer 2020	46.816
Collisions Summer 2020 with 98% Avoidance	0.94
Collisions Autumn 2020	18.303
Collisions Autumn 2020 with 98% Avoidance	0.366
Collisions Winter 2020/21	9.7
Collisions Winter 2020/21 with 98% Avoidance	0.19
Total Collisions Per annum	**104.4**
Total Collisions Per annum with 98% Avoidance	**2.088**

Tawny Eagle (*Aquila rapax*) – IUCN Vulnerable

Tawny Eagle are uncommon throughout Uzbekistan and this species was only recorded once on the spring surveys. This registration was of an individual bird that was migrating through the site and was recorded at risk height for a total of 120 seconds.

The results of the CRM are shown below (Table 5-14) which indicate the Project would result in a combined 0.01 collisions per year based on 98% avoidance.

Table 5-14: Predicted Collisions– Tawny Eagle

Season	Predicted Collisions
Collisions Spring 2020	0.555
Collisions Spring 2020 with 98% Avoidance	0.01
Total Collisions Per annum	**0.555**
Total Collisions Per annum with 98% Avoidance	**0.01**

Golden Eagle (*Aquila chrysaetos*) – Uzbek Red Data Book – Vulnerable: Rare

Golden Eagle are a widespread, resident bird throughout Uzbekistan although they were only recorded flying within the site on the Spring and Winter surveys, a single stationary bird was recorded during the Autumn surveys. There were no registrations of this species in the Summer surveys and nests characteristic of this species were not noted during the dedicated raptor nest search surveys. It was noted however that, during mammal surveys in 2020, the observers identified a Golden Eagle nest at 41°38'16.30"N, 64°28'0.60"E which is on the southern edge of Mount Aktau IBA and approximately 3 km from the nearest WTGs.

During the scoping surveys in October 2019, an individual Golden Eagle was observed on pylons to the south of the Project site (41°32'53.80"N, 64°26'12.87"E), approximately 400 m from the nearest WTG). In addition to the Golden Eagle nest noted above, a feeding station (likely used regularly by Golden Eagle), was identified within the proposed Project site boundary at 41°35'4.80"N, 64°27'41.50"E, this is approximately 500 m from the nearest proposed WTGs.

In Spring 2020, 30 individual birds were recorded flying through the site and all these flights were at risk height. A total of 4,215 at risk flight seconds were recorded.

In Winter 2020/21, there were a total of 31 registrations concerning 31 individual birds, 30 of the recorded flights were at risk height. A total of 4,785 at risk flight seconds were recorded.

The results of the CRM are shown below (Table 5-15) with collisions per annum based on 99% avoidance.

Table 5-15: Predicted Collisions– Golden Eagle

Season	Predicted Collisions
Collisions Spring 2020	22.275
Collisions Spring 2020 with 99% Avoidance	0.223
Collisions Winter 2020/21	26.67
Collisions Winter 2020/21 with 99% Avoidance	0.267
Total Collisions Per annum	**48.94**
Total Collisions Per annum with 99% Avoidance	**0.49**

White-tailed Eagle (*Haliaeetus albicilla*) – Uzbek Red Data Book – Vulnerable: Rare

White-tailed Eagle are rare breeders within Uzbekistan however have a broad distribution during the migration and winter periods. In Winter 2020/21, 10 flight lines of individual birds were recorded with all observations being at risk height. A total of 1,380 at risk flight seconds were recorded.

The results of the CRM are shown below (Table 5-16) with collisions per annum based on 95% avoidance.

Table 5-16: Predicted Collisions– White-tailed Eagle

Season	Predicted Collisions
Collisions Winter 2020/21	7.78
Collisions Winter 2020/21 with 95% Avoidance	0.389
Total Collisions Per annum	**7.78**
Total Collisions Per annum with 95% Avoidance	**0.389**

Booted Eagle (*Hieraaetus pennatus*) – Uzbek Red Data Book – Vulnerable: Declining

Booted Eagle are a species of eagle that breeds in forest habitats and as such are not likely to be breeding on or in the vicinity of the site, which is devoid of forests. Birds were only recorded on the Spring 2020 surveys, which presumably relates to passage or non-breeding first-year birds. There were no registrations of this species for the remainder of surveys.

In Spring 2020, 13 individual birds were recorded flying through the Project site and all of these flights were at risk height. A total of 1,965 at risk flight seconds were recorded.

The results of the CRM are shown below (Table 5-17) with 0.18 collisions per annum based on 98% avoidance.

Table 5-17: Predicted Collisions– Booted Eagle

Season	Predicted Collisions
Collisions Spring 2020	9.167
Collisions Spring 2020 with 98% Avoidance	0.18
Total Collisions Per annum	**9.167**
Total Collisions Per annum with 98% Avoidance	**0.18**

Saker Falcon (*Falco cherrug*) – IUCN Endangered

Saker Falcon are listed on the IBA citation for the adjacent Mount Aktau IBA where between two and 10 individuals were present at the time of designation. They are likely to be present within Uzbekistan as both resident and migratory populations. A nest site was identified in October 2019 at a location south-west of the Project Area however no registrations were recorded on site between Spring and Autumn 2020.

During Winter 2020/21, seven individual birds were recorded flying through the Project site and all these flights were at risk height. A total of 645 at risk flight seconds were recorded.

The results of the CRM are shown below (Table 5-18) with 0.06 collisions predicted per annum based on 98% avoidance.

Table 5-18: Predicted Collisions – Saker Falcon

Season	Predicted Collisions
Collisions Winter 2020/21	2.98
Collisions Winter 2020/21 with 99% Avoidance	0.06
Total Collisions (March to November)	**2.98**
Total Collisions (March to November) with 98% Avoidance	**0.06**

Lesser Kestrel (*Falco naumanni*) – Uzbek Red Data Book – Near Threatened

Lesser Kestrel are listed on the IBA citation for the adjacent Mount Aktau IBA where between 17 and 33 individuals were present at the time of designation. Birds were only recorded in the Project area during Autumn 2020 surveys, which presumably relates to passage birds. There were no registrations of this species throughout the remainder of the surveys.

In Autumn 2020, four individual birds were recorded flying through the Project site and all these flights were at risk height. A total of 570 at risk flight seconds were recorded.

The results of the CRM are shown below (Table 5-19) with 0.099 collisions predicted between Spring and Autumn based on 95% avoidance.

Table 5-19: Predicted Collisions– Lesser Kestrel

Season	Predicted Collisions
Collisions Autumn 2020	1.989
Collisions Autumn 2020 with 95% Avoidance	0.099
Total Collisions Per annum	**1.989**
Total Collisions Per annum with 95% Avoidance	**0.099**

5.8.3.2 Other Species

General

A single record of MacQueen's Bustard (IUCN V and UZ RDB VU:D) was identified during the Winter 2020/21 surveys however this individual was not recorded leaving the ground as such there is no flight data to include in the CRM.

The CRM results for non-IUCN/Uzbekistan Red Data Book species at risk of collision are shown in Table 5-20, with additional details included in subsequent sections. These records relate to birds seen on the Autumn 2020 and Winter 2020/21 surveys, after the priority and secondary species lists had been updated and full flight line data was collected for a wider range of species.

Table 5-20: CRM results for all non-IUCN/Uzbekistan Red Data Book species (All avoidance at 98% except Common Kestrel = 95%)

Common Name	No. Collision	No. Collision with Avoidance
Long-legged Buzzard	19.39	0.388
Common Buzzard	4.283	0.086
Hen Harrier	5.64	0.113
Common Kestrel	25.16	1.258
Little Owl	0.5406	0.011

None of the above species are of international or national conservation concern and likely predicted collision impacts are negligible. As such these species are not discussed further.

5.9 Assessment of Impact

5.9.1 VP Survey

A total of 17 Target or Secondary bird species (that may be at higher risk of risk of impacts through collision or displacement) were recorded during the VP surveys and of these, twelve species (Cinereous Vulture, Eurasian Griffon Vulture, Egyptian Vulture, Bearded Vulture, Golden Eagle, Steppe Eagle, Booted Eagle, Tawny Eagle, White-tailed Eagle, Saker Falcon, Lesser Kestrel and MacQueen's Bustard) are listed as Near Threatened or above on the IUCN Red List or Uzbekistan Red Data Book.

The most frequently recorded birds of conservation concern over the survey period were Egyptian Vulture (144 flights) and Steppe Eagle (133 flights). Spring and Summer were the observation periods with the highest levels of activity overall in terms of time spent in the Project area.

90% of VP sessions recorded between 0 and two flight lines from species of conservation concern, or others considered at risk of collision. No sessions recorded more than four flightlines from these species per observation period.

No species were recorded migrating over the Project site in internationally or nationally significant numbers although a number of species of global and national conservation concern, as well as those listed on the IBA designation were recorded flying over the site.

5.9.2 Raptor Nest Search Survey

A single pair of Common Kestrel and Long-legged Buzzard breed within the Project site. No nests of IUCN or National Red Data Book species were recorded in the Project area. Nests of species of conservation concern (vultures and eagles) were noted from within the IBA to the north of the site.

Additional nest searches of both the Project area and the IBA are currently being completed in Spring 2021.

5.9.3 Construction

5.9.3.1 General

The proposed Project site and WTG locations have been designed to avoid the areas of highest ecological sensitivity. Potential impacts on birds arising during construction comprise:

- Direct loss of vegetation and habitat (including food sources).

- Indirect damage to habitats and disturbance of birds from presence of people, machinery, traffic, and noise, both within and outside of the Project area. This indirect impact could affect species of global and regional conservation concern.
- Indirect impacts associated with pollution.

5.9.3.2 Direct Habitat Loss

The Project area is dominated by native ephemeroid-sagebrush and saltwort-sagebrush plant communities typical for the remnant low mountains of the Kyzylkum Desert and these habitats will be directly impacted by construction activities. Construction areas have been chosen so that they avoid areas of higher ecological value and those that support receptors of greatest sensitivity, such as plant and animal species listed on the IUCN Red List or the Uzbekistan Red Data Book. Where the loss of habitat is unavoidable, only the minimal amount required will be removed.

Direct impacts resulting in the loss of habitat will occur during construction activities and in particular due to the establishment of the construction compound, earthworks for the control centre, WTG foundations and electrical transmission connections, on-site construction roads and construction of off-site access road and grid connection works.

Habitats directly affected by the Project have not been shown to be of significant importance for birds during surveys completed so far.

Detailed Breeding Bird Surveys are taking place throughout the Project site, and wider IBA, in Spring 2021 (estimated completion date is mid-June 2021) and these will allow the impacts of direct habitat loss on breeding species to be fully assessed. However, given that comparable habitat is present in the immediate surrounds, impacts are unlikely to be significant.

No areas used by nesting raptors are being lost as a result of the proposals and based on current data no construction activities will be taking place within 3 km of known nesting locations. Potential mammal prey such as Ground Squirrel species were found in very low numbers within the Project area. As such, based on available data no direct impacts on these nesting raptors are anticipated from construction.

5.9.3.3 Indirect Impacts

There may be a disturbance impact to resident or breeding species during construction. This may lead to short-term loss displacement of birds from feeding, roosting or nesting places. These impacts are considered to be short-term and reversible however will be impacting upon an assemblage of birds which is of conservation importance and as such the anticipated impacts will be significant.

Although not directly affected by the proposals, potential indirect impacts include pollution and increased human pressure across the site which could increase dust levels which in turn could affect the ecological value and function of these habitats and the species they support.

Mitigation for these impacts will be included in the Environmental and Social Management Plan (ESMP) and will include timing works to avoid the periods of highest sensitivity – *e.g*. periods when young birds are in the nest, dust suppression activities (*e.g*. watering of tracks in dry periods, adherence to site speed limits, etc.) and banning of site workers from using vehicles away from the established transport routes.

5.9.4 Operation

5.9.4.1 Collision Risk

General

Of all the species recorded and used in the CRM, four species of conservation importance had an annual collision risk of over one bird. These were: Cinerous Vulture (IUCN NT), Eurasian Griffon Vulture (UzRDB VU:D), Egyptian Vulture (IUCN EN) and Steppe Eagle (IUCN CR).

The following sections express mortality in terms of annual mortality of species of national and international conservation concern.

Notable Species

Cinereous Vulture

Cinereous Vulture are predicted to have an annual mortality of 2.062 individuals based on 95% avoidance. This would equate to approximately 51.55 collisions during the operational lifetime of the Project (assuming 25 years of operation) or 61.86 individuals over a 30-year operational period. The global population of Cinereous Vulture is estimated to be between 15,600 and 21,000 individuals, with the population within the Asian continent estimated to between 5,500 and 8,000 pairs. This species is listed on the IBA citation with an estimated resident population of between eight and 24 individuals, some of which are likely to use the Project area for feeding or commuting over. At the predicted collision rate, unmitigated the Project could cause local extinction of this species within a four-to-12-year period and as such the predicted impacts are considered to be high, long-term and irreversible.

Eurasian Griffon Vulture

Eurasian Griffon Vulture are predicted to have an annual mortality of 3.128 individuals based on 95% avoidance. This would equate to approximately 78.2 collisions during the operational lifetime of the project (assuming 25 years of operation) or 93.84 individuals over a 30-year operational period. The global population of Griffon Vulture is increasing and is currently estimated to be between 500,000 and 999,999 individuals. Data relating to the populations within the Asian continent are not readily available however the population within Uzbekistan was estimated to be between 400 and 600 individuals in the 1980's. It is predicted that impacts to Eurasian Griffon Vulture will be moderate, long-term and reversible (assuming decommissioning at the end of operation).

Egyptian Vulture

Egyptian Vulture are predicted to have an annual mortality of 5.859 individuals based on 95% avoidance. This would equate to approximately 146.475 collisions during the operational lifetime of the Project (assuming 25 years of operation) or 175.77 individuals over a 30-year operational period.

The global population of Egyptian Vulture is declining and estimated at present to be between 12,000 and 38,000 individuals, with the population in central Asia estimated in 2012 to be less than 2,000 pairs. The population in Uzbekistan is estimated to likely be between 134 and 140 pairs[43]. The species is listed on the adjacent IBA citation however no population estimate is given therefore it must be assumed that in absence of mitigation, collisions at the rates stated above would potentially cause local extinction and result in high irreversible negative impacts for this species over the lifespan of the Project.

Steppe Eagle

Steppe Eagle are predicted to have an annual mortality of 2.0885 individuals based on 98% avoidance. This would equate to approximately 52.212 collisions during the operational lifetime of the Project (assuming 25 years of operation) or 62.655 individuals over a 30-year operational period.

The global population of Steppe Eagle is declining and is currently estimated to be between 50,000 and 75,000 individuals and the population in central Asia has been estimated to be between at least 22,000 and 35,500 pairs. All records collected during surveys were of single birds and the species is not known to nest in the Kyzylkum Desert region and it is therefore assumed that individual non-breeding birds only or single birds on passage are using the Project area. In absence of mitigation, collisions at the rates stated above would result in moderate negative impacts for this species over the lifespan of the Project.

Other Species

Golden Eagle

Golden Eagle are predicted to have an annual mortality of 0.489 individuals based on 99% avoidance. This would equate to approximately 12.225 collisions during the operational lifetime of the Project (assuming 25 years of operation) or 14.67 individuals over a 30-year operational period. The global population of Golden Eagle is currently estimated to be between 100,000 and 200,000 individuals and the population in Uzbekistan has been estimated to be approximately 200 pairs. In absence of mitigation, collisions at the rates stated above would result in moderate to high negative impacts for this species over the lifespan of the Project.

[43] The Red Data Book of the Republic of Uzbekistan. Volume 2 (2019)

One IUCN Endangered (Saker Falcon), one IUCN Near Threatened (Bearded Vulture), two IUCN Vulnerable (Tawny Eagle and MacQueen's Bustard) and one IUCN Red Data Book Vulnerable: Declining (Booted Eagle) species were also recorded during the VP surveys, with each of these species present in low numbers and only for limited periods of time (i.e., two seasons or less). Saker Falcon were observed nesting off site during the 2019 scoping surveys and individual birds were found within the Project Area during the winter surveys. None of the above species were recorded regularly enough and/or in large enough numbers at collision risk height to suggest the proposed Project will pose high risk to these species as a result of collisions or displacement and as such no significant negative impacts are predicted.

Additional surveys in Spring 2021 are being carried out to give additional site data and to refine the results of collision risk modelling further still, these will be updated in future versions of this document.

5.9.4.2 Displacement

Displacement occurs at wind farm sites where birds use areas of land for activity such as feeding, roosting and loafing. Whilst displacement will occur on one level with birds flying through the site, this is covered more by barrier effect and accordingly the data from peak counts of birds actively using site habitats is used to assess displacement.

No birds were recorded regularly enough and/or in large enough numbers during the seasons surveyed to date to suggest the proposed Project will have a significant risk to these species as a result of displacement. Feeding resources (e.g. Russian Tortoise and Ground Squirrel species) and evidence of feeding roosts used by eagles were identified during the surveys, however foraging / hunting behaviour was not observed during the surveys completed on the site indicating that these are not important to or well used by raptors. Any displacement impacts by operational WTGs on these areas is therefore likely to be not significant.

5.9.4.3 Barrier Effect

Operational WTGs can cause additional impacts as a result of barrier effect. These effects are a result of birds flying around operational WTG arrays due to natural avoidance behaviour. In some cases, these enforced flights can lead to significant increases in energy expenditure which subsequently can cause a reduction in survivability. At their worst, barrier effects can result in significant population impacts if large numbers of birds are forced to change annual or daily migration patterns.

The migration surveys completed in Spring and Autumn 2020, do not indicate that the proposed Project site is subject to high levels of migration, either in terms of a particular species or the combined migrating assemblage. The Project site is within a large, open and relatively flat landscape and any birds migrating through the operational Project would not have to significantly deviate (either fly around or at greater heights) from their migration route to avoid the WTGs. In isolation, it is therefore considered that the Project will not cause a significant barrier to migrating birds.

The proposed OHLs (which is comprised of two short sections (510 m and 630 m), as well as the existing OHLs that run east-west along the southern part of the Project site (approximately 5 km inside the Project site) and from the south eastern to north western parts of the Project site (for approximately 15.5 km) could have an impact on large soaring birds as a result of collision with the wires or as a result of electrocution when perching on the OHL poles / towers. The survey of these existing routes is ongoing however based on the initial vantage point survey results, there have been zero noted collisions. Transects completed below the OHL in Spring 2021 also do not appear to have encountered any carcasses therefore it is considered that impacts associated with collision will not be significantly increased above the risks currently posed with the addition of two small OHLs for connection of the Project to the existing network. Adding markers to the new OHLs will increase visibility to birds and reduce the risk of collision and addition of markers for up to 22.3 km within the Project site will ensure that collision rates remain low on site.

Several species of large raptor have been recorded sitting on existing pylons meaning there is the threat of electrocution of these animals which would result in a negative impact of moderate significance. Mitigation will be undertaken on all pylons within the Project area to reduce the likelihood of electrocution, along with inclusion in any carcass monitoring protocol that is introduced and taking this into consideration it is likely that any impacts will be minor and not significant.

5.9.5 Decommissioning

Similar to construction, the main impacts during decommissioning are likely to comprise habitat loss and disturbance to birds. The exact potential impacts of decommissioning will be assessed in detail at a later stage, prior to decommissioning. Following decommissioning, reinstatement will be important to re-establishing the ecosystems in areas previously occupied by WTGs, site roads and other structures, with habitats rehabilitated to a natural, non-degraded state. At the time of decommissioning, the sensitivity of some species, particularly those birds which are regionally rare, may have increased.

5.9.6 Cumulative Impacts

Whilst all individual projects or actions affect their environment, the combined or cumulative effects of multiple projects of actions can be greater than the sum of their individual parts (Canter and Kamath 1995[44]). This is especially pertinent where these individual projects are similar, and any resultant impact will affect similar ecological receptors. The proposed Project is the first of its kind in the region as such cumulative impacts of multiple wind energy developments will not be a significant impact at any level.

Part of the work to the Navoi – Besopan OHL will take place within the AoI for the Project, with the northern end of the proposed upgraded line starting within 2 km of the nearest proposed WTG. The ESIA document for this development details construction impacts for the entirety of the proposed route as site clearance and excavation and finds these to be direct, temporary and of negligible significance for habitats and protected areas, negligible for flora and avifauna, and of minor significance for terrestrial fauna.

Operational impacts for the entirety of the proposed route are defined as being the presence of the OHL and towers and are considered to be direct, long-term and of negligible significance for habitats and protected areas, negligible for flora and fauna, and of moderate significance for avifauna due to risk of collision with wires or through electric shock to perching/nesting birds. Mitigation to reduce collisions and the likelihood of electrocution are included in the ESIA document for the areas considered to be of highest importance for birds, the closest of which is approximately 100 km from the Zarafshan Project site.

[44] Canter and Kamath, 1995. L.W. Canter, J. Kamath Questionnaire checklist for cumulative impacts. Environmental Impact Assessment Review, 15 (4) (1995), pp.

Cumulative impacts resulting from the operation of both projects in combination are considered to be long term and of moderate significance for avifauna.

5.10 Mitigation

The predicted impacts of construction are low and not significant based on survey information obtained so far, however mitigation during construction will include timing work to remove suitable nesting habitat to avoid the most sensitive times of year for ground nesting species to be done under the supervision of an on-site ecologist. Additional Bird Surveys have taken place in Spring 2021 (completed end of May to mid-June 2021) and the assessment will updated to incorporate these findings within the Final ESIA.

This mitigation and monitoring is presented broadly within this section and will go on to form the basis of a more detailed Adaptive Management and Monitoring Plan (AMMP).

The AMP will include the details of general and species-specific mitigation and monitoring and be used to ensure that any changes of site use over time are understood and no impacts on species of conservation concern develop unnoticed throughout the life of the project.

WTGs have been microsited so that all proposed WTG locations are located at least 500 m from areas known to be used by feeding and roosting species considered most at risk of the operational wind farm.

Once operational, the levels of predicted collisions between some species of bird and the WTGs will potentially result in significant negative impacts to four species of conservation concern. Based on the data collected to date, impacts to Cinerous Vulture and Egyptian Vulture have been assessed to be of high significance and impacts to European Griffon Vulture and Steppe Eagle have been assessed to be of moderate significance.

Mitigation to avoid impacts to sensitive species of bird will be implemented by the Project and will be reviewed, updated and adapted regularly using the pre-construction and operational survey data. The following mitigation strategy will be implemented:

- Finalisation of the Critical Habitat Assessment (CHA) (outline set out in Appendix 6 of this ESIA) in accordance with IFC PS 6 for species of conservation concern (IUCN VU, EN or CR) or those associated with the adjacent designated site identified during surveys. This will be finalised at the end of surveys to allow a full data set to be included (and will also include terrestrial ecology survey findings).

- Utilise coloured blades (as per standard aviation markings) on individual WTG blades to increase visibility of the operational WTGs and potentially reduce collisions in species such as Golden Eagle and Steppe Eagle.
- Shut down WTGs in the event that any individual priority species or significant flock of non-priority species (lists to be determined in an ESMP) flies within 500 m of WTGs. The shutdown procedures would require suitably trained and experienced surveyors to be present over a number of VPs to view the entire Project site along with a 500 m buffer to relay information back to the control building in the event of a priority species observed moving toward an operational WTG. Shut down on demand protocols would be required for the entirety of the operational period of the Project unless data to suggest the contrary is collected and further agreement is reached.

  Data from the 2020-21 surveys suggests that general flight activity at the site is low, with over 90% of observation periods recording two flights or less. None of the 3 hr VP sessions recorded more than four flight lines therefore it is not anticipated that bird activity would be overwhelming for observers to cope with and risk missing birds flying at collision risk height.
- Shut down on demand observations should be carried out by suitably trained and experienced individuals. There is however a recognised potential skills gap within the country, where the number of operating ornithologists is likely to be limited. If this is the case the Project will commit to recruiting and training survey teams (from the local community or College/Universities) who would work alongside existing and experienced surveyors until such a time as they are deemed competent in the required survey methods, bird identification in the field, recording and communication protocols.
- Estimates on shut down on demand timings have been made based on activity recorded (using flight line and flight time data) over Spring, Summer and Autumn 2020. These calculations made the assumption that birds would continue to use the Project area in the same way post construction as they did in the 2020 seasons and exercise zero avoidance of WTGs. This is considered a precautionary approach to calculating the shutdown time. Bearing this in mind the hours of shutdown over the project site have been estimated at 864 hrs for Spring (9.4 hrs per WTG), 778 hrs for Summer (8.5 hrs per WTG) and 326 hrs for Autumn (3.6 hrs per WTG).

- Carcass clearing from the Project site and wider area for the duration of the Project life to deter carrion feeders from feeding within the Project boundary. This could be coupled with the creation of several carcass dumps well outside of the wind farm to encourage feeding in 'safe areas'. Any carcasses used as such facilities would need to be safe for raptors to consume. A specialist is not required to conduct this work and can be done by any designated Project employee.
- The Project will also undertake a campaign to stop persecution of raptors and other species groups (e.g., reptiles) by locals as well as educating shepherds in the use of animal treatments (e.g. diclofenac) which are potentially harmful to raptors, particularly vulture species.
- The mitigation strategy would however be reviewed annually to take in to account any natural changes in the baseline value of the ornithological receptors.

It may be possible for this Project to utilise a technology-led shut down (e.g., radar or a system such as Identiflight[45] automatic bird detection cameras) however any technology-led scheme will need to be supported by observers in the early phases of operation to ground truth the findings and establish that the technology-led scheme will work.

In order to reduce the possible impact of electrocution of birds perching on new and existing OHLs, it is recommended that there is a 300 cm minimum horizontal separation between energized conductors and/or energized conductors and grounded hardware and a vertical separation of at least 120 cm. These separations accommodate the typical height of the largest eagle species recorded and wrist to wrist widths of the largest vulture species. If adequate spacing cannot be provided, the hardware will need to be insulated against simultaneous contact. Material should be used to cover both the conductor and installation and if transformers, cut-outs or other energized or grounded equipment are present on the structure, jumpers, cut-outs and brushing should also be covered to decrease the chance of a bird electrocution.

The mitigation proposed for the OHL within the Project area should also be included in collaboration with the proposed Navoi – Besopan OHL upgrade project at locations where the new OHL is at its closest to the Project area. Doing this would be expected to reduce the levels of predicted cumulative impacts from moderate to minor significance.

[45] https://www.identiflight.com/

5.11 Residual Impacts

It is considered likely that the careful site selection of the WTGs (avoidance and reduction of impacts) along with standard mitigation and monitoring measures included above will result in residual impacts that will be considered as being not significant. This will however be updated on completion of the final ornithological assessment once all fieldwork has been completed (mid-June 2021). All updates will be included within the Final ESIA document.

5.12 Enhancement

Where possible, areas of land procured for the Project should be enhanced for birds (and other wildlife). This will include restricting human access to certain parts of the site and allowing areas of natural vegetation to grow that would otherwise have been grazed or destroyed by vehicle movements. A programme to discourage locals from removing vegetation or hunting in the area would also be very beneficial.

Erecting nest boxes suitable for falcon species (such as Saker Falcon and Lesser Kestrel) on pylons outside of the Project area (to the west and north-west) will enhance nesting opportunities for these species.

5.13 Monitoring

In addition to the ongoing operational monitoring detailed above (which includes shutdown on demand) operational monitoring should also include post construction fatality monitoring. The protocol for this will be fully agreed within an AMP with methods also applicable to bats.

The three approaches detailed below will collectively provide an understanding of the impact of the operational WTGs on the birds that are using the Project site.

- Searcher Efficiency Trials:
    - Searcher efficiency trials will be undertaken pre-operation and then on a seasonal basis (Spring, Summer, Autumn and Winter) during operation in order to evaluate the efficiency of the carcass search survey.
    - Results of the trials will be assessed and if needed the carcass search methods and procedures within the AMP adjusted.
- Carcass Removal Trials:

  - Carcass removal trials are a continuity of the searcher efficiency trials with the same carcasses that were located in the searcher efficiency trials (from the second searcher efficiency trial onwards), being revisited on specific intervals to assess the carcass removal by scavenging animals.
  - Each carcass that was placed out will need to be visited on days 1, 2, 3, 4, 7, 10 14, and 20 after being placed.
  - On completion of the carcass removal trials, results and any other relevant information will enable assessment of removal rates and if needed, provide an update to the carcass search methods/procedures detailed within this AMP.
- Carcass Search:
  - Carcass search frequency and coverage will be fully confirmed after the first of the searcher efficiency and carcass removal trials and updated based on ongoing trials but will likely initially take place twice weekly for at least one full year as well as including additional monitoring during the Spring and Autumn migration seasons in Years 2 and 3.
  - A plot under each WTG measuring a minimum of 50 m x 50 m, will be searched for carcasses with each plot centered on a WTG and the sides orientated north/south, east/west.
  - If a carcass is found details such as species, GPS position, distance from WTG obtained as well as photographs of carcass, location and the state of each carcass will be recorded.
  - The issued results and information will be assessed using the most appropriate fatality estimation tool (*e.g.* GenEst or the Evidence of Absence software packages), and the AMP adjusted where appropriate including increases/decreases in search frequencies or extent of searches.

If there is a significant increase in the flight activity recorded over the Project site that may lead to higher collision risk than predicted, or high rates of carcasses found (over that which has been predicted) additional mitigation may be required including further shut-down measures. Breeding bird surveys, including detailed raptor nest searching within the Project site and wider area, should be undertaken in years 2, 5, 10 and 20 of operation to monitor the breeding bird assemblage on the Project site and in the adjacent IBA. This will allow assessment of predicted impacts from habitat loss during construction and displacement from the operational wind farm to be verified.

6 Terrestrial Ecology

6.1 Introduction

6.1.1 General

This chapter was prepared by Turnstone Ecology Ltd and describes and evaluates the potential ecological impacts of the proposed Project and associated works on flora and fauna. The species groups included within this chapter are as follows with a separate chapter covering birds.

- Flora (including general habitats).
- Herpetofauna.
- Invertebrates.
- Mammals (excluding bats).
- Bats.

Where appropriate, mitigation measures are detailed to reduce adverse impacts and / or enhance benefits.

6.1.2 Project Overview

A full description of the Project including number of WTGs and extent of roads, sub-stations and other buildings as well as location and extent of grid connection works are included in Chapter 2 and shown in Volume 2, Figure 2-1.

The methods of survey were based on a layout of up to maximum of 125 proposed WTG locations within the supplied site boundary although the assessment and evaluation is being completed based on the current proposed layout of 111 WTG locations.

6.1.3 Objectives

This chapter has been informed by data collected from literature reviews and surveys completed on, and in the vicinity of, site between October 2019 and March 2021. Data collection is still ongoing on site, with final completion of surveys due in late Spring 2021. Following this the results, assessment and mitigation measures will be updated where appropriate.

The field surveys were / are being completed in order to:

- Provide site survey information to help confirm accuracy of the background data search and information obtained from published literature.
- Confirm habitats present on site and in the wider vicinity.

- Confirm species use at the time of proposals.
- Gain an understanding of species use throughout the year.

All of the above were completed to be able to robustly assess the likely risk to habitats and species on, and in the vicinity of, the development site from the proposed Project.

The field survey was undertaken primarily over two areas:

- Proposed Project site.
- The wider vicinity (within areas of un-modified habitats near to site, within nearby designated site boundaries and connected habitats considered contiguous with them, in particular the nearby designated site, Mount Aktau Important Bird Area (IBA), which has species of mammal, reptile, invertebrate and plant listed as important non-bird considerations in the site citation).

6.2 Assessment Methodology

The sections below describe the methodology utilised to carry out the terrestrial ecology assessment.

6.2.1 Impact Assessment Methods

6.2.1.1 General

The impact assessment process is adapted from the UK Chartered Institute of Ecology and Environmental Management (CIEEM) "*Guidelines for Ecological Impact Assessment in the UK and Ireland*" 2018.

There are a number of approaches for determining the significance of effects on ecological features. This includes methods for scoring and ranking impacts on the basis of subjective criteria. Results are often presented in the form of a matrix in which ecological value/importance and magnitude of impact are combined into a significance score. A matrix approach is commonly used in ESIA by disciplines other than ecology to assign significant residual effects to categories (*e.g*. major, moderate, minor).

When using a matrix approach within ecology chapters, it can be less easy to make a clear distinction between evidence-based and value-based judgements in order that decision makers and other stakeholders are aware of the level of subjective evaluation that has been used. Accordingly, the CIEEM Guidelines avoid and discourage use of the matrix approach and categorisation and make it clear that the suggested approach should be used only where categorisation has been specifically required. Spurious quantification can be avoided using the recommended methods where numerical scores or significance rankings/categories without a clear definition of the criteria and thresholds that underpin them are not used.

6.2.1.2 Introduction to assessment guidelines

The impact assessment process involves:

- Identifying and characterising impacts and their effects.
- Incorporating measures to avoid and mitigate negative impacts and effects.
- Assessing the significance of any residual effects after mitigation.
- Identifying appropriate compensation measures to offset significant residual effects.
- Identifying opportunities for ecological enhancement.

The assessment should include potential impacts on each ecological feature determined as 'important' from all phases of the Project, *e.g*. construction, operation and decommissioning. Impacts should be characterised, through consideration of their magnitude and/or extent, the route through which they occur (whether direct, indirect, secondary or cumulative) and their duration and their reversibility. Positive impacts should be assessed as well as negative ones.

The assessment of impacts should take into account the baseline conditions to allow:

- A description of how the baseline conditions will change as a result of the Project and associated activities.
- The identification of cumulative impacts arising from the proposal and other relevant developments.

6.2.1.3 Predicting Impacts and Effects

The process of predicting ecological impacts and effects should take account of relevant aspects of ecosystem structure and function.

Available resources:

- Territory – hunting/foraging grounds, shelter and roost sites, breeding and spawning sites, corridors for migration and dispersal, stop-over sites.
- Food and water (quantity and quality).
- Soil minerals and nutrients and hydrochemistry.
- Solar radiation, light penetration and gaseous resources.
- Water movement and connectivity.
- Environmental processes
- Flooding, drought, wind blow and storm damage, disease, eutrophication, erosion, deposition and other geomorphological processes, fire, temperature fluctuations and climate change.

Ecological processes and relationships:

- Population dynamics – population cycles, survival / reproduction rates, competition, predation, seasonal behaviour, dispersal / genetic exchange.
- Vegetation dynamics– colonisation, succession, competition, and nutrient-cycling.
- food webs, predator-prey relationships, herbivore food-source relationships, herbivore-carnivore relationships, adaptation, and dynamism
- Decomposer, primary producer, parasite, predator, keystone species.

Human influences:

- Animal husbandry, cutting, burning, mowing, draining, irrigation, culling, hunting, excavations, dredging, ground profiling, water abstraction, ploughing, seeding, planting, cropping, fertilising, pesticides, herbicides, pollution and contamination, introduction of non-native species, weeds and genetically modified organisms, disturbance from public access and recreation, pets, transport.

Historical context:

- Natural range of variation over recorded historical period.
- Irregular perturbations beyond normal range (e.g. very infrequent storm events).
- Historical human influence, e.g. water quality changes, land claim, species exploitation.
- Geomorphological evolution.

Ecosystem properties:

- Fragility and stability, carrying capacity and limiting factors, productivity.
- Connectivity.
- Open/closed system.
- Source/sink.
- Numbers in a population or meta-population, minimum viable populations.
- Sex and age ratios.
- Patchiness and degree of fragmentation.
- Ecological coherence.

Other environmental influences:

- Air quality.
- Hydrology and water quality.
- Nutrient status and salinity.

6.2.2 Characterising Ecological Impacts

6.2.2.1 General

When describing ecological impacts and effects, reference should be made to the following characteristics as required:

- Positive or negative.
- Extent.
- Magnitude.
- Duration.
- Frequency and timing.
- Reversibility.

6.2.2.2 Positive or negative

Positive and negative impacts and effects should be determined according to whether the change is in accordance with nature conservation objectives and policy:

- Positive – a change that improves the quality of the environment e.g. by increasing species diversity, extending habitat or improving water quality. This may also include halting or slowing an existing decline in the quality of the environment.
- Negative – a change which reduces the quality of the environment e.g. destruction of habitat, removal of foraging habitat, habitat fragmentation, pollution.

6.2.2.3 Extent

The extent is the spatial or geographical area over which the impact/effect may occur under a suitably representative range of conditions (*e.g.* noise transmission under water).

6.2.2.4 Magnitude

Magnitude refers to size, amount, intensity and volume. It should be quantified if possible and expressed in absolute or relative terms e.g. the amount of habitat lost, percentage change to habitat area, percentage decline in a species population.

6.2.2.5 Duration

Duration should be defined in relation to ecological characteristics (such as the lifecycle of a species) as well as human timeframes. For example, five years, which might seem short-term in the human context or that of other long-lived species, would span at least five generations of some invertebrate species.

The duration of an activity may differ from the duration of the resulting effect caused by the activity. For example, if short-term construction activities cause disturbance to birds during their breeding period, there may be long-term implications from failure to reproduce that season.

Impacts and effects may be described as short, medium or long-term and permanent or temporary. These will need to be defined in months/years.

6.2.2.6 Frequency and timing

The number of times an activity occurs will influence the resulting effect. For example, a single person walking a dog will have very limited impact on nearby wading birds using wetland habitat, but numerous walkers will subject the waders to frequent disturbance and could affect feeding success, leading to displacement of the birds and knock-on effects on their ability to survive.

The timing of an activity or change may result in an impact if it coincides with critical life-stages or seasons *e.g.* bird nesting season.

6.2.2.7 Reversibility

An irreversible effect is one from which recovery is not possible within a reasonable timescale or there is no reasonable chance of action being taken to reverse it. A reversible effect is one from which spontaneous recovery is possible or which may be counteracted by mitigation. In some cases, the same activity can cause both reversible and irreversible effects.

6.2.2.8 Assessment of Cumulative Impacts and Effects

Cumulative effects can result from individually insignificant but collectively significant actions taking place over a period of time or concentrated in a location. Cumulative effects are particularly important in impact assessment as ecological features may be already exposed to background levels of threat or pressure and may be close to critical thresholds where further impact could cause irreversible decline. Cumulative effects can also make habitats and species more vulnerable or sensitive to change. Cumulative effects are detailed further Chapter 4.

6.2.2.9 Assessment of Residual Impacts

After assessing the impacts of the proposal, all attempts should be made to avoid and mitigate ecological impacts. Once measures to avoid and mitigate impacts have been finalised, assessment of the residual impacts should be undertaken to determine the significance of their effects on ecological features. Any residual impacts that will result in effects that are significant, and the proposed compensatory measures, will be the factors considered against conservation objectives (legislation and policy) in determining the outcome of the application.

6.2.2.10 Significant Effects

Significance is a concept related to the weight that should be attached to effects when decisions are made. For the purpose of impact assessment, 'significant effect' is an effect that either supports or undermines biodiversity conservation objectives for 'important ornithological features' or for biodiversity in general. Conservation objectives may be specific (*e.g*. for a designated site) or broad (*e.g*. national/local nature conservation policy) or more wide-ranging (enhancement of biodiversity). Effects can be considered significant at a wide range of scales from international to local.

A significant effect is simply an effect that is sufficiently important to require assessment and reporting so that the decision maker is adequately informed of the environmental consequences of permitting a project. A significant effect is a positive or negative ecological effect that should be given weight in judging whether to authorise a project: it can influence whether permission is given or refused and, if given, whether the effect is important enough to warrant conditions, restrictions or further requirements such as monitoring. A significant effect does not necessarily equate to an effect so severe that consent for the project should be refused planning permission.

In broad terms, significant effects encompass impacts on the structure and function of defined sites, habitats or ecosystems and the conservation status of habitats and species (including extent, abundance and distribution). Significant effects should be qualified with reference to an appropriate geographic scale (*e.g*. local, regional, country).

When seeking mitigation or compensation solutions, efforts should be consistent with the geographical scale at which an effect is significant. For example, mitigation and compensation for effects on a species population significant at a county scale should ensure no net loss of the population at a county scale. The relative geographical scale at which the effect is significant will have a bearing on the required outcome which must be achieved.

6.2.3 Determining Ecologically Significant Effects

6.2.3.1 Designated/defined sites and ecosystems

Significant effects encompass impacts on the structure and function of defined sites and ecosystems. The following need to be determined:

- For designated sites – is the Project and associated activities likely to undermine the conservation objectives of the site, or positively or negatively affect the conservation status of species or habitats for which the site is designated, or may it have positive or negative effects on the condition of the site or its interest/qualifying features?
- For ecosystems – is the Project likely to result in a change in ecosystem structure and function?

Consideration should be given to whether:

- Any processes or key characteristics will be removed or changed.

- There will be an effect on the nature, extent, structure and function of component habitats.
- There is an effect on the average population size and viability of component species.

Consideration of functions and processes acting outside the formal boundary of a designated site is required, particularly where a site falls within a wider ecosystem *e.g.* groundwater dependent terrestrial ecosystems can be damaged where the proposed activity impacts on the quantity or quality of groundwater that feeds these habitats. Predictions should always consider wider ecosystem processes.

Information pertaining to protected areas were sourced from the Bird Life Data Zone with regards to Important Bird Areas (IBAs) as well as through consultation with local experts regarding locally or nationally protected areas in the vicinity of the wind farm.

6.2.3.2 Habitats and species

Consideration of conservation status is important for evaluating the effects of impacts on individual habitats and species and assessing their significance:

- Habitats – conservation status is determined by the sum of the influences acting on the habitat that may affect its extent, structure and functions as well as its distribution and its typical species within a given geographical area.
- Species – conservation status is determined by the sum of influences acting on the species concerned that may affect its abundance and distribution within a given geographical area.

In many cases (*e.g.* for species and habitats of principal importance for biodiversity), there may be an existing statement of the conservation status of a feature and objectives and targets against which the effect can be judged. However, not all species or habitats will be described in this way and the conservation status of each feature being assessed may need to be agreed with the relevant statutory nature conservation body and set out in the impact assessment. The conservation status of a habitat or species will vary depending on the geographical frame of reference.

When assessing potential effects on conservation status, the known or likely background trends and variations in status should be taken into account. The level of ecological resilience or likely level of ecological conditions that would allow the population of a species or area of habitat to continue to exist at a given level or continue to increase along an existing trend or reduce a decreasing trend, should also be estimated.

National and regional Red List data books as well as other available sources (e.g. IUCN, Habitats Directive Annexes) were used to inform the impact assessment when characterising species sensitivity.

6.2.4 Precautionary Principle

The evaluation of significant effects should always be based on the best available scientific evidence. If sufficient information is not available further survey or additional research may be required. In cases of reasonable doubt, where it is not possible to robustly justify a conclusion of no significant effect, a significant effect should be assumed. Where uncertainty exists, it must be acknowledged in the assessment.

6.2.5 Background Data

Extensive literature and background record searches have been completed in connection with each survey discipline to inform the species status and likelihood of occurrence in the Project Area. These searches are detailed further in each specific section.

6.2.5.1 Protected Areas

Information pertaining to protected areas were sourced from the Bird Life Data Zone with regards to Important Bird Areas (IBAs) as well as through consultation with local experts regarding locally or nationally protected areas in the vicinity of the wind farm.

6.2.5.2 Important Species

National Red list data books as well as other available sources (e.g. IUCN, Habitats Directive Annexes) were used to inform the impact assessment when characterising species sensitivity.

6.2.6 Field Survey

6.2.6.1 General

Flora and fauna field surveys are ongoing within and immediately adjacent to the proposed Project (including the Mount Aktau IBA). Surveys have been undertaken during 2019, 2020 and 2021and, to date, have included surveys of habitats and flora, terrestrial mammals, bats, birds (detailed in Chapter 5), invertebrates and reptiles. Terrestrial surveys are anticipated to be completed by the end of June 2021.

6.2.6.2 Survey Area

The proposed wind farm site itself was surveyed to understand direct impacts from loss of habitat and impact of disturbance and harm to species present during construction and operation works.

The OHLs required for the Project measure approximately 1.1 km in total and are all situated within the main Project area and therefore survey results and impacts associated with these are incorporated into each receptor group.

The wider vicinity survey covers the areas surrounding the proposed development site within which it is assessed that habitats or species could be directly impacted (*e.g.* by destruction of habitats or disturbance) or indirectly impacted (*e.g.* removal of feeding areas or a commuting route). Due to the differences in behaviour of the species present in the area as well as the differences in habitat requirements there is no defined range to which this area covers.

The location of the Project area is shown in Figure 6-1.

Figure 6-1:Project Area Boundary

6.2.6.3 General Survey Methods

Wind farms can affect flora and fauna in the following ways:

I. Direct habitat loss or injury and killing.
II. Loss or damage to commuting and foraging habitat, (wind farms may form barriers to commuting or seasonal movements and can result in severance of foraging habitat).
III. Loss of, or damage to, refuges or burrows.
IV. Displacement of individuals or populations (due to wind farm construction or because animals avoid the wind farm area).

The above information should be interpreted in the context of likely impacts on local habitats and populations. Relevant factors that should be considered include whether populations are at the edge of their range, cumulative effects, presence of protected areas designated for their flora and fauna interest and proximity to important sites for species.

For each of these three risks, detailed knowledge of flora and fauna distribution is necessary in order to predict the potential effects of the wind farm on them.

Species lists and details of any protected or notable species were provided on completion of each of the expeditions and are included in this chapter.

Whilst on site undertaking other ecological surveys, all specialists were instructed to also record incidental sightings of protected or notable fauna species on the site (*e.g.* mammals and reptiles seen by bird surveyors or birds and mammals recorded at night by the bat surveyors).

During the scoping survey visit, Ecologists from Turnstone Ecology also made records of incidental sightings that were observed during their time on site.

6.2.6.4 Habitats and flora

A botanical specialist completed walkover surveys of the proposed Project area and OHL routes in October 2020, further surveys have been completed in May and June 2021, the results of which are to be updated for the Final ESIA. Vegetation structure and species composition was described from 50 x 50 m geobotanical sample plots (squares) chosen in an area with homogeneous vegetation, representative for each survey locations, 14 survey areas were used and these are considered representative of the overall site and the habitats contained within. Sample plots (squares) were located away from roads and boundaries between different vegetation communities (coordinates of these boundaries observed during the survey were recorded separately where encountered).

For each location, photographs of the landscape and vegetation were taken using a digital camera, and the following data were recorded: location and physical environment (including GPS coordinates, elevation, topography, and soil), state of vegetation and disturbance factors (grazing, etc.), plant association, canopy cover (%), canopy height, all plant species present at the plot, their cover and abundance, phenological stage and height. Micro complexes (e.g. along dry riverbeds) were described separately. Coordinates of populations of endemic, red listed or alien species, number of individuals and area occupied by populations also were recorded.

The main aims of the surveys were to broadly categorise the habitat types of the site and compile basic species lists, and to confirm the presence/likely absence of any species of importance (IUCN and Red Data Book of Uzbekistan 2019).

Species cover and abundance was determined using the Braun-Blanquet cover-abundance scale (1965), widely used in geobotanical and ecological studies as a rapid visual assessment technique, but robust and highly repeatable, minimizing among-observer differences:

+ – occasional and less than 1% cover of the sample plot area.

1 – abundant with low cover, or less abundant but with higher cover, 1–5% of the sample plot area.

2 – abundant with >5–25% of the sample plot area, irrespective of the number of individuals.

3 – >25–50% cover of the sample plot area, irrespective of the number of individuals.

4 – >50–75% cover of the sample plot area, irrespective of the number of individuals.

5 – >75% cover of the sample plot area, irrespective of the number of individuals.

6.2.6.5 Herpetofauna

The herpetofauna study comprised of literature and online resource searches of species and region accounts to determine what species may be present on site, and on-site field survey which was completed in October 2020 and April 2021. During the field survey an attempt was made to assess the status of reptiles and amphibians in the study area (specification of the species and quantitative composition, territorial distribution, including places of concentration, the state of habitats).

The field survey entailed a mix of stationary point surveys and transect surveys which were focused on representative habitats across the proposed Project Area.

The field research methodology aims to understand:

- Species composition in the study area.
- Distribution across habitats.
- Daily and seasonal changes in activity.

Thus, the method of quantitative assessment was based on the ecology of the species under consideration, landscape and geographical conditions, season and type of work.

The quantitative assessment of reptiles and amphibians was mainly based on the transect survey. The transect method consists of counting individuals along a route with the length of the survey determined depending on the type of reptile and the area covered but did not exceed 1 km in one direction. In this case, all individuals encountered on the transect are registered, regardless of the distance they are identified at. The perpendicular distance is measured between the transect axis and each individual. The results are then used to calculate the density of recorded reptiles. The 1 km transect was chosen because heaviest errors arise when long transects are used for species that, like the Russian Tortoise, have high density, daily and seasonal activity cycles fluctuations with high peak values, and are caused by incorrect selection of a minimum survey area for a particular species (Vashetko et al, 2001).

The reptiles' population density (**D**) was calculated using the following formula (Bondarenko & Chelintsev, 1996[46]):

$$\boldsymbol{D = \frac{n}{2LB}}$$

where **n** – number of animal individuals recorded on the transect; **L** – length of the transect; **B** – formula to calculate an effective width of the survey strip:

$$\boldsymbol{B = W(0,79F + 0,21F^4)}$$

where **W** – width of the limited strip on both sides of the transect axis; **F**:

$$\boldsymbol{F = \frac{2y}{W}}$$

Formula to calculate a relative statistical error **e(D)**:

$$\boldsymbol{e(D) = \frac{1,25 + 0,1F}{\sqrt{k}}}$$

[46] Bondarenko, D.A. and Chelintsev, N.G., Comparative Evaluation of Different Methods of the Line Transect Census of Desert Reptiles, *Byull. Mosk. O-va Ispyt. Prir., Otd. Biol.*, 1996, vol. 101, no. 3, pp. 26–35.

where **k** – number of records of individuals on the transect.

The use of perpendicular distances to carry out survey on a strip of limited width excludes underestimation of the population density of the reptiles caused by a decrease in their detectability in remote parts of the survey strip, regardless of the degree of its limitation (Bondarenko & Chelintsev, 1996).

The abundance of the reptiles in habitats is estimated using the following population density scale for 1 ha (Kuzyakin, 1962[47]): 0.1 – 0.9 – rare, 1.0 – 9.9 – common, 10.0 and higher – abundant.

6.2.6.6 Invertebrates

Research into the invertebrate species present within the Project area has combined desk-based studies on the Kyzylkum Desert and transects and point / area studies conducted at the same locations as studied during floral and reptile surveys. Field studies were completed in October 2020 with additional surveys being completed in between 09 and 22 April 2021.

Area studies collected entomologic material using a combination of Barber pitfall traps, light traps, Moericke traps, malaise traps and hand nets. Transects involved walking 1 km transects and recording/capturing larger species from a 2 m corridor.

6.2.6.7 Mammals (not including bats)

During the field survey, nine points were studied. These sites covered representative habitats within the Project site along with surrounding areas (including Mount Aktau IBA) and habitats to allow comparison between them. Habitat types surveyed included degraded mountains (Big and Little Aktau, and Tamdytau ridge), mountain foothills, vegetated semi-desert with Artemisia and Salsola plant associations, mountain steppe with rocks, elements of sandy desert and tugai (river) forest. Camera traps were also used and moved between survey points periodically, with cameras deployed between November 2020 and April 2021 to give a total of 854 camera trapping days across the site. Camera trap data collected by the survey teams on previous expeditions within the region has also been used in this assessment.

[47] Kuzyakin A P 1962 Zoogeography of the USSR (Moscow: CIX) pp 3-182

During ground surveys, mammal species composition and numbers were determined with walking survey transects. The length of each walking transect was 2 km for each monitoring point, with a total length of 18 km over the Project site.

During the field research, non-invasive technologies were used, including:

- Camera trapping.
- Visual observation of mammals both by eye and using 10x binoculars.
- Registration of field signs of wild mammals, including animal tracks, faeces, digging, burrows, dead animals, etc.
- Photographing the animals, their tracks and traces of their vital activity, typical habitats.

The studied area was recalculated by multiplying the length of the traversed route by the width of the surveyed transect, which is determined taking into account visibility, relief, vegetation, and particular species. The variation in detectability is shown with animal footprints on the ground, their faeces, burrows of small mammals (e.g. Small five-toed jerboa (*Allactaga elater)*) are visible at a distance of up to 2 m, burrows of yellow ground squirrel (*Spermophilus fulvus)* and midday jird (*Meriones meridianus*) are visible at a distance up to 5 m, colonies of Libyan jird (*Meriones libycus*) – visible at a distance of up to 10 m, colonies of great gerbil (*Phombomys opimus*) and a mole vole (*Ellobius tancrei*) – visible at a distance up to 20 m. Active medium-sized animals (e.g. red foxes (*Vulpes vulpes)*) are visible at a distance of up to 150 m. Ungulate species like Goitered gazelle (*Gazella subgutturosa*) and Severtsov's argali (*Ovis ammon severtzovi*) can be spotted at distances of up to 500 m.

6.2.6.8 Bats

During Summer and Autumn 2020, bat surveys were completed in order to quantify the impact of the Project on key bat (*Chiroptera*) species, to subsequently inform final WTG layout, develop any additional mitigation (e.g. WTG shut down, cut-in speed modification (the point at which the WTG starts to generate electricity from turning), habitat/species management plan) and to form the baseline for any future required supplementary surveys and operational monitoring. Further surveys, including additional static detector surveys and roost searches are being completed in 2021 with the results of these to be provided in subsequent iterations of this document.

The protocol for surveys at the Project site has been adapted from methodology developed by the Bat Conservation Trust (BCT) survey guidelines (Collins 2012 and 2016), Eurobat Guidance (Guidelines for Consideration of Bats in Wind Farm projects. Revision 2014) and Scottish Natural Heritage (SNH) Guidelines (Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation. Version: January 2019).

The habitats on site are of low suitability for bats therefore a seasonal, rather than monthly schedule was adopted with the static detectors moved between groups of WTGs after at least five nights of deployment. Surveys have been completed using Wildlife Acoustics SM4 FS static detectors with sound analysis being completed using the Kaleidoscope software package (see below). Definitions of species potentially present within the region have been taken from the IUCN species distribution records[48] and those species and groups considered as being at high, medium and low risk from WTGs have been adapted from Eurobats Publication 6 (2015)[49] and can be seen in Table 6-1 below.

Table 6-1: Bat Species/Groups of Uzbekistan and Risk Factor posed by WTGs

High Risk	Medium Risk	Low Risk
Nyctalus species	*Eptesicus species*	*Myotis species*
Pipistrellus species	*Barbastella species*	*Plecotus/Otonycteris species*
Vespertilio murinus		*Rhinolophus species.*
Hypsugo savii		
Miniopterus schreibersii		
Tadarida teniotis		

Survey types and timings are summarised below with static detector locations are shown in Figure 6-2:

- Static Bat Detectors – August 2020 to November 2020 and ongoing from March to June 2021.

[48] https://www.iucnredlist.org/

[49] Rodrigues, L., Bach, L., Dubourg-Savage, MJ, Karapandža, B., Kovač, D., Kervyn, T., ... & Harbusch, C. (2015). Guidelines for consideration of bats in wind farm projects: Revision 2014 . UNEP / EUROBATS.

- Roost Searches – October 2019 and November 2020, March and April 2021, with additional roost visits planned for June-August 2021.

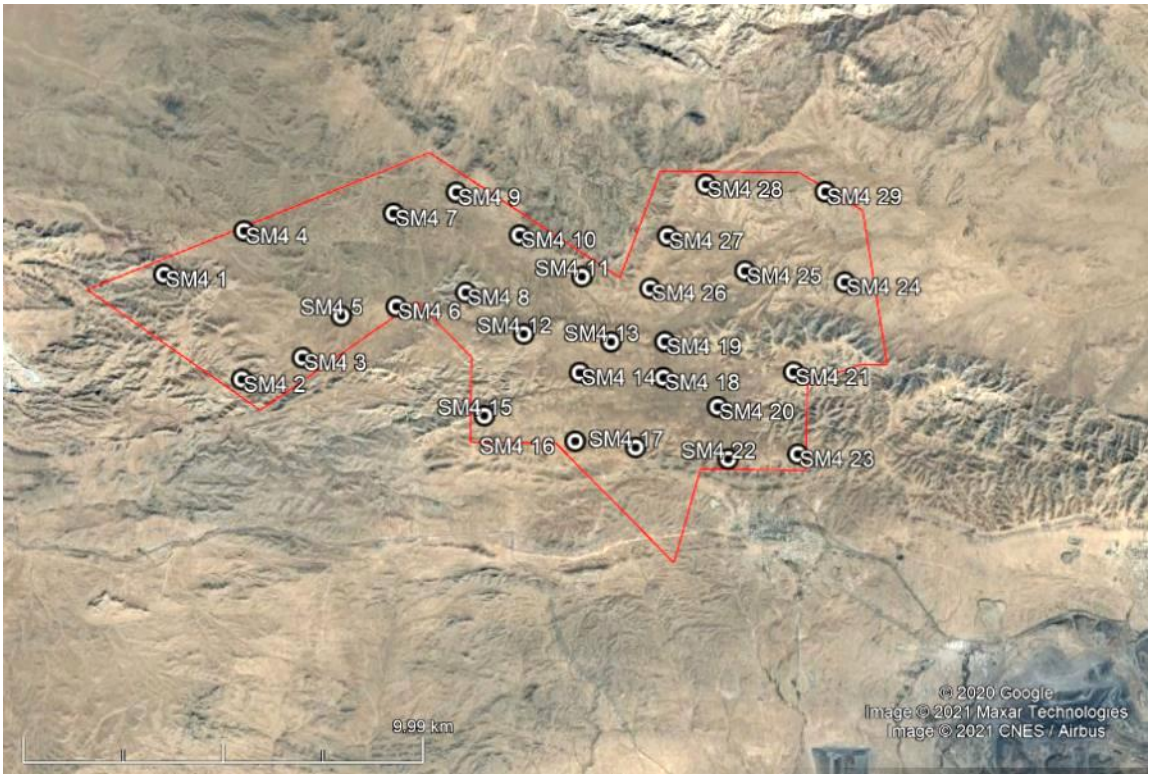


Figure 6-2: Static Detector Locations

Acoustic bat identification was confirmed to species level where possible using the Kaleidoscope (Wildlife Acoustics version 5.2.1 and later) and BatSound (Pettersson) software packages, along with published data on echolocation call parameters for bats within the wider region (Hackett, 2016), (Dietz, 2016) and (Barataud, 2015), and available in-country literature regarding species occurrence in the region. Where identification to species level has not been possible (mostly on account of the ultrasound dataset for the region being limited) the audio track has been assigned to species group e.g., *Eptesicus* species.

6.2.6.9 Limitations

Due to in-country restrictions on movements imposed in the first half of 2020 as a result of the COVID-19 pandemic, certain survey teams have not been able to travel at the optimal times and survey types have had to be delayed. Surveys which required personnel to move between regions (reptile, bat, botany, mammal and invertebrate) were not possible in the optimal spring period due to the in-country lock-down rules or methods adapted to give as much level of site coverage in the timescales allowed as was possible. This has meant the total number of survey days is lower than initially proposed. However, sufficient coverage has been achieved on the Project site, as well as extensive use of desk-based studies and background data to give a good level of survey information to allow an appropriate level of assessment with a precautionary approach to be adopted. Survey has been completed in Spring 2021 to allow for these gaps in data to be filled, give comparative data and identify any additional constraints prior to the commencement of construction activities.

6.3 Baseline Conditions

6.3.1 Regional Overview

The Project is located approximately 7 km east of Zarafshan City which is within the Navoi Province of Uzbekistan. It lies within the central part of the Kyzylkum Desert and occupies an area approximately 9,600 hectares in size.

6.3.2 Site Overview

The ESIA study has considered the overall site boundary with the potential for 125 WTGs however current proposals involve the construction of 111 WTGs and associated two short OHLs, access tracks and buildings within an area dominated by desert and desert vegetation.

The topography of the site is predominantly a combination of shallow sloping plains, smooth hills, dry riverbeds, and steep stony/rocky slopes. The elevation above sea level ranges from approximately 780 m on the central plateau of the site down to a low point of approximately 620 m on the plains to the north. The highest point in the surrounding landscape is Mount Aktau (6.5 km to the north) which is approximately 950 m above sea level at its peak.

6.3.3 Designated Sites

No national or international designations were identified within the site boundary. The nearest designation is Mount Aktau Important Bird and Biodiversity Area (IBA), the boundary of which is approximately 3.5 km north of the Project site. No further designations or protected sites are identified within 30 km of the Project site.

6.3.4 Wind Farm Habitats

6.3.4.1 General Overview

The Project site is represented by the habitats noted above and these are detailed in the following sections. The distribution of the habitats is shown in Figure 6-4 and the species of higher conservation concern found on site are shown in Table 6-2. Habitats throughout the site are predominantly natural or degraded natural however the plain area to the south of the site (around the survey point viewpoint (VPs) 5, 6, 7, 8 and 10 (Figure 6-4)) has evidence of extensive former attempted agricultural use along with a series of man-made parallel lines (assumed to be for irrigation purposes) which are clearly visible on satellite imagery. From historical imagery it can be seen that these lines and cultivated agricultural area have been in place since at least 2004 (shown in Figure 6-3) however there is no evidence on site of recent cultivation.

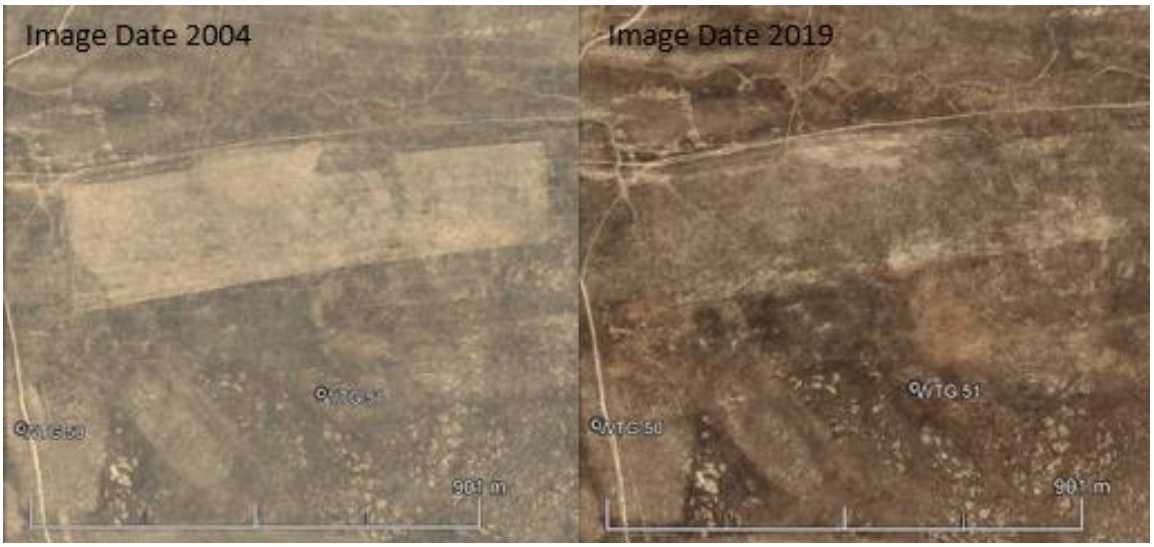


Figure 6-3: Showing Historical Evidence of Agricultural Use

6.3.4.2 Weakly inclined piedmont plains and smooth hills

These habitats where found to contain a variety of plant species, with ephemeroid-sagebrush vegetation types such as *Artemisia diffusa, Poa bulbosa* and *Carex pachystylis,* and ephemeroid-saltwort-sagebrush vegetation type such as *Artemisia diffusa, Salsola arbusculiformis, Poa bulbosa and Carex pachystylis* on sabulous grey-brown desert soil, and with sagebrush-saltwort and saltwort vegetation such as *Artemisia turanica, Artemisia diffusa, Salsola arbusculiformis, Salsola orientalis, Salsola sclerantha,* and *Ceratocarpus arenarius* on slightly saline or skeleton sabulous-loamy and loamy grey-brown desert soil. There is no clear boundary between sagebrush and sagebrush-saltwort communities; thus, they can be combined into one type of habitat.

6.3.4.3 Skeleton and stony slopes

These habitats were found to contain ephemeral-black saltwort-sagebrush vegetation types including *Artemisia turanica, Artemisia diffusa, Salsola arbusculiformis, Poa bulbosa, Eremopyrum bonaepartis, Taeniatherum caput-medusae and Ceratocarpus arenarius*, with sparse spiny almond (*Prunus spinosissima*) found on skeleton grey-brown desert soil with outcrops of bedrocks.

6.3.4.4 Dry riverbeds

These were identified in a limited number of locations and occupy a very small area of the site. They were found to contain eurotia-feathergrass-sagebrush community, including *Krascheninnikovia ceratoides, Artemisia juncea* and *Stipa hohenackeriana.*

6.3.4.5 Steep stony and rocky slopes

Primarily found outside the main Project area, within the Mount Aktau protected site, these habitats were found to contain sparse petrophytic vegetation which includes xerophytic shrub species such as *Prunus spinosissima* and *Atraphaxis spinosa*, sagebrush (*Artemisia turanica*), black saltwort (*Salsola arbusculiformis*), feathergrass (*Stipa hohenackeriana*), forbs and ephemerals.

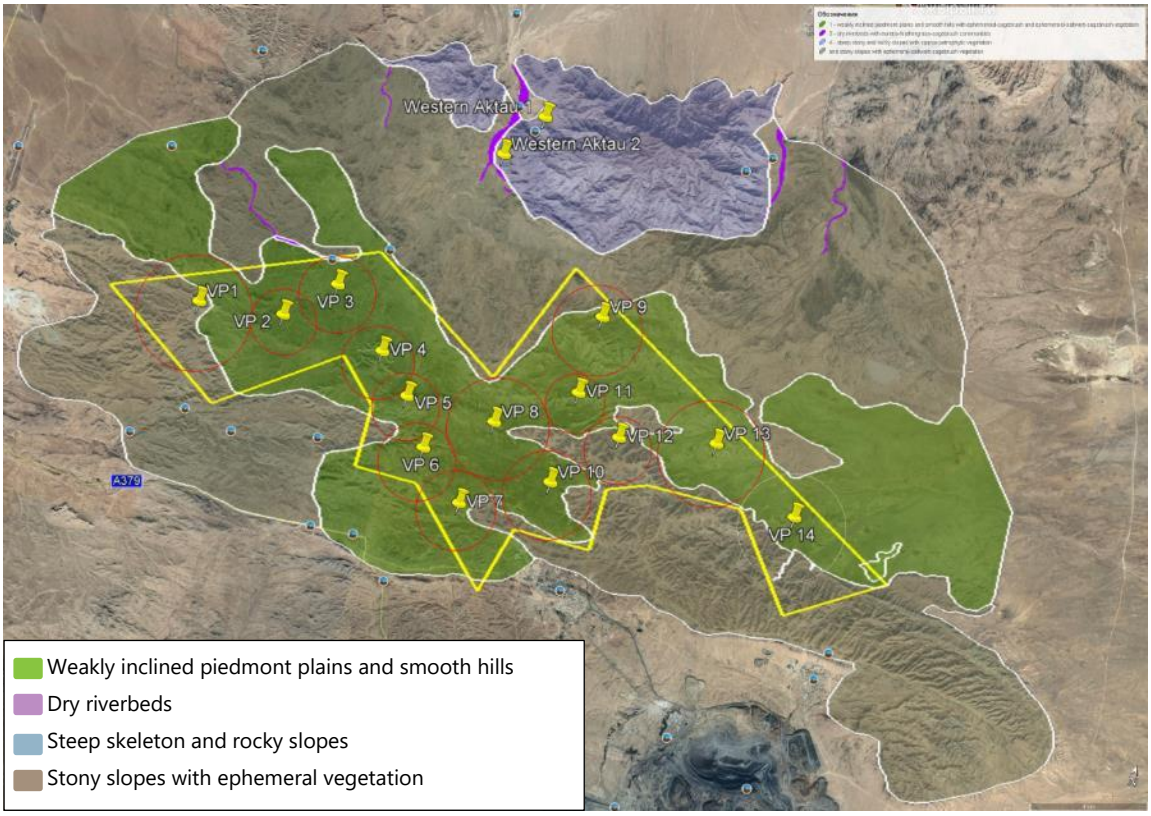


Figure 6-4: Habitat Types on Site and VP Locations

Table 6-2 illustrates the plant species of importance recorded during the survey effort.

Table 6-2: Plant Species of Importance Recorded

Common Name / Family	Scientific Name	Uzbek Red Book*	IUCN Status	Present on Site
N/A	*Ferula kyzylkumica*	VU:D	-	Yes – VP12&14
N/A	*Lappula aktaviensis*	EN	-	Yes – at VP12
N/A	*Silene tomentella*	VU:R	-	Yes – at VP12
N/A	*Lagochilus inebrians*	VU:D	-	Yes – at VP11&14

*VU:D = Vulnerable: Declining, VU:R = Vulnerable: Rare, EN = Endangered

A single Uzbek Red Data Book listed species has been identified as being potentially present within the gently sloping plain areas of the site: *Tulipa lehmanniana* is an ephemeral species listed nationally as Vulnerable: Declining. The four other Red Data Book listed species that were identified during the surveys (*Lagochilus inebrians, Lappula aktaviensis, Ferula kyzylkumica* and *Silene tomentella*) are present on stony slopes within the Project area (around VPs 11, 12 and 14). From communications with the botanists who have undertaken the surveys (in advance of receipt of the final reports), it is understood that sensitive species are at least 500 m from proposed working areas and in less accessible parts of the site (i.e. on rocky hillsides) therefore less likely to be at direct risk from the proposals.

6.3.5 Fauna

6.3.5.1 Herpetofauna

Background data records suggest that the proposed Project area is likely to be used by up to 15 species of reptile and one species of amphibian. Records are confirmed in the locality from four species by the surveys completed in 2019 and 2020 and an additional five from studies detailed in the literature. Table 6-3 shows the species identified as being present or potentially present on site.

Of the species recorded on site, Russian Tortoise and Caspian Monitor are listed as Vulnerable by the IUCN and on the Red Data Book of Uzbekistan. There is potential for the site to support low numbers of southern even-fingered gecko, which is listed as Critically Endangered by the IUCN, with records collected during background data searches highlighting sites 100 km north and 100 km south of the proposed Project site. Given the rarity of this species it is considered unlikely that it occurs within the Project area and surveys completed in April 2021 did not identify any individuals present within the survey area.

Records within the region for species such as the Derafshi Snake (UzRB Vulnerable: Rare), the Tatary Sand Boa and Desert Sand Boa (both UzRB Near Threatened) have also been extracted from the available literature but were not recorded on site during surveys.

Based on the study findings It is confirmed that Russian Tortoise are present on site in low densities (0.46 to 0.72 animals per hectare) around VP's 1, 2, 3 and 5, medium densities (1.03 to 5.65 animals per hectare) around VP's 4, 6, 7, 8, 10, 11, 12 and 14 and high densities (10.2 and 14.95 animals per hectare) around VP's 9 and 13.

Table 6-3: Baseline Species Table – Reptiles and Amphibian

Common Name	Scientific Name	Uzbek Red Book*	IUCN Status	Confirmed on site	Confirmed in previous studies	Potential to be in works areas
Turan toad	*Bufotes turanensis*	-	LC	Yes	-	Yes
Russian tortoise	*Testudo horsfieldii*	VU:D	VU	Yes	Yes	Yes
Southern Even-fingered Gecko	*Alsophylax laevis*	VU:D	CR	No	No	Yes
Turkestan thin-toed gecko	*Tenuidactylus fedtschenkoi*	-	LC	Yes	Yes	Yes
Steppe Agama	*Trapelus sanguinolentus*	-	LC	Yes	Yes	Yes
Sunwatcher toad-headed agama	*Phrynocephalus helioscopus*	-	LC	Yes	Yes	Yes
Rapid Lizard	*Eremias velox*	-	LC	-	Yes	Yes
Aralo-Caspian racerunner	*Eremias intermedia*	-	LC	Yes	No	Yes
Caspian Monitor	*Varanus griseus caspius*	VU:D	-	Yes	Yes	Yes
Desert sand boa	*Eryx miliaris*	NT	LC	-	-	Yes
Tatary sand boa	*Eryx tataricus*	NT	-	No	-	Yes
Sand racer	*Psammophis lineolatus*	-	-	No	Yes	Yes

Common Name	Scientific Name	Uzbek Red Book*	IUCN Status	Confirmed on site	Confirmed in previous studies	Potential to be in works areas
Spotted whip snake	*Hemorrhois ravergieri*	-	LC	Yes	-	Yes
Spotter Desert Racer	*Platyceps karelinii*	-	-	No	Yes	Yes
Derafshi Snake	*Lytorhynchus ridgewayi*	VU:R	LC	No	-	Yes
Karaganda pit viper	*Gloydius caraganus*	-	-	No	-	Yes

*Where NT = Near Threatened, VU=Vulnerable, VU:D = Vulnerable: Declining, VU:R = Vulnerable: Rare, EN = Endangered, CR = Critically Endangered, LC = Least Concern

6.3.5.2 Invertebrates

Limited research has been conducted in the area although the Red Data Book of Uzbekistan (2019) suggests that the area of the Kyzylkum desert around the construction site may be inhabited by eight rare and threatened species of insects and one species of spider.

Species recorded from the Project site were more common and the assemblage is noted as being relatively poor. No rare or Red Data Book species or species of restricted geographic range were encountered during the surveys, although some habitat suitable for these species are present in low / very low densities.. Table 6-4 shows the species recorded along with their conservation statuses.

Table 6-4: Baseline Species Table – Invertebrates

Common Name	Scientific Name	Uzbek Red Book*	IUCN Status	Confirmed on site	Confirmed in surroundings	Potential to be in works areas
Dahl's Black Widow Spider	*Pelophylax ridibunsus*	Y (NT)	-	N	N	Yes
Five-striped Flowerfly	*Lathyrophthalmus quinquelineatus*	Y (VU:R)	-	N	N	Yes
Feruler Flowerfly	*Eumerus ferulae*	Y (EN)	-	N	N	Yes
Pavlowski's Digger Wasp	*Kohlia pavlowskii*	Y (VU:R)	-	N	N	Yes
Transcaspian Digger Wasp	*Larra transcaspica*	Y (VU:R)	-	N	N	Yes
Black-combed digger wasp	*Prionyx nigropectinatus*	Y (VU:R)	-	N	N	Yes
Mournful digger wasp	*Prionyx macula*	Y (VU:R)	-	N	N	Yes
Fadtschenkia Sapigid Wasp	*Fedtschenkia indigotea*	Y (EN)	-	N	N	Yes
Tugay Underwing wasp	*Catocala remissa*	Y (VU:D)	-	N	N	Yes

*where EN=Endangered, VU:R=Vulnerable: Rare, VU:D=Vulnerable: Declining

6.3.5.3 Mammals (not including bats)

Desk based and field surveys to date have identified 30 terrestrial mammal species (as well as two species of bat though these are discussed separately below) present within and close to the Project site. These include eight which are included on the Red Data Book of Uzbekistan and/or the IUCN Red List. Table 6-5 shows species recorded to date along with their conservation statuses.

Table 6-5: Baseline Species Table – Terrestrial Mammals

Common Name	Scientific Name	Uzbek Red Book*	IUCN Status	Confirmed on site	Confirmed in surroundings	Potential to be in works areas
Long-eared hedgehog	*Hemiechinus auritus*	-	LC	-	Yes	Yes
Brandt's hedgehog	*Paraechinus hypomelas*	NT	LC	-	Yes	Yes
Lesser white-toothed shrew	*Crocidura suaveolens*	-	LC	-	Yes	Yes
Piebald shrew	*Diplomesodon pulchellum*	-	LC	-	Yes	Yes
Tolai hare	*Lepus totai*	-	-	Yes	Yes	Yes
Long-clawed ground squirrel	*Spermophilopsis leptodactylus*	-	LC	-	Yes	Yes
Yellow ground squirrel	*Spermophilus fulvus*	-	LC	Yes	-	Yes
Small five-toed jerboa	*Allactaga elater*	-	-	Yes	-	Yes
Severtzov's jerboa	*Allactaga severtzovi*	-	LC	-	Yes	Yes
Northern three-toed jerboa	*Dipus sagitta*	-	LC	-	Yes	Yes
Great gerbil	*Phombomys opimus*	-	LC	-	Yes	Yes
Libyan jird	*Meriones libycus*	-	LC	Yes	Yes	Yes
Midday jird	*Meriones meridianus*	-	LC	-	Yes	Yes

Common Name	Scientific Name	Uzbek Red Book*	IUCN Status	Confirmed on site	Confirmed in surroundings	Potential to be in works areas
Grey dwarf hamster	*Cricetulus migratorius*	-	LC	-	Yes	Yes
Zaisan Mole Vole	*Ellobius tancrei*	-	LC	Yes	Yes	Yes
Carruther's vole	*Microtus (Neodon) carruthersi*	-	-	Yes*	-	Yes
House Mouse	*Mus musculus*	-	-	Yes	Yes	Yes
Grey wolf	*Canis lupus*	-	LC	-	Yes	Yes
Corsac Fox	*Vulpes corsac*	VU:D	LC	-	Yes	Yes
Red Fox	*Vulpes*	-	LC	Yes	Yes	Yes
Weasel	*Mustela nivalis*	-	LC	-	Yes	Yes
Marbled Polecat	*Vormela peregusna*	VU:D	LC	-	Yes*	Yes
Steppe Polecat	*Mustela eversmanii*	VU:D	LC	-	Yes	Yes
Asian Badger	*Meles leucurus*	-	LC	-	Yes	Yes
Asiatic Wildcat	*Felis sylvestris ornata*	-	LC	Yes	Yes	Yes
Sand Cat	*Felis margarita*	NT	LC	-	Yes	Yes
Caracal	*Caracal*	CR	LC	-	Yes	Yes
Wild Boar	*Sus scrofa*	-	LC	-	Yes	Limited
Severtzov's sheep	*Ovis ammon* ssp. *Severtzovi*	VU:D	NT	-	Yes	Limited

Common Name	Scientific Name	Uzbek Red Book*	IUCN Status	Confirmed on site	Confirmed in surroundings	Potential to be in works areas
Goitered Gazelle	*Gazella subgutturosa*	VU	VU	Yes	Yes	Yes

*These species require further survey to positively establish their presence.

6.3.5.4 Bats

Full analysis of survey results is ongoing, with the remainder of data from 2020 and 2021 to be included in future iterations which will be compiled in July 2021.

Eight species of bat have been recorded on the static detectors to date during the survey effort to date. Table 6-6 shows the species, risk from wind farms and their conservation statuses.

No roosting activity was noted within the proposed Project area however a small accumulation of bat droppings consistent with Botta's Serotine were found at survey point T05 during the Mammal surveys, this point is a small rock crevice located approximately 150 m outside the development boundary at 41°36'39.24"N, 64°27'31.74"E.

Table 6-6: Baseline Species Table – Bats

Common Name / Family	Scientific Name	Uzbek Red Book	IUCN Status	Risk from Windfarms
Serotine	*Eptesicus serotinus*	-	LC	Medium
Botta's Serotine	*Eptesicus bottae*	-	LC	Medium*
Lesser Horseshoe	*Rhinolophus hipposideros*	VU:D	LC	Low
Horseshoe species	*Rhinolophus sp. (Possible R.bocharicus)*	-	LC	Low*
Common Pipistrelle	*Pipistrellus pipistrellus*	-	LC	High
Savi's Pipistrelle	*Hypsugo savii*	-	LC	High
Parti-coloured Bat	*Vespertilio murinus*	-	LC	High

Common Name / Family	Scientific Name	Uzbek Red Book	IUCN Status	Risk from Windfarms
Noctule	*Nyctalus noctula*	-	LC	High

*Risk posed by windfarms for species not listed in Table 6-1 has been inferred based on their family and general flight characteristics.

The highest number of registrations detected at any one point over the summer period to date was 114 passes over a 10-night period between 30 July and 09 August at Point 20. This equates to 1.14 passes per night with the majority of registrations (89) from Serotine species which are a genus of bat considered to be at moderate risk from operational WTGs.

Activity in Autumn over the areas covered was higher, but still low overall, with 92 passes from Common Pipistrelle recorded over a seven-night recording period at point 26. This equates to 13.1 passes per night from a species which is considered to be at higher risk from operational WTGs.

Results from analysed calls to date are included in Table 6-7 and Table 6-8 below.

Table 6-7: Bats Static Detector Results – August 2020

Species	Point 20	Point 21	Point 26	Total
Serotine	89	14	7	**110**
Lesser Horseshoe	0	0	3	**3**
Horseshoe species	0	1	0	**1**
Common Pipistrelle	0	0	1	**1**
Savi's Pipistrelle	2	0	1	**3**
Parti-coloured Bat	1	0	13	**14**
Noctule	0	0	2	**2**
Social Calls	22	0	4	**26**
Total	**114**	**15**	**31**	**160**

Table 6-8: Bats Static Detector Results – October 2020

Species	Point									Total
	1	5	7	9	13	18	19	20	26	
Serotine	1	1	0	0	1	4	0	1	3	**11**
Botta's Serotine	0	0	0	0	1	0	0	0	1	**2**
Horseshoe species	0	0	0	0	0	0	0	0	1	**1**
Common Pipistrelle	1	1	1	0	2	7	3	0	92	**107**
Parti-coloured Bat	3	1	2	16	0	5	1	0	8	**36**
Noctule	1	0	0	0	0	0	0	0	0	**1**
Social Calls	0	0	0	2	0	0	0	0	0	**2**
Total	**6**	**3**	**3**	**18**	**4**	**16**	**4**	**1**	**105**	**160**

6.4 Evaluation and Assessment of Effects

Table 6-9 establishes the conservation status of important ecological receptors present within the Project site or surrounding area. Species not listed as national conservation concern or listed on the IUCN as being of Least Concern or data deficient are not included and are considered to be of negligible value only. The table also includes species of conservation concern identified during background literature searches as being present in similar habitat types within the region. Figure 6-4 provides the locations of VPs referred to in the table below.

Table 6-9: Conservation Status of Ecological Receptors Present

Habitat / Species	Location	Conservation Status	Sensitivity
Ferula kyzylkumica	VP12&14	UzRB - VU:D	High
Lappula aktaviensis	VP12	UzRB - EN	High
Silene tomentella	VP12	UzRB - VU:R	High

Habitat / Species	Location	Conservation Status	Sensitivity
Lagochilus inebrians	VP11&14	UzRB - VU:D	High
Tulipa lehmanniana	Site	UzRB – VU:D	High
Russian tortoise	Site	IUCN & UzRB - VU	High
Southern Even-fingered Gecko	-	IUCN - CR	High
Caspian Monitor	Site	UzRB – VU:D	High
Desert Sand Boa	-	UzRB – NT	High
Tatary sand boa	-	UzRB – NT	High
Derafshi Snake	-	UzRB – VU:R	High
Dahl's Black Widow Spider	-	UzRB – NT	High
Five-striped Flowerfly	-	UzRB – VU:R	High
Feruler Flowerfly	-	UzRB – EN	High
Pavlowski's Digger Wasp	-	UzRB – VU:R	High
Transcaspian Digger Wasp	-	UzRB – VU:R	High
Black-combed digger wasp	-	UzRB – VU:R	High
Mournful digger wasp	-	UzRB – VU:R	High
Fadtschenkia Sapigid Wasp	-	UzRB – EN	High
Tugay Underwing wasp	-	UzRB – VU:D	High
Brandt's hedgehog	Near site	UzRB - NT	High
Corsac Fox	Near site	UzRB – VU:D	High
Marbled Polecat	Near site	UzRB – VU:D	High
Steppe Polecat	Near site	UzRB – VU:D	High

Habitat / Species	Location	Conservation Status	Sensitivity
Sand Cat	Near site	UzRB - NT	High
Caracal	Near site	UzRB – CR	High
Severtzov's sheep	Near site	UzRB – VU:D	High
Goitered Gazelle	On site	UzRB & IUCN – VU	High
Lesser Horseshoe	On site	UzRB – VU:D	High

The presence of species listed locally and internationally as Endangered and Critically Endangered within the locality of the Project mean that it will be necessary to assess whether the habitats contained within the site are of critical importance to these species. An Outline Critical Habitat Assessment (CHA) is provided within Appendix 6 of this ESIA. This will be developed further and finalised for the Final ESIA.

The magnitude and significance of impacts on valued ecological receptors are assessed below.

6.4.1 Construction

6.4.1.1 General

The proposed Project site is situated within areas of low species diversity and WTG locations have been designed to avoid the areas of highest ecological sensitivity. Potential impacts on flora and fauna arising during construction comprise:

- Direct loss of vegetation and habitat (including food sources).
- Direct loss of fauna during construction activities.
- Damage to habitats and disturbance of fauna from presence of people, machinery, traffic, and noise, both within and outside of the Project area. This indirect impact could affect species of global and national conservation concern.
- Indirect impacts associated with pollution.

6.4.1.2 Habitats and Flora

The Project area contains predominantly native ephemeroid-sagebrush and saltwort-sagebrush plant communities typical of the remnant low mountains of the Kyzylkum Desert. In places, these habitats have been degraded by human activities such as vehicle movements, excavation and animal grazing. In addition, there are areas showing signs of former agricultural use, with the most impacted area a previously farmed block of land on the central plateau approximately 20 ha in size. These are now disused however are visible and habitat has not recovered to cover these features. Each of these habitats will be directly impacted by construction activities.

Based on the habitats present on site and information obtained from literature searches a single Uzbek Red Data Book listed species has been identified as being potentially present within the gently sloping plain areas of the site: *Tulipa lehmanniana* is an ephemeral species listed nationally as Vulnerable: Declining. Four other Red Data Book listed species that were identified during the surveys (*Lagochilus inebrians, Lappula aktaviensis, Ferula kyzylkumica* and *Silene tomentella*) are present on stony slopes within the project area (around VPs 11, 12 and 14) but these are all over 500 m from works and will not be directly impacted by the proposals as no construction work will take place in these areas.

It should be noted that updated botanical surveys have also been completed in Spring 2021 (April-May) to ensure that the main growing season is covered, and impacts assessed fully but, based on the habitats present, it is unlikely that the site supports further rarer species of plants beyond those already identified.

Direct impacts resulting in the loss of habitat and flora will occur during construction activities and in particular due to the establishment of the construction compound, workers' accommodation area, earthworks for the substation, WTG foundations and electrical transmission connections, on-site construction roads and construction of off-site access roads and grid connection works.

Habitats directly affected by the proposals are a mix of; natural with low levels of human influence; degraded with moderate levels of human influence (from grazing, excavation and vehicle movements); and degraded from previous agricultural use. The majority of habitats found within the proposed Project site are also of limited botanical value and common in the region. Any areas of higher plant species diversity and general ecological interest which attracts a variety of species will be avoided due to their slightly higher ecological value or if this is not possible harvesting of the bulbs and/or seeds of species

of conservation concern will take place to allow the replanting and restoration of surrounding areas and protect populations of these species long term.

Based on the extent of habitat loss and the type and status of habitats and flora species that are likely to be affected by construction works, direct impacts on the degraded or previously modified terrestrial habitats are considered to be of low significance, whereas the impacts to natural habitats are considered to be of moderate significance.

Although not directly affected by the proposals, potential indirect impacts include pollution and increased human pressure across the site which could increase dust levels which in turn could affect the ecological value and function of surrounding habitats and the species they support.

The loss and damage of small areas of natural habitats will be offset so that the Project achieves no net loss of biodiversity (most likely a net gain). Habitat loss in the areas of WTG and road construction will be compensated by restoring and replanting land formerly used for agriculture (as shown in Figure 6-3) with native species. In addition, the areas with man-made parallel lines will be replanted within the area shown in Figure 6-5 with vegetation removed or seed harvested from vegetation during WTG base clearance. Improvements/restoration will take placed in a phased manner to allow regeneration of habitats in some parts of the site (up to 21 ha at a time) whilst not limiting ongoing activities such as livestock grazing in others. When areas have established to a satisfactory level, restrictions will be removed and the restoration efforts moved to the next location. This will create a mosaic of habitats in varying stages of recovery. The area of habitat being improved in these areas totals approximately 977 ha whilst the areas of habitat overall being lost as a result of WTG base construction and pylon tower installation totals approximately 21 ha. A full restoration plan will be developed in order to ensure that the offsets more than equal the loss of habitat. As part of the restoration, plants in these areas not native to the habitat type will be removed to help recreate and rehabilitate suitable native habitat. Details on methods for restoration and monitoring of restoration results will be taken from the range of studies on Steppe restoration that has taken place over the last decade in Uzbekistan and in particular within the province.

Mitigation for impacts will be included in an Environmental and Social Management Plan (ESMP) and will also include dust suppression activities (e.g. watering of tracks in dry periods, adherence to site speed limits) and banning of site workers from using vehicles away from the established transport routes.

Figure 6-5: Degraded Habitat Improvement Areas

6.4.1.3 Herpetofauna

Habitats within the Project area are suitable for several species of conservation concern, with Russian tortoise (IUCN VU), Caspian Monitor (Uz RDB VU:D) confirmed as being present during 2019 and 2020 surveys. In addition, there is habitat suitable for Southern Even-fingered Gecko (IUCN CR), Desert sand boa (Uz RDB NT), Tatary sand boa (Uz RDB NT) and Derafshi Snake (Uz RDB VU:R) on site with records of these species existing in literature following studies within the region. Direct impacts to these species are likely as a result of construction activities including killing or injuring, disturbance, direct habitat loss from construction of WTG bases, substation, compound area, workers' accommodation and access roads and habitat loss through fragmentation/barrier effect.

Habitat suitable for use by reptiles will be removed under the road and WTG bases prior to construction and as such low to moderate significant temporary negative impacts at a local level are predicted for these species on the basis that comparable contiguous habitat is located throughout the Project area. Russian Tortoise has been found to be present at densities of between 0.46 and 14.95 animals per hectare within the study area. In areas with WTGs, it is estimated that a maximum of between 0.432 (VP3 area) and 12.24 (VP9 area) individuals will be impacted by the WTG base construction. In total it is estimated that a maximum of approximately 45.2 individuals will be displaced during the construction of WTG bases, and 2.88 by the construction of pylon bases. Damage to sites used by hibernating and breeding individuals would result in impacts of substantially higher significance at a local level, therefore timing works (including the translocation of individual animals) to avoid the most sensitive periods is essential.

Loss of suitable reptile habitat will be mitigated with the restoration of degraded and former agricultural land as noted in Section 6.4.1.2. This will improve the habitat quality with the intention to move habitat from low quality former agricultural or degraded to good or high quality.

The indirect impacts associated with dust and other pollution as well as collection or persecution of animals could impact these and other species of reptile, although these are considered of low significance, temporary and at a local scale only.

6.4.1.4 Invertebrates

No rare or protected species were found during the surveys though previous studies in the region have identified eight species of rare or threatened insect species and one near threatened species of spider.

Given the low levels of land take and suitable directly comparable adjacent habitat, the predicted impacts of construction on invertebrate species of conservation concern are likely to include minor habitat loss and the direct killing of low numbers of individual invertebrates. As a result of the proposals, impacts are considered to be low and of minor significance at a local level.

Loss of suitable invertebrate habitat will be mitigated with the restoration of degraded and former agricultural land as noted in Section 6.4.1.2. This will improve the habitat quality with the intention to move habitat from low quality former agricultural or degraded to good or high quality.

6.4.1.5 Mammals (not including bats)

Eight mammal species listed as threatened, declining or critically endangered were identified as being present, or with potential to be present during the surveys. With Brandt's Hedgehog and Sand Cat (UzRB NT), Corsac Fox, Marbled Polecat, Steppe Polecat, Severotzov's Sheep and Goitered Gazelle (all UzRB VU:D), and Caracal (UzRB CR) all present within the region.

Habitat suitable for use by the above species for foraging and commuting will be lost as a result of the construction of the Project which will result in a minor negative impact at a local level. In addition, disturbance of these species from construction activities are also likely to result in temporary short-term negative impacts of minor significance.

Additional surveys for terrestrial mammals will be completed in Spring 2021 to further cover the site, in particular the WTG locations and potential resting sites and the results of this will inform further impact assessment.

6.4.1.6 Bats

Bat analysis and survey is ongoing at the Project site until late Spring / early Summer 2021 however habitats on site are considered of low suitability for bats and activity data collected to date suggests very low levels of activity from species deemed at risk from wind farms. No roosting activity has been identified in the areas of proposed WTG bases or assess tracks. Based on this information the direct impact of construction on loss of suitable foraging and commuting habitat is likely to be low.

6.4.2 Operation

Potential impacts during operation of the Project are as follows:

- Disturbance of fauna from WTG noise, shadow flicker, people, and traffic.
- Displacement from immediate surrounds of WTG's and wind farm area resulting in loss of feeding resources.
- Loss of fauna from collision with WTGs (bats).

There will be some disturbance and possible displacement from around each WTG as a result of operational noise from the WTGs. However, at the likely noise levels and habituation rates, it is unlikely that the resultant effect of noise on terrestrial fauna within the immediate vicinity of the operational WTGs will be significant and as such no negative impacts are predicted at any geographic level.

It is possible, without control measures, that staff working on the operational WTGs could cause disturbance to ecological receptors. Control measures, including no access outside of the established road network of the Project area, no hunting or collection of wild animals and control of lighting and night-time vehicle movements, will be incorporated into the Project. This will ensure no operational disturbance outside of the Project area.

Habitats within the proposed Project area are of lower suitability for bats and bat activity levels recorded at the site during August and October (at the locations analysed to date) have been low. Survey and analysis at the site is ongoing but if activity levels remain at similar or even slightly raised levels, impacts as a result of collision with operational WTGs are unlikely to be significant at any geographic level.

6.4.3 Decommissioning

Similar to construction, the main impacts during decommissioning are likely to comprise habitat loss, loss of small numbers of reptiles and mammals, and disturbance to animals. The exact potential impacts of decommissioning will be assessed in detail at a later stage, prior to decommissioning. Following decommissioning, reinstatement will be important to re-establishing the ecosystems in areas previously occupied by WTGs, site roads and other structures. At the time of decommissioning, the sensitivity of some species, particularly flora and fauna receptors of conservation concern may have increased, or new species or species groups could have been added to lists of international or national importance.

6.5 Mitigation

6.5.1 General

In addition to mitigation detailed above, the following measures will be incorporated into the scheme. The implementation of these measures has been considered when determining the significance of likely ecological impact of the Project.

Surveys which are ongoing at the Project site will further inform the mitigation measures which will be detailed in updates to this ESIA. Pre-construction surveys will identify sensitive areas and species immediately before work commences so that they can be captured and moved to safe areas of the site.

Mitigation principles have been identified to align with the relevant IFC Performance Standard (PS 6 - Biodiversity Conservation and Sustainable Management of Living Natural Resources).

6.5.2 Mitigation by Design

WTGs will be micro-sited to avoid known locations of large animal burrows, areas of high activity and more valuable habitat features. The construction timetable will be designed so that activities such as breaking ground in un-prepared areas will be timed to avoid the most sensitive times (i.e. mid-October to March when vulnerable species of reptile, such as Russian Tortoise may be hibernating below ground).

Known bat roosts of higher sensitivity species are not within 250 m of proposed WTG locations and as such micro-siting of WTGs to protect bat roosts is not considered appropriate at present. On-going work to establish the locations of roosts is taking place in Spring 2021 and results, assessment and mitigation will be updated as appropriate.

6.5.3 Pre-construction

The first stage of mitigation should ensure that the site is prepared in such a way as to discourage animals from using the Project area. This would involve site preparation around each WTG location, substation, pylon and other areas requiring ground breaking works during the Spring, Summer and early Autumn months when temperatures are above approximately 18°C and animals are active. No ground-breaking works will take place between late Autumn and Winter to avoid causing harm to species which may hibernate below ground.

Site preparation works will clear vegetation from the proposed working areas and make those areas unsuitable for use by species which may dig or burrow into the ground. In addition, one-way exclusion fencing will be erected around the perimeter of areas where the presence of torpid animals underground cannot be ruled out. One way fencing would comprise wire mesh around the majority of an area, with a compacted slope or angled board set into the ground for the remaining section. Animals can climb out and leave the working area, but the angle of the board prevents any animals returning. Regular checks will be completed by qualified personnel and any tortoises present above ground will be captured and moved / translocated away from the working area to the nearest safe location.

Pre-construction surveys will be completed by a qualified ecologist to check for animal burrows or ephemeral waterbodies within construction zones and if necessary, works will be modified to avoid these areas or if needed construction activities should be stopped in the vicinity of the animal/nest until they have move or can be moved to another suitable location.

6.5.4 Construction

To reduce the risk of loss of habitat it is proposed that roads, the control compound and other site facilities are clearly demarcated before construction begins. Equipment should also be confined to the demarcated areas.

Excavations for WTG bases and cable routes should be protected each night, either with fencing or covering with boards. This will prevent sensitive species such as Russian Tortoise, Caspian Monitor or hedgehog species falling into excavations and becoming trapped/injured.

The loss of habitat directly in the Project area can be mitigated post-construction through planting of species comparable to those being lost and management and restoration of habitat within the area marked in Figure 6-5. As a minimum this will result in a no net loss or even turn a positive gain in habitat in the area.

Limits on night-time driving should also be enforced as it is likely that light-shine from vehicles would illuminate a very large area due to the relative 'open' nature of the construction area. Machinery should also be regularly maintained to reduce potential noise disturbance as well as reduce air pollution.

Construction work should be limited to daytime working hours only to avoid impacting on potentially sensitive nocturnal species of mammal and reptile.

Pollution control measures will be put into place to avoid these impacts in accordance with requirements of IFC PS3. Fuel and other potential pollutants will be stored in double bunded containers and all re-fuelling activities will only take place is designated areas. Pollution spill kits will be available at all fuel stores and re-fuelling areas and any spills will be reported to the site manager immediately and clean up completed. Dust suppression may be required during the hot summer months and this will be monitored by site staff. Wetting of access tracks across the site may be required and enforcement of speed limits and ensuring no off-road driving will further reduce the likelihood of dust pollution.

During road construction, gravel will be placed on access roads around 4.5 m wide so that they will accommodate vehicles and reduce soil erosion in adjacent areas.

6.5.5 Operation

Mitigation measures to reduce damage to habitats through use of on-site and off-site roads include:

- All vehicles confined to roadways.

- Speed limits enforced around the Project site and notices warning of the potential presence of animals crossing roads placed in strategic locations.
- Road condition to be monitored regularly and damaged and rutted roads repaired rather than bypassing damaged sections.
- Monitoring of erosion controls and repair as needed.

Further mitigation to reduce damage associated with off-road vehicle trafficking include prohibiting the use of vehicles and equipment off prepared roads and re-stabilizing existing eroded tracks with restoration of vegetation cover as required.

The operational workforce may impact on local resources and so to reduce this risk, mitigation consists of:

- Not collecting firewood from the site or the wider area.
- Prohibiting hunting or collection of wild animals on the site and, where possible, in the surrounding areas by site staff

The ongoing bat activity surveys will determine appropriate levels of operational mitigation. Based on activity levels recorded to date, no significant impacts are predicted however in accordance with best practice guidance it is likely that carcass monitoring around the Project site would be appropriate in the first year of operation so that changes in site usage by bats can be managed and operation adapted. If activity levels are shown to be significantly higher in Spring and early Summer, then some level of WTG curtailment may be necessary, though the need for this will be updated for the Final ESIA.

6.5.6 Decommissioning

Activities associated with the decommissioning of the Project such as vehicle traffic and earth movements and site restoration may have impacts on vegetation and sensitive species on the site. Measures to reduce / enhance impacts include:

- Confine vehicles, equipment and foot traffic to demarcated areas.
- After roads or other compacted areas are removed and / or abandoned, scarify and preferably allow natural vegetation to recolonise although it is anticipated that the land will be returned to agricultural production. Shelter belts should not be adversely impacted by these activities and these should also be left as wide as possible.

6.6 Enhancements

Enhancements will be completed to improve the quality of the habitats being retained as well as ensure that suitable refuge habitats are present for a range of mammals, reptiles and invertebrates.

Enhancements will include seed harvesting from native vegetation along with planting away from proposed WTG bases and roads to increase the amount of cover and improve opportunities for wildlife to move through the site. Any additional planting and associated habitat improvement will also replace areas of habitat that are being lost to the development.

If any additional opportunities for enhancement are highlighted by the ongoing surveys these will be updated in subsequent iterations of this document and within a specific Biodiversity Management Plan.

Enhancements will also be completed once the Project has been decommissioned and this will involve re-planting the WTG base and road areas of the site.

6.7 Residual Effects and Summary

Based on information available at the time of writing, the impacts on other habitats and all species on, or within the vicinity of, the proposed Project site have been assessed as low generally, with some impacts anticipated at local levels. The proposed mitigation will reduce the levels of impact to not significant at any geographic level.

Provided that the proposed mitigation measures are fully and successfully implemented, the overall effect of Project on species and habitats will be Minor and not significant in the long-term. Following decommissioning, reinstatement will re-establish the ecosystem in the areas previously occupied by the WTGs, site roads and other structures should result in a residual impact that is considered to be a positive impact of low to moderate significance.

7 Social Impact Assessment

7.1 Introduction

This chapter provides a description of the way in which stakeholders have been informed, consulted, and have participated in the process of preparing the ESIA. Stakeholders have assisted in the identification of potential socio-economic impacts and provided information on socio-economic conditions and land use activities.

The social impact assessment chapter considers the changes which may occur during the construction, operation, and decommissioning of the Project in demographics and economics, social infrastructure, land use, community wellbeing, and the health and safety of workers and communities.

As stated in Section 1.1, the Project is considered as a Category A for environment impacts and a Category B for involuntary resettlement and Category C for indigenous peoples under the Asian Development Bank (ADB) safeguard categories. This classification reflects the following:

- Category B for involuntary resettlement: "*A proposed project includes involuntary resettlement impacts that are not deemed significant. A resettlement plan, which includes assessment of social impacts, is required*".
- Category C for indigenous peoples: *"A proposed project is not expected to have impacts on indigenous peoples. No further action is required"*.

7.1.1 Principles of Consultation and Consultation Requirements

IFC Performance Standards, EBRD Performance Requirements and Equator Principles

Consultation and disclosure of information is a key part of the ESIA and Project development process. The consultation principles align with the Equator Principles and IFC Performance Standard on Environmental and Social Sustainability (2012), with the aim of ensuring that all reasonable public opinions are adequately considered.

Equator Principle (EP) 5 (Consultation and Disclosure) requires the Project to undertake a process of consultation with affected communities in a manner that provides them with opportunities to express their views on Project risks, impacts, and mitigation measures, and allows the Sponsor to consider and respond to them. The consultation process should be undertaken in a manner that is inclusive, culturally appropriate, free from intimidation, timely and informed.

EP 6 (Grievance Mechanism) requires that a grievance mechanism must be developed which allows Project affected parties to raise grievances to either the Sponsor or a third party who will seek to resolve the grievance as appropriate.

IFC Performance Standard (PS) 1 (Social and Environmental Assessment and Management Systems) requires community engagement, Project information disclosure, consultation and grievance mechanisms to be implemented similar to the requirements of EP 5.

IFC PS 4 (Community, Health, Safety and Security) objectives are to:

- To avoid or minimise risks to and impacts on the health and safety of the local community during the Project life cycle from both routine and non-routine circumstances.
- To ensure that the safeguarding of personnel and property is carried out in a legitimate manner that avoids or minimises risks to the community's safety and security.

EBRD Performance Requirements

EBRD's Environmental and Social Policy (ESP) (2019) and the accompanying ten Performance Requirements (PRs) provide a robust set of principles and minimum standards that the Project needs to demonstrate compliance with. All of the applicable PRs apply to this Project, with the exception of EBRD PR7: Indigenous Peoples as there is no evidence that any indigenous persons are present within the Project area of influence.

7.1.2 ESIA Consultation Activities to Date

A summary of stakeholder engagement activities completed with local stakeholders during preparation of the ESIA is presented in Table 7-1 along with details of the key discussion points. At the start of each meeting, a broad overview of the Project was provided alongside details of the purpose of the specific meeting or focus group discussion. The term 'mahalla' used in Table 7-1 refers to an urban neighbourhood within a larger urban settlement, with the leader (the 'mahallah') having a role that includes the resolution of small conflicts and grievances amongst the population, whilst providing assistance to vulnerable people to the extent that they are able to.

Stakeholder engagement activities have been completed with the following:

1. Teachers of primary school №5 in Muruntov.
2. Teachers of secondary Schools №10, Zarafshan.
3. Chair of Mahalla Yangi area, Zarafshan.
4. Chair of mahalla and family department, Zarafshan.
5. Women of Yangi, Zarafshan.
6. Community leaders, Jingildy village.
7. Women of Jingildy village.
8. Farmer, Kynyr village.
9. Women, Kynyr village.
10. Community leaders, Tamdybulak.
11. Women, Tamdybulak and Kazbekbi villages.
12. Teachers of a secondary School № 4, Tamdybulak.
13. Community leaders, Ajiriqti village.
14. Teachers of a secondary School №1, Ajiriqti village.
15. Farmer, Ajiriqti village.
16. Women, Ajiriqti village.
17. Community leaders, Yangi Tamdy village.
18. Teachers of a secondary School №25, Yangi Tamdy village.
19. Teachers of a secondary School №18, Rokhat village.
20. Community leaders, Rokhat village.
21. Community members, Mahalla Alisher Navoi, Zarafshan.
22. Director of Youth Centre NGO Timaris, Kanimekh district, Navoi.
23. Director of the Society of Disabled People of Kanimekh district, Navoi region.
24. Zarafshan city Khokimiyat (a Khokimiyat is local government administration unit).
25. Tamdy District Khokimiyat.
26. Zarafshan Golden Mining.

For the purpose of disclosing information to stakeholders, the following visual aids were used and prepared in three languages: Russian, Uzbek and Kazakh:

- Project leaflet (A5 format).
- Grievance leaflet (A2 format).
- Project poster (A0 format).

In addition to the above, a GIS Mapping and Social Study was undertaken during March / April 2021 to gather additional information from farmers and herders who are active in the Project Area. The results of the interviews completed with these types of stakeholders are presented in Section 7.4.6.

The consultation and disclosure carried out to date will be continued, with the disclosure of findings of the ESIA and ESMP, all of which shall be undertaken prior to the start of construction. The consultation process will be led by Masdar's Community Liaison Manager with the outcomes of future consultation communicated through SEP updates.

During the consultation and disclosure activities undertaken, a Project Information leaflet, a Grievance Mechanism Leaflet and a large poster were utilised. The Project Information Leaflet included details of the following:

- An introduction to the Project.
- A summary of the environmental and social studies that are being carried out.
- Details of the consultation process.
- Details of what a WTG is and how it functions.
- A summary of construction activities.
- A summary of the activities that are to take place during operations.
- Frequency asked questions about local electrification, local employment opportunities, noise generation, whether animals can graze near to the WTGs, potential impacts from shadow flicker, impacts to people's health and livestock health, and how long the WTGs will be present.
- Details of the grievance mechanism.

To accompany the Project Information Leaflet, a Grievance Mechanism Leaflet was also prepared. This include a summary of how the mechanism operates, a flow-chart indicating the various steps to be taken during the grievance resolution process, and a grievance form that could be completed by a person wishing to raise a complaint.

The large poster prepared included details of the proposed WTG locations, the substation and the OHLs.

Table 7-1 Stakeholder engagement activities

Date	Attendees	Location	Key Discussions
29.09.2020	Leaders of Muruntov mahalla	Muruntov mahalla of Zarafshan	Mahalla Muruntov is located inside the Navoi mining industrial zone near the Muruntov quarry, which is active. There are no private houses in the mahalla. All houses belong to the Navoi Mining Company and were built for the employees of the mine and are owned by the Company. In the near future, the mahalla will be moved to the city of Zarafshan due to the expansion of the mining industrial zone. The wind farm project is supported because of the generation of employment for local people, and due to the expected future increase in electricity that will attract more industrial plants and factories, which will generate even more employment and development.
29.09.2020	Women of Muruntov: entrepreneur, secretary of mahalla	Muruntov mahalla of Zarafshan	Since Muruntov is a village for employees of Navoi Mining Company, many women in the mahallas are wives, mothers, sisters, and daughters of the employees of the Company. There are few job opportunities for women and most spend their time on housework. In terms of weddings, respondents commented that Kazakh men steal their future wives before the wedding, then pay a fee (a bride price or *"kalym")* and also pay for the wedding. Amongst the Uzbeks, matchmakers are looking for future daughters-in-law and, between families, Uzbeks also have a tradition of paying a price for the bride. All marriages must proceed through a formal state and religious registration. The local religious leader reads the *"nikah"* and then declares them husband and wife. The inheritance from Kazakhs and Uzbeks is by default transferred to the youngest son, who typically stays at the parental home and takes care of his parents when they are retired. If the Project creates, directly or indirectly, employment opportunities for women, there will be many women willing to work and apply.
29.09.2020	Teachers of school №5	Muruntov mahalla of Zarafshan	There are two schools in Muruntov: Kazakh and Uzbek. Due to the pandemic, many children are out of school this year and are studying remotely. Television channels broadcast the school curriculum daily. However, less than half of the students attend this 'virtual' school.

Date	Attendees	Location	Key Discussions
29.09.2020	Chair of Mahalla Yangi Zarafshan	Khokimiyat of Zarafshan city	Mahalla Yangi Zarafshan is located in the southern and southwestern part of the city. The mahalla until 1994 was a separate village named after Abai (famous Kazakh poet) as part of the Tamdynsky Region. During the expansion of the city, Zarafshan was assimilated with this village. The ethnic composition is 40% Kazakhs, 40% Uzbeks, 10% Karakalpaks, 5% Tajiks, 5% Russians. The population is currently estimated to be 5,146 people. Most people work for the Navoi Mining Company (60%). There are 3 farmers in the mahalla, but they graze their herds on the side of Uchkuduk which is not close to the Project area. There are self-employed citizens who keep small herds of cattle they graze their cattle around the mahalla, and two traditional 'folk healers'. People use the Project Area when they travel to the holy cemetery "*Gujumli Avlie*". The residents of the mahalla are supportive of the Project as they expect future employment opportunities.

Date	Attendees	Location	Key Discussions
29.09.2020	Chair of mahalla and family department	Khokimiyat of Zarafshan City	The questions on the role and responsibilities of men and women, indicate that all household work is undertaken by a woman, and men take care of their cattle and household plot of land. Many women know how to sew which is a local skill. Women are willing to apply for employment positions generated by the Project. In the city where the participants live, women work in private factories such as PE Agama, Arianna Yarst Textile LLC. About 270 women work in the Agame private enterprise and about 118 women work in Arianna Yarst Textile LLC. Since there are many nationalities in the city, everyone has different customs. After marriage, the girl must move to the groom's house and the woman has an equal voice in the decisions made in the household. There is a significant problem of unemployment for all people, men and women. There are cases of violence against women and during 2020, 15 women were issued a protection order. There is a shelter in the city of MSG "Gornobyvateli", which is financed by Navoi Mining Company and women can stay there for two weeks, free of charge, until the conflict situation has passed. Women inherit land if their spouse is absent, although the land usually belongs to the man. With regards to potential impacts of the Project, no negative impacts were identified. Positive impacts include employment generation and increased electricity for home and business, new jobs from future industrial developments. These benefits should impact both women and men. The participants commented on the way in which the information was shared, which was undertaken with transparency and openness. *"It's complete and reliable"* they commented and are supportive of the Project. Participants suggested to share information about the Project using social media networks as the entire population will benefit from the Project. The creation of new jobs will improve the living standards and income of women.
29.09.2020	Women of Yangi Zarafshan mahalla: housewifes	Yangi Zarafshan mahalla	Women are generally constantly at home, and all household chores are undertaken by women. Men are engaged in shopping for the household. Women know how to sew, and weave carpets. There are no women's organisations on their territory, and there are no shelters for protection, either. After getting married, a girl moves to the groom's house. According to their knowledge there are no local conflicts over land. The Project has no significant negative impacts expected, and positive impacts include increased electricity generation. They support the Project.

Date	Attendees	Location	Key Discussions
29.10.2020	Teacher of school №10, Zarafshan city	Khokimiyat of Zarafshan City	The school has 800 students: 350 boys and 450 girls. There are 120 teachers. The school has 36 classrooms. There are approximately 25-26 students in each class. There is a library in the school. The school has water and electricity. Attendance does not depend on gender. The school has students from an orphanage and there are 150 orphans attending. The literacy rate is 100%. There are middle and high school disabled students and have home-based education. During the last five years living standards have improved. The developer could, in the future, provide support by helping students with disabilities in purchasing computers. In general, they are supportive of the Project.
29.10.2020	Teacher of school № 5	Muruntov village	The school has 60 students, including 20 boys and 40 girls. There are 12 teachers and 8 classrooms. Approximately 6-8 students study in each class and there is a library and electricity. Children attending school live in the village and attendance is 100%. There are no vulnerable students in the area. The information on the Project was useful, and it would be good if the wind farm developer could support the village school with educational equipment.
30.09.2020	Community leaders	Jingildy village	Jingildy is one of the most sparsely populated villages in the Tamdy District. The meeting was held with community leader and 4 women from this location. Respondents mentioned the problem with the availability of water and the unfair distribution of land. There is no source of water in the village itself and this is transported to the village from a well with a depth of more than 100m, located a distance of 2km. Regarding the pasture, when a local farm company "*shirkat*" ceased operation in 2017, they were promised by the government that an 8-kilometer pasture belt around the village would be planted for the village's cattle and the rest would be given to general farmers. Instead, just 2km of pasture was planted and when they graze their cattle 2km or more, they have conflicts with other farmers over access to pasturelands. The participants mentioned the importance of having strong power transmission wires, because when a strong wind joins together the wires, short circuits are formed and results in the burnout of household appliances. There are 8-10 unemployed men and women in the village who will be happy to apply for employment positions.

Date	Attendees	Location	Key Discussions
30.09.2020	Women of Jingildy village: 3 housewives and a pensioner	Jingildy village	The village is home to only seven families who remained after the reorganisation of the shirkat farm. There are no women's organisations in the area. No negative views towards the Project were raised and the women hope the Project brings employment and other benefits.
30.09.2020	Farmer	Kynyr village	The farm Aldiyarov Kalambay is located close to the village of Kynyr and specialises mainly in camel breeding. Farmer Kalambay is famous for his "*shubat*" camel milk mare (milk from a female camel). He has 35 camels, 100 sheep, 40 goats and 4 cows, and the family are involved in his pastoralist livelihood. Women are responsible for milk production, and there are 2 water wells in the area he uses for pasture. Livestock and meat are sold quite cheaply, about 4 USD a kilo. Locals or middlemen purchase it, and there is no livestock market in the whole area. His main problem is a lack of water and they need more wells. There is a veterinarian who can provide support and his livestock is vaccinated against anthrax. A further challenge is the loss of newborn lambs (about 20 a year) that are killed by foxes and wild cats when they lag behind the herd. They do not hunt and the collection of wild herbs is very rare. Herbs collected by women: comprise Isirik (*peganum harmala*) for medicinal purposes including pain relief, Artemisia (*Artemisia terra alba*) for cough, stomach and intestinal upset, and *Alhagi pseudoalhagi* for cattle.
30.09.2020	Meeting with women	Kynyr village, community leader's place	There are only six families in the village. There is no shop, no school, there is a medical room but very often it is not functioning, and they travel to Tamdy District to buy food. The family of Tulegenova Gulzira was visited. Her husband owns a farm with 60 heads of camels and she is a housewife and knows how to sew. She stated that all household chores are performed by woman. Agricultural crops are not grown, and the man decides on the grooming and breeding livestock. The host invited another woman and her family members work in the farm.

Date	Attendees	Location	Key Discussions
30.09.2020	Tamdybulak village Mahalla leader, 2 village leaders, pensioners	Mahalla of Tamdybulak village	Tamdybulak (Old Tamdy) is an old regional centre of Tamdy District. The decision to move the regional centre was made in 1993-1996, but the Khokimiyat itself was moved in 2008. Old Tamdy is located in a seismically active area and near the village there is a tectonic fault, as well as bentonite rocks under the soil of the village, which increases the risk of earthquakes. Therefore in 1996 the village was recommended to be relocated. The population current estimate is 2,580 people and it's decreasing. As this is a former regional centre there is water and electricity and mobile operators provide antennas for companies Ucell and Uzmobile. The ethnic composition is 80% Kazakhs, 10% Uzbek, 10% Karakalpaks. The stakeholders present at this meeting stated that there are 8 farmers who have registered their land within the Project Area of the wind farm and many of them are based in Tamdy are not local. *NOTE: the numbers of farmers who have land leases in the Project area was later clarified with Zarafshan District in March 2021 where it was found that the actual number is 10.*
01.10.2020	Women of the Tamdybulak and Kazbekbi villages	Mahalla of Tamdybulak village	The village has 2 schools, 3 shops, feldsher obstetric station (a primary healthcare centre that provides basic access to medical services and treatments). Medical personnel at such stations typically refer patients (where necessary to the larger hospitals. They said that women are mostly engaged in housework and raising children, and there is no violence against women. There 4 vulnerable families in the area, that live in poverty, and community members support them. The perceptions towards the Project were favourable as it is expected to bring employment opportunities and electricity.
01.10.2020	Teachers of schools № 4	Mahalla of Tamdybulak village	The school has 55 students, including 20 boys and 25 girls. There are 12 teachers and 8 classrooms. Approximately 6-8 students study in each class. There is a library, electricity and the school does not provide meals. Children attending the school live in the village. Within the last five years the socio-economic situation has improved. However, within some families both parents do not work and they tend to pay less attention to their children's education. The Project is expected to be beneficial for all residents and children in the school will learn about renewable energy.

Date	Attendees	Location	Key Discussions
01.10.2020	Community leaders	Ajiriqti village mahalla	The Ajiriqti village is located between the Old and New Tamdy settlements and, together with the Kynyr village, belong to the Aktau village gathering of citizens. There are 810 inhabitants in the village and people have lived on the territory for a long time; nomadic herders lived here previously close to a water well. In 1950-60, a collective farm named after Balimanov was established. In the village, drinking water and electricity are supplied constantly. There is a school and kindergarten. The employment level is 40% with another 40% of the population self-employed in cattle breeding. Many houses keep sheep, goats, cows and horses. From the former collective farm of Balimanov, 4 farmers have territories on the Project area: (Mirzatai Bekatai farm, Abdubakhtzhan LLC, Madina Sinbad farm, Aisultan Danabek farm).
01.10.2020	Teachers of school № 21	Ajiriqti village mahalla	The school has 240 students, of which 130 are boys and 110 are girls. There are 22 teachers and 8 classrooms, with approximately 24-26 students in each class. There is a library and equal numbers of male/female students attend the school. Parents support their children and help them with their studies. The school request support from the wind farm developers to build a football stadium in the school. After the information on the Project was shared, the participants indicated that they support the Project.
01.10.2020	Farmer, "Aysultan Danabek"	Ajiriqti	Aisultan Danabek farm is located on the eastern and south-eastern part of Aktau Mountain and was established in 2019 through a land lease agreement for 49 years. They have 300 sheep, 30 horses, 16 cows and 10 goats. On the territory there is one well with brackish water and it is collected in a pool of 500 litres. The farmer himself works as a shepherd in the farm and his son, a student, helps him. There are no livestock markets in Tamdy District and dealers from Gijduvan work in this area. There are veterinarians in the area. Community members don't hunt and collect wild plants, and sometimes hunters from outside arrive into the Project Area.
01.10.2020	Meeting with women, Ajiriqti village: Pensioner librarian	Mahalla premises, Ajiriqti	Women in the area are either housewife or employed in public services. Men graze livestock and would be happy to apply for a job within the Project.

Date	Attendees	Location	Key Discussions
01.10.2020	Chair of Mahalla, deputy khokim on women and family issues	Yangi Tamdy	Yangi Tamdy village is the regional centre of Tamdy District and all administrative buildings and institutions of the district are located here. The village is connected with a regional gas network, and the supply of electricity and drinking water is also stable. The current population is estimated to be 692 and is increasing due to the availability of employment in government departments. The ethnic composition is dominated by 85% Kazakhs. Of the farmers registered in Yangi Tamdy, at least 8 have land in the Project area. When shirkat farms began to close in 2017, the Khokimiyat announced auctions for land and farmers from other regions received land under the Aktau mountain. The participants warmly support the Project, as this is expected to generate electricity which will then lead onto more factories and jobs for people. There will also be employment opportunities from the wind farm as well.
01.10.2020	Teacher of school № 25, Public education Specialist	Yangi Tamdy	The school has 125 students, 67 boys and 58 girls, 20 teachers and there are 21 students in each class. There is running water and electricity available in the school. All students live in the school district. There is no gender inequality in school attendance, everyone has equal attendance. Parents support the education of their children. The teacher raised a concern associated with the poor quality of teaching equipment. Within the last 5 years, conditions have improved through renovation of the school, additional classrooms, and the number of new textbooks increased. There are several disabled students in the school, and they receive support from the government. They believe the Project will benefit everyone in the villages and region through the generation of employment.
02.10.2020	Teachers of Schools № 18	Rokhat village, school №18	There are 144 boys, 56 girls, 21 teachers and each class have their own classroom. There are 21 students in each class, a library, running water, electricity, and the school does not provide food. All students live in the school district. There is no gender inequality in school attendance. A new school is under construction which will be commissioned in November 2020. There are several vulnerable families in the district that receive community support. The teachers supported the Project and wanted the children to learn about renewable energy.

Date	Attendees	Location	Key Discussions
02.10.2020	Village leaders: Doctor, pensioners	Rokhat village, school №18	Rokhat village is located 6km south of the city of Zarafshan. The current estimated population is 1,050. The settlement was created in 1971 around the farm of the Tamdy state farm. In the village there is a school, medical station. The electricity supply is reliable and non-potable water which is abstracted from the Amu Darya river. An estimated total of 440 people are officially employed, of which 180 are employed at the Navoi Mining Company. There are also 8 farmers locally active. The ethnic composition of the population is 75% Kazakhs, 20% Uzbeks and 5% Karakalpaks. Among socially vulnerable people, the respondents mentioned that 13 are disabled, 22 are families living in poverty, and there are also some lonely old men. Rokhat is far from the Project Area and they are not against the construction of a wind farm. Conflicts on land and pasture in Rokhat do happen, mainly between local private herders, and farmers who have long-term leases on land. The private herders encroach on the leased land without permission. The main challenge of residents is a shortage of natural gas and drinking water. The nearest source of drinking water is 5km in the city of Zarafshan. The views on the Project were mixed, as they were not familiar with this type of activity. If the Project generates employment, then they are favourable towards the Project.
02.10.2020	Community members of Alisher Navoi	Zarafshan, Mahalla premises	Mahalla Alisher Navoi is the largest mahalla of the city with a current estimated population of 7,728 people and 1,722 families. The population of the mahalla is increasing as many people from other districts of provinces and districts come to the city in search of work. The mahalla has a kindergarten, a school, a clinic, and a bazaar. The industrial zone of the city also belongs to the territory of the mahalla. There are 4,767 officially employed in the mahalla, out of them at least 2,500 people work in the Navoi Mining Company. The ethnic composition of the mahalla is as follows: 3,870 Uzbeks, 1,311 Russians, 1,235 Kazakhs, 1,257 Kirghiz, 20 Tajiks, 35 others. Mahalla residents do not visit the Project area, and if the Project generates employment then many people will be willing to apply. Alisher Navoi mahalla is one of the richest mahallas in the city of Zarafshan. There are no communal problems, and it is their mahalla that has a prestigious gymnasium school in Zarafshan. The average salary of residents of the mahalla is higher than that of similar residents of Tashkent. They support the idea of the Project, expecting employment and electricity. The Project may benefit men rather than women from employment.

Date	Attendees	Location	Key Discussions
02.10.2020	Director of Youth Centre NGO "Timaris"	Kanimekh district, Navoi	The goal of our organisation is to assist in increasing the role and activity of disabled people, women and youth in the Navoi region, by involving them in social, economic and cultural life of the region. The NGO cooperates with the following institutions: • Administrator of Navoi region; • Union of Youth of Navoi region; • Council for the coordination of the activities of self-government bodies of citizens of the Navoi region; and • Editorial office of the "Banner of Friendship" newspaper. The organisation was created in 2018 and started 2 projects to educate unemployed women and girls on their legal rights in the territories of Uchkuduk, Zarafshan, Tamdy, Kanimekh and Zafarabad. Navoi region is the largest in terms of territory in the Republic of Uzbekistan, the second after Karakalpakstan. There is a problem with the provision of public transport due to the large distances between settlements in the region.
02.10.2020	NGO "society of disabled people"	Kanimekh, Navoi region	The goal of our organisation is to increase the role, opportunities and protect the rights of disabled people, women and youth in the Navoi region. The organisation was created in 2013 and registered under No.122 by the Department of Justice of the Administrator of the Navoi region. The NGO's partners are: • Administrator of Kanimekh District, • Council for the coordination of the activities of self-government bodies of citizens of the Navoi region; • Office for support of family and mahalla; and • Department of employment of the Kanimekh District. The Project is expected to benefit the local population and businesses, both at home (for women) and for men through employment. The Project should offer employment places for disabled people, as well as raise the level of education and social support to the disabled community of the region.

13.11.2020	Representatives of Zarafshan City Administrator, Zarafshan Golden Mining Company	On-line session via ZOOM	Zarafshan city is a relatively young city being established in 1965. The population is 82,000, of which 46,000 are economically active. There are 4 banks, 13 mahallas, 2 markets in the city, plus 12 schools, 13 kindergartens one in each mahalla. 30,000 city inhabitants are young people aged 18-30 years. Major sectors are industry and services. The agriculture sector is barely present. The average monthly wage is 4,700 UZS (470 USD). The main part of the population (25 000) is employed in Zarafshan Golden Mining Complex. There are no conflicts observed in the city, and the streets are equipped with cameras resulting in a low crime rate. There are 323 residential buildings and of these 50 are relatively new. The work in the mine is carried out in shifts, all year around. The main road is used for the transportation of workers to the plant. The mining ore is transported by railroad and not by the public road network. The resort area "Golden Keys" belongs to the mining complex. Employees of the mine can book and spend weekends or vacations in the resort which is mostly occupied in summer. Information about future employment vacancies can be communicated via the Cities' official website, local newspaper, and local labour office. Social media is very popular (telegram) and can also be used. The city representatives fully support the Project and there is the potential for the Project to attract tourists, as this is the first wind farm in the country. The representatives stated that they believe men will benefit more than women, as men have higher levels of education in areas such as energy and construction. Overall, this type of Project is crucial for the region and may attract further investment in the future as all projects need energy.

Date	Attendees	Location	Key Discussions
30.11.2020	Representative of Tamdy District Khokimiyat	On-line session via ZOOM	Deputy Khokim informed that the Project land is categorised as pastureland. On 02 September 2020, this land was transferred to the newly established Committee for the Development of Silk and Pots (No. 6059 dated 02.09.2020). All land users have now signed their contracts with the Committee. The representative did not have any information associated with the terms of lease agreements although the number of farmers with lease agreements in the Project Area could be up to 10. There are no settlements or houses in the area, other than informal shelters used by herders. Usually there are 2-3 herders who stay and work in shifts. The herders are young and middle age local people. There may be around 10 shelters in the area and their exact locations are not known as the shelters are not included in official maps and are not considered legal buildings. Usually farmers build a shelter next to the well, water course. The shelters are occupied all year around. In relation to future engagement on land-related matters, this should take place between the Project Developer and the Tamdy District, through the Committee for the Development of Silk and Pots. Deputy Khokim stated that any legal entity needing land should be registered in Tamdy District, as the taxes paid in the district will then return to the people of the area through pensions and social payments, etc. Overall, the stakeholder supports the Project.

7.2 Analysis of Stakeholder Opinions and Concerns

A review of stakeholders' opinions towards the Project reflect the following:

- A clear expectation of local employment opportunities and improved electricity supply, which is expected to result in follow-on industrial developments, bringing even more employment and improved economic opportunities in the future.
- The expectation for Project employment opportunities to benefit men more than women.
- Community investment projects that are funded by the developer to address challenges such as inadequate teaching materials, water supply problems, and the living standards and future opportunities for young and disabled people.
- The opportunity for young people to learn about this type of renewable energy which is new to both the region, and country as a whole.

During the stakeholder engagement activities, there were no specific concerns reported associated with the Project. The potential for the Project to interact with people collecting wild herbs, using land for the grazing of livestock, accessing the holy cemetery "*Gujumli Avlie*" and equal access to women for employment opportunities that were mentioned in the stakeholder engagement meetings, will be addressed in the impact assessment.

7.3 Assessment Methodology

The Project's positive and negative impacts are assessed with reference to baseline socio-economic conditions and take into consideration the following:

- The type of the impact, including whether the impact is direct or indirect, and/or reversible or irreversible.
- The duration (i.e. temporal dimension) of the impact, including whether the impact is short (up to or less than a year), medium (few years years) or long-term (lifespan of the Project), and/or temporary (few weeks/months) or permanent.
- The extent (i.e. spatial dimension) of the impact to reflect the expected change that may take place at a national (Uzbekistan) level, regional level (Tamdy District) or local community or individual household level).
- The magnitude of the impact which reflects the extent of change that is predicted from baseline conditions and the number of communities or households potentially affected.

- The sensitivity of the receptor, taking into consideration stakeholder value that reflects the importance of changing a receptor's current status (this reflects stakeholder outcomes during the various engagements completed).
- Gender and vulnerability considerations that are relevant to the impact being assessed so that these issues are systematically evaluated across the social impact assessment.
- The likelihood or probability of the impact occurring during the Project to the receptor, based upon the Project's aspects and professional experienced from similar Projects in Central Asia.

Impact magnitude is defined as below.

Table 7-2: Definitions for Impact Magnitude

Impact Magnitude	Criteria
High	Very significant, permanent / irreversible change to key characteristics, livelihoods or features of the receptor's character or distinctiveness.
Medium	Significant, potentially permanent change, over the majority of the Project's site and potentially beyond, to key characteristics or features of the receptor's status, character or distinctiveness.
Low	Noticeable, temporary (during the Project duration) change, over a part of the Project's site, to key characteristics or features of the receptor's character or distinctiveness.
Negligible	Noticeable, temporary (for part of the Project duration) change, or barely discernible change for any length of time, over a small part of the Project's site, to key characteristics or features of the receptor's character or distinctiveness.

Receptor sensitivity is defined in Table 7-3.

Table 7-3: Definitions for Receptor Sensitivity and Value

Receptor Sensitivity & Value	Value
High	Sensitivity: Receptor has a very low capacity to accommodate the impact. Value: Receptor has key characteristics which contribute significantly to the distinctiveness, and character of the socio-economic receptor (e.g. community health, physical security, food security, social cohesion, living standards, livelihood condition, mental well-being, etc.).
Medium	Sensitivity: Receptor has a low capacity to accommodate the impact. Value: Receptor has key characteristics which contribute significantly to the distinctiveness and character of the receptor (e.g. very important to some households in an affected village, but not all).
Low	Sensitivity: Receptor has some tolerance to accommodate the impact. Value: Receptor only has characteristics which are important to few people or households.
Negligible	Sensitivity: Receptor is generally tolerant and can accommodate the impact. Value: Receptor characteristics do not make a significant contribution to local socio-economic conditions, living standards or mental well-being.

The impact magnitude and the receptor sensitivity are combined to determine the magnitude of the effect, as illustrated in Table 7-4. Moderate and Major effects are considered significant.

Table 7-4: Significance Matrix

Impact Magnitude	Receptor Sensitivity / Value			
	High	**Medium**	**Low**	**Negligible**
High	Major	Major	Moderate	**Negligble**
Medium	Major	Moderate	Minor	**Negligble**
Low	Moderate	Moderate	Minor	**Negligble**
Negligible	**Negligble**	**Negligble**	**Negligble**	**Negligble**

7.4 Socio-economic Baseline Conditions

7.4.1 Introduction

The purpose of this section is to provide a summary of the existing socio-economic baseline conditions, identifying future trends where possible to do so. A photo log of local land use conditions is provided in Appendix 7.

7.4.2 Geo-political setting and administrative structures

The Republic of Uzbekistan gained independence in 1991 after being part of the former Soviet Union since 1924 and began its transition to a market-based economy. Uzbekistan is a presidential republic and conducts presidential and parliamentary elections on a regular basis. All citizens of Uzbekistan over the age of 18 have the right to vote.

The Uzbekistan population is 34.4 million people (recorded in October 2020[50]), of which approximately half live in urban areas.

Uzbekistan is a resource-rich, doubly landlocked country, strategically located in the heart of Central Asia. It shares borders with Kazakhstan to the west and to the north, Kyrgyzstan and Tajikistan to the east, and Afghanistan and Turkmenistan to the south. The territory of Uzbekistan occupies 448.9 thousand km^2.

The official language of Uzbekistan is Uzbek. Uzbekistan's capital is Tashkent.

People govern the state directly or through their elected representatives. Participation by people in the state administration is defined by the Constitution of the Republic of Uzbekistan and secured by special laws.

People administer the state through deputies whom they elect to *Oliy Majlis* (national parliament) of the Republic of Uzbekistan, *Kengashs* (councils), *viloyats* (provinces), *tumans* (districts), and towns. Only those elected to the *Oliy Majlis* of the Republic of Uzbekistan and the President of the Republic of Uzbekistan can act on behalf of the people.

The Oliy Majlis is a legislative branch of power and consists of two chambers: the legislative chamber (Lower House) and the Senate (Upper House). The President of the Republic of Uzbekistan is a head of the state as well as an executive branch of power.

[50] The State Committee of the Republic of Uzbekistan on statistics. Available at: https://stat.uz/en/press-center/news-of-committee/6574-demographic-statistics-in-numbers [accessed November 2020].

The judiciary is independent from legislative and executive branches, political parties, and other public organisations. The judiciary consists of Constitutional, Supreme, and Supreme Economic Courts, and the Supreme, and Economic Courts of the Republic of Karakalpakstan. Military and economic courts of provinces, the city of Tashkent, districts and towns, are appointed for the same term.

The Project area is located within the Navoi Region and is located in the Tamdy District.

7.4.3 National and regional economic setting

Uzbekistan is a lower middle-income country, defined by the World Bank[51] as an economy with a Gross National Income per capita between 1,036 and 4,045 USD. The Uzbekistani som (UZS) is the currency of Uzbekistan and as of 21 April 2021, 1 USD was equal to 10,552 UZS.

According to the World Bank, in the first half of 2020 Uzbekistan' GDP growth was nearly zero compared to growth of 5.8% in the first half of 2019. Investment in fixed capital decreased by 12.8% in the same period. The unemployment rate increased sharply from 9.4% in the first quarter of 2020 to 15% in the second quarter. There is limited data for the rate of unemployment across the Navoi Region. According to the CEIC[52], the rate of unemployment in 2017 was 5% and this level has remained relatively stable since 2007.

Uzbekistan is among the world leaders in the supply of certain types of minerals: gold, uranium, copper, phosphate, molybdenum, etc. Higher gold production and agriculture growth have helped offset a recent, sharp fall in industry and services.

Annual GDP growth is projected by the World Bank to be between 0.4 and 0.8% in 2020. Assuming limited further COVID-19 lockdowns, GDP growth is projected to be between 4.8 and 5.0% in 2021.

According to the IMF[53], in 2019, the Gross Domestic Product (GDP) of Uzbekistan was at 60.490 billion USD.

[51] World Bank Country and Lending Groups. Available at: https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups [accessed November 2020].

[52] CEIC Data, 2012. Available at: https://www.ceicdata.com/en/uzbekistan/unemployment-rate-by-region/unemployment-rate-navoi [accessed April 2021).

[53] The World Economic Outlook database by International Monetary Fund. Available at https://www.imf.org/en/Publications/SPROLLs/world-economic-outlook-databases [accessed November 2020].

According to preliminary data for nine months of 2020[54], the share of agriculture, forestry and fisheries in GDP growth was the highest. The volume of production in this sector increased by 3.4%, providing GDP growth by 0.8% points. While the growth rate of construction increased by 8.6%, its contribution to GDP growth was 0.5%. In industry, there was a decrease in GDP by 0.7% point, due to a decrease in production by 2.7%. In addition, a 0.7% decline in the service sector had a negative impact on GDP growth by -0.2% points.

The Navoi Region occupies the fourth place of contribution to the formation of the GDP of Uzbekistan, with a share of 7.2%; just below the neighbouring Samarkand Region (7.3%). The Navoi Region has the fourth largest GDP of Uzbekistan (36,685.2 billion UZS) and the largest GDP per capita, at 37,119.5 thousand UZS.

The geology of the Navoi Region is rich in precious metals and the mining, chemical and energy sectors are important. Navoi International Airport is the largest air cargo terminal in Central Asia. The entire Navoi Region was designated as a free economic zone[55] (FEZ) following the enactment of a Presidential Decree No. UP-5719 of May 15, 2019. The aim was 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. In order to finance relevant investment projects, the Ministry of Investments and Foreign Trade together with commercial banks have been instructed to develop proposals for attracting credit lines from international financial institutions and foreign export credit agencies.

Muruntau gold mine, located near Zarafshan, is the largest gold mine in Uzbekistan and one of the world's biggest open-pit gold mines. The mine is located in the mountains of Muruntau in the south-west of the Kyzylkum desert, on the territory of the Tamdynsky district of the Navoi region. The mine has estimated[56] reserves of 170 million ounces of gold. The Muruntau gold mine is currently producing 38.5 million tonnes of ore a year (Mtpa), which will be increased to 50Mtpa by 2026.

[54] The State Committee of the Republic of Uzbekistan on statistics. Available at: https://stat.uz/en/press-center/news-of-committee/6544-645645645-3 [accessed November 2020].
[55] Dentons law firm.uz. Available at https://www.dentons.com/en/insights/alerts/2019/may/28/uzbekistan-has-declared-its-largest-region-a-free-economic-zone [accessed November 2020].
[56] NS Energy database on Muruntau Gold Mine project. Available at https://www.nsenergybusiness.com/projects/muruntau-gold-mine/ [accessed November 2020].

According to the Ministry of Foreign Investments[57], the government has developed a program for the development of Navoi region for 2020-2021. In particular, Zarafshan, Uchkuduk, and Nurata districts were noted to be in need of investment.

Several projects in horticulture, rabbit farming, beekeeping, sericulture (silk farming using worms), poultry farming, as well as the sewing and knitwear industry have developed to create local employment and stable income sources. Future projects planned for the Navoi Region are located in Zarafshan, Kanimekh, Tamdyn, Kyzyltepa, and Uchkuduk districts and focus on handicrafts, animal husbandry, poultry farming, and textile production. In addition to the above, construction of an OHL from Navoi to Besopan is ongoing and is scheduled to be completed by 2025.

7.4.4 Income distribution and livelihoods

Uzbekistan has made modest progress in reducing income inequality, according to official data. Although the Gini coefficient moderated from 0.30 in 2011 to 0.26 in 2016, inadequate data makes it difficult to measure income inequality[58] in Uzbekistan.

Total income per capita, according to stat.uz[59] data on January-September 2020 is 8,336 thousand soms [808 USD] for Uzbekistan and 13,515 thousand soms [1,309 USD] for Navoi region. Low-income population estimated in September-2020 as 11% of the country population.

[57] Ministry of investments and foreign trade of Uzbekistan, Further prospects for the development of investment activities in Navoi region. Available at: https://mift.uz/en/news/further-prospects-for-the-development-of-investment-activities-in-navoi-region [accessed November 2020].

[58] ADB Country Partnership Strategy. Uzbekistan, 2019-2023: Supporting Economic Transformation, p.3. Available at https://www.adb.org/sites/default/files/institutional-document/510251/cps-uzb-2019-2023.pdf [accessed November 2020].

[59] The State Committee of the Republic of Uzbekistan on statistics. Available at https://stat.uz/en/official-statistics/living-standards [accessed November 2020].

According to the human development index[60], Uzbekistan is a high human development country, with an index equal to 0.710 (ranked 108th out of 189 countries). Challenges persist with regard to gender equality including traditional values that influence gender roles, the segregation of women in the labour market, disparities in property ownership, and an absence in senior management and government. To tackle the key problems, the government adopted an action plan in 2018 to promote women's employment and private entrepreneurship, improve women's reproductive health, and strengthen the institution of the family.

According to 2019 FAO report[61] on "*Gender, agriculture and rural development of Uzbekistan*", over the past decade, poverty levels have declined significantly in Uzbekistan. Poverty is still characteristic within rural populations and is driven by factors such as low agricultural productivity, high dependency rates within households, limited access to productive assets (for example, infrastructure, energy, land, water, and technical and financial services) and a high level of informality in rural labour markets.

While the services sector and industry are areas of higher growth, agriculture is still one of the most significant employers in the country. Almost half of the population of Uzbekistan lives in rural areas and engages directly in agriculture-related activities, on which they depend for their livelihoods. Horticulture and crop diversification have the potential to generate income for rural households and to increase dietary diversity and food security. Outside of farming as a formal occupation, most rural households keep livestock.

An analysis of the categories of farms by Stat.uz[62] in 2019 shows that 77.9% of the total agricultural output falls on *dehkan* (personal subsistence) farms, 19.4% on farms, and 2.7% on organisations engaged in agricultural activities. The 2019 World Bank report[63] define farms structure in Uzbekistan as *dekhkan* smallholders averaging 1 ha and producing livestock and horticulture products and large individual farms, averaging 100 ha and producing cotton and wheat under the state order system.

[60] UNDP Human Development Report for Uzbekistan. Available at http://hdr.undp.org/en/countries/profiles/UZB [accessed November 2020].

[61] FAO report on "Gender, agriculture and rural development in Uzbekistan. Available at http://www.fao.org/3/ca4628en/ca4628en.pdf [accessed November 2020].

[62] The State Committee of the Republic of Uzbekistan on statistics. Available at https://stat.uz/uploads/docs/qishloq_22.07.2019_eng.pdf [accessed November 2020].

[63] World Bank report on "Farm Restructuring in Uzbekistan: How Did It Go and What is Next?" Available at http://documents1.worldbank.org/curated/en/686761549308557243/pdf/134322-WP-P162303-PUBLIC-Report-Farm-Restructuring-in-Uzbekistan-eng.pdf [accessed November 2020].

There is no specific information about the level of household income within the settlements surrounding the Project Area.

Important livelihoods within the settlements surrounding the Project Area include livestock rearing (cattle, camels, goats, sheep), rearing horses, and very few households practice subsistence crop agriculture.

7.4.5 Population, demographics and migration trends

According to stat.uz[64], as of 01 October 2020 the population of the country stood at 34,382,937 people. The majority of the population (64%) is aged below 35 years-old while those over 35 account for 36%. The 0-14 age group is the largest (28.8%) among all age groups, which may indicate a high birth rate. In terms of gender distribution, the country has slightly more males (50.2%) than females (49.8%). The Navoi Region has a population[65] of 997,100 (as of December 2019), or about 3% of the whole population of Uzbekistan. This figure is almost equally split between the urban (487,700) and rural (509,400) population. Navoi is the second least populated region of Uzbekistan after Syrdarya. With the lowest density relative to the countrywide average density of 72.2 people per sq. km, Navoi Region, home to the Kyzylkum Desert, has a population density of 8.6 people per sq. km.

The Navoi Region 2020 population by age groups as per January 1, 2020[66] is illustrated in Table 7-5.

Table 7-5: Navoi Region population and demographic breakdown

Area	Total population	0-15	16-24	25-34	35-49	50-74	75 and older
Navoi region	997,100	296,156	136,025	189,993	196,922	163,262	14,742
Navoi city	144,158	41,901	20,165	25,422	30,577	23,924	2,169
Zarafshan	83,815	25,855	11,178	15,720	17,774	11,657	1,631
Gozgon	7,242	1,929	1,003	1,088	1,586	1,532	104
Districts							

[64] The State Committee of the Republic of Uzbekistan on statistics. Available at https://stat.uz/en/press-center/news-of-committee/6574-demographic-statistics-in-numbers [accessed November 2020].
[65] The State Committee of the Republic of Uzbekistan on statistics. The number of urban and rural population by region. Available at https://stat.uz/en/official-statistics/demography [accessed November 2020].
[66] The State Committee of the Republic of Uzbekistan on statistics. Population distribution by age groups and regions. Available at https://stat.uz/en/official-statistics/demography [accessed November 2020].

Area	Total population	0-15	16-24	25-34	35-49	50-74	75 and older
Kanimekh	35,571	10,955	4,317	6,152	7,324	6,288	535
Kyzyltepa	151,710	43,352	21,174	29,331	30,287	25,421	2,145
Navbahor	112,831	31,902	14,799	23,448	22,116	18,904	1,662
Karmana	125,578	36,609	17,478	23,351	26,384	20,332	1,424
Nurata	85,281	25,745	12,006	15,364	17,096	13,867	1,203
Tamdy	14,675	3,955	1,931	2,509	3,018	2,940	322
Uchkuduk	37,234	13,444	4,377	7,154	6,074	5,530	655
Khatyrchi	199,005	60,509	27,597	40,454	34,686	32,867	2,892

The population of Uzbekistan comprises a majority of Uzbeks (80%), as well as other ethnic minorities[67] i.e. Tajiks, Kazakhs, Russians, Karakalpaks, Kyrgyz, Tatars, Turkmens, Koreans, Ukrainians, Meskhetian Turks and Jews. Official regional data indicate a larger proportion of Uzbeks within the Navoi District (96.4%).

Due to economic difficulties in Uzbekistan, labour migration to Russia, Kazakhstan, the United Arab Emirates (UAE), Turkey, the Republic of Korea and Europe has been increasing over the last years, making it one of the major countries of origin for trafficking in persons.

As per IOM 2015 data[68], Uzbekistan' Net Migration Rate (2015-2020) is -1.6 migrants/1,000 population, Immigrants are 3.9% of the population, and women are 53.4% of the immigrants.

[67] World Directory of Minorities and Indigenous people, data for Uzbekistan. Available at https://minorityrights.org/country/uzbekistan/ [accessed November 2020].
[68] IOM overview of Uzbekistan. Available at https://www.iom.int/countries/uzbekistan [accessed November 2020].

According to the World Bank "*International Migration and Household Well-Being*" report[69] on Uzbekistan, both in terms of absolute numbers and in terms of percentages, most Uzbek labour migrants are from poorer and more rural areas. More than 26% of the poorest quintile of households in Uzbekistan include at least one member who is an international migrant compared to about 14% in the nine richest quintiles. More than 80% of migrants are men.

The Russian Federation remains the dominant destination for international migrants from Uzbekistan, accounting for more than 75% of current migrants abroad, followed by Kazakhstan at nearly 14% and Turkey at nearly 5%.

7.4.6 Land use and land tenure

Within central government, two State committees in Uzbekistan share responsibility for effective land management and have different mandates; these are the State Committee on Ecology and Environmental Protection, and *Goskomzemgeodezkadastr* (the State Committee of the Republic of Uzbekistan on Land Resources, Geodesy, Cartography and State Cadastre).

The State Committee for Nature Protection exercises State control over general land use and environmental protection. *Goskomzemgeodezkadastr* exercises state control over land use policies not covered by the State Committee for Nature Protection and is responsible for holding the cadastral register.

Land degradation is a major challenge[70] for agricultural and rural development in Uzbekistan. Extensive land use practices for crop production exhaust the soil of nutrients, while harvest practices deplete residual organic matter from the field leading to the loss of topsoil, the most productive layer. This degradation had led to a steady loss in land value and benefits derived from it since the 1990s.

All land within the Project Area is owned by the government and managed by Tamdy District on behalf of central government. Certain parts of the Project Area are leased to ten farmers for agricultural activities in the form of animal keeping.

Land use within the Project Area is used for the following purposes:

[69] World Bank International Migration and Household Well-Being. Evidence from Uzbekistan. Available at http://documents1.worldbank.org/curated/en/615721561125387061/pdf/International-Migration-and-Household-Well-Being-Evidence-from-Uzbekistan.pdf [accessed November 2020].

[70] The economics of land degradation program, Uzbekistan Case Study Policy brief. Available at http://www.eld-initiative.org/fileadmin/pdf/Country_Policy_Brief_-_Uzbekistan_WEB.pdf [accessed November 2020].

- General access to/from different locations as there is a variety of unpaved roads and tracks that cross the broader area; and
- Farmers who have signed land lease agreements with Tamdy District and pay rent annually to access their land. Typically, farmers have one, or more, informal herder shelters that provide accommodation to the herders whilst they are within the Project Area looking after the livestock.

Traditional herbs used for medicines are collected in areas that surrounding the villages and large settlements in the region. There are no specific sites within the Project Area that are used for this activity which is undertaken across the region.

A GIS Mapping and Social Study was completed during March and April 2021 to gather additional information on land use and land tenure within the Project Area. The objectives of the study were to:

- Identify using satellite imagery, features of interest within a mapping area, broadly representing the Project area but slightly expanded in all directions to check for the presence of adjacent sensitivities.
- Prepare a list of locations that were later visited by a survey team to check the location of the features identified, take photos, and conduct interviews with farmers and herders to gather information on their socio-economic status.
- Compile the results into a land use sensitivity map that could be used to inform the final layout of the windfarm, so that environmental and social impacts are avoided/minimised to the extent possible in accordance with the mitigation hierarchy.

A map indicating the boundaries of leased land areas was obtained from Tamdy District and digitised so that this could be used for a quantitative assessment of land use changes within each leased area.

The Project comprises a total of 111 WTGs. The results of the GIS Mapping and Social Study has confirmed the presence of 10 farmers currently leasing land within the Project Area. Within the 10 leased land areas, there are 41 WTGs, sections of land that are to be used for new internal roads and the upgrade of existing roads. The substation and OLHs are located outside of all leased land area boundaries.

The leased land areas and the overlap with Project infrastructure are illustrated in Figure 7-1.

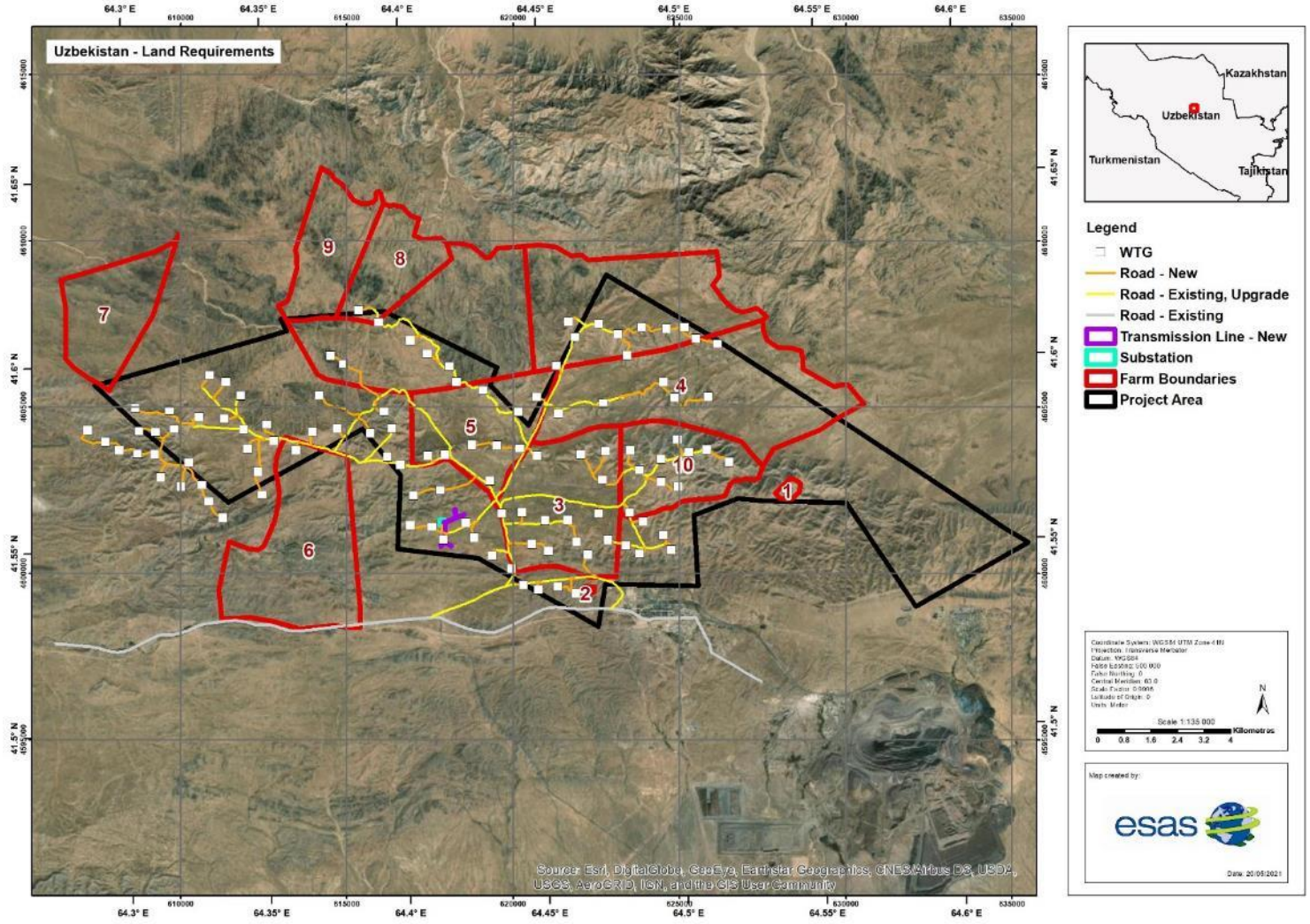


Figure 7-1: Illustration of leased land areas and Project infrastructure

The GIS Mapping and Social Study identified four herder shelters used as accommodation by herders who graze their animals within the leased farming areas, a tourist hotel, mining complex and a cultural heritage site. A variety of abandoned or non-residential structures were also identified. All of the features identified are illustrated in Figure 7-2 along with their active/abandoned status.

Table 7-6 provides a summary of the residential features within the Project Area along with a photo to illustrate the current condition of each location.

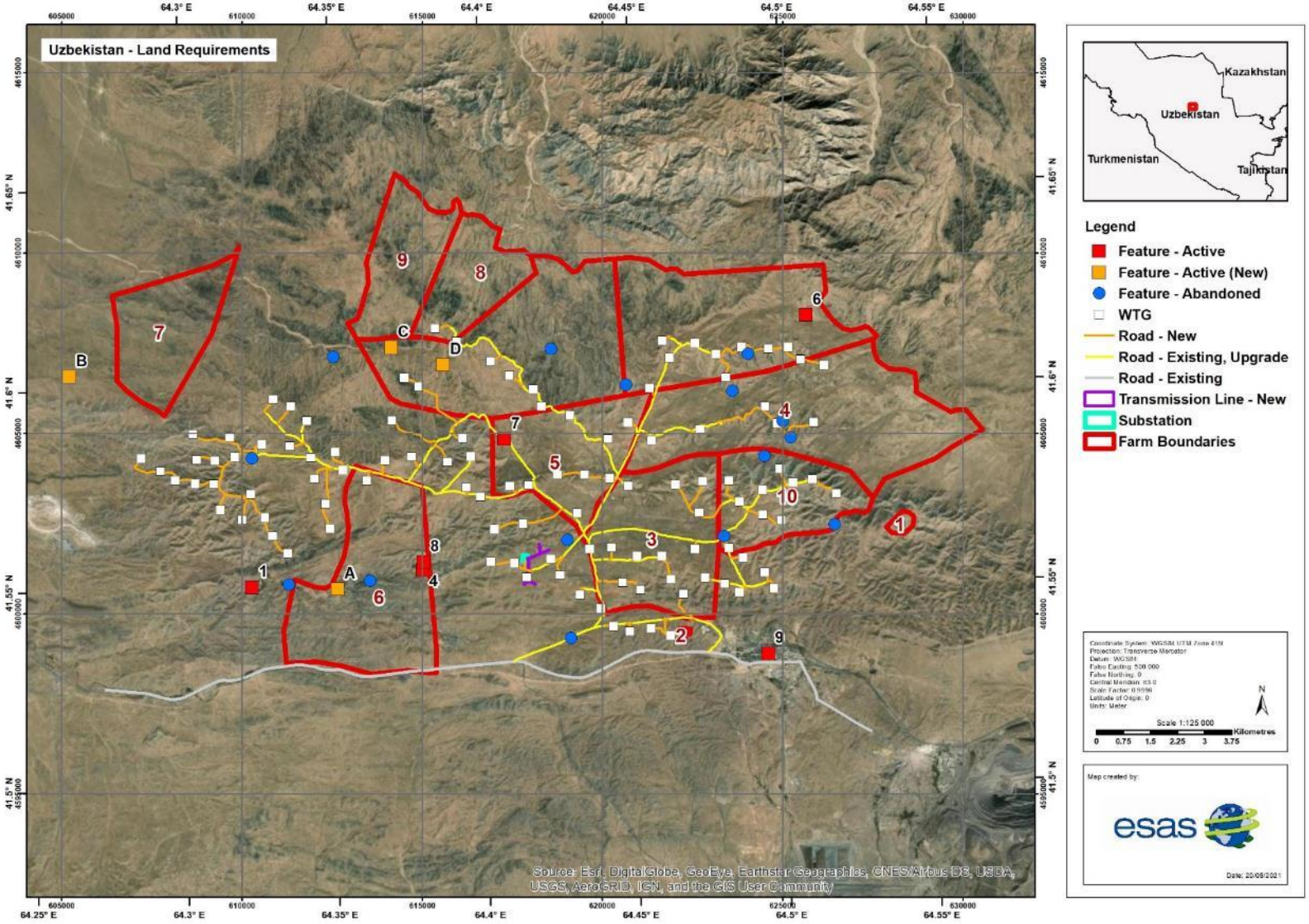


Figure 7-2: Illustration of active and abandoned features within the Project Area

Table 7-6: Summary of active sites within or adjacent to the Project Area

Map ID No.	GPS Coordinates (Decimal Degrees)	Land Use and Category Description	Example photo
A	41.3259 64.2048 This is around 1.7 km from the nearest WTG (WTG 25)	Herder shelter that provides overnight accommodation for herders.	

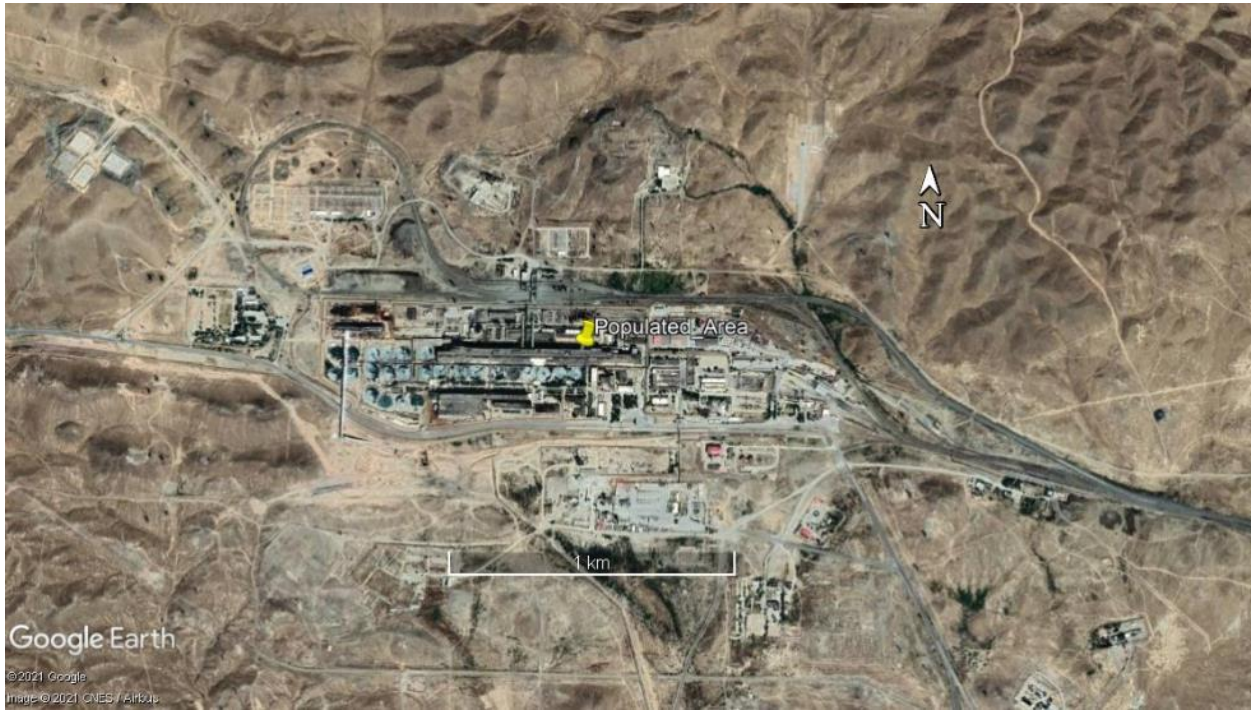
Map ID No.	GPS Coordinates (Decimal Degrees)	Land Use Category and Description	Example photo
C	41.6101 64.3698 This is around 940 m from the nearest WTG (WTG 31)	Herder shelter that provides overnight accommodation for herders.	

Map ID No.	GPS Coordinates (Decimal Degrees)	Land Use Category and Description	Example photo
1	41.5507 64.3223 This is around 1.4 km from the nearest WTG (WTG 18)	Herder shelter that provides overnight accommodation for herders. There are two buildings inside a single compound, with a smaller structure to the eastern side.	

Map ID No.	GPS Coordinates (Decimal Degrees)	Land Use Category and Description	Example photo
4	41.5544 64.3792 This is around 2 km from the nearest WTG (WTG 42)	Residential location with a cluster of buildings. This is the Gujumli Avliyo site which is a burial site considered as a holy place by local community.	

Map ID No.	GPS Coordinates (Decimal Degrees)	Land Use Category and Description	Example photo
7	41.5868 64.4070 This is around 1.1 km from the nearest WTG (WTG 39)	Herder shelter.	

Map ID No.	GPS Coordinates (Decimal Degrees)	Land Use Category and Description	Example photo
8	41.5565 64.3795 This is 1.9 km from the nearest WTG (WTG 42)	Tourist hotel which is part of the "Cold Spring" Mining Complex	

Map ID No.	GPS Coordinates (Decimal Degrees)	Land Use Category and Description	Example photo
9	41.5322 64.4937 This is 1.8 km from the nearest WTG (WTG 101)	Muruntau gold mine complex where workers are present, including convicted criminals as this is both a commercial enterprise as well as a penal colony.	

A summary of farmer consultation activities is presented in Table 7-7.

Table 7-7: Farmer Consultation Activities

Interview Reference	Farm Name / Map Reference (Figure 7-2)	Interviewee	Date	Coordinates	Summary
1	Farm Arhar / Map ID No. 1	Farmer: Ergashev Sherzod 1 Farmer +2 herders	02/04/2021	41.6165, 64.508	The farmer has two herders. He is interested in the new project. There are two shelters in the farm. No major concerns were raised. He currently lives in Zarafshan City with his family and two children and has a secondary level of education. He has leased land in the Project Area for the last four years and pays the lease on an annual basis to Tamdy District. He does not sub-let any part of his leased farm area to another party. He owns 100 cows and 200 sheep and uses two herders (not the same as the herder interviewed below). The herders are not members of his family. He has two animal shelters on his farmland constructed in 2018 from concrete, wood and clay. He gives permission to the herders to use the shelters and they are used throughout the year.
2	Farm Iskanderni Chorvasi / Map ID No. A	Herder: Azim Yuldoshev 1 Farmer +2 herders	01/04/2021	41.5498, 64.3467	Two herders are employed at the farm. The interview herder has a wife. The second herder has a wife and two young children. It's their first working month. There are four shelters within the farm and the 5th is under construction. No concerns about the project, new working opportunities.

Interview Reference	Farm Name / Map Reference (Figure 7-2)	Interviewee	Date	Coordinates	Summary
3	Farm Abdubahtjan	Farmer: Bakitjan Pulatov 1 farmer +1 herder (his brother)	02/04/2021	41.6165,64,508	Works himself as a herder, together with his older brother. He has a family of five people and the family resides in the Tomdy, whereas he spends most of the time in the farm. There are three shelters for animals on the farm. No major concerns about the project.

Interview Reference	Farm Name / Map Reference (Figure 7-2)	Interviewee	Date	Coordinates	Summary
4	Farm Mirzatay Bekatay / Map ID No 7	Farmer: Marat Ayimbetov 1 farmer and his son	07/04/2021 and revisited on 11/07/2021	41.5868,64.407	The farm was visited but farmer was not at the place. The interview was taken by phone. The farm is maintained by farmer and his son. The family resides in Zarafshan. The farm has three animal shelters. The farmer heard about the project and had no major concerns about the wind farm. He has leased land in the Project Area since 2017 from Tamdy District. He does not sub-let his farming area to anybody else. He has a large number of cows (reported to be 1,700) and is involved in large-scale cattle breeding. He also has 400 sheep and 20 horses. He uses a number of herders, none of which are members of his family. He uses three buildings within this farm which were constructed since 1975, and these are used all year round. The farmer was revisited on 11 July 2021. The farmer is currently now using the land and shelter of the farm, Nashirov Zokhid. The farmer informed that he is herding from May to February in the new place (Nashirov Zohid Farm) and during the months of March and April he is using his own farm

Interview Reference	Farm Name / Map Reference (Figure 7-2)	Interviewee	Date	Coordinates	Summary
5	Farm Ramzan city	Farmer: Hurshid Kadirov A farmer and 2 herders	07/04/2021	41.600042, 64.447816	The area was visited but both farmer and herders were away from the area. The farmer has shelter in the project are, that surveyors were not able to locate. The farmer, two herders and one of them often stays with his family (wife and three children). The farmer has no objections for the project. He was interested on possible implication on the farm activities.
6	Farm Qarabayir Pok	Farmer: Iskander Islomov A farmer and his son	07/04/2021	41.6165,64,508	The farmer has a wife and four children and resides in Zarafshan. The farmer herds the livestock, and his son helps him sometimes.
7	Farms Qyzylkum Barakasi and Mustang Gold	Farmer: Mirzokhid Turdiev A farmer and 2 herders	07/04/2021	(not available as the farmer is yet to construct one)	The farm was visited but the no one was in the area and so the interview was undertaken by phone. The farmer has a wife and children living in Zarafshan city. The farmer has a herder from Rokhat and the family frequently stays with herder in the farm. The farm has transferable yurt and a paddock. The farmer was interested to know more about the location of the WTGs as he plans to build a shelter in the farm area.
8	Farm Tomdy Kudukcha / Map ID No C	Farruh	Area visited on 2 April and 7 July 2021	41.6101,64.3698	The farmer has a family and 3 children residing in Zarafshan City. He has a shelter and a sheep pen in the area. He is using the area all year around.

Interview Reference	Farm Name / Map Reference (Figure 7-2)	Interviewee	Date	Coordinates	Summary
9	Nashirov Zahid Farm	The house and area are currently used by Farmer of Mirzatay Bekatay farm.	12.07.2021	41.629857, 64.40288	Mirzatay Bekatay farmer (Map ID No 7) showed the area. The farmer is herding his sheep as well as takes care of the small number of sheep of Nashirov Zakhid Farm

A total of nine interviews with farmers were held and this covers all of the farms present within the Project site. Note that the Nashirov Zakhid farm is currently being used by Mirzatay Bekatay farmer (Map ID No 7) who has access to two farms. In addition to the nine farmers interviewed, two interviews with herders were also completed.

The interview with the herder based in 'Map ID A' revealed the following:

- Herders active in the Project Area are predominately male and are of working age, although it is possible to find young male herders who are just below the age of 18.
- The herders are from smaller villages across the region.
- The herder is responsible for 66 cows within the farm lease, and he spends up to one month on a single herding trip, travelling with another male companion of a similar age (50-54). He leaves his wife and two children at home to herd the animals.
- They receive cash payment after they return to the livestock owner and expect to receive 2.5 million Soms (USD 240) each for their time.
- During their time in the Project Area, they use the same animal shelter as a place to temporarily live. When they return with the animals, other herders will then take the livestock and return to the Project Area and use the same shelter, so the shelter is in use throughout the year.
- The herders do not own the shelters as this is under the responsibility of the farmer, and the shelters are in reasonable physical condition. The shelters typically have an adjacent area where the livestock are kept overnight so they do not get lost.

7.4.7 Community health

According to the Health System Review of Uzbekistan[71] (2014), most health care providers in Uzbekistan are public. The state-run health system consists of three distinct hierarchical layers: the national (republican) level, the *viloyat* (regional) level, and the *tuman* (district) or city level. The private sector is still small and mainly comprises pharmacies, small practices, and institutions involved in health care delivery or the production and supply of pharmaceuticals or medical equipment.

[71] Uzbekistan Health system review. Available at https://www.euro.who.int/__data/assets/pdf_file/0019/270370/Uzbekistan-HiT-web.pdf?ua=1 [accessed November 2020].

Despite many efforts to reform the healthcare system, the challenges facing the public health sector in Uzbekistan remain. These include underinvestment, regional disparities in terms of allocation of resources and health outcomes, informal payments, and low quality of services. The state provides primary care, emergency care and specialised care for groups of the population classified by the government as vulnerable. Out-of-pocket expenses[72] (formal and informal) for healthcare represent close to 50% of per capita health care expenditure in Uzbekistan.

The number of available hospital beds[73] in 2019 was estimated at 153,400 in total, and 4,100,000 beds are available in Navoi Region. The number of hospitals and outpatient clinics is provided in Table 7-8.

Table 7-8: Number of hospital and outpatient clinics in Navoi Region

Region	Number of hospitals for 2019	Number of outpatient clinics in 2019
Republic of Uzbekistan as a total	**1,205**	**5,955**
Navoi city	15	93
Zarafshan city	2	24
***Hospitals are located in the following districts*:**		
Kanimekh	1	13
Kyzyltepa	1	28
Navbahor	3	22
Karmana	5	38
Nurata	1	15
Tamdy	2	7
Uchkuduk	2	15
Khatyrchi	3	32

Source: The State Committee of the Republic of Uzbekistan on statistics, 2019

[72] OECD COVID-19 Crisis response in Central Asia. Available at https://read.oecd-ilibrary.org/view/?ref=129_129634-ujyjsqu30i&title=COVID-19-crisis-response-in-central-asia [accessed November 2020].

[73] The State Committee of the Republic of Uzbekistan on statistics. Available at https://stat.uz/en/official-statistics/social-protection [accessed November 2020].

According to the World Bank[74] and national statistics[75], life expectancy at birth has continuously been increasing in Uzbekistan, from 58 in 1960 to 75.1 in 2019. There has been an increase of 4.9 years compared to 1990. The observed progress is partly because public spending on health care remains quite high[76] (5.8% of GDP). On average, women live five years longer than men (77.4 years for women against 72.8 for men). The Navoi Region has the life expectance at birth as 75.5 years (77.4 for women and 73.6 for men), which is slightly above the national average.

The government implemented a programme entitled: *"Healthy mother is a healthy child"* between 2011-2015 to decrease maternal mortality, which was highly effective.

A high burden of disease experienced in Uzbekistan and other Central Asian countries is due to the prevalence of non-communicable diseases (NCDs), which leads to high costs for treatment, disability, and a loss of economic productivity. The primary health care system is not well adapted to meet the health needs in general and in particular the NCDs. Although the proportion of deaths due to tuberculosis (TB) and HIV / AIDS has been decreasing gradually since 2000, the prevalence of drug-resistant tuberculosis is growing rapidly and is a public health concern.

Overall, Navoi Region is performing better on health-related indicators than the average for the country. For example, 1.5% of children were underweight in Navoi in 2012, below the national average of 1.8% and the Region has one of the lowest rates of infant mortality, with 7 per 1,000 births compared with 9.9 per 1,000 births across the country.

In general, infant mortality rate is higher in urban areas (11.6) compared with rural areas (3.5). However, the maternal mortality ratio for the Navoi Region in 2018 is 27.8 per 100,000 births, which is higher than the ratio of 19 observed across the country and is the second highest in the country.

The nearest healthcare facility within the Project Area is located in Zarafshan City and is a regional hospital. There are healthcare facilities present in each village surrounding the Project Area.

[74] The World Bank Data Portal. Available at https://data.worldbank.org/indicator/SP.DYN.LE00.IN?locations=UZ [accessed November 2020].

[75] The State Committee of the Republic of Uzbekistan on statistics. Available at https://stat.uz/en/official-statistics/demography [accessed November 2020].

[76] The State Committee of the Republic of Uzbekistan on statistics. National database on SDGs. Available at http://nsdg.stat.uz/en/goal/6 [accessed November 2020].

In relation to COVID-19, the first case was identified in Uzbekistan on 15 March 2020 following a citizen returning from France. As of 24 May 2021, the cases have increased to 98,657 with 6,80 deaths[77]. The government has responded to the pandemic through the closure of international borders to some nationals (including British Citizens), a prohibition on mass gatherings, closure of recreational facilities, regional lockdowns including mandatory homeworking, and a requirement to wear face masks in public spaces. At the time of preparing this report, the COVID-19 pandemic was ongoing and the number of daily new cases gradually increasing. On 17 April 2021, the government imposed new restrictions on public events, catering and transport services.

Current number of confirmed cases in the Navoi region since the start of the pandemic is 982. Of these, 96% have recovered. There are 40 active cases (less than in other regions), with 10 cases per day[78]. The growing dynamic is observed in all regions of Uzbekistan including the Navoi region.

As has been informed in the interview with Rustam Khamraev, First Deputy Head of the Regional Department of Health of the Navoi Region, the vaccination programme stated in April of this year, however the rate is still low, around 2%. Since the first week of July 2021, the 18+ program for vaccination has been launched in all regions including Navoi. Electronic database has been created. The Government has undertaken number of measures to prevent additional cases. The state has provided necessary medicines for outpatient and home treatment. People with signs of illness, without waiting for a PCR test, can receive medications from local clinics.

Navoi region has all necessary equipment and medications for the emergency deployment of the hospital. There are four oxygen stations, each with capacity for 200 beds is available in Navoi. One of the four stations is allocated for the city of Zarafshan. To date, out of 500 available beds, 100 inpatients are occupied. There are mobile assistance teams for examining patients at home, for transporting seriously ill patients. The region is well positioned in terms of health system capacity and ready for increasing demand.

[77] Worldometers. Available at: https://www.worldometers.info/coronavirus/country/uzbekistan/ [Accessed 24 May 2021].

[78] Coronavirus COVID 19: Statistics in Uzbekistan and World. Available at https://www.gazeta.uz/ru/coronavirus-stat/ [Accessed 7 July 2021]

During the pandemic period, businesses have been subject to the requirements of the Special Republican Commission on COVID. Sanitary inspection has been regularly undertaken for each enterprise and those who did not meet the requirements suspended work until all sanitary standards were restored. In general, large industry projects continued to operate without major interruptions.

Dilnoza Gafforova, Head of Department, Navoi Devision of Mahalla and Families support referred to two periods of hard quarantine in April and August 2020. There were restrictions on the use of transport and vehicles. During these periods, call centres were organized the support to population. It is stated that they have provided food packages, psychological assistance. Government provided support for businesses: Credit payments were suspended for the period of six months last year.

Due to the pandemic, the official unemployment rate rose to 15 per cent in July 2020, compared to 9.1 per cent in August 2019. Unemployment among women and youth was higher at 17.4 per cent and 20.1 per cent respectively, and the crisis has been more disruptive for self-employed and informal labour, especially in urban areas. Formal employment started recovering in mid-August once the lockdown measures were lifted, though recovery in the informal sector was slower, with the share of households reporting self-employment falling by 67 per cent in April. After an easing of restrictions, the unemployment rate recovered significantly to 10 per cent by the end of 2020 (Ministry of Employment and Labour Relations).

7.4.8 Human Rights context and Gender

In 2019, Uzbekistan ranked 106th out of 189 countries in the Human Development Index and was categorized as a high human development country. In the Gender Inequality Index that same year, Uzbekistan was rated 62nd out of 189 countries, mainly because of women's high education levels and relatively high labour force participation rates[79].

The purpose of this section is to provide a summary of key human rights risks that are relevant to the Project which comprise the following:

- The potential for labour violations to occur within the supply chain of the Project.
- Civil liberties and freedom of expression if citizens wish to organise a protest against the Project.

[79] United Nations Development Programme. Gender Inequality Index. 2020. Available at: http://hdr.undp.org/en/composite/GII [Accessed March 2021].

- Gender-based violence and harassment which could take place within the workplace, and/or within the households of local communities.
- Citizen's access to justice should they wish to raise a complaint against the Project using a judicial process.
- Compensation from expropriation and other land-related impacts arising from the Project.
- Discrimination against persons within the workforce due to disability, race, ethnicity or another factor.

Unless otherwise specified, the current situation in relation to human right risks is described in the subsequent sections using information taken from the following:

- Doing Business in Uzbekistan, Dentons, 2020[80].
- Uzbekistan 2019 Human Rights Report, United States Department of State, Bureau of Democracy, Human Rights and Labor[81].
- Uzbekistan Country Gender Assessment, Update 2018. Asian Development Bank.[82]

7.4.8.1 Labour law and labour violations

On August 20, 2018, the President of Uzbekistan adopted the Resolution No. PP- 3913 that proposed various reforms in the labour sector of Uzbekistan to protect labour rights and take additional steps to prevent and eradicate forced labour in the country. In particular, the Resolution changes national labour legislation to align with the conventions and recommendations of the International Labor Organization (ILO), and provides additional funding for labour inspection personnel across regional government departments. The new edition of the Labor Code (2020) came into force in January 2021.

[80] Doing Business in Uzbekistan, Dentons. 2020. Available at: https://www.dentons.com/en/insights/guides-reports-and-whitepapers/2020/february/26/doing-business-in-uzbekistan-guide [Accessed March 2021].

[81] Uzbekistan 2019 Human Rights Report, United States Department of State, Bureau of Democracy, Human Rights and Labor Available at: https://www.state.gov/wp-content/uploads/2020/03/UZBEKISTAN-2019-HUMAN-RIGHTS-REPORT.pdf [Accessed March 2021].

[82] Uzbekistan Country Gender Assessment, Update 2018. Asian Development Bank. Available at: https://www.adb.org/documents/uzbekistan-gender-assessment-update [Accessed March 2021].

Discrimination in the workforce

Laws and regulations prohibit discrimination with respect to employment and occupation based on race, gender, religion, and language. The law does not prohibit discrimination based on sexual orientation or gender identity, age, political opinion, national origin or citizenship, or social origin.

The use of employment contracts, minimum wage, working hours, pensions and leave

The law allows companies to conclude employment contracts for either a short or long-term duration. Employees can be hired for an indefinite or fixed term, and on a full-time or part-time basis. A fixed-term employment agreement may be concluded only in special circumstances.

Uzbekistan's minimum wage is the lowest amount a worker can be legally paid for their work. Uzbekistan's minimum wage rate is 747,300 Uzbekistani (USD 71) *som* per month for all workers and was last changed in February 2020.

A standard working week is 40 hours and any time worked over 40 hours is classified as overtime and must be paid at double the normal hourly rate. Overtime work may not exceed four hours within two days and 120 hours per year. Vacation is paid by the employee and cannot be less than 15 working days. There is no limit for employee sick leave. The allowance for employee temporary disability (sick leave) is paid by the employer from their own funds. In case of prolonged illness, the employee is subject to a special medical expert commission which makes an independent assessment regarding the employee's ability to continue work.

Female employees who have a baby are entitled to paid maternity leave for a period of 126 days. Maternity allowance is paid by the employer for the period of maternity leave based on the employee's wage. Childcare leave is then paid by the employer at the rate of 2 monthly minimum wage for a period of two years. The employee may work part time and, in this case, she is paid her part time wage plus the childcare allowance.

Pensions are provided by the state. The retirement age is 55 for women (provided that the employment record is equal to 20 years) and 60 years for men (provided that the employment record is equal to 25 years).

The number of labour inspectors increased during 2020, and there was a rise in the number of public complaints received as well as the penalties issued. Overall, the government effectively enforced these laws in the formal economy and very few labour violations were reported associated with working hours and leave, within the formal sector. No data was available on enforcement of these laws and topic areas in the informal economy.

Redundancy

The new Labour Code (2020) requires an employer to provide employees with one months prior notification before a large-scale redundancy occurs[83]. The Labor Code provides the employer with a right to choose either to keep the employees as staff for an extra month(s), or to terminate the relationship immediately with an appropriate compensation provided. An employer is obliged to inform regional labour departments on all mass dismissals. The Labor Code defines the term "*mass layoffs*" as a large-scale redundancy of 10% of employees for companies with less than 100 employees.

Misconduct

The employer should specify in its internal HR policies, the types of misconduct for which the employer can terminate employment. If the employer fails to specify these adequately, there may be no legal ground to terminate the employment of an individual.

Data privacy

An employees' written consent is required for any type of personal data processing.

A Single National Labor System was introduced from January 1, 2020. The System is designed to serve as a platform for a number of activities including:

- The electronic registration of labor relations between employers and employees, including the procedures for concluding, amending and terminating employment contracts.
- The creation of an electronic database on the structure (staffing table) of employers, including information on available and created workplaces, working conditions and remuneration.

[83] KOSTA Legal, Legal Alerts. Labour Law Reforms. Available at: https://kostalegal.com/legal-alerts/labour-law-reforms?utm_source=Mondaq&utm_medium=syndication&utm_campaign=LinkedIn-integration [Accessed March 2021]/

- The generation and maintenance of data on the employment of individuals in the electronic workbook.

Freedom of association

Trade unions can be formed, and workers can freely join, an association under national law. In practice, trade unions are common within state-owned companies and are rare in private companies.

The law provides penalties for violating freedom of association laws equal to five to 10 times the minimum salary. The government amended the law on "*professional unions, rights, and guarantees of their activities*." Despite legal protections, in practice workers have not generally been able to form or join independent unions.

There is no public information available regarding government enforcement of applicable laws ensuring workers have the right to create or join a union, as there are no known judicial cases associated with this topic.

In reality, workers continue to worry that attempts to create independent unions would be repressed by management, and that they could be forced out of their employment for irrelevant reasons. Unions remain centralised and dependent on the government and are rare within the private sector.

Child labour

The information in this section was taken from the details on the United States Embassy in Uzbekistan[84].

In 2019, Uzbekistan made a moderate advancement in efforts to eliminate the worst forms of child labour. The government took active measures to prevent the use of child labour in the cotton harvest, including the introduction of criminal penalties for repeat violations of hazardous work prohibitions, doubling the number of labour inspectors, and conducting extensive awareness-raising on child labour laws and penalties for violations. The government also established a new National Commission on Combating Trafficking in Persons and Forced Labor and adopted a new roadmap to combat trafficking in persons and forced labour.

[84] https://uz.usembassy.gov/child-labor-and-forced-labor-reports-uzbekistan/

Despite the above actions, children in Uzbekistan engage in the worst forms of child labour, including commercial sexual exploitation. Although the government made meaningful efforts in all relevant areas, laws prohibiting the commercial sexual exploitation of children do not meet international standards. Uzbekistan also has not carried out a national child labour survey to determine the prevalence of child labour in sectors other than cotton production, despite repeated calls from the United Nations Educational, Scientific and Cultural Organization (UNESCO) and other organisations, for a national survey to be conducted.

According to data published by UNESCO Institute for Statistics (2020), 4.3% of children aged 5 to 14 are actively working, and just 84% of children in the same age range regularly attend school. Where labour violations occur, the majority of these are found within the agricultural sector which includes cultivating silk cocoons and preparing land for cotton crop planting. Other economic sectors where children are present in the workplace include the collection of scrap metal, vending in markets, public works such as refurbishing school grounds and facilities, and street work such as car washing or begging.

Forced labour

The law prohibits all forms of forced or compulsory labour, except as legal punishment for offenses such as robbery, fraud, or tax evasion. Certain sections of the criminal code allow for compulsory labour as a punishment for offenses including defamation and incitement of national, racial, ethnic, or religious enmity.

Inspectors from the Ministry of Employment and Labor Relations have the authority to enforce laws on forced labour. During the 2019 the government informed the public of the prohibition against forced labour, including the annual cotton harvest.

Regional cotton production quotas remain in place, and this is a key factor that creates pressure on local officials to meet production targets set by the government which in turn encourages the use of forced labour. In October 2020, the president approved the Agriculture Development Strategy 2030, designed to stage out quotas for agricultural products by 2023.

Worker's exposure to occupational health and safety risks

The Ministry of Employment and Labor Relations establishes and enforces occupational health and safety standards. According to the law, health and safety standards should be applied in all sectors. The government effectively enforced these laws in the formal economy. No data was available on the enforcement of these laws in the informal economy.

Employers are responsible for ensuring compliance with standards, rules, and regulations on labour protection as well as obligations under collective agreements. The law provides that workers may legally remove themselves from hazardous work if an employer fails to provide adequate safety measures for the job, and the employer must pay the employee during the time of the work stoppage or provide severance pay if the employee chooses to terminate employment. However, workers do not generally exercise this right because it is not effectively enforced by government officials, and employees often fear retribution from their employers.

The law requires employers to insure against civil liability for damage caused to the life or health of an employee in connection with a work injury, occupational disease, or other injury to health caused by the employee's performance on the job. In addition, a company's employees have the right to demand, and the administration is obliged to provide them with, information on the state of working conditions and safety at work, available personal protection means, benefits, and compensations.

Workers do not generally report occupational health and safety concerns to government departments due to fear of losing their job. It is common in Uzbekistan for workers to conduct hazardous activities without the necessary personal protective equipment (PPE) and safety incidents are not properly reported, documented or investigated.

7.4.8.2 Civil liberties and freedom of expression

The government exercises official and unofficial restrictions on the ability of individuals to criticise the government or to discuss matters of general public interest. The law restricts criticism of the president, and publicly insulting the president is a crime for which conviction is punishable by up to five years in prison. The law prohibits publication of articles that incite religious conflict and ethnic discord or that advocate subverting or overthrowing the constitutional order.

While authorities relaxed some controls, independent national media did not operate freely because the state exercises control over national media coverage. All media entities, foreign and domestic, must register with authorities and provide the names of their founder, chief editor, and staff members. Print media must also provide hard copies of publications to the government. Articles in state-controlled newspapers reflect the government's viewpoint.

The government generally allows access to the internet, including social media sites. Internet service providers, allegedly at the government's request, occasionally blocked access to websites or certain pages of websites that the government considered objectionable. In 2020 the government unblocked access to international media outlets including websites operated by the BBC, Voice of America, Deutsche Welle, the Fergana news agency, Amnesty International, Human Rights Watch, and *Reporters Sans Frontieres*.

Freedom of peaceful assembly

The constitution and law allow the freedom of peaceful assembly. National media outlets reported that thousands of protestors in different cities across the country demonstrated in July against the illegal demolition of private homes and businesses (see section below relating to property rights). The demonstrations prompted the government to meet some of the protestors' demands.

Freedom of movement

Prior to the COVID-19 pandemic, the constitution and laws allow for the freedom of internal movement, foreign travel, emigration, and repatriation. The government requires hotels to register foreign visitors with the government daily. The government requires foreigners staying in private homes to register their location within three days of arrival. Authorities recently simplified these registration procedures which allow foreigners to register through an online portal.

7.4.8.3 Compensation from expropriation and other land-related impacts

Under the constitution, owners of property are required to be 'fairly' compensated for their assets before expropriation can take place.

In 2020, an ongoing government urban renewal campaign to demolish older, Soviet-era apartment blocks and private homes in both Tashkent and other regions resulted in authorities displacing tens of thousands of citizens from their homes and businesses. This was typically undertaken without due process being completed and was a source of national media attention and concern.

The government officials involved, allegedly did not provide adequate compensation to many citizens for their property. Authorities moved thousands of individuals to unsanitary temporary shelters. The resulting public protests in several locations led to swift central government action in August to compensate financially many citizens. Authorities punished some local government officials responsible for the demolitions, including by firing these local officials from their jobs. Law enforcement authorities initiated or continued criminal investigations of some officials for their role in the demolitions.

7.4.8.4 Gender

Gender context in the country

In June 2020, Uzbekistan's President approved a National Human Rights Strategy aimed at improving the country's efforts to protect and promote the human rights of its citizens, including women.

The Strategy outlines measures aimed at protecting women's rights, such as:

- The development of proposals on ensuring gender equality and preventing violence in all spheres of public life.
- The development of the Gender Equality Strategy of Uzbekistan for 2021 - 2025.
- The development of a National Plan of Action for the implementation of UN Security Council Resolution No. 1325 entitled: "Women, Peace and Security".
- Expanding women's support programs for gender-inclusive economic growth.
- Ensuring full compliance with international standards of mechanisms and the legal framework for protecting women from domestic violence.
- Raising public awareness of gender equality.
- The implementation of effective measures to ensure gender equality in all spheres of public life, especially in political activities and decision-making activities.

Gender equality in Uzbekistan has improved since independence in 1991 where the principles of non-discrimination and equal rights for women and men are enshrined in the Constitution. The Women's Committee of Uzbekistan (WCU) is the national organisation for women's issues and an important stakeholder in promoting gender equality. Chaired by the deputy prime minister, the WCU has a wide network of branches.

For urban women, the WCU identified the priority issues of *"employment, creation of new jobs, development of business and entrepreneurship skills"*. For rural women, the key issues are insufficient social and municipal infrastructure, and the need for family and home-based business development.

Gender roles and norms

Traditional norms and customs associated with the role of women as mothers, taking responsibility for looking after children and family life, are prevalent in Uzbekistan, particularly in rural areas. A woman who decides to have a career is expected to balance work and family life. Gender stereotypes related to female behaviour and social roles significantly affect professional choices for women and men and influence young women's opportunities in education and in the selection of a field for future career development. Gender norms in rural areas are more conservative, especially regarding women's roles and marriageable age, with women starting a family at a comparatively, much younger age.

According to Asian Development Bank (ADB)[85], enrolment rates in higher education are 38.2% for females and 61.8% for males; but the number of females appears to be decreasing. Rural families with limited income might give preference to higher education for boys, for economic reasons or because they are unwilling to send their daughters far from home to study, given that two-thirds of higher-education institutions are based in just three large cities.

Over the past 25 years, the level of women's participation in public administration has increased[86]. Therefore, the proportion of women in the *Oliy Majlis* (Parliament) during 1994-2017, increased from 7.3% to 15.6%. Despite these measures, the role of women in government decision-making is low. Women predominate in the lower echelons of power, in positions that do not involve decision-making.

The government in 2020 launched a new programme entitled: the "*Strategy for Achieving Gender Equality in Uzbekistan in 2020-2030*" which is being implemented by the Senate Committee on Women and Gender Equality, the Commission on Gender Equality, and the Centre for Women's Entrepreneurship.

[85] Asian Development Bank: Uzbekistan country gender assessment update, 2018. Available at https://www.adb.org/sites/default/files/institutional-document/479841/uzbekistan-country-gender-assessment-update.pdf [accessed November 2020].

[86] The State Committee of the Republic of Uzbekistan on statistics. National database on SDGs. Available at http://nsdg.stat.uz/en/goal/8 [accessed November 2020].

7.4.8.5 Support to Women

Dilnoza Gafforova, Head of Department, Navoi Devision of Mahalla and Families support mentioned a special programme for women currently undertaken to support social economic well-being of women, that has been implemented in Uzbekistan. Under the supervision of *Navoi Division of Mahalla and Families support* each mahalla conducted families' survey and studied the condition of women in need of various kinds of assistance. The assistance was divided into nine categories including support to unemployed, disabled, those in need of legal aid, medical, etc. Work is underway on each identified case.

7.4.8.6 Women's right to property and access to resources

Although legislation guarantees equal rights to property ownership for both women and men, there are still significant gender disparities. Most people acquire residential houses through inheritance which traditionally favours men. Female-owned property composes only 22.3% of the total value of property registered with the National Agency on Land and Property Cadastre.

Rural households are traditionally headed by men and. Family funds accumulate in the hands of the eldest male, usually an in-law living with the family who supervises the budget. Women's limited access to finance and assets affects their economic opportunities and empowerment.

7.4.8.7 Women's participation in business

In the first half of 2017, Small-to Medium Enterprises (SMEs) generated 46% of Uzbekistan's gross domestic product and accounted for more than 16,000 new small businesses. Among those, 42.3% are headed by women. The SME sector is a leading national employer that provided 78.2% of all jobs in the 2016 formal labour market. Women have no legal impediments to engaging or participating in income-generating opportunities.

However, some challenges remain. Women mainly occupy micro- and mini-business segments, mostly because of low skills in finance and management. The traditional mind-set consigns women to work in micro, small, and medium enterprises rather than in larger businesses. This attitude affects the behaviour of women entrepreneurs and limits their sphere of business activity.

7.4.8.8 Women's participation in agriculture

In Uzbekistan, national employment levels in agriculture, forestry, and fisheries declined from 36.2% in 1999 to 27.4% in 2016, mainly on account of men's preference for higher-paid manufacturing jobs or labour out-migration. In contrast, women's proportion of employment in small and micro businesses including farms, increased from 21.7% in 2014 to 22.5% in 2016. Women contribute to the family budget by tending small gardens and larger plots of land. They grow fruits, vegetables, or seedlings; care for livestock and poultry; produce dairy products for family consumption; sell products in the community; bake bread; and sew for the family and sometimes take sewing orders from neighbours.

Women in rural households usually manage the small funds received from the sale of milk and dairy products, eggs, and other agricultural products although only 5% operate farm enterprises themselves. Women are not involved in the grazing of livestock within the Project Area which is a male dominated activity.

7.4.8.9 Gender and sexual-based violence and harassment

In September 2020 the president signed a domestic violence law that provides a legal definition of sexual, physical, economic, and psychological violence against women, and provided support to the victims of harassment and violence. It also set up an interagency framework of responsibilities, including governmental entities such as the Cabinet of Ministries, Ministries of Internal Affairs and Employment and Labor Relations, local government bodies, the mahalla (neighbourhood) committee network, and NGOs working in the area of protecting women from domestic violence.

Cultural norms discourage women and their families from speaking openly regarding rape, and domestic media rarely report it. There are government-run shelters for victims of domestic abuse and telephone hotlines for victims seeking assistance.

The law does not explicitly prohibit sexual harassment, but it is illegal for a male supervisor to coerce a woman who has a business or financial dependency into a sexual relationship. Social norms, lack of reporting, and lack of legal recourse made it difficult to determine how prevalence this is in the workplace.

Bride kidnapping, marriage by abduction or marriage by capture, is a practice in which a man abducts the woman he wishes to marry. In the region of Karakalpakstan, an autonomous region in Uzbekistan, it is estimated that nearly 25% of all marriages are conducted by bride kidnapping[87]. Research undertaken by Becker et alk, (2017) revealed that the children of bride kidnapping have an average birth weight of 2 % to 6% lower than the regional average, reflecting that the outcome of bride kidnapping has consequences both for the women and also her children.

The results from stakeholder engagement activities completed during preparation of the ESIA, indicated that within the settlements in the vicinity of the Project Area, violence against women was common.

Gender equality at work

An analysis of past labour legislation and practice shows that one of the main causes of gender discrimination was that most of the benefits and guarantees associated with family responsibilities are granted only to women. It is for this reason that many employers preferred to employ men, who will not ever need such guarantees and benefits.

Following Presidential Decree No. PP - 4235 of March 7, 2019, men have now been eligible for the same package of rights related to the childcare. In parallel, a previous list of professions that women were not able to hold has been removed from national legislation.

7.4.9 Social infrastructure and services

According to the UNESCO Institute for Statistics[88], the gross primary school enrolment ratio of Uzbekistan was 102.22% in 2019 *(UNESCO explains that the enrolment ratio can exceed 100% due to the inclusion of over-aged and under-aged students because of early or late entrants, and grade repetition).* Uzbekistan has a high ratio, which has been increasing continuously since 2010, when it was at a lower percentage point of 92. A slightly higher ratio for males (102.84) than for females (101.57) must be noted.

[87] Alena Aminova, 2016. Uzbekistan: No Love Lost in Karakalpak Bride Thefts. Wayback Machine, Institute of War and Peace Reporting. Available at: https://iwpr.net/global-voices/uzbekistan-no-love-lost-karakalpak-bride-thefts [Accessed March 2021].

[88] UNESCO Institute for Statistics, data for Uzbekistan. Available at http://uis.unesco.org/en/country/uz

At the same time, the level of enrolment in pre-school and higher education lags significantly behind the performance of countries with similar levels of development. According to the World Bank research[89], the proportion of children regularly attending pre-school education remains low at 30%, although there has been a recent increase.

The high number of citizens aged between 0 to 3 years generates challenges in the education sector. The World Bank developed the Multi-Dimensional Preschool Education Needs Index (MDPNI) to determine the preschool education needs in each region of Uzbekistan based on 12 indicators. The indicators covered: access to infrastructure, economic conditions of households, and enrolment of children in pre-school education.

In the method adopted, a household is defined as "*deprived*" or "*in need*" when it is at or above the threshold of 33% of the index. The regions of Uzbekistan were ranked based on the share of households in each region classified as "*in need*." The five regions of Uzbekistan most in need according to the MDPNI are Kashkadarya, Djizzak, Surkandarya, Navoi (with 32.10% as of 2018), and the Republic of Karakalpakstan.

From the start of 2018, the amount parents have to pay for their children to be in pre-school education changed. Separate fees were established for Tashkent, districts, regional centers and rural areas. For certain locations (Karakalpakstan and Khorezm region; Tamdy, Uchkuduk, Kanimekh, and Nurata districts; Zarafshan city in Navoi Region), the fee[90] is one-half of the amount applied elsewhere in the country.

Uzbekistan lags significantly behind in the proportion of the population that have a higher education qualification, at equal to 9%[91].

The number of general educational institutions in 2019 is 9,942[92] schools. Among them 2,709 (27.3%) are located in the cities and 7,233 (72.7%) in rural areas. A total of 364 schools are located in the Navoi Region, with 178,060 pupils (489 pupils per education institution).

[89] World Bank. Uzbekistan Education Sector Analysis, Final report, December 2018. Available at http://documents1.worldbank.org/curated/en/379211551844192053/pdf/Uzbekistan-Education-Sector-Analysis.pdf [accessed November 2020].

[90] Online media Gazeta.uz, publication available at https://www.gazeta.uz/ru/2018/01/09/kindergarten [accessed November 2020].

[91] The State Committee of the Republic of Uzbekistan on statistics. National database on SDGs. Available at http://nsdg.stat.uz/en/goal/7 [accessed November 2020].

[92] Ministry of Public Education of Uzbekistan. Available at https://www.uzedu.uz/ru/statistika [accessed November 2020].

One of the biggest challenges being faced in Uzbekistan's education system is the availability of teachers. The Navoi Region has the lowest concentration of teachers[93] (4%) across the country.

The water supply and sanitation system in Uzbekistan was inherited from the Soviet Union and has reached the end of its economic life, requiring extensive rehabilitation. The sector is faced with a series of issues, including deteriorated infrastructure, outdated sector strategy and planning, inappropriate standards, limited financial resources, and weak institutional capacity.

Currently, over 30% of households do not have quality drinking water, and over 1 000 settlements have no drinking water at all (WHO, 2019[94]). Providing safe and affordable water and supply services for the population is therefore proving a key challenge for the government. The government has made access to safe water and sanitation a priority in its *Poverty Reduction and Welfare Improvement Strategy*. The objective of this strategy is to reach within the next decade 100% service coverage in urban areas and 85% in rural areas.

Within the Project Area, municipal pipelines provide water to the large settlements such as Zarafshan City, Tomdy, and Old Tomdy. Smaller communities reply on borehole water or potable water which transport by vehicle using large containers that are filled at larger settlements.

7.4.10 Transport and public infrastructure

The nearest airport is Navoi International Airport[95], a brand-new logistics hub, working as a part of Navoi Free Industrial Economic Zone, with 15 km distance from Navoi city.

The Project Area is connected to the regional network of existing OHLs, which include a line passing through the Project, connecting to the Navoi Mine Company that is located to the south-east of the Project. A regional railway also connects to the Navoi Mine Company.

[93] World Bank. Uzbekistan Education Sector Analysis, Final report, December 2018. Available at http://documents1.worldbank.org/curated/en/379211551844192053/pdf/Uzbekistan-Education-Sector-Analysis.pdf [accessed November 2020].
[94] World Health Organization project in Uzbekistan on Climate change adaptation to protect human health. Available at https://www.who.int/globalchange/projects/adaptation/en/index7.html [accessed November 2020].
[95] Website of Navoi International Airport. Available at https://navoiairport.com/ [accessed November 2020].

Vehicles are the most commonly used mean of transport in Uzbekistan and their use has experienced a 78% increase since 2000 while railroad has also slightly increased. The use of trolleybus, trams and metros have all decreased.

The nearest road to the Project Area is the A379 which runs east-west to the south of the Project Area. This connects the Project Area to Zarafshan City which lies to the west. There are a variety of unpaved roads and tracks within the Project Area.

7.4.11 Conflict and security

Uzbekistan does not have a history of internal conflict.

Externally, conflicts over water resources have been at the heart of recurrent disputes[96] among Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan since the demise of the Soviet Union. Kazakhstan and Uzbekistan are short on water, and Kyrgyzstan and Tajikistan short on electricity. Tensions have been greatest in the densely populated Ferghana Valley, where Uzbekistan, Kyrgyzstan and Tajikistan converge, located 700km from the Project Area.

A breakthrough occurred in 2017, when Uzbekistan and Kyrgyzstan agreed to develop hydroelectric power plants on the Naryn river, which feeds the Syrdarya traversing Uzbekistan and Kazakhstan toward the Aral Sea.

In Navoi Region there are no ongoing conflicts at a regional level. However, some of the farmers engaged with indicated that there are occasional conflicts between animal grazers, and holders of private land title, where the grazers encroach upon their land with their livestock.

7.4.12 Worker safety and health

The Labour Code of the Republic of Uzbekistan of April 1,1996 (amended on December 22, 2010) defines regarding workers safety and health requirements. A brief summary is provided below:

- Chapter VI. Employment contract - Articles 4 and 72 to 76 determine the content, form and term of the employment contract, the limitation of rights of the employer to enter into fixed-term employment contract.

[96] International Crisis group publication of 2018: "End the weaponization of water in Central Asia", available at https://www.crisisgroup.org/europe-central-asia/central-asia/kazakhstan/end-weaponisation-water-central-asia [accessed November 2020].

- Article 77 determines the age at which employment is permitted and this is 16 years old.
- Article 239 establishes that all persons under the age of 18 years shall be employed only after undergoing a preliminary medical examination and further until reaching the age of 18 are subject to a mandatory, annual medical examination.
- Article 7 prohibits forced labour, understood as work performed under threat of punishment.
- Articles 211 and 212 establish requirements on labour protection, and the duties of the employee to comply with the norms, rules and regulations on labour and protection. The employee is obliged to comply with the norms, rules and regulations on labour protection, as well as the administration of the order of safe operation, use the obtained personal protective equipment, and immediately notify their supervisor if any accidents or situations that create a direct threat to human life and health occur.
- Article 213 establishes the right of the worker to the information on occupational health and safety (OHS). At the conclusion of the employment contract and the transfer to another job, the worker shall be informed by the employer about working conditions, including the presence of risk occupational and other diseases due to him in connection with these benefits and compensation, as well as personal protective equipment. The employer must also inform employees or their representatives about the accessibility of OHS support in the workplace.

The Ministry of Employment and Labour Relations of Uzbekistan[97] establishes and enforces occupational health and safety standards in consultation with unions. According to the law, health and safety standards should be applied in all sectors.

Employers are responsible for ensuring compliance with standards, rules, and regulations on labour protection as well as obligations under collective agreements. The law provides that workers may legally remove themselves from hazardous work if an employer fails to provide adequate safety measures for the job, and the employer must pay the employee during the time of the work stoppage or provide severance pay if the employee chooses to terminate employment. Workers generally do not exercise this right, as they fear retribution by their employers.

[97] Website of the Ministry of Employment and Labour Relations of Uzbekistan, available at https://mehnat.uz/en [accessed November 2020].

The law requires employers to insure against civil liability for damage caused to the life or health of an employee in connection with a work injury, occupational disease, or other injury to health caused by the employee's performance on the job. In addition, a company's employees have the right to demand, and the administration is obliged to provide them with, information on the state of working conditions and safety at work, available personal protection means, benefits, and compensations.

The Ministry of Labour investigates complaints within five business days, although enforcement is sporadic and uneven geographically. In the informal economy, enforcement is very low, and penalties are too low to deter future violations. According to the ILO's Decent Work Country Program[98], the most common labour violations were working without contracts, receiving lower than publicly announced payments, delayed payments, and substandard sanitary or hygienic working conditions.

At a local level, the main source of employment is the Navoi Mine Company which employees more than 54,000 people[99] that are resident, mostly in Zarafshan City.

7.4.12.1 Regional health and safety labour issues

An interview was held with the Labour Department of Navoi on 09 July 2021 which gathered the following information.

Within Zarafshan City, there are regular inspections on working standards and conditions undertaken by Labour Department of Navoi. There is a single state labour inspector which is not enough to cover the high number of businesses that are present in the Navoi region. Violations that are reported are typically made by employees. In general, employers have a good understanding of national labour legislation. A key challenge is that there are simply not enough state labour inspectors. The salary level offered is very low and few people want to work in this position.

7.5 Social Impact Assessment

The following social impacts are assessed for the Project:

- Inaccurate information and negative perceptions towards the Project.

[98] ILO's Decent Work Country Program for Uzbekistan (2014-2016 and extended to 2020). Available at https://www.ilo.org/global/about-the-ilo/how-the-ilo-works/departments-and-offices/program/dwcp/WCMS_560739/lang--en/index.htm [accessed November 2020].

[99] Investment promotion Agency under the Ministry of investments and foreign trade of Uzbekistan. Publication on Navoi mining and metallurgy plant. Available at https://invest.gov.uz/mediacenter/news/nmmc-navoi-mining-and-metallurgy-combinat-may-issue-corporate-eurobonds/ [accessed November 2020].

- Impacts to the regional and national economy during construction from procurement.
- Impacts from local employment and training during construction.
- Impacts from potential labour violations within the supply chain.
- Impacts from potential increases in crime and conflict from opportunistic influx.
- Health and safety incidents involving the workforce and local communities.
- Impacts from increased community health and safety risks from road transport, and the potential for damage to occur to local roads.
- Impacts to land-based livelihoods from land use change.
- Impacts from the use of an incoming workforce and workforce accommodation camp.
- Impacts from the use of security personnel.
- Impacts from local employment during operation.
- Impacts to the national and regional economy during operation of the Project.
- Impacts from implementation of a Community Development Plan.
- Socio-economic impacts during decommissioning.

The results of the noise and shadow flicker modelling indicate that there are no planned exceedances to people living in the herder shelters expected when compared to the relevant threshold limits as discussed in Chapter 11 and Chapter 12, respectively, after mitigation measures have been applied. During operations, the Grievance Mechanism can be used to raise a concern associated with the generation of noise, shadow flicker or any other aspect of the Project. On this basis, impacts to land from shadow flicker and noise during operations are not included further in the impact assessment.

7.5.1 Inaccurate information and negative perceptions towards the Project

7.5.1.1 Impact assessment

The outcome of stakeholder engagement activities with farmers, herders, representatives of local government and educational facilities has consistently indicated their general support towards the Project. This may be linked to expectations associated with employment opportunities, improved energy infrastructure and generation, and other potential benefits.

However, there is a risk that communication associated with the Project is mis-interpreted, either because the information is seen to be controlled by the state government, or from a lack of understanding of potential Project impacts such as shadow flicker and noise. In Uzbekistan, independent media does not operate freely, and all media entries need to register with the government to provide personal details of the owner chief editor, and staff members.

Table 7-9 sets out the likely impacts from inaccurate information and negative perceptions towards the Project.

Table 7-9: Inaccurate information and negative perceptions towards the Project

Project stage	Preparation	Construction	Operation	Decommissioning	
	The impact is relevant to all stages of the Project.				
Impact Nature	Positive		Negative		
	The impact is negative as people living within the Project Area may have inaccurate perceptions towards Project impacts, or unrealistic expectations of potential benefits, such as local electrification or the quantity of jobs available.				
Impact Type	Direct	Indirect	Reversible	Irreversible	
	The impact is direct because perceptions of risk influence people's behaviour and general wellbeing. The impact could be both reversible and irreversible.				
Impact Duration	Temporary	Short-term	Medium-term	Long-term	Permanent
	The impact is long-term as it will continue throughout the Project, even during the preparation stage when final details of the Project are disclosed to people in the Project Area.				
Impact Extent	Local	Regional	National		
	The impact will occur at a regional and local level.				
Impact Magnitude	Negligible	Low	Medium	High	
	Impact magnitude is high to reflect the scale and uniqueness of the Project. The Project is the first wind power investment in the country and there has been little major investment in the region during the last few decades.				

Gender and vulnerability Considerations	Yes		No	
	There is the potential that sections of the population in the Project Area experience change differently due to their age, gender, and other source of vulnerability. Elderly people may particularly be concerned about the Project as they are not likely to directly benefit through employment opportunities that more younger people may be able to access. Women may assume that they are not eligible for employment opportunities. There is also the possibility that local perceive that operation of the WTGs will adversely affect their health, even if noise and shadow flicker levels are within acceptable limits.			
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	The sensitivity is high as people's perceptions towards the Project is important as this has potential consequences to their general wellbeing, anxiety, aspirations for the future, and influences their future decisions.			
Impact Significance (negative impact)	Negligible	Minor	Moderate	Major
	The overall significance for negative impacts is major.			

7.5.1.2 Mitigation and enhancement

The Project will develop and implement a Stakeholder Engagement Plan (SEP) that aims to provide accurate and timely information to people living in the Project Area throughout each stage of the project. The SEP will disclose the findings of the ESIA and ESMP and, as it evolves, will contain:

- The outcome of a stakeholder identification exercise to identify all stakeholders, their profile, and a stakeholder analysis to reflect their level of influence on the Project, and how they could be impacted.
- A variety of visual materials that can be used to illustrate details of the Project. Example photographs of worker camps, storage areas and other Project facilities will also be used.
- A detailed schedule of future engagement activities, roles and responsibilities, and ways to monitor the effectiveness of the engagement activities undertaken. The schedule of activities will include targeted sessions towards elderly people, women, people who have knowledge of vulnerable groups in the Project Area, and others as defined in the Plan.

- Meaningful consultation and disclosure activities on Project risks and impacts, and the proposed mitigation and monitoring measures that are proposed, so that stakeholders can comment on their adequacy. These activities will also help to build stakeholder's knowledge of the Project and the potential impacts.
- Details of the grievance mechanism and how information associated with the mechanism will be disclosed to stakeholders, and how grievances raised will be resolved. The Project will recruit at least one female Community Liaison Officer.

7.5.1.3 Residual impact assessment

Table 7-10 sets out the predicted residual impacts from inaccurate information and negative perceptions towards the Project.

Table 7-10: Residual Impacts from inaccurate information and negative perceptions towards the Project

Impact Significance (negative impact)	Negligible	Minor	Moderate	Major
	Following implementation of the SEP, the adverse impacts are expected to be reduced to Minor.			

7.5.2 Impacts to the regional & national economy during construction from procurement

7.5.2.1 Impact assessment

The Project will positively influence the regional and national economy during construction from the direct procurement and supply of materials and services from companies based in Tamdy District and elsewhere in Uzbekistan. This includes for example, companies providing earth moving equipment, cranes and workers to complete general civil works, logistics services to transport the WTGs to the Project area, and construction of the worker accommodation camp. Other companies located outside of Uzbekistan will be responsible for the supply of wind farm components, such as the nacelle structure and blades. In total, the combined capital investment of the Project is expected to be up to USD 600 million.

Table 7-11 sets out the likely impacts to the local, regional, and national economy during construction, as a result of the Project.

Table 7-11: Impacts to the local, regional, and national economy during construction from procurement

Project Stage	Preparation	Construction	Operation	Decommissioning	
	The impact is relevant to the preparation and construction stages of the Project where procurement on materials and services will take place.				
Impact Nature	Positive		Negative		
	The impact is largely positive because construction activities will generate economic growth at a local, regional and national level through the procurement of services and materials. Increases in the cost of living amongst the nearby communities is not expected to occur as the workforce numbers are relatively low compared to the population of the Navoi region.				
Impact Type	Direct	Indirect	Reversible	Irreversible	
	The impact is both direct and indirect because the company will pay taxes during the purchase of materials and services and generate indirect economic opportunities as Project suppliers procure materials and services from their own internal supply chain networks. The increased demand for business-to-business services to small-to-medium enterprises (SMEs) will generate increased revenue across the Navoi Region and Tamdy District, resulting in higher turnover for the SMEs involved. The impact is reversible as it will only continue during the construction stage.				
Impact Duration	Temporary	Short-term	Medium-term	Long-term	Permanent
	The impact is medium-term as construction works are expected to continue for a period of approximately 24 months.				
Impact Extent	Local		Regional	National	
	The impact is expected to occur at a local, regional and national level. SMEs based in Zarafshan City are expected to be able to provide general civil works and other services throughout the construction period.				
	Negligible	Low	Medium	High	

Impact Magnitude	The impact magnitude is medium because the total capital expenditure incurred by the Project developer during construction is expected to be a reasonable contribution to the annual economic output of Tamdy District. Where local companies are to be used, the impact magnitude to the owners of these businesses is expected to be medium-high depending upon the actual level of capital spend. Outside of the mining sector, there has not been much historic investment into the district.			
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	The receptor value is medium as the use of SMEs based in the region will have multiple clients and the Project's contribution to their revenue and profitability will vary depending upon the overall size of the business. For some SMEs, their involvement in the Project may result in a significant increase in business turnover during construction which may represent a substantial boost to their annual revenue and profits. It is also possible that the SMEs will recruit additional staff.			
Gender and vulnerability Considerations	Yes		No	
	There are no gender and vulnerability considerations associated with this impact.			
Impact Significance	Negligible	Minor	Moderate	Major
	The overall impact significance is moderate. This is a positive impact and no mitigation is required. No residual impacts are expected to occur.			

7.5.2.2 Enhancement

In order to strengthen the positive effects and record the use of SMEs during construction, the following enhancement measures will be implemented:

- Where possible, the Project Company will seek to procure materials and services from SMEs based in Tamdy District to ensure that the positive effects of using SMEs are experienced as close to the Project site as possible to enhance the positive benefits of the Project at this location. For this purpose, The Project Company will develop a Local Content Policy.

- The total capital spent on SMEs during the construction stage will be recorded, broken down by where they are based and operational (i.e. at a local, regional and/or national level). This information will be collated and compiled into future Environmental and Social Performance Reports to provide stakeholders with information on how SMEs have been involved in the Project. The reports will also include details (presented as individual case studies) that reflect how the SMEs have benefitted from their involvement in the Project to date, using the information from interviews with business owners which will be accompanied by photographs and statistical/graphical summaries.

7.5.3 Impacts from local employment and training during construction

7.5.3.1 Impact assessment

Masdar have estimated that the construction workforce could be up to 1,050 and are expected to include three categories of workers (the estimated number of each worker is not currently known):

- Category 1: low-skilled.
- Category 2: skilled.
- Category 3: expatriates.

There will be no need for the Project to use low-skilled people from outside of Tamdy District as there is sufficient supply of people based in Zarafshan City and surrounding communities. To the extent possible, category 2 workers (skilled) will be recruited within the Tamdy District through advertisement outlets active at a district level only. However, given that this is the first wind farm development in the country, it is likely that skilled workers from elsewhere in the country will be needed.

The total number of the local workforce is expected to increase as site preparation activities commence. After the peak level has been reached during construction, 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 that is likely to increase their overall standard of living, access to healthcare and educational resources, and reduce their socio-economic vulnerability. The provision of job opportunities and training has repeatedly been mentioned during stakeholder engagement activities and is a key, local expectation arising from the Project.

Workers will receive induction training before staring work. This includes basic training on HSE, labour management and, where required for specific job profiles, vocational training. The Project presents 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 vocational training may be able to seek alternative work within the construction sector in the future, having benefitted from their involvement in the Project.

Table 7-12 sets out the likely impacts from employment and training during construction of the Project.

Table 7-12: Impacts from local employment and training during construction

Project stage	Preparation	Construction	Operation	Decommissioning
	The impact is relevant to the preparation and construction stage as the workforce receives training prior to the start of construction works.			
Impact Nature	Positive		Negative	
	The impact is largely positive as local employment is a key expectation amongst local village residents and their representatives, and this has been recorded during the extensive stakeholder engagement activities. However, there is a potential for local tensions to arise if residents within local communities incorrectly perceive that people from outside the local area are being provided with employment opportunities. Whilst local employment is generally a positive impact, a loss of reputation and negative perceptions towards the Project could occur if the local recruitment process is not adequately managed and negative perceptions arise. Negative impacts could occur if the income earned is not spent in a sustainable, gender-inclusive manner. This may include, for example, male workers spending earned income on alcohol or highly valued products (such as vehicles and motorbikes) which require capital for their ongoing maintenance and use, rather than on basic materials and services that may be required in the household. Negative impacts could also occur is local people decide to leave lower-paid, public sector positions such as teachers in schools.			
Impact Type	Direct	Indirect	Reversible	Irreversible

	The impact is direct because the individuals and their household members will benefit from increased income and from training and skill development opportunities. The impact is reversible as the income generated from local employment will cease at the end of their employment as numbers reduce towards the start of operations.				
Impact Duration	Temporary	Short-term	Medium-term	Long-term	Permanent
	The majority of the impact is medium-term as construction works are expected to continue for approximately 24 months. However, permanent impacts are expected to take place from increase in living standards and from the vocational training provided. Short-term employment provides an opportunity for households to pay off their debts, invest in the quality of their housing and increase access to education and health services (Uzbekistan has a very high level of out-of-pocket expenses for healthcare). These types of impacts will be long-lasting and represents a significant opportunity within the household for positive change.				
Impact Extent	Local		Regional	National	
	The impact will occur at a regional and local level.				
Impact Magnitude (positive impact)	Negligible	Low	Medium	High	
	Impact magnitude is medium as the generation of income into the household is expected to have a substantial change on the employed person and their household. This does, to a large extent, depend upon the way in which the money is shared amongst household members whether it is used in a sustainable, gender-inclusive manner.				
Impact Magnitude (negative impact)	Negligible	Low	Medium	High	
	The negative impact magnitude is medium associated with local employment as there is a potential for ill-feeling towards the Project if the recruitment process is not managed carefully and non-locals are able to access positions that could have been filled by local people.				
	Yes		No		

Gender and vulnerability Considerations	There is an opportunity for women to become a substantial part of the low-skilled and skilled workforce, benefitting from the vocational training and earned income, as well as opportunities for disabled people. This has the potential to work towards inclusive economic growth and increase the ability of women to influence decisions in the households associated with spending decisions. During stakeholder engagement meetings with women, the participants state that they expect the majority of positions to be given to men only, even though many were interested in seeking employment. During stakeholder engagement meetings with an NGO representing the interests of disabled people, it is clear that current opportunities for this group of people in society, are currently very limited.			
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	The sensitivity is high as local employment is a key expectation amongst local people. It is essential that the local recruitment process is adequately managed and perceived to be both fair and transparent, involving the active participation of local and regional stakeholders, and include the interests of women.			
Impact Significance (negative impact)	Negligible	Minor	Moderate	Major
	The overall significance for negative impacts is major.			
Impact Significance (positive impact)	Negligible	Minor	Moderate	Major
	The overall significance for positive impacts is major.			

7.5.3.2 Mitigation and enhancement

The Project will develop and implement a human resources management system which contains, policies and procedures using documentation that is clear and understandable, reflecting labour rights under national labour and employment law, details of the ability of workers to create collective agreements, and include details of worker's right relating to their hours of work, wages, overtime, compensation, and any additional benefits that workers are entitled to.

The Project will also develop and implement a Construction Local Employment Plan that includes:

- Details of the Project Company's policies towards working conditions, anti-harassment and bullying, and legislative compliance.
- A summary of the numbers and job description profile required for the construction stage.
- A description of the process used to recruit the construction workforce based upon the (1-3) categories of workers and how this is to be disclosed to local communities. The description will include details of the way in which positions are to be publicly advertised, how candidates can apply and what support will be provided to candidates seeking work who are not able to complete an application form due to literacy or other reasons, how candidate details will be recorded on a central register/database; how candidates will be individually screened based upon a clearly defined criteria to be applied to determine the suitability of candidates against specific job requirements, and how workers will be subject to a medical test to demonstrate their fitness to work.
- Details of a fitness to work certificate that each worker will be required to obtain following a medical examination which will be organised and paid for by the Project. The fitness to work assessment will include the identification of any co-morbidity conditions such as high blood pressure, obesity, heart disease, lung disease, or diabetes which means that they may be at high risk of COVID-19.
- A prohibition of recruitment of local people at the gatehouse, or any other entry point to the site to prevent people from moving towards the site expecting work. Any person wishing to apply for an employment position must follow the appropriate procedure and people will not be employed 'on the spot'.
- How the legal rights and terms and conditions of employment are to be provided to workers at the start and periodically during their employment. This will include details of their salary, right for freedom of association, severance pay, working hours, overtime payments, tax and other types of deductions, and provision of insurance from a Project-related health and safety incident.
- The outcome of a regional benchmarking study that aims to offer salaries to local people at a rate that is similar to public sector workers, so that the Project does not create substantial differences between Project salaries and public sector pay.

- Targets for women and disabled people to form part of the low-skilled and skilled construction workforce, and details as to how women and disabled people will be specifically encouraged to apply for employment positions. This may include, for example, using female managers within the Project Company to present the content of the Construction Local Employment Plan to women's groups in each settlement in the vicinity of the Project Area, and further engagement with NGOs.
- Details of the vocational training that each worker will be provided with. This is expected to include a basic HSE induction in addition to the training required that is specific to their role.
- How labour relations are to be managed during the construction period to ensure the workplace is suitable for the presence of women and any minority groups, ethnic monitories, LGBT (lesbian, gay, bisexual, and transgender)) and potentially others who are legally eligible to be employed. This will include a Worker's Code of Conduct that is presented individually during their initial HSE induction process for their review and signature to reflect their acceptance.
- Details of a worker grievance mechanism that will be available (and disclosed) during the recruitment process and regularly during their employment (which will include an anonymous 'whistle-blower hotline' where allegations of bullying or harassment can be reported).
- Providing workers with regular information about the temporary nature of their position and giving them enough notice as to when the termination of their contract may occur, notification does not come as a sudden shock and trigger resentment or protests.
- A commitment to provide a certificate to each worker that describes their job title, profile, vocational training received and any certifications, duration of employment, and contact details for a future employer to use to check that the information contained therein is accurate and valid once their involvement in this Project is complete.
- How the above arrangements will apply to contractors used within the EPC Contractor's primary supply chain.
- Reporting and monitoring indicators covering the recruitment process and ongoing management of the workforce.

In addition to the above, expectations associated with local employment will be managed through timely and accurate information which will be provided to local communities through implementation of the Project's Stakeholder Engagement Plan (SEP).

7.5.3.3 Residual impact assessment

Table 7-13 sets out the predicted residual impacts of the Project on local employment and training during construction following implementation of mitigation.

Table 7-13: Residual Impacts from local employment & training during construction

Impact Significance (negative impact)	Negligible	Minor	Moderate	Major
	Following implementation of the Construction Local Employment Plan and additional controls to be incorporated into the ESMS, it is anticipated that negative impacts associated with the recruitment process are reduced to moderate. It is possible that local people may remain dissatisfied with the recruitment procedure, due to the limited number of available positions during construction or from unrealistic salary expectations.			

7.5.4 Impacts from potential labour violations within the supply chain

7.5.4.1 Impact assessment

The use of a supply chain introduces the potential for labour violations to occur. This includes, for example, poor working conditions, a lack of written worker contracts being used, low-levels of occupational health and safety, child labour, forced labour and other forms of labour-related exploitation. Uzbekistan has a generally poor record on human rights within the labour market and the level of government oversight is low.

There have been international media reports in 2021[100][101] associated with allegations associated with the use of forced labour camps to manufacture photovoltaic panels and WTG components, from the Xinjiang province in China. On 15 July 2021, the United States Senate passed a bill to ban all products from China's Xinjiang in the form of a Weak or Forced Labor Prevention Act[102].

[100] Fears over China's Muslim forced labor loom over EU solar power. 2021. POLITICO. Available at: https://www.politico.eu/article/xinjiang-china-polysilicon-solar-energy-europe/

[101] Apple Did Business With A Wind Energy Company That Has Close Ties To Xinjiang. 2021. BuzzFeedNews. Available at: https://www.buzzfeednews.com/article/meghara/apple-xinjiang-wind-power-labor

[102] U.S. Senate passes bill to ban all products from China's Xinjiang. Reuters. Available at: https://www.reuters.com/world/us-senate-passes-bill-ban-all-products-chinas-xinjiang-2021-07-15/ [Accessed 15 July 2021].

Information from a potential supplier to the Project who have a manufacturing base in Xinjiang, indicates that the Xinjiang region is not the source of raw material or major components that are to be used by the Project. The supplier is primarily a manufacturing assembly line, research and development centre, spare parts and testing centre, and a sales office/show room. Within this facility, it is expected that the assembly lines will be operated by skilled labour in controlled environment where the potential for forced labour to be present is much lower, compared to other suppliers of global products based in the same location.

Table 7-14 sets out the likely impacts from potential labour violations within the supply chain.

Table 7-14: Impacts from potential labour violations within the supply chain

Project stage	Preparation	Construction	Operation	Decommissioning	
	The impact is relevant to the preparation and construction stages as various supply chain companies will be used to supply materials and services including WTG components.				
Impact Nature	Positive		Negative		
	The impact is negative. Labour violations could result in injury or fatality, mental distress and anxiety, protests and worker stoppages. Violations could also result in regulatory enforcement action being undertaken against the relevant supplier and potentially, the Project Company. There is also the potential for reputational impacts to occur is the Project receives negative attention from the international media over the use of suppliers based in China and elsewhere.				
Impact Type	Direct	Indirect	Reversible	Irreversible	
	The impact is direct because it affects the general wellbeing of individuals involved. Depending upon the nature of any long-term consequences of exploitation, the impact could be reversible or irreversible.				
Impact Duration	Temporary	Short-term	Medium-term	Long-term	Permanent

	The majority of the impact is medium-term as suppliers will be used during construction works which are expected to continue for approximately 24 months. However, permanent impacts could occur from a serious incident involving a worker.			
Impact Extent	Local	Regional	National	
	The impact will occur at the location of where the worker is based and from where suppliers operate. This may include a local, regional, national and/or international level.			
Impact Magnitude	Negligible	Low	Medium	High
	The negative impact magnitude is high as there is a significant risk that labour violations will occur amongst the supply chain, depending upon which suppliers are used.			
Gender and vulnerability Considerations	Yes		No	
	There are substantial gender and vulnerability considerations associated with this impact. Ethnic minorities, migrants, women and children are particularly vulnerable from labour violation, as well as those who are low-skilled and have a low education and alternative means of earning income. This includes, for example, migrant workers in China from the distinct ethnic group. In addition, there is the potential for women-owned SMEs to become part of the supply chain network (a Tier 2 supplier) and provide materials and services to the EPC Contractor.			
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	The sensitivity is high as this is a key Project issue. The Project Company will not tolerate any labour violations within the supply chain.			
Impact Significance	Negligible	Minor	Moderate	Major
	The overall significance for negative impacts is major.			

7.5.4.2 Mitigation and enhancement

The Project Company will implement a Supply Chain Management Plan. This will include the following:

- All primary (Tier 1) suppliers (including the EPC Contractor) will be pre-qualified by the Project Company before a contract is placed for the supply of materials and services. The process to become a pre-qualified supplier to the Project will include an assessment of the supplier's existing human resources policies and procedures (including those on child labour, forced labour, occupational health and safety, bullying and harassment in the workplace), management system controls and monitoring activities on their own workforce, how the above are applied to their own internal supply chain network of companies, their internal (Tier 2) supply chain, and the overall risk of labour violations to occur taking into consideration the types of materials and services they provide, and where they are based to explore the effectiveness of national regulations associated with working conditions.
- A register of all Project suppliers will be maintained so that a central record is available of the companies involved, and the types of materials or services that they are providing.
- The Project Company will use this register and information provided during the pre-qualification process, to conduct a risk assessment of labour violations occurring within the supply chain. For example, labour violations within the provision of construction aggregate materials, has a higher risk of violations compared with a company providing accounting services. The international reports associated with China-based suppliers of WTG components reflect that this type of supplier would be expected to be assessed as a source of high risk. It is also recognised that SMEs have a higher risk of non-compliance with regards to labour violations (such as child labour) and poor occupational health and safety controls.
- Using the results of the screening assessment, additional actions (such as audits, review of supplier's audit and inspection records, etc.) may be undertaken to check the adequacy of existing controls and monitoring activities. For this purpose, a sub-contractor monitoring procedure shall be developed as an appendix to the Supply Chain Management Plan which includes a checklist that will be used on suppliers considered to be high-risk.

- The Project Company's Environmental and Social Management System will include details of the minimum specifications of working conditions and worker recruitment, including controls to avoid forced and child labour. The contracts between the Project Company and all suppliers will include legally binding obligations for them to undertake their contracted scope in accordance with the ESMS (this includes adherence to IFC and ADB standards/policy requirements). This is important, as if a legally binding obligation is not present, then it can be difficult to persuade suppliers to improve their worker conditions.
- Details of how women-owned SMEs shall be provided with specific types of support so that they can potentially become part of the Tier 2 supply chain network. The type of support provided shall be defined on a case-by-case basis and could include, for example, support to improve their worker policies and procedures, technical capacity linked to the output of the business, financial planning and legal support.

7.5.4.3 Residual impact assessment

Table 7-15 sets out the predicted residual impacts of the Project from potential labour violations within the supply chain following implementation of mitigation.

Table 7-15: Residual Impacts from potential labour violations within the supply chain

Impact Significance	Negligible	Minor	Moderate	Major
	Following implementation of the Supply Chain Management Plan the residual impact is moderate, as it could be difficult to conduct audits and other types of checks outside of Uzbekistan in locations such as China where access to factories can be restricted.			

7.5.5 Impacts from potential increases in crime and conflict from opportunistic influx

7.5.5.1 Impact assessment

During construction there is a potential for people from outside the Tamdy District to turn up without invitation, seeking employment and other types of economic opportunities from the Project. This may result in a spread of communicable diseases, increased tensions between local people and newcomers, and may result in an increase in the local incidence of crime. The potential for influx to occur was not mentioned during stakeholder engagement meetings with local community leaders, although could still occur as employment positions across Tamdy District are limited, and details of the Project will become known at a regional and national level.

There are very high levels of social cohesion and group identity amongst community residents, and newcomers are likely to be quickly identified. Many of the security staff used to guard construction sites and the workforce accommodation camp, are likely to be local people themselves and will be able to easily identify the presence of newcomers.

Table 7-16: Potential Increases in Crime and Conflict from Opportunistic Influx

Impact Nature	Positive		Negative		
	The impact is negative. Tensions may arise between locals and newcomers competing over Project benefits and opportunities. Additional pressure on environmental and social welfare resources may also occur, alongside an increase in crime.				
Impact Type	Direct	Indirect	Reversible	Irreversible	
	The impact is direct as the arrival of newcomers may result in a rise in tensions. It is reversible as tensions are expected to quickly reduce once newcomers realise that they will be unable to obtain employment from the Project and move on elsewhere.				
Impact Duration	Temporary	Short-term	Medium-term	Long-term	Permanent
	The impact is temporary as newcomers are only expected to arrive during the construction period due to the relatively low workforce of the operational stage.				
	Local	Regional	National		

Impact Extent	The impact will occur at a local level. Influx is likely to be focused into the nearest large settlement which is Zarafshan City.			
Impact Magnitude	Negligible	Low	Medium	High
	The impact magnitude is low, as this issue is not a stakeholder concern although still could occur. Where increases in crime do occur, this is expected to be a localised occurrence and the perpetrators rapidly identified due to strong social cohesion amongst the local communities.			
Gender and vulnerability Considerations	Yes		No	
	Women and children are particularly at risk from the presence of newcomers who are likely to be male. Women may be harassed or subjected to unwarranted attention. Elderly people may also experience adverse changes to their standard of living if local increases in prices occur.			
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	The receptor value is medium as it may not require multiple incidents for a general rise in local community tensions and perceptions of crime to occur.			
Impact Significance	Negligible	Minor	Moderate	Major
	The impact significance is moderate.			

The following mitigation and enhancement measures will be implemented:

- The Project shall prepare an Influx Management Plan prior to the start of construction.
- In accordance with the Construction Local Employment Plan and Stakeholder Engagement Plan, details of the local employment process will be publicly disclosed to emphasise that local communities within Tamdy District are being preferentially offered opportunities, and that people resident outside of the district should not move towards the Project Area as they will not be considered for employment.
- No employment at the construction gate/work sites will be undertaken as this could result in even more people travelling to the sites.

- Public announcements in local and regional media (newspapers, etc.) will inform people that job seekers should not move towards the Project Area as all recruitment processes for the local workforce requirements are already established and finalised.

It is anticipated that these measures collectively, will dissuade people from moving towards the Project Area during construction as they will be unable to obtain work or seek other types of economic opportunities.

In accordance with the Influx Management Plan, the Project will monitor the arrival of newcomers to track if influx is occurring during construction. If this is noted to occur, in large numbers, then additional resources will be provided by the Project to support communities to maintain calm, and newcomers will be informed (by community leaders and/ or Community Liaison Officers) that there are no employment positions or other forms of economic opportunities available to them and that they should return to their place of origin.

The Influx Management Plan will describe how the Project will monitor the price of basic goods, such as food, fuel and bottled water, to determine if local inflation is occurring. If local inflation is identified, then the Project will liaise with local stakeholders, as to what steps should be taken to ensure that the standard of living amongst vulnerable people (retired, disabled people, etc) does not decrease. Steps may include, for example, providing food and other types of support to vulnerable households; and

The incidence of crime and other social ills will be recorded through regular engagement with community leaders and from local policing forces, to gather their perceptions associated with any changes in the type and incidence of crime. Crimes that are brought to the attention of the Project will be recorded and immediately referred to the Uzbekistan Police for investigation.

7.5.5.2 Residual impact assessment

Table 7-17 sets out the predicted residual impacts of the Project on increases in crime and conflict from opportunistic influx following implementation of mitigation.

Table 7-17: Residual Impact: Potential increases in crime and conflict from opportunistic influx

Impact Significance	Negligible	Minor	Moderate	Major
	The residual impact significance is expected to be minor once the mitigation measures have been implemented.			

7.5.6 Health and safety incidents involving the workforce and local communities

7.5.6.1 Impact assessment

The use of a workforce and construction activities generates a variety of occupational health and safety risks to the workforce and to local people arising from:

- General construction works which will include the use of mechanical excavation machinery, rotating construction tools and mobile machinery.
- The introduction of slips and trips that could cause an injury to the workforce.
- Heavy lifting of components and construction tools by the workforce.
- Working with live electrical components during construction and operation.

The Project also needs to ensure that an effective emergency response plan is in place.

Health and safety risks associated with the Project's use of vehicles on the public road are addressed in Section 7.5.7.

Table 7-18 sets out the likely impacts from health and safety incidents involving the workforce and local communities.

Table 7-18: Impacts resulting from Health & Safety Incidents involving the Workforce & Local Communities

Project Stage	Preparation	Construction	Operation	Decommissioning
	The impact is relevant to all stages of the Project, although the greatest risk will take place during construction when earth moving equipment is being used and trenches and excavations are present.			
Impact Nature	Positive		Negative	
	Occupational health and safety incidents have the potential to impact the health of the workforce.			

	A community health and safety incident during construction, such as a local person gaining unauthorised entry into a working area where excavations are present, could result in an injury or fatality. During operations emergency events could be linked to an electrical fire or catastrophic failure of a WTG.				
Impact Type	Direct	Indirect	Reversible	Irreversible	
	The impact is direct because it involves impacts to the workforce or a member of the public. The impact is either reversible or irreversible depending upon the type of injury or if a fatality occurs.				
Impact Duration	Temporary	Short-term	Medium-term	Long-term	Permanent
	The impact is long-term as the exposure to increased health and safety risks will be introduced from the start of the construction stage and continue throughout operation of the Project. Depending upon the type of incident and impact to human health, the duration of any impact could be permanent.				
Impact Extent	Local	Regional	National		
	The impact will occur at a local level amongst the communities in the vicinity of the construction site working areas and WTGs.				
Impact Magnitude	Negligible	Low	Medium	High	
	The magnitude of the impact is medium as the location of each WTG and the path of the two OHLs and the single substation are located a significant distance from settlements in the vicinity of the Project Area. However, local people may still be present in the area where construction works are ongoing, as they use land for animal grazing.				
	Yes	No			

Gender and vulnerability Considerations	Children/young people are naturally inquisitive and are often used to taking high-risks that older, more mature people would not do. Consequently, children need to be informed about the presence of working areas during construction so that they understand the risks and know that it is dangerous to enter the sites. Similarly, children need to be reminded that they should not enter fenced-off areas surrounding the substation, or approach areas where construction work is ongoing, or try and interfere with any equipment present. There is also a possibility that elderly people may also not be fully aware of the risks involved in approaching construction works. Land-users such as farmers may not be literate and unable to read warning signs and other markings. Livestock could enter a working area with the livestock owner subsequently trying to catch and recover the animal before it injures itself, exposing themselves to increased risk.			
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	The sensitivity is high as safety is the Project's highest priority.			
Impact Significance	Negligible	Minor	Moderate	Major
	The potential impact significance is major.			

7.5.6.2 Mitigation and enhancement

The Project will develop a Workforce Health and Safety Plan, a Community Health and Safety Plan and an Emergency Response Plan.

The Workforce Health and Safety Plan will include the following:

- The outcome of a risk assessment to identify potential health and safety risks during construction and operation, to the workforce and local communities. The risk assessment will be informed through a hazard identification workshop which will be attended by The Project Company and the EPC Contractor. A Risk Register will be prepared using the outcome of the workshop and compiled into a Risk Register Report that describes the control measures and monitoring activities required. Alongside each control measure recorded the roles and responsibilities between the Project and the EPC Contractor will be clearly defined.
- Specific measures to ensure that there is effective oversight of the health and safety performance of the EPC Contractor and their internal network of supply chain companies. Oversight activities undertaken by the Project Developer shall include audits, inspections, review of method statements and other activities.

- The provision, free of charge, of PPE to workers including safety shoes, helmet, goggles, earmuffs, and safety harnesses for working at height. PPE will be provided alongside safe drinking water and adequate protection from the sun. PPE will also be provided in relation to the COVID-19 Management Plan (see below).
- Training activities to generate a culture of safety amongst the workforce. This will include the correct use of PPE, identification of risks, reporting unsafe acts and near misses, and rewards for safety observations. A job competency matrix will be prepared to identify the type of training required for each job description.
- Ensuring that electrical work is not carried out during poor weather when lightning strikes may occur.
- Certification and pre-use inspections for all lifting equipment used, such as cranes, and checking that they are operated by competent and trained personnel.
- An up to date first aid box will be provided at all construction sites and a trained person will be appointed to manage it.
- Monitoring and evaluation framework to record all training activities, tool-box-talks, risk assessments, provision of PPE, and the investigation of all incidents and near-misses.

The Community Health and Safety Plan will include the following:

- A commitment to ensure that public access is restricted to the areas used during construction of the substation and the fences will have signs with warning notices (in both Uzbek, Kazak and Russian) to deter people from entering. Contact details will also be placed on the fences that use the details in the grievance mechanism so that any person can request additional information on the fence lines, should they wish to do so.
- A commitment to engage with children and young people in local schools in the settlements in the vicinity of the Project Area, to inform them about the start of construction works in advance, to educate them on the dangers inside the fenced-off area at the substation, and the danger of approaching construction works at other locations.
- A commitment to engage with land users to warn them of the risk of approaching close to construction working areas; this shall include engagement with elderly people, the farmers and herders.
- Warning signs indicating the presence of the Project along access roads (to be installed during both construction and operation) to inform local people of the dangers posed by the Project. This will include the potential for ice throw to occur during Winter.

Details of the nearest hospital, ambulance, fire station and police station will be identified in the Emergency Response Plan, along with details of the procedure for the medivac of workers who need hospital treatment. A copy of the Emergency Response Plan will be shared with the relevant authorities so that it is clear what a coordinated response should be following a major incident.

7.5.6.3 Residual impact assessment

Table 7-19 sets out the predicted residual impacts of the Project on health and safety incidents involving the workforce and local communities following implementation of mitigation.

Table 7-19: Residual Impact: Health and safety incidents involving the workforce and local communities

Impact Significance	Negligible	Minor	Moderate	Major
	The residual impact significance is expected to be minor given the mitigation measures implemented in the Health and Safety Plan, Community health and Safety Plan, and Emergency Response Plan.			

7.5.7 Impacts from increased community health and safety risks from road transport, and the potential for damage to occur to local roads

7.5.7.1 Impact assessment

The use of road vehicles to transport materials and personnel to/from the site introduces significant community health and safety risks. The Navoi Mine Company does not use the public road network for the export of ore as a railroad is present.

The transportation route of the WTGs, their major components and the substation has been extensively studied and road modifications may be required.

A road traffic incident has the potential to result in an injury or fatality to a member of the public, other road user, driver of a Project vehicle and its occupants. Damage from an incident could also be caused to a third-party structure (such as a house).

Table 7-20: Impacts from increased community health and safety risks from road transport, and the potential for damage to occur to local roads

Project Stage	Preparation	Construction	Operation	Decommissioning
	The impact is relevant to all stages of the Project as Project vehicles will be used throughout.			
Impact Nature	Positive		Negative	
	The increase in community health and safety risks is a negative impact, and physical deterioration of the local road network is also a negative impact.			
Impact Type	Direct	Indirect	Reversible	Irreversible
	The impact is direct because it involves increased community health and safety risk to a range of receptors. The impact is either reversible or irreversible depending upon the type of injury or if a fatality occurs. Damage to third-party structures are reversible as these can be repaired. However, deterioration to the physical condition of the local road network is only reversible if damages are repaired within a reasonable period of time.			

Impact Duration	Temporary	Short-term	Medium-term	Long-term	Permanent
	The impact is long-term as community health and safety risks will be introduced from the start of the construction stage and continue throughout operation of the Project. Depending upon the type of safety incident and impact to human health, the duration could be permanent. The duration of damage to the local road network depends on when any repairs needed, are completed. The majority of road transport movements will take place during construction although they will still continue (to a lesser extent) during operations.				

Impact Extent	Local	Regional	National
	The impact will occur at a local and regional level. Physical damage to the local road network could affect the integrity of the A379 which runs east-west and lies to the south of the Project Area.		

	Negligible	Low	Medium	High

Impact Magnitude	The magnitude of the impact is medium as multiple trucks will be used to transport WTG components and other large components to the site, and some of the local roads which could be used are currently in a relatively poor state of repair.			
Gender and vulnerability Considerations	Yes		No	
	Children often take high-risks and often have a poor understanding of road safety. Women may also be at risk.			
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	The sensitivity is high as safety is the Project's highest priority.			
Impact Significance	Negligible	Minor	Moderate	Major
	The potential impact significance is major.			

7.5.7.2 Mitigation and enhancement

The Project will develop a Transport Management Plan (TMP) which is detailed further within Chapter 8.

In addition to the TMP, a road safety campaign will be implemented in local schools within the settlements in the vicinity of the Project area. The purpose of the road safety campaign is to raise general awareness of the risks associated with road crossings, discuss the Project's road movements, and describe the extra caution that children need to take in relation to both road traffic, and also with the construction works that will be taking place across the regional area when the WTGs and internal roads are being installed.

7.5.7.3 Residual impact assessment

Table 7-21 sets out the predicted residual impacts of the Project from increased community health and safety risks related to road transport and the potential for damage to occur to local roads following implementation of mitigation.

Table 7-21: Residual Impacts from increased community health & safety risks from road transport & the potential for damage to occur to local roads

Impact Significance	Negligible	Minor	Moderate	Major
	The residual impact significance is expected to be minor given the mitigation measures implemented in the Traffic and Transport Plan.			

7.5.8 Impacts to land-based livelihoods from land use change

7.5.8.1 Impact assessment

The purpose of this Section is to assess impacts to land-based livelihoods from land use change. Land will be required for the physical presence of the WTGs, new internal roads, upgraded internal roads, the substation and OHLs. During construction, additional land surrounding each physical feature will be temporarily required for the movement of machinery and storage of materials.

Land will also be required for the workers' camp and temporary storage areas, and it is expected that the land required shall be leased through a willing lessee, willing leaser arrangement and be located outside of farm boundaries present. There is the potential for economic displacement to occur to herders, if the land selected is used for general grazing activities even if this is located outside of a farm boundary.

The Projects status of identifying land needs and land acquisition

The substation will incorporate an area of around 19,000 m^2 incorporating the substation building, protection equipment, gantries, etc. The whole area will be fenced to prevent unauthorised access. The substation is located on government-owned land, outside of a farming leased area, and the land is not currently being used for the cultivation of crops. The land required for the substation will be provided (through acquisition or a long-term lease) between the Project Developer and the government.

The OHLs will use land which is outside a farming leased area and is also owned by the government.

At the time of preparing the Preliminary ESIA, exact details on the specific land requirements for the internal roads was not available and the information provided in this section is indicative with the aim of quantifying land-related impacts from this component of the Project. There is a possibility that some, or all, of the internal roads are either upgraded using gravel, or become asphalt surfaced roads to enable the WTG components to be installed.

The status of existing land lease agreements

To date, no legal agreements have been signed between the Project Developer and the government in relation to the specific land parcels required for the Project. No land acquisition has taken place and farmers who are leasing land within the Project Area, have not had any of their own lease agreements modified (see section below).

All land in Uzbekistan is owned by the government.

As stated in Section 7.4.6, farmers who have land leases within the Project Area pay an annual rent to Tamdy District. Within each land lease agreement, there is a clause providing Tamdy District with the legal right to make a change to the lease. According to a meeting with a representative from Tamdy District in charge of land-related matters during March 2021, there are recent examples where changes have been made to existing lease agreements between the Tamdy District and farmers that can be used to illustrate what could (potentially) happen in relation to this Project.

According to the Tamdy District representatives, where a farmer's lease needs to be changed there are two scenarios: (1) the farmer will lose part of their lease where a Project impacts a proportion of their allocated land. In this case, Tamdy District will proportionally reduce the annual rental payment to reflect the reduced geographical area of the lease. Scenario (2) reflects a situation where the majority (or all) of the lease is impacted and, in this case, the farmer shall be entitled to cash compensation that reflects the remainder of their lease period, or relocation to a new leased area that has the same size.

Under both scenarios, the farmer is not entitled to livelihood restoration measures or other type of support, although an allowance is sometimes provided to assist the farmer in the practical relocation of assets. In accordance with national legislation, if a shelter needs to be removed from a farmer's leased area, then Tamdy District shall not provide any monetary compensation as these types of buildings have been constructed by farmers without their permission and are not considered to be legal dwellings.

Impacts from changes in land lease agreements and restrictions in land access

During construction, small areas of land surrounding each WTG, new internal roads, upgraded internal roads, the substation and two OHLs will become unavailable for the grazing of animals. Fences will not be used to restrict general access, other than surrounding the substation which is located outside a leased land area. Areas where the workers' camp and other areas of land temporarily used for construction will be fenced off.

A quantitative analysis was undertaken to calculate the total area of land impacted within each leased land area held by the 10 farmers, based upon the geographical boundaries of the farm and the physical presence of the WTGs, new internal roads and upgraded internal roads. The OHLs and substation are not within a leased land area. The calculations reflect the current level of information available for the Project and it is likely that the land needs of the Project will increase in the future, once the exact design details become available. For example, land will also be required for the workers' accommodation although it is unclear exactly where this will be located, and how large it will be. This will be incorporated into the Final ESIA once the EPC Contractor has been appointed.

From the internal roads, approximately six leased farm areas (2, 3, 4, 5, 8 and 10) shall be directly impacted, based upon the indicative internal road layout and farm maps that are currently available. There is the possibility that land-related impacts from development of the internal roads may be slightly higher than calculated, if the layout were to change, or if the construction right of way for the road is much wider than the operational width.

The results of the analysis are illustrated in Table 7-22 and indicate that the percentage of land affected from the Project to an individual farmer is relatively small, ranging from 0% where the farmer's leased land area is not affected by the Project, to a maximum of 2.65% (leased land area 5). The leased land areas that are to be impacted by more than 2% are colour shaded in the table.

Impacts associated with changes in land lease agreements are presented in Table 7-23.

Table 7-22: Results of the quantitative analysis of farmer's leased land impacted by the Project

Leased land area Reference	Length of new roads (m)	Length of existing road upgrade (m)	Total length of roads (m)	Land use change from roads (m^2)	Land use change from OHL lines (m^2)	Land use change from substation (m^2)	Number of WTGs inside land lease	Area of WTG based on plot plan (25m x 70m area) including hardstanding	Total land use change (m2)	Land area of the farm plot (m2)	Total Percentage of land affected (%)
1	0	0	0	0	0	0	0	0	0	304,377	0
2	0	0	0	0	0	0	0	0	0	76,038	0
3	6,924	9,590	16,513	330,262	0	0	14	24,500	354,762	13,617,000	2.61
4	4,845	4,347	9,192	183,835	0	0	6	10,500	194,335	22,062,200	0.88
5	3,223	9,806	13,029	260,582	0	0	9	15,750	276,332	10,436,400	2.65
6	307	888	1,194	23,886	0	0	1	1,750	25,636	16,295,100	0.16
7	0	0	0	0	0	0	0	0	0	8,550,540	0
8	453	445	898	17,956	0	0	1	1,750	19,706	6,406,130	0.31
9	0	0	0	0	0	0	0	0	0	7,573,950	0
10	4,257	4,753	9,010	180,198	0	0	10	17,500	197,698	8,762,090	2.26

NOTE: the above calculations reflect an indicative layout of the internal road design, and this may change in the future when additional design details become available, and more accurate farm boundary maps are prepared. The calculations above do not also take into consideration land required for the worker camp which is likely to be located outside of a leased land area, or land that may be temporarily required for the storage of materials. This will be updated once further information is available and included within the Final ESIA.

Table 7-23: Impacts to livelihoods from land use change

Impact Nature	Positive		Negative	
	The impact is negative.			
Project Stage	Preparation	Construction	Operation	Decommissioning
	The impact is relevant to the preparation, construction, operation, and decommissioning stages of the Project.			
Impact Type	Direct	Indirect	Reversible	Irreversible
	The impact is direct because six out of 10 farmers will no longer have access to areas of relatively small amounts of land used for grazing livestock. Based upon a consultation meeting with representatives from Tamdy District, farmers are expected to be offered a proportional reduction in their annual rent payments that reflects the area of land to be used by the Project (Scenario 1 in the text above). The remaining 4 will not need to have any changes to their lease made. The impact is irreversible as the six farmers impacted will experience a net loss of land available for their livestock. None of the herder shelters shall be impacted by land-use change arising from the Project. The land required for the substation, OHLs, worker camp and storage areas (if required) shall reduce the area of non-leased land available to the general public including herders of animals who may being using this land informally for grazing, as well as local people who may be using these areas for the collection of medicinal plants, and other purposes. The area that is to be fenced off for these project components represents a very small proportion of the regional, non-leased land available, and it is unlikely to result in any significant impacts from occurring.			

Impact Duration	Temporary	Short-term	Medium-term	Long-term	Permanent
	The impact duration will be long-term as land-related impacts described will occur throughout the operation stage.				

Impact Extent	Local	Regional	National
	The impact will occur at a local level only, as the impact is restricted to a few farmers and their respective households. Impacts at a regional level are not expected to occur.		

Impact Magnitude	Negligible	Low	Medium	High
	The impact magnitude is low due to a combination of a few (just 6 out of 10) farmers being impacted, and due to the relatively low percentage of land which shall be taken from each of their leased land area.			

Receptor Value / Sensitivity	Negligible	Low	Medium	High
	The receptor value is low. Project infrastructure is not located on areas that are particularly favourable to herding activities (such as areas of dense vegetation for example), and there will be plenty of alternative land that can be used to support land-based livelihoods within the leased land areas impacted.			
Gender and vulnerability Considerations	Yes		No	
	Whilst women are not directly involved in the grazing of animals, they may still be impacted if a farmer's or animal grazer's household experiences a loss of livelihood. Elderly farmers may also be vulnerable as they may not be able to deal with changes in access restrictions or to their lease, compared to younger people who may be more flexible.			
Impact Significance	Negligible	Minor	Moderate	Major
	The impact significance is moderate as the economic displacement experienced by the farmers and grazers using areas of land at the substation (and to a lesser extent at the OHL towers) shall be involuntary, and the provisions of IFC PS5 and ADB SPS (Safeguard Requirements 2) are triggered by the Project.			

7.5.8.2 Mitigation and enhancement

Prior to the start of the construction stage, the Project shall engage with all ten farmers in the Project Area using a Community Liaison Officer (CLO), to inform them of the following:

- The start of construction works and presence of activities at specific locations within the Project Area.
- Advice to avoid areas where construction works are ongoing to maintain the safety of themselves and their livestock.
- The grievance mechanism that can be used to raise a concern about any aspect associated with the Project, request compensation or other matter.
- That during operations they will be able to graze in between the WTGs which will be safe to do so, although particular care will need to be taken during winter periods, when snow and ice throw could occur.
- That the occupation of existing shelters, or the construction of new shelters, will not be impacted by the Project from the generation of noise or shadow flicker.
- That they should not construct new shelters in the close vicinity to WTGs as otherwise these shelters could potentially be exposed to shadow flicker and noise impacts that exceed applicable thresholds.

In relation to the last measure above, the Project shall engage with representatives from Tamdy District to discuss the optimum way to prevent farmers from constructing new shelters in the future, within their farming area, so that they are not too close to the WTGs during operations.

The location of the workers' accommodation during construction and any areas of temporary land use which will be fenced off during construction, shall be located to avoid (to the extent possible) areas that could be used for animal grazing activities, and the collection of medicinal plants. In order to locate such features, the CLO shall engage with community leaders and farmers to assist in the identification of a suitable location which is away from favoured grazing and collection areas.

The Project will prepare a Livelihood Restoration Plan (LRP) to address involuntary economic displacement. The LRP shall include the following:

- A census and asset inventory survey to gather quantitative information on assets that are to be impacted and their ownership, including if farmers are sub-letting areas of their farming land (formally or informally such as through verbal agreement) to other third-parties.
- A socio-economic analysis of Project Affected People (PAPs) to understand their pre-displacement conditions and sources of vulnerability. This includes the identification of young and elderly people, so that a range of specific measures can be adopted to provide them with any additional assistance that they may need.
- A commitment to ensure that adequate compensatory measures are provided to PAPs in advance of changes being made to their lease agreements, and prior to any land-use changes being instigated.
- Details of eligibility and entitlements to PAPs and their Project Affected Households (PAHs). The LRF shall include a description of how the entitlements to livelihood restoration measures shall be defined using an engagement-led approach. This may comprise, for example, the provision of capacity building measures to monitor livestock health, providing practical support to farmers such as improvements to accessing water, providing assistance to create a social organisation of farmers in the Project Area so that they can coordinate their activities and enhance social cohesion, and potentially other measures.
- The potential for impacts to PAPs to be differentially impacted by vulnerable people within a farmer's household, and how additional support will be provided to vulnerable people.

- How PAPs are to be provided with preferential access to employment and vocational skill training opportunities during the construction and operational stage of the Project.
- Details of a grievance mechanism that can be used to raise a concern about any aspect associated with the Project, compensation or other matter.
- A reporting and evaluation framework which includes a specific set of measures to track any change in the status of vulnerable people.
- Clearly defined roles and responsibilities, a realistic budget (including contingency) and an implementation schedule.

7.5.8.3 Residual impact assessment

Table 7-24 sets out the predicted residual impacts of the Project to livelihoods from changes in land lease agreements and restrictions in land access following implementation of mitigation.

Table 7-24: Residual impacts to livelihoods from land use change

Impact Significance	Negligible	Minor	Moderate	Major
	Following implementation of the mitigation measures it is anticipated that negative impacts will be reduced to minor. However, additional information is required on the exact location of the workforce camp and areas used for the temporary storage of materials.			

7.5.9 Impacts from the use of an incoming workforce and workforce accommodation camp

7.5.9.1 Impact assessment

The incoming construction workforce will be provided with accommodation in the form of an on-site camp, located within the Project Area and outside a leased farming area. The selection of the location of the camp would be the responsibility of the EPC Contractor and approved by the Project Company before any construction work is started. During construction, the workforce is expected to be present at the camp. After the construction phase is complete, there is a possibility that a part of the camp remains in use as a base for the smaller operational workforce.

Workers using the camp may be exposed to health and safety risks associated with fire, poor sanitation and food safety, electrical safety and security risks of theft or assault. There is also the potential for workers based in accommodation facilities to interact with local people and communities close during non-working hours, increasing the risk of communicable diseases (including COVID-19), raising local tensions, and increasing crime (including sexual assaults) on local people.

In light of the ongoing COVID-19 pandemic, there is also the potential for the incoming workforce to result in transmission between the workers and local communities. A specific source of risk is the interaction between the local workforce based in their homes and the incoming workforce, where there is the potential for local workers to be at exposed at work, and then take the disease back to their homes, families, and local community.

The IFC has issued detailed guidance on preventing and managing health risks of COVID-19 in the workplace (IFC Guidance Note on COVID-19 dated April 2020) and this guidance will be followed. A summary of the measures to be taken is provided in the mitigation section for this impact.

Table 7-25: Impacts from the use of an incoming workforce and workforce accommodation camp

Project Stage	Preparation	Construction	Operation	Decommissioning	
	The impact is relevant to the preparation and construction stage when the camp will be in operation and the incoming workforce will be present.				
Impact Nature	Positive		Negative		
	The impact is negative as the construction workforce will be potentially exposed to a variety of risks, including transmission between workers of COVID-19 and other infectious diseases, and also between workers and local communities.				
Impact Type	Direct	Indirect	Reversible	Irreversible	
	The impact is both direct and indirect because the individuals involved, and the nearby communities may be impacted by the behaviour and health of workers inside the accommodation camp. The impact is both reversible and irreversible, depending upon the type of health incidents that occur.				
Impact	Temporary	Short-term	Medium-term	Long-term	Permanent

Duration	The majority of the negative impacts are medium-term as construction works are expected to continue for approximately 24 months. However, long-term and permanent effects may arise depending upon the type of health incidents that occur. It is possible that this impact leads to permeant and irreversible changes in health status either amongst workers, or to other people.			
Impact Extent	Local	Regional	National	
	The impact will occur at a regional and local level.			
Impact Magnitude	Negligible	Low	Medium	High
	The impact magnitude is high as potentially the entire workforce could be exposed to communicable health risks, as well as people and communities close to the facilities used.			
Gender and vulnerability Considerations	Yes	No		
	Women, particularly young girls are at risk from the presence of the incoming workforce who may try to seek sexual services. Interactions between incoming workers and women has the potential to increase the incidence of communicable diseases, raise tensions and increase the prevalence of gender-based violence (which is already high).			
Receptor Value/ Sensitivity	Negligible	Low	Medium	High
	The sensitivity is high as the health and safety of the workforce and surrounding people, particularly vulnerable groups, is the Project's highest priority.			
Impact Significance	Negligible	Minor	Moderate	Major
	The overall significance for negative impacts is major.			

7.5.9.2 Mitigation and enhancement

The way in which the location of accommodation camp is to be selected shall take into consideration the nearby proximity of social receptors such as residential housing units and schools, and the road route to be used by vehicles transporting personnel. The camp is expected to be located within the Project Area, at a remote location away from local communities to reduce the potential for close interactions with workers based at the camp and local people.

The Project Company will prepare a COVID-19 Management Plan and a Worker Accommodation Plan.

The COVID-19 Management Plan will describe the controls on the workforce that are necessary to prevent and respond to, positive cases of COVID-19. The COVID-19 Management Plan will be based upon the IFC Guidance Note on COVID-19 dated April 2020 and contain the following:

- A summary of the objectives of the plan and the importance of open and transparent communication and behaviour amongst the workforce.
- Details of a dedicated team with responsibilities to identify and implement actions that can mitigate the effects of COVID-19 on the company and the community.
- A Worker Code of Conduct shall be implemented inform workers that there should be no discrimination or stigmatisation of persons affected by COVID-19 or their families. The worker Code of Conduct will be disclosed to workers during the initial HSE induction process.
- How information on the prevention and response to COVID-19 is to be provided to the company and local communities. This aims to raise awareness amongst the workforce and local communities of the steps needed.
- All workers shall be tested prior to their arrival into the Project Area, and a testing system shall be established to routinely check the workforce during construction. The temperature of each worker will be checked daily using a non-contact thermometer.
- Workers who exhibit any of the COVID-19 symptoms or have been in close contact with a confirmed COVID-19 case during the previous 14 days shall be required to isolate and then take a test to prove they are negative.
- A requirement for all workers to wear masks in specific areas where necessary, practice 'cough hygiene' to reduce the risk of transmission, undertake social distancing to prevent person-to-person infection, frequently wash hands using hand sanitisers.
- Measures to ensure that all areas frequented by workers (including the accommodation camp) shall be regularly cleaned and disinfected to prevent the spread of the virus. Surfaces around the camp (doorknobs, etc.) shall be cleaned twice a day. Bed linen will be washed at least 72°C once a week or more frequently.
- A requirement for all kitchen staff preparing food at the worker accommodation camp to undertake a range of specific measures to prevent the spread of the virus through food preparation.

- The use of air quality control measures to increase ventilation in the worker accommodation camp and other areas such as offices, etc., to the extent possible. Air conditioning filters shall be replaced at least monthly.
- The provision of PPE free of charge to all workers which is designed to prevent the spread of COVID-19. Training will also be given to ensure workers are aware of how to use the PPE correctly.
- The camp will be provided with a well-equipped medical facility that is able to deal with positive cases, allowing people to recover under supervision and privacy. Medivac transport will be available for serious cases that require hospital treatment and workers shall be evacuated in accordance with the Project's Emergency Response Plan. All workers will have free access to medical personnel and any languages barriers will be addressed.
- Workers who test positive will be required to quarantine in a dedicated area and will be prohibited from entering the main accommodation area.
- Numbers of workers in rooms shall be limited to maintain social distancing requirements.

The Project Company will prepare and implement a Worker Accommodation Plan.

The camp shall be constructed and operated in accordance with the applicable content of the IFC/EBRD publication entitled: 'Workers' accommodation: processes and standards - A Guidance Note (2010)'. This includes details of minimum specifications of fire safety, electrical safety, sanitation, security, food safety and recreational activities.

The Worker Accommodation Plan will include the following measures:

- The prohibition of non-local workers moving outside into local communities, seeking nightlife outside of the working day. This shall be prohibited to prevent the spread of COVID-19 and adverse interactions with local communities. If a worker accommodated in the camp wishes to leave during non-working hours, then they will need to obtain the permission of a senior manager in advance.
- A Worker Code of Conduct will be used to prohibit sexual interactions inside the workforce accommodation camp, and between the incoming workforce and local people. Any workers seeking to obtain sexual services will be immediately terminated from their employment.
- The worker grievance mechanism will be disclosed inside the working accommodation facilities. Information associated with worker's labour rights under national legislation will also be clearly disclosed in open areas to raise awareness.

- The Project's grievance mechanism that can be used by local people or any other party to raise a concern or complaint about the behaviour of resident workers.
- Regular meetings between workers and Project Senior Management will take place to discuss the quality of the workforce accommodation camp. Similar meetings will also be held between the Project Company and local community leaders to discuss the behaviour of the incoming workforce.
- A range of reporting and monitoring indicators will be used to ensure that the above controls are being effectively implemented within the worker accommodation camp.

7.5.9.3 Residual impact assessment

Table 7-26 sets out the predicted residual impacts of the Project from use of an incoming workforce and workforce accommodation camp following implementation of mitigation.

Table 7-26: Residual Impacts from the use of an incoming workforce & workforce accommodation camp

Impact Significance	Negligible	Minor	Moderate	Major
	Following implementation of the Worker Accommodation Plan the impacts will reduce to minor.			

7.5.10 Impacts from the use of security personnel

7.5.10.1 Impact assessment

During the construction stage, private security personnel will be used by the Project to provide general security at construction working areas to ensure that there is no entry of unauthorised personnel, and that construction equipment is safe and secure.

There is the potential for security personnel to use excessive force that results in damage to the Project's reputation, and act as a trigger point to result in reputational loss or negative perceptions towards the Project. Security personnel will be present during the operational stage in significantly lower numbers. Based upon the information currently available on the Project, no security personnel involved in the Project will be armed with munitions (firearms).

Table 7-27 sets out the potential impacts from use of security personnel as a result of the Project.

Table 7-27: Impacts from the Use of Security Personnel

Project Stage	Preparation	Construction	Operation	Decommissioning	
	The impact is relevant to all stages of the Project as security personnel will be used throughout.				
Impact Nature	Positive		Negative		
	The impact is negative as the presence and behaviour of security staff may result in a rise in local tensions if they behave in an inappropriate manner.				
Impact Type	Direct	Indirect	Reversible	Irreversible	
	The impact is direct because it involves the use of the Project's security staff and their potential interactions with local people. The impact is reversible as it is hoped that even if an incident occurs, this is unlikely to result in permeant damage.				
Impact Duration	Temporary	Short-term	Medium-term	Long-term	Permanent
	The impact is long-term as the security personnel will be present throughout the duration of the Project. The numbers of security present during the operational phase will be significantly lower when compared to the construction phase.				
Impact Extent	Local	Regional	National		
	The impact will occur at a local level only where the security personnel are present.				
Impact Magnitude	Negligible	Low	Medium	High	
	The magnitude of the impact is low, as the potential for multiple incidents occurring that involve large numbers of people, is remote. If an incident does occur, it is likely to be restricted to a small number of people.				
	Yes		No		

Gender and vulnerability Considerations	It is possible that women may be particularly at risk from inappropriate behaviour of security personnel, as they may be perceived to be easier to manipulate and have 'less of a voice' to raise a complaint, when compared to their male counterparts.			
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	The receptor value is high as even a single incident could act as a trigger for local protests, result in damage to the Project's reputation, or result in a injury to a local community resident.			
Impact Significance	Negligible	Minor	Moderate	Major
	The potential impact significance is moderate given the above magnitude and receptor sensitivity.			

7.5.10.2 Mitigation and enhancement

The Project will develop a Security Management Plan that includes:

- A summary of current human rights issues for Uzbekistan.
- A risk assessment associated with the use of security personnel by the Project to identify the types of incidents that could occur, how they may be generated/triggered, and the potential ways in which security personnel could respond to provocation.
- Details of a screening procedure to ensure that all security personnel involved in the Project have not been implicated in past human rights abuses. This screening procedure will be applied during their original recruitment so that only screened personnel are selected.
- Details of training that will be provided to all security personnel to ensure that they are trained in the rules of force, culturally appropriate engagement, and the Project's grievance mechanism.
- Details of the uniform to be used so that they are easily identified as security personnel, including a unique reference/label that can be used to make a grievance about a specific person.
- Details of communications equipment so that personnel are able to request support during the start of any incident, and PPE that will be provided free-of-charge to all personnel, along with training on its usage.

- A cross-reference to the Project's grievance mechanism that can be used to address any concerns promptly associated with the actions of security personnel, and details as to how this is to be disclosed.
- Reporting and monitoring indicators which will include periodic audits of third-party security companies used to provide personnel, to check that the provisions above have been adequately implemented.

7.5.10.3 Residual impact assessment

Table 7-28 sets out the predicted residual impacts of the Project from the use of security personnel following implementation of mitigation.

Table 7-28 Residual Impacts from the use of security personnel

Impact Significance	Negligible	Minor	Moderate	Major
	The residual impact significance is expected to be minor after the mitigation and monitoring measures have been implemented.			

7.5.11 Impacts from local employment during operation

7.5.11.1 Impact assessment

The number of local people that are to be employed during operation is not yet known, although it is unlikely that any expatriates will be permanently employed in Uzbekistan. The estimated operational workforce is likely to comprise 35-45 people and include one site manager, two administrative staff, five operators working shifts, 10-15 technicians and up to 8-10 security guards.

As the Project transitions from construction into operation, there will be a shift in the skills required. Consequently, it will be necessary to develop the skills of local people during construction so that suitable individuals are able to take up the long-term positions during operations.

The individuals employed and their household members, will benefit from increased income that is likely to increase their overall quality of life and access to healthcare, educational and other types of resources across a longer time frame. The household is also expected to experience increased resilience to external shocks from the supply of income, that could arise from a sudden change in the incidence of agricultural pests and disease, drought, or food price inflation.

Table 7-29 sets out the likely impacts from local employment opportunities during operation.

Table 7-29: Impacts from Local Employment during Operation

Project Stage	Preparation	Construction	Operation	Decommissioning
	The impact is relevant to the operational stage.			
Impact Nature	Positive		Negative	
	The impact during operations is positive.			
Impact Type	Direct	Indirect	Reversible	Irreversible
	The impact is both direct and indirect because the individuals and their household members are expected to benefit from an increase in standard of living and reduced vulnerability to external shocks. The impact is reversible as the income generated from local employment will cease at the end of their employment at the end of the operational stage.			

Impact Duration	Temporary	Short-term	Medium-term	Long-term	Permanent
	The period of employment will continue over the lifetime of the Project.				

Impact Extent	Local	Regional	National
	The impact will occur at a local level amongst the employed households.		
Impact Magnitude	Negligible	Low	Medium	High
	The impact magnitude is low as the workforce required during operations is relatively small when compared to the construction stage.			
Gender and vulnerability Considerations	Yes		No	
	There is an opportunity for women to become a substantial part of the operational workforce, benefitting from vocational training and earned income.			
	Negligible	Low	Medium	High

Receptor Value / Sensitivity	The sensitivity is high as local employment during both construction and operations is a key expectation amongst local communities and their representatives.			
Impact Significance	Negligible	Minor	Moderate	Major
	The overall impact significance is moderate.			

7.5.11.2 Mitigation and enhancement

The Project will develop and implement an Operational Employment Plan that contains many of the same measures included in the version used for the construction stage. Targets for females to occupy both low-skilled and skilled roles during the operational stage will be included in the Plan.

Table 7-30 sets out the predicted residual impacts of the Project from the use of security personnel following implementation of mitigation.

Table 7-30: Residual Impacts from the use of security personnel

Impact Significance	Negligible	Minor	Moderate	Major
	The residual impact significance is expected to be minor after the mitigation and monitoring measures have been implemented.			

7.5.12 Impacts to the national and regional economy during operation of the WTGs

7.5.12.1 Impact assessment

Operation of the Project, which features 111 WTGs, will generate up to 500 MW a year, all of which will be linked to the national transmission grid. This Project will be the first wind farm at a national level that contributes renewable wind energy to the national grid.

The Project will use SMEs for ongoing support during operations, such as consulting, legal, and accounting companies.

There are no anticipated adverse impacts to the tourism sector identified. During stakeholder engagement activities completed as part of the ESIA none of the people interviewed indicated that the Project would spoil their enjoyment of the landscape. Stakeholders did mention the expectation that the supply of more electricity could result in follow-on developments as other companies and investors are attracted to the Navoi Region, creating more jobs and economic opportunities.

Table 7-31 sets out the likely impacts to the national and regional economy during operation.

Table 7-31: Impacts to the National and Regional Economy during Operation of the WTGs

Project Stage	Preparation	Construction	Operation	Decommissioning	
	The impact is relevant to the operation stage when energy is being generated.				
Impact Nature	Positive		Negative		
	Impact is positive because the operation of the Project will generate energy, which is fed into the national grid, contributing towards the ongoing development of the country using a low-carbon, renewable source. The Project may also attract follow-on developments.				
Impact Type	Direct	Indirect	Reversible	Irreversible	
	The impact is both direct and indirect because the company will provide energy to the national grid which will benefit other electricity users (households, businesses and government buildings), pay taxes, purchase materials and services which will lead to the growth of small and medium business. The impact is reversible as it will only continue during operation.				
Impact Duration	Temporary	Short-term	Medium-term	Long-term	Permanent
	The impact is long-term because it would continue throughout the whole period of Project operation.				
Impact Extent	Local	Regional	National		
	The impact will occur at a regional and national level as energy will be injected into the national grid.				

Impact Magnitude	Negligible	Low	Medium	High
	The impact magnitude is high as this Project will be the first to contribute renewable wind energy into the national grid.			
Gender and vulnerability Considerations	Yes		No	
	There are no gender and vulnerability considerations for this impact.			
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	The sensitivity is medium as Uzbekistan's energy demand will continue to increase during the lifespan of the Project.			
Impact Significance	Negligible	Minor	Moderate	Major
	The overall impact significance is moderate.			

7.5.12.2 Mitigation and enhancement

In order to strengthen the positive effects, the following enhancement measures will be implemented:

- The Project will record the capital spend and location of SMEs used during the operational period so that an accurate record is available of the companies involved, broken down by their geographical location.
- The Project will record the Project's generation of energy and contribution to the national grid. This information will be collated and compiled into future Environmental and Social Performance Reports to provide stakeholders with accurate information about the Project's contribution towards the countries energy generation sector.

7.5.13 Impacts from implementation of a Community Development Plan

7.5.13.1 Impact assessment

During construction and operations, the Project Company will design and implement a Community Development Plan (CDP) that aims to provide a range of benefits to people in local communities in the vicinity of the Project. The CDP is an entirely voluntary initiative and there is no contractual or other form of legal requirement on the Project Company to implement such a framework.

The CDP will have the following objectives:

- To establish procedures for responding to community needs, working with the community and other partners including local government, planning and implementing community Projects, and managing financial arrangements.
- To describe the way in which information associated with community development is to be disclosed and shared in a culturally appropriate manner.
- To ensure that the needs of women and vulnerable groups are taken into consideration during the selection of community development Projects.
- To define clear roles and responsibilities between the various stakeholder groups involved; and
- To define monitoring and reporting procedures that can be used to track implementation over time.

Table 7-32 sets out the likely impacts from implementation of the CDP.

Table 7-32: Impacts from implementation of the CDP

Project Stage	Preparation	Construction	Operation	Decommissioning
	The impact is relevant to the construction and operation stages of the Project when the CDP is being implemented.			
Impact Nature	Positive		Negative	
	Impact is positive because implementation of the CDP is expected to provide a range of benefits to local people. This is expected to include enhancements to local educational facilities and the supply of equipment, potentially water supply challenges, and provide opportunities for disabled people.			
Impact Type	Direct	Indirect	Reversible	Irreversible
	The impact is both direct and indirect because the provision of the facilities will have a direct impact upon the overall quality of life of local people. The impact is irreversible as the provision of the facilities is expected to provide lasting benefits for local people.			

Impact Duration	Temporary	Short-term	Medium-term	Long-term	Permanent

	The impact is long-term as the CDP will be implemented throughout the operational stage of the Project.			
Impact Extent	Local	Regional	National	
	The impact will occur at a local and regional level, as people outside the local communities elsewhere in Tamdy District or Navoi Region may use the facilities.			
Impact Magnitude	Negligible	Low	Medium	High
	The impact magnitude is medium as the initiatives are likely to benefit a high number, and broad range, of local residents including children.			
Gender and vulnerability Considerations	Yes		No	
	The provision of these types of social welfare services is expected to benefit women, children the elderly and other people in a positive manner.			
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	The sensitivity is high as there is a high level of expectations associated with the way in which The Project Company will provide support to local people and municipalities.			
Impact Significance	Negligible	Minor	Moderate	Major
	The overall impact significance is moderate as the provision of support is expected to have a positive impact upon the current standard of living.			

7.5.13.2 Mitigation and enhancement

The table of contents of the CDP will comprise the following:

1. Introduction.
2. Objectives.
3. Scope and budget.
4. The need for community development and types of assistance required.
5. Management of the CDP and Social Agreements.
6. Financial arrangements.
7. Potential initiatives within the Social Agreements.
8. Project approval process.

9. Documentation.
10. Roles & responsibilities.
11. Monitoring & reporting.

7.5.14 Socio-economic impacts during Decommissioning

The socio-economic impacts expected during decommissioning are similar to those experienced during construction, as there will be increased road traffic movements, use of a workforce to remove the WTGs and dismantle the substation infrastructure, incoming presence of a workforce and regional use of hotel facilities, and the presence of a security force. All of these impacts during decommissioning will be managed in a near-identical manner to construction, and the impact assessment and mitigation and monitoring measures are not repeated in this section.

The key change arising from decommissioning primarily relates to the future use of the land using for the foundation of the WTGs. It is likely that even after the Project the land will continue to be used for industrial (i.e. energy generating) purposes and is not expected to be 'passed back' for public or private use. On this basis, there are no significant (positive or negative) impacts expected during decommissioning other than redundancy.

However, the extent of redundancy depends on the future use of land. If the WTGs are to be replaced with new WTGs, then it is likely that the level of redundancy will be reduced, if not eliminated as an incoming 'construction' workforce will effectively be mobilised to the site to replace the WTGs as part of a construction stage of a new project.

Closer to the end of Project life, a Decommissioning Plan will be prepared that reflects the Project Company's final decision in relation to the future use of land and this will include measures to transition the operational workforce into the 'new' Project's workforce to eliminate the need for redundancy, and/or address any other relevant impacts arising from decommissioning.

In addition to the above, there is the possibility that some Project infrastructure will be left at request of local community representatives, farmers, and/or Tamdy District. This presents a potential liability and there is a risk that there may be misunderstandings associated with who is responsible for the maintenance of such infrastructure, and who is responsible for maintaining it in a safe manner to people and livestock. The Decommissioning Plan prepared for the Project shall be developed before the decommissioning stage and include written agreements that reflect who is responsible for maintenance and community health and safety of all handed-over infrastructure.

7.5.15 Cumulative impacts associated with construction of the OHL line from Navoi to Besopan

The purpose of this section is to describe the cumulative impacts of the Project, combined with the proposed upgrading of the OHL from Navoi to Besopan which is currently ongoing and scheduled to be completed by 2025. The cumulative assessment takes a Valued Ecosystem Component (VEC) approach where individual topic areas are considered for the potential for cumulative impacts to occur, and the need for additional mitigation measures beyond what has already been included in the previous sections above. The result of the cumulative impact assessment is presented in Table 7-33.

Table 7-33: Social Cumulative Impact Assessment

VEC Name	Description	Potential Impacts	Cumulative Assessment	Additional Project mitigation required?
Economy	Direct and indirect employment, contracting and procurement, workforce capability and skills, and taxes.	Changes in economic activities away from lower-paid public services (such as schools) to project-related employment by people seeking improved salaries.	The Category 1 workforce requirement of the Project and some Category 2 skilled positions may be filled by people resident in the local communities. The local employment workforce associated with the OHL construction is not defined in the ESIA, although a commitment is made to maximise the opportunity for local employment. The level of unemployment in the Navoi Region in 2017 is 5% (latest data available) and this has remained relatively stable since 2007. Given the relatively low quantity of local employment opportunities with the Project workforce, and the broader population of the Navoi Region (997,100 in 2020) and Zarafshan City (83,815 in 2020), there are unlikely to be significant changes in economic activities away from lower-paid public services. Even though the two projects will undergo construction at the same time, the total number of employment opportunities available will be low compared with the region's total economically active population.	No – existing mitigation measures include the commitment to benchmark employment salaries to avoid people leaving the public sector and seek higher salaries.
		Increased local skills base from vocational training.	The workforce of both projects shall be provided with a basic HSE induction. Some personnel may also be provided with vocational training. The workforce involved in the OHL construction will also be provided with similar training, contributing to an overall increase in technical capacity across the region.	No – the provision of training is included in the Construction Local Employment Plan. This is a positive impact.

VEC Name	Description	Potential Impacts	Cumulative Assessment	Additional Project mitigation required?
		Improved local wage and income levels improved standard of living of those directly or indirectly employed including improved access to health and educational resources.	The households that have one, or more, people involved in the workforce of either project shall experience an increase in their standard of living from waged employment. This impact shall take place during the construction stage when local employment is at its highest. It is likely that a proportion of the household income is spent on improving housing conditions and access to basic services.	No – this is a positive impact
		There is a potential for local inflation to occur and the price of basic services to increase.	Considering the relatively large distance between the Project and the OHL route, and that the OHL construction will not directly impact Zarafshan City which is the nearest large settlement to the Project, changes in the price of local goods and services is not likely to occur.	No.
Land based livelihoods	Provisioning ecosystem services (grazing land)	A loss of access to grazing land used to support land-based livelihoods.	The Project's impact on land and land-based livelihoods is very limited given the size of the Project Area. Construction works along the OHL follows a linear route and does not overlap into the Project Area. No cumulative impacts to land-based livelihoods are expected to occur.	No.
Social infrastructure and services	Includes the access to and quality of educational and health resources.	Additional pressure placed on educational and health resources from the incoming population.	This is not likely to occur as the incoming Project workforce will not be permitted to take their wives and children with them. This is likely to be the case for the OHL Project as well and no cumulative impacts are expected to occur.	No.

VEC Name	Description	Potential Impacts	Cumulative Assessment	Additional Project mitigation required?
Community health and safety	Includes community health status and any exposure to additional health risks (including COVID-19), access to health services, water and sanitation.	Increased risk from a road traffic incident due to the use of project-related vehicles and large trucks to transport materials and personnel.	There is the potential for some sections of the national road network to be used by both projects for the transport of materials and personnel. This could lead to a cumulative increase in community health and safety risks to pedestrians and other road users, including women and children.	Yes – The Project will check with the EPC Contractor working on the construction of the OHL to check which roads routes they are using, and whether the transport of large components of the WTG and substation infrastructure, could interfere with their own traffic movements, and the other road users. If overlaps are identified, the Project will assess the potential to reduce risks to the extent possible.
		Increased demand on public healthcare services.	The Project will provide dedicated healthcare services to the workforce so that no additional pressure is placed upon the public healthcare system. Due to the distance with the OHL line and the location of the OHL workforce, no cumulative impacts are expected to occur.	No.

VEC Name	Description	Potential Impacts	Cumulative Assessment	Additional Project mitigation required?
		Increased risk from the spread of transmissible diseases, including COVID-19, spread by the incoming workforce.	Both projects involve the arrival of an incoming workforce into the Navoi region, thereby increasing the risk of spreading transmissible diseases with local populations. As both projects are externally financed, they will both operate to international social standards which includes the use of prevention, management and monitoring techniques for COVID-19.	No – Project mitigation measures already include a COVID-19 Management Plan and risks have already been reduced to as low as reasonably practicable.

8 Transportation and Access

8.1 Introduction

This Chapter describes the likely effects of the Project including a description of the access route and the likely extent of highway works along the route and presents the assessment of the significance of these effects. Where required, appropriate mitigation measures are outlined, and any resultant residual effects assessed. As with the other chapters, a realistic worst-case scenario has been assessed i.e. delivery of 111 WTGs with all materials transported via the identified route.

At this stage, it is assumed that WTG components will be transported from the port of Aktau to site (1,358 km distance) as illustrated in Volume 2, Figure 8-1. Alternative routes are under assessment as part of the Project logistics study underway at present.

8.2 Assessment Methodology

The assessment is based on the use of a number of different types of vehicles used during the construction and operation of the Project. These include:

- Light Goods Vehicles (LGVs) – contractors' vans, minibuses, private cars etc.
- Heavy Goods Vehicles (HGVs) – vehicles with a maximum rigid length of 12 m and a maximum articulated length of 16.5 m.
- Abnormal loads – vehicles over 25 m in length or 3.6 m wide.

8.2.1 Guidance

The assessment has been carried out using the IEMA 'Guidelines for the Environmental Assessment of Road Traffic'[103]. The guidelines suggest the following thresholds are adopted to assess whether particular links of the network are to be subject to assessment:

- Rule 1 – Include highway links where traffic flows will increase by more than 30% (or number of HGVs increasing by more than 30%).
- Rule 2 – Include any other specifically sensitive areas where traffic flows will increase by 10% or more.

[103] IEMA (2003)

8.2.2 Assessment of Effects

The following sections set out the methodology that has been used to determine if the increased traffic flows during the construction phase of the Project are likely to be significant.

8.2.2.1 Sensitivity Criteria

The sensitivity of roads, their users, and settlements along the proposed route, has been assessed in accordance with the criteria set out in Table 8-1. The IEMA guidance details those sensitive locations defined as receptors that are sensitive to traffic including amenities such as hospitals, places of worship, schools, and historic buildings.

Table 8-1: Sensitivity Criteria

Sensitivity	Criteria
High	Large rural settlement containing numerous amenities. Traffic management measures in place such as controlled crossings, signalled junctions etc. Minor / unclassified unpaved roads with low traffic flow volumes. These may not be suitable for large HGV vehicles.
Medium	Rural settlement with a number of amenities. Minor traffic management measures in place. Local road (paved / unpaved) suitable for HGV traffic / abnormal loads.
Low	Small rural settlement with few local amenities. Minimal traffic management measures in place. Paved road capable of large volumes of HGV traffic / abnormal loads.
Negligible	Scattered dwellings with no local amenities. No / little traffic management in place. Highway suitable for all types of vehicles and volumes.

8.2.2.2 Magnitude of Change Criteria

The magnitude of impact on traffic flow is determined based on criteria set out in the IEMA guidelines. This is set out within Table 8-2 below.

Table 8-2: Magnitude of Change Criteria

Magnitude of Change	Increase in Traffic Flow	Increase in HGVs
Large	Above 90%	Above 90%
Medium	Between 60% and 90%	Between 60% and 90%
Small	Between 30% and 60%	Between 30% and 60%
Negligible	Under 30%	Under 30%

8.2.2.3 Assessing Level of Effect

Using these definitions, a combined assessment of sensitivity and magnitude has been made to determine the level of the predicted effect on a receptor i.e. Negligible, Minor, Moderate or Major. All direct and indirect impacts causing Moderate or Major effects, as identified within Table 8-3, are considered to be significant in terms of the EIA Regulations.

Table 8-3: Matrix for Assessing Level of Effect

Magnitude of Change	Sensitivity			
	Negligible	Low	Medium	High
Negligible	Negligible	Negligible / Minor	Negligible / Minor	Minor
Small	Negligible / Minor	Negligible / Minor	Minor	Minor / Moderate
Medium	Negligible / Minor	Minor	Moderate	Moderate / Major
Large	Minor	Minor / Moderate	Moderate/ Major	Major

Where existing traffic levels are exceptionally low (e.g. on some unclassified / unpaved roads), any increase in traffic level is likely to result in a predicted increase in traffic levels which may exceed thresholds. It is important therefore to also consider the available road capacity.

Where the identified thresholds above are exceeded, the IEMA guidance sets out a list of effects which should be assessed. This includes:

- Accidents and safety.
- Driver delay.
- Pedestrian amenity.
- Severance.
- Air pollution.
- Dust and dirt.
- Ecological effects.
- Hazardous loads.
- Heritage and conservation.
- Noise.
- Pedestrian delay.
- Vibrations.
- Visual effects.

A number of these effects are covered elsewhere in the ESIA and so those considered within this chapter include:

- Accidents and safety.
- Severance.
- Driver delay.
- Pedestrian amenity.
- Pedestrian delay.

Accidents and Safety

IEMA guidelines do not recommend the use of thresholds for identifying significance of impacts due to numerous local causation factors involved in personal injury accidents. However, it is recognised that a significant increase in overall traffic volumes and abnormal loads may raise concerns over road safety. Therefore, measures to address road safety concerns will form a key part of the assessment methodology and development of mitigation options.

Driver Delay

Driver delay occurs due to additional traffic present on the road network. IEMA guidelines note that additional delays are only likely to be significant if the traffic on the network is already at, or close to, capacity. Key areas where delays may occur include:

- At the site entrance due to turning of vehicles.
- On the highway passing the site.
- At key intersections along the highway.
- At junctions where the ability to find gaps in the traffic may be reduced, thereby lengthening delays.

Pedestrian Amenity

This is broadly defined as the relative pleasantness of a journey and is considered to be affected by traffic flow, traffic composition and pavement width / separation from traffic. IEMA guidelines state that this may be significant where traffic is either halved or doubled.

Severance

IEMA guidelines state that severance is the perceived division that can occur within a community when it becomes separated by a major traffic artery. The term is used to describe a complex series of factors that separate people from places and other people. Severance can also result from difficulty in crossing a heavily trafficked road. The guidance indicates that severance effects are considered 'slight' in cases that include:

- Pedestrian at-grade crossings on new roads carrying below 8,000 vehicles per day (AADT) (DoT, June 1993); or
- Changes of traffic flow of less than 30% (IEMA, March 1993).

Pedestrian delay

Changes in the volume and composition or speed of traffic on the road network may affect the ability of people to cross the roads. In general, increasing traffic volumes will lead to an increase in pedestrian delay. Thresholds are not recommended for use to identify significance of potential effects due to the range of local factors and conditions which can affect delay.

8.2.3 Assumptions

It is assumed for the purposes of this assessment that construction will commence in early 2022 and will span over a 24-month period.

At this stage, it is assumed that all traffic will travel from the Port of Aktau in Kazakhstan. Alternative routes are under assessment as part of the Project logistics study. This includes a route from mainland land China to Horgos, Almaty, Tashkent and Zarafshan. Final route options will be assessed in the Final ESIA document, the Logistics Study and the Transportation Management Plan.

As the concrete sources and the details of how road stone will be supplied are not known at this stage, it is assumed that the routing of all materials will follow the abnormal load route identified in the section below, thus presuming a 'worst-case' scenario. A concrete batching plant will be located on the Project site.

It is currently unclear whether a suitable amount of stone will be available on-site and so it has been assumed, as a worst-case scenario, that all stone will be delivered to site for construction of access tracks and hardstanding.

For the purposes of this assessment, 80 km of internal access track has been assumed.

As detailed in Section 8.3, no traffic count data has been obtained however they have been estimated to be of low to moderate volume, dependant on the time and day of the week and the location (i.e. traffic is generally higher where the route travels through built-up areas such as Nukus).

8.3 Baseline Conditions

8.3.1 Baseline Data Collection

A desktop review has been undertaken to identify any key issues regarding accessing the site. This high-level route assessment was based on existing maps, previous studies, and satellite imagery.

No traffic data has been sourced for the route from the port to the Project site and so predicted impacts are estimated based on information obtained during Wood's Scoping site visit in late 2019, through local consultation and satellite imagery.

The 2019 site visit identified that the roads leading into the Project site area are in relatively good condition as can be seen by the photo below. Figure 8-1 illustrates the A739 from which there is one access point and track up to the Project site. The access road is set out within Volume 2 of this ESIA, Figure 1-2.

Figure 8-1: Road Condition A739 North of Zarafshan[104]

A route / logistics survey will be required once the EPC contractor and WTG supplier are finalised to identify any key constraints, pinch points, stopover points and other areas where works may be required to allow for passage of abnormal loads.

8.3.2 Transportation of WTGs

The WTG model proposed for the Project is the Goldwind GW155-4.5 MW WTG. The WTGs will be three bladed horizontal axis machines with a hub height of 95 m and a rotor blade diameter of 155 m.

Appropriate traffic management measures will be put in place as required during transportation of these abnormal loads to ensure minimal disruption to other users of the proposed route. The relevant authority(ies) will be informed, and relevant permits obtained to transport these loads. Police escorts may also be required, and this has been taken account of in the assessment.

[104] Image taken from Google Earth 2012

When on site, all drivers will be advised of site rules in relation to speed limits, traffic flow, restricted entry areas, parking areas and road hazards through a site-specific induction. All drivers will also be required to adhere to the transport management plan (TMP) and site safety plan and follow any instructions from the management team.

8.3.3 Transport Route

It is envisaged that the WTG components will be shipped to Aktau Port in Kazakhstan. The indicative route to site is as follows:

1. Arrival at Aktau Port in Kazakhstan.
2. Travel east along the A33 for around 60 km.
3. Right onto E-121 and continue for 308 km.
4. Travel south-west on E40 / P-1 for 410 km.
5. Turn onto Route 4P173 and continue for 86 km.
6. At Nukus, travel onto A381 for 22 km and up to Route 4P176.
7. Continue on Route 4P176 for 21 km and north onto 4P180.
8. Proceed along Route 4P180 for 350 km to A379.
9. Travel south-west onto A379 for around 100 km and down to the Project site.

The total distance from port to site is approximately 1,358 km and therefore there is a significant journey time from the port to the Project site.

The A379 leading up to the Project site is in moderate condition with damage in places. Access is proposed at off the A739 with new the access track (around 3 km) constructed up to the Project site (see Volume 2, Figure 2-1).

Some repairs / upgrades are likely to be required prior to deliveries commencing, particularly the abnormal load vehicles. Traffic volumes appear to be moderate to low in places and consist of a mix of cars, LGVs and HGVs. It is assumed that pedestrian levels on these roads are low given these are major roads utilised however the exception may be where the roads pass built up / residential areas (as identified in the table below).

Table 8-4 sets out the level of sensitivity of the different sections of roads along the proposed route considering the type of road, estimated traffic volumes (based on the site visit and in-country consultant feedback) and the presence of any sensitive receptors.

Table 8-4: Sensitivity Analysis

Road	Description	Receptors	Sensitivity
A33 Kazakhstan	Paved road with assumed medium to low traffic flows. Largely runs through unpopulated areas. Currently used for HGVs and likely suitable for abnormal loads.	Zhetybay (passes through residential area)	Low
E121	Paved road with assumed medium to low traffic flows. Largely runs through unpopulated areas. Currently used for HGVs and likely suitable for abnormal loads.	Shetpe – residential areas.	Low
E40 / P1 Uzbekistan	Paved road with assumed medium to low traffic flows. Passes through a number of small settlements. Currently used for HGVs and likely suitable for abnormal loads.	Beyneu (passes outskirts of town with houses).	Low / Medium
4P173	Paved road with assumed medium traffic flows. Travels through built up areas. Likely suitable for HGVs / abnormal loads.	Stanciya Shumanay (edge of with houses set back from the road) Khojayli (outskirts of town).	Medium
A381	Paved road with assumed medium to high traffic flows. Passes through Nukus built up area. Likely suitable for HGVs / abnormal loads.	Nukus (residential area).	Medium
4P176	Paved road with assumed medium to low traffic flows. Passes through a number of settlements and agricultural areas. Currently used for HGVs and likely suitable for abnormal loads.	Halkobod (passes through mix of industrial and residential area)	Low / Medium

Road	Description	Receptors	Sensitivity
4P180	Paved road with assumed medium to low traffic flows. Largely runs through unpopulated areas. Currently used for HGVs and likely suitable for abnormal loads.	Khalabad (passes through residential area).	Low
A379	Paved road with assumed medium to low traffic flows. Largely runs through unpopulated areas until reaches Zarafshan City. Currently used for HGVs and likely suitable for abnormal loads.	Zarafshan City	Low / Medium

8.4 Assessment of Effects

8.4.1 Construction Phase

8.4.1.1 Traffic Generation

The construction period for the Project is proposed to be over 24 months. The construction period will include the following sub-phases:

- Site establishment including siting of temporary construction compound and workers' camp area.
- Construction of access tracks (80 km total length).
- Cable laying.
- Construction of WTG foundations and hardstanding areas.
- Sub-station building construction.
- Construction of OHLs (x2 with three to four poles per line).
- WTG erection (111 WTGs).
- Commissioning and site demobilisation.

The requirement for imported material will be minimised by reusing suitable aggregate materials excavated on-site from the foundations and cable trenches, etc.

Activities to be undertaken with the sub-phases of construction, the total number of HGV / abnormal loads associated with the activities and predicted traffic generation are detailed in Table 8-5 below. Each delivery consists of two movements, into and out of the site.

Estimates of traffic generation during the construction phase have been developed based on estimates of the quantities of material and equipment required and previous experience of other wind farm developments.

For the delivery of water to the Project site, it is assumed that each tanker can hold an average of 20 m^3. As per calculations within Chapter 13, the total water to be transported is 99,590 m^3 for workers' needs and 33,265 m^3 for construction purposes.

Table 8-5: Summary of Traffic during Construction

Activity	Vehicle Type	Total Trips (Two Way)	Total Trips (One Way)
Delivery of stone for internal access track construction & hardstanding.	Articulated HGV	39,820	79,640
Delivery of concrete for WTG foundations and substation.	Road lorry	8,325	16,650
Delivery of reinforcing steel.	Articulated HGV	351	702
Delivery of cable.	Articulated HGV	56	112
Delivery of crane.	Mobile crane and articulated HGV	450	900
Delivery of WTG components.	Oversized road transporter (abnormal load)	888	1,776
Delivery of ancillary infrastructure (transformers, switchgear etc.)	Articulated HGV	596	1,192
Miscellaneous construction vehicles (including delivery vehicles for workers' accommodation supplies).	Various	912	1,824
Authority Escorts (if required)	Car	714	1,428
Construction workers.	Various light vehicles	5,400	10,800
Delivery of water to the Project site	HGV / Tanker	6,643	13,286
	TOTAL	**63,531**	**127,062**

For each WTG, a maximum of eight abnormal loads will be required to be transported to site on oversized road transporters (16 total trips in and out of site):

- WTG tower sections – Three loads per WTG, each transported separately.
- Blades – Three loads per WTG, each transported separately.
- Nacelle – One load per WTG.
- Transformer – One load per WTG.

A total of 111 WTGs will be transported to the Project site. All other loads are classified as HGVs or LGVs.

The number of vehicles associated with journeys by construction workers is assuming that workers will reside on the Project site during construction with limited movements in and out of the Project site daily.

Table 8-6 illustrates the monthly traffic volumes over the 24-month construction period. The maximum traffic impact for HGV movements associated with the construction phase will be within month 8.

Table 8-7 sets out the daily average traffic movements per month based on an average of 4.5 weeks per month and an average of five working days per week (rounded down to 22 days per month).

During month 8, an average of 497 vehicle movements are predicted to be generated on each working day (around 249 in and 249 out). For HGV / abnormal load traffic, this would be around 236 movements into site and 236 out of site per day.

It should be noted that the direction of traffic movements is dependent upon the source of the construction materials. Furthermore, this is the worst-case scenario based on the transportation of all stone for road construction to the Project site. In reality, it may be possible to source some or all road stone via borrow pits on site.

Table 8-6: Trips per Month during the Construction Period

Activity	Vehicle Type	Construction Month																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Delivery of concrete for WTG foundations	HGV							1,110	1,110	1,110	1,110	1,110	1,110	1,110	1,110	1,110	1,110	1,110	1,110	1,110	1,110	1,110			
Stone delivery, access track and hardstanding construction	HGV	8,000	8,000	8,000	8,000	8,000	8,000	8,000	7,640	6,000	6,000	4,000													
Delivery of reinforcing steel	HGV									70	72	80	80	80	80	80	80	80							
Delivery of cable	HGV							56	56																
Delivery of cranes / removal	HGV								450															450	
Delivery of WTG components	Abnormal							148	148	148	148	148	148	148	148	148	148	148	148						
Delivery of ancillary infrastructure (transformers, switchgear)	HGV								140	140	140	150	160	160	160	142									
Delivery of water via tankers	HGV	200	400	400	400	600	600	600	800	800	800	800	800	800	800	686	600	600	600	600	400	400	200	200	200
Miscellaneous construction vehicles	HGV	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	LGV	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Escort	LGV							119	119	119	119	119	119	119	119	119	119	119	119						
Construction staff	Minibus, 4x4, car	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450
TOTAL	HGV	8,212	8,412	8,412	8,412	8,612	8,612	9,778	10,208	8,132	8,134	6,152	2,162	2,162	2,162	2,030	1,802	1,802	1,722	1,722	1,522	1,522	212	662	212
	Abnormal							148	148	148	148	148	148	148	148	148	148	148	148						
	LGV	12	12	12	12	12	12	131	131	131	131	131	131	131	131	131	131	131	131	12	12	12	12	12	12
	Minibus, 4x4, car	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450
	ALL	**8,674**	**8,874**	**8,874**	**8,874**	**9,074**	**9,074**	**10,507**	**10,937**	**8,861**	**8,863**	**6,881**	**2,891**	**2,891**	**2,891**	**2,759**	**2,531**	**2,531**	**2,451**	**2,184**	**1,984**	**1,984**	**674**	**1,124**	**674**

Table 8-7: Daily Average Movements per Construction Month

	MONTHS																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
HGV	373	382	382	382	391	391	444	464	370	370	280	98	98	98	92	82	82	78	78	69	69	10	30	10
Abnormal	0	0	0	0	0	0	7	7	7	7	7	7	7	7	7	7	7	7	0	0	0	0	0	0
LGV	1	1	1	1	1	1	6	6	6	6	6	6	6	6	6	6	6	6	1	1	1	1	1	1
Minibus, 4x4, car	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
ALL	**394**	**403**	**403**	**403**	**412**	**412**	**478**	**497**	**403**	**403**	**313**	**131**	**131**	**131**	**125**	**115**	**115**	**111**	**99**	**90**	**90**	**31**	**51**	**31**

8.4.1.2 Effects on the Road Network

As no baseline information with regards to current traffic volumes along the proposed transport route is available, it has not been possible to quantify the predicted impact of HGVs on the proposed road network route. A route / logistics study completed prior to construction will further inform the assessment. It is considered however that, given the 24-month construction period and information obtained during site visits, that the Project will likely have a temporary, short-term impact of Moderate significance on the road network.

Mitigation is proposed in Section 8.6 which would assist in alleviating some of this impact.

8.4.1.3 Road Works

Damage to road edges and general 'wear and tear' of the road may occur through increased HGV movements. It is difficult to identify the extent to which this may occur however, it is likely that, at worst, there would be an impact of Moderate significance, pre-mitigation. Given the route distance, it is utilised by a range of different traffic (cars, LGVs and HGVs). The majority of the main roads utilised are considered to largely be of an adequate condition to withstand the predicted construction HGV movements. On approach to the Project site, it is likely that some upgrade work would be required to enhance access.

8.4.1.4 Evaluation of Effects

Given the potential significance, a full review has been carried out as per Section 8.2.3.3 of this Report. This section provides an evaluation of effects based on the IEMA guidelines.

Accidents and Safety

IEMA guidelines do not recommend the use of thresholds for identifying significance of impacts, however the magnitude of change on accident and safety levels is expected to be minor prior to operation.

Uzbekistan experiences a lower rate of road traffic fatalities with 11.2 deaths per 10,000 population. According to January 2020 statistics, the Navoi region of Uzbekistan had the lowest number of traffic accidents of all regions (nine in total).

Road accidents in Kazakhstan increased significantly in the last 20 years with 24.2 deaths per 100,000 population attributed to road traffic fatalities. More recently however the country has adopted a range of road safety legislations which are moderately to well enforced.[105]

Statistics for the whole route in detail have not been obtained however it is likely that impacts prior to mitigation are moderate to major. Good practise measures such as driver awareness training, vehicle and driver safety checks, wheel washing facilities and signage where appropriate to make other road users aware of construction traffic and turnings will minimise the risk of accidents as a consequence of the Project.

Severance

Severance is not likely to be a significant issue particularly as major roads are utilised which are already subject to HGV traffic. It is likely to be of minor to moderate significance prior to mitigation. Mitigation measures should include appropriate traffic control measures, adherence to speed limits and possible implementation of pedestrian crossing areas where the route passes smaller settlements. These should be set out within the construction Traffic Management Plan (TMP).

Driver Delay

IEMA guidance states that driver delay is only likely to be significant where roads are already at, or reaching, capacity. Table 8-2 sets out capacity levels for different types of roads. It is not possible to determine the impact on capacity given that no baseline data is available however due to the significant volume of traffic predicted to be generated over the 24-month construction period, impacts are likely to be of moderate significance.

Measures to limit the impact of abnormal loads on the road network will be further refined within the construction TMP. Additional mitigation measures will be implemented to reduce driver delay along the route.

Pedestrian Amenity

IEMA guidelines state that impact on pedestrian amenity may be significant where traffic is either halved or doubled. The impact on pedestrian amenity is likely to be most significant where the route passes through or close to settlements. The level of effect of the construction phase on pedestrian amenity is predicted to be minor overall.

[105] https://www.grsproadsafety.org/programmes/countries/kazakhstan/

Pedestrian Delay

There is the potential for pedestrian delay due to increased traffic. This will be most significant around the settlements that the route passes. Given that only major roads are utilised to access the Project site, this should help to limit pedestrian delay which may occur. This impact is likely to be of minor to moderate significance and appropriate mitigation should be set out within the TMP to alleviate impacts in settlements which the route passes through as so far as is possible.

8.4.2 Operational Phase

The main transport impacts will occur during the construction phase. The number of vehicles during operation is likely to be low, with access required only for maintenance and servicing. The majority of these will be light vehicles with HGVs only required if WTG components need replacing. The effects of traffic movements stemming from the operational phase are therefore considered negligible and so insignificant.

8.5 Further Work

It is recommended that the route is verified through further assessment (including site swept path analysis). Furthermore, the method of transportation for other materials and equipment should be verified.

It is recommended that a pre-construction survey is carried out on the local road network utilised followed by another on completion of construction to fully establish any damage / wear and tear to the roads which could have resulted from Project traffic. This will include an assessment of existing bridge capacities and conditions, as applicable.

8.6 Mitigation and Monitoring

8.6.1 Pre-Construction

Prior to construction it is advised that the following should be developed:

- Carry out route / logistics survey once the preferred route option is identified and EPC Contractor / WTG supplier is finalised.
- Following the survey, identify appropriate stop over points en-route for driver overnight stays.
- Obtain all relevant permits for use of the proposed route (particularly for abnormal loads) and for customs clearance points crossing from Kazakhstan into Uzbekistan.

- A pre-condition survey of the public road network that is to be used within the local area should be undertaken to ascertain the physical condition of the road prior to use. This will enable the Project Developer and local authorities to monitor the condition of the road before, and after, the construction stage.
- Consultation with local communities identified as sensitive receptors to notify of commencement of construction and delivery of materials, particularly in relation to abnormal loads.
- Develop a Construction TMP to manage potential impacts on the road network and its users. This should include (but not limited to):
    - Details of the proposed route and allocated stop-over points.
    - Details regarding the Customs Point at the crossover from Kazakhstan into Uzbekistan.
    - Commitment to all construction vehicles only using approved access routes to site. All drivers are prohibited from undertaking any off-road driving and are not permitted to make deviations off designated routes unless authorised to do so.
    - Verification of all drivers taking the required number of stops and not exceeding the safe driving limits.
    - All drivers will prevent the idling of engines whilst they are stationary unless it is necessary to do so. The aim is to avoid the unnecessary generation of air and noise emissions from idling vehicles (which could generate community nuisances) whilst they are not in active use.
    - The wearing of safety belts by the driver and its occupants whilst travelling in any project vehicle is mandatory. All belts (for all occupants) will be of the 3-point configuration (only).
    - All drivers of Project vehicles must:
        - Have in their possession a valid driving licence issued by the Uzbekistani authorities.
        - Passed a defensive driving safety course organised by the HSE Manager.
        - Conform to the Project's Drug and Alcohol Policy.

        - Not make or answer a mobile telephone call while driving a vehicle. This restriction also applies to the use of text or mobile data services found on smart phones. Mobile telephones can be left on during a trip to alert the driver of any incoming calls but must not be actively used whilst driving. If the driver wishes to use their phone, then they should safely leave the road and bring the vehicle to a complete and safe stop, in a safe area, before initiating or answering a call.
    - All vehicles used by the Project will be fit for purpose based on an assessment of usage and be maintained in safe working order in line with manufacturers' specifications and all applicable national legal requirements. This includes the repair of all minor defects that have an implication to safety, such as the presence of cracked glass windscreens, unlit bulbs, etc. All vehicles will also have a reverse alarm system installed that activates automatically.
    - Speed restrictions along the route and within the Project site.
    - When required, on-coming traffic halted to enable abnormal load transporters to negotiate any pinch points along the route.
    - Parking requirements / restrictions on site.
    - Toolbox talk details regarding road safety, driver obligations etc.
    - The above requirements will apply to all Project vehicles, which extends to all sub-contractors used for the purpose of transporting materials or people to the project area. No exceptions or exclusions will be granted by the Project.
    - Details of notifications to local communities / signage.
    - Movement of abnormal loads restricted to outside of peak traffic periods.
    - The requirement (if any) for escort of abnormal loads.
    - Temporary direction signs indicating local routes to site and site entrances (statutory and site identification boards) provided along with advisory speed limit (to be agreed) signs along the length of the access route.
    - Maintenance of the access routes during construction by the main contractor to a condition suitable for use.
    - Development of Incident and Contingency Plan.
- Consultation with local authorities regarding proposals and any authorisations / escorts required for the movement of abnormal loads.

- Consultation will be required with services / utility providers to determine the exact location of any underground and overhead services / utilities and prior to removal or re-alignment of any overhead cables.
- Prior to construction of the Project, a series of leaflets and notices should be posted making local residents and businesses aware of any likely disruption.

8.6.2 Construction Phase

It is recommended that the following is implemented to reduce the significance of effects during construction:

- Monitoring of the efficiency of deliveries of construction materials to the site and if necessary sufficient storage provision made available on site to prevent any delays to the construction process.
- Construction TMP adhered to in order to reduce risks to drivers, local road users and pedestrians (where applicable).
- Consultation with local communities, particularly to inform of abnormal load delivery dates and times.
- Immediately after completion of construction phase, undertake a post-construction road survey to establish any damage caused by the Project traffic. Repairs should be carried out should any damage attributable to the Project be identified.

8.6.3 Operational Phase

It is recommended that a TMP is developed for the operational phase of the Project detailing safety measures required during transportation of any required materials and traffic generated for maintenance requirements.

8.7 Residual Impacts

The effect of the Project's construction HGV / abnormal load traffic on the existing roads cannot be quantified given the lack of traffic data however, considering all construction traffic and proposed mitigation, the impact is likely to be of Minor to Moderate significance during construction, and Negligible during operation.

8.8 Cumulative Impacts

The Navoi to Besopan Transmission Line Upgrade is currently under construction. Construction materials required for the OHL upgrades will be transported by rail unloading at Karakatta rail station then transported to allocated locations using the A379 (Navoi-Uchkuduk highway). This will occur south of the Project site and it is not thought that there will be conflict associated with this.

Nevertheless, it is recommended that the EPC contractor working on the OHL is consulted to confirm the roads being utilised by the OHL project and whether the transportation of WTG components and other Project equipment and materials could impact on their own traffic movements. If overlaps are identified, the Project will assess the potential to reduce these risks as so far as possible.

The operational Muruntau Mine is located to the south-east of the Project site and accessed from the A379. There is the potential for traffic conflict during key stages of the Project development. The A379 is considered of low sensitivity in this location with medium magnitude of change predicted leading to impacts of minor significance. Mitigation will include consultation with the mine operator particularly during periods of high traffic relating to the Project construction and timed abnormal load deliveries to reduce any potential conflict. Measures will be detailed further within the construction TMP developed prior to construction. No significant operational cumulative impacts are predicted.

The Project's construction period should not run concurrently with any other known major development in the area to avoid significant cumulative impacts and this should be determined in consultation with the local authorities prior to construction and deliveries commencing.

An update to the cumulative assessment will be completed at the Final ESIA stage.

8.9 Conclusions

The traffic assessment has found that the most significant month for deliveries during construction is month 8 when there is anticipated to be around 249 traffic movements into site and 249 traffic movements out of site per day. Of these vehicle movements, around 236 are HGV / abnormal loads. Although it has not been possible to quantify the impact on the existing road network, this is considered to be of Moderate significance, reducing to Minor with mitigation.

During operation, traffic movements are limited to monitoring and maintenance requirements on site and are deemed to be of Negligible significance.

No significant cumulative impacts are predicted to occur as a result of the Project's construction or operational phase considering other developments in the vicinity. Appropriate mitigation will be applied to reduce any potential conflict with other cumulative developments in the area.

9 Landscape and Visual Impact Assessment

9.1 Introduction

This chapter evaluates the impacts of the Project on the landscape character and visual amenity. It describes and evaluates the change to the landscape and visual amenity during construction and once in operation, and the extent to which these affect perception and views of the landscape and visual resource.

The subjects of landscape character and visual amenity, although closely related to one another, have been considered separately in this chapter for reasons of clarity and robustness. The related subject cultural heritage is addressed in Chapter 10. Consideration of this subject in this chapter has been limited to the extent to which they influence the landscape character and visual amenity of the Project site and the wider area.

9.1.1 Assessment Scope

9.1.1.1 Scope

The aim of the Landscape and Visual Impact Assessment (LVIA) is to identify, predict and evaluate potential key impacts arising as a result of the Project.

The following potential issues have been assessed:

- The direct impact of the WTGs, OHLs, associated structures and required access tracks on the baseline landscape of the site and its immediate environs.
- The indirect impact upon the landscape designations, character and visual amenity of the wider area arising from the introduction of potentially visible WTGs into the area.

From a cumulative perspective, there are no existing or proposed wind farms within 60 km of the Project however there is a long distance OHL under construction spanning from Navoi up to Besapan (Navoi Transmission Line Upgrade Project) which has been considered within this assessment.

9.1.1.2 Impacts Scoped out of Assessment

Impacts arising from the process of decommissioning have been scoped out since they are of a similar nature to construction issues, but of a smaller scale and shorter duration. Where the assessment refers to potential construction impacts these are also considered representative of predicted reasonable worst-case decommissioning effects.

9.1.2 Assessment Study Area

A Zone of Theoretical Visibility (ZTV) has been utilised to define the study area for both the landscape and visual assessment. A ZTV is a computer-generated tool used to identify the likely (or theoretical) extent of visibility of a development. The software uses a digital elevation dataset with the output from the analysis used to create maps of visibility. For this Project, a 35 km study area has been utilised.

9.1.2.1 Landscape Assessment

All Landscape Character Types (LCTs) within the ZTV have been identified and are illustrated on Figure 9-2. Those receiving potential inter-visibility with the Project have been considered as part of this assessment.

9.1.2.2 Visual Assessment

Within the overall 35 km study area (as defined by the ZTV) a series of seven viewpoints were selected and form the basis of the visual assessment (see Volume 2, Figure 9-1). Viewpoints include:

- VP1: Road at Besapan.
- VP2: South of Muruntov.
- VP3: South of Industrial Area / Railway Depot.
- VP4: Edge of Zarafshan.
- VP5: High Ground to the North of the Project.
- VP6: Tourist Area.
- VP7: Farm Shelter.

In addition to the viewpoints, a detailed assessment of any potential receptors (including residential properties, any workplaces and routes) within 15 km of the Project has been carried out, as it is within this area that significant visual impacts are considered most likely to occur.

9.1.2.3 Landscape Assessment Methodology

This section describes the key components, features and characteristics that contribute to the quality and perception of the landscape within the study area. It provides an evaluation of the implications of the Project in terms of direct impacts on key landscape components and features. It considers the extent to which loss of features, and the introduction of the Project, would influence perception of local character within the study area, and its implications for the wider regional landscape character.

WTGs inevitably attract a spectrum of opinion from members of the public, ranging from very adverse to very beneficial. However, using the precautionary principle, the LVIA has been carried out based on the assumption that all landscape and visual impacts reported are adverse.

9.1.3 Assessment Guidance

The assessment has been prepared with reference to the Guidelines for Landscape and Visual Impact Assessment (Third Edition) (GLVIA) published by the Landscape Institute and the Institute of Environmental Management and Assessment[106].

9.1.3.1 Key Stages of the Assessment

The GLVIA relies on an appreciation of the existing landscape, its sensitivity to change, a thorough understanding of the development proposals, the magnitude of change that would result from the construction and operation of the proposals and the potential to mitigate impacts.

There are four key stages to the assessment:

- Establishment of the baseline.
- Appreciation of the Project.
- Consideration of variation of impacts over time.
- Assessment of Impacts.

9.1.3.2 Establishment of Baseline

The following specific tasks have been undertaken:

- A review of national and regional/local landscape designations.
- A site appraisal of landscape character and its key landscape, ecological and cultural elements and identification of its Sensitivity to Change to development of the type proposed.

[106] Landscape Institute and the Institute of Environmental Management and Assessment (2013)

9.1.3.3 Establishment of Zone of Theoretical Visibility

In order to identify and assess potential impacts on the landscape and visual resource, Zone of Theoretical Visibility (ZTV) have been prepared. The ZTV defines the effective boundaries within which views of the Project could potentially be obtained. ZTVs have been prepared using specialist computer software, Resoft Windfarm (Version 4). This produces an analysis of a computer-based model that uses landform as the key determinant of availability or construction of view.

9.1.3.4 Limitations of the ZTV

It should be noted that the computer model does not take into account features such as trees or woodland, buildings and other structures or local landform, which can vary the ZTV locally and therefore the ZTV is not representative of visual impact in itself. Nevertheless, the ZTV is a valuable tool in assisting with the identification of areas of potential impact.

9.1.3.5 Landscape Sensitivity to Change

Sensitivity to change considers the nature of the landscape and its ability to accommodate development of the type proposed without compromising its key characteristics and components. Sensitivity to change is defined through appraisal of scenic quality, value, and the capacity of the landscape to accommodate change.

9.1.3.6 Scenic Quality

An appraisal of scenic quality has been carried out based on a three-point scale and evaluated against the following criteria:

- **High** – Landscape components combine to create a stimulating and distinctive composition which is aesthetically and scenically outstanding or which is an exceptionally example in the areas of a reasonably cared for landscape but with some degraded or obtrusive areas or features.
- **Medium** – Landscape components combine to create a pleasing but un-stimulating composition which is aesthetically and scenically unremarkable or which is an example in the area of a reasonably well cared for landscape but with some degraded or obtrusive areas or features.
- **Low** – Landscape components combine to create a poor composition which is aesthetically and scenically conflicting or which is an example in the area of a poorly cared for landscape with frequent degraded or obtrusive areas or features.

This evaluation is only relevant to landscapes in the local context. It should be noted that areas of different landscape scenic quality do not necessarily correlate with different landscape character areas.

9.1.3.7 Landscape Value

Landscape value is another determinant of sensitivity and is frequently addressed by reference to international, national, regional, and local designations, determined by local and national Planning Authorities. However, absence of such a designation does not necessarily imply a lack of quality or value. Factors such as accessibility and local scarcity can render areas of nationally unremarkable quality, a highly valuable local resource.

9.1.3.8 Criteria for Identification of Sensitivity to Change

Sensitivity to change of the type proposed has been evaluated with reference to the subject areas above and using a three-point scale as follows:

- **High** – A landscape of particularly distinctive character susceptible to relatively small changes of the type proposed.
- **Medium** – A reasonably valued landscape with a composition and characteristics tolerant of some degree of change of the type proposed.
- **Low** – A relatively unimportant landscape which is potentially tolerant of a large degree of change of the type proposed.

9.1.4 Variation of Impacts over Time

Landscape effects change over time as mitigation, such as planting and restoration of habitat types, included as part of the Project, evolves. The assessment acknowledges change and reports on the impacts during the construction phase and during the operation of the Project.

9.1.5 Assessment of Landscape Impacts

The aim of the landscape assessment is to identify, predict and evaluate potential key impacts arising from the Project. The assessment of predicted impacts involves:

- A review of the sensitivity to change of designated sites and landscape character in relation to changes proposed. This is arrived at by a review of landscape value and scenic quality.
- An evaluation of the predicted magnitude of change experienced by designated sites and landscape character types, resulting from the construction and operation of the Project.

- Assessment of the degree and significance of the potential effect of the Project on the identified landscape designations and character during the construction and operational phases.

9.1.5.1 Magnitude of Change

Magnitude of change concerns the degree to which the Project would alter the existing characteristics of the landscape. The determination of magnitude of change has considered the potential for both direct and indirect change. Direct change occurs where the Project would result in a physical change to the landscape, whilst indirect change may occur where the Project would become a feature in the landscape but would be physically located in an adjacent landscape area. The ZTV is used as a tool to gauge the extent of potential indirect change, supported by targeted field surveys.

Magnitude of change has been assessed on a four-point scale of high, medium, low or negligible. These criteria are described as follows:

- **High** – Noticeable change in the landscape characteristics over an extensive area ranging to a very intensive change over a more limited area.
- **Medium** – Perceptible change in landscape characteristics over an extensive area to noticeable change in a localised area.
- **Low** – Virtually imperceptible change in landscape characteristics over an extensive area or perceptible change in a localised area.
- **Negligible** – No discernible change in any landscape characteristics or components.

Intervisibility as a medium of indirect change to landscape character has been considered in determining the magnitude of change. The potential extent of this visibility is assessed from the ZTV, or visual envelope. Wireframe diagrams and photomontages from viewpoint receptors have also been used as a tool to aid assessment.

The prominence of the WTGs in the landscape would vary according to the weather conditions. Therefore, the assessment has been carried out, as is best practice, by assuming the 'worst case' scenario i.e. on a clear, bright day, when neither foreground features nor haze can interfere with the clarity of the view obtained.

9.1.5.2 Landscape Impact Criteria

Evaluation of the predicted level of impact has been carried out through analysis of the magnitude of change anticipated to be experienced by a designated site or landscape character type/area in relation to the identified sensitivity to change of the type proposed and using a degree of professional judgement. The assessment takes into account direct impacts upon existing landscape elements, features and key characteristics and assesses whether these would be either lost or their relationships modified, in the context of their importance in determining the existing sensitivity of the character type/area in question. It also takes into account indirect impacts on the wider landscape context.

Anticipated impacts are reported in terms of a descriptive scale ranging from substantial – moderate – slight adverse – through negligible and no change to an ascending scale of slight – moderate – substantial beneficial.

The criteria adopted for the assessment of landscape impacts are as follows:

- Substantial adverse (or beneficial) – very noticeable deterioration / improvement in the existing landscape.
- Moderate adverse (or beneficial) – noticeable deterioration / improvement in the existing landscape.
- Slight adverse (or beneficial) – perceptible deterioration / improvement in the existing landscape.
- Negligible – virtually imperceptible deterioration / improvement in the existing landscape.
- No Change – no deterioration / improvement in the existing landscape.

For the purposes of this assessment, impacts of moderate and above are considered to be significant in terms of ESIA.

The predicted impacts have been considered in the context of primary mitigation measures associated with site planning, culminating in a statement of the predicted impacts and their overall significance to the landscape resource of the study area.

9.1.5.3 Landscape Mitigation

Landscape and visual mitigation for the Project has been embedded in the design of the wind farm and has largely centred on the selection of a layout and WTG option which minimise the potential for significant impacts whilst achieving operational objectives.

9.1.5.4 Residual Impacts

As all mitigation for landscape and visual impacts was centred on WTG location and selection, the impacts outlined in the main assessment are considered to represent residual impacts.

9.1.5.5 Limitations of the Assessment

The assessment of potential impacts was assisted by information gathered during Wood's 2019 Scoping site visit, photographic records (from the Scoping visit and site visits carried out by local specialists) and via a range of maps and satellite images. The assessment was undertaken in May 2021, therefore any changes to the landscape resource taken place since this date has not been included in this assessment. Covid-19 restrictions prevented Wood from undertaking site visits in 2020 and 2021 and therefore local specialists were utilised to visit the Project site.

Furthermore, it is recognised the layout may be subject to minor change depending on the preferred EPC contractor and their chosen WTG supplier / type. The assessment has been undertaken based on the worst-case WTG tip height. The Project layout has been amended from the initial assessment to take account of preliminary environmental and social findings.

9.1.6 Assessment of Visual Impacts

9.1.6.1 Issues scoped out of the assessment

Impacts arising from the process of decommissioning are considered to be of a similar nature and duration to those arising from the construction process and therefore have not been considered separately in this chapter. Where this assessment refers to potential construction impacts, there are also representative of predicted decommissioning impacts.

9.1.6.2 Potential Impacts

Visual amenity relates to the way in which people visually experience the surrounding landscape. Adverse visual impacts may occur through the intrusion into established views of new features, out of keeping with the existing structure, scale, and composition of the view. However, visual impacts may also be beneficial where an attractive focus is created in a previously unremarkable view or the influence of previously detracting features is reduced. The significance of impacts will vary, depending on the nature and degree of change experienced and the perceived value and composition of the existing view.

In the context of the Project, key concerns relate to:

- The introduction of WTGs, OHLs and associated structures, tracks, compound, workers' camp area and laydown areas to established views.
- The introduction of WTGs, OHLs and associated features into views from roads and other routes experienced by those passing through the area.
- The potential for WTGs, OHLs, or other features to alter recognised or valued views experienced by tourists and visitors, including hill tops.

A full description of the elements is provided in Chapter 2 (Project Description).

9.2 Visual Amenity Methodology

The assessment has been prepared with reference to the Guidelines for Landscape and Visual Impact Assessment (GLVIA) (Third Edition), 2013, published by the Landscape Institute and the Institute of Environmental Management and Assessment (IEMA). Reference has also been made to the following documents specific to visual impact assessment:

- Visual Assessment of Windfarms: Best Practice[107].
- Visual Representation of Windfarms: Good Practice Guidance[108].
- Photography and photomontage in landscape and visual impact assessment [109]

9.2.1 Receptors

For there to be a visual impact there is the need for a viewer. Views experienced from locations such as buildings, recognised routes and popular viewpoints used by the public have been included in this assessment. Potential receptors have been identified through analysis of the ZTV (Volume 2, Figure 9-1) in combination with targeted field survey.

9.2.2 Sensitivity to Change

Sensitivity to change considers the nature of the receptor and the viewing expectation of those -present at the receptor locations. The importance of the aspect of the view which would be changed contributes to the sensitivity evaluation.

[107] SNH (2002)

[108] SNH (2007)

[109] Landscape Institute (2011).

Sensitivity to change proposed has been evaluated with reference to the subject areas above and using a three-point scale as follows:

- **High sensitivity**: dwellings, footpaths, tracks, and vantage points where the changes form part of an important view.
- **Medium sensitivity**: dwellings, footpaths, tracks, and vantage points where the changes form part of a less important view, and roads where the changes form part of an important view.
- **Low sensitivity**: dwellings, footpaths, tracks, and vantage points where the changes form part of an unimportant view, roads where the changes form a part of a less important view, and farm buildings (not used as dwellings) and industrial buildings where the changes form part of an important view.

9.2.3 Variation of Impacts over Time

Visual impacts change over time as mitigation, such as planting and restoration of habitat types, included as part of the Project, establish and mature, and as the existing landscape external to the development evolves. The assessment acknowledges change and reports on the impacts during the construction phase, and during the operation of the Project.

9.2.4 Assessment of Impacts

The aim of the visual assessment is to identify, predict and evaluate the significance of potential impacts to established views arising from the Project. This has involved the following specific assessment tasks:

- An appreciation of the nature, form, and features of the Project in the context of the baseline landscape character (refer to Section 9.3).
- An evaluation of the predicted magnitude of change likely to take place to existing views from identified receptors as a result of the construction and operation of the Project.
- An evaluation of the degree and significance of the potential impact of the Project on views from identified receptors during the construction and operational phases.

9.2.4.1 Magnitude of Change

Magnitude of change concerns the extent to which the existing view would be altered by the Project.

Magnitude of change has been evaluated using a four-point scale comprised of the following criteria:

- **High** – Where the Project would result in a very noticeable change in the existing view.
- **Medium** – Where the Project would result in a noticeable change in the existing view.
- **Low** – Where the Project would result in a perceptible change in the existing view.
- **Negligible** – Where the Project would result in a barely perceptible change in the existing view.

9.2.4.2 Impact criteria

The level of impact identified concerns the importance of changes resulting from the Project. Evaluation of the impact is based on consideration of the magnitude of change in relation to sensitivity and is established using professional judgement. The assessment takes into account likely changes to the visual composition, including the extent to which new features would distract or screen existing elements in the view or disrupt the scale, structure or focus of the existing view.

The prominence of the WTGs in the view will vary according to the prevailing weather conditions. The assessment has been carried out, as is best practice, by assuming the 'worst case' scenario i.e. on a clear, bright day in winter, when neither foreground deciduous foliage nor haze can interfere with the clarity of the view obtained.

Level of Impact has been evaluated using a five-point scale and using the following criteria:

- **Substantial** – The Project would become a prominent and very detracting feature and would result in a very noticeable deterioration to an existing highly valued and well composed view.
- **Moderate** – The Project would introduce some detracting features to an existing highly valued and well composed view, or would be prominent within a pleasing or less well composed view, resulting in a noticeable deterioration of the view.
- **Slight** – The Project would form a perceptible but not detracting feature within a pleasing or valued view or would be a more prominent feature within a poorly composed view of limited value, resulting in a small deterioration to the existing view.
- **Negligible** – The Project would form a barely perceptible feature within the existing view and would not result in any discernible deterioration to the view.

- **No Change** – The Project would not feature in any existing views and would result in no change to the view.

For the purposes of this assessment impacts of moderate adverse and above are considered to be significant in terms of ESIA.

9.3 Landscape Character Assessment

9.3.1 Landscape Character Types (LCT)

The Project is located within the Kyzulkum desert and is considered to largely be within a Rocky Deserts LCT. The wider area consists in the main of gymsum deserts LCT with urban areas of Zarafshan and smaller towns and villages. Within 35 km, the following LCTs are present:

- Gypsum Deserts LCT.
- Saline Deserts LCT.
- Sand Deserts LCT.
- Urban LCT.
- Mining and Industry LCT.
- Tamdytau Mountains LCT.

9.3.1.1 Deserts LCTs

The Gypsum Deserts LCT extends across the majority of the 35 km study area while the Sandy Desert LCT is limited to the outer parts of this area. The Saline Desert LCT is characterised by a higher content of saline. Rocky Deserts LCT extend across the Project area and surroundings.

Figure 9-1: Photo across the Project Area – Rocky Deserts LCT[110]

The Desert LCT sub-groups are typical of this region and are not isolated to the Project area alone.

9.3.1.2 Urban LCT

This LCT relates to the settlements of Zarafshan City and smaller settlements in the Project area. The largest area is that of Zarafshan City however, considering the wider area, the LCT covers a small percentage.

9.3.1.3 Mining and Industry LCT

This LCT includes the Muruntau gold mine to the south-east of the Project area which is one of the world's largest open-cut gold mines which is operational for over 50 years. The open-pit mine measures 3.5k m x 3 km.[111] Additionally, there are other mines and smaller industries within 35-40 km of the Project site as shown within Volume 2, Figure 9-2.

[110] Image from Google Earth 2020

[111] https://www.nsenergybusiness.com/projects/muruntau-gold-mine/

9.3.1.4 Tamdytau Mountains LCT

The mountain range lies to the north of the Project area. The range has elevations up to 1,000 m and it extends over 60 km. It consists of flat-topped, dissected massif with latitudinal rocky ridges and a few rocky eminences.[112] Figure 9-2 below illustrates this LCT area.

Figure 9-2: Tamdytau Mountains LCT[113]

9.3.2 Assessment of Landscape Effects

The extent to which the Project would affect the existing landscape varies depending on the individual components of the Project and the ability of the existing landscape to accommodate these various components.

[112] The Great Soviet Encyclopaedia, 3rd Edition 1970-1979. 2010 Gale Group.

[113] Image from Google Earth 2020.

The following section provides an assessment of the impacts that the Project would have on landscape designations and the landscape character identified within the baseline. The assessment considers impacts during construction and in the longer term during the operational phase, in accordance with the effect criteria outlined in Section 9.1.5.

The key elements and characteristics of the Project which may give rise to landscape impacts are as follows:

- 111 WTGs.
- Access tracks and hardstanding areas.
- Temporary construction compound.
- Workers' accommodation area.
- Substation building.
- Two OHLs.

All disturbed areas would be restricted as far as practicable to the specified areas and the laydown areas, temporary construction compound, excavations for WTG foundations, crane pads, underground cables and borrow pits (if utilised on site) would be reinstated once construction is complete.

Landscape and visual impacts arising from the Project construction and operation are detailed below. The effects on the rocky, gypsum, saline, sand deserts LCTs are considered similar in nature and so are grouped together for the purposes of this assessment.

9.3.2.1 Deserts Group LCT

As noted above, the Project area belongs to the Rocky Deserts LCT. The main areas of landscape disturbance are listed in Chapter 2, Project Description and Section 9.3.1 above. New machinery and equipment will be introduced into the landscape, including a crane, trucks (usually 20-tonne trucks, but sometimes larger), excavators, bulldozers, and other heavy equipment. In addition, there will be temporary storage areas and temporary workers' accommodation. The main source of impact to the LCT during operation is the erection of the WTGs.

The key aspect of this LCT is its relatively sparse desert nature but with an existing presence of man-made vertical features of OHLs and roads. The sensitivity is assessed to be Medium as the rural nature of the landscape is likely to have some importance in a local context. The magnitude of change to the LCT during construction is Low, as only a small proportion of the local landscape will be affected. The impact duration during construction is temporary and medium-term and likely to be screened somewhat by the surrounding topography. The significance of impact during construction is therefore Slight and not significant.

The greatest impacts would be experienced during operation, particularly at distances of less than 5 km from the proposed Project site. However, the vastness of the LCT together with the presence of existing OHLs, provides adequate capacity to absorb this level of impact without materially affecting the key characteristics of the LCT. The new OHLs will not present a significant change to the LCT with numerous existing OHLs already present. Therefore, the magnitude of impact is likely to be Medium at distances of up to 10 km reducing to Low at further distances. As a result, the impact is Moderate and significant within 5 km of the Project. Over 5 km the impact is assessed as Slight and not significant.

9.3.2.2 Urban LCT

Within the wider study area there are a number of settlements. These include the larger Zarafshan City which is around 7 km to the west and other smaller settlements of Tamdybulak and Muruntov along with the villages of Jingildy, Kynyr, Kazbekbi, Rokhat, Ajiriqti and Yangi Tamdy in wider Project area. Around these smaller settlements, mining, subsistence and small-scale agriculture are the main land uses. The landscape sensitivity of the area towards the Project has been reduced due to the presence of existing man-made developments.

The Project infrastructure is largely not located within this LCT. The sensitivity of this LCT is considered Low as it is already developed both in a residential and industrial context. The magnitude of change to the LCT during construction is overall Low, as the change will be barely perceptible in the landscape. The impact duration during construction is temporary and short-term and likely to be screened by the surrounding topography. The effect during construction is Negligible and not significant.

The greatest impacts would be experienced during operation, however due to the already heavily disturbed nature of the LCT the magnitude of change overall is likely to be Low, as a result, the effect is Slight and not significant.

9.3.2.3 Mining and Industry LCT

There are a number of mining and industrial areas in the wider Project area. The closest mine to the Project is Muruntov mine located to the south-east of the site. Given the industrial nature of this LCT, the sensitivity is assessed as Low. The magnitude of change due to the Project is also considered to be Low as these are already built-up areas with a landscape character which will not alter as a result of construction nor the introduction of WTGs into the landscape. The impact duration during construction is temporary and short-term and likely to be screened by the surrounding topography. The effect during construction and operation is Slight and not significant.

9.3.2.4 Tamdytau Mountains LCT

The mountain range is located to the north of the Project area. This LCT consists of a wide-open mountainous space largely free of development. The sensitivity of the landscape is considered Medium given its lack of built-up development. Due to the elevated position of the LCT, the magnitude of change due to the Project is also considered to be Medium as the Project will be perceptible in the distance.

The impact duration during construction is temporary and short-term and likely to have some partial screened by the surrounding topography. The effect during construction is Moderate to Slight and not significant.

The greatest impacts would be experienced during operation and are considered Moderate and so significant.

9.3.3 Key Stages of Assessment

GLVIA suggests that visual impacts are assessed from a clear understanding of the development proposed and any mitigation measures which are being adopted. Familiarity with the site and the extent, nature and expectation of existing views is also a key factor in establishing the visual sensitivity to change in terms of the development proposed. The guidelines require evaluation of magnitude of change to views experienced by sensitive receptors comprising individuals living, working, travelling, and carrying out activities within the landscape, subsequent evaluation of impact significance.

9.4 Visual Amenity

The following section provides an assessment of potential impacts on the visual amenity of the area resulting from the introduction of the Project. It describes and evaluates the potential change in existing views obtained from residential properties, places of work, routes, popular destinations and strategic viewpoints during the construction and operational phases of the Project, and the extent to which these affect residents, visitors, and users of the landscape.

9.4.1 Basis of the Assessment

This section assesses the visual impact of the Project by determining the degree of anticipated change in the visual amenity of people using buildings and areas of public open space that would occur as a result of the Project. The key elements and characteristics of the Project which may give rise to landscape and visual impacts are as follows:

- The introduction of 111 WTGs into the landscape.
- Access tracks and hardstanding areas.
- Temporary construction compound.
- Workers' accommodation area.
- Substation building.
- Two short OHLs.

All disturbed areas would be restricted as far as practicable to the specified areas and laydown areas, temporary construction compound, excavations for WTG foundations, crane pads and underground cables would also be reinstated once construction is complete.

9.4.2 Viewpoints

As described previously, the ZTV has informed the selection of seven viewpoints (VP) within the 35 km study area. These viewpoints are intended to provide a representative cross section of potential visibility and impact of the Project throughout the wider study area. The seven viewpoints selected are detailed in Table 9-1 and shown on Figure 9-1 of Volume 2.

Visualisations (wirelines) are shown in Volume 2, Figures 9-3 to 9-9. No photomontages have been produced to date, as it has not been possible to take the required photographs due to COVID-19 related travel restrictions during 2020 and 2021.

Table 9-1: Representative Viewpoints

Ref	Location	Distance to nearest WTG	Grid Reference		Reason for Inclusion
VP 1	Road at Besapan	6.5 km	E629651	N4596350	South-east of WTGs. Representative view for road users.
VP 2	South of Muruntov	9 km	E633524	N4597713	South-east of Project near settlement.
VP 3	South of Industrial Area / Rail Depot.	3 km	E625229	N4597936	Representative of rail users, industrial working area. South-east of the Project.
VP 4	Edge of Zarafshan.	8 km	E599506	N4601932	Edge of settlement to west of Project site.
VP 5	High ground to the North.	5.3 km	E622812	N4612770	View from higher elevation to the north of the Project.
VP 6	Tourist Area.	1.8 km	E615083	N4601432	View from the an area used by tourists.
VP 7	Farm Shelter.	921 m	E614078	N4607363	Representative view for farms / shelter users in this area in the north-west of Project site.

9.4.3 Assessment of Visual Impacts

The impacts are recorded for both the construction phase and the maximum operational life of the wind farm (25 years). Whilst it is acknowledged that in this case, the majority of receptors would not be aware of large phases of the construction programme, the assessment of construction impacts must take into account the worst-case scenario, i.e. when WTGs are being erected. Consideration is also given to the visual impact experienced as a result of construction traffic, and this is reflected in the assessment. Impacts of "moderate" and above are considered to be significant.

The paragraphs below provide a description of the existing visual context for each of the viewpoint receptors followed by an explanation of the implications that the introduction of the Project would have on the existing view and evaluation of the impact on the view.

9.4.3.1 VP 1: Road at Besapan (Volume 2, Figure 9-3)

This viewpoint is located to the south-east of the Project area on a road at Besapan, around 6.5 km from the nearest WTG. The road is representative of the population travelling to the Project. In this view, many WTGs are grouped to the centre in the far ground with none particularly more prominent than another.

The sensitivity of the viewpoint is considered to be Medium as the view is not considered of high importance, however, it is representative of people travelling along the road. The magnitude of change is considered to be Low during construction and Low during operation as, due to the distance to the WTGs, the Project would not result in a noticeable change in the existing view. The impacts during construction and operation are considered Slight and not significant.

9.4.3.2 VP 2: South of Muruntov (Volume 2, Figure 9-4)

VP2 is located to the south-east of the Project, to the south of Murutov settlement near a mining area and 9 km from the nearest WTG. People who reside here are employees of the mine. Within this viewpoint, the view of the WTGs is negligible with tips barely visible in the far ground.

The sensitivity of the viewpoint is considered to be Medium to Low as it is representative of where people reside however, it is also located in the mining industrial zone. The magnitude of change is considered to be Low-Negligible during construction and Low during operation as, due to the distance to the WTGs, the Project would not result in a noticeable change in the existing view. The impacts during construction and operation are considered Negligible and not significant.

9.4.3.3 VP 3: South of Industrial Area / Rail Depot (Volume 2, Figure 9-5)

The viewpoint is representative of views from the industrial area located around 3 km to the south-east of the Project. From this location, the Project is visible across the view in the far to middle ground. WTGs 92 and 101 are completely visible in the middle ground with 86, 88 and 98 partially visible. The nature of the topography means that the WTGs are obscured from the view to an extent. WTGs are not visible to the far east of this viewpoint.

The sensitivity of the viewpoint is considered to be Medium to Low given it is representative of an area where people work. The magnitude of change is considered to be Medium to Low during both construction and operation as the Project would result in a perceptible change in the existing view. The impacts during both construction and operation are assessed as Moderate to Slight and therefore not significant.

9.4.3.4 VP 4: Edge of Zarafshan (Volume 2, Figure 9-6)

This viewpoint is representative of the settlement of Zarafshan. The viewpoint is located around 8 km from the nearest WTG. From this viewpoint, the Project is barely visible, situated in the far ground. The sensitivity of the viewpoint is considered to be Medium as the view is not considered of high importance, however, it is representative of residential dwellings. The magnitude of change is considered to be Low during both construction and operation as the Project would result in a negligible change in the existing view. The impacts during both construction and operation are assessed as Negligible and therefore not significant.

9.4.3.5 VP 5: High Ground to the North (Volume 2, Figure 9-7)

The viewpoint is located 5.3 km from the nearest WTG in the mountainous area to the north. This view is considered representative of people who may use the mountains for recreation or for other purposes.

The sensitivity of the viewpoint is considered to be Medium as it is representative of an area used by people walking / recreation. The majority of WTGs are visible from this viewpoint in the far ground spread relatively evenly throughout the view.

The magnitude of change is considered to be Low during construction rising to Moderate during operation as the Project would result in a perceptible change in the existing view. The impacts during construction are therefore considered Slight and not significant rising to Moderate during operation and significant.

9.4.3.6 VP 6: Tourist Area (Volume 2, Figure 9-8)

The VP is located at the tourist area, 1.8 km from the nearest WTG in the west of the Project site. It has been selected to determine the impact of the Project on views that tourists will experience when staying at this location.

The sensitivity of the viewpoint is considered to be Medium to High as the view is of moderate importance and is a place where people come to stay and enjoy the scenery and surroundings. Due to the topography however, the Project is barely visible particularly from a north-west perspective with only WTG 18 blade tip visible. Looking to the north-east, the tip of WTG 38 is visible to the west and WTGs 42 and 46 partly visible in the east of the view.

The magnitude of change is considered to be Low during construction as the change will be barely perceptible. Overall, the impacts during construction and operation are considered Slight and not significant.

9.4.3.7 VP 7: Farm Shelter (Volume 2, Figure 9-9)

The VP is located to the north-west of the Project site and is representative of views which will be experienced by farmers / herders using the shelter and wider area throughout the year.

The sensitivity of the viewpoint is considered Medium as it's a view experienced by people residing in the area and working on the land tending to sheep and cattle (in the main). From a north-east view at this location, WTG 34 and WTG 36 are more prominent with WTGs 41 and 44's blades seen to the far east of the view. The tips of WTGs 75 and 82 are barely visible.

From a south-east view, WTG 35 is a very prominent feature in the centre of the view with WTG 33 also prominent but set further back in the landscape. Tips of WTGs 50, 51, 55, 66 and 73 feature to the west of the view. To the east of the view, the tip of WTG 32 is visible with all blades of WTGs, 28-30 seen.

Moving to the south-west view of the Project from this location, there is a relatively uniform spread of 27 WTGs visible from the west of the view to centre. The far east is free of WTGs. All are set back in the landscape with none of significant prominence in the view.

These locations are not utilised consistently throughout the year, rather they are utilised by farmers / herders for 2 to 3 days to one month at various times in the year to tend to their animals. The assessment however has considered a worst-case scenario of full occupancy all year round.

The magnitude of change is considered to be Low to Moderate during construction and High during operation. Overall, the impacts during construction are considered Moderate to Slight and not significant. During operation this would rise to Moderate and therefore Significant.

9.5 Mitigation

9.5.1 Construction

The best form of mitigation for landscape and visual impacts arising from construction is related to conservation of soils in Chapter 9 (Geology and Soils) and include:

- Limiting damage to any vegetation by keeping the construction areas and roads to a minimum and maintaining strict requirements for vehicles to remain on the roads at all times.
- Reinstating native plant species / vegetation where construction areas and roads are no longer required. This would reduce the duration of the visual impact.

Mitigation to reduce the adverse impact resulting from litter and garbage (plastic bags, bottles etc.) include:

- Provision of adequate facilities for the disposal of garbage.
- Training of the workforce in waste management.
- Reduce the amount of waste to the maximum extent possible.
- Collect all solid waste and store until transported to an appropriate waste disposal facility and disposed.
- Organization of clean-ups for existing garbage.

9.5.2 Operation

Mitigation options are fairly limited during operation and, for this Project, the focus would be on the full implementation of the community benefits strategy to ensure that any visual impacts on the local population is offset by an appropriate level of community benefit.

9.6 Residual Impact

The impacts relating to landscape character remain with impacts of moderate significance predicted for the Deserts Group LCT within 5 km of the Project during operation only and moderate significance during construction and operation relating to the Tamdytau Mountains LCT.

Given the topography of the area, the majority of viewpoints experience impacts which are not considered significant. VP 5 view from the high ground to the north of the site and VP 7, view from farm shelter, are likely to experience impacts of moderate significance during operation given the extent of WTGs in the far ground visible. Mitigation options are fairly limited during operation and would therefore be focused on a community benefits strategy to ensure that any visual impacts on the local population is offset by an appropriate level of community benefit.

9.7 Cumulative Impacts

There are no cumulative impacts relating to other wind farms given that this Project is one of the first wind farms to be developed in Uzbekistan. Consideration has however been given to the OHL under construction from Navoi up to Besapan.

The cumulative impact of the Navoi to Besapan OHL upgrade alongside the Project will not affect the overall character of the area. Similarly, although the OHL may be noticeable in some of the views, particularly alongside the proposed WTGs, it will not alter the overall significance of effect for visual receptors especially given existing OHLs that cross the Project site.

No significant cumulative impacts are predicted in relation to the operational Muruntau mine to the south-east of the Project.

9.8 Summary of Impacts

Significant impacts are considered to be those assessed as moderate or above. Significant impacts are expected for the Tamdybuk Mountains LCT. VP 5 (high ground to the north) given the elevated position and extent of WTGs visible from this location. VP 7 (farm shelter) will experience moderate impacts due to its location and prominence of a number of WTGs from this location and so significant.

10 Archaeology and Cultural Heritage

10.1 Introduction

Cultural heritage is important as a source of valuable historical and scientific information, as an asset for economic and social development and as an integral part of a people's cultural identity, practices, and continuity.

This chapter assesses the potential impacts of the Project and associated works on cultural heritage assets in the surrounding area. Mitigation is proposed where appropriate to reduce adverse impacts and enhance benefits where possible.

10.2 Assessment Methodology

Baseline data was collected through desk-based studies, a specialist Archaeology Report (October 2020)[114], a site visit and interviews with representatives from the Ministry of Cultural Affairs and the Spiritual Administration of Muslims of Uzbekistan, undertaken by an Archaeologist[115] in October 2020.

This information has been utilised to guide the assessment of potential impacts. The method of assessment has been based upon that which is outlined in Chapter 4 (Assessment Methodology).

10.3 Baseline Conditions

A search of United Nations Educational, Scientific and Cultural Organization's (UNESCO) online resources indicates that there are no World Heritage Sites located within the vicinity of the Project. The nearest world heritage site is the cultural Historic Centre of Bukhara, located approximately 190 km south of the proposed Project site[116].

According to the Ministry of Cultural Affairs, there is no data on intangible cultural heritage in the Project area. It was also confirmed by the Ministry that no recent proposals regarding cultural heritage sites in the Navoi region have been submitted to UNESCO.

[114] Dr. Vladimir Karasyov. Archaeological Sites in the Central Part of Tamdytau, Navoi Region of Uzbekistan, October 2020.

[115] Dr Vladimir Karasyov, Doctor of Historical Sciences, Archaeologist

[116] https://whc.unesco.org/en/statesparties/uz

According to the Archaeology Report, there are no known archaeological or cultural heritage sites within the Project area, however, the area has not been well studied with respect to archaeology, and there are no documents for the area within the archives of the Main Scientific Department for Protection of Cultural Heritage of the Ministry of Culture Affairs, Republic of Uzbekistan.

Located within the north-eastern section of the Project site are traces of natural ring structures, composed of rock. According to the Archaeology Report, this geological structure is assumed to be remnants of a paleo volcano. Ring structures with a diameter of at least 1000 m with accompanying smaller traces of suspected volcanic structures in the form of rings with a diameter of 200 to 450 m, have been identified on aerial photographs. It was surveyed in 1993 by the Aerospace Party of the Tashkentgeologiya Association, for ancient ore workings, however none were detected. According to the Archaeology Report, this geological structure is not included in any government registers. It is recommended, however, that the Project consults relevant local authorities prior to construction, to ascertain if any protection zones/buffers are required for this geological structure.

There is a religious site located just south of the Project, adjacent to the Golden Key Tourist Resort. According to the Spiritual Administration of Muslims of Uzbekistan, the site is a memorial to saints Altynbay-ata and Teleu-Ata[117]. The religious site is approximately 2 km west of the closest WTG.

Photographs of the site, referred to as 'Gujumli Arliyo' are shown in Figure 10-1 and Figure 10-2. The location of the religious site is presented in Volume 2, Figure 10-1.

[117] Dr. Vladimir Karasyov. Archaeological Sites in the Central Part of Tamdytau, Navoi Region of Uzbekistan. October 2020.

Figure 10-1: Religious site (Photo 1)

Figure 10-2: Religious site (Photo 2)

Ancient mining works dating from the 10th and 12th centuries AD, were located at the Muruntau quarry (located south-east of the Project site), however, with the expansion of mining, the last ancient mine was demolished in August 1995[118].

It is noted in the Archaeology Report that, approximately 30 km north-east of the Project site, on the outskirts of the village of Tamdybulak, there are remains of archaeological sites (an ancient, fortified estate and a medieval caravanserai). In the same area, several burial mounds have been identified, however these sites have not been studied as part of any archaeological survey or research investigation.

A paleontological site comprising of petrified trees is located in the western part of the Mingbulak Basin, 32 km from the village of Mingbulak, and approximately 185 km north-west of the Project site. This system of canyons is more than 10 km long and covers an area of approximately 30 km^2. The area is called Jurakuduk and comprises of a geological formation of coastal-marine and deltaic formations of the Late Cretaceous period. The petrified forest, resulting from forest growing at this location more than 96 million years ago, is well preserved, and stores the fossilised remains of numerous extinct animals (more than 70 species of animals at the family level, and in excess of 200 at the generic and species level). In areas of the stone forest the height of the preserved tree trunks reaches four meters. Large horned dinosaurs lived in the forests, and shark teeth, as well as ancient turtles have been found in the rocks amongst the petrified trees.

10.4 Assessment of Effects

The Project is not deemed to directly impact on any international or nationally recognised heritage (critical cultural heritage as defined by IFC PS 8).

Based on the Archaeology Report, there are no known cultural heritage sites within the Project area (the religious site is at least 2 km from the closest WTG). The site sensitivity is therefore assessed to be Low and magnitude of change during construction and operation, Low. Therefore, the impact significance is negligible and not significant.

[118] Dr. Vladimir Karasyov. Archaeological Sites in the Central Part of Tamdytau, Navoi Region of Uzbekistan. October 2020.

However, due to the fact that the Project area has not been well studied with respect to archaeology, there remains the potential to uncover previously buried archaeology (chance finds) during construction works. The sensitivity is considered Low / Medium (taking account potential for buried archaeology), the magnitude of impact on unknown features is assessed as Medium therefore the impact significance is Minor / Moderate and not significant.

10.5 Mitigation

10.5.1 Construction

Mitigation during construction will focus on an appropriate archaeological chance finds procedure during initial construction works to identify any uncovered archaeological features.

The Construction ESMP will outline actions and measures necessary for the effective management of risks and impacts to cultural heritage during the construction phase of the Project. This will include setting out roles and responsibilities for implementation of mitigation and management requirements and outlining mitigation for the protection of existing cultural heritage features by way of demarcation of existing features for example.

In accordance with the requirements of the Civil Code of the Republic of Uzbekistan (of 21.12.1995), IFC PS8, EBRD PR8 and the ADB Safeguard Policy Statement, provisions for managing chance finds will be developed through a chance find procedure which will be applied in the event that cultural heritage is subsequently discovered. It is recommended that the procedure document is prepared with the input from a national archaeologist.

Masdar or its contractors will not disturb any chance find further until an assessment by a competent professional is made and actions consistent with the requirements of IFC PS 8 are identified.

An archaeological chance finds procedure is defined as a formal programme of observation and investigation conducted during any operation carried out for non-archaeological reasons (i.e. construction of a wind farm) within a specified area, or site where there is the possibility that archaeological deposits may be disturbed or destroyed (the working area). The procedure will result in the preparation of a report and ordered archive.

An archaeological chance finds procedure will in all cases be intended:

- To allow, within the resources available, the preservation by record of archaeological deposits. The presence and nature of which could not be established (or established with sufficient accuracy) in advance of development or other potentially disruptive works.
- To provide an opportunity, if needed, for the watching archaeologist to signal to all interested parties, before the destruction of the material in question, that an archaeological find has been made for which the resources allocated to the chance find procedure itself are not sufficient to support a treatment to a satisfactory and proper standard.

The archaeological chance finds procedure will be intended to establish and make available information about the archaeological resource existing on the site. In accordance with the Civil Code (of 21.12.1995) and the Uzbekistan Law on the Protection and Use of Objects of the Archaeological Heritage (of 13.10.2009, N ЗРУ-229), if archaeological or historical objects are discovered during excavation works, such excavation shall be terminated with immediate notification to the nearest Police Department and State Museum.

During construction, toolbox talks and training sessions will be provided to ensure that workers will be alert to any signs of past cultural activity in the area. A national archaeologist is recommended to be involved in the development of training material.

Should any artefacts or evidence of past activity be discovered, the Developer will notify the appropriate authorities and await direction before taking action that would disturb the resources.

10.5.2 Operation

At present, no mitigation is considered required during operation. It is unlikely that any excavation works will be required during operation. In the event that such works are required, then the chance finds procedure should be reinstated for the operational phase and managed through the operational ESMP.

10.6 Cumulative Impacts

There are no wind farms identified as operational or proposed to be constructed in proximity to this Project. It is not considered that the OHL upgrade from Navoi to Besapan, currently under construction, will have a cumulative impact in relation to cultural heritage aspects. Furthermore, the operational Muruntau mine is not predicted to result in any cumulative impacts in conjunction with this Project.

10.7 Residual Effects / Summary

There is the potential for impacts on any previously undiscovered sites and features that may be discovered during construction works. Mitigation measures will be put in place to alert the appropriate authorities to artefacts or evidence of past activity discovered.

With mitigation, it can be concluded that there would be no significant impacts associated with cultural heritage as a result of the Project.

11 Noise

11.1 Introduction

This assessment considers the likely effects resulting from noise generated by the WTGs at noise sensitive receptors (NSRs). Noise can have an effect on the environment and on the quality of life enjoyed by individuals and communities.

The chapter provides details on the assessment methodology; the baseline conditions currently existing at the Project site and surroundings; the likely noise effects during the construction, operation, and decommissioning phases of the Project; the mitigation measures required to prevent, reduce, or offset any significant adverse effects; and the likely residual effects after these measures have been employed.

11.2 Assessment Methodology

11.2.1 Regulatory and Policy Context

An overview of key guidance with respect to noise is outlined below, and further details of legislation, policy and guidance specifically for construction and operational noise are set out in Sections 11.2.1.1 and 11.2.1.2, respectively.

Noise propagation has been modelled in accordance with International Standard ISO 9613-2: 1996 Acoustics – Attenuation of Sound Propagation Outdoors – Part 2: General Method of Calculation[119].

[119] International Standard ISO 9613-2: 1996, *Acoustics – Attenuation of Sound during Propagation Outdoors*

The impact of operational noise has been assessed in accordance with local regulations[120], the IFC Environmental, Health, and Safety (EHS) Guidelines for Noise Management[121], along with ETSU-R-97[122], taking cognisance of the most recent good practice guide (GPG) of the (UK) Institute of Acoustics[123], and Supplementary Guidance Notes[124].

11.2.1.1 Construction Phase

Construction noise effects are normally of a temporary nature and result from both moving and static sources. Assessment allows the temporary impact of construction noise to be understood and for suitable mitigation measures to be identified to minimise any potential adverse effects.

It is noted that the construction compound and workers' accommodation area has not been confirmed at present. The temporary accommodation should be located no nearer to the Project than the closest receptor where possible.

There are no known local regulations or international standards for construction noise, but representative limits limit construction noise in the grounds of residential development to the levels set out in Table 11-1.

[120] Sanitarian Rules and Norms on providing allowed noise level into the living building, public building and territory of living area" (SanR&N No.0267-09)

[121] International Finance Corporation - Environmental, Health, and Safety (EHS) Guidelines, *Noise Management,* 2007

[122] ETSU-R-97 (2007) *The Assessment and Rating of Noise from Wind Farms*, ETSU for the Department of Trade and Industry

[123] *A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise,* Institute of Acoustics, May 2013

[124] *A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise,* Supplementary Guidance Notes 1-5, November 2013 - September 2014

Table 11-1: Construction Noise Level Limits at Noise Sensitive Receptors

Period	L_{Aeq} (dB)
Day (08:00 – 22:00)	60
Night (22:00 – 08:00)	50

11.2.1.2 Operational Phase

When operational, WTGs emit two types of noise – mechanical noise, and aerodynamic noise. The main sources of mechanical noise are from internal components housed within the nacelle, such as gearbox and generator. Mechanical noise from a modern WTG is negligible as designs are highly refined. Aerodynamic noise occurs from the movement of the blades passing through the air. At high wind speeds, that aerodynamic noise is usually masked by the increasing sound of wind blowing through trees and around buildings, and turbulent noise within the air itself. The level of masking determines the perceived audibility of the wind farm. The noise impact assessment establishes the relationship between WTG noise and the natural masking noise and assesses levels against established standards.

The local regulations[120] and IFC guidelines[121] limit operational noise in areas external to residential, institutional, and educational buildings to the levels set out in Table 11-2.

Table 11-2: Operational Noise Level Limits at Noise Sensitive Receptors

Period	L_{Aeq} (dB)
Day (08:00 – 22:00)	55
Night (22:00 – 08:00)	45

For industrial areas, the day and night L_{Aeq} values are relaxed to 70 dB(A).

The IFC guidelines also recommend that the newly introduced noise should not increase the ambient noise by more than 3 dB, but this is a difficult goal to achieve. It is not required by the local regulations. The local regulations are mandatory and are deemed to supersede the IFC guidelines.

Clearly wind farm noise increases with increasing wind speed, up until the point where the power curve levels off. It is unreasonable to restrict wind farm noise to artificially low levels in situations where the background noise, due to wind or other sources, is so high that the wind farm noise is inaudible. Wind farm operational noise can be assessed as a function of wind speed, against existing background noise (BGN) levels at the same wind speed, with fixed lower limits, that only affect the lowest wind speeds. In the absence of background noise measurements, the operational noise assessment has been carried out only in accordance with the IFC guidelines[121] on the allowable noise impacts beyond the property boundary of the Project together with recommendations of ETSU-R-97 – The Assessment and Rating of Noise from Wind Farms.

Separate noise limits should apply for daytime and for night-time as during the night the protection of external amenity becomes less important, and the emphasis should be on preventing sleep disturbance. Absolute noise limits and margins above background should relate to the cumulative effect of all WTGs in the area contributing to the noise received at the properties in question. Any existing WTGs should not be considered as part of the prevailing BGN.

11.3 Baseline Conditions

Even when noise limits are fixed, there is merit in assessing wind farm noise by comparison with existing background noise (BGN). BGN is usually measured in the external amenity of nearby NSRs. Measurements are made in ten-minute intervals over an extended period.

BGN has not been measured as it has not been considered necessary to meet local regulations[120]. The local regulations are mandatory and are deemed to supersede the IFC guidelines. Furthermore, collection of BGN data would not change the output of the noise assessment. Information regarding nearby sensitive receptors has been collected from Google Earth imagery and a social mapping exercise conducted in March 2021. In total, 10 receptors have been modelled. These represent a mix of temporary farm dwellings, tourism area, settlements (including mining area settlement for workers).

Table 11-3 details the sensitive receptors considered within both this assessment and the shadow flicker assessment (see Chapter 12). These receptors are also illustrated within Volume 2 of this ESIA, Figure 11-1.

Table 11-3: Sensitive Receptor Locations

Receptor No.	Sensitive Receptor	Easting	Northing	Distance from Nearest WTG
1	Tourist area	615083	4601432	1.8 km
2	Zarafshon (east)	603582	4605044	3.7 km
3	Besapan	623250	4599111	1.4 km
4	Adzherekty	626676	4619254	12 km
5	New Farm 1 Residential	612659	4600694	1.7 km
6	New Farm 2 Residential	605207	4606582	3 km
7	Farm - Residential	614135	4607394	924 m
8	Structure 1 - Residential, 2 buildings in a compound	610278	4600737	1.4 km
9	Residential and agricultural	617277	4604857	1 km
10	Gold Mine Settlement	624608	4598916	1.8 km

11.4 Assessment of Effects

11.4.1 Construction

The following representative limits have been applied to the Project for the purposes of this assessment:

- Day time – limit of 60 dB(A).
- Night-time - limit of 50 dB(A).

These limits should apply both to the existing permanent receptors and to any temporary locations where construction workers are to be housed.

Construction noise should be managed in accordance with the best practice set out in Section 11.6.1 below.

11.4.2 Operation

The criteria for operational noise are subject to fixed lower limits for daytime and night-time. These limits account for the overall noise levels receive data NSRs including background noise in addition to modelled WTG predicted noise.

The following limits from local regulations[120] and IFC guidelines[121] have been applied to the Project for the purposes of this assessment:

- Day-time – limit of 55 dB(A).
- Night-time – limit of 45 dB(A).
- For industrial areas, the day and night L_{Aeq} values are relaxed to 70 dB(A).

At levels above the criteria, the noise emissions from the Project would be considered a significant adverse effect.

11.4.2.1 WTG Noise Emission Data

The candidate WTG is the Goldwind GW155-4.5 MW machine, with 95 m hub height and 155 m rotor diameter. The sound power level, as a function of wind speed at 10 m above ground level, is shown in Table 11-4[125]. In view of manufacturers' stated uncertainty of 1.7 dB1.7 dB has already been added to the values in Table 11-4.

Table 11-4: Goldwind GW155-4.5 MW Sound Power Level Against Hub Height Wind Speed (dB(A))

Hub Height Wind Speed (m/s)	Sound Power Level (dB(A))
5	98.0
6	102.8
7	106.1
8	107.9
9 +	108.5

[125] Edition: C No.: GSC-08AP.a0006, Goldwind, 25 May 2021

11.4.2.2 Wind Farm Operational Noise Propagation Model

The sound propagation over distance, including the effect of atmospheric absorption, was calculated using the WindPRO model based on ISO 9613-2. In accordance with the GPG, a ground factor of 0.5 was used. The receiver height was taken to be 4 m, and air absorption characteristic of 10ºC, 70% relative humidity was used. Topographical screening of -2 dB and valley effect penalty of 3 dB is considered in the model.

11.4.2.3 Operations Phase Assessment Effects

Ten NSRs are assessed as being of high sensitivity. There will be no permanent workers' accommodation area on the Project site. The magnitudes of change, and resulting effects are described in Table 11-5.

Table 11-5: Magnitude of Change and Resulting Effect for Noise Limits

Excess over Criterion	Magnitude of Change	Effect
Greater than 0 dB	High	Significant
Less than or equal to 0 dB	Low	Not Significant

The noise impact assessment assumes that the sound energy propagates in all directions from the WTG. Some energy will be absorbed in the air and some by the ground. On that basis, the levels received at the NSRs have been predicted, at a 10-metre wind speed of 8 m/s. This is equivalent to a hub height wind speed of 11.4 m/s, by which time the maximum sound power level in Table 11-4 has been reached. The results are as shown as a noise contour map in Volume 2, Figure 11-1. The maximum level in each of the settlements is shown in Table 11-6. Levels are presented as equivalent continuous L_{Aeq} values.

Table 11-6: Sound Pressure Levels and any Excesses over Limits

Receptor Area	Easting	Northing	L_{Aeq} (dB(A))	Day Excess (dB)	Night Excess (dB)
Tourist area	615083	4601432	37.5	-17.5	-7.5
Zarafshon (east)	603582	4605044	30.4	-24.6	-14.6
Besapan	623250	4599111	40.4	-14.6	-4.6
Adzherekty	626676	4619254	18.8	-36.2	-26.2
New Farm 1 Residential	612659	4600694	37.8	-17.2	-7.2
New Farm 2 Residential	605207	4606582	31.3	-23.7	-13.7
Farm - Residential	614135	4607394	41.1	-13.9	-3.9
Structure 1 - Residential, 2 buildings in a compound	610278	4600737	39.1	-15.9	-5.9
Residential and agricultural	617277	4604857	43.6	-11.4	-1.4
Gold Mine Settlement	624608	4598916	38.9	-16.1	-6.1

The contours and table show that the predicted levels for total operational noise meet the limits at all receptors. The effect is therefore assessed as not significant.

11.4.2.4 Infra-sound

Infra-sound is defined as noise occurring at frequencies below that at which sound is normally audible, i.e., at less than 20 Hz, due to the significantly reduced sensitivity of the ear at such frequencies. In this frequency range, for sound to be perceptible, it has to be at very high amplitude, and it is generally considered that when such sounds are perceptible then they can cause considerable annoyance.

WTGs have been cited as significant producers of infra-sound. This has, however, been due to the high levels of such noise, as well as an audible, low frequency, thumping noise, occurring on older 'downwind' WTGs of which many were installed in the USA prior to the large-scale take up of wind power. Downwind WTGs are configured with the blades downwind of the tower such that the blades pass through the wake left in the wind stream by the tower resulting in a regular audible thump, with infra-sonic components, each time a blade passes the tower. All modern WTGs are of the upwind design, with the blades upwind of the tower, and this effect is eliminated.

A study for the UK Department of Trade and Industry (DTI)[126] concluded that 'Infrasound noise emissions from WTGs are significantly below the recognised threshold of perception for acoustic energy within this frequency range. Even assuming that the most sensitive members of the population have a hearing threshold which is 12dB lower than the median hearing threshold, measured infrasound levels are well below this criterion'. It goes on to state that, based on information from the World Health Organisation, 'there is no reliable evidence that infrasound below the hearing threshold produces physiological or psychological effects' it may be concluded that 'infrasound associated with modern WTGs is not a source which may be injurious to the health of a wind farm neighbour'. Therefore, it is concluded that this effect is negligible.

[126] W/45/00656/00/00 The Measurement of Low Frequency Noise at Three UK Windfarms. Department of Trade and Industry 2006

11.4.2.5 Low Frequency Noise

Noise from modern WTGs is essentially broadband in nature in that it contains similar amounts of noise energy in all frequency bands from low to high frequency. As distance from a wind farm site increases, the noise level decreases as a result of the spreading out of the sound energy, but also due to air absorption, which increases with increasing frequency. This means that although the energy across the whole frequency range is reduced, higher frequencies are reduced more than lower frequencies with the effect that as distance from the site increases, the ratio of low to high frequencies also increases. This effect may be observed with road traffic noise or natural sources, such as the sea, where higher frequency components are diminished relative to lower frequency components at long distances. At such distances, however, overall noise levels from WTGs are so low that this effect is negligible and not significant.

11.4.2.6 Amplitude Modulation

The RenewableUK research programme on amplitude modulation (AM) has concluded[127] that high levels of AM can occasionally be heard at long distances from WTGs. The phenomenon is not yet so well understood as to be predicted.

11.4.3 Decommissioning

It is considered that the noise effects of the decommissioning phase of the Project will be similar to those associated with the construction phase and therefore no additional assessment has been carried out for decommissioning.

11.5 Cumulative Impacts

This Project is one of the first wind farms proposed to be constructed in Zarafshan. No other proposed wind farms have been identified within a 60 km radius of the Project.

11.6 Mitigation

11.6.1 Construction

Any temporary camps for construction workers should be located no closer to the nearest WTG location than the nearest permanent receptor.

[127] RenewableUK (2013). Wind Turbine Amplitude Modulation: Research to Improve Understanding as to its Cause and Effects - Brief Summary. http://www.renewableuk.com/en/publications/reports.cfm/wind-turbine-am-cause-effects-briefing.

Construction activities will be scheduled from Monday to Saturday 08:00 to 22:00 so as to comply with the limits in Table 11-1. Unattended plant equipment should be kept to a minimum. Construction activities outside of these times, short term high transient noise events, or activities relatively close to NSRs should be scheduled in consultation with the residents to minimise their inconvenience.

The EPC contractor should produce and implement a Noise Management Plan for the construction phase (this will be incorporated into a Noise and Air Quality Management Plan to form a sub-plan of the ESMP). The plan will be taken forward for all construction works and any post construction works of a similar nature that are associated with the proposed development e.g., maintenance. The plan should include a clear construction schedule detailing the equipment to be used and the following information:

- Detailed plan showing how permitted working hours will be adhered to.
- Mitigation identified to attenuate noise levels at source (preferable) to ensure construction noise limits are met.
- Community consultation details including reference to the Stakeholder Engagement Plan (SEP) and grievance mechanism process in the event of any noise-related complaints.

11.6.2 Operation

As modelled in this ESIA, no significant impacts are predicted and therefore no specific mitigation is required.

A community grievance mechanism will be in place for the life of the Project to enable local people to raise any complaints or concerns, including those relating to noise. The grievance mechanism is set out in the SEP for the Project.

11.6.3 Decommissioning

Decommissioning noise will be similar to, or less than, construction noise. A similar approach to construction noise will reduce the likelihood of complaints and noise levels breaching advised limits.

11.7 Residual Effects and Summary

11.7.1 Construction Phase

The levels of noise attributable to the activities associated with the construction work should be kept to a minimum. A well-planned noise management programme as described in Section 11.6.1 will reduce the likelihood of complaints.

11.7.2 Operational Phase

Without mitigation, noise levels fall within international standard IFC limits.

11.7.3 Decommissioning Phase

11.8 Summary of Effects

Table 11-7 provides a summary of the potential effects associated with the operational phase of the Project.

Table 11-7: Summary of Effects

Receptor	Sensitivity	Predicted Effect Prior to Mitigation	Mitigation	Residual Effect
Tourist area	High	Not Significant	None	Not Significant
Zarafshon (east)	High	Not Significant	None	Not Significant
Besapan	High	Not Significant	None	Not Significant
Adzherekty	High	Not Significant	None	Not Significant
New Farm 1 Residential	High	Not Significant	None	Not Significant
New Farm 2 Residential	High	Not Significant	None	Not Significant
Farm - Residential	High	Not Significant	None	Not Significant
Structure 1 - Residential, 2 buildings in a compound	High	Not Significant	None	Not Significant
Residential and agricultural	High	Not Significant	None	Not Significant
Gold Mine Settlement	High	Not Significant	None	Not Significant

11.9 Statement of Significance

The effects of the Project during daytime and night-time are not significant.

12 Shadow Flicker

12.1 Introduction

This chapter presents an assessment of the shadow flicker effect of the Project on nearby sensitive receptors. The assessment considers shadow flicker effects from the operation of the proposed Project.

Shadow flicker occurs during the operational phase of a wind farm when the sun passes behind the WTG and casts a shadow. As the blades rotate, shadows pass over the same point causing an effect termed shadow flicker. Shadow flicker may become a problem when potentially sensitive receptors (residential properties, workplaces, learning spaces and health care settings are all potentially sensitive to shadow flicker) are located near, or have a specific orientation to, the wind farm.

The magnitude of the shadow flicker varies both spatially and temporally and depends on a number of environmental conditions coinciding at any particular point in time, including, the position and height of the sun, wind speed, direction, cloudiness, and position of the WTG relative to a sensitive receptor.

12.2 Methodology

12.2.1 Applicable Standards

There is variation in the limits of acceptability applied in different countries if specific limits are stipulated at all. The IFC Environmental, Health and Safety Guidelines for Wind Energy (2015) recommends the use of a 30 hours per year and 0.5 hours per day limits for shadow flicker, based on worst-case scenario modelling.

Limits on shadow flicker are applied primarily to avoid nuisance and preserve amenity.

12.2.2 Software Parameters

The shadow flicker analysis was conducted using the Shadow Flicker module of the ReSoft WindFarm software.

The WindFarm analysis reports the ‘worst case’ scenario, that is, a situation where there is always sunshine, the wind is always blowing, and the wind and the WTG rotor track the sun by yawing the WTG exactly as the sun moves. In addition, the model does not include consideration of any screening effects of existing vegetation and buildings.

12.2.3 Analysis Parameters

12.2.3.1 WTG Data and Layout

The modelling was undertaken based on the proposed WTG layout comprising 111 WTGs each with a rotor diameter of 155 m and a hub height of 95 m.

12.2.3.2 Potential Receptors

The identification of potential shadow flicker receptors was based on inspection of topographical maps, satellite imagery and a social mapping exercise involving consultation with local people who utilise the Project site area. It is not always possible to identify all potential receptors from these sources and some buildings, which have been assumed to be residential, may in reality be otherwise, and therefore would not be considered to be sensitive receptors. Consequently, prior to construction, the presence and location of all potential receptors the predicted shadow flicker impact area (see Section 12.3.1) will be checked and confirmed.

Each receptor was modelled as having four windows (2 m by 2 m in dimension), assumed to have one window orientated towards each of the four cardinal directions (north, south, east, and west).

12.3 Impact Assessment

12.3.1 Shadow Flicker Impact Area

Using the WindFarm software, a potential shadow flicker impact area map was produced based on the assumption that shadow flicker impact is negligible beyond a distance of 10 rotor diameters (1,550 m). This is shown in Volume 2, Figure 12-1. The shading illustrates areas predicted to experience shadow flicker effects >30 hours per year, based on conservative worst-case modelling scenario. Model input assumed a rotor diameter of 155 m, with a hub height of 95 m.

12.3.2 Wind Farm Shadow Flicker Analysis Results

Modelling of shadow flicker duration was undertaken for 10 identified sensitive receptors within the predicted shadow flicker area (see locations shown in Volume 2, Figure 12-1), based on the worst-case scenario. Table 11-3 within Chapter 11: Noise, sets out the sensitive receptors and distances from the nearest WTG.

The results of the shadow flicker modelling are shown in Table 12-1.

There are a number of factors that are likely to reduce the incidence of shadow flicker. These include weather conditions (lack of bright sunshine), presence of vegetation and buildings, the WTG being in shut down mode, due to wind speeds being too high or too low, and orientation of the rotor disc. These factors are not taken into account in the WindFarm software analysis.

It should be noted that if there is no direct sun then the intensity of shadow flicker is dramatically reduced. A more realistic scenario would also take account of sunshine hours. Available information regarding annual average sunlight hours indicates that the area typically experiences sunshine for approximately 66.5% of daylight hours each year[128]. For illustration, an adjusted estimate of total annual shadow flicker duration at the modelled locations was calculated based on a more realistic scenario that takes account of sunshine hours.

Table 12-1: Potential Shadow Flicker Occurrence

No.	Representative Location	Easting (UTM Zone 36N)	Northing (UTM Zone 36N)	Days per Year	Max hours per day	Total hours per year (worst-case)	Total hours per year (adjusted)
1	Tourist area	615083	4601432	22	0.36	7.4	4.92
2	Zarafshon (east)	603582	4605044	0.00	0.00	0.00	0.00
3	Besapan	623250	4599111	40	**0.61**	18.3	12.1
4	Adzherekty	626676	4619254	0.00	0.00	0.00	0.00
5	New Farm 1 Residential	612659	4600694	0.00	0.00	0.00	0.00
6	New Farm 2 Residential	605207	4606582	0.00	0.00	0.00	0.00
7	Farm - Residential	614135	4607394	111	**0.52**	**41.9**	27.86

[128] http://www.samarkand.climatemps.com/sunlight.php

No.	Representative Location	Easting (UTM Zone 36N)	Northing (UTM Zone 36N)	Days per Year	Max hours per day	Total hours per year (worst-case)	Total hours per year (adjusted)
8	Structure 1 - 2 Residential, buildings in a compound	610278	4600737	0.00	0.00	0.00	0.00
9	Residential and agricultural	617277	4604857	127	**0.94**	**57.3**	**38.1**
10	Gold Mine Settlement	624608	4598916	0.00	0.00	0.00	0.00

Table 12-1 demonstrates exceedances of the 30 hours per day and 30 hour per year shadow flicker limit at Receptors 7 and 9 (as highlighted in bold red text). With adjustments made to take account of sunshine hours, no exceedances of the 30 hours per year limit are seen for Receptor 7 however limits are still exceeded at Receptor 9. The 30 minutes per day limit is seen to be exceeded at Receptor 3 however on detailed analysis of shadow flicker effects per WTG (Table 21-2), no breaches in the limit occur.

Given the potential for shadow flicker impacts, a further analysis has been carried out for each affected property to determine the WTG(s) causing shadow flicker in addition to the dates and times of the day when effects are predicted. Appendix 12 sets out the results in detail.

Table 12-2 below provides further information with regards to exceedances of the 30 minutes per day limit for each affected property (Receptors 7 and 9) per WTG.

Table 12-2: Shadow Flicker Exceedances per WTG[129]

No.	Representative Location	WTG No.	Date From	Date To	Time of Day (approx.).	Max. Duration per Day
7	Farm – Residential	34	21-May	30-May	Early Morning (0613 - 0614)	00:31:01
		34	14-July	23-July	Early Morning (0622 – 0623).	00:31:02
9	Residential and Agricultural	37	31-March	08-April	Evening (1812 - 1846)	00:32:47
		37	03-Sept.	11-Sept.	Evening (1807 – 1841)	00:32:55
		39	04-Feb	19-Feb	Evening (1658 – 1735)	00:36:37
		39	22-Oct.	06-Nov.	Evening (1627 – 1704)	00:35:47

The results in Table 12-1 and 12-2 demonstrate that Receptor 9 is the worst affected, experiencing exceedances of the 30 minutes per day and 30 hours per year limits. As can be seen by Table 12-1, the hours per year limit is exceeded by 27.3 hours and impacts are therefore considered significant for this receptor.

Exceedances of both the 30 minutes per day and 30 hours per year limits occur at Receptor 7 to a lesser extent however the impacts are still considered to be significant.

12.4 Cumulative Impacts

There are no wind farms identified as operational or proposed to be constructed in proximity to this Project at the time of undertaking this assessment (May 2021). No cumulative impacts in relation to shadow flicker are therefore predicted to occur.

[129] Exceedance of the 30 minutes per day limit

12.5 Mitigation Measures

Communities will be informed during the consultation process about the shadow flicker impacts and proposed measures. Shadow flicker modules will be installed in identified WTGs (34, 37 and 39) to shut down the WTGs at specific dates and times of the year when shadow flicker is an issue. This will ensure there are no significant impacts relating to shadow flicker for Receptors 7 and 9. In addition, for all affected receptors appropriate vegetation screening, provision of blinds / curtains will be provided as required.

If any complaints are raised by the local community (through the grievance mechanism or other channels) relating to shadow flicker from the Project, the Project operator shall investigate and, where found to be necessary, instigate appropriate further measures to mitigate the shadow flicker effects. This may include, for example, providing land-based improvements to enhance livelihoods or similar measures which are defined on a case-by-case basis. It should be noted however that, with mitigation, shadow flicker events will be within the specified IFC limits and therefore no significant impacts will remain.

12.6 Residual Effects

Shadow flicker effects are predictable and generally easily mitigated. For this Project, the impacts are manageable through monitoring of grievances and, if required, installation of shadow flicker modules into the WTGs identified as causing unacceptable shadow flicker effects. There are therefore no identified residual effects.

13 Hydrology and Hydrogeology

The hydrology and hydrogeology assessment examines any potential impacts resulting from the construction, operation and decommissioning of the Project on the water environment including surface water and groundwater conditions. Mitigation is proposed where required to reduce potential impacts during construction, operation and decommissioning of the Project.

13.1 Assessment Methodology

Baseline data has been collected to inform the assessment process. The assessment has been undertaken in accordance with the criteria set out in Chapter 4 (Assessment Methodology).

The sensitivity of water resources is based on the size and function of the feature and water quality. The function includes use by humans as well as providing habitat for aquatic organisms.

Examples of sensitivity of the water environment are listed in Table 13-1.

Table 13-1: Examples of General Sensitivity of the Water Environment

Sensitivity	Examples
High	River which supports fish with conservation status or provides major fisheries resources. River with good water quality (no pollution sources). Surface or groundwater which is used for drinking water. Large floodplain.
Medium	River which supports common fish or provides resource for small-scale fishing. River with fair water quality (occasional pollution sources) Surface or groundwater used for industry or agriculture. Small floodplain.
Low	River which does not support fish resources. River with poor water quality (pollution discharge sources). Intermittent or no use of surface or groundwater by humans. No floodplain.

13.2 Baseline Conditions

A baseline review was conducted by a national Uzbek specialist to inform the ESIA chapter. The full baseline report can be found within Appendix 13 with a summary of findings presented below. A desk-based study was also carried out by Wood.

13.2.1 Surface Water

Zarafshan is located in the Kyzylkum desert and, as a result, experiences low levels of rainfall. The city receives water from the Amu Darya River via a 220 km pipeline.

The major river deltas including Amudarya and Syrdarya are located far from the Project site. The distance of the major a tributary of the Syrdarya river is approximately 320 km from the Project at its closest point. The Amudarya River is around 230 km from its closest point to the Project.

Spatial data on key surface hydrological features, including rivers and lakes, was obtained from the World Resources Institute[130]. This confirms that there are no permanent waterbodies on or adjacent to the Project site. However, a number of seasonal drainage channels were observed across the site. Of most concern is the drainage channel leading from the site to the adjacent holiday resort approximately 2 km to the east of the closest WTG. The temporary channels are active during the Spring period and during heavy rains and snow melt.

In addition to the route discussed above, there are other smaller seasonal drainage channels that would need to be considered further during the development of the wind farm.

Figure 13-1 illustrates the water sources and their distribution in the Project area.

[130] World Resources Institute, Uzbekistan GIS Data - www.wri.org

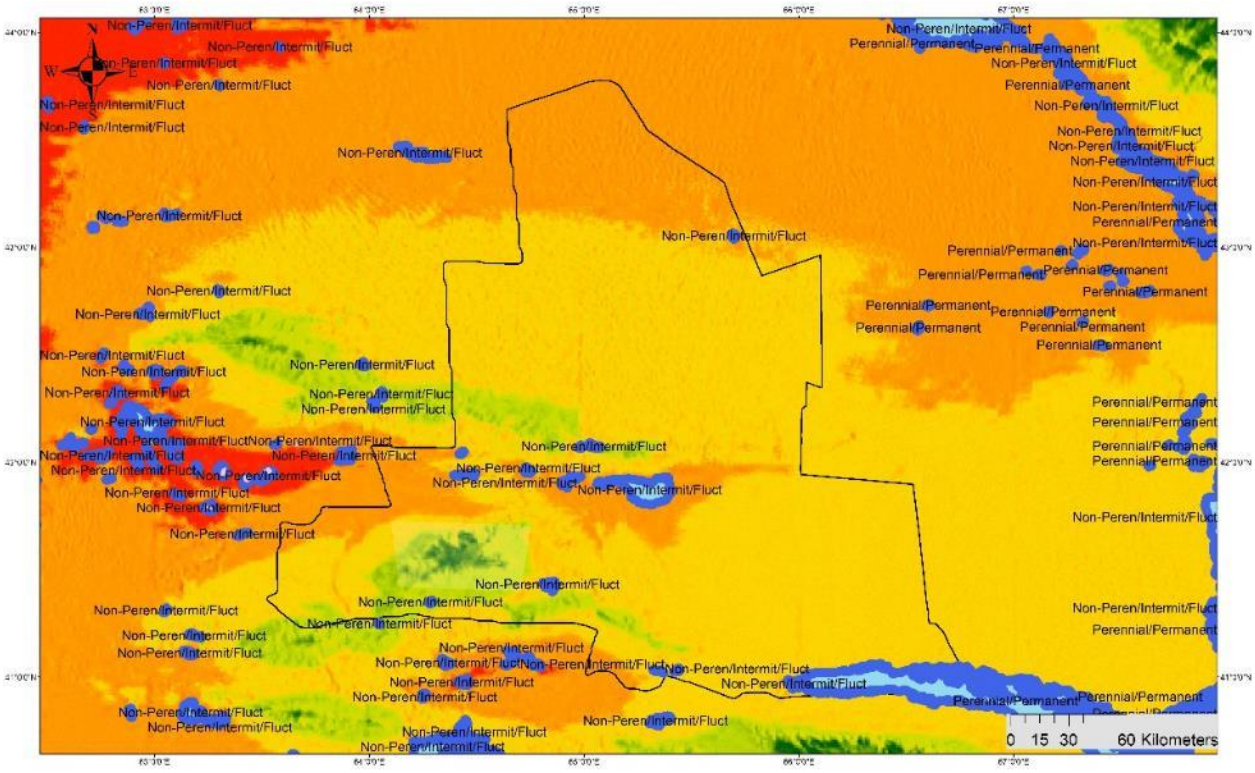


Figure 13-1: Geographic Map of Water Sources & Distribution around the Project Area

13.2.2 Water Resources and Distribution

In Uzbekistan as a whole, there is a continuing water resource shortage which worsens year on year due to growing demand and effects of climate change. There are continuing challenges for communities to access clean and reliable water services. More than half the population (around 31 million people) remain unconnected to a piped water system.[131]

Efforts are underway to ensure stable and guaranteed water supply for households as well as sectors of the economy. This is through development of irrigation systems, improved water management infrastructure and improved quality of irrigated land along with efficient and rational use of land and water resources.[132]

[131] World Bank (2016) Modernizing Uzbekistan's Water Sector – with Citizen Engagement

[132] Presidential Degree on Approval of the Concept of Development of the Water Management Sector of the Republic of Uzbekistan for 2020 -2030 (2020).

A survey of existing production wells and water intakes was carried out by the hydrological institute of Uzbekistan. The survey looked at the conditions and regime of water supply to six rural settlements located at the foot of the mountain ranges in the south-eastern area of the Tamdy district. The study was carried out in order to establish the existing sources of drinking water supply. These settlements included Kulumbet, Aldabergan, Ugiz (Kerigetau), Jrik, Uriskuduk and Utemurat of the Tamdy district of Navoi region. These six settlements are located in the south-eastern side of the Tamdy region, and the approximate distance from Project area varies from 50-100 km.

During the survey of the territories, sources of potable water supply to settlements and watering of pastures were identified, the location of production wells and water intakes was identified, the available geological and technical documentation was collected, the technical condition of ground water lifting equipment was described, the level and flow rates of water in wells were measured and water samples were taken for chemical analysis.[133]

Within the six rural settlements (total number of 3,169 people), the potable water requirement is 366 m^3/day. Water for these villages is largely supplied by wells however the water quality largely does not meet the O'zDSt 950: 2011 "Drinking water" Uzbekistan Standard and the problem of clean water supply is on-going. Appendix 13 provides further details of individual village water supplies.

Closer to the Project site, the settlement of Rohat ovuli (located in the south-western part of Zarafshan City around 20 km from the Project), has no tap water source. Water sources extend from the Amudarya River basin and inhabitants of the settlement consume unfiltered water for everyday needs. Within New Tamdy (around 692 inhabitants located 15 km from the Project) and Tamdybulak (2,580 people), there is established resources such as tap water. In smaller villages such as Qinir, inhabitants pay to transport drinking water from Tamdybulak.

[133] The source has prepared on the basis of HydroIngeo Institute's report and their activities related on previous expedition on this area. Originally, the report translated from Russian to English.

13.2.3 Precipitation

Uzbekistan has a generally dry climate with long, warm to hot summers and moderate winters. The country can be broadly divided into two climatic zones: the desert and steppe climate in the western two thirds of the country, and the temperate climate, characterized by dry summers and humid winters in the eastern areas. The climate in the southern areas is characterized as arid and subtropical. The terrain of Uzbekistan is mainly sandy desert with dunes (which comprise 78% of the country's land), foothills, and parts of the Tien-Shan and Gissar-Alay Mountain ranges.

Most of the Uzbek territory is arid receiving, on average, 300 mm precipitation per year and which occurs mainly in Winter and early Spring. The desert plains receive only around 80-200 mm of precipitation annually, while the foothills can get as much as 300-400 mm and the mountainous regions receive up to 600-800 mm per year. Rainfall occurs mostly in late fall through early spring, dropping off significantly during the summer months.

The weather data for the Tamdy region from 1990 until 2019 is based on monthly observations. The average total rainfall varies from 100-111 mm per year. The majority of rainfall is during March and April with little during the Summer months of June, July and August.

The country is prone to large fluctuations in temperature, both seasonally and from day to day. Average monthly temperature for the country is highest in July, at 30°C, and lowest in January, at around -3°C. However, temperature ranges vary across the country. Uzbekistan's desert regions can reach maximum temperatures of 45-49°C, while minimum temperatures can drop as low as -25°C. Uzbekistan is exposed to a range of weather-related extreme events, including dust storms, mudflows, floods, drought, and avalanches[134].

13.2.4 Hydrogeology

The occurrence of groundwater (and its quality) in the aquifers and its movement depends not only on type of formation but also on the recharge mechanisms. All groundwater must have had a source of recharge. This is normally rainfall but can also be seepage from rivers, canals, or lakes.

[134] https://www.climatelinks.org/sites/default/files/asset/document/Uzbekistan_CRP_Final.pdf

Infiltrating water percolates to the water table and flows from the points of recharge to the points of discharge. The aquifer flow regime depends on the hydraulic characteristics of the rocks (media) and the hydraulic gradient and may vary widely with the geology and the recharge conditions.

Groundwater systems are dynamic with groundwater continuously in slow motion from zones of recharge to zones of discharge. Tens, hundreds, or even thousands of years may elapse, especially in arid and semi-arid regions.

There are 94 major aquifers in Uzbekistan. The renewable groundwater resources are an estimated 8.8 km^3/year, of which 2 km^3/year are considered an overlap with surface resources[135]. In the Amu Darya basin, the largest reservoir is the Tuaymuyun, in Khorezm vilayat, with a storage capacity of 7.8 km^3, comprising four separate reservoirs.

The main impact on groundwater resources in recent years in Uzbekistan is from irrigated agriculture and its vast expansion. Significant amounts of the water currently entering the irrigation system are lost as a result of infiltration, evaporation and inefficient, non-rational use of water. These water losses from the system contribute to the high levels of groundwater, the salinity of the soils and the occurrence of waterlogging in low-lying areas.

13.2.5 Groundwater

Figure 13-2 details the groundwater resources for the Project area and its surroundings. It shows that the groundwater in the area of Zarafshan has mixed salinity (shown by blue line areas) with the city having its own drinking water supply.

[135] http://www.fao.org/nr/water/aquastat/countries_regions/UZB/UZB-CP_eng.pdf

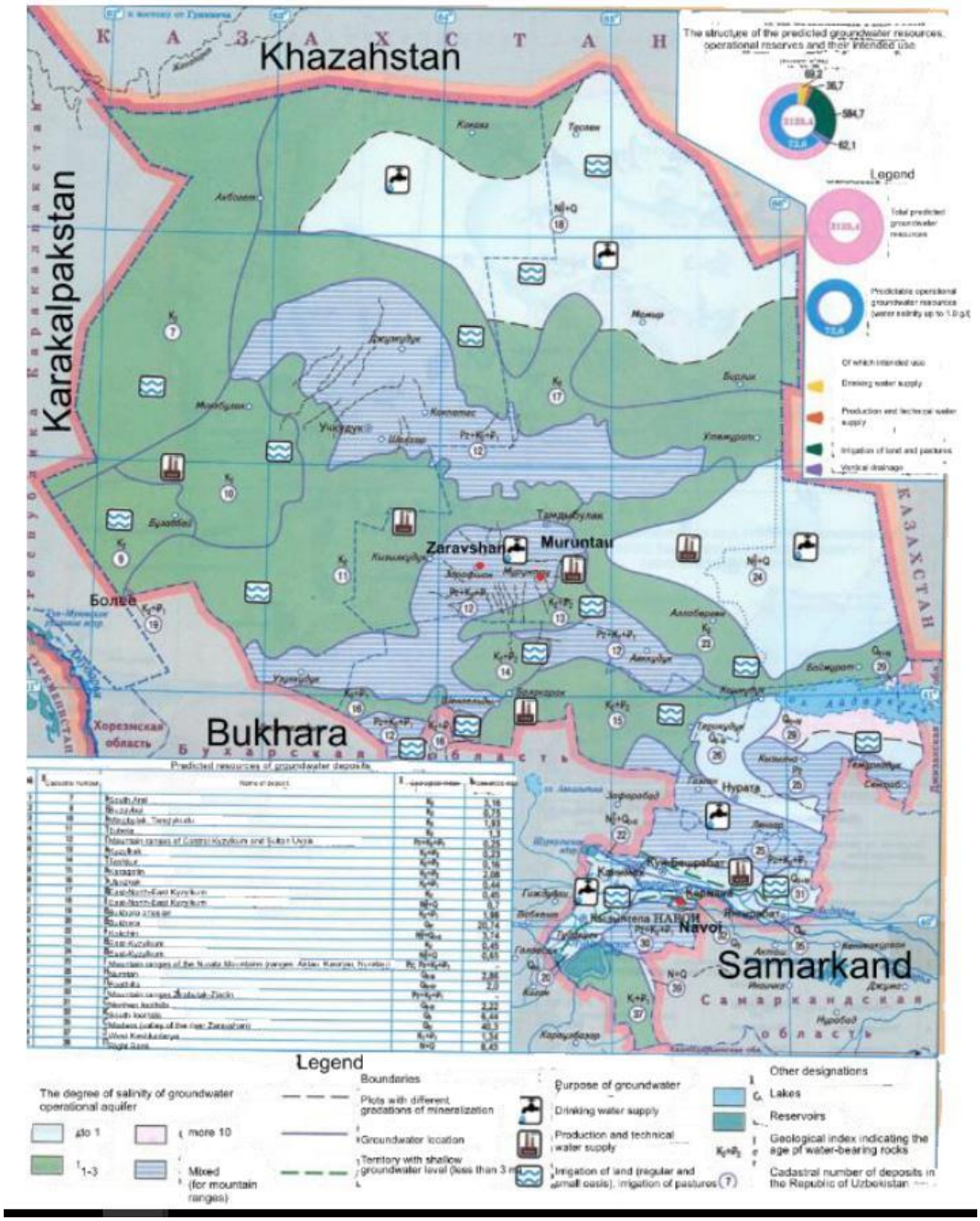


Figure 13-2: Groundwater Resources in Region[136]

The mining area of Muruntau is likely responsible for some groundwater pollution in the area, however this is based only on oral communications held during 2020.

[136] Atlas, Yergoedezkadastr (2016)

The general groundwater direction is from south - east to north - west towards the Mulala depression. The complex is operated by numerous wells and aquifers. The following aquifers are identified in the Project area:

- Aquifer complex of Quaternary deposits.
- Aquifer of the Upper Pliocene sediments.
- Aquifer of the Lower Pliocene deposits.
- Aquifer of Senonian and Palaeocene sediments.

13.2.6 Flood Risk

There is no data available in terms of flood risk for this area of the Navoi region. It is likely that some flooding could occur during times of heavy rain fall or snow melt. Further pre-construction studies are likely to be required to determine flood risk on the Project site.

13.3 Assessment of Effects

This section describes the potential impacts of the Project on the water environment, including both surface and groundwater.

Potential impacts on water resources include:

- Water consumption, potentially affecting local water resources.
- Alteration of surface and groundwater flow.
- Water discharge and pollution.

The potential impacts on the water environment during construction, operation and decommissioning are set out in the following sections below.

13.3.1 Construction

13.3.1.1 Surface water drainage

During construction earthworks, road construction and use of heavy vehicles could alter surface drainage patterns. The removal of any vegetation present and compaction of soils (see Chapter 9 (Geology and Soils)) will reduce infiltration and surface run-off will increase. The risk is greatest during Spring months when the drainage channels are utilised. The water flowing down drainage channels and creeks is likely to cause additional soil erosion and increase the size of the channels. Surface run-off will also contain larger amounts of suspended sediments during construction than would otherwise be the case. The sensitivity of the channels is low during the summer months and medium during spring when they are likely to be accommodating runoff / heavy rains. The magnitude of impact is considered medium and so during Spring months, the significance is considered Moderate and significant prior to mitigation.

13.3.1.2 Water resources

Construction workers must have easy access to a source of clean potable water. Drinking water must meet local or World Health Organisation (WHO) drinking water standards and water quality must be monitored regularly[137]. IFC / EBRD workers' accommodation guidance states that (dependant on weather conditions and accommodation standards), 80 to 180 litres of water per person per day should be made available.

Anticipated construction worker totals are still to be determined, however assuming a work force of 1,050 at its peak and an average of 130 litres per person per day, the Project would require 136,500 litres/day to cover the needs of the workforce (or 136.5 m^3 per day).

Assuming a construction phase of 24 months (136.5 m^3/day*30.4 days (average)*24 months) would result in a total water requirement of 99,590 m^3 for the workforce.

The main water requirement during construction would be water for concrete production. We have assumed 0.2 m^3 of water for every 1 m^3 of concrete.

137 http://documents.worldbank.org/curated/en/604561468170043490/pdf/602530WP0worke10Box358316B01PUBLIC1.pdf

The estimated water requirement has been calculated below for the wind farm site and OHLs. This calculation will be updated for the Final ESIA once the dimensions and requirements for the compound area including workers' accommodation is known.

Wind Farm Area

111 bases 1,200 m^3/base = 133,200 m^3 concrete	= 26,640 m^3 water
Substation base = 19,000 m^3 concrete	= 3,800 m^3 water
Compound area – Size unknown at present and so water requirement not included.	
Allow 30% extra for waste/washdown	= 2,802 m^3 water
Total volume required for wind farm works*	**= 33,242 m^3 water**

*Excluding compound and camp area at this stage.

Transmission line construction water requirements

Each transmission line tower/pylon base is assumed to be 2500 x 2500 mm with a depth of 450 mm and 4 bases per tower.

Volume of concrete per tower = 2.813 m^3 * 4	= 11.25 m^3 concrete
Volume of water for 8 towers = 90 m^3 concrete	= 18 m^3 water
Allow 30% extra for waste/washdown	= 5.4 m^3 water
Total volume required for transmission line	**= 23.4 m^3 water**

Water Source

Water required during construction will likely be delivered to the Project site via tankers. This will be determined following appointment of the EPC Contractor with further information provided within the Final ESIA document.

A water availability assessment will be developed to fully determine requirements and potential impacts on local communities who currently depend upon that water supply. Given the aridity of the region and issues with water supply, it is considered, prior to mitigation, that the sensitivity of the region's water resources is high with a magnitude of change associated with the construction phase considered medium. The impact is therefore assessed as major.

As groundwater will not be utilised for during construction, impacts relating to groundwater extraction are not considered significant.

Groundwater pollution

Potential sources of pollution to groundwater during construction comprise leaks and spills of oils from machinery and discharge of sanitary waste and wastewater. The largest source of wastewater during construction will arise from the workers' accommodation block. A septic tank will be in place with disposal via tankers to the nearest wastewater treatment facility. During construction, sanitary waste will be collected in containers below portable toilets and transported to a registered waste disposal facility for disposal.

Storage and handling procedures for oils and other chemicals will be required to minimize risk of pollution. These measures will be incorporated into a Project ESMP. The groundwater sensitivity is considered medium / high, the magnitude of the impact on groundwater is low and therefore, impact significance is assessed as minor to moderate.

13.3.2 Operation

Potential impacts to surface waters by operating activities would be confined to increased runoff and erosion, primarily in existing or new erosion channels that receive run-off from roads.

The sensitivity of the channels is low during the summer months and medium during spring when they are likely to be accommodating runoff / heavy rains. The magnitude of the impact is considered low. Therefore, overall, the significance of the impact is Minor to negligible.

Any water requirements during operation are likely to be imported onto the Project site. This will be determined closer to the time of operation.

Potential sources of pollution to groundwater during operation include sanitary waste and leaks and spills of oils or more chemicals. The sanitary waste from employees will be treated using wastewater recycling equipment likely installed at the control centre compound. Recycled water will be used to water restored areas of any grassland and landscaping.

It is anticipated that hydraulic and lubricating oils will be stored at the control centre. Despite the low risk of contamination involved during operation, measures will be specified in the ESMP to prevent leakage or spillage to groundwater. Groundwater is assessed as medium sensitivity and the magnitude of pollution risk is low, therefore the significance of the impact is minor.

13.3.3 Decommissioning

Effects on water resources during decommissioning are likely to be similar to those during construction, so sensitive features such as ephemeral drainage channels would need to be avoided. Contaminated materials such as oil storage tanks would need to be removed from the site and taken to a suitable disposal site to prevent future contamination of surface and groundwater.

13.4 Mitigation

13.4.1 Mitigation by Design

A geotechnical report was conducted by Juru Energy in November 2020. The results of these studies will be fed into the detailed design process. Micro-siting of WTGs and Project infrastructure will be undertaken during the detailed design process.

It is recommended that 50 m is maintained as a minimum separation distance between any development and the nearby drainage channels. Maintaining such a separation distance, in addition to implementing industry standard pollution prevention measures, should avoid any significant impacts on this drainage route.

The route of the access tracks should be optimised to reduce the need for cut-and-fill material and run-off and erosion control features should be incorporated in designs.

13.4.2 Construction

To reduce the potential for erosion of drainage channels during road construction, routes should be selected to avoid ephemeral drainage channels. Culverts or other drainage control features should be installed where crossings of drainage routes are unavoidable.

The risk of contamination through temporary storage facilities should be reduced through the storage of all materials within designated areas. Supplies should also be provided for the clean-up of minor spills.

To reduce the risk of soil and water pollution from leaks and spills through storage of oil it is recommended that:

- A designated storage area is established with an impervious base and impermeable bund walls. Capacity must be sufficient to contain the full volume within a bund and secured area.
- All fuel, oil and chemical storage is stored in a designated secure area.
- Hoses and valves are checked regularly for signs of wear and ensure that they are turned off and securely locked when not in use.

- Diesel pumps and similar items are placed on drip trays to collect minor spillages. Trays should be checked regularly, and accumulated oil removed.

With regards to potential impacts associated with the construction workforce, it is proposed that sanitary waste is collected in containers below portable toilets and transported for disposal. The waste will be disposed of by a licenced contractor.

A construction water availability assessment plan is proposed to confirm construction water use, an assessment of the ability and capacity of identified supply to provide construction requirements without impacting any existing users. If required, this will be carried out once further information is available from the EPC Contractor and updates provided within the Final ESIA.

Mitigation and monitoring requirements will be set out in the Construction ESMP for compliance during the construction phase.

13.4.3 Operation

The potential for soils and groundwater contamination associated with waste disposal should be reduced through the reduction of wastes to the extent possible whilst maximising the re-use and recycling of materials. All waste and garbage should be collected and stored before disposal at a designated storage location.

Mitigation measures associated with maintenance and use of oils and other chemicals include:

- Establish a designated storage area with an impervious base and impermeable bund walls and protected from precipitation. Capacity must be sufficient to contain the full volume within a bund and secured area.
- Store all fuel, oil, and chemical storage in the designated secure area.
- Do not leave vehicles unattended during refuelling, never leave open a delivery valve.
- Check hoses and valves regularly for signs of wear and ensure that they are turned off and securely locked when not in use.
- Place diesel pumps and similar on drip trays to collect minor spillages. Check trays regularly and remove any accumulated oil.

Mitigation and monitoring requirements will be set out in the Operational ESMP for compliance during the construction phase.

13.4.4 Decommissioning

During decommissioning it is recommended that:

- Structures are recycled and other materials sent to a suitable disposal site.
- All containers are capped, and all valves closed then transported to a suitable disposal site.
- To reduce effects on drainage channels, vehicles, equipment, and foot traffic should be confined to demarcated areas.
- After roads or other compacted areas are removed and / or abandoned, scarify soils and plant native grass seeds. This should be monitored and repeated until reclamation is successful for at least two growing seasons after the last planting / seeding.

13.5 Cumulative Impacts

The ESIA for the OHL upgrade works from Navoi to Bespan does not specify where water is to be sourced from for use during construction and for drinking. It is important therefore that the Project does not place additional pressure on water sources utilised for the OHL works and therefore it is recommended that consultation is carried out once the water supply source is known for this Project to understand any potential conflict.

13.6 Residual Effects and Summary

The assessment has identified areas of activity, particularly during construction and decommissioning operations that have the potential to impact on the hydrology and hydrogeology of the site.

With the implementation of mitigation measures outlined in Section 13.4, the following residual impacts are predicted:

- Surface water drainage – reduction in impact significance to minor.
- Water source – reduced to moderate to minor significance.
- Groundwater pollution – reduced to minor significance.

14 Geology and Soils

14.1 Introduction

This chapter provides review of the existing baseline conditions at the Project site in relation to geology, soils and seismic risk and discusses the potential impacts that the construction and operation of the Project and its OHLs will have. Where required, appropriate mitigation has been set out to limit any identified significant impacts to geology, soils and seismic risk.

14.2 Assessment Methodology

Baseline data was collected through desk-based studies undertaken by a local Uzbek specialist and Wood. Furthermore, information was obtained from the geotechnical survey report (Juru Energy, 2020) carried out for Masdar. This information has been utilised to guide the assessment of potential impacts. The method of assessment has been based upon that outlined in Chapter 4 (Assessment Methodology).

14.3 Baseline Conditions

The geological, seismic and soil conditions within and around the Project site are described in the following sections. Appendix 14 provides detailed baseline study information undertaken by an in-country specialist.

14.3.1 Geology

The main Project area is located within the Kyzylkum desert with topography predominantly a combination of shallow sloping plains, smooth hills, dry riverbeds, and steep stony/rocky slopes.

Most of the Project area is covered by platform sediments (gravel, sand and clay) of Mesozoic to Cenozoic ages. Topographic elevations and their surroundings form large tectonic windows within the sedimentary cover with outcrops of Caledonian to Hercynian fold and thrust rocks. The area is a peculiar neotectonic uplift of the West-Northwest strike, composed of Paleozoic folded formations framed by a cover of Quaternary deposits.[138] The geotechnical report (2020) details slate and limestone layers present from around 3 m depth.

[138] Credited: https://www.sciencedirect.com/science/article/pii/S1674987115001139

Located within the north-eastern section of the Project site are traces of natural ring structures, composed of rock. This geological structure is assumed to be remnants of a paleo volcano[139]. Ring structures with a diameter of at least 1,000 m with accompanying smaller traces of suspected volcanic structures in the form of rings with a diameter of 200 to 450 m, have been identified on aerial photographs.

The Muruntau gold mine, situated approximately 5.3 km south-east of the Project site, is located in the Southern Tien Shan, one of the most significant late Paleozoic, gold-bearing mineral deposits (see Figure 14-1 and Figure 14-2). Muruntau is one of the world's largest open-pit gold mines. Reported in 2016, the reserves at Muruntau are expected to last until approximately 2032. The processing plant at the mine treats ore with an average head grade of 2.4 g/t Au at the rate of 2.2kt/day[140].

[139] Dr. Vladimir Karasyov. Archaeological Sites in the Central Part of Tamdytau, Navoi Region of Uzbekistan. October 2020.

[140] Kempe, U., Graupner, T., Seltmann, R., de Boorder, H., Dolgopolova, A., van Emmichoven, M. (2016). The Muruntau gold deposit (Uzbekistan) – A unique ancient hydrothermal system in the southern Tien Shan. Geoscience Frontiers 7 (2016), 495 – 528

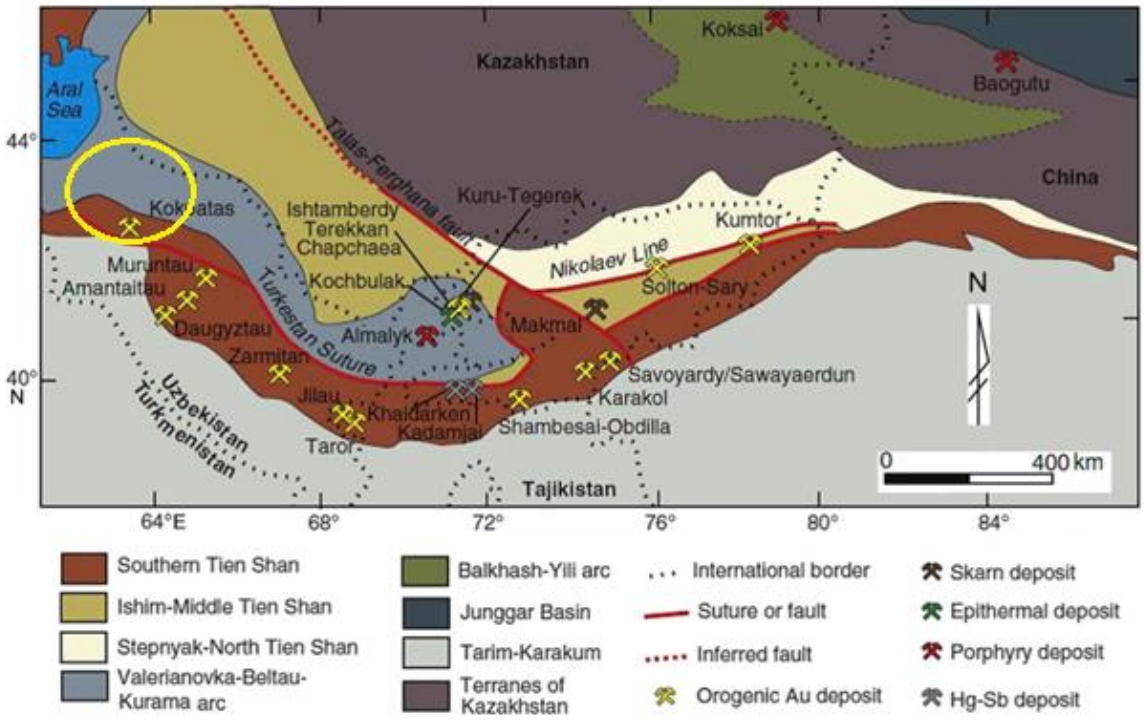


Figure 14-1: Geology of the Tien Shan, central Asia, showing the most significant late Paleozoic Au-bearing mineral deposits[141] (Project area is located within yellow circle)

[141] Kempe, U., Graupner, T., Seltmann, R., de Boorder, H., Dolgopolova, A., van Emmichoven, M. (2016). The Muruntau gold deposit (Uzbekistan) – A unique ancient hydrothermal system in the southern Tien Shan. Geoscience Frontiers 7 (2016), 495 – 528.

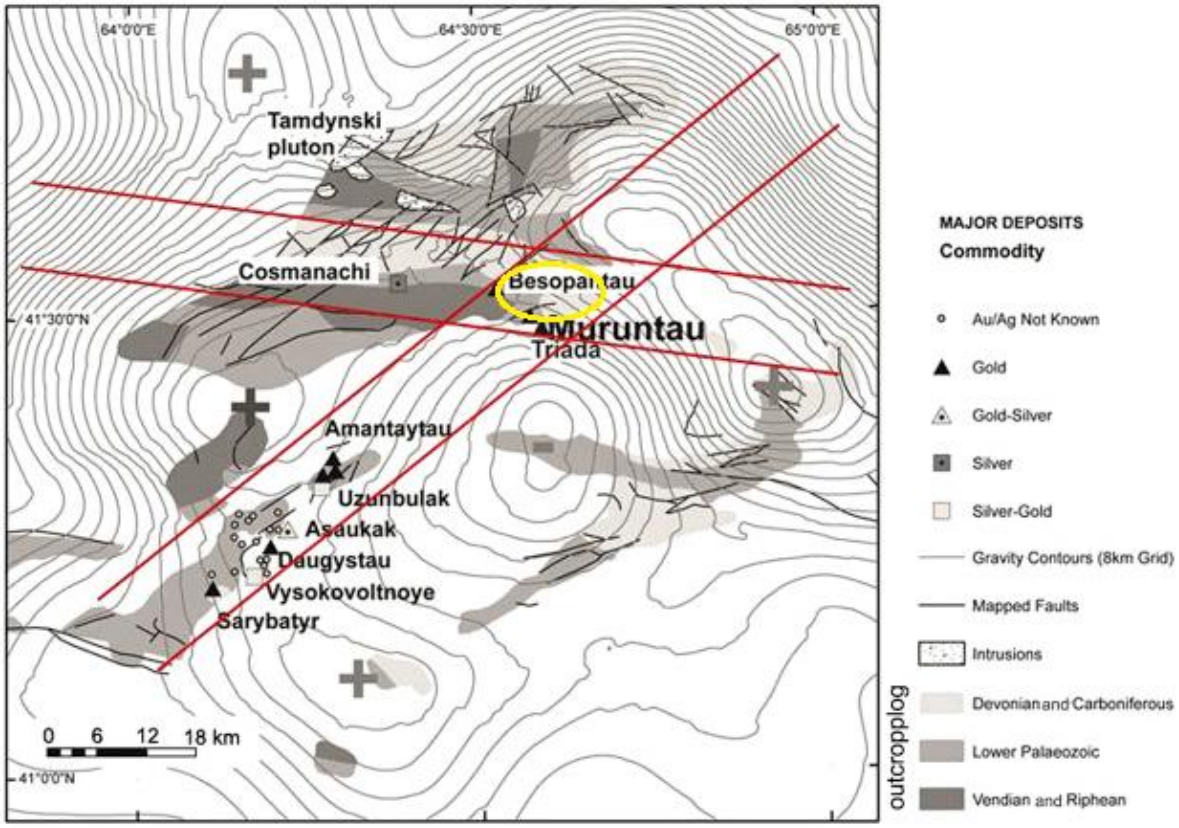


Figure 14-2: Position of gold and silver deposits in the Central Kyzylkum area

Within Figure 14-2, Muruntau is located at the junction of two main structural zones (in red). The north-east structural trend is thought to represent a trans-crustal shear zone and a sub-horizontal structural trend reflecting the east-west strike of thrusted stratigraphy and fold axes[142]. The Project area is located within yellow circle within the map.

In addition to gold, the mountains in the general Project area contain deposits of minerals such as coal, iron, and sulphur. There is considered a potential for mineral reserves within the site area itself.

Table 14-1 illustrates the mineral resources present within Uzbekistan.

[142] Kempe, U., Graupner, T., Seltmann, R., de Boorder, H., Dolgopolova, A., van Emmichoven, M. (2016). The Muruntau gold deposit (Uzbekistan) – A unique ancient hydrothermal system in the southern Tien Shan. Geoscience Frontiers 7 (2016), 495 – 528.

Table 14-1: Mineral Resources

Mineral	Predicted existence (x1000 tonnes)
Fuel and energy raw materials (slates)	2,425,062.6
Moulding materials	76,073
Glass raw materials	80,872
Phosphorous ores	41,627.9
Mineral salt	362.6
Kaolin ore	16,386
Wollastonite	71,001.4
Semi-precious stones	256.3
Turquoise	2,065.1
Bentonite	24,402
Slabs for construction and silicate	15,071
Sand crushed material	14,797
Brick cher	86,949.6
Stones	206.1
Mineral fibres	1,955.8
Cement raw materials	939,294.9
Marble and granite	102,944.8

14.3.2 Seismic Conditions

Uzbekistan, located in the middle of central Asia, is situated in an area of transition from the mountain structures of the Tien Shan to the Turan platform. This transitional area is characterised by heterogeneous manifestations of seismicity due to the complex geodynamic interaction of lithospheric plates.[143]

Uzbekistan lies within a zone of high seismic activity. The Tamdy region lies within a medium seismic hazard level. This means that there is a 10% chance of a potentially damaging earthquake occurring in the next 50 years.

For the Project site itself, the Global Seismic Hazard Map developed by OpenQuake indicates that bedrock Peak Ground Accelerations (PGA) illustrates a seismic hazard of less than 0.05g implying a low seismic hazard level (Figure 14-3). This refines the percentage chance of a potentially damaging earthquake occurring in the next 50 years to 2%. This translates to three earthquakes every 150 years.

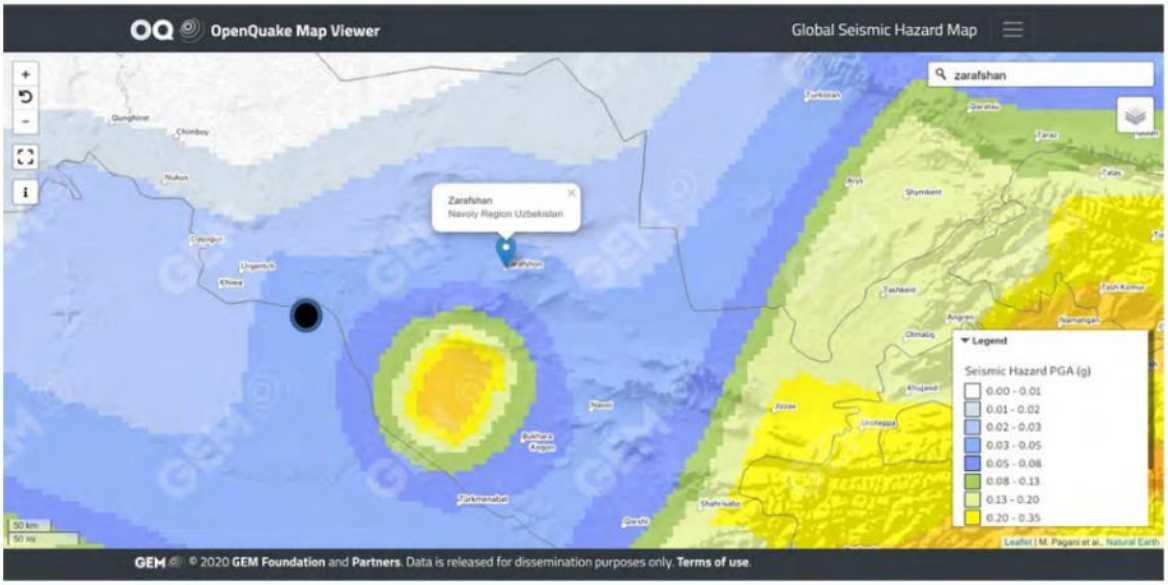


Figure 14-3: Global Seismic Hazard Map[144]

[143] Ulomov V.I. Dynamics of the Earth's crust in Central Asia and earthquake forecast.Monography. Tashkent: FAN. 1974. Pp-218 (In Russian)

[144] OpenQuake, 2020

The map in Figure 14-4 illustrates that the Project site is within an area identified as point 7 intensity of potential shocks according to the European Macroseismic Scale (EMS) 98. The EMS is used as a basis for assigning seismic intensities in European countries. It relates to the classification of the severity of ground shaking on the basis of observed effects in a limited area.[145]

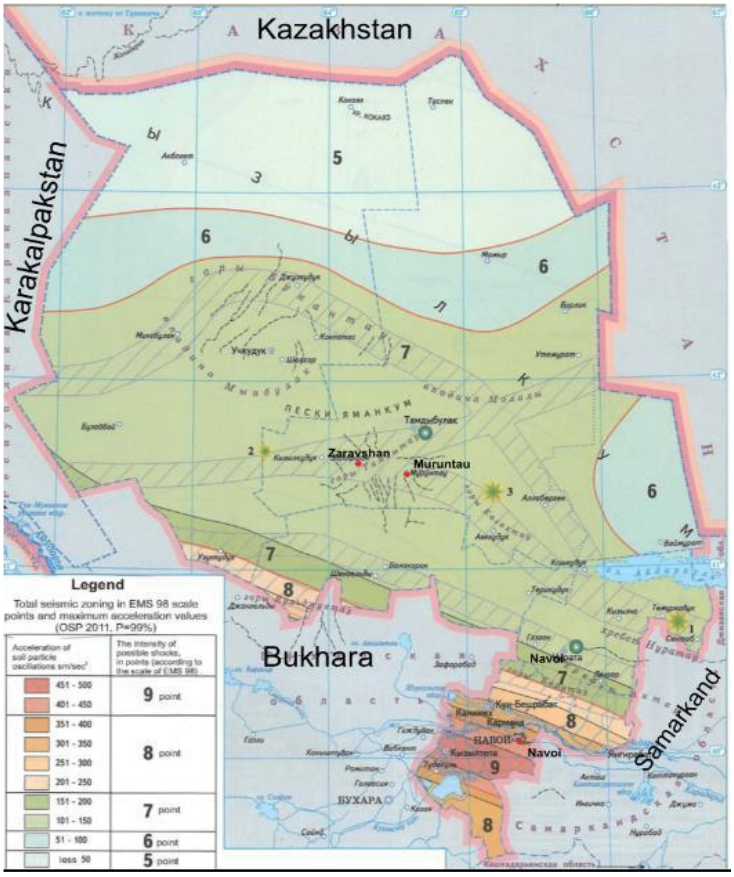


Figure 14-4: Seismic Map of Navoi Province[146]

A map sourced from the Seismology Institute (Figure 14-5) shows "fault systems" in eastern Uzbekistan. The Project area is located inside the blue circle in the top left corner of the map. Black dots on the map indicate observed faults.

[145] https://www.gfz-potsdam.de/en/section/seismic-hazard-and-risk-dynamics/data-products-services/ems-98-european-macroseismic-scale/

[146] https://www.gfz-potsdam.de/en/section/seismic-hazard-and-risk-dynamics/data-products-services/ems-98-european-macroseismic-scale/

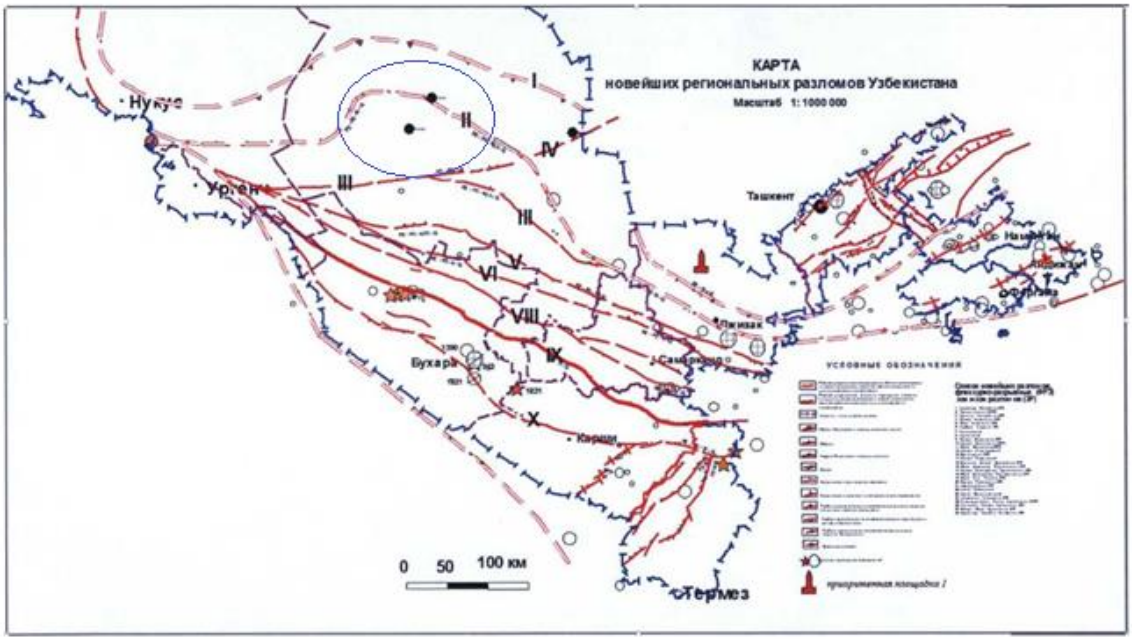


Figure 14-5: Schematic map of fault systems in eastern Uzbekistan (Fault system I – North Kyzylkumskaya; II – Bukantau.)[147] (Project area is located within blue circle)

14.3.3 Soils

The Project site consists of desert type soils. The plains area contains cretaceous and tertiary sedimentation. Soils are rubbly grey-brown and subject to erosion. Grey-brown soils are often saline and solonetzic, the most part eroded, sandy-loam, easy-loamy and fine-grained.

A map of topsoil classifications for the Navoi region is presented in Figure 14-6. A vast area of the region is characterised by desert (such as Kyzylkum, Karakum, and Aralkum). The soil group for Tamdy zone is classified as *sand dunes and calcisol*.

[147] http://seismos-u.ifz.ru/personal/centrasia.htm

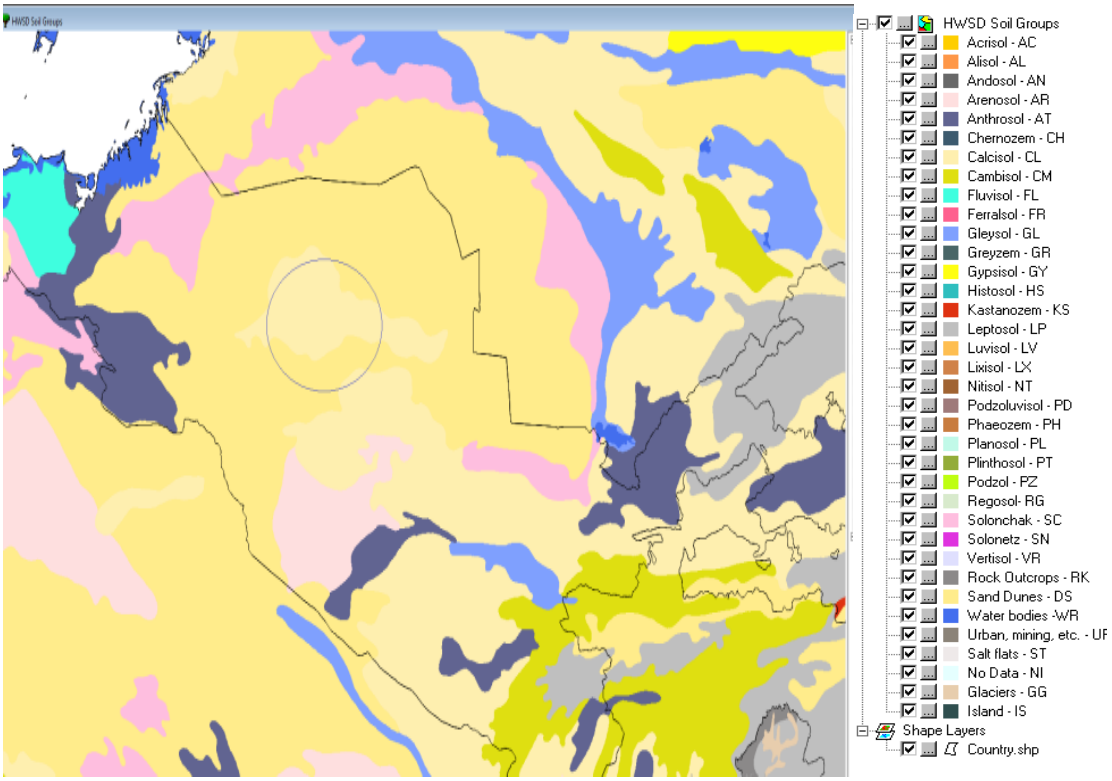


Figure 14-6: Soil classification map for Navoi region[148] (Project area located within grey circle)

In Uzbekistan, land degradation occurs mostly as secondary salinisation, rangeland degradation and desertification, as well as soil erosion. Adverse environmental impacts due to land degradation include the drying up of the Aral Sea, water and air pollution caused by salinisation and erosion, which result in the loss of biodiversity and reduction of land ecosystem services. [149]

On average, sand and dust storms occur 20 days a year, mostly during summer, when there is high evapotranspiration. The average temperature in the region in July is 23.7°C, with a maximum of 46°C having been recorded.

As such, soils are vulnerable to erosion and desertification.

[148] http://www.fao.org/soils-portal/data-hub/soil-maps-and-databases/harmonized-world-soil-database-v12/en/

[149] Economics of Land Degradation and Improvement – A Global Assessment for Sustainable Development. Edited by Ephraim Nkonya, Alisher Mirzabaev, Joachim von Braun

14.4 Assessment of Effects

The main impacts on soils and geology are likely to arise during the various site preparation and construction activities associated with the Project and its access roads.

Soils in the Project area are identified as vulnerable to erosion and desertification. In particular, soil erosion caused by vehicles on unimproved tracks and water erosion that may occur during winter. Construction activities which may impact and exacerbate soil erosion have been identified and mitigation measures proposed where appropriate.

Soils will remain vulnerable during the operation phase. Soils are assessed as a medium sensitivity receptor. Impacts on soils and geology are discussed below.

14.4.1 Construction

The main impact on soils during construction will be the increase in vulnerability to erosion. The following types of construction activity could lead to potential soil erosion and dust generation:

- Vehicle traffic along dirt tracks used during construction of on- and off-site roads, power lines, control centre and WTGs will cause soil compaction.
- Off-road vehicle traffic will damage vegetation and cause soil compaction.
- Any vegetation and some soil will be removed for the construction workers' accommodation (if required), the substation, WTG foundations, and both on- and off-site roads.
- The use of heavy equipment, including cranes for WTG erection, will cause soil compaction if used off roads.
- Blasting will result in the removal of any vegetation and topsoil and near-surface rock for WTG foundations, possibly for the control centre and for some on-site and access roads.

Soil compaction and loss of vegetation increases the soils' vulnerability to erosion. Soils will be particularly vulnerable during wet weather or after snowmelt, when vehicle traffic is likely to cause the greatest damage.

Where roads are un-surfaced, rutting and gully erosion eventually makes the roads impassable so that vehicles drive off the track and the area affected by erosion continually widens.

Damage to soils has further effects on land use. When soil is compacted, it cannot support the native grasses, and this in turn reduces the pasturage that can be used by the livestock of local herders. In addition, the loss of grass affects biodiversity, since grassland is a food source for small mammals, which in turn provide food for predators.

Furthermore, during the summer months, the soils in the area are often dry. Activities can result in dust generation with impacts on surrounding grazing lands and livestock. In addition, there may be significant geological resources within the Project area, which could restrict the use of these resources during the Project's life.

The sensitivity of soils is medium, and the magnitude of the impact is High, since there is the potential for larger areas around the foundations of the WTGs to be affected during construction, in addition to off-site impacts of roads and power transmission. The significance of the impact is therefore assessed as Major. The impact should be of relatively short duration, lasting only through construction of the WTG foundations and roads. Once WTG foundations have been buried and roads have been narrowed, a much smaller area will be affected, and previously disturbed areas will have been reclaimed.

There is potential for soils to be contaminated by waste. Liquid wastes such as oils and sanitary waste are discussed in Chapter 13 (Hydrology and Hydrogeology). Inert waste will be taken off-site and disposed of in a suitable landfill site. Because residual waste is very low, the significance of the impact is assessed as minor.

14.4.2 Operation

During this phase of the Project, the main impacts on soils would be from continued vehicle traffic. Vehicle movements will comprise:

- Movement of staff and materials to and from the site along the access roads. As described in Chapter 2 (Project Description).
- Movements between the control centre and WTGs for operation and maintenance. Workers are expected to visit each WTG location at least once per week for routine maintenance.

There should be no need for vehicles to travel off the improved roads, and this should be actively discouraged. As described under construction above, the main risk to soils would be where vehicles leave prepared roads and drive cross-country. If designated roads are not used, vehicle movements will cause damage over a wide area around the WTGs or other off-road areas. The soils are a medium sensitive receptor, but the magnitude of the effect during operation is low, since there will be much less frequent traffic than during

construction, and only occasional use of heavy equipment. In addition, vehicles will keep to improved roads. The significance of the impact is assessed as minor.

As the Project area is seen to be at a low seismic level, the sensitivity of the Project in relation to seismic activity is considered low. The risk of a potentially damaging earthquake in the Project area within 50 years is 2%. Given that WTGs generally have a lifespan of 25 years, there is only a 1% risk of a potentially damaging earthquake during this time. It should also be noted that a WTG tower is a flexible structure and loads imposed from seismic activity are unlikely to exceed that imposed through operation (such as an emergency stop situation). If such an event occurred, potential impacts such as WTG collapse would be unlikely however should this result, the magnitude of change would be high with low to moderate sensitivity, resulting in an impact of moderate significance prior to mitigation.

14.5 Mitigation

14.5.1 Design

To reduce damage to soils and risks of soil erosion, the length and width of the on-site and off-site roads should be with the route optimized to reduce the need for cut-and-fill material. Run-off and erosion control features should be included in designs.

In Uzbekistan, all buildings are to be constructed in accordance with the Uzbekistan Seismic Specifications KMK 2.01.03-96 (1996) and therefore this will be adhered to for construction of buildings on the Project site.

WTG foundations will be designed for the loads which could reasonably be expected to be applied during the Project's life. This may include seismic loading however emergency stop situations apply very high loads which can exceed any seismic loading and therefore it is unlikely there will be any specific requirement. This will be confirmed at a later stage on appointment of the EPC contractor.

14.5.2 Construction

The mitigation emphasis will need to be on minimizing damage, with reclamation of land being the last alternative for soil protection. Scarifying and planting may help stabilize small areas such as road verges. Mitigation will be incorporated into the construction ESMP and relevant sub-plan(s). Proposed mitigation measures are as follows:

- Clearly demarcate storage and staging areas and store all materials, equipment, and vehicles in demarcated area to reduce soil damage. Furthermore, vehicles should be confined to demarcated roadways.
- Establish native grasses in erosion control channels and in other areas immediately after final disturbance.
- Salvage and store topsoil and subsoil before areas are excavated, with topsoil stripped and stockpiled separately.
- Segregate excavated soils into stockpiles dependant on material type and provide erosion control while stockpiled.
- On completion of earthworks, backfill material in the same stratigraphic sequence.
- When wide roads are narrowed after WTG construction, scarify compacted areas and establish native grasses.
- Development and implementation of a Dust Management Plan and use of water bowsers on roads during dusty conditions (likely summer months).
- Once construction and roadbuilding are complete, scarify all areas compacted by off-road vehicle / equipment movements and establish native grasses.
- Store all materials within designated areas of temporary storage facilities and provide supplies to clean-up of minor spills.
- Confine all vehicles and equipment to the roadway and, to extent possible, minimize activities during wet conditions. When activities must occur in wet conditions, control storm water by using fabric, straw bales, and other measures to impede storm water flow and prevent erosion.
- When damage to wet soil occurs, repair once dry conditions return.
- For storage of oil, establish a designated storage area, with impervious base and impermeable bund walls. Capacity must be sufficient to contain full volume within a bund and secured area.
- Store all fuel, oil, and chemical storage in the designated storage area.
- Check hoses and valves regularly for signs of wear and ensure they are turned off and securely locked when not in use.
- Place diesel pumps and similar items on drip trays to collect minor spillages. Check trays regularly and remove any accumulated oil.
- Reduce the amount of waste to the maximum extent possible.
- Collect all solid waste and store until transported to the designated disposal site.

14.5.3 Operation

Several measures are recommended during operation of the Project to reduce damage to soils. These will be incorporated into the operational ESMP and relevant sub-plan(s). These include:

- Confine all vehicles to roadways.
- Monitor road condition regularly; then repair damaged and rutted roads rather than bypassing damaged sections.
- Monitor erosion controls and repair as needed.
- Maintain grass cover on berms and ditches.
- Prohibit use of vehicles and equipment off prepared roads.
- Re-stabilize existing eroded tracks and restore grass cover as needed.
- Do not collect firewood from the site.
- Reduce wastes to the extent possible and maximise re-use and recycling of materials. Collect and store all waste and garbage before disposal at the designated site.
- Clean up and store oily and chemical waste and contaminated material before transport to the designated disposal site to reduce risk of soil and groundwater contamination.
- Establish a designated storage area with an impervious base, impermeable bund walls, and protected from precipitation. Capacity must be sufficient to contain full volume within a bund and secured area.
- Store all fuel, oil, and chemicals in the designated secure storage area.
- Do not leave vehicles unattended during refuelling, never leave open a delivery valve.
- Check hoses and valves regularly for signs of wear and ensure that they are turned off and securely locked when not in use.
- Place diesel pumps and similar on drip trays to collect minor spillages. Check trays regularly and remove any accumulated oil.

14.6 Cumulative Impacts

There is the potential for cumulative impacts relating to erosion however the OHL upgrade project is of sufficient distance and adequate mitigation is proposed for these impacts not to be significant. Furthermore, the operation of the mine to the south-east of the Project is not predicted to result in any impacts.

14.7 Residual Effects and Summary

No residual effects on geology or seismic risk are predicted to occur.

The most significant impacts on soils have been assessed as occurring during construction as a result of vehicle traffic, topsoil stripping, use of heavy equipment and blasting (if applicable). Impacts should be relatively short in duration, lasting only through construction of the WTG foundations and the roads. Following implementation of mitigation measures, impacts are expected to reduce to moderate to minor and therefore not significant.

During operation, impacts on soils are less significant and mainly confined to continued vehicle traffic. The main risks are associated with vehicles leaving the prepared roads and driving cross-country. With mitigation implemented, these risks should be reduced, resulting in minimal residual impacts.

15 Aviation, Radar and Telecommunications

15.1 Introduction

A number of impacts on aviation and radar (both direct and indirect) can occur as a result of the presence of WTGs. Direct impacts relate to WTGs presenting as an obstacle where the WTG produces a physical obstruction to the continued safety of a flight. Principally, this would occur where the aircraft are closest to the ground, for example, on take-off and landing from or to aerodromes, or when taking part in low-flying activities such as military low-flying[150]. WTGs can also cause radar and other navigational aid interference whereby the blades appear as 'clutter' on radar screens and can be mistaken for aircraft.

This chapter aims to establish the potential impacts associated with the Project and nearby airports, radar systems and telecommunications.

15.2 Baseline Information

15.2.1 Military radar and communication systems

There is a non-directional beacon (NDB) located near Tamdybulak airport, around 20 km north-west of the nearest WTG. NDBs are installed at strategic points on the flight path or at airports, emitting non directional radio beams on medium-and long-wave bandwidths to enable aircraft to track the direction of ground facilities using the onboard Automatic Direction Finder (ADF).

15.2.2 Aviation

The locations of airports and airfields in the neighbourhood of the Project were identified using Google Earth and OurAirports[151]. A 30 km study area was utilized for identifying airports and airfields due to the potential for collision risk or aviation radar impacts within 30 km of WTG locations.

The closet airport is Zarafshan at a distance of around 5.8 km west-north-west of the western edge of the Project site. Zarafshan is served by Uzbekistan Airlines with direct daily flights to and from Tashkent. Other airports within 30 km of the Project site include:

- Muruntau South-East – located around 16.5 km east of the nearest WTG.

[150] https://www.bbga.aero/wp-content/uploads/2011/08/20130701ManagingTheImpactOfWindTurbinesOnAviation_Script_FINAL_V1.pdf

[151] ourairports.com/

- Tamdy Bulak – approximately 20 km north-west of the nearest WTG.

15.2.3 Aviation /Radar Consultation

Consultation took place in November 2020 with the Republic of Uzbekistan aviation authorities and specialists of the Flight Safety Department of the Civil Aviation Authority (CAA). Two meetings were held with the head of the Uzbekistani aeronavigation centre (TSUAN) and ATS specialists (air traffic control department). The CAA specialists provided information on requirements to be applied following construction and commissioning of the Project.

The specialists confirmed that the Project is within a 15 km radius of an airfield control point of the nearest airfield (Zarafshan Airport).

On confirmation of the final layout for the Project, the WTG details will be required to be provided (coordinates and height). If this shows that WTGs are higher than 50 m relative to the height of the airfield and located within a radius of up to 30 m from the airfield control point, then it will be necessary to conduct a study to determine the influence that the WTGs will have on flight visibility and radio communications.

Consultation has confirmed that permission will be required from the CAA. The permit will then be issued in accordance with the requirements of the Resolution of the Cabinet of Ministers RUz (Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 226 dated 11.08.2014). The documentation required in support of the application includes:

- Application completed in accordance with the established form (in print or electronic form).
- Technical documentation for construction of the Project.
- The coordinates of the WTGs in WGS84 coordinate system.
- The layout of the Project (1: 500,000).
- Plan of the Project site (indicating the size of the WTGs in the horizontal plane).
- Protocols for the studies of the quality of atmospheric air, noise levels, electromagnetic radiation at the height of the WTGs etc. (this document should be coordinated with the State Committee for Ecology so likely required following permission for the Project).

AP RUZ- 150 Regulation (as set out in Chapter 3, Section 3.1.11), regulates the marking and equipment of facilities located near civil aviation airfields.

According to AP Ruz-150, stationary objects with a height of 50 m or more, regardless of their location, must be marked (Chapter IV, clause d, clause 11).

Chapter V, clauses 12- to 23 states that "White lights operating in flashing mode can be used to illuminate freestanding obstacles located outside the airfield zones that do not have extraneous lights around them. The flash strength of the obstruction light must be at least 10 candelas (cd) and the flash rate must be at least 60 per minute."

Other requirements for equipping objects with light-shielding lights will be provided once the CAA specialists study the coordinates of the WTGs (in the WGS-84 system) and their technical characteristics. After receiving the data in the required format, specialists will hold meetings with the Developer or their representative to determine additional requirements or change the conditions of requirements, depending on the initial data.

15.2.4 Electromagnetic Interference

The IFC EHS Guidelines for Wind Energy[152] states that "*wind turbines could potentially cause electromagnetic interference with telecommunication systems (e.g., microwave, television, and radio). This interference could be caused by path obstruction, shadowing, reflection, scattering, or re-radiation. The nature of the potential impacts depends primarily on the location of the wind turbine relative to the transmitter and receiver, characteristics of the rotor blades, signal frequency receiver characteristics, and radio wave propagation characteristics in the local atmosphere*".

Interference can be produced by three elements of a WTG: Tower, rotating blades and generator. Tower and blades may obstruct, reflect or refract the electromagnetic waves. Modern blades are typically made of synthetic materials which have a minimal impact on the transmission of electromagnetic radiation. The electrical system is not usually a potential problem on telecommunications because interference can be eliminated with proper nacelle insulation and good maintenance. Interferences to mobile radio services are usually negligible whilst interference to TV signals have been clearly minimized with the substitution of metal blades with synthetic materials.[153]

[152] IFC (2015) Wind Energy – Environmental, Health and Safety Guidelines.

[153] https://www.wind-energy-the-facts.org/electromagnetic-fields-and-marine-organisms-5.html

Should any complaints be received from local communities or stakeholders through the grievance mechanism or otherwise with regards to signal interference, then the Project Company will employ and independent engineer to investigate and provide mitigation in the event of a valid complaint. As the Project is some distance away from settlements, there are unlikely to be any issues with interference.

15.3 Assessment of Effects

Given the proximity of the Project to Zarafshan Airport and radar, prior to mitigation it is considered that the Project would result in effects of Moderate significance during operation. Mitigation set out in Section 15.4 would assist in reducing these effects to Minor.

15.4 Mitigation and Monitoring

15.4.1 Pre-Construction

Once the final Project layout is agreed, consultation will need to take place with the CAA to provide the information required to obtain a permit for the Project. The documentation required in support of the application, is set out in Section 15.2.3 above.

15.4.2 Construction

One the WTGs are erected, their final positioning (coordinates) and height information should be provided to the CAA. Furthermore, WTGs will likely be required to have some form of lighting installed which should be agreed prior to WTG erection.

15.4.3 Operation

No specific operational mitigation is required.

15.5 Residual Impacts

With mitigation there should be no significant residual effects on aviation and radar interests as a result of the Project.

16 Climate Change

16.1 Introduction

This report forms the Climate Change Risk Assessment (CCRA) for the Project to ascertain on-going and expected changes in climatic patterns and an evaluation of the climate-related physical risks and transitional risk (as appropriate). Furthermore, a greenhouse gas (GHG) emissions calculation is also provided.

The CCRA provides a high-level review of the following:

- The current and anticipated climate change risks (transition and / or physical as defined by the Task Force on Climate-related Financial Disclosures (TCFD) of the Project's operations.
- The plans, processes, polices and systems required for the Project to manage these risks (i.e. to mitigate, transfer, accept or control).

The assessment will also include a review of the Project's compatibility with Uzbekistan's national climate commitments.

16.1.1 Applicable Requirements

The Equator Principles (EPs) are a financial industry benchmark for determining, assessing and managing environmental and social risks of projects. There are 10 EPs which require consideration when developing a project with international funding. The latest revision (EP V4) came into effect in October 2020. The updates included a requirement to undertake a CCRA for all Category A and, as appropriate, Category B Projects. Due to the nature, location and scale of this project, it is considered to fall under Category A – *"Projects with potential significant adverse environmental and social risks and / or impacts that are diverse, irreversible or unprecedented."*

The CCRA guidance also details the requirement for greenhouse gas (GHG) emissions calculations to be included (see Section 16.3 for further information). GHG emissions considerations are also set out in the following:

- IFC PS3 & EBRD PR3 (pollution prevention and abatement).
- EBRD protocol for assessment of greenhouse gas emissions (2017)[154].

[154] https://www.ebrd.com/documents/admin/ebrd-protocol-for-assessment-of-greenhouse-gas-emissions.pdf

- Guidelines for estimating greenhouse gas emissions of Asian Development Bank projects – additional guidance for clean energy projects (2017).[155]

The CCRA is required to assess potential physical risks and transition risks (the latter only for projects emitting more than 100,000 Tco2e per year). Physical risks include increased extreme weather events, changes in precipitation patterns, rising mean temperatures, sea level rise etc. Transitional risks are defined as policy, technology and market, legal and reputational risks.

Furthermore, the CCRA is required to undertake an alternatives analysis. This is included within Chapter 2 of this ESIA and should be referred to for further details.

The criteria for screening projects against the EPs for climate assessment are set out in Table 16-1.

Table 16-1: Criteria for Screening Projects against the EPs for Climate Assessment

Assessment Type	Recommendation Type	Criteria
Climate Change Risk Assessment – Physical risks	Requirement	For all Category A and, as appropriate Category B Projects
Climate Change Risk Assessment – Transitional risks	Requirement	For all Projects, in all locations, when combined Scope 1 and 2 emissions are expected to be more than 100,000 Tco2e annually.
Climate Change Risk Assessment – Physical risks	Requirement	For all Category A and, as appropriate Category B Projects
GHG Assessment	Requirement	For all Category A and, as appropriate Category B Projects, where combined Scope 1 and 2 Emissions during the operational phase of the Project are expected to be more than 100,000 Tco2e annually.
	Recommendation	For all Projects that are expected to emit over 25,000 Tco2e.

[155] https://www.adb.org/sites/default/files/institutional-document/296466/guidelines-estimating-ghg.pdf

Assessment Type	Recommendation Type	Criteria
GHG Assessment – Alternative analysis	Requirement	For all Projects, in all locations, when combined Scope 1 and 2 emissions are expected to be more than 100,000 Tco2e annually.

16.2 Risk Assessment

16.2.1 Overview

As discussed within Section 16.1.1, the revised EPs (IV)[156] introduced the requirement to carry out a CCRA aligned with the Climate Physical Risk and Climate Transition Risk categories set out in the Recommendations of the Task Force on Climate-Related Financial Disclosures (TCFD)[157]. The CCRA presents an overview of the global and regional climatic trends, an assessment of the Project's GHG emissions and an evaluation of climate-related risks for the Project.

The risk assessment reviews the climatic patterns over the Project location and surrounding area over recent years including changes in temperature, precipitation, wind and hazardous climatic events. Projected trends are set out for the coming years up to 2100 with a risk evaluation undertaken detailing physical risks in line with TCFD recommendations.

16.2.2 Baseline Information

16.2.2.1 Legislative background

Uzbekistan joined the United Nations Framework Convention on Climate Change (UNFCCC) in 1993 as a non-Annex I party and ratified the Kyoto Protocol in 1999. Up until 2019, Uzbekistan did not have a focused and overarching climate change policy document to provide a strategic framework for national climate change adaptation and mitigation actions[158].

[156] https://equator-principles.com/

[157] https://assets.bbhub.io/company/sites/60/2020/10/FINAL-2017-TCFD-Report-11052018.pdf

[158] https://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2015/05/UZBEKISTAN.pdf

In 1999, the National Strategy on Sustainable Development was introduced governing climate change policies and actions. This included leveraging international cooperation, taking account of climate change impacts transcending national borders and requiring regional and global action in addition to setting out the climate change policy context in the country.

In 2019, the Republic of Uzbekistan, set out a strategy for the transition to a green economy from 2019 to 2030 period[159]. The resolution sets out a strategy aiming to improve energy efficiency, rational consumption and conservation of natural resources, reducing GHG emissions, ensuring access to green energy, creating "green" jobs and ensuring climate resilience. Goals and priorities include (amongst others):

- By 2030, a reduction in GHG emissions per unit of GDP of 10% from 2010 levels and twofold increase in energy efficiency.
- The creation of a monitoring, reporting and verification system on GHG emissions, taking into account national circumstances, to continuously track the implementation of the country's quantitative obligations under the Paris Agreement and ensure GHG reporting.
- Further development of renewable energy sources, with coverage of more than 25% of the total volume of electricity generation.
- Development of a climate monitoring system.
- The introduction of a system of "green" lending and financing.

Fulfilment of the UNFCCC obligations falls under the responsibility of the Centre of Hydrometeorology (Uzhydromet).

Climate change is also addressed in various policy documents including (but not limited to):

- Resolution of the Cabinet of Ministers No. 142 (2013) – Action Plan of the Republic of Uzbekistan for Environmental Protection.
- Resolution of the Cabinet of Ministers No. 183 (2007 and updated in 2019) – Improvement of the Hydro-meteorological Service of the Republic of Uzbekistan.

[159] Resolution of the President of the Republic of Uzbekistan No.PP-4477 Strategy for Transition to a Green Economy.

- Resolution of the Cabinet of Ministers No. 9 (2007) – Approving the Order of Preparation and Implementation of Investment projects in the framework of the Clean Development Mechanism under the Kyoto Protocol.

16.2.2.2 Temperature

The region experiences hot and arid conditions in summer and very cold temperatures in winter. Over the course of the year, the temperature typically varies on average from around -1°C in January to around 30°C in July. The average annual temperature in the region is around 15°C. The temperature range and averages are set out within Figure 16-1 below. In January and February, temperatures can fall as low as -25°C whilst a maximum of 47°C occurs in July.[160]

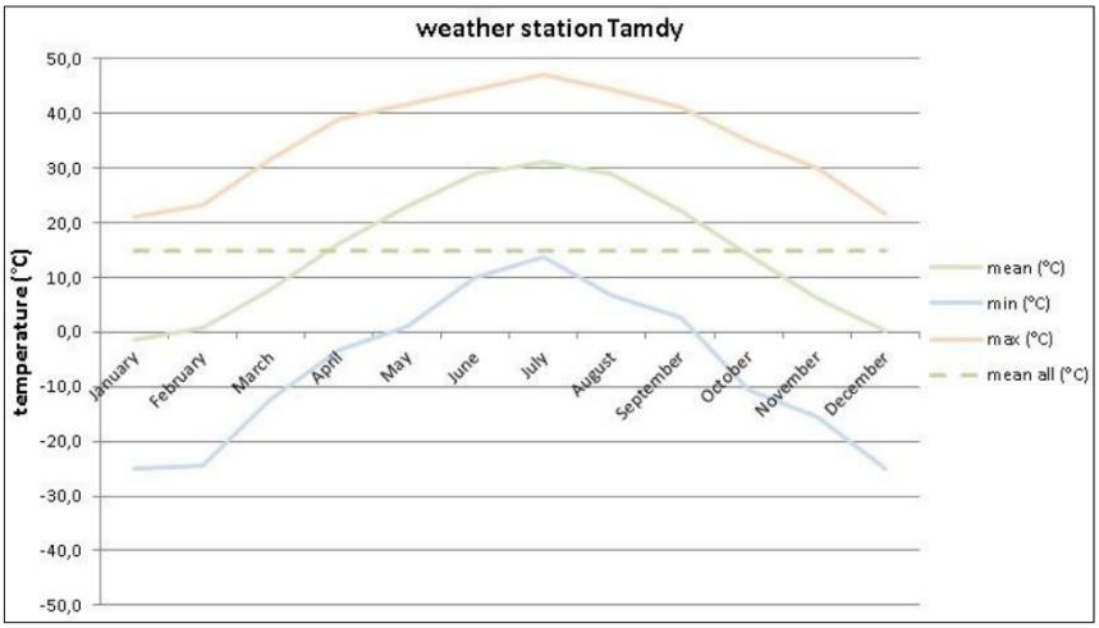


Figure 16-1: Annual Temperature (Tamdy Weather Station)[160]

Warming rates observed in Uzbekistan since 1951 exceeded the average rates around the world more than twice, with particularly significant changes being observed in summer and fall for most of the country's territory. Warming rates in the mountainous regions have been somewhat lower.[161]

[160] Intec (2014), Assessment of Wind Power Potential Development of the Republic of Uzbekistan - Mesoscale Modelling and Site Selection Report.

[161] http://infoclimate.org/wp-content/uploads/2014/04/Uzbekistan_Country_Profile-EN.pdf

16.2.2.3 Precipitation

As also discussed within Chapter 8, the annual precipitation varies between 100 and 111 mm per year with the majority of rainfall occurring in March and April. The driest months are June to August. The average precipitation per month is set out in Figure 16-2 below.

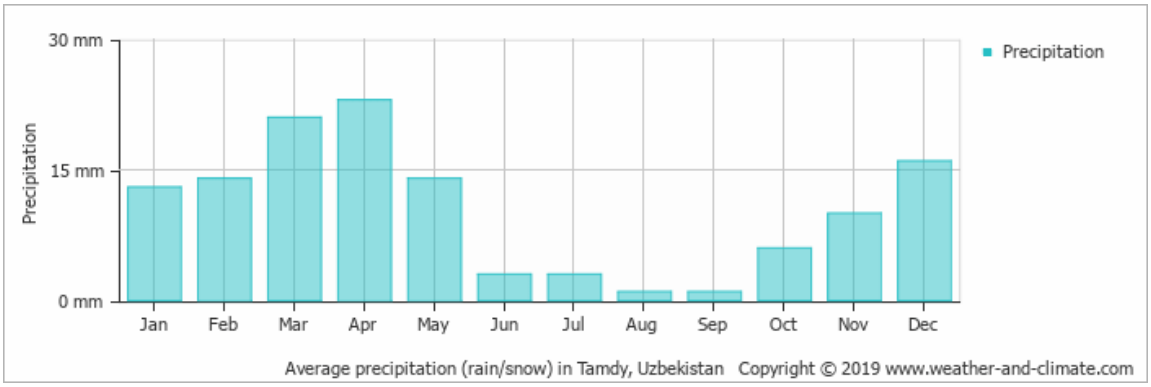


Figure 16-2: Average Precipitation (rain/snow) in Tamdy Region[162]

16.2.2.4 Wind

The Mesoscale Modelling and Site Assessment Report (October 2014) produced for NPC Uzbekenergo and the Word Bank provides information on wind speed and distribution across Uzbekistan and focusing on key areas including Zarafshan.

Figure 16-3 illustrates the qualitative wind speed distribution (average wind speed) for 80 m above ground level across the country. On review of the map, it can be seen that the Project area is within an area of relatively high wind speeds (orange area to the north-west of Navoi).

[162] www.weather-and-climate.com (accessed April 2021).

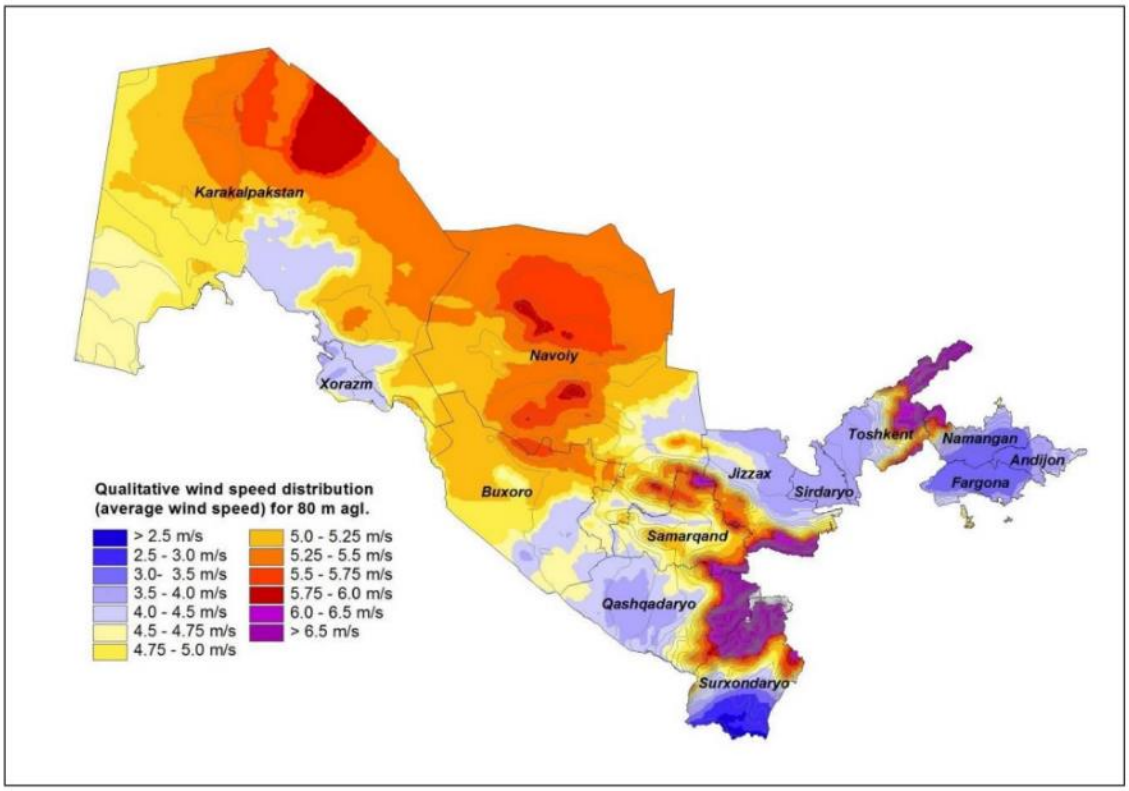


Figure 16-3: Wind Atlas of the Republic of Uzbekistan[160]

Information obtained from Tamdy weather station details that the predominant wind direction is easterly for the Project area.

16.2.2.5 Hazardous climatic events

Uzbekistan is at risk of hydrometerological hazards primarily affecting the agricultural sector through seasonal flooding and periods of drought. Threats from landslides and avalanches have also been observed.

Aridity and drought risks are high with increased demand and consumption from economic development and population growth. Water scarcity, heat waves and increased frequency of high heat days (over 39°C) are the most severe risks from climate change.[163]

[163] World Bank Climate Change Knowledge Portal https://climateknowledgeportal.worldbank.org/country/uzbekistan/vulnerability (Accessed April 2021).

Drought events occur over the Project area and wider region. Flooding in the Project area is not common with only a small area detailed within World Bank data to experience flood events south of the Project near the Muruntov mining area (90 cm inundation height, once in 100 year mean return period). No landslides (earthquake or precipitation-triggered) are detailed to occur within the Project area or wider region.[163]

It can therefore be concluded that the greatest hazardous climatic events to occur within the Project area and wider region is drought.

16.2.2.6 Predicted climate change

Uzbekistan is predicted to experience an increase in high temperatures, prolonged heat waves and longer Summer season. This will result in increased drought and aridity within the region. Aridity is particularly likely to increase in the western areas of Uzbekistan (including where the Project is located).

Projections suggest that the average temperature increase over the next 50 years is expected to be 2-3°C whilst water flow may potentially decrease by 2 to 5% in the Syrdarya River Basin and by 10-15% in the Amudarya River Basin by 2050, worsening the water scarcity situation.

Increase in temperatures coupled with a decrease in water supply across the country is expected to increase the proliferation of waterborne diseases as well as of various health issues caused by dust storms, desertification, heat stress, and extreme weather events.[164]

Precipitation changes are more uncertain however it is generally forecast to increase. Despite this forecast increase, precipitation is likely to decrease from June to August in desert and steppe zones when it is already at a very low level[161].

Climate warming is also predicted to shift the boundaries of spring frosts with potential adverse impacts on the agricultural sector.

16.2.3 Risk Evaluation

16.2.3.1 Physical risks

The increasing air temperatures and high number of high heat days is predicted which could result in drought conditions and increased aridity.

[164] Uzbekistan overview of climate change activities (2013) http://infoclimate.org/wp-content/uploads/2014/04/Uzbekistan_Country_Profile-EN.pdf

Increases in the number of high temperature days could damage Project infrastructure and maintenance activities would likely be restricted on these days. Furthermore, high temperatures result in lower air density thereby potentially reduced energy output.[165] This would result in a high magnitude of change and moderate to major impacts prior to mitigation.

The IFC EHS Guidelines for Wind Energy[166] states that *"A failure of the rotor blade can result in the "throwing" of a rotor blade, or part thereof, which may affect public safety. The overall risk of blade throw is extremely low… Turbines must be sited at an acceptable distance ("setback") between wind turbines and adjacent sensitive receptors to maintain public safety in the event of ice throw or blade failure."*

In terms of management of blade throw, the IFC Guidelines include management guidelines for site design to include establishing setback distances between WTGs and populated locations. The Guidelines state that a "*minimum setback distance is 1.5 x turbine height (tower + rotor radius), although modelling suggests that the theoretical blade throw distance can vary with the size, shape, weight, and speed of the blades, and the height of the turbine. It is therefore recommended that the minimum setback distances required to meet noise and shadow flicker limits be maintained with respect to sensitive residential receptors to provide further protection."*

Furthermore, a study by MMI Engineering for the UK Heath and Safety Executive estimated that at a distance of two times the WTG's height from the tower base, the risk that a thrown blade would directly strike someone causing a fatality is 1 in 100 million and the risk of an indirect impact is 1 in 10 million[167].

There is the potential for ice throw from WTG blades to increase with climate change however, there is a recognised safe buffer of 1.5 x (WTG hub height + rotor diameter). This equates to 375 m for this Project with the nearest receptor to a WTG, 940 m away.

[165] DNV-GL (2016) Extreme temperature conditions for wind turbines. https://rules.dnv.com/docs/pdf/DNV/RP/2016-04/DNVGL-RP-0363.pdf

[166] IFC (2015) Wind Energy Environmental, Health and Safety Guidelines.

[167] Residential Buffer Zones for Wind Turbines: the evidence (2013) http://cdn.pes.eu.com/assets/misc_dec/buffer-zonespdf-192550783046.pdf

No WTGs are located within the ice throw buffer (375 m) of permanent residential properties. No significant impacts are therefore anticipated. Sufficient buffer should be maintained as per current design. This will ensure a suitable set back distance is maintained to mitigate any blade throw impacts.

During the operational phase, warning signs will be located throughout the wind farm area of potential blade throw impacts for any land users utilising the Project site.

16.2.3.2 Transitional Risks

The evaluation of transitional risks has not been assessed for this Project given that electricity is generated from a renewable source and GHG emissions relating to the Project are only due to machinery and facilities used during construction and maintenance and repair activities carried out during operations.

16.3 GHG Emissions Assessment

16.3.1 International Requirements

The Intergovernmental Panel on Climate Change (IPCC) is the United Nations body for assessing the science related to climate change. It was created to provide policymakers with regular scientific assessments on climate change, its implications and potential future risks, as well as to put forward adaptation and mitigation options. The fifth assessment report was produced in 2013/14 and the sixth report is currently underway, due for release in 2022.[168]

The IPCC first produced guidelines in 2006 for national GHG inventories which were refined in 2019. The aim of the guidelines is to support the preparation of the national GHG inventories by the member countries, by providing default values of emission factors for various fuels and sectors, to allow the quantification of GHG emissions based on national data. The methodologies were updated in 2019.

Further to this, International Finance Institutions (IFIs) such as IFC and EBRD are committed to the reduction of GHG emissions as reflected in their standards and requirements. These are underpinned by the EPs (as described further within Section 16.1.1).

[168] https://www.ipcc.ch/

In accordance with EPs Version 4, for projects with Scope 1 (direct) and Scope 2 (indirect) GHG emissions totalling more than 100,000 Tco_2e per year, reporting of GHG emissions must take place.

16.3.2 National GHG Emissions Overview

Uzbekistan has established a carbon intensity target in its Intended Nationally Determined Contribution (INDC), pledging to decrease emissions of GHGs per unit of GDP by 10% by 2030 from the 2010 levels. Achieving this target ensures development of the economy along with curbing GHG emissions growth[169].

Uzbekistan's total GHG emissions in 2014 were 214.70 million metric tons of carbon dioxide equivalent ($MtCO_2e$), totalling 0.44% of global GHG emissions. The energy sector serves as the predominant source of GHG emissions in Uzbekistan, with 89.4% of emissions from energy emissions, 13.1% from agriculture, 2.7% from industrial processes, and 2.4% from waste. Uzbekistan's land-use change, and forestry (LUCF) sector was a net carbon sink, absorbing 16.40 $MtCO_2e$ more than was emitted from that sector in 2014[169].

[169] https://olc.worldbank.org/content/greenhouse-gas-emissions-factsheet-uzbekistan

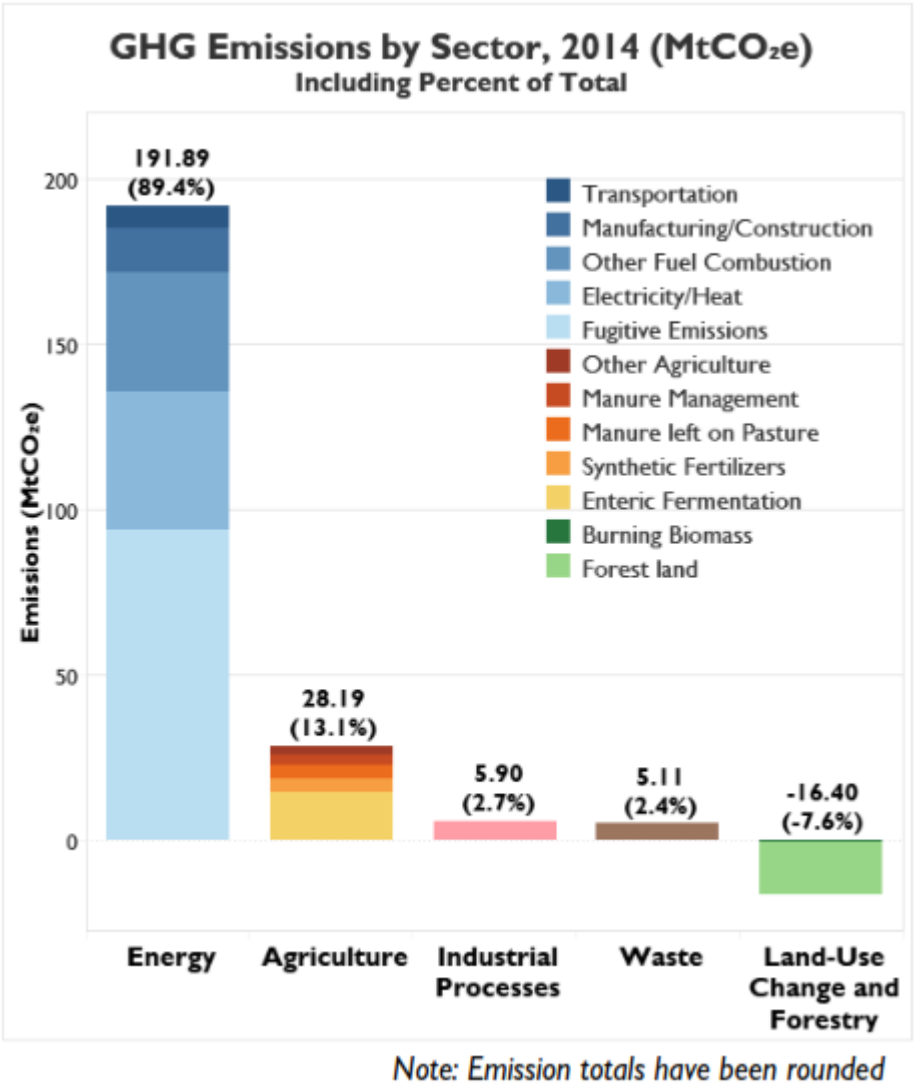


Figure 16-4: Uzbekistan GHG Emission Structure 2014[169]

Uzbekistan's GHG emissions increased by 13% (25.05 $MtCO_2e$) from 1990 to 2014, with an average annual change of 0.6%.

As of 2003, Uzbekistan has been pursuing a new goal to improve energy efficiency and introduce renewables into the energy mix. This goal includes modernizing systems to transport and process natural gas, and associated petroleum gas flaring. The TNC notes that transmission and distribution efficiency is one of the government's main priorities to reduce fugitive emissions.

16.3.3 Project GHG Emissions

16.3.3.1 Construction phase

GHG emissions during the construction phase of the Project relate to the use of fuels for aspects such as generators, transport, on-site equipment, and machinery. The manufacture and installation stages together account for over 90% of the total life cycle carbon emissions of an onshore wind farm[170]. Although the quantities of emissions have not been calculated, these are expected to be around 340,000 Tco_2 based on previous experience.

16.3.3.2 Operational phase

During operation of the Project, there will be minimal GHG emissions, limited to the movement of machinery during maintenance and repair works. Due to the nature of a wind farm, minimal emissions will be emitted during operation of the WTGs.

The emissions factor for the Uzbekistan energy system is 617 tonnes of CO_2 per GWh (sourced from Ministry of Economy).

The Project consists of 111 WTGs with a capacity of up to 500 MW. Using a capacity factor average of 25%[171], the GWh of electricity generated per year by the Project is calculated as:

500 MW x 8,760 hours x 25% = 1,095,000 MWh (1,095 GWh) of electricity per year.

Carbon reduction is calculated by multiplying the total amount of electricity generated by the Project each year by the Uzbekistan emissions factor.

1,095 GWh x 617 = 675,615 tonnes of carbon emissions saved through operation of the Project each year.

The project will contribute to Uzbekistan's target to reduce annual GHG emissions per unit of gross domestic product by 10% by 2030 (relative to 2010), thereby providing a minor overall benefit.

[170] https://www.climatexchange.org.uk/media/1459/life_cycle_wind_-_executive_summary_.pdf (accessed April 2021)

[171] Theoretical actual average output of a WTG.

16.4 Mitigation

16.4.1 Climate Change

Increases temperature and high temperature days could damage Project infrastructure. It is envisaged that insurance could cover these extreme events with engineering solutions also possible (such as modification to the cooling system) thereby reducing moderate to high impacts to low.

To reduce emissions during the construction, the following can be considered:

- Use of low-carbon HGVs.
- Securing a grid connection rather than use of generators.
- Use of recycled materials where possible for construction.
- Design of buildings and placement of windows so as to reduce air conditioning cooling requirements or potentially heating requirements in winter.

A rise in air temperatures and irregular rainfall events could impact on water availability and also increase the occurrence of dust. During construction (and also operation, as applicable), water conservation measures should be implemented including recycling of water where possible (for example, use of grey water for dust-dampening measures as required).

Given the nearest farm (Receptor 9) is around 940 m from the nearest WTG, ice throw should not be an issue however it is recommended that physical and visual warnings are provided for site workers during operation and local farmers / herders.

If required, WTGs can be shut down if ice accumulation is visualised by site personnel.

16.5 Residual Effects and Summary

The residual risks associated with climate change to the Project are anticipated to be low with mitigation measures in place. Benefits are envisaged through carbon emission reductions each year by reducing reliance on fossil fuels for electricity generation.

No significant residual impacts are anticipated.

17 Summary of Impacts

Table 17-1 provides a summary of impacts during construction and operation in the absence of mitigation. Mitigation and monitoring measures are set out in Chapter 18 (ESMP).

Note that the table below is not an exhaustive list of all impacts and mitigation measures. For this, each individual chapter of the ESIA should be consulted.

Table 17-1: Summary of Impacts and Mitigation

Environmental Receptor	Predicted Impact	Mitigation / Enhancement
Ornithology	Impacts during construction include direct loss of habitat and vegetation. Indirect damage to habitats and disturbance of birds occurs through the Prescence of people, machinery, traffic and associated noise both within and outside of the Project area. Furthermore, there are indirect impacts associated with pollution. These impacts are considered low and not significant.	Mitigation including timing of works to avoid periods of high sensitivity (such as when young are in nest), dust suppression, adherence to speed limits and utilizing only designated tracks for vehicles. If required, timing work to remove suitable nesting habitat to avoid the most sensitive times of year for ground nesting species to be done under the supervision of an on-site ecologist.
Ornithology	<u>Collision risk during operation</u> *Cinereous Vulture* – At the predicted collision rate (2.062), unmitigated the Project could cause local extinction of this species within a four-to-12-year period and as such the predicted impacts are considered to be high, long-term and irreversible. *Eurasian Griffon Vulture* – It is predicted that impacts will be moderate, long-term and reversible (assuming decommissioning at the end of operation). *Egyptian Vulture* – collisions at the rates stated (5.859) would potentially cause local extinction and result in high irreversible negative impacts for this species over the lifespan of the Project.	Development of Adaptive Management and Monitoring Plan (AMMP) to include details of general and species-specific mitigation and monitoring. Final Critical Habitat Assessment developed at Final ESIA stage. Utilisation of coloured blades (as per standard aviation markings) on individual WTG blades to increase visibility. Shutdown of WTGs in the event that any individual priority species or significant flock of non-priority species fly within 500 m of WTGs. This would be observer-led shutdown by suitably trained and experienced surveyors. Shutdown on demand protocols to run for the entire operation of the Project unless data collected for at least three years during operation suggests otherwise.

Environmental Receptor	Predicted Impact	Mitigation / Enhancement
	Steppe Eagle – collisions at the rates stated (2.0885) would result in moderate negative impacts for this species over the lifespan of the Project. *Golden Eagle* – No significant negative impacts predicted considering survey findings to date.	Estimates on shut down on demand timings have been made based on activity recorded (using flight line and flight time data) over Spring, Summer and Autumn 2020. These calculations made the assumption that birds would continue to use the Project area in the same way post construction as they did in the 2020 seasons and exercise zero avoidance of WTGs. This is considered a precautionary approach to calculating the shutdown time. Bearing this in mind the hours of shutdown over the project site have been estimated at 864 hrs for Spring (9.4 hrs per WTG), 778 hrs for Summer (8.5 hrs per WTG) and 326 hrs for Autumn (3.6 hrs per WTG). Recruitment and training survey teams from the local community or college / universities to work alongside existing and experienced surveyors until competent. Carcass clearing from the Project site and wider area for the duration of the Project to deter carrion feeders. Potential to coincide with creation of safe carcass dumps well outside of the Project area. Undertake campaign to stop persecution of raptors and other species groups by locals and educating shepherds in use of animal treatments which are potentially harmful to raptors. Review of mitigation strategy annual during operation to account for any natural changes in the ornithological baseline value. Potential to use technology-led shutdown approach but will need to be supported by observers in the early phases of operation to confirm findings. Post-construction fatality monitoring (methodology to be confirmed in the AMP) with methods also applicable to bats. Approaches include searcher efficiency trials, carcass removal trials and carcass searches.

Environmental Receptor	Predicted Impact	Mitigation / Enhancement
		Breeding bird surveys to be carried out (including detailed raptor nest searching) within the Project site and wider area for years 2, 5, 10 and 20 of operation. For the OHL, recommended 300 cm minimum horizontal separation between energized conductors and/or energized conductors and grounded hardware and a vertical separation of at least 120 cm. Material should be used to cover both the conductor and installation and if transformers, cut-outs or other energized or grounded equipment are present on the structure, jumpers, cut-outs and brushing should also be covered to decrease the chance of a bird electrocution. Enhancement – Restriction of human access to certain areas of the Project site to allow for natural vegetation to grow and a programme to discourage locals from removing vegetation or hunting in the area. Erection of nest boxes suitable for falcon species (such as Saker Falcon and Lesser Kestrel) on pylons outside of the Project area (to the west and north west).
Ornithology	Displacement: No birds were recorded regularly enough and/or in large enough numbers during the seasons surveyed to date to suggest the proposed Project will have a significant risk to these species as a result of displacement.	No specific mitigation.

Environmental Receptor	Predicted Impact	Mitigation / Enhancement
Ornithology	Barrier Effect: The Project site is within a large, open and relatively flat landscape and any birds migrating through the operational Project would not have to significantly deviate (either fly around or at greater heights) from their migration route to avoid the WTGs. In isolation, it is therefore considered that the Project will not cause a significant barrier to migrating birds.	No specific mitigation.
Ornithology	Cumulative Impacts: Cumulative impacts resulting from the operation of both the Project and the OHL upgrade project from Navoi to Besapan in combination are considered to be long term and of moderate significance for avifauna.	The mitigation proposed for the OHL within the Project area should also be included in collaboration with the proposed Navoi – Besopan OHL upgrade project at locations where the new OHL is at it's closest to the Project area.
Ecology – general	*Construction* – Direct loss of vegetation and habitat (including food sources). Direct loss of fauna during construction activities. Damage to habitats and disturbance of fauna from presence of people, machinery, traffic, and noise, both within and outside of the Project area. Indirect impacts associated with pollution.	Pre-construction surveys by a qualified ecologist will identify sensitive areas and species immediately before work commences so that they can be captured and moved to safe areas of the site. To reduce the risk of loss of habitat it is proposed that roads, the control compound and other site facilities are clearly demarcated before construction begins. Equipment should also be confined to the demarcated areas.

Environmental Receptor	Predicted Impact	Mitigation / Enhancement
		Site preparation works will clear vegetation from around each WTG location, substation, pylon and other areas requiring ground breaking works and make those areas unsuitable for use by species which may dig or burrow into the ground. In addition, one-way exclusion fencing will be erected around the perimeter of areas where the presence of torpid animals underground cannot be ruled out. One way fencing would comprise wire mesh around the majority of an area, with a compacted slope or angled board set into the ground for the remaining section. Animals can climb out and leave the working area, but the angle of the board prevents any animals returning. Excavations for WTG bases and cable routes should be protected each night, either with fencing or covering with boards. Construction work should be limited to daytime working hours only to avoid impacting on potentially sensitive nocturnal species of mammal and reptile. Pollution control measures will be put into place to avoid these impacts in accordance with requirements of IFC PS3. Dust suppression may be required during the hot summer months and this will be monitored by site staff. Enforcement of speed limits and ensuring no off-road driving will further reduce the likelihood of dust pollution.
		No access outside of the established road network of the Project area. No hunting or collection of wild animals. No collecting firewood from the site or the wider area. Control of lighting and night-time vehicle movements

Environmental Receptor	Predicted Impact	Mitigation / Enhancement
	During operation, at the likely noise levels and habituation rates, it is unlikely that the resultant effect of noise on terrestrial fauna within the immediate vicinity of the operational WTGs will be significant and as such no negative impacts are predicted at any geographic level.	Speed limits enforced around the Project site and notices warning of the potential presence of animals crossing roads placed in strategic locations. Road condition to be monitored regularly and damaged and rutted roads repaired rather than bypassing damaged sections. Monitoring of erosion controls and repair as needed.
		<u>Enhancement</u> Seed harvesting from native vegetation along with planting away from proposed WTG bases and roads to increase the amount of cover and improve opportunities for wildlife to move through the site. Any additional planting and associated habitat improvement will also replace areas of habitat that are being lost to the development. Enhancements will also be completed once the Project has been decommissioned and this will involve re-planting the WTG base and road areas of the site.
Ecology – Habitats and flora	Based on the extent of habitat loss and the type and status of habitats and flora species that are likely to be affected by construction works, direct impacts on the degraded or previously modified terrestrial habitats are considered to be of low significance, whereas the impacts to natural habitats are considered to be of moderate significance.	The loss and damage of small areas of natural habitats will be offset so that the Project achieves no net loss of biodiversity (most likely a net gain). Habitat loss in the areas of WTG and road construction will be compensated by restoring and replanting land formerly used for with native species. The areas with man-made parallel lines will be replanted within the area with vegetation removed or seed harvested from vegetation during WTG base clearance. As part of the restoration, plants in these areas not native to the habitat type will be removed to help recreate and rehabilitate suitable native habitat.

Environmental Receptor	Predicted Impact	Mitigation / Enhancement
	Potential indirect impacts include pollution and increased human pressure across the site which could increase dust levels which in turn could affect the ecological value and function of surrounding habitats and the species they support.	
Ecology – Herpetofauna	Direct impacts to these species are likely as a result of construction activities including killing or injuring, disturbance, direct habitat loss from construction of WTG bases, substation, compound area, workers' accommodation and access roads and habitat loss through fragmentation/barrier effect. Low to moderate impacts predicted. The indirect impacts associated with dust and other pollution as well as collection or persecution of animals could impact these and other species of reptile, although these are considered of low significance, temporary and at a local scale only.	Habitat suitable for use by reptiles will be removed under the road and WTG bases prior to construction. The construction timetable will be designed so that activities such as breaking ground in unprepared areas will be timed to avoid the most sensitive times (i.e. mid-October to March when vulnerable species of reptile, such as Russian Tortoise may be hibernating below ground). Regular checks will be completed by qualified personnel and any tortoises present above ground will be captured and moved / translocated away from the working area to the nearest safe location.
Ecology – Invertebrates	Given the low levels of land take and suitable directly comparable adjacent habitat the predicted impacts of construction on invertebrate species of conservation concern as a result of the proposals is considered not to be significant at any geographic level.	As above.

Environmental Receptor	Predicted Impact	Mitigation / Enhancement
Ecology – Mammals	Eight mammal species listed as threatened, declining or critically endangered were identified as being present, or with potential to be present during the surveys. Habitat suitable for use by these species for foraging and commuting will be lost as a result of the construction which will result in a minor negative impact at a local level. In addition, disturbance of these species from construction activities are also likely to result in temporary short-term negative impacts of minor significance.	WTGs will be micro-sited to avoid known locations of large animal burrows, areas of high activity and more valuable habitat features. Site preparation during the Spring, Summer and early Autumn months when temperatures are above approximately 18°C and animals are active. One-way exclusion fencing will be erected around the perimeter of areas where the presence of torpid animals underground cannot be ruled out.
Ecology – Bats	Bat analysis and survey is ongoing at the Project site until late Spring / early Summer 2021 however habitats on site are considered of low suitability for bats and activity data collected to date suggests very low levels of activity from species deemed at risk from wind farms. No roosting activity has been identified in the areas of proposed WTG bases or assess tracks. Based on this information the direct impact of construction on loss of suitable foraging and commuting habitat is likely to be low.	No specific mitigation required at present.

Environmental Receptor	Predicted Impact	Mitigation / Enhancement
	Survey and analysis at the site is ongoing but if activity levels remain at similar or even slightly raised levels, impacts to bats as a result of collision with operational WTGs are unlikely to be significant at any geographic level.	
Perceptions towards the Project.	Potential negative impacts through inaccurate perceptions towards Project impacts or unrealistic expectations of potential benefits such as local electrification or the quantity of jobs available.	Development of Stakeholder Engagement Plan (SEP).
Regional & National Economy – Construction.	Positive impact during construction from direct procurement and supply of materials and services from Zarafshan and elsewhere in Uzbekistan.	Where possible, the Project Company will seek to procure materials and services from SMEs based in Tamdy District to ensure that the positive effects of using SMEs are experienced as close to the Project site as possible to enhance the positive benefits of the Project at this location. For this purpose, The Project Company will develop a Local Content Policy. The total capital spent on SMEs during the construction phase shall be recorded, broken down by where they are based and operational (i.e. at a local, regional and/or national level). This information will be collated and compiled into future Environmental and Social Performance Reports to provide stakeholders with information on how SMEs have been involved in the Project. The reports will also include details (presented as individual case studies) that reflect how the SMEs have benefitted from their involvement in the Project to date, using the information from interviews with business owners which will be accompanied by photographs and statistical/graphical summaries.

Environmental Receptor	Predicted Impact	Mitigation / Enhancement
Regional & National Economy – Operation.	Positive impacts due to electricity generation and an ongoing demand for general support from national and regional businesses, such as consulting, legal, and accounting using SMEs.	Record the capital spend and location of SMEs used during the operational period. Record the Project's generation of energy and contribution to the national grid. This information shall be collated and compiled into future Environmental and Social Performance Reports to provide stakeholders with accurate information about the Project's contribution towards the countries energy generation sector.
Crime and conflict from opportunistic influx.	During construction there is a potential for people from outside the Tamdy District to turn up without invitation, seeking employment and other types of economic opportunities from the Project. This may result in a spread of communicable diseases, increased tensions between local people and newcomers, and may result in an increase in the local incidence of crime. The impact significance is moderate.	Preparation of Influx Management Plan. Public disclosure of the local employment process. No employment at the construction gate / work sites. Public announcements in local and regional media to inform people job seekers should not move towards the Project site. Monitor arrival of newcomers to track if influx is occurring during construction. Monitor price of basic goods to determine any local inflation. Record incidence of crime and other social ills through regular engagement with community leaders and local police force.
Land Use Changes.	The impact significance is moderate as the economic displacement experienced by the farmers and grazers using areas of land at the substation (and to a lesser extent at the OHL towers) shall be involuntary, and the provisions of IFC PS5 and ADB SPS (Safeguard Requirements 2) are triggered by the Project.	Prior to the start of the construction stage, the Project shall engage with all ten farmers in the Project Area using a Community Liaison Officer (CLO), to inform them of the following: • The start of construction works and presence of activities at specific locations within the Project Area. • Advice to avoid areas where construction works are ongoing to maintain the safety of themselves and their livestock.

Environmental Receptor	Predicted Impact	Mitigation / Enhancement
		• The grievance mechanism that can be used to raise a concern about any aspect associated with the Project, request compensation or other matter. • That during operations they will be able to graze in between the WTGs which will be safe to do so, although particular care will need to be taken during winter periods, when snow and ice throw could occur. • That the occupation of existing shelters, or the construction of new shelters, will not be impacted by the Project from the generation of noise or shadow flicker. • That they should not construct new shelters in the close vicinity to WTGs as otherwise these shelters could potentially be exposed to shadow flicker and noise impacts that exceed applicable thresholds. In relation to the last measure above, the Project shall engage with representatives from Tamdy District to discuss the optimum way to prevent farmers from constructing new shelters in the future, within their farming area, so that they are not too close to the WTGs during operations. The Project will prepare a Livelihood Restoration Plan (LRP) to address involuntary economic displacement.
Local employment & training.	Construction impact is largely major positive as local employment is a key expectation amongst local village residents and their representatives, and this has been recorded during numerous stakeholder engagement activities.	Development & implementation of a Construction Local Employment Plan incorporating details set out in Chapter 7 of this document. Develop and implement a human resources management system.

Environmental Receptor	Predicted Impact	Mitigation / Enhancement
	However, there is a potential for local tensions to arise if residents within local communities incorrectly perceive that people from outside the local area are being provided with employment opportunities. This would lead to major adverse impacts. Following implementation of the Construction Local Employment Plan it is anticipated that negative impacts associated with the recruitment process are reduced to minor. Impacts during operation are considered positive.	
Local employment during operation	The individuals employed and their household members, will benefit from increased income that is likely to increase their overall quality of life and access to healthcare, educational and other types of resources across a longer time frame.	Operational Employment Plan.
Incoming workforce and worker accommodation camp.	The impact is major prior to mitigation as the construction workforce shall be potentially exposed to a variety of risks arising from the use of accommodation facilities.	Preparation of a COVID-19 Management Plan and a Workers Accommodation Plan.
Use of security personnel	The impact is moderate as the presence and behavior of security staff may result in a rise in local tensions if they behave in an inappropriate manner.	Development of Security Management Plan.

Environmental Receptor	Predicted Impact	Mitigation / Enhancement
	The residual impact significance is expected to be negligible after the mitigation and monitoring measures have been implemented.	
Influx job seekers during construction.	Newcomers outside of the local area may arrive seeking employment and other economic opportunities. This may result in moderate impacts linked to spread of communicable diseases, increased tensions, and increased crime. This was raised as a concern during consultation. The residual impact significance is expected to be minor once the mitigation measures have been implemented.	The presence of newcomers will be monitored by the Project's Community Liaison Officer (CLO) and placed on a central register. Newcomers will be respectfully informed about the Project's Construction Local Employment Plan and the priority that is given to local people for low-skilled employment. Newcomers will subsequently be requested to return to their place of origin and informed that there are no economic opportunities for them arising from the Project. At no time during this discussion, will force or intimidatory language be used to the individuals concerned.
Health & Safety involving the workforce & local communities.	The use of a workforce and construction activities generates a variety of occupational health and safety risks to the workforce and to local people leading to the potential for major impacts.	Development of a Health and Safety Plan (for the workers). Development of a Community Health and Safety Plan. An Emergency Response Plan shall also be prepared and available prior to the start of construction works.

Environmental Receptor	Predicted Impact	Mitigation / Enhancement
Labour violations within the supply chain,	The impact is negative. Labour violations could result in injury or fatality, mental distress and anxiety, protests and worker stoppages. Violations could also result in regulatory enforcement action being undertaken against the relevant supplier and potentially, the Project Company. There is also the potential for reputational impacts to occur is the Project receives negative attention from the international media over the use of suppliers based in China and elsewhere. The overall significance for negative impacts is major.	Supply Chain Management Plan.
Community health & safety.	The increase in community health and safety risks from road traffic is a major negative impact.	Development of a Transport Management Plan. Road safety campaign.
Local communities.	Impact is moderate positive because implementation of the Community Development Framework (CDF) is expected to provide a range of benefits to local residents.	Implementation of a CDF.
Traffic and Transport.	Impacts relating to construction traffic on roads leading to moderate impacts.	A logistics study is underway which will identify the most appropriate transport route to the site and will include swept path analysis and bridge assessment (where applicable). Undertake pre-construction route survey to establish the road condition prior to

Environmental Receptor	Predicted Impact	Mitigation / Enhancement
		construction commencing. Establish stop over points along the proposed route and customs check point. Development of construction Transport Management Plan (TMP).
Traffic and Transport.	Overall moderate impacts on road network and users (including pedestrians) in relation to accidents and safety, severance, driver delay, pedestrian amenity and pedestrian delay.	Development of Construction TMP. Consultation will be required with services / utility providers to determine the exact location of any underground and overhead services / utilities and prior to removal or re-alignment of any overhead cables. Prior to construction of the Project, a series of leaflets and notices should be posted making local residents and businesses aware of any likely disruption. Monitoring of the efficiency of deliveries of construction materials to the site and if necessary sufficient storage provision made available on site to prevent any delays to the construction process.
Traffic and Transport.	Negligible impacts on the road network and its users during operational phase.	Operational TMP will be developed prior to operational phase.
Cumulative – local road network	Potential conflict with use of the road network whilst the Project is constructed alongside the Navoi to Besapan OHL upgrade works.	Confirm the EPC contractor working on the OHL to determine the roads being utilised by the OHL project and whether the transportation of WTG components and other Project equipment and materials could impact on their own traffic movements. If overlaps are identified, the Project will assess the potential to reduce these risks as so far as possible.

Environmental Receptor	Predicted Impact	Mitigation / Enhancement
Visual amenity	VP1 – Road at Besapan: The Project would not result in a noticeable change in the existing view. The impacts during construction and operation are considered Slight and not significant. VP2 – South of Muruntov: The Project would not result in a noticeable change in the existing view. The impacts during construction and operation are considered Negligible and not significant. VP3 – South of Industrial Area / Rail Depot: The impacts during both construction and operation are assessed as Moderate to Slight and therefore not significant. VP4 – Edge of Zarafshan: The Project would result in a negligible change in the existing view. The impacts during both construction and operation are assessed as Negligible and therefore not significant. VP5 – High Ground to the North: The impacts during construction are therefore considered Slight and not significant rising to Moderate during operation and significant. VP6 – Tourist Area: Overall, the impacts during construction and operation are considered Slight and not significant.	Implementation of a community benefits strategy to ensure that any visual impacts on the local population is offset by an appropriate level of community benefit.

Environmental Receptor	Predicted Impact	Mitigation / Enhancement
	VP7 – Farm Shelter: Overall, impacts during construction are considered Slight and not significant. During operation, this would rise to Moderate and so significant given the prominence of a number of WTGs in the view.	
Landscape character types.	Deserts Group LCT – Moderate impacts (and therefore significant) predicted within 5km of the Project during operational phase. Over 5km is Slight and not significant. Urban LCT – due to the already heavily disturbed nature of the LCT the magnitude of change overall is likely to be Low, as a result, the effect is Slight and not significant during operation. Mining and Industry LCT – The impact duration during construction is temporary and short-term and likely to be screened by the surrounding topography. The effect during construction and operation is Slight and not significant. Tamdytau Mountains LCT – The impact duration during construction is temporary and short-term and likely to have some partial screened by the surrounding topography. The effect during construction is Moderate to Slight and not significant.	Limiting damage to any vegetation by keeping the construction areas and roads to a minimum and maintaining strict requirements for vehicles to remain on the roads at all times. Reinstating vegetation with native plant species where construction areas and roads are no longer required. This would reduce the duration of the visual impact. Mitigation to reduce the adverse impact resulting from litter and garbage (plastic bags, bottles etc.) include: • Provision of adequate facilities for the disposal of garbage. • Training of the workforce in waste management. • Reduce the amount of waste to the maximum extent possible. • Collect all solid waste and store until transported to an appropriate waste disposal facility and disposed. Organization of clean-ups for existing garbage.

Environmental Receptor	Predicted Impact	Mitigation / Enhancement
	The greatest impacts would be experienced during operation and are considered Moderate and so significant.	
Archaeology & Cultural Heritage	Based on the Archaeology Report, there are no known cultural heritage sites within the Project area (the religious site is at least 2 km from the closest WTG). The site sensitivity is therefore assessed to be Low and magnitude of change, Low. Therefore, the impact significance is negligible and not significant.	Development of a Chance Finds Procedure to be applied in the event that artifacts are discovered during construction. Toolbox talks to ensure that workers are alert of any signs of past cultural activity in the area.
	The Project area has not been well studied with respect to archaeology and so there remains the potential to uncover previously buried archaeology (chance finds) during construction works. The magnitude of impact on unknown features is assessed as Medium therefore the impact significance is Moderate and significant.	Chance finds procedure.
Noise	Noise emissions from construction works will not be significant.	Any temporary camps for construction workers should be located no closer to the nearest WTG location than the nearest permanent receptor. Construction activities will be scheduled, unless otherwise agreed, from Monday to Saturday 08:00 to 22:00. Unattended plant equipment should be kept to a minimum. Construction activities outside of these times, short term high transient noise events, or activates relatively close to NSRs should be scheduled in consultation with the residents to minimise their inconvenience. Implementation of a Noise Management Plan for construction.

Environmental Receptor	Predicted Impact	Mitigation / Enhancement
	During operation, no exceedances of IFC noise limits at identified receptors are found to occur. <u>IFC noise limits:</u> Day-time – limit of 55 dB(A). Night-time – limit of 45 dB(A). For industrial areas, the day and night LAeq values are relaxed to 70 dB(A). Impacts are therefore not significant.	Monitoring of grievances in the event of a noise complaint.
Shadow Flicker.	The IFC recommended shadow flicker limit of 30 hours per year is exceeded at three identified receptors (3, 7 and 9). With adjustments made to account for sunshine hours, exceedances only occur at Receptor 9. At Receptors 7 and 9, exceedances of the 30 minutes per day recommended limit are experienced. Exceedances of the limit for Receptor 7 (albeit exceedances are small) and Receptor 9 are considered significant.	Communities will be informed during the consultation process about the shadow flicker impacts and proposed measures. Shadow flicker modules installed in identified WTGs (34, 37 and 39) to shut down the WTGs at specific dates and times of the year when shadow flicker is an issue. This will ensure there are no significant impacts relating to shadow flicker for Receptors 7 and 9. For affected receptors, appropriate vegetation screening, provision of blinds / curtains will be provided as required. If any complaints are raised by the local community (through the grievance mechanism or other channels) relating to shadow flicker from the Project, the Project operator shall investigate and, where found to be necessary, instigate appropriate further measures to mitigate the shadow flicker effects. This may include, for example, providing land-based improvements to enhance livelihoods or similar measures which are defined on a case-by-case basis.

Environmental Receptor	Predicted Impact	Mitigation / Enhancement
Hydrology & Hydrogeology.	Erosion of drainage channels as a result of construction process.	Routes should be selected to avoid ephemeral drainage channels. Culverts or other drainage control features should be installed where crossings of drainage routes are unavoidable.
Hydrology / groundwater	Contamination / pollution during construction leading to minor to moderate impacts prior to mitigation.	Storage of all materials within designated areas. Supplies should also be provided for the clean-up of minor spills. Establishment of a designated storage area with an impervious base and impermeable bund walls. Capacity must be sufficient to contain the full volume within a bund and secured area. All fuel, oil and chemical storage is stored in a designated secure area. Hoses and valves are checked regularly for signs of wear and ensure that they are turned off and securely locked when not in use. Diesel pumps and similar items are placed on drip trays to collect minor spillages. Trays should be checked regularly, and accumulated oil removed. Sanitary waste collected in containers below portable toilets and transported for disposal. The waste will be disposed of by a licenced contractor.
Hydrology & Hydrogeology.	Potential for impacts on current water supplies and their users.	It is likely that the Project will deliver water to the Project site via tankers, possibly from Zarafshan City. The source will be determined at Final ESIA stage. A water resource assessment will be carried out prior to construction to ensure no significant impacts occur to current water supply users.

Environmental Receptor	Predicted Impact	Mitigation / Enhancement
Hydrology – Cumulative	Potential for cumulative impacts relating on pressure on water sources for use during construction of both this Project and the OHL upgrade works.	Consultation to determine water sources utilised for the OHL upgrade works and ensure no conflict of use.
Soils & Geology	Increased vulnerability to erosion during construction leading to moderate impacts.	To reduce damage to soils and risks of soil erosion, the length and width of the on-site and off-site roads should be with the route optimized to reduce the need for cut-and-fill material. Run-off and erosion control features should be included in designs. Clearly demarcate storage and staging areas and store all materials, equipment and vehicles in demarcated area to reduce soil damage. Furthermore, vehicles should be confined to demarcated roadways. Establish native grasses in erosion control channels and in other areas immediately after final disturbance. Salvage and store topsoil and subsoil before areas are excavated, with topsoil stripped and stockpiled separately. Segregate excavated soils into stockpiles dependant on material type and provide erosion control while stockpiled. On completion of earthworks, backfill material in the same stratigraphic sequence. When wide roads are narrowed after WTG construction, scarify compacted areas and establish native plant species. Use of water bowsers on roads during dusty conditions (likely summer months). Once construction and road-building are complete, scarify all areas compacted

Environmental Receptor	Predicted Impact	Mitigation / Enhancement
		by off-road vehicle / equipment movements and establish native plant species. Confine all vehicles and equipment to the roadway and, to extent possible, minimize activities during wet conditions. When activities must occur in wet conditions, control storm water by using fabric, straw bales and other measures to impede storm water flow and prevent erosion. When damage to wet soil occurs, repair once dry conditions return.
Soils & Geology	Potential for contamination of soils due to spills and liquid wastes leading to minor impacts.	Store all materials within designated areas of temporary storage facilities and provide supplies to clean-up of minor spills. For storage of oil, establish a designated storage area, with impervious base and impermeable bund walls. Capacity must be sufficient to contain full volume within a bund and secured area. Store all fuel, oil and chemical storage in the designated storage area. Check hoses and valves regularly for signs of wear and ensure they are turned off and securely locked when not in use. Place diesel pumps and similar items on drip trays to collect minor spillages. Check trays regularly and remove any accumulated oil. Reduce the amount of waste to the maximum extent possible. Collect all solid waste and store until transported to the designated disposal site.
Soils & Geology	During operation, the main impacts are related to vehicle traffic leading to minor impacts.	Confine all vehicles to roadways. Monitor road condition regularly; then repair damaged and rutted roads rather than bypassing damaged sections.

Environmental Receptor	Predicted Impact	Mitigation / Enhancement
		Monitor erosion controls and repair as needed. Maintain grass cover on berms and ditches. Prohibit use of vehicles and equipment off prepared roads. Re-stabilize existing eroded tracks and restore vegetation cover as needed. Do not collect firewood from the site. Reduce wastes to the extent possible and maximise re-use and recycling of materials. Collect and store all waste and garbage before disposal at the designated site. Clean up and store oily and chemical waste and contaminated material before transport to the designated disposal site to reduce risk of soil and groundwater contamination. Establish a designated storage area with an impervious base and impermeable bund walls and protected from precipitation. Capacity must be sufficient to contain full volume within a bund and secured area. Store all fuel, oil and chemical storage in the designated secure area. Do not leave vehicles unattended during refuelling, never leave open a delivery valve. Check hoses and valves regularly for signs of wear and ensure that they are turned off and securely locked when not in use. Place diesel pumps and similar on drip trays to collect minor spillages. Check trays regularly and remove any accumulated oil.
		Pre-construction: Once the final Project layout is agreed, consultation will need

Environmental Receptor	Predicted Impact	Mitigation / Enhancement
Aviation and Radar	Given the proximity of the Project to Zarafshan Airport and radar, prior to mitigation it is considered that the Project would result in effects of Moderate significance during operation.	to take place with the CAA to provide the information required to obtain a permit for the Project. One the WTGs are erected, their final positioning (coordinates) and height information should be provided to the CAA. Furthermore, WTGs will likely be required to have some form of lighting installed which should be agreed prior to WTG erection.
Climate change	Increases in the number of high temperature days could damage Project infrastructure and maintenance activities would likely be restricted on these days. Furthermore, high temperatures result in lower air density thereby potentially reduced energy output. This would result in a high magnitude of change and moderate to major impacts prior to mitigation.	Insurance cover for extreme events. Consideration of the following during construction: • Use of low-carbon HGVs. • Securing a grid connection rather than use of generators. • Use of recycled materials where possible for construction. • Design of buildings and placement of windows so as to reduce air conditioning cooling requirements or potentially heating requirements in winter. During construction (and also operation, as applicable), water conservation measures should be implemented including recycling of water where possible (for example, use of grey water for dust-dampening measures as required). Ice throw may become more of an issue with a changing climate and therefore it is recommended that physical and visual warnings are provided for site workers during operation and local farmers / herders. If required, WTGs can be shut down if ice accumulation is visualised by site personnel.

Environmental Receptor	Predicted Impact	Mitigation / Enhancement
GHG emissions	Through its operation, the Project will save around 675,615 tonnes of carbon emissions per year.	None.

18 Environmental and Social Management and Monitoring

18.1 Introduction

The Environmental and Social Management and Monitoring Plan (ESMMP) summarises the monitoring proposed within this ESIA (mitigation is set out in Chapter 17, Table 17-1). This ESMMP will be transposed into the construction ESMP (CESMP) which will constitute the overarching document referring to a number of sub-plans required for the Project and implemented by the EPC contractor.

The mitigation, monitoring and performance improvement measures will be incorporated into the Project Environmental and Social Management System (ESMS) developed by Masdar. The measures and actions to address identified impacts and risks will favour the avoidance and prevention of impacts over minimisation, mitigation or compensation wherever technically and financially feasible. Where risks and impacts cannot be avoided or prevented, mitigation measures and actions are identified so that the Project can operate in compliance with applicable laws and regulations in addition to meeting international standards, namely IFC PSs 1 to 8 and EBRD PRs 1 to 10. Mitigation and enhancement measures are set out in Chapter 17 of this ESIA.

18.2 ESMS and Sub-Plans

The scope of the ESMS for the Project will include:

- The operational standards to be applied to the Project, referred to as the "Applicable Standards".
- Masdar's policy for environmental management, occupational health and safety, labour and community health, safety and security.
- Organisational chart for environmental, social, health and safety (ESHS) elements, roles and responsibilities and Contractor management.
- ESHS reporting – both of routine and incidents / accidents.
- Audit, review and management of non-conformances.
- Community grievance mechanism (see also the SEP).
- Workers' grievance mechanism.

A number of management plans (sub-plans) will be produced in support of the ESMS. Management plans consist of a combination of operational policies, procedures and practises. These plans will provide a system against which to monitor and audit environmental and social performance. In addition, they will detail the practical methods required to ensure work is completed in accordance with current best practice, the mitigation measures in the ESIA and legislative and regulatory requirements.

The construction management plans are anticipated to include (but not be limited to):

- Hazardous and Non-Hazardous Waste Management Plan.
- Wastewater Management Plan.
- Pollution Prevention and Control Plan.
- Dust Management Plan.
- Noise Management Plan.
- Biodiversity Management Plan.
- Adaptive Management and Monitoring Plan.
- Chance Find Procedure.
- Transport Management Plan.
- Security Management Plan.
- Community Health and Safety Plan.
- Occupational Health and Safety Plan.
- Emergency Preparedness and Response Plan.
- Hazardous Substances Management Plan.
- Local Employment Plan.
- Worker Accommodation Plan.
- Influx Management Plan.
- Workers' Code of Conduct.
- COVID-19 Management Plan.
- Communicable Diseases Management Plan.

A variety of operational management plans shall be prepared, in advance of the start of operations and these documents shall take into consideration any lessons learned gained from the construction stage of the Project.

18.3 Environmental and Social Monitoring

A programme of Environmental and Social Monitoring will be undertaken in order to verify the effectiveness of the proposed mitigation measures (identified in Chapter 17) in reducing impacts and also to allow mitigation measures to be refined or developed as needed to further address potential impacts or to develop plans for future development. More specifically, the objectives of the monitoring program are to:

- Record Project impacts during construction and operation.
- Meet legal and community obligations.
- Evaluate the effectiveness of the mitigation measures and identify any shortcomings.
- Allow refinement and enhancement of mitigation measures to further reduce impacts.
- Allow identification unforeseen issues or changes in operations and provide information for development of mitigation measures to deal with those issues or changes.

The environmental and social monitoring program was developed in accordance with the best international practices for the wind energy sector.

The monitoring will be comprised of weekly inspections and quarterly audits during construction and monthly semi-annual / annual audits during operation (frequencies will be determined). Table 18-2 details the proposed monitoring programme.

Environmental and social targets set by the Developer will be assessed by the following key performance indicators (Table 18-1) which were set according to the national standards and international best practice for the Project during construction, operation and decommissioning phases as appropriate.

Table 18-1: Key Performance Indicators

Environmental Component	Project Activities	Key Performance Indicators	Project Phase	Best Practice Guidelines
Dust	Earthwork and removal of vegetation cover. Transportation of materials, equipment, and employee commuting. Storage of chemicals, materials, and waste on site. On-site energy and heat consumption. Other indirect supply chain activities.	Fugitive dust and particles (SPM, PM10)	Pre-construction Construction Decommissioning	International best practice (IFC EHS General Guidelines) on management of emissions to air.
Ambient noise and vibration level	Earthwork and site preparation. Transportation of materials, equipment, and employee commuting. On-site workers' accommodation. WTG electricity generation process (aerodynamic noise caused by blade rotation and mechanical noise caused by nacelle operation and others).	Sound levels in Leq dBA for day-time and night-time.	Construction Operation Decommissioning	IFCs general EHS guidelines (operational fixed night time limit of 45dBA, daytime limit of 55 dBA for residential, institutional and educational facilities. 70 dBA daytime and night-time limit for industrial and commercial facilities.)
Shadow flicker	WTG operation	Number of complaints received through the grievance mechanism.	Operation	Shadow flicker events must meet IFCs EHS wind energy guideline limit (30 hour per year / 30 minute per day limit).

Environmental Component	Project Activities	Key Performance Indicators	Project Phase	Best Practice Guidelines
Surface and Groundwater quality / pollution prevention.	Storage of oil, lubricating materials, chemicals, domestic and industrial waste on site. Transportation of oil, lubricating materials, chemicals, and other computations. Earthworks.	Levels of: pH (SI) Conductivity (µS/cm) TDS (mg/L) TSS (mg/L) DO (mg/L) ORP (mV) Metals (mg/L) E-coli (cfu) Hydrocarbons (µg/L)	Prior to start of Construction Operation Decommissioning	International best practice (IFC EHS General Guidelines) on protecting surface and groundwater, management of hazardous materials and management of waste.
Soil quality and erosion	Storage of oil, lubricating materials, chemicals, domestic and industrial waste on site. Transportation of oil, lubricating materials, chemicals, and other computations. Earthwork.	Erosion rate observation. Soil contaminants identified in the international standards. Incidents requiring clean-up operations – spill kits	Construction Operation Decommissioning	International best practice (IFC EHS General Guidelines) on restoring degraded land and re-establishing vegetation relevant to construction, operation, and decommission.
Flora protection	Earthwork. Transportation.	Destruction rate observation. Number of pollution / spill incidences.	Construction Operation Decommissioning	International best practice (IFC EHS General Guidelines) on restoring degraded land and re-establishing grassland vegetation relevant to construction, operation, and decommission.

Environmental Component	Project Activities	Key Performance Indicators	Project Phase	Best Practice Guidelines
Fauna protection.	Earthworks. WTG operation. OHLs.	Bird and bat injury, mortality, and nest abandonment in the vicinity of the WTGs. Feeding bird species and prey concentration near the WTGs. Number of carcasses removed from Project site.	Construction. Operation.	Best international standards and practices for bird and bat surveys and monitoring.
Archaeology / cultural heritage.	Earthwork activities	Number of chance finds	Construction	International best practise (IFC EHS General Guidelines). Civil Code of the Republic of Uzbekistan (of 21.12.1995).
Occupational H&S	Earthwork and site preparation. Site construction activities, use of construction equipment.	Sound levels in Leq dBA. Levels of fugitive dust and particles (SPM, PM10) EU Water Quality drinking water parameters.	Construction Decommissioning	International best practice (IFC EHS General Guidelines) on minimising occupational hazards and the use of appropriate PPE. European Water Quality Directive. EU Directive 89/3918 OSHA standards

Environmental Component	Project Activities	Key Performance Indicators	Project Phase	Best Practice Guidelines
Waste management	Generation of general waste on site. Use of oil, lubricating materials and other chemicals on site.	Number of inspection reports produced. Quantity of waste removal.	Construction Operation Decommissioning	International best practice (IFC EHS General Guidelines) on waste management.

Table 18-2: Project Monitoring Programme

Component	Project phase	Parameters	Responsibility	Deliverables	Frequency	Location	Standard
Dust	Pre-construction	SPM, PM10 emissions	EPC Contractor	1 sample per location	Once	Along the roadways Construction areas Worker camp Closest residential receptor.	Uzbek air quality standards. Best international practise.
	Construction				Monthly during construction season		
	Operations		Developer.		Once per year		

Component	Project phase	Parameters	Responsibility	Deliverables	Frequency	Location	Standard
Noise	Construction	dBA level	EPC Contractor	Records of each location	Monthly during construction season Annual or 6 monthly independent audit Following any complaint	Along the roadway The identified recipient location Substation	Best international standard (IFC General EHS Guidelines Limit)
	Operation		Developer.	Records of each location	Start of operations Following any complaint		Best international standard (IFC General EHS Guidelines Limit)
Shadow flicker	Operation	Duration of shadow flicker events	Developer.	Records of location.	Following any complaint received.	Identified receptor location / receptor.	Best international standard (IFC General EHS Guidelines Limit)
Surface and groundwater quality	Pre-construction	pH (SI) Conductivity (µS/cm) TDS (mg/L) TSS (mg/L)	Developer. EPC Contractor	1 sample per location	Once		
	Construction			1 sample per location	Once during construction season		

Component	Project phase	Parameters	Responsibility	Deliverables	Frequency	Location	Standard
	Operation	DO (mg/L) ORP (mV) Metals (mg/L) E-coli (cfu) Hydrocarbons (µg/L)	Developer.	1 sample per location	Annual After any spill within 1km of the well	At any groundwater supply wells constructed prior to construction / operation (if applicable). At any groundwater wells / springs within the Project site operation (if applicable). At any groundwater monitoring wells installed for the Project operation (if applicable). Any other natural waters used as potable water (none at this time)	International best practice (IFC EHS General Guidelines) on protecting surface and groundwater, management of hazardous materials and management of waste.

Component	Project phase	Parameters	Responsibility	Deliverables	Frequency	Location	Standard
Soil quality and erosion	Pre-construction	Erosion rate observation Soil contaminants identified in international standards since soil contaminants vary in properties from organic to water soluble contaminants, radioactive contaminant properties.	Developer.	Photographic records	Once	General	International best practices. Dutch Ministry of Housing Soil Quality Standards.
	Construction		EPC Contractor	Records at each location Checklist observation reports Annual photographic record	Continuous during construction After any accidental spill	All areas destructed by earthwork, construction equipment, and workers. All roadways. All areas of accidental spills	
	Operation		Developer.	Annual photographic record Checklist observation record	Quarterly observation for evidence of soil erosion After major spills, precipitation/run-off event		
Flora protection	Pre-construction	Disturbance levels, erosion.	Developer.		Once	Soil monitoring locations	

Component	Project phase	Parameters	Responsibility	Deliverables	Frequency	Location	Standard
	Construction		Developer.	Photographic and narrative record Inspection reports	Before construction and after construction season (reclamation)	Soil monitoring locations	Best international standards
	Operation		Developer.		Annually	Soil monitoring locations	
Fauna protection	Pre-construction	Breeding bird survey Bird VP surveys. Operational monitoring – observer-led shutdown. Animal carcass survey Carcass searching for birds and bats	Developer.	Bird survey.	Once.	Past and present nests. Vantage points.	Best International Standards.
	Construction			Bird survey.	Each season (breeding, migration etc).	Past and present nests. Vantage points.	Best International Standards.
	Operation			Bird survey. Survey reporting.	Each season (breeding, migration etc). During audits. After any incident with large	Past and present nests. Vantage points.	Best International Standards.

Component	Project phase	Parameters	Responsibility	Deliverables	Frequency	Location	Standard
					number of bird collisions or electrocution		
Archaeology / Cultural heritage	Construction	Chance finds.	EPC Contractor	Chance find recording.	Daily	All areas disturbed by earthwork, construction equipment and workers.	Best international practises.
Occupational and public health and safety	Construction	Noise, fire safety, hazardous materials registrar, solid and sanitary waste PPE use. COVID-19 protection measures use. Health and safety trainings Traffic safety, signs, road inspection	EPC Contractor.	Incident reporting. Inspection Reports	Daily	At construction camp. Construction compound. Substation building. All roadways	Best international practices. International best practice (IFC EHS General Guidelines) on OH&S. International COVID-19 guidelines.
	Operation		Developer.	Incident reporting. Inspection Reports	Daily		

Component	Project phase	Parameters	Responsibility	Deliverables	Frequency	Location	Standard
		Accident, incident registration Speed limit enforcement Health checks Workers' grievances Other workplace inspections Accommodation and welfare checks.					The Guidelines include measures for minimising occupational hazards (related to noise, electrical hazards etc.). IFC / EBRD, Workers' Accommodation: Processes and Standards (2009).
Socio –economic conditions	Pre-construction	Baseline social economic condition	Developer.	Baseline socio-economic conditions report (completed as part of ESIA) Inspection reports	Once	Project affected communities. Construction camp.	Best international practices.
	Construction	Population size Grievances	Developer. EPC Contractor.		Continuous		

Component	Project phase	Parameters	Responsibility	Deliverables	Frequency	Location	Standard
		Social and employment records (wage rate, unemployment rate, local government annual budget, contracts with local service)		Annual summary report			
	Operation		Developer.	Annual summary report	Continuous		
Safety and Security	Construction	Number of security personnel employed. Number of inspection missions. Number of grievances received.	EPC Contractor.	Inspection and security reports	Continuous	Construction areas	Best international practices. IFC Good Practice Handbook: Use of Security Forces: Assessing and Managing Risks and Impacts
Drinking Water (delivered to site)	Construction Operation Decommissioning	Analytes stipulated in the European Water Quality Directive Standards	Developer. EPC Contractor.	Water chemical analysis reports (certificates of analysis)	Per batch / delivery	At supplier	European Water Quality Directive Standard.

18.4 Commitments Register

Masdar will evaluate environmental and social aspects for the Proposed Project, as reported in this ESIA Report, and as a result will prepare a Commitments Register. This register will list mitigation and monitoring measures required to manage the significant environmental and social impacts identified in the ESIA Report. The Commitments Register will provide a focus for the Developer CESMP, Developer OESMP and the Contractor CIPs and OIPs.

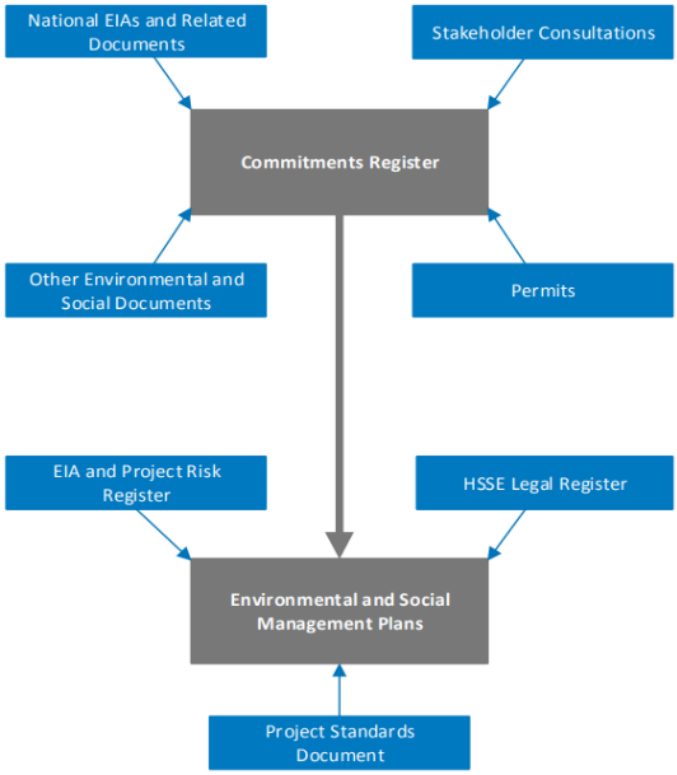


Figure 18-1 ESMP Development Flow Diagram[172]

Changes and additional sources of commitments (e.g. permit conditions) will be incorporated to the Commitments Register throughout the Proposed Project lifecycle. An ESIA Commitments Register template will be provided in the Final ESIA document. This will be adjusted to fit the project-specifics e.g., activities, type and size. It indicates how management, mitigation and monitoring measures from the ESIA will be actively implemented on the ground by the EPC Contractor and sub-contractors.

[172] https://esa.afdb.org/sites/default/files/20%20UK11-24483_6_NBIA%20ESIA%20ESM_Chapter%2020.pdf