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INVESTMENT BANK

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## ZHANATAS WIND POWER PLANT PROJECT ENVIRONMENTAL AND SOCIAL ANALYSIS



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## ABBREVIATIONS AND CURRENCY CONVERSION

AIIB	Asian Infrastructure Investment Bank
EIA	Environmental Impact Assessment according to local requirements (OVOS)
ESA	Environmental and Social Analysis
ESIA	Environmental and Social Impact Assessment according to international requirements
ESMP	Environmental and Social Management Plan
HR	Human resource
HSE	Health Safety and Environment
HVL	High voltage line
ILO	International Labour Organization
KEGOC	Kazakhstan Electrical Grid Operation Company
PPE	Personal protective equipment
RoK	Republic of Kazakhstan
SEP	Stakeholder Engagement Plan
WPP	Wind Power Plant

For financial figures an exchange rate KZT380/\$ is used in this report

## EXECUTIVE SUMMARY

The Asian Infrastructure Investment Bank (“AIIB” or the “Bank”) is considering providing financing to China Power International Development Limited Co., Ltd (the Company) for the construction and operation of the 100MW wind power plant (WPP), located near Zhanatas town, Zhambyl Region (the Project).

Forty 90m high Envision EN-121/2.5 towers with 2.5 MW turbines will spin 59.5 m long blades at the most frequently occurring speed of one turn per 5 seconds. The turbines will be arranged at 0.5-0.6km from each other in 5 segments that can be viewed as one complete and one broken row 1.4 km apart, placed on the elevated flanks of an eroded anticline. The turbines will have reinforced concrete 22m wide and 3m deep foundations. The 35kV alternate current powerlines will run along the connecting roads to the internal substation from where an 110kV overhead line will run along the road to Shymkent for 7.6km to the 110/35kV national grid substation.

The Project has been assigned by the AIIB the Category B. This environmental and social assessment (ESA) conducted by EcoSocio Analysts LLC between April 2019 and November 2019 has not identified any issues that would warrant a review of this categorization as no critical environmental and social issues have been identified and impacts are judged to be site specific or short term in nature. The environmental and social sensitivity and perceptive value of the area where the windfarm and the connecting powerline is to be constructed is not high. The area does not have international, national or regional designations for protection and does not possess specific value for indigenous and vulnerable groups. The project will not generate any notable adverse social impact to local communities or other project stakeholders and will not lead to resettlement or economic displacement.

With one exception, the project followed the local requirements. The design contractor has prepared and obtained approval for a local EIA and conducted public hearing and archaeological survey of the turbines area but not the connecting roads corridor and powerline route. The 233.5ha of land under all project components is leased from the State for 49 years with nominal annual payment and \$35 080 onetime payment for losses of pasture land, which in fact remains available for pasturing. All land acquisition paperwork was arranged according to the legislation.

Although the project minimally affects the farmers whose land was taken for the windfarm (54ha out of 6195ha or 0.9%), the land acquisition process did not comply with the AIIB and IFC requirements on several points. The acquisition was the district council responsibility and the Company took no part in it. As a result, seven farmers affected by land acquisition signed the agreement to give up small parts of the land they leased from the State without clear understanding of what the acquisition was made for. The minutes of the meetings with the farmers have been prepared but the meetings have not been conducted and the minutes have not been signed. Interviews with 4 farmers showed that one of them remembers signing some land acquisition agreement and only two heard about the windfarm construction plans. None of the 7 farmers were compensated for the land transfer with land or cash.

It should be noted, however, that the farmers rented as much land as they could after the collective farm disintegration because the rent was very low. They have no attachment to the rented plots and giving up parts of the rented land on several occasions has not deprived them from any access to the pasture land that is available in abundance and is used by several farms without paying regards to the land allocation.

Apart from several spots that found to contain three protected ephemeral flowers, the WPP area has low ecological value with the vegetation and animals typical for the water-deprived piedmont hills. It lacks endangered species, bats, birds resting areas and significant food sources. Total destruction of vegetation and partial destruction of soil is expected on up to 71.7ha (or 30% of the leased area), which includes 11.7ha under the roads, 48ha under turbines, 8ha under substation, concrete plant and storage area and another 4ha under the second storage area. Vegetation cover is expected to recover within 1-2 warm seasons and close to natural succession is likely to form in 6-7 years. Ephemeral

plants bulbs will take this time to grow and start flourish. Shortcutting roads may add to destruction but recovery will be retarded by continuous use. Without considerable reduction in the construction footprint the impact on the protected flowers found at the turbines 12, 15, 38-40 and 36-51 is considered to be high. This is exacerbated by absence of information on the extend of these plants' population in the area.

The birds' main migratory routes lie 28km north of the WPP area. Compared with over 2000 birds noted in one visit on the Zhanatas wastewater lagoon located on the outskirts of the main migration route, only 300 birds were recorded at the turbines during two monitoring sessions in March and April 2019. Out of 4 birds of two non-sparrow like species found to be breeding between the turbines 19 and 23, only little bustard, 3 birds of which was noted on the 5km transect, is considered to be near threatened by the IUCN and is in the Kazakhstan Red Book. The March and April surveys found only one red fox and signs of a mole activity in on place. This may be explained that the rodents and reptiles were still hibernating but their quantities could not be significant as no signs of their presence were found. These rodents, reptiles and other small animals that may use the territory later in the year will be partially displaced during construction but will return to the area. When erected, the turbines may increase predation due to introduction of elevated scanning places for pray birds. But rodents population natural fluctuation is by far higher than the reduction that can be caused by displacement and increase in predation. Risk of resident birds collision with blades is low albeit further monitoring focusing on the target species is requested by ESMP (6.5) to verify this, and an Autumn bird survey was conducted between August and October 2019.

The oversize parts will have to be transported through at least one sharp turn in Zhanatas where the selected trailer with 15m turning radius and protruding from the back blade will not fit. Turning problems may also occur at two sharp turns in the built up area on the two lane M36 road near Almaty. The transportation route survey does not address this and the other risks (that also relate to overweight freight) like rises descends and the bridges and two lane roads surface condition. This is needed to be addressed in a transportation plan requested in ESMP (4.3).

Visual impact of the 150m tall wind turbines was assessed using modelling aids, juxtaposing turbines on the panoramas taken from the vulnerable points that the modelling identified as having visibility on the turbines. Then the collages were sent to the affected people and their opinions collected. Initially 10 such points were identified but after the turbines rearrangement Aktogay village lost visibility. Visual impact on the Peishbek farm was considered to be low and on the others, as non-significant. As the viewers interviewed after seeing the collages expressed no concern over the landscape change, no mitigation or compensation measures were suggested. There will be no impact from shadow flicker.

The main social impact could be from the absence of any benefits to the local society from the project. Risk of head-on collision while overtaking the oversize parts carrying trailers on the congested parts of the two lane roads is considered to be high. Some impact on the ancient burial memorials is possible as not all parts of the windfarm has been surveyed and the surveyed part contained 33 mounds of early middle age nomads (IIAC– VIIIAD) 22 of which has to be excavated for being too close to the project components.

Worker accommodation of selected subcontractors have been observed to warrant improvement, but most of the workers are expected to be local and thus will live at home. Properly engineered waste disposal sites are not available locally but the project related waste volumes are low. Hazardous waste will be taken away after the camp closure.

The project benefits will be more apparent on the regional level when reduction in energy deficit will allow further economic development, especially for local industries and creation of new jobs. Jobs will be created for the local unskilled labour during construction but only few jobs will be available to them during operation. Yet, presence of the WPP may encourage targeted education among the local school



graduates that may be able to obtain the skilled jobs. Indirect benefits are expected to be minimal or none. There will also be sizable reduction in air pollution (500t of SO<sub>2</sub> and 270t of NO<sub>x</sub>) and the country contribution to the global warming (265 860tCO<sub>2</sub> avoided annually), in line with Kazakhstan's Nationally Determined Contribution<sup>1</sup>.

Stakeholder engagement to date has been minimal. Communication with the affected parties will be enhanced according to the stakeholder engagement plan prepared by the consultant. To allow for some benefits from the project to be felt by the local community a Corporate Social Responsibility Program (CSR) that would include both financial as well as other forms of support is to be agreed with the Zhanatas Public Governance Council and the District Council. Selection of actions will be restricted by the budget commensurable with the size of the project, absence of overlap with the State programs and their sustainability.

Summary of the project impacts in relation to AIIB Environmental and Social Policy and Environmental and Social Standards are given below. The suggested impact mitigation measures are expected to reduce risks to acceptable level and ensure that the project is developed and operated in accordance with the applicable environmental and social requirements.

AIIB/IFC ESS/PS	Impacts and Issues	ESMP Action
1 Environmental and Social Assessment and Management	Overall compliance expected but the risk that EHS system may not be developed for project and transferred to subcontractors effectively. Local population may not gain from the Project	Complete assessment for associated facilities and migratory birds surveys. Develop project specific EHS and stakeholder management system, include subcontractors and suppliers. Develop CSR Program.
2 Labour and Working Conditions	Overall compliance expected but risk of insufficient management of subcontractors	Ensure that contractor and subcontractor have HR policy disclosed to workers, have a worker representative, provide grievance mechanism accessible to workers. Provide relevant HSE training to all Project Workers. Ensure that accommodation of all project workers meet applicable standards.
3 Resource Efficiency and Pollution Prevention and Control	Potential for small and localized spills during refueling and engines repair	Equip fuel tanks and places of small repairs of machinery with leakage containers and swapping material and control usage
4 Health and Safety	Full local compliance expected but subcontractors HS performance may not be controlled effectively. For high risk work, safety culture instruments may not be applied to eliminate risk of rare accidents with severe consequences.	Develop project specific HS and ER plans and procedures (e.g. oversize equipment transportation, IWA, near misses register) and worker code of behaviour, equip nacelle with fire detectors and arrestors,
5 Land acquisition, Involuntary Resettlement and Economic Displacement	Full local compliance but AIIB/IFC noncompliance. Seven land plots leased by farmers and used for pasturing were altered to accommodate WPP with farmers formal consent but no proper consultation and no compensation in land or cash. After the turbines number reduction, the land was not returned to the tenants.	Conduct meetings with each farmer, document results. Return unused land to the tenants. Provide compensation for land taken with preferably equal quality and size land, livelihood support or cash.
6 Biodiversity Conservation and Sustainable Management of Living Natural Resources	Risk of partial compliance if internal traffic and noisy activities are not managed and footprint in the protected plants habitats is not minimised. Wildlife monitoring is not complete	In the protected plants habitats reduce construction footprint as much as practically possible. Where possible, reduce noisy works at the reproduction period March-June. Prohibit flowers picking and towers parts and wire dragging over the ground. Commission an experienced ornithologist

<sup>1</sup> [https://www4.unfccc.int/sites/submissions/INDC/Published%20Documents/Kazakhstan/1/INDC%20Kz\\_eng.pdf](https://www4.unfccc.int/sites/submissions/INDC/Published%20Documents/Kazakhstan/1/INDC%20Kz_eng.pdf)

AIIB/IFC ESS/PS		Impacts and Issues	ESMP Action
			to continue through year wildlife monitoring
7	Indigenous People	There are no communities which meet AIIB's and IFC's criteria to be considered as Indigenous Peoples.	None
8	Cultural Heritage	Archaeologists surveyed only area around turbines missing the internal roads, storage areas and connecting powerline. Possible chance finds may not be recognised and thus damaged. The remaining mounds may not be marked	Commission a licensed archaeological company to conduct additional archaeological survey. Mark the remaining mounds. Inform the locals about the sites and their protection status. Develop and require the earthwork conducting subcontractors to instruct their workers to follow the chance find procedures.
9	Information Disclosure and Stakeholder Engagement	Information on land acquisition purpose was not disclosed clearly to land tenants and owners whose land was seized for windfarm components building and operation. No compensation for lost land was provided. SEP and grievance mechanism may not be implemented.	Arrange meeting with tenants from which the land was seized and disclose the purpose of land acquisition clearly with notes of tenants' complaints, suggestions and claims. Compensate for land taken either in cash, through livelihood support or land replacement. Implement SEP and grievance mechanism. Provide public access to information on E&S performance. Report annually on E&S performance to stakeholders and lender(s)

## 1 PROJECT DESCRIPTION

The 100MW wind power plant (the WPP or the Project) is to be built 10-12km southwest of Zhanatas town in Sarysu District, Zhambyl Region. The Project aims to provide a sustainable and environmentally friendly source of renewable electrical energy for the region and allow Kazakhstan to meet its commitment to producing 3% of total energy from renewable sources. The annual energy output is expected to be 350GWh.

The 233.5ha of land was leased for 49 years for WPP construction and operation. Forty 90m high Envision EN-121/2.5 towers with 2.5 MW turbines will spin 59.5 m long blades at the most frequently occurring speed of one turn per 5 seconds. The blades will not rotate if the wind is below 3m/s and above 20m/s. The turbines will be placed on the elevated flanks of an eroded anticline on reinforced concrete 21.6m square and 2.8m deep foundations at 0.5 – 0.65 km from each other in 2 rows and 2 smaller segments 6.5km away. The main row will stretch for 12km. The 35kV alternate current powerlines will run along the 26km long and 4.5m wide internal roads to the internal substation from where an 110kV overhead line will run along the road to Shymkent for 7.6km to the 110/35kV national grid substation. This line will go 2m underground for 2.7km under an overpass and for 70m on the approach to the substation. The line will have 12 up to 25m high anchor towers. Both, 110kV and 35kV lines will be on 19m high poles. The 35kV powerlines will have handing sets of 3 insulators and 110kV line will have sets of 6 insulators. The land deeds were obtained for all project components. The oversize parts like towers, blades and main crane will be transported in the fixed horizontal position reducing by this maneuverability of the trailers that will also travel in groups of 5 or 6, transporting one turbine at a time. Examination of the satellite images shows that the over 1100km route from Khorgos (Figure 3) enters some settlements, has two lane segments (highways R43 and R44), sharp turns, steep rises, gates and road crossing utilities that may need to be altered. The Company commissioned transportation to a qualified contractor that surveyed the transportation route but has not prepared a detailed plan. It plans to solve the road constraints on the way as they occur. A road police car will escort the trailers caravan. The trailers will have sufficient number of wheel pairs to comply with the maximum load for the selected roads taking into account the ambient temperature effect if some transportation runs into the hot weath-

er period. With the maximum allowed load 20t, the trailers have 14-18 tires and 4-6 wheel pairs with the 8t maximum load on each pair.

Construction started in January, 2019 and was planned to last 16 months. By March a container-type construction office and worker camp have been built and foundation pits for 2 turbines have been dug. Further works include foundation pits digging, steel frames wire tying and filling them with concrete, wires pulling, poles installation, internal roads laying and turbines assembling. Small energy blasting will be used for the pits. There will be no welding as tying up steel rods with wire is considered to be more reliable albeit more labour intensive. The crane pads and turbines assembling pads will be cleared. Cement will be brought to the concrete plant, which will be built at the construction site. Water for ablu-tion, cooking and drinking is transported by tank trunk to the construction site.

The construction is sequential: In March 120 workers were involved in construction but in peak time up to 250 workers are expected to be needed. Most of the workers will be local from nearby villages and Zhanatas. The others: supervisors and specialists involved in turbines assembling will be placed in a container type camp close to the turbine 11. The steel wire frame tying is expected to be conducted in the day time only and to keep up with the work schedule more workers are expected to be hired. Concrete filling will be conducted throughout the clock and will require 12/12 hour shifts.

The crane pad, storage and assembly areas will take up to 0.4ha for each turbine. With the absence of fertile top soil there will be no need to remove store and re-apply it after the work completion. Excess ground will be disposed onto Kazfosfat overburden heaps close to the turbines.

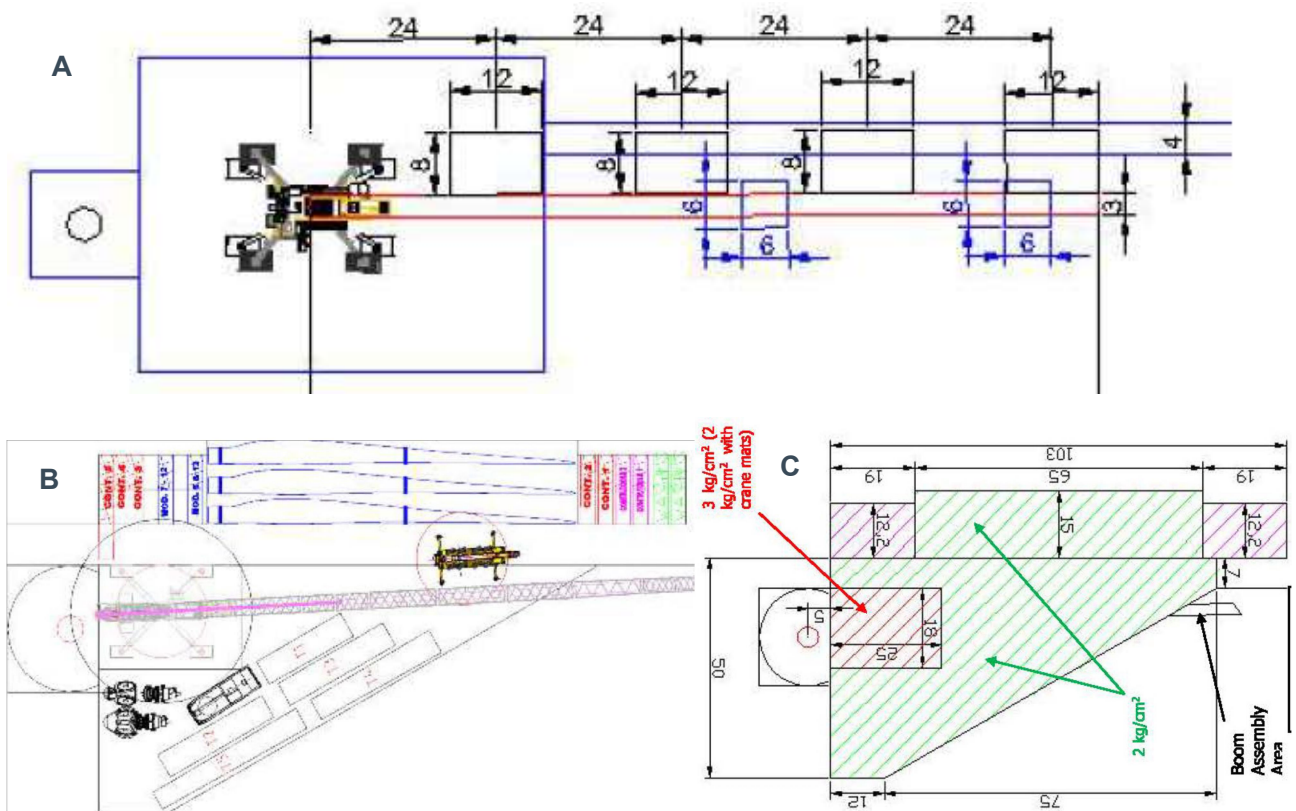


Figure 1 Example of a turbine components ideal arrangement: A. 4m wide access road with 12x8m intermediate crane pads and 6x6m main crane hoist supporting pads next to it. B. Storage layout with blades, containers, generator, main crane hoist, nacelle and tower sections and C. Storage dimensions, total 0.4ha.

Non-hazardous waste and waste water will be taken to Zhanatas waste dump and untreated sewage lagoon respectively. Both places are approved and the waste dump is fenced and guarded.

Because only one main crane will be available, one turbine will be erected at a time, which is expected to take 4 windless days. The work will stop in high wind and at night. In parallel, the poles will be erect-

ed, the wires will be pulled, access turbines roads will be constructed and substation components will be erected. The passages and parking lots will be paved with macadam without drainage collection.

The fully automatic operation is planned for 20 years without major repair. It will be carried from the control room at the substation via SCADA. Around 15 workers will be involved in the operation and maintenance. The non-skilled workers that can be employed locally will consist of 2-4 guards and a cleaner. They will be provided with hygienic facilities with an underground septic tank emptied via a tank truck into the Zhanatas untreated sewage lagoon.

In high wind, the blades will be turned to prevent uncontrolled spinning with the following gearbox overheating, and potential fire or blades disconnection. The blades will have ice formation prevention. Security lighting will be kept through the night at the fenced area, along the passages and at each turbine pad

The noise from wind turbines at ground level with the maximum operating wind speed 20m/s is expected to be 66.5dB(A). This is below the level at which the workers are to be provided with air protection (80dB(A) as per GOST 12.1.003-83).

The volume of domestic waste generated during construction was calculated as 77t, which can be seen in Section 6.1.4. The other waste from construction site will be small. Nonhazardous waste will be placed into Zhanatas waste dump. Hazardous waste will be accumulated at the site and handled to a licensed contractor at the end of the construction. Transformer oil will not contain PCBs. Two step up transformers will have an oil dumping tank in case of fire. The high voltage circuit breakers will be filled with sulphur hexafluoride (SF<sub>6</sub>) that has global warming potential almost 24 000 times that of CO<sub>2</sub> and atmospheric lifetime of 800-3200 years.

**Table 1 Weight of turbine components. Trailer weight taken as 3.7t**

Component	Weight, t	Length,m
Blades	12.5	59.5
Nacelle	76	n/d
Hub	n/d	n/d
Tower top	41.1	30
Tower middle 2	52.8	30
Tower middle 1	73.1	26
Tower bottom	80.6	17
Power unit	7.6	n/d

**Table 2 Noise dB(A) at various wind speeds m/s with 1.2kg/m<sup>3</sup> air density**

Wind	Hub	Ground
6	103.3	58.5
7	106.6	61.3
8	109.5	64.5
9-16	111.2	66
16-22	111.4	66.5

## 2 EPC CONTRACTOR EHS LABOUR AND SOCIAL MANAGEMENT

The experienced Chinese company SINOHYDRO Co., Ltd has been selected as the EPC contractor. Its HSE management capacity and practices were judged on the answers to an 8 page questionnaire supported by 15 HSE documents that have been translated into English for the purpose indicating absence of experience of implementing its HSE management system outside China.

SINOHYDRO has integrated HSE management system certified with ISO 9001:2015, ISO 14001:2015 and OHSAS 18001:2007, which is due to verification in December 2020. The procedures are clearly written and include all required environmental control procedures like air emissions control, water quality control, hazardous waste disposal, hazardous substances and dangerous goods control, pit slopes management, stockpiles, spoil and waste dumps arrangement, public consultation and community relations. The Occupational Health and Safety control procedures include emergency response, spill prevention and control, material safety data sheets, incident reporting, recording and investigation. The Grievance and Complaint Mechanism Procedure stipulates the actions required for handling grievances. Its implementation is controlled by a separate officer who reports to the HSE manager.

For each project SINOHYDRO tailors its HSE and labour requirements and procedures and allocates a budget for HSE training, emergency drills and the third party HSE system audit. It requires prospective subcontractors to submit with the bids information on their HSE management system. SINOHYDRO HSE policy and general requirements to the contracts are attached to the contracts and adherence is controlled through regular audits..





Figure 2 Overview of the wind-farm area. Project components are written in white, social constraints are shown in green. Green dash lines are pasturing routes. See Figure 6 for visual impact modeling from the identified sensitive viewpoints shown here as cameras.





Figure 3 Windfarm parts road transportation route 1100km from Khorgos. Four lane roads shown in green, two lane roads – in pink where the route also has steep (12%) rises and descends. Turns that may require infrastructure alteration are framed black. The potentially constraining structures such as gates, overhead powerlines, above-road gas pipelines were located during a reconnaissance survey but bridges integrity and maximum allowed load is still to be assessed.

The volume of domestic waste generated during construction was calculated as 77t, which can be seen in Section 6.1.4. The other waste from construction site will be small. Nonhazardous waste will be placed into Zhanatas waste dump. Hazardous waste will be accumulated at the site and handled to a licensed contractor at the end of the construction. Transformer oil will not contain PCBs. Two step up transformers will have an oil dumping tank in case of fire. The high voltage circuit breakers will be filled with sulphur hexafluoride (SF<sub>6</sub>) that has global warming potential almost 24 000 times that of CO<sub>2</sub> and atmospheric lifetime of 800-3200 years.

The labor agreements for employees take into account the local labor protection legislation. Through the commitments in its HR policy and collective agreement, SINOHYDRO provides equal opportunities and non-discrimination for all employees. The men/women ratio is 61:39 since the engineering field mainly includes men powered construction workers. The employees are not part of any trade union but the company does not obstruct workers joining trade unions or electing their representatives.

SINOHYDRO website <http://eng.sinohydro.com/> discloses the environmental and social responsibility policy in Chinese, English, Spanish and French but does not report on its environmental and social performance and does not allow receiving feedback giving neither email nor telephone.

### 3 LEGAL AND INSTITUTIONAL REQUIREMENTS FOR ZHANATAS WINDFARM

AIB have a set of Environmental and Social Standards defined in the Environmental and Social Framework (ESF). None of the project activities are listed in the AIB Environmental and Social Policy Exclusion List. The project also does not fall under the Category A where the project would be expected to have irreversible, cumulative, diverse or unprecedented environmental and social impacts. The project is classed in category B because it is expected to have limited number of potentially adverse environmental and social impacts limited to the project area that can be successfully managed using good practices.

The ESS1 on Environmental and Social Assessment and Management System apply for the Project. The ESS2 on Involuntary Resettlement is relevant because the WPP crosses 7 farm enterprises land plots leased in 2000s and the land was acquired and rearranged with the help of the regional and district authorities to accommodate the initial 51 turbines and access roads to them. The ESS3/PS7 Indigenous People is not relevant since there are no indigenous people present in the area of influence.

The AIB and IFC have a set of Environmental and Social Standards (ESS)/Performance Standards (PS) defined in the AIB Environmental and Social Framework (ESF) and IFC Performance Standards on Environmental and Social Sustainability (PS ESS). Although AIB and IFC establish the same standards, in contrast to the comprehensive PSs, the ESS are not as clear and coherent as the PSs. The standards are presented in detail in the Table 3.

None of the project activities are listed in the AIB Environmental and Social Policy Exclusion List. The project also does not fall under the Category A where the project would be expected to have irreversible, cumulative, diverse or unprecedented environmental and social impacts. The project is classed in category B because it is expected to have limited number of potentially adverse environmental and social impacts limited to the project area that can be successfully managed using good practices.

The ESS1 on Environmental and Social Assessment and Management System and PS 1-4 and PS 6 apply for the Project. The ESS2/PS5 on Land Acquisition and Involuntary Resettlement is relevant because the WPP crosses 7 farm enterprises land plots leased in 2000s and the land was acquired and rearranged with the help of the regional and district authorities to accommodate the initial 51 turbines and access roads to them. The ESS3/PS7 Indigenous People is not relevant since there are no indigenous people present in the area of influence.



In addition, the IFC Environmental, Health and Safety Guidelines for Wind Energy requests special consideration to the landscape, noise, biodiversity, shadow flickering, water quality; working at height and in remote locations, lifting operations; blade and ice throw, aviation interference, electromagnetic radiation and signals interference, public access and abnormal load transportation.

In terms of Kazakhstan requirements, the project is given the hazard category 4; it will be controlled by the Natural Resource Management Department of the Regional Council that involves in the decision making the regional departments of the Emergency Situation Committee, the Consumer Rights Protection Office and the Ministry of Labor and Social Security. During the operation these bodies will also be entitled to review all current and historic relevant documentation that has to be retained for 5 years. The WPP is not in a list of activities that require sanitary protection zone according to Sanitary-Epidemiological requirements of the RoK on establishment of sanitary protection zones (SanPiN #237 dated March 20, 2015).

Emission discharges and waste volumes are calculated in the environmental impact assessment report (EIA) for construction using the personnel, machinery and material specifications. The positive conclusion on EIA acts as a permit for the calculated pollution. The possible emission of a potent greenhouse gas Sulphur hexafluoride ( $SF_6$ ) from high voltage circuits breakers is not accounted and not regulated. The Company will not need an Emission Permit for construction or operation. The construction contractor shall have the Emission Permit for the emissions of the machinery used in construction. Cement for foundations and chip rock for internal pathways will be bought from existing suppliers that have Emission Permits for its production activities. The onsite concrete plant contractor will also have the Emission Permit from its plant. Special Water Use Permit will not be needed because the water will be bought from a supplier that has such a permit. As no pollution sources will be at the site during the WPP operation, there will be no need to prepare an environmental protection plan or an environmental operational control plan and impact monitoring will not be required by Kazakh legislation, while it will be required for the Lenders.

Apart from the main requirements of the RoK Environmental Code and the SanPiNs, the project is to comply with the requirements of the ratified international conventions and following EU directives that are obligatory under Kazakhstan Renewable Energy Financing Facility (KazREFF) requirements:

- The United Nations Framework Convention on Climate Change;
- Strategic Environmental Assessment Directive 2001/42/EC;
- Bird Directive 2009/147/EC;
- Habitats Directive on the protection of sensitive and vulnerable natural habitats 92/42/EC
- EU Water Framework Directive 2000/60/EC;
- Air Quality Framework Directive 96/62/EC;
- Habitats Directive'92/43/EEC 2007;

KazREFF also requests in general terms to account for integrity of the transportation roads surface and structures, noise, dust and risk of working at height during construction, risk of birds and bats collision with the turbines blades and powerlines and effect of noise, vibration and flicker during operation.

More detailed requirements for accounting the wind power impacts are given in the World Bank EHS Guidelines for Wind Energy released 7.08.2015; UNDP's 2010 Guidelines on the Environmental Impact Assessment for Wind power plants, the EU Guidance on Wind Energy Developments, Natura 2000, the European Wind Energy Association Wind Energy Facts 2009 and the IFC Environmental, Health, and Safety Guidelines for Wind Energy

The following legislation creates favorable conditions for the industry in order to increase the share of renewable energy for electric and thermal energy production:

- Kazakhstan Concept of Transition to "Green Economy 2013-2050,
- The Law On Support of Use of Renewable Energy Sources #165-IV from July 4, 2009 that



Production, transfer and use of electricity in Kazakhstan are regulated by the Electric Power Law #588-II from July 9, 2004.

In Kazakhstan state-owned land can be leased to legal entities that are residents of Kazakhstan. Most leases are on a long-term basis for a maximum of 49 years. A lease may have the 3 year probation period in which the tenant is to conduct necessary studies of the land and to provide evidence of the land being used according to its designation. The main applicable law regulating land allocation process is the Land Code. The district council is responsible for reserving and providing land plots for the renewable energy sources (RES) projects in accordance with the Law "On supporting the Use of RES" #165-IV dated July 4, 2009.

According to the Land Code № 442-II from 2003 Article 81, the land that has been leased to a private entity can be reallocated to another private entity by the responsible State body on mutual agreement between two entities involved. The State body (currently the district council) can terminate the initial lease contract if the tenant was not using the land according to the designated purpose (e.g. not developing the land designated for agriculture). Article 69 of the Land Code provides procedures for easement right for private land that is established through agreement between the land owner and the party requesting easement right, e.g. allowing passage along a road or a powerline that goes through the plot.

Payment for leasing is regulated by the Tax Code 2008 (with alterations 2017) and the Government Resolution #890 from 2003 (with alterations 2011) on Establishment of Base Payment Rates for Land Plots Leased to Private Entities. For the given 233.5ha plot, the powerline corridor and access road right of way the annual payment is \$178.

Archaeological survey of the site is required to be submitted with the design for the State Expertise of the project. If archaeological objects are found, the survey results are also submitted to the regional council which then becomes responsible for registering and protecting the objects including installation of signage. The Company would however be obliged to ensure adherence to these objects related restrictions that are separated into 3 zones measured from the edge of the object or group of the objects: the 50m protection zone where work that may damage the object is prohibited; the 150m zone where installation of structures is regulated and the 250m zone where alteration of the natural landscape is prohibited. If the Company decides to initiate protection measures before the regional council, it has three options: install signage at four sides of an object, stake out the 50m zone by ploughing or planting trees or shrubs. Using other forms of barriers is prohibited.

Restrictions are applied to some local hard surface roads along the transportation route as being maximum 10 tonnes for a wheel pair load. This limit lowered further to 8 tonnes for the day time and for the ambient temperature at or above +25°C. An oversize equipment transportation plan and traffic management plan prepared by the EPC contractor are to be approved by the:

- Regional branches of the National Company (NC) KazAvtoZhol PLC of the Committee for the Automobile Roads of the Ministry of the Industry and Development;
- Transport Control Inspection;
- Traffic Police;
- Railway operator NC Kaztemirzholy PLC if railway is used;
- Municipal electric power, district heating and gas distribution companies.

Transportation shall be conducted according to the Procedures for Transportation of Oversize and Heavy Freight on the Republic of Kazakhstan Territory #206, 2015 with amendments. The procedures restrict the speed to 60 km/h and to 10km/h above the dams and bridges, oblige to conduct transportation in the hours of the least road occupancy and during daylight outside the settlements and specify the conditions when a 'cover' car and an escort car with the blinking beacon lights are needed. The Procedures prohibit overtakes of all vehicles that move at speed above 30 km/h.

The imported lifting equipment will have to pass the local expertise before it can be used.

## 4 COMPANY'S COMPLIANCE STATUS

Table 3 summarizes project compliance with the Kazakhstan, AIIB and IFC requirements. The main issue is absence of compensation and improper engagement of 7 farm enterprises whose land was seized for this project. This issue, however, can easily be sorted as the land was initially leased opportunistically from the State after disintegration of the collective farm because the rental cost was very small. The land is undeveloped and the farmers pay no attention to the land plots boundaries when pasturing their livestock on the land that is available in abundance. The documents needed locally to prove the farmers' consent with this seizure are in place (see Appendix 2 doc #15) but the interviewed farmers hardly remember of giving this consent mainly because they have given several consents in the past and do not distinguish one from another.

Within the detailed design the design contractor prepared the EIA (OVOS) and obtained all the required approvals and the Regional Environmental Protection Department Positive Conclusion that is the environmental permit prior to construction. Due to discrepancy in the requirements, the EIA does not comply with the level of assessment required by the AIIB or IFC in several key components like social environment including visual impact, impact on birds, bats and moles and oversize and heavy parts transportation. For a windfarm, public consultation is not required, however public hearings were conducted on 15.02.2019 in Zhanatas central library.

**Table 3 AIIB ESS and IFC PS requirements compliance status : MN – material noncompliance ; PC-partial compliance; FC-full compliance; NA-not applicable.**

ESS /PS	ESS/PS Requirement	Com-pliance	Comment/Gaps	Actions required to achieve compliance	ESMP #
<b>1 Environmental and Social Assessment and Management</b>					
Summary: The Company has local EIA approved by authorities. Identified gaps filled with this report. No EHS and social management system has been developed yet.					
1A/1.7-12	Environmental and Social Assessment	PC	Limited coverage of avian fauna and lack of archaeological survey of access roads and power export line	See 1B/6.9-6.24 and 1C/8.6-9,16	6.5 8.1
1A/1.13-16	Environmental and Social Management system, policy and plan	Risk of PC	Project specific ESMS may not be developed or may not be passed to all sub-contractors or ESMS implementation may not be controlled effectively. Local population may gain little from the project	Develop the project specific Environmental, Health and Safety (EHSM) and Stakeholder Management Systems with plans and procedures and implement them. Ensure full compliance with National legislative requirements and applicable standards. With Zhanatas District councils develop and implement a Corporate Social Responsibility Program (CSR) for Project and disclose it as per SEP. Include into tender documentation and Contractor's contract a provision on compliance with AIIB/IFC EHS, social and labour protection requirements. Select contractors that demonstrate adequate capability in EHS and labour management including managing subcontractors. Ask contractors to obtain all required EHS permits and develop an EHS plan agreeable to the Company before starting any activities	1.1  1.2  1.3
1A/1.17-19	Organisational capacity	Risk of PC	EHS capacity may be insufficient	Appoint CLO and EHS manager proficient in ISO 14001, OHSAS 18001 and familiar	1.1

ESS /PS	ESS/PS Requirement	Compliance	Comment/Gaps	Actions required to achieve compliance	ESMP #
				with the applicable E&S standards to develop EHSM and SEP	
1/2.27-29, 6.30	Supply chain management	Risk of PC	AIB/IFC EHS requirements may not be included into subcontracts	See 1.13-16. Develop Subcontractor and Supply Chain Management and Monitoring Plan to ensure contractors, sub-contractors and suppliers of core materials comply with the national legislation on labor and the applicable standards.	2.3
1A/1.2 2-24	Project monitoring	Risk of PC	Subcontractors adherence to EHS requirements may not be well controlled	See 2.27-29. Audit the contractor adherence to the EHS aspects of the contract, ensure timely correction of deviations.	1.3
<b>2 Labour and Working Conditions</b>					
Summary: The Company and EPC contractor has EHS and labour protection policies, plans and procedures but there is a risk that they will not be passed over to the subcontractors and implementation will not be controlled effectively					
1D/2.8 2.9	Human resource policies and working relationships	Risk of PC	The HR policy may not be disclosed to contractor and subcontractors' workers	Ensure that contractor and its subcontractors have a human resource policy which is disclosed to workers.	2.1
1D/2.15-17, 21-22	Child and forced labour, non-discrimination and equal opportunity	Risk of PC	All effectively controlled by Kazakhstan labour inspectors but giving opportunities to women.	See 2.27-2.29. Arrange sufficient number of meetings with women in Zhanatas and nearby villages to identify the jobs that can be performed by them and assess their interest and capability to participate in the project. Agree with the EPC contractor the % or number of women to be employed and specific training to be provided and control fulfillment of the set quota. Submit all the meetings outcomes to the lender banks. For the operation, define women involvement quota, fulfill it and reassess once a year for the options to increase it.	2.4
1D/2.13-14	Workers' Organisations	Risk of PC	Subcontractors workers may lack worker representative	Ensure that contractor and its subcontractors have a worker representative	2.1
1D/2.10-12	Wages, benefits, working conditions	Risk of PC	Subcontractors working conditions and payments may not comply with AIB ESS1	Request the contractor to monitor subcontractors working conditions and timely disbursement of wages	2.2
-/2.12	Workers' accommodation	Risk of PC	The workers camp may not fulfill IFC Workers' Accommodation: processes and standards	Check workers camps design for compliance with the national legislation and IFC Workers' Accommodation: processes and standards 2009. Inspect worker camp accommodation regularly	2.5
1D/2.18-19	Retrenchment	NA	Temporary contract termination of ~200 local unskilled workers expected after construction completion. Retrenchment requirements do not apply in this circumstances		
1D/2.20	Grievance Mechanism	Risk of PC	Grievance mechanism may not be implemented properly	Provide one grievance mechanism accessible to all project related workers with the ability to complain anonymously, and include in each answer a roadmap for an unsatisfied worker to take the grievance further. Produce annual report on implementation of grievance mechanism, types of grievances and resolutions.	2.1 2.2
1/2.24-26	Non-Employee Workers	Risk of PC	See 2.10-12		
1D/5.	Security Personnel	FC ex-	A licensed security subcontractor will be employed. Its staff will not use firearms		

ESS /PS	ESS/PS Requirement	Compliance	Comment/Gaps	Actions required to achieve compliance	ESMP #
12	Requirements	pected	and have the required training and instructions		
<b>3 Resource Efficiency and Pollution Prevention and Control</b>					
Summary: Potential for small and localized air pollution and contamination of ground with oil products if no measures are taken.					
1B/3.6	Resource efficiency	NA	Very limited resources are used during construction and operation. Zhanatas has good supply of water needed for concrete making		
1B/3.10-11	Air emissions	Risk of PC	Equipment smoke emission control may not be included in the internal audit.	Conduct regular preventive maintenance of all engines, include control of excessive machinery smoke in the internal audit checklist.	3.1
			Excessive dust from construction vehicles	Pave internal roads	3.6
			Excessive release of sulfur hexafluoride from circuit breakers during repairs may not be noticed	Develop maintenance and repair procedures to minimise risk of Sulfur Hexafluoride release from circuit breakers. Keep SF6 inventory to track releases.	3.7
1B/3.9	Soil and groundwater contamination	Risk of PC	Oil storage may not have secondary containment and trays may not be used when refueling machinery	Control that oil drums are stored on a sheltered and bunded pad. If storage of backup oil and diesel cans is unavoidable, arrange mobile secondary containment with a lid and secure drainage tap.	3.3
			Septic overflow and groundwater contamination from vehicles and equipment washing possible	Ensure that contractor controls fuel tank drivers use of trays under refueling couplings and that places of small repairs of machinery have leakage containment and swapping material Install septic level indicators. Arrange equipment and vehicles wash pad. Capture and dispose safely its drainage.	3.4
1B/3.7	Water use	NA	Water management plan is not required as little water will be used during construction and operation and water is in good supply in the area		
1B/3.10-11	Greenhouse gases	NA	Operation emission of SF <sub>6</sub> is negligible, small and short construction emission. Project will save significant amount of greenhouse gas emissions.		
1B/3.10-12	Wastes and wastewater	Risk of PC	Waste management plan may not be developed	Request the contractor to develop waste management plan that follows the reuse-reduce-recycle-recover-safe disposal hierarchy and includes waste disposal chains of custody. Control subcontractors adherence to the plan	3.2
			Small volumes of waste is disposed into non-engineered dump and wastewater lagoon without treatment	Monitor appearance of a planned engineered landfill at Zhanatas or elsewhere. Obtain permit to dispose appropriate waste there	3.5
1B/3.13	Hazardous substances and materials	Risk of PC	Insignificant volume of paints and solvents will be stored in the standard railway container with impermeable floor and barrier at entry. See 3.9		
<b>4 Health and Safety</b>					
Summary: Company and EPC contractor have an OHS management system, but EPC contractor may not be able to control subcontractors OHS performance in transportation, high voltage works and behavior towards locals					
1D/2.23	Occupational health and safety	Risk of PC	Full local compliance expected but subcontractors HS performance may not be controlled effectively.	Request the contractor to develop site specific HS plan with identification of risks and to transfer its OHS policy and system requirements to subcontractors through trainings and regular HS audits	4.1
			For high risk work, safety culture instruments may not be applied to eliminate risk of rare accidents with severe consequences	For all high-risk works, add site specific risk assessments in the local permit-to-work system and enforce register of near misses with their in depth internal analysis For operation stage develop safety provi-	4.2



ESS /PS	ESS/PS Requirement	Compliance	Comment/Gaps	Actions required to achieve compliance	ESMP #
				sions for an individual electrician working alone (IWA)	
1D/5	Community health and safety	Risk of PC	Zhanatas residents may be affected by imported labour behaviour	Develop code of conduct and control workers' adherence to it	4.4
1D/5.6	Infrastructure, building, and equipment design and safety	FC Expected	All lifting equipment will be certified, all project buildings will comply with the safety requirements		
-/5.8-10	Ecosystem services safety <sup>2</sup>	FC Expected	Grass and groundwater as ecosystem products will not be impaired and there will be no improvement. Cultural benefit from ancient burial mounds excavation. Improved access to objects of aesthetic value (flowers, views). Supporting services (plants photosynthesis and pollination, nutrients cycle and soil development) are not affected		
1D/-	Traffic and road safety	Risk of PC	Head-on collision on overtaking the project vehicles on 2 lane parts of the route, traffic congestions, damage to road surface and bridges may occur	Develop oversize and non-standard weight equipment transportation plan. Obtain the road police approval and request a second escort car to arrange controlled overtaking of oversize trailers.	4.3
1D/5.6	Natural hazards	NA	MSK-64 Scale seismicity 7 will be accounted in design. Risk of spring flooding and ground fire risk is negligible, extreme cold and dust storms not recorded.		
1D /5.9	Exposure to disease	NA	No rodents or other disease carrying animals were noted at WPP area		
1D/5.11	Emergency preparedness and response	Risk of PC	Emergency response plan may not include all risks identified in this report, not engage local capacities at various levels and may not be disclosed to the relevant stakeholders Nacelle level fire may damage turbine beyond repair. Possibility of parts flying onto highway	Prepare site specific health and safety and emergency response plans for construction and then for operation and disclose it to relevant stakeholders. Integrate local fire brigades into the second tier response and arrange sufficient firewater replenishment. Inside nacelle consider provision of automatic fire detection systems linked to automatic shutdown and fire abatement.	4.5
<b>5 Land Acquisition, Involuntary Resettlement and Economic Displacement</b>					
Summary: areas of 7 leased by farm enterprises land plots used for pasturing were altered to accommodate WPP. Incomplete consultation. No compensation in land or cash. After the turbines number reduction, the land was not returned to the tenants					
2/5.8	Avoid or minimise displacement and compensate for it	MN	Land deeds for turbines, storage/camp areas, internal roads and connecting powerline route were obtained with consent of 7 tenants, whose land was partially taken. No efforts were made to minimise economic displacement or compensate for lost land. After the turbines number reduction, the land was not returned to the tenants.	Conduct one joint meeting with 7 farmers whose leased land has been taken for the windfarm, document results. Provide compensation for land taken either through land replacement, livelihood support or in cash.	5.1
2/5.9	Consultation with affected by acquisition	PC	Tenants' consent obtained in 2013 through signing land arrangement agreement with a map without a clear understanding of what the acquisition was made for. Meetings minutes prepared but	Conduct one meeting with 7 tenants and document results.	5.1

<sup>2</sup> benefits that people and businesses, derive from ecosystems are divided into (i) products (ii) made improvements (iii) cultural and aesthetic and (iv) natural processes that support ecosystems.

ESS /PS	ESS/PS Requirement	Compliance	Comment/Gaps	Actions required to achieve compliance	ESMP #
			meeting not conducted.		
2/5.11	Grievance mechanism	PC	Kazakhstan grievance mechanism available for tenants was not used	Implement SEP with the grievance mechanism, disclose it to the affected tenants and update annually	10.1
2/5.12 -16	Livelihood restoration plan	NA	Not required: tenants use land seized from the leased plots, windfarm does not affect pastures and powerline take insignificant land for poles and turning towers		
<b>6 Biodiversity Conservation and Sustainable Management of Living Natural Resources</b>					
Summary: Impact is expected to be of low significance if internal traffic is managed and noisy activities start before birds nesting. Footprint in the protected vegetation habitats shall be minimised					
1B/6.9 - 6.24	Biodiversity Conservation	Risk of PC	<p>Total destruction of vegetation on up to 16ha under turbines, 25ha along the access roads and trenches and partial damage under 10.8ha of the storage areas with risk of damage to protected plant species by excavating, tramping or picking.</p> <p>Breeding birds may abandon their eggs.</p> <p>Sensitive animals may be temporarily displaced with increase of competition and predation and food availability reduction leading to decrease in chances of offspring survival</p> <p>Impact of lighting on bats is not considered during design</p> <p>Nacelle supplier need to seal the gaps to prevent bats and birds roosting in them</p> <p>Birds and bats monitoring may not be continued through the year according to the internationally accepted methodology</p> <p>Post commissioning birds mortality monitoring methodology for staff may not be developed and staff may not be trained and birds and bats mortality may not be recorded and included in Annual Report to AIIB/IFC as required</p>	<p>In the area of turbines 28-40 reduce construction footprint beyond the standard approach to preserve the protected plants - develop specific parts transportation, storage, earthwork and erection methods to minimise deliberate and accidental damage, minimise the need for levelling earthwork;</p> <p>Prohibit flowers picking, animals chasing and eggs collection;</p> <p>Establish paved access routes prior to use of heavy vehicle to construction sites, prohibit driving outside them and control adherence;</p> <p>When reinstating the working sites, ensure that the impact from reinstatement does not exceed the impact that has been done already.</p> <p>Reduce noisy works at the reproduction period March-June where it is possible</p> <p>Plan work to shorten human presence at a particular tower</p> <p>Prohibition of towers parts and wire dragging over the ground</p> <p>Discourage public access to the area by digging trenches across the connection of the internal roads with the main roads.</p> <p>Make site less attractive to bats by reducing the warm period night light pollution by placing the LED warm (wave-length 590nm) lights as low as possible, shading them from the areas that do not have to be illuminated and installing ambient light and movement detectors to minimise the time of the lights operation. Use intermittent lighting and infrared security cameras</p> <p>Make and keep inaccessible to bats and birds all the gaps and interstices in the nacelles</p> <p>Commission an experienced ornithologist to continue birds and bats monitoring to complete through the year assessment of the WPP territory usage. Develop methodology and train the plant staff to monitor birds and bats site usage and mortality with a focus on protected species. If annual mortality exceeds the industry statistics for the given turbines: 100 bats, 20 birds and 1 pray birds per 10MWh generated or more than 1% of the population of protected species using the site,</p>	<p>6.1</p> <p>6.2</p> <p>6.3</p> <p>6.4</p> <p>6.5</p>

ESS /PS	ESS/PS Requirement	Compliance	Comment/Gaps	Actions required to achieve compliance	ESMP #
				implement additional mitigation measures in liaison with AIIB/IFC	
1B/6.2 6-29	Sustainable management	Risk of PC	See 1.13-16		
<b>7 Indigenous Peoples</b>					
3/7	Indigenous Peoples	NA	Project area has no communities which meet AIIB's criteria to be considered as Indigenous Peoples.		
<b>8 Cultural Heritage</b>					
Summary: The additional archaeological survey may result in other mounds findings that may need to be excavated because protection zone cannot be avoided. The remaining mounds may not be marked and chance finds neglected.					
1C/8. 6-9,16	Assessment and Management of Impacts Consultation with affected communities and other stakeholders Project's use of cultural heritage	PC	Archaeologists surveyed only area around turbines missing the internal roads, storage areas and connecting powerline The remaining mounds may not be marked Possible chance finds may not be recognised and thus damaged	Commission a licensed archaeological company to conduct additional archaeological survey of the new and altered project components that were not covered by the initial survey and excavate finds, which protection zone cannot be avoided. Mark the remaining mounds. Inform the locals about the sites and their protection status according to SEP. Develop and require the earthwork conducting subcontractors to instruct their workers to follow the chance find procedures.	8.1
<b>9 Information Disclosure and Stakeholder Engagement</b>					
Summary: A project specific stakeholder engagement plan, grievance mechanisms has been developed as part of this ESA. The Company appointed CLO that would disclose information and establish communication with relevant parties. SEP and grievance mechanism as part of it will disclosed.					
1A/1.2 5-33	Stakeholder engagement plan	Risk of PC	SEP developed Transparency on E&S issues is provided but plan may not be implemented	Implement the Stakeholder Engagement Plan and update it annually. Provide general public access to information on the E&S performance of the Project and the Company. Report annually on project E&S issues and benefits and implementation of action plans to Lenders and other stakeholders	10.1 10.2 10.3
1A/1.3 4-36	Operational grievance mechanism	Risk of PC	Grievance Mechanism many not be implemented	Implement grievance mechanism as part of SEP	10.1
<b>Overall Compliance</b>					
Summary: The Company's performance to date is in partial compliance with national legislation, missing archaeological survey of the missed project components. The project is consistent with the State policy towards promotion of renewable energy sources and the other local development plans. The banks requirements are not fulfilled in land acquisition and there are risks of partial compliance if ESMP actions are not implemented. The main risk is in insufficient control over subcontractors compliance with the banks EHS and social requirements and in inadequate stakeholders engagement.					
National ESHS, requirements		Risk of PC	Most permits and reports to regulatory bodies in place, no records of fines or litigations but archaeological survey is to be completed		
AIIB/IFC ESHS requirements		Risk of PC	Control over subcontractors' EHS management system may be inadequate; land acquisition documents are be rearranged		

## 5 EXISTING ENVIRONMENTAL AND SOCIO-ECONOMIC CONDITIONS

### 5.1 CLIMATIC CONDITIONS

The WPP is located in sharply continental zone, with large daily and annual air temperatures fluctuations. Summer is dry with minimal precipitation; winter is soft with rare and unstable snow cover. Annual precipitation is 140-254mm falling mainly during winter-spring seasons. The average temperature in summer is +34.6°C with absolute maximum +45.3°C. The average temperature in winter is -8.6°C with absolute maximum -32.2°C. As seen from Table 4, northeastern, eastern, western and southwestern winds prevail throughout a year. Annual average wind speed is 9.3m/s, the maximum speed is 45m/s.

**Table 4**  
**Wind rose**

	%
N	7
<b>NE</b>	<b>17</b>
<b>E</b>	<b>19</b>
SE	9
S	7
<b>SW</b>	<b>17</b>
<b>W</b>	<b>16</b>
NW	8

### 5.2 AIR QUALITY AND NOISE

At the time of the WPP site visit, the air quality was good and noise was ambient. The main sources of noise were rare vehicles that pass along the road to Shymkent. The noise from Kazfosfat remote blasting is not heard at the site. The ambient noise was measured using the first-grade noise meter at the nearest to the road turbines 10 and 11 as LAeq,8h=44-50dB(A) and LAmax=59-61dB(A) which is below the maximum permitted in Kazakhstan residential areas for the night and day time - 55 and 70dB(A) respectively.

The nearest significant air polluting source Kazfosfat LLP open pit phosphate extraction machinery is 1.2km north of the WPP. The EU LV and the WHO Guideline for ambient air quality gives the criteria for annual average as 40µg/m<sup>3</sup> for NO<sub>2</sub>; 20µg/m<sup>3</sup> for PM10 and 20µg/m<sup>3</sup> as the 24hour average for SO<sub>2</sub>. Air quality was not measured to compare with the above standards because the obtained Kazfosfat air monitoring data showed no exceedance of the concentrations permitted for residential areas for the measured at the edge of the 1km Sanitary Protection Zone around the quarrying activities pollutants: NO<sub>x</sub>, SO<sub>2</sub>, CO, dust and hydrocarbons. Rare vehicles that pass along the road to Shymkent do not add to air pollution significantly.

### 5.3 GEOMORPHOLOGY

The turbines 1-46 are located on the northern and southern edges of the plateau of the NW-SE stretched ridge called Dongelektau Mountains. The plateau is lower than the edges where the base rock outcrops with inclinations (dips) that suggest anticlinal origin of the ridge. The hard rock slopes fall steeply 70m to the south and 60m to the north. At the turbines 11-51 the plateau turns into a gradually declining to the north slope cut by several large V-shape galleys leaving the turbines on the top of the ridge. This part is called Ulken-Aktau Mountains. The turbines 36-51 stand along on a separate elevation to 870.2m

The water catchment is split at the turbines 23-26 from where the ridge descends both directions from the altitude 872.6 (turbine 26) to 850m eastwards to turbine 35 and westwards to 745m at turbine 37 and 763m at turbine 1.

The connecting powerline descends between two groups of turbines and after crossing the Kazfosfat quarries and 40-55m high overburden mounds turns to the network substation at 660m through two wide galleys.

### 5.4 GEOLOGY AND GROUND CONDITION

Construction will affect geology to the depth of 3m at the turbine location. Thirty eight boreholes drilled to the depth of 8m and 2 to the depth of 10m at the location of each turbine indicated that limited blasting and some hammering through dolomites will be required in places:



Depth,m Thickness,m Geological layer description

0.2-4.7 0.2-4.7 Light brown hard loam with up to 30-40% inclusions of debris (grass) and chip rock;

0.7-8.5 0.5-3.8 Chip rock

2.5-10 1.8-5.8 Weathered dolomites

3.0-10 0.5-2.6 Frail undifferentiated sand

5.8-10 2.8-7.6 Poorly weathered dolomites (C)

5.8-10 4.6 Poorly consolidated conglomerates

5.8-10 2.0 Medium consolidated conglomerates

Ground total salinity does not exceed 0,4 %. The area is located on the denudation plate with the MSK-64 Scale seismicity being 7 (damage to structures) and an earthquakes possibility less than one in 10 000 years.

Neither ground contamination nor sources of possible contamination have been noted at the turbines area. Kazfosfat overburden mounds along 3km of the transmission powerline route are not reported by Kazfosfat to leach any contaminants.

The allocated for the windfarm area does not intrude into geologically valuable structures or deposits. The 110kV cable laying at 2m depth will not reach the dolomites and thus blasting will not be required for trenches.

## 5.5 SURFACE AND GROUND WATER AND ITS QUALITY

The WPP site has no natural or artificial sources of surface water. In particularly wet years groundwater seeps out of the rock fractures to form surface flow northwestwards along the turbines 48-47 road. It will not be affected by the project. The transmission powerline passes 170m from the Kazfosfat open pit filled with groundwater. Several permanent and seasonal creeks discharge spring water to the Ushbas River. The springs are 3km south from the nearest turbine. Their output is very small as they are fed by a small (40km<sup>2</sup>) catchment under the 1-23 turbines. Some water may be retained by cavities in dolomite but because the spring flow varies over the seasons, this buffer is thought to be insignificant in the area. Only at Ushbulak (meaning 3 springs) the Zharasbek farm was recently arranged after impounding the creek that collects water from 3 springs. The same farm uses water of Tamdy spring 1.8km east of the farm by installing a yurt on it in summers. Precipitation at the windfarm area water runs through fractures to the north into the Kazfosfat quarries forming lakes in them. In all 51 boreholes drilled to 8m depth at the turbines location groundwater was not found.

The groundwater quality that flows from the WPP site is not known but Kazfosfat monitors quality of the water that collects in its quarries 1.8km north from the 37-48 turbine line and reported no violations of the maximum permitted concentrations for potable water.

## 5.6 SOIL AND VEGETATION

Neither soil nor vegetation of the WPP area has been studied previously because with its outcrops of tilted dolomites it was not suitable for agriculture. Several plots of land just south and downhill of the turbines row 11-23 have been used as arable land without irrigation and marginal productivity since 2007. Most of the fields are located further south beyond the Ushbas River around Burkitbayev and Ushbas villages. Most of the area under the turbines has thin light gray underdeveloped slightly loamy soils with low salinity. Soil layer is thicker in the depression between the rows 38-46 and 1-10 but it is still largely underdeveloped and poor in nutrients.

With low water availability, this soil supports xerophytic, ephemeral (annual) and ephemeroïd (perennial) plants. Among them are three protected ephemerals: crocus *Crocus alatavicus* (15, 36-51), iris *Juno Juno kuschakewiczii* (38-40) and the ancestor of all tulips *Tulipa greigii* (turbines 12-15, 36-51). The project site is also full of the other flowering plants that being not palatable to the livestock proliferate.

These are spearworts *Ranunculus sp.*, fritillaria (*Fritillaria karelinii*), *Geranium transversale*, chickweed *Cerastium sp.* rock jasmine *Androsace sp.* and *Alyssum desertorum*.

The xerophytes like sagebrush (*Artemisia sublessingiana* and *A. terrae-albae*), *Ephedra intermedia* and locoweed (*Astragalus sp.*), found on the elevated, sloppy and rocky places, give way to the steppe plants like feather grass (*Stipa sp.*), meadowsweet (*Spiraea hypericifolia*) and brier (*Rosa sp.*) on the flatter areas. Here isolated rhubarbs (*Rheum sp.*), burdocks (*Arctium sp.*) and *Crambe kotschyana* appear. In the flatter rocky area with less soil, shrubs like *Acantholimon sp.* and *Atraphaxis spinosa*. Tamarix shrub was noted along the water bodies (creeks and Zhanatas wastewater lagoon) that are far from the project territory.



Photo 1 View south from turbine 15 showing sagebrush vegetation



Sagebrush with spearwort flowers and feather grass at the transformer and open storage area near turbine 11



*Juno kuschakewiczii* spreads over turbines 38-41 area among feather grass and isolated rhubarbs and *Crambe kotschyana*



Red book protected *Juno kuschakewiczii*

Red Book crocus under a brier shrub at turbine 15

Red Book *Tulipa greigii* at Turbine 15

Fretilaria with Spearwort at the back at Turbine 12

Photo 2 Typical vegetation of the WPP area and 3 protected flowers

## 5.7 ANIMALS

Both, birds and mammals diversity and numbers are low at the WPP territory during migration and breeding and are expected to be low during winter too.

Two field assessments (5-6.03.2019 and 8-9.04.2019) found practically no mammals or reptiles in the WPP area. In March a Red Fox (*Vulpes vulpes*) and in April mounds of the Northern Mole Vole (*Ellobius talpinus* Pall.) were noted. This is partially explained that the rodents and reptiles were still in hibernation with the borrow holes covered, which did not allow animals identification by the borrows structure. The consultant previous assessments in the area found only long-eared hedgehog (*Erinaceus autirus*) skin in the owl nest near Aktogay village 4km north of the turbine 51. The literature sources that cover larger neighboring area also indicate low diversity and density of animals.

Birds diversity and numbers on the same dates were also low and although it was known that most of them breed in the area, the observed birds were migratory. In total, 396 birds belonging to 21 species of 7 orders were recorded on the WPP territory. Only Jackdaw and Kestrel started to build nests and Little Bustard staked out its territory to breed. Out of the observed birds, the most numerous were sparrow like birds (Passeriformes): Calandra Lark, Tawny Pipit, Wheataer, Isabelline and Pied Wheataer. They nest and migrate through the area in a wide dispersed front without forming significant concentrations at a particular place. This is explained by wide dispersion of their food source.

Three Little bustards were noted staking the territory in the area of the turbines 19-22, which indicates that at least two pairs breed there. This bird has Near Threatened IUCN protection status and is included in the Red Book of Kazakhstan. Prior migration flocks normally congregate near the water bodies because the food stock there is better. At the site breeding bustards are very sparsely distributed due to territorial claims of the males. They feed on the ground and fly below the 30-150m risk window only when threatened. It adapts well to human impact as long as its habitat is not affected.

**Table 5 Number of birds of the species observed at the project area and in the habitats around it where the birds were most concentrated. In the IUCN red list of protected species all birds are of least concern but the near threatened Little Bustard, which is also in Kazakhstan Red Book. It is shown in blue. Species that migrated through the area also breed in or near it, so no purely migratory birds are indicated.**

Order	Latin name	Approximate assignment of the records to the areas  Common name	5.03			6.03		8.04				9.04
			Turbine 50	Turbine 15	Wastewater lagoon	Turbine 12	Turbine 46	Quarry lake	Turbine 14	Turbine 12	Turbine 15-23	Turbine 30-40
Pel	<i>Phalacrocorax carbo</i>	Cormorant						1				
Ans	<i>Cygnus olor</i>	Mute Swan			10							
	<i>Anas specius</i>	Ducks			2000							
Falc	<i>Buteo rufinus</i>	Long-legged Buzzard		1				1				
	<i>Falco naumanni</i>	Lesser Kestrel								2		
	<i>Falco tinnunculus</i>	Kestrel		1						1	1	
Gal	<i>Alectoris chukar</i>	Chukar	30					50				
Gru	<i>Tetrax tetrax</i>	Little Bustard								3		
Chr	<i>Larus ridibundus</i>	Black-headed Gull								75		
	<i>Larus cachinnans</i>	Caspian Gull										5
Col	<i>Columba livia</i>	Rock Dove				1 2	4	2				
Passeriformes	<i>Galerida cristata</i>	Crested Lark						5				2
	<i>Melanocorypha calandra</i>	Calandra Lark	30	25				9	3	13	5	
	<i>Anthus campestris</i>	Tawny Pipit						3	1	5	3	
	<i>Corvus monedula</i>	Jackdaw		15						7	3	5
	<i>Corvus frugilegus</i>	Rook										2
	<i>Corvus corax</i>	Raven		2								
	<i>Oenanthe oenanthe</i>	Northern Wheatear								4	2	
	<i>Oenanthe pleschanka</i>	Pied Wheatear						4		9	3	
	<i>Oenanthe isabellina</i>	Isabelline Wheatear						2		9	3	2
	<i>Sitta tephronota</i>	Eastern Rock Nuthatch	6									
	<i>Emberiza calandra</i>	Corn Bunting								8	7	

Pel – Pelecaniformes (pelecan like), Ans - Anseriformes (ducks like), Falc – Falconiformes (birds of prey), Gal – Galliformes (chicken like), Gru – Gruiformes (Crane like), Col – Columbiformes, Chr – Charadriiformes (near water)

Key for the types of presence in the study area around SPP: Migrating Resident Breeding nearby Breeding

To identify the nearest to the WPP birds migration routes and important for resting, feeding and breeding areas, the consultant used its previous observations in the period 1995-2018 in the key birds areas like Chokpak Overpass, Ters-Aschibulak Reservoir, Kyzylkol and Akkol lakes. These observations and the rings return data from 1966 suggested that the corridor nearest to the WPP migration lies 20km to the north along the Kyzylkol, Sorkol, Akkol lake system that is visited by over 75 species of waterfowl.

The most commonly met there are:

- Great Crested Grebe (*Podiceps cristatus*)
- Black-necked Grebe (*Podiceps nigricollis*),
- Common Shelduck (*Tadorna tadorna*),
- Common Pochard (*Aythya ferina*),
- Tufted Duck (*Aythya fuligula*),
- Cormorant (*Phalacrocorax carbo*),
- Pygmy Cormorant (*Phalacrocorax pygmaeus*),
- Great Egret (*Egretta alba*)
- Grey Heron (*Ardea cinerea*),
- Coot (*Fulica atra*),
- Caspian Gull (*Larus cochinnans*).

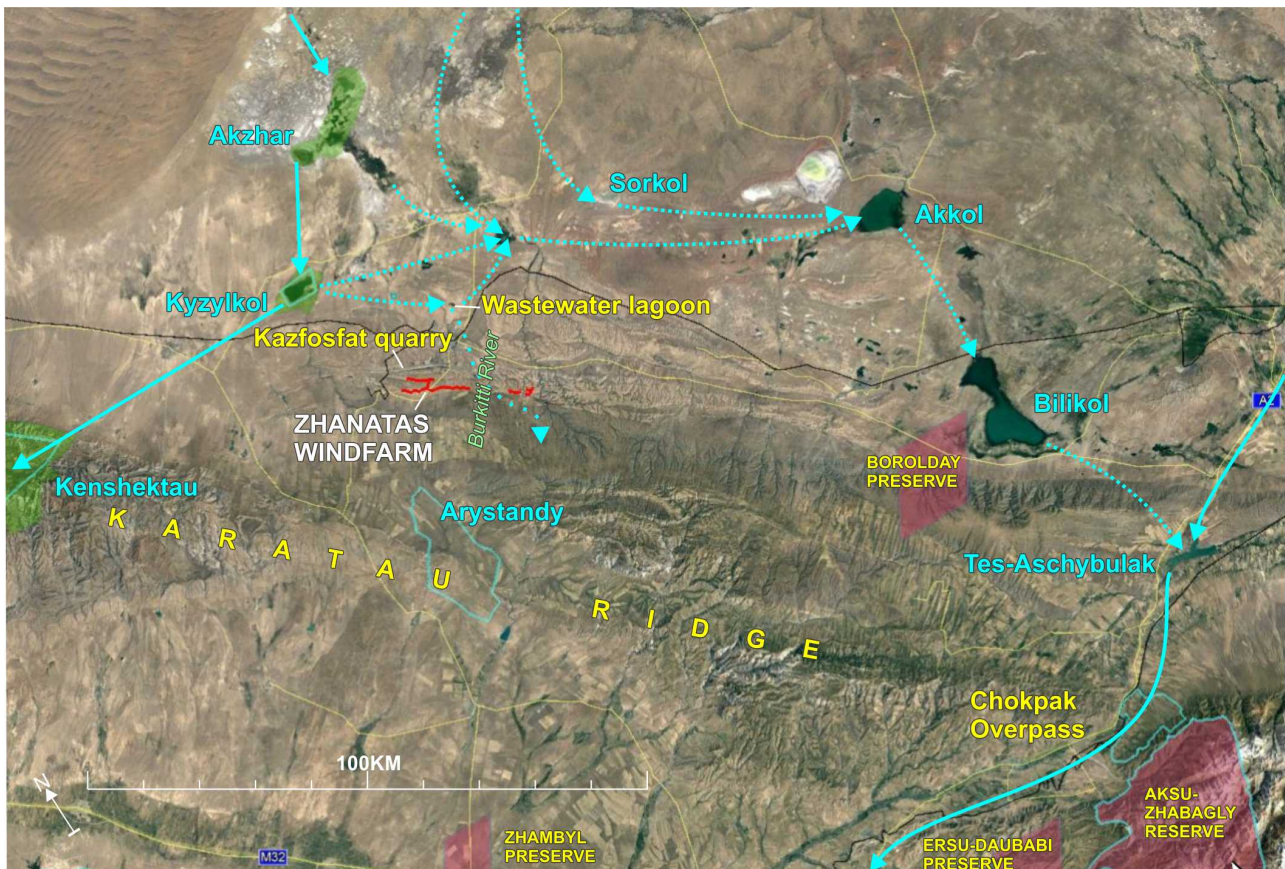


There, over 120 species of birds breed near water and the neighboring habitats. The most common are sparrow like birds (Passerinoformes). The others are:

- Mallard *Anas platyrhynchos*
- Ruddy Shelduck *Tadorna ferruginea*
- Montagu's Harrier *Circus pygargus*
- Long-legged Buzzard *Buteo rufinus*
- Kestrel *Falco tinnunculus*
- Lesser Kestrel *Falco naumanni*
- Black-bellied Sandgrouse *Pterocles orientalis*
- Pin-tailed Sandgrouse *Pterocles alchata*
- Roller *Coracias garrulus*
- Kingfisher *Alcedo atthis*
- Bee-eater *Merops apiaster*
- Blue-cheeked Bee-eater *Merops persicus* and other

And the following rare and disappearing birds were noted along this migratory route:

- White Pelican (*Pelecanus onocrotalus*),
- Dalmatian Pelican (*Pelecanus crispus*),
- Ferruginous Duck (*Aythya nyroca*),
- Steppe Eagle (*Aguila nipalensis*),
- Common Crane (*Grus grus*),
- Demoiselle Crane (*Anthropoides virgo*),
- Black-bellied Sandgrouse (*Pterocles orientalis*),
- Eagle Owl (*Bubo bubo*)



**Figure 4** Showing the nearest sensitive ecological areas: Important bird areas (blue); Key biodiversity areas (green); State protected areas (pink) and the nearest to the WPP birds migration route (blue dash line) that approaches the Karatau Mountain Ridge but then follow the lakes system to join the main migratory route 115km away from WPP at Ters-Aschibulak Reservoir to go over the Ridge at the Chokpak Overpass. Noted migration along Burkitti River 2.5km from the turbines 24 and 25 was very minor and went below turbines level.

During autumn migration very few birds were observed. In August a flock of barn swallows crossed the site from northwest at turbines 20-21 flying below the risk window 20-120m; 30-40 wagtails and pipits were resting around the turbines 45-46. All of them fly below the risk window but 3 breeding nearby common kestrels that came to hunt on them, fly within the risk window. Observation of their flight from a vantage point suggested low risk to these birds. In September, 70 swallows flew in the risk window along a noted then migration route along Burkitti River 2.5 and 2.8km from the nearest turbines. Through the plant area, 10 kestrels passed near the turbines 11-13 and 50 jackdaws sat on overhead line along the road to Zhanatas where the transmission powerline will be erected. These species are given the least concern status by IUCN. The jackdaws migrate short distances within Kazakhstan.

## 5.8 FAUNA AND FLORA SENSITIVITIES

The sensitive ecological areas are at some distance from the WPP. The closest protected area is Kyzylkol Lake 24km northwest (Figure 4). The nearest concentration of ducks was noted at the Zhanatas wastewater lagoon where migrating ducks were resting. They then joined the main migration route as is shown on the figure. Few local birds were noted on the Kazfosfat quarry lakes that are apparently not used by the migratory birds most likely for the lack of fodder as the lakes have no vegetation.

### 5.8.1 Critical Habitat Assessment

The AIIB's ESS1 (paragraphs 20 to 24), the IFC Performance Standard 6 (PS6) and the associated Guidance Note 6 (GN6) focus on the protection and conservation of biodiversity. In most cases, the required conservation outcome under these standards is no-net-loss of biodiversity value achieved using the "like-for-like" or better principle of biodiversity offsets. However, when a project occurs in critical habitat (CH) supporting exceptional biodiversity value, a net gain in biodiversity value is required. Below is the assessment of the study area against criteria that define a high biodiversity value:

1. habitat of significant importance to critically endangered (CR) and/or endangered (EN) species;	None was noted during two surveys, no records in literature and not derived from interviewing of hunters and rangers
2. habitat of significant importance to endemic and/or restricted-range species;	No endemic species noted
3. habitat supporting significant global concentrations of migratory species and/or congregator species;	Most migratory birds pass at some distance
4. highly threatened and/or unique ecosystems; and/or	Ecosystem has low diversity of plants and animals and has self-regenerating potential
5. areas associated with key evolutionary processes	Not noted or stated in the literature

Thus, it was determined that the project territory is not crucial for preserving the diversity.

## 5.9 SOCIO-ECONOMIC AND CULTURAL ISSUES

### 5.9.1 Zhambyl Region

The 144 300km<sup>2</sup> Zhambyl Region is located in the basin of Shu and Talas rivers and is bordered by Karatau Ridge in the west, Kirgiz Ridge in the south and Shu-Ili Mountains in the east. The north of the Region adjoins Betpakdala Desert. There are 10 districts and 4 towns: Taraz, Sarysu, Talas and Shu. Around 20% of the gross regional product is created by industry, 7% by agriculture, 18% by transport and communications, 7% by construction, 12% by trade and 38% by the other industries. The region is rich of phosphorites, fluorites, non-ferrous metals, barite, coal, cover, ornamental and technical stones and various building materials.

**Table 6 Zhambyl region key demographic indicators at the start of a year.**

	2012	2013	2014	2015	2016	2017	2018
Population in thousands							
Total	1055.8	1073.4	1085.0	1098.7	1110.9	1116.3	1117.5
Women	539.5	548.0	553.4	559.8	565.5	567.4	567.8
Rates per thousand of population							
Birthrate	26.79	27.36	27.23	25.4	25.82	23.69	24.2
Mortality	7.74	7.37	6.93	6.19	6.59	6.54	6.4
Marriages	9.06	9.62	8.81	6.59	7.24	7.02	7.03
Divorces	1.96	2.29	2.38	1.41	2.22	2.25	2.31

With more than 90 nationalities and ethnic groups the region is dominated by Kazakh (72.6%). Majority of migrants are from Uzbekistan. Most of the newcomers arrive in search of employment opportunities and are mainly hired for construction, agricultural work and retail at the local markets.

Child mortality is 7.28 per 1000. The main cause of infant mortality is from conditions originating in the perinatal period. The most common death causes are congenital anomalies – 15%, pulmonary diseases – 6% and infectious and parasitic diseases – 6%.

### 5.9.2 Sarysu District

The 31 000m<sup>2</sup> Sarysu district was formed in 1928 with the efforts to eliminate nomadic behaviour and arrange population into collective farms. Because urbanization required food for the city workers, livestock was taken from the farms. Kazakhs that had no skills in agriculture and solely relied on products from the livestock started to starve, migrate to wherever they thought food can be found and die in numbers. About 1/3 of those who survived migration ended in industrial cities or in Uzbekistan, Kyrgyzstan and Turkmenistan. By 1934 livestock started to recover and some that had left gradually came back. Agriculture started to be developed. New infrastructure projects like irrigation channels and roads created industrial jobs and thus food provision security. Many however joined slavery labour in the numerous prison camps. This labour was a key for these large projects that lacked construction machinery. The work burden fell on women during the Second World War and after it because almost 2700 men did not come back from the War. The population recovered gradually through high birth rate, which was encouraged by the State. Single mothers were given adequate support to bring up the new generation of workers. Kindergartens, maternity centres, 9 medical rooms, hospitals and a cinema were built. More than 25000m<sup>3</sup> of housing was provided. As a result, by the end of 1950s, the district population has doubled. Eleven collective farms consistently increased the crops cultivation and cattle breeding and new infrastructure projects like the Yntaly Water Reservoir were started.

After the Soviet Union demise the State farms were disbanded and many social utilities shut. Without demand the mining industry stopped and many people moved to other districts for jobs. In 10 years the mining was reestablished, jobs appeared and situation started to improve. The social infrastructure, utilities and houses were reconstructed. Since then the population and its wellbeing closely related to health of the mining industry. The next 10% decrease of population was from 1998 to 2017 when it fell 44 000.

In one town and 9 rural areas with 26 settlements of the district, there are 25 health care institutions, 27 schools, 3 colleges, 6 kindergartens and 24 pre-school education centres, 2 cultural institutions, 4 sport schools and 19 public houses.

The equal men/women ratio suggests that the mining workers move to the area permanently. Kazakhs prevail (92.8%) over the other ethnicities, of which Russians comprise the largest portion - 5% of the population.

Out of economically active population of 20 000, 880 are unemployed and 4 300 are self-employed. The average wage is \$250 and minimum wage is \$74. The minimum subsistence level in the district is determined as \$57. Considerable part of the population is occupied in farming. By the end of 2018, 1 260 tons of leguminous and cereal crops were produced, which comprises 1.6% of total regional production. Many small and medium businesses appear.

Forty five cultural heritage objects have been found in the district. Twenty seven of them are burial mounds dated I-III A.D.



### 5.9.3 Zhanatas Town

The first mineral resources exploration commenced in the territory in 1936 when phosphorous deposits were found. The worker camp appeared when first phosphorus mining and refinery started in 1945. In 1969 it grew to a town size and was called Zhanatas. For the rapidly growing population 214 panel block of flats were erected that formed 8 quarters. Incomers were attracted by housing and exclusive supplies that were not available in Almaty or Zhambyl. By the beginning of 1990 the population reached 66 000 but the Soviet Union demise brought the collapse of mining. People that lost jobs left and the population fell to 18 000. The empty houses were cut from the utilities and looted. Many of them deteriorated beyond repairs and 111 had to be demolished to prevent their uncontrolled collapse. Currently out of 85 blocks, 10 are empty while 1900 families are on the list for housing. The council provided housing for those most in need in one rehabilitated block made into a dormitory.

Rebirth of the town started in 2013 when a Russian company Eurokhim began development of two phosphate deposits for fertilizers production. Now only 300 people are registered as unemployed. Besides providing jobs the company agreed to help with social development. A Turkish enterprise Kazsoda has also allocated \$23 197 000 for the town. Kazfosfat also has its corporate social responsibility program, but the allocated budget and actions were not disclosed during the assessment.

In addition to the annual income from taxes (\$3 000 000) the town is also supported by the State budget that provides \$26 300 annually and funds specific projects like rehabilitation of the sewage treatment plant (\$6 565 000) or rehabilitation of 2 blocks of 80 flats each. The plans are also to rehabilitate another two blocks in 2019 and start the town gasification within the next 3-5 years.

By the end of 2018, the population reached 21 400 with 7 800 families. Ninety four percent of population are Kazakhs, the rest are Russians and other nations. The majority are employed in Eurokhim and Kazfosfat. Others either work in the State bodies, organise small businesses or are self-employed. The State job security program 2017-2021 funds enrolling unemployed into jobs in two directions: 1) a month theoretical study and work practice and 2) six month trainee jobs with further employment for youth. The cost is split between the State and the private companies that agree to participate in the program. The low interest loans are provided for small and medium businesses.

The town infrastructure consists of 3 colleges, 5 schools, a medical centre and sport facility. The local 2 lane tarmac roads condition is poor but the traffic is not intense. Zhanatas streets are paved and duly maintained. Due to shallow lying base rock, the field roads are passible most of the year.

### 5.9.4 Settlements near the Windfarm

Four settlements, two farms and a children summer camp have been identified to be close to the windfarm. Only two farms use the WPP site for pasturing. The closest to the site Zharasbek farm (2.3km) was established at three water springs in 2003 by 55 years old Peishbek and his brothers. The farm has 30 horses, 30 cows and 400 sheep. Three shepherds herd the cattle in the area of the turbines 4-7 daily. Water for the cattle is provided by a pond made on the Ushbas Creek that emanates from the springs. The farm is not connected to the electric power network. The farmer uses diesel to generate basic power. He also tried solar panels but they broke soon after the installation. At the time of the assessment he was querying the local grid operator whether he can pay for making a line to the farm from the 35kV powerline that runs along the road to Shymkent 650m north of the farm. Each summer the farmer sets up guests and resting yurts at the farm and at the Tamdy Creek 2km east of the farm. He also keeps some sheep at the latter yurt.

The Ganiez Farm is set at the Kananiya Creek 4km south of the wind turbines 12-14 where it herds its 50 horses, 50 cows and 700 sheep. They drink midway between the turbines and the farm at the spring that starts the creek. Due to the weather deterioration it could not be reached during the assessment.

Burkitbayev village is located near the Ushbas River 6.5km south of the WPP site. It was formed in 1954 as a State farm Tselinnyy. Deported from the other parts of the country people of 17 nationalities developed 24 000ha of non-irrigated arable land on the slopes. After the Soviet Union collapse more than a half of the population moved back to their homeland and more prospective cities and regions. Many houses, school and kindergarten became abundant. By the beginning of 2000, the population fell to 1 150 and then further to 880 by 2009. The current population has fallen slightly to 800. Kazakhs (92%) prevail over other nationalities and Kurds are major minority group (8%). The village has 31 farming enterprises spread around the village that still exports various crops to other settlements and districts. Besides the cultivation, the residents usually have livestock, comprising mainly horses and sheep. The livestock number is 400 horses, 750 cows and 7800 sheep. A farm worker monthly wage is normally \$80, which is partially subsidized by the State. The livestock travels daily to the spring 2.5km south of the turbine 15.

Ushbas village is located on the same river. Its 160 population is involved in agriculture and husbandry in the same way as the Burkitbayev village residents. The livestock number is 90 horses, 160 cows, 1700 sheep.

Aktogay village with 820 inhabitants is located 3.5km northeast from the closest wind turbine row. Syzdykbayuly village with 900 residents is 5.9km northeast from the WPP. The villages cultivate 800ha of arable land that is located south of the windfarm. However, in the past 10 years most of development was in non-intensive pasturing of the livestock, which number is increasing by 10% annually because both villages are set at the creeks and shallow groundwater with plenty of water for the livestock and vegetable patches. The livestock does not enter the WPP area. The Syzdykbayuly livestock grazes between the village, 23 and 31 turbines while Aktogay livestock uses gorges under 47 and 51 turbines. The R43 road to Taraz seems to be secondary in importance as both villages are set at some distance from it.

Zhuldyz children summer camp was built by LLP in 1982. It is sheltered from the WPP with large hills. The camp hosts around 350 Kazfosfat workers children. A 15 day stay cost \$22. Children from low income families stay for free.

### 5.9.5 Land Use

The windfarm infrastructure takes 145ha of State Reserve land, 3.5ha of Kazfosfat land and 85.2ha of 7 farming enterprises (Table 7). Initially it took 7 farm enterprises areas, but after Markenov's death in 2013, his wife gave up the rent in July 2018. After the collective farm disintegration, the farmers leased from the State as much land as they could because the rent was very low. They have no attachment to the rented plots and giving up parts of the rented land on several occasions (see Total land taken in the table) has not deprived them from any access to the pasture land that is available in abundance (estimated as 40 500ha) and is used by the farms without paying regards to the land allocation. The number of livestock is restricted by hay availability and cost as well as the price of meat at the local markets. A farm keeps on average 400-500 heads of various livestock but mainly sheep. Only Medibekov owns 2000 sheep and 100 horses.

Land acquisition was the district council responsibility and the Company took no part in it. As a result, seven farmers affected by land acquisition signed the agreement to give up small parts of the leased land without clear understanding of what the acquisition was made for. The minutes of the meetings with the farmers have been prepared but the meetings have not been conducted and the minutes have not been signed. Interviews with 4 farmers showed that one of them remembers signing some land acquisition agreement and only two heard about the windfarm construction plans. None of the 7 farmers were compensated for the acquired for the project land with land or cash albeit Medibekov was compensated with land for the previous larger seizures unrelated to the project. The lease contracts were



rearranged for free. After the turbines number reduction from 51 to 40, the released land was not returned to these tenants.

**Table 7 Farm land taken for various developments including the WPP project (Total ha) and for WPP with indication of WPP components for which the land was taken. Interviewed tenants shown in *italic*.**

Land Tenants	Leased Since	Lease Duration	Leased land, ha	Land taken for			Plot ID	Residency
				Total ha	WPP ha	WPP components		
Markenov	1999	Till 07.2018	806	23.0	23.0	13-16, 45-46 storage, powerline	06094047023	Burkitbayev
Akbergenov	2006	Permanent	187.2	4.0	4.0	19	06094047028	Burkitbayev
<i>Kaysarbekov</i>	2001	Long term	266.8	9.3	7.4	23, 24*	06094047076	Zhanatas
<i>Kabulov</i>	2000	Long term	1573.9	42.4	21.6	28-30*,31,32, 33*	06094041096	Syzdykbayuly
<i>Rasulova</i>	2002	Long term	300.0	11.9	11.9	34,35, storage	06094041038	Syzdykbayuly
Akhmetov	2002	Long term	226.0	14.3	5.3	48	06094041039	Syzdykbayuly
<i>Medibekov</i>	2000	Permanent	3641.3	45.2	3.8	50*	06094041021	Aktogay

\* turbines removed from initial plan but the land was not returned

### 5.9.6 Stakeholder Consultation

Public hearing started on 15.01.2019 when a public note (comprising of project name, meeting date and place, name of local executive body, environmental expertise body, EIA developer, digital documents location and email for comments) was posted on the regional council website and public notes website market.kz and finished a week after 15.02.2019 when a public meeting was arranged at the Zhanatas community hall. Farmers, officials, the public governance councilor, project manager and project designer were present at the meeting. Farmers whose land plot was seized for windfarm were not invited to the hearing in person but the council informed them about the project. The questions from public governance councilor were about archaeological surveys, local people employment, impact of the WPP on environment and pastures. No other comments or grievances were expressed at the meeting and over the consultation period. Further information disclosure and engagement with stakeholders will be carried out according to the stakeholder engagement plan prepared as a part of this assessment and disclosed to the stakeholders.

The Stakeholders consulted during this assessment are shown in Appendix 1. After finding out on the project details and seeing the collages of visual impact (Figures below), most of them either welcomed the project or were neutral to it. Only the nearest farm owner expressed concerns about the construction works that may obstruct the grazing paths and scare the livestock with blasting.

Consultations were conducted with the district council when the WPP land was rented. There were no consultations with the land users and the farmers that rent 7 plots into which the initial project layout intruded.

### 5.9.7 Archaeological Finds in the Project Area

Archeological survey of the initial 51 turbines areas was conducted in November, 2017 by a licensed archaeological company. The areas of internal roads with 35kV powerlines, 110kV powerline corridors as well as the internal substation and storage areas were not surveyed since no data was available by that time. Overall 33 burial mounds 0.25-1.2m high and Ø3-16m made of large igneous rocks were found. Twenty two were in 20-120m from 15 turbines. The distance to the others was over 150-600m. Basing on the information on burial methods that existed in different tribes of Southern Kazakhstan, the archaeologists concluded that the identified burials belonged to the early middle age nomads (IIBC – VIIIAD) who used to erect the mounds on the top of a plateau with good view onto the low-lying areas. All 33 mounds were included in the list of the cultural heritage.

These cultural resources-related restrictions are separated into 3 zones measured from the edge of the object or group of the objects: the 50m protection zone where work that may damage the object is prohibited; the 150m zone where installation of structures is regulated and the 250m zone where alteration of the natural landscape is prohibited. Because the project does not alter the landscape, only two first zones apply. Since the construction intrudes into both zones of 22 burial mounds, they were excavated by a licensed archaeological company in February 2019. The graves were not deep (<1m) due to hard rock beneath. Only one mound was looted in the past. The skeletons were found in 16 mounds. One mound thought to belong to sarmat tribe because of their burial method, which included sheep corpse being put next to a buried person. Six mounds were not graves but middle age rocky monuments (cenotaphs) erected for rituals or as memorials. Iron swords, bronze daggers and arrowheads and ceramic plates were found in the graves. After approval of the excavation report, the 22 mounds were excluded from the list of the objects of historical and cultural value and thus construction could proceed unrestricted after installation of nameplates at four ends of 50m protection zones of the remaining 11 mounds. However, the consultant identified that 4 remaining mounds are located in less than 50m distance from the internal roads that need to be altered or the mounds excavated too (Table 8).

**Table 8 Remaining identified burial mounds. Internal roads that enter the 50m protection zones shown in red.**

Burial mounds	Turbines Near	Distance from turbines	Distance from road
1	22	305	8
	23	590	
2	34	163	62
	35	440	
3	31	337	22
	32	150	
4	41	225	110
	44	260	63
5	43	350	
	45	166	70
6	44	390	
	45	170	10
7	45	173	1
	7.1	173	
8	46	173	175

## 6 PROJECT IMPACT AND IMPACT MITIGATION MEASURES

### 6.1 CONSTRUCTION

Visual impact will be less than the impact during operation as not all turbines will be up at a given time and the blades will not rotate. The project and its contractors and subcontractors are expected to comply with the Kazakhstan Labor Code that is close to the principle of ILO's core labor standards.

#### 6.1.1 Traffic

The main impact is expected on the users of the 2 lane road segments along which the oversize and heavy equipment will be transported. Congestions and overtaking at risk of the long train of trailers may occur particularly on the urban roads like M36. Trailers may also experience difficulties climbing to and descending from steep (12%) parts that may be present on R44 and R49 roads. Some infrastructure may also have to be altered at sharp turns shown in Figure 3. As the R44 and R49 roads and likely the associated bridges are in poor condition, damage to their surface by the trailers carrying the tower parts and nacelles is possible.

The local traffic is not expected to be significant as the parts will be transferred to and stored at the turbines location. The concrete trucks will run through the night but in batches of 6-10 trucks for a relatively short period due to sequential nature of the foundations construction.

Sensitivity	6	High for M36 drivers and medium for R44-R49 drivers, high for Chapayev and Shamalgan residents and medium for Zhanatas residents. Vegetation and soil sensitive to indiscriminate driving
Magnitude	6	Increase in time of travel for rural and urban drivers on two lane roads, disturbance to 4 settlements infrastructure and 3 settlements traffic. Possible damage to 2 lane roads and their bridges. Vegetation may not recover on the field roads shortcuts to the turbines for 2-3 warm seasons.
<b>Significance</b>	<b>12</b>	<b>High due to absence of transportation plan and traffic management plan</b>

The mitigation measures shall include:

- Include in environmental management plan access routes maps and prohibit driving outside them. Add the plan implementation control in the internal audit checklist.
- Developing oversize and non-standard weight equipment transportation plan. Obtain the road police approval and request a second escort car to arrange controlled overtaking of oversize trailers.

See Section 6.4.1 for the traffic risk assessment.

### 6.1.2 Earthwork, Driving and Concrete Making impact on Vegetation and Soil

Soil structure will be damaged during construction the internal roads and 35kV powerlines along them. Figure 1 shows typical compact arrangement of a turbine components on 0.4ha. The consultant previous assessment of vegetation destruction at the Korday Windfarm, which is located on the same latitude and altitude 400km east of the WPP, showed average damage 0.5ha per turbine. But because the expected differences in the construction practices between the EPC contractors, here, soil and vegetation is assumed to be destroyed on 1.2ha around the foundation, the crane pad and storage and assembly area. The total loss of top soil and vegetation will therefore be **71.7ha**, which includes 11.7ha under the roads (26km\*4.5m), 48ha under turbines (1.2ha\*40), 8ha under the substation, concrete plant and storage area and another 4ha under the second storage area. This is comparable with the half of Zhanatas town area with multistory houses. Some vegetation will also be damaged at the 35kV lines poles that run along the internal roads.

Top soil will be mixed with the lower soil horizons where earthwork is conducted and blown off onto the adjacent vegetation from the areas where vegetation is damaged. But because the humus content in the soil of the turbines area is less than 1%, it has no agricultural value and its preservation is not required by law.

Xerophytic vegetation has small foliage with tightly closing stomata (leave pores) that opens for active plant growth when water becomes available for roots during precipitation that will also wash off dust from the leaves. Xerophytes, ephemers and ephemeroids flowering and seeds production also occur in this period of active growth. If during this period excessive dust remains on the leaves for a long time, up to 28% reduction of growth and inability to produce seeds may occur mainly due to dust shading, adaxial (upper surface) stomata blockage<sup>3</sup> and leaves temperature increase by 2-4°C<sup>4</sup>. Outside of this period ephemers and ephemeroids will be absent and moderate deposition of inert dust on the nearly dormant xerophytes will not generate notable effect as it would be similar to drought stress.

Yet, more severe deposition near the unpaved access roads and the concrete plant can add to the drought stress to the extent that the plants physiology will suffer. If a concrete plant filters fail to retain cement dust during the cement silos loading, growth of vegetation in immediate proximity to the plant may also be affected. Here, the effect may be more prolong then elsewhere due to the cement cohesive property<sup>5</sup>. Severe dust deposits damage adaxial leave structure: increase in number of epidermal cells and decrease in their size, piercing of wax crust, breakage of stomata cuticles and complete failure of one or both stomatal guard cells<sup>6</sup>. Due to reduced transpiration and overheating, protein and starch content of the leaves may fall. All of these may eventually result in leaves death and alteration of the plants community. Epiphytic lichen and Sphagnum crust that is in symbiosis with the higher plants is also sensitive to dust deposition and can simply be buried under it.

<sup>3</sup> Zia-Khan S. et. al Effect of Dust Deposition on Stomatal Conductance and Leaf Temperature of Cotton in Northwest China

<sup>4</sup> Eller, B.M. Road dust induced increase of leaf temperature. *Environmental Pollution*. 1977, 13, 99–107.

<sup>5</sup> Singh, S.N.; Rao, D.N. Certain responses of wheat plants to cement dust pollution. *Environ. Pollut.Ser. A* 1981, 24, 75–81; Borka G. Effect of cement kiln dust on Maize plant. *Acta Agron Hung.* 1981;30:289–295.

<sup>6</sup> Garg SS, Kumar N, Das G. Effect of the Bansal Ramraj mill dust on vegetation and health at Jaitwara, District Satna. *Indian Journal of Environmental Protection*. 1999;20:326–328.

Again, dusting in the wetter active growth period will generate the most impact. Due to coarser grain composition, significantly lesser amount of dust will emanate from the sand and gravel heaps of the plant despite that they are exposed to higher wind speeds than soil.

After the construction impact ends, natural revegetation of the disturbed areas is possible because the damaged area at each particular place will be small and cohesive soil structure will prevent start of desertification or further soil erosion by wind. Seeds from the adjacent areas will be blown in the soil cracks with higher moisture content. Basing on the observation of natural revegetation at the above mentioned Korday Windfarm, the first annual vegetation may cover the disturbed area in 1-2 warm seasons. In the areas without earthwork, where only vegetation is damaged and soil compacted, initial vegetation can cover the bare patches in 1-2 warm seasons. Although the natural for the area vegetation is accustomed to the undifferentiated soil with low humus content, it may take up to 6-7 years for near natural community of plants to re-establish. The bulbs of ephemeral plants take that time to grow and flourish.

**Indiscriminate driving** along the shortcuts between the turbines and the main roads will **create significant damage** to the vegetation, which will have no chance to recover during the operation because the shortcuts will likely to remain in use. However, the **largest impact** is expected in the area **where 3 protected flowering ephemeral plants were found**: *Juno kuschakewiczii* at the turbines 38-41 and crocus and tulip at the turbine 15. These flowers may also be present in lesser numbers near the other turbines where similar ecological conditions exist.

Construction impact	Where protected species grow and during intensive growth in spring		Where shortcut roads are made		Rest of the affected area	
Sensitivity / Value	4	Protected ephemeral plants would take 6-7 years to re-establish if not completely eliminated. Plants growth and reproduction susceptible to dust	2	Low humus content in poorly developed soil, low plants diversity and absence of endangered species. Semi shrubs can recover from roots and replace weedy annual plants in 2 warm seasons.		
Magnitude	3	Irreversible loss through excavation and soil compaction but reappearance is possible as no change to habitat. Failure to reproduce, loss of foliage and some plants where dusting is excessive	4	Continuous use that prevents recovery	3	Destruction of vegetation and soil on 61.5ha but in spot like pattern that eases recovery
<b>Significance</b>	<b>12</b>	<b>High</b>	<b>8</b>	<b>Medium</b>	<b>6</b>	<b>Low</b>

In addition to standard measures for impact reduction, the following is suggested to reduce impact significance to the low level: Include in the construction environmental management plan the following actions

- In the area of turbines 38-41, 12 and 15 reduce construction footprint beyond the standard approach to preserve the protected plants - develop specific parts transportation, storage, earthwork and erection methods to minimise deliberate and accidental damage, minimise the need for leveling earthwork;
- Prohibit flowers , picking animals chasing and eggs collection;
- Establish construction sites access routes prior to use of heavy vehicles access routes as early as possible, pave the areas that prone to dust generation with chip rock, prohibit driving outside them and control adherence;
- Control the concrete plant fugitive emission of cement during solos loading;
- When reinstating the working sites, ensure that the damaged vegetation and soil area does not increase from reinstatement.

### 6.1.3 Air Pollution, Noise and Vibration Impact on Animals

During construction the air quality will be reduced locally with diesel combustion products, dust and volatile hydrocarbons (Table 9). The total amount of emissions for construction period was calculated as 1.7t Painting will be minimal as most of the components will be galvanized or pre-painted. The turbine

parts will be bolted rather than welded. Considering the distance to the residential area and the expected wind turbulence for most of the construction period no discernible impact is expected on the population from air pollution. Excessive abrasive dust on plants may grind the livestock teeth but the herders are likely to avoid places of such dust deposition and return to them when the rain washes the dust off the leaves. The other animals that are expected to be present in the area are less susceptible to teeth grinding. They are also likely to move away from the disturbed areas but will return after the construction ends.

**Table 9 Air polluting activities and pollutants**

Activity	Pollutant	Built in impact mitigation
Heavy machinery operation: leveling, drilling, hammering, excavation, lifting	fuel combustion gases (NO <sub>x</sub> , SO <sub>2</sub> , CO, saturated hydrocarbons C <sub>12</sub> -C <sub>19</sub> ), dust	Excessive smoke control, engines maintenance
Aggregate and sand transportation offloading and storage	Inorganic dust	Truck body covering, regular water spraying
Offsite concrete making	Cement dust	Filters cleaning, visual monitoring

The excavator mounted pneumatic hammer that will be used to crash hard rock will generate 110 dB(A) and the other earth moving equipment will generate noise around 90 dB(A). At the nearest farm, which is 2.2km away from the closest turbine, this noise will attenuate below the background level. Hammering may however impact the nesting birds, rodents, moles and reptiles. Nesting birds may abandon their eggs if they are caught during the breeding period that last from March to August.

The borrow dwelling mammals will be particularly sensitive during reproduction period that in general lasts from March to the end of June. After June these animals may have to move with their offspring, they will be exposed to predation and aggression from their like that occupy the territory they move in. It is noted however that rodents population and wellbeing is more affected by the natural causes like epidemics, predation or lack of food than by noise and vibration. The rodents can also quickly return and replenish any losses in numbers after the end of hammering.

Noise and vibration impact	Breeding period		After breeding period	
Sensitivity	4	Pregnant rodents and offspring sensitivity is high but population replenishes quickly. Breeding birds may abandon their eggs but burrow dwelled animals can move with offspring	2	Low diversity of animals that are tolerant to human and disruption Temporary displacement of sensitive animals to neighboring area, increase in competition and predation, reduction of food availability and chances for offspring survival
Magnitude	2	Blasting and hammering for 14 days at each turbine and for 7 days at each anchor tower		
<b>Significance</b>	<b>8</b>	<b>Medium</b>	<b>4</b>	<b>Low</b>

To mitigate the impact the following can be considered:

- Start work before nesting period to ensure that birds nest elsewhere
- Where possible, reduce noisy works at the reproduction period March-June
- Plan work to shorten human presence at a particular tower
- Pave internal roads to prevent dust formation

#### 6.1.4 Waste

Small amount of waste is expected to be generated during construction (Table 10). It is expected to be disposed in the Zhanatas town landfill 16.5km northeast of the WPP. The landfill was arranged in 2013 inside the rail road borrow pit. It is fenced and guarded and an attempt is made to separate plastic from the rest of the waste which is either self-ignites or is burned to reduce volume. Cells are dug for waste burial but they are not used. Waste is mainly domestic and construction. No hazardous waste has been found as a result of visual inspection.



If any, hazardous materials will be stored up until the worker camp closure and then given to a licensed waste contractor or be amalgamated with the contractor hazardous waste at its material base. Wastewater will be delivered to the Zhanatas wastewater treatment plant 11km away. Only the solids separation screen operates at the plant. Untreated sewage is piped 4km further north into a wastewater lagoon overgrown with tamarix shrubs and inhabited by waterfowl. An attempt was made to channel water 8km further into a quarry that discharges into the Burkitti River that starts from the Ulken Mountains springs near the WPP but it was not implemented to the end. The lagoon has groundwater connection with this river that runs 1.4km west. The discharge rate is unknown but the underlying hard base rock may have fractures that increase the outflow. The lagoon is shallow and its water level varies significantly from zero in 2011 to 1 000 000m<sup>3</sup> and 73ha water surface in 2018. It is likely that with the increase in Zhanatas population, further water channeling will be implemented but then the treatment plant is also likely to be put in operation.

Despite these inadequacies in waste and wastewater management, impact from the project waste is considered to be **insignificant** mainly because of small volume, nonhazardous nature of the disposed waste and the fact that most workers will be local whose sewage would end up in the lagoon in any way.

**Table 10 Estimated waste expected quantity and elimination methods (hazardous waste is highlighted) during construction**

Waste name	Quantity, t	Elimination method
Used oil	0.15	Regeneration by specialized company
Oiled ground	0.4	Removed on worker camp closure to a landfill or material base
Oiled cloth	0.01	
Scrap metal	10	To metal recycling yard «Kazvtorchermet» in Taraz on worker camp closure
Domestic waste	7.7	
Paint cans	0.25	
Construction waste	80	Zhanatas landfill - guarded and fenced but without sealed bottom
Welding rod ends	0.05	
Wood	3.5	
Sewage	960	Zhanatas untreated sewage lagoon

## 6.1.5 Socioeconomic Impact

### 6.1.5.1 Livestock

The WPP construction is expected to have **insignificant impact** on the livestock from Aktogay and Syzdykbayuly villages that grazes around the WPP construction sites. All the land will remain available for pasturing and the damaged vegetation will be away from the main grazing grounds spread along 17 gulleys. The 3m deep foundation pits will be the only hazard for the livestock during the construction but access to the pits will be obstructed by the excavated ground. Trenching for the cable laying will be done only at the overpass where no cattle is present.

### 6.1.5.2 Cultural Heritage

Without additional survey, impact from the roads and storage area construction can be significant as it may lead to damage of unidentified mounds that seem to concentrate along the roads. Some project components may also intrude into the 50m protection zone of these mounds that is drawn around the possible remains of ritual activities that occurred at the time of burial and that can give clue about the buried person belonging.

Uninformed turbine foundations digging subcontractor may also damage valuable objects that may have not been identified by archaeologists. Being under time pressure, an excavator operator is unlikely to stop after recovering artifacts even if this is obligatory under the legislation.

To reduce impact to cultural heritage to low significance, the following measures are suggested:

- Commission a licensed archaeological company to conduct additional archaeological survey of the new and altered project components that were not covered by the conducted survey and excavate finds, which protection zone cannot be avoided.

- Place information plates 50x60cm 1.7m high on each mound with engraving in Russian and Kazakh: “Zhanatas burial mounds IV-II BC Cultural heritage object, Protection zone 50m”. Inform the locals about the sites and their protection status according to SEP.
- Develop and require the earthwork conducting subcontractors to instruct their workers to follow the chance find procedures.
- Control driving along designated routes to prevent damage to unidentified cultural heritage

## 6.2 OPERATION

### 6.2.1 Air and Groundwater

**No discernable impact** on groundwater quality from the WPP waste and sewage is expected. There will be no impact on air quality. Risk of accidental releases of sulfur hexafluoride (SF<sub>6</sub>) during maintenance and repair of the high voltage circuit breakers is covered in Section 6.4.5.

Develop maintenance and repair procedures to minimise risk of Sulfur Hexafluoride release from circuit breakers. Regularly check SF<sub>6</sub> inventory to spot excessive releases.

### 6.2.2 Vegetation

Vehicles are expected to use the internal access roads covered with chip rock that connect to the local tarmac roads. Yet, because loops would have to be made between specific turbines (e.g. 1 and 38; 23 and 31), shortcutting is likely to occur. Also, access to the area will be improved, which can create induced impact on three protected plants from picking. Alteration of the pollination by night insects due to insects' attraction to the security lighting and the light body of the turbines is unlikely to be sufficient to significantly alter species composition or survival potential.

Sensitivity	4	High: Protected plants at several turbines
Magnitude	4	High: Flowers picking can effectively eliminate the protected plants from the WPP area.
<b>Significance</b>	<b>16</b>	<b>High</b>

The impact can be reduced with the following measure:

Prohibit staff driving outside the designated roads and flowers picking. Include field road from turbine 23 into the designated for driving routes

Instruct the security to prevent flowers picking by the local population. If necessary, install road signs with information on flowers protection status and fines for picking.

### 6.2.3 Animals

Reptiles and some insects are likely to use the access roads and the turbines body and shade for warming up in the mornings and cooling in the afternoons. This will however have no effect on the site ecology and will not increase reptiles' mortality as the transport movement along the roads will not be intensive. Bats are not present in the wind power plant site and do not hibernate anywhere near the site over winter.

Birds collision with the blades may occur but is not expected to constitute a significant risk. Migrating birds pass at considerably higher altitudes than the span of the turbines blades. In bad weather the birds can be forced down by high wind, feather icing or heavy snow or rain and continue flight at lower height. The waterfowl birds land on large clear water as a protection from predators and wait until the weather improves. During this night descend in poor visibility larger birds like swans, geese, ducks waders and prey birds will be more vulnerable to collision with the blades than smaller birds due to inability to change flight direction quickly. The known migration routes lie 54 kilometers north from the turbines and parallel to them (Figure 4). The nearest significant water body used for resting is the Zhana-

tas wastewater lagoon 26km north of the nearest turbine 46. Zhanatas recreation pond 16km north and Kazfosfat quarry 5km north are rarely used due to the human presence. The Zhanasbek Farm 0.3ha pond located 2.5km south from Turbine 7 is used by small number of migrating birds for feeding and resting. The low number of visiting birds is explained by small size of the pond, human presence and 40km distance from the main migration route.

The resident birds are not attracted by the turbines and their foraging strategy defines flights below the 30-150m risk zone<sup>7</sup>. Some sub lethal effects may be on the prey birds that are tolerant to human presence. Their hunting flights may be altered forcing birds to spend more time monitoring blades than hunting or to avoid the turbines areas all together. On the other hand, the pray birds will gain additional scanning points in the form of turbines and powerline poles and towers. The prey birds density will be also limited by the territorial claims of stronger individuals. Some nesting birds may be displaced from the turbine area by the blades noise but birds are known to become accustomed to repetitive sound.

The 110 kV power line sets of 6 insulators will be long enough to prevent large birds' shortcutting them with their wings. Cranes, which often try to establish nests on the crossbars and can create shortcut by urinating near the insulators, were not noted in the area during two surveys or by the local hunters and shepherds. They are not attracted to area for absence of an appropriate food source. Large flocks of smaller birds that may shortcut the parallel wires through the flock were not noted in the area and have no basis for presence. The 35kV powerlines will have hanging sets of 3 insulators which also provide sufficient protection of birds from electrocution.

Birds collision with the powerlines wires is possible but unlikely due to absence of large migrating birds that have low maneuverability and are not familiar with the area.

Sensitivity	2	Low ecological value, absence of bats and birds resting areas and significant food sources
Magnitude	2	Increase in predation due to introduction of elevated scanning places for pray birds. Rare collision with blades of a passing by bird possible. No disruption to migratory routes
<b>Significance</b>	<b>4</b>	<b>Low</b>

Despite the evaluated low sensitivity and impact, some uncertainty exists due to a short period of observation in early spring. The following observations may change the impact significance. Therefore, the following measures should be considered:

Make and keep inaccessible to bats and birds all the gaps and interstices in the nacelles;

Commission an experienced ornithologist to:

- Continue birds and bats monitoring to complete through the year assessment of the WPP territory usage;
- Develop methodology and train the plant staff to monitor birds and bats site usage and mortality with a focus on protected species.

If annual mortality exceeds the industry statistics for the given turbines: 10 bats, 2 birds and 0.1 pray birds per MW generated or more than 1% of the population of protected species using the site, implement additional mitigation measures in liaison with AIIB and IFC. Some of them could be increase in turbines cut-in wind speed or blades feathering. This is known to reduce mortalities by > 50%<sup>8</sup>. The associated loss in power is expected to be <1% of total annual output<sup>9</sup>. The turbine wind, humidity and temperature detectors can be set to alter cut-in wind speed and feathering automatically.

<sup>7</sup> Herrera-Alsina, L., Villegas-Patraca, R., Eguiarte, L.E., Arita, H.T. (2013). Bird communities and wind energy: a phylogenetic and morphological approach. *Biodiversity and Conservation*, 22: 2821 – 2836

<sup>8</sup> Baerwald & Barclay 2009, Arnett *et al.* 2011, 2013c. Behr & Von Helversen 2006, Bach & Niermann 2013

<sup>9</sup> Brinkmann *et al.* 2011, Arnett *et al.* 2013c



## 6.2.4 Waste

During operation the waste generation is expected to be small. The wastewater from control room will be accumulated in the underground tank at a maximum rate of 1.2m<sup>3</sup> per day and removed to the Zhanatas wastewater treatment plant by a tank truck. It is expected that with time the plant will be reconstructed and all the treatment stages will start to operate. Small amount of office waste will end up in the Zhanatas landfill, in which waste management practices are also likely to improve as the town recovers from depression.

## 6.2.5 Socioeconomic Impact

### 6.2.5.1 Land Requirements and Use

The impact on the tenants of the land, small parts of which have been acquired for the windfarm components is thought to be low. They opportunistically rented as much the land as they could after disintegration of the collective farm because the rent was very low. The size and shape was decided by the district council but none of the farms pay any attention to the land plots boundaries when pasturing the livestock. Interviewing four farmers showed that the land has been consequently seized from their plots on several occasions with the farmers consent and sometimes the seizures were not compensated with land or otherwise. When larger parts were taken, additional land was adjoined to their plots. Seizures for the windfarm was thought to be small and no compensation in land was provided purely on the consideration of the efforts needed to rearrange the paperwork.

Practically all WPP territory will be open for livestock pasturing. Use of the WPP land in any other way (e.g. ground resources extraction, agriculture, recreational etc.) is not envisaged. The State reserve land that surrounds the WPP is also unlikely to be used for anything more than non-intensive pasturing. Therefore impact on land use during the operation is considered to be **negligible**.

### 6.2.5.2 Noise and Electromagnetic Interference

Noise will emanate from rotating blades and locally by the gearbox. For the given turbines 106.6 dB(A) noise is expected at the ground level at 7 m/s wind speed. Noise will increase to 107 dB(A) at 8 m/s wind and remain stable until the 13 m/s wind speed. The consultant measurements at other sites for similar turbines showed that at 100m from the turbine, noise will be close to 50 dB(A) and at 300m - less than 40 dB(A) which is **below the background level** made by the wind and passing vehicles. According to the World Bank EHS Guidelines for Wind Energy (7.08.2015 par.1.1.2), preliminary modeling should be carried out if sensitive receptors are within 2km from any of the turbines. The closest receptor is the Ushbulak Farm 2.2km from the turbines.

Two 35/110kV step up transformers will be located 120m away from the main road and 5m above it. They will produce constant low frequency humming noise from the core vibration. The noise from switchgear appears after it automatically switches off during high voltage connections or damage in the circuit in order to protect the equipment. Since no one uses the surroundings, no impact will be generated.

The blades lightning protection in the form of aluminum grounded wire may interfere with the cell phone, radio and TV signal only in immediate proximity of a receiver which is not the case here.

The nearest airport with air traffic control and meteorological radars is located in Shymkent 130km away from the WPP. Thus, the radars cannot be affected by producing electromagnetic shadow, clutter effects or effects on Doppler (moving target indicator processing).

### 6.2.5.3 Visual impact

The 150m tall wind turbines have a potential to affect the scenery properties of the identified sensitive viewpoints (Modelling the turbines from sensitive viewpoints and interviewing the owners of the land

plots showed that the owner of Zharasbek Farm Peishbek is the most sensitive to the view change. He lives in a larger family with his brothers that help him with the farm that is set on joining of streams from several springs. In 2003 at the age of 40 he arranged the farm and impounded the joint stream to retain Ushbulak springs water. The pond is not used for recreation by him or his relatives that visit the farm in summer. Discussion of the landscape value and the collage with the turbines showed that the farm inhabitants' focus is inwards, to the livestock. The main problem Peishbek has is lack of electricity.

**Table 11 Viewpoints around the wind turbines. At all views turbines project is onto the sky. All views are obstructed by hills in various degrees. Interviewed means that the inhabitants were questioned of the landscape value and their opinion on the view change modeling that was mailed to them.**

Viewpoint	Distance, km	What is seen at the closest place	Altitude difference, m	View focus	Consultation
Zharasbek Farm	2.2	First row	+120	Inwards	
Zharasbek Yurt	2.8	First row 14 turbines + second row half blade 3 turbines	+100	Away	Interviewed
Summer camp pond	2.6	Half blade #36, #48, #49	+160	Away	Not found
Aktogay village nearest house	3.5	No turbine visibility 120m high hill obstructs view	+280	Away	Interviewed
Ganiez farm	3.9	1 turbine + 3 half blades	+130	Inwards	Not found
Burkitbayev village nearest house	6.2	Two rows	+100	Away	Interviewed
Zhanatas block of flats inhabited	7.6	Half turbine #15	+260	Away	Interviewed
Zhanatas block of flats derelict set for reconstruction	7.7	Half turbine #16, half blade #15	+260	Towards	NA
Zhanatas block of flats derelict set for demolition	7.9	Half blades #17, #18	+270	Towards	NA
Ushbas village nearest house	9.5	Two rows	+2	Away	Interviewed

In the summer Peishbek sets up one or two yurts in his pasture land and for guests. Being authentic, yurts are considered to be more sensitive to visual impact. The yurts location can change from year to year but one place next to a creek is used constantly. Although the yurt inhabitants spend most of the time outside, the northward view is valued less than the southward view. The yurt entry is turned south towards the creek, the incoming road and the view along the creek gorge. The north view is associated with the main road traffic and invisible mining activities over the hills. Some inhabitants were interested in the turbines as a local attraction, something to be proud of.

Such view on the turbines was also expressed in Burkitbayev and Ushbas villages. Most inhabitants will not see the turbines because of trees. Only few houses at the edge of the villages will see the array of the first row turbines of the 1/3 of an electric pole size. When examined the modelling results, the interviewed inhabitants did not express any concern over the view change.

Although being much closer to the turbines, residents of Aktogay village will not see the turbines because of 120m hill obstruction. In Syzdykbayuly only turbine 27 can be seen from the backyard of one house. The owner did not assign any value to the wind turbines because he rarely stays in a village due to frequent work trips to the cities. The rest of the houses are screened with trees or hills.

). Visual impact from such viewpoints where the turbines were visible is shown in figures below. The relative position and size of the turbines was determined using Google software SketchUp, the modified open-source wind turbine 3d model was provided by [www.3dwarehouse.sketchup.com](http://www.3dwarehouse.sketchup.com), and Google Earth 3D modelling tool.

Modelling the turbines from sensitive viewpoints and interviewing the owners of the land plots showed that the owner of Zharasbek Farm Peishbek is the most sensitive to the view change. He lives in a larger family with his brothers that help him with the farm that is set on joining of streams from several

springs. In 2003 at the age of 40 he arranged the farm and impounded the joint stream to retain Ushbulak springs water. The pond is not used for recreation by him or his relatives that visit the farm in summer. Discussion of the landscape value and the collage with the turbines showed that the farm inhabitants' focus is inwards, to the livestock. The main problem Peishbek has is lack of electricity.

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Figure 5 View from the Zharasbek Farm yard 2.2km south from the closest wind turbines row.

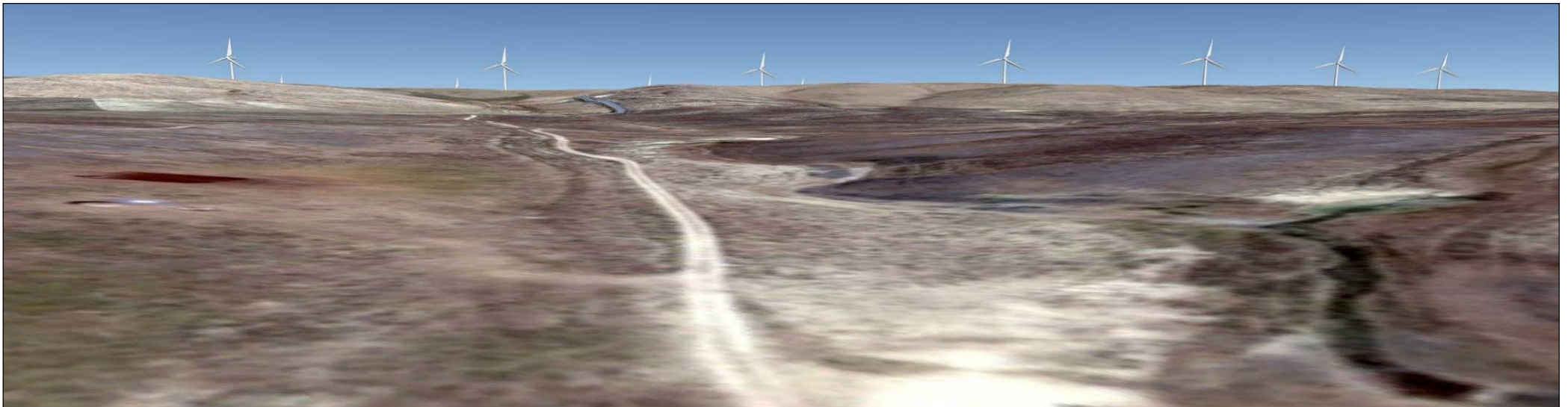


Figure 6 Yurt (left) is 2.8km from the closest wind turbines row with 14 turbines being visible but its entry and focus is towards the access path, the creek and the creek gorge. Swimming place is in the right bottom corner of the model. Hiway is the gray line in front of the turbines. The owner viewed the turbines as a local attraction.





Figure 7 View from the edge of the garden of the nearest residential house at Burkitbayev village 6.2km south from the closest turbine row.



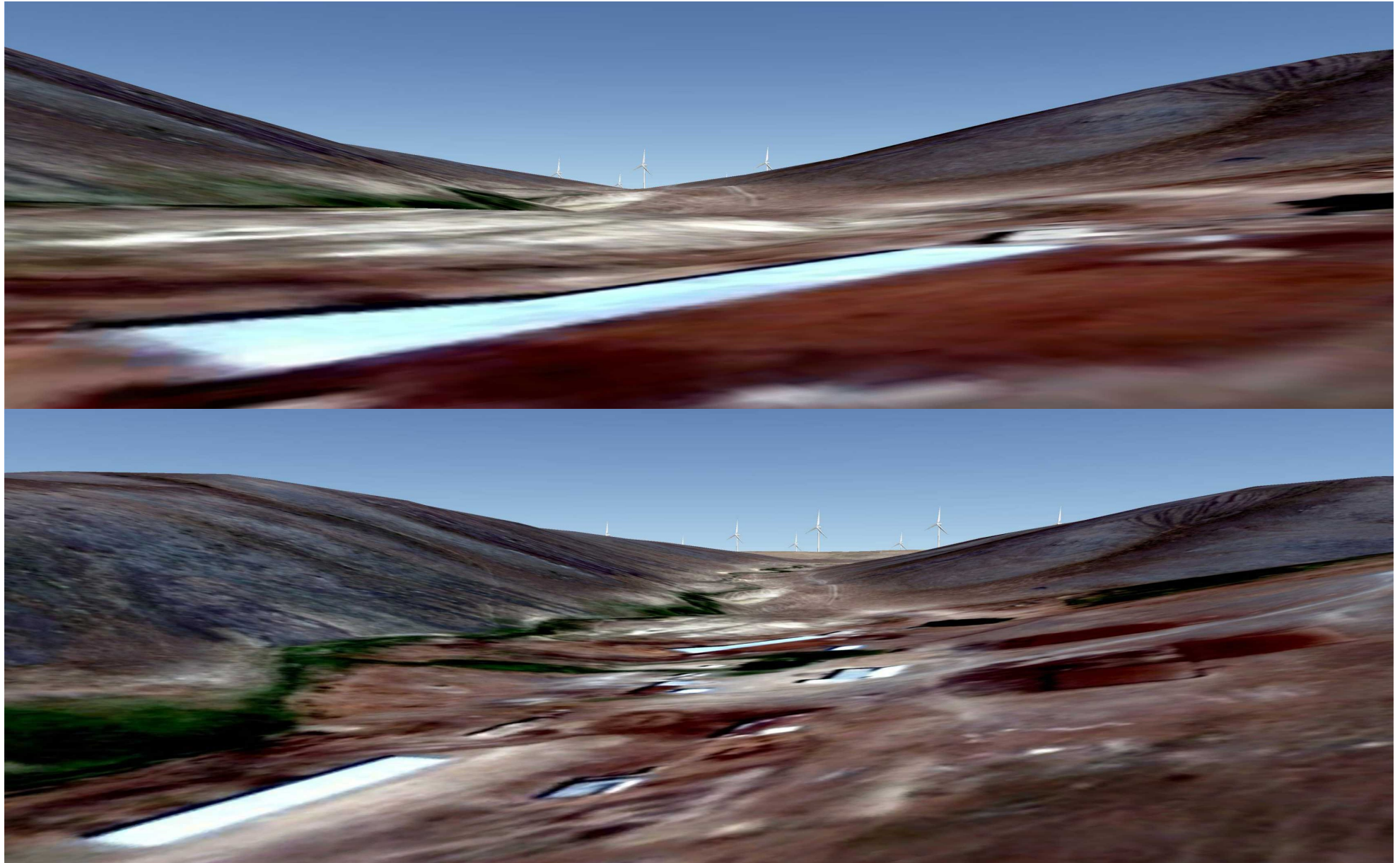
Figure 8 View from the nearest house at Ushbas village 9.5km southeast from the closest wind turbine. The view from the graveyard (on the right) is the same but partially obstructed by the tree line. The view from the other houses is obstructed by trees.





Figure 9 View from one of two points in Zhanatas town where a part of turbine could be observed: #1 above – from the left corner of the fifth floor of derelict block of flats planned for reconstruction 7.9km north from the visible wind turbines #15 and #16; #2 below – from the fifth floor flat of inhabited block 7.6km north from the visible wind turbine #18 but obstructed with abandoned house and trees.





**Figure 10** Above is the farm #2 with four barns (in front) and turbines seen behind. Below is the closest barn 3.9km south from the closest wind turbine visible from this distance





Figure 11 View from the pond at Zhuldzy summer camp 2.6km east from the turbines

The view from the house porch of Ganiez farm towards the turbines is obstructed by the barn but even behind the barn only one turbine and 3 half blades of the other turbines will be seen. With the general focus inwards and to the south along the Angarsay creek, the impact on this farm is considered to be low to negligible.

In Zhanatas only 4 families on the top floor of one block of flats can see from their balconies half of the blade among the other electrical installations (Figure 9). Similar view will be from the corners of the top floors of 2 empty derelict blocks of flats, one of which is set for demolition and the other is planned to be restored. The view with these blades over the hills for 3 families of the restored house that will be able to see them will be new and thus will be accepted as given.

There will be no visual impact on Zhuldyz summer camp. Only two half blades will be seen from the very edge of the camp among electric poles and a distribution unit. The children attention will also be directed inside the camp.

Drivers at southwest highway will see turbines in full height but the driver's focus will be towards road because the road is in poor condition. The mountains behind the turbines are low and not new to eyes, the power poles interline with the turbines making the turbines not the only vertical structures on the horizon. Drivers at southeast highway will focus on destination, but the turbines will be viewed as amusement and rest to the eyes that are tired of monotonous relief. Drivers at these highways are likely to rarely stop on road shoulder for viewing and taking pictures because of the multiple turbines encountered along the road that adapt eyes to the view quickly. Thus, the drivers are expected to be less sensitive to the view and the turbines are not seen as a hazardous distraction.

Shadow flicker will not affect the local population due to the distance from the turbines.

Basing on the above, visual impact on the Peishbek farm is considered to be **low** and on the others, as insignificant. As the viewers interviewed after seeing the collages expressed no concern over the landscape change, **no mitigation or compensation measures** beyond already implemented are **required**. Implementation of the prepared Stakeholder Engagement Plan will allow monitoring the public perception of visual impact and managing it with available compensation instruments

### 6.3 CLOSURE AND DECOMMISSIONING

When the operational period ends in 20 years, the site may be redeveloped to continue the operation as a WPP with new turbines installed. Due to the need to rent a special long beam crane, turbines disassembling is likely to proceed quickly in a reverse way to construction. Without proper control of the decommissioning contractor, the turbines and anchor towers parts may be dragged on the ground stripping this vegetation on the large areas.

Practically all parts of the plant including the substation components can be reused or recycled but cables are likely to be left in the trenches. Transformer oil will be collected and cleaned by a licensed electric company and after testing for insulating properties reused in lower voltage transformers. The other parts will constitute non-hazardous waste of low enough volume that it can be disposed to the Zhanatas landfill that is expected to be upgraded by that time. Leaving the main transformers and turbines and power line towers foundations will not generate an impact. However, leaving internal roads and storage areas will ease the public access to the area for picking the protected by the Red Book of Kazakhstan plants. The air pollution will be less intense and last less.

Develop a decommissioning plan and include in it:

- Prohibition of towers parts and wire dragging over the ground
- Discouraging public access to the area by digging trenches across the connection of the internal roads with the main roads.



## 6.4 RISK ASSESSMENT

### 6.4.1 Construction: Road Accidents and Site Material Damage by Gusty Winds

The standard length vehicles may generate high risk to the other two lane roads users if they move in a train like manner leaving insufficient gaps between for the overtaking cars. These vehicles will not be escorted by the police and thus the distance will not be regulated. The probability of head on collision or overturn from being pushed off the road is higher for more congested M36 (Figure 3) which is also in a better condition than R43 and R44, allowing higher speeds.

The oversize freight will be escorted by a police car traveling in front of 2-3 vehicles. Yet, the of collision here is higher than for the standard size freight because the queuing behind drivers would not expect such a long trailer and may easily misjudge their cars overtaking capacity.

Significant spills are not expected to occur because there will be no large diesel storage tanks at the site. However, 5-20L of backup of oil and diesel may be stored on the ground without secondary containment. A vehicle can rupture them when reversing. Accidental diesel spills during heavy machinery refueling may be small but fairly frequent. Considering that the equipment will be refuelled by a tank truck driver from a small local fuel supplier, small and medium spills may occur as the driver is not trained for the equipment refuelling and will not have enough preventive equipment. The soil has medium permeability to diesel and oil but the underlying base rock is fractured. A medium size spill (~10-20L that would be expected on accidental disconnection of a fuelling hose) would enter groundwater that will partially seep out to the surface in the nearest gully and partially go down the gradient inside the fractures. Such spills residue from the rows 1-10, 11-23 and 38-46 would end up in the open water of the Kazfosfat quarries. Only spills near the turbines 31-36 may end up in the Tomsaly Creek 1-1.5km away that forms the Burkitti River 5km downstream. Some part of the spills at the turbines 47-51 may seep through Tenteksay Gorge and up in Uzynbulak Spring 5.5km downstream. Due to proximity of the Shabakhty River, the spring is not used by the Aktogay livestock. The spring water disappears into the ground 150m before this river (Figure 2).

From the above it can be concluded that remains of an accidental diesel spill of medium size would be broken by sun and digested by aerobic bacteria at the surface and in the open water before it reaches sensitive receptors like Zhanatas water intake 2.2km downstream the Burkitti River from the Tomsaly Creek mouth and the Shabakhty River.

Probability of extreme storms (above 20mm/day) during construction is negligible. Yet, the likelihood of gusting wind remains. Risk of diesel fuel ignition while fueling the equipment is negligible considering the diesel properties and safety precautions taken by the refueling truck driver. The vegetation is also not fire prone.

Probability	2	The project traffic induced road accidents and wind storms are unlikely but may occur during transportation and construction.
Consequence	5	Major injuries, possible deaths, material damage to freight, equipment and third party
<b>Significance</b>	<b>10</b>	<b>High</b>

The following measure will allow reducing the risk to the low level:

- Develop oversize and non-standard weight equipment transportation plan. Obtain the road police approval and request a second escort car to arrange controlled overtaking of oversize trailers.
- Fold the main cranes arms and ground the large crane arms for the night;
- Purchase fuel from a reputable supplier and check on site entry that the driver passed spill prevention training and has the required spill containment equipment.
- If storage of backup oil and diesel cans is unavoidable, arrange mobile secondary containment (usually cut in half 1m<sup>3</sup> water container) with a lid and secure drainage tap.



### 6.4.2 Operation: Blades and Nacelle Disintegration and Fire

A combination of high wind and break of blades angle change failure may lead to uncontrolled blade spinning and consequent rupture of the blades and gearbox. Mandatory safety standards in turbine design, manufacturing, and installation as well as more frequent maintenance have made the occurrence of blade throw a rare phenomenon. If occurs, the problem would be noted well before the consequences but once the turbine disintegrates, the fractures can be thrown to a distance of up to 500m from the turbine in the direction of the spin. The highway is 270m from the nearest turbines 10 and 11 that are likely to be turned in a way of the blades flying towards the road (see Table 4). The traffic would have to be stopped until the blades spin off the turbine. The alternative route to Shymkent through Sholakkorgan is 80km longer but it also leads to Eurokhim plant for which the route will increase by 170km.

Out of infrastructure, only the windfarm internal 35kV overhead line between the turbine 10 and 11 may be damaged. The line will be shut in the case of such an accident. Some power will be lost for the time of the line repair. Only another turbine 36 is closer than 500m from a local road to a summer camp. Blockage of this road is unlikely to have any consequences.

In the event of a nacelle fire, best practice is usually to allow burnout, and for firefighting services to establish a safety zone to ensure secondary fires in the area surrounding the turbine is prevented or controlled. Due to the vegetation nature, ground fires from either natural or human induced causes are unlikely. The availability in Zhanatas of fire engines can provide the required control of the fire and water is available at the Kazfosfat quarry and Zhuldyz summer camp 4-15km away from the turbines.

Probability of the step-up transformers ignition is thought to be negligible. The most severe consequence is loss of a transformer because the power will be cut and the oil automatically discharged into the sink provided for such circumstances.

Probability	1	The activity is very unlikely to occur under normal operating conditions but may occur in exceptional circumstances. Probability of blade through confined to 3 turbines.
Consequence	6	Damage to turbine possible beyond repair. Possibility of parts flying onto highway, damage to windfarm internal powerline.
<b>Significance</b>	<b>6</b>	<b>Low</b>

- Develop site-specific emergency response plan that accounts for the nacelle level fire.
- Consider installing automatic fire detection systems linked to automatic shutdown systems and automatic fire fighting like foam water or powder sprinklers in the nacelle that can be engaged remotely.

### 6.4.3 Operation: Ice Throw on Blades Heating Failure

The probability of the blades throwing ice is considered to be once a year at one turbine. The consequence of such an event will be low for the distance between the turbines and the sensitive objects (270m from the closest turbine 10 to the road). The area will not be used by the cattle in winter. EC Guidelines suggest a safety threshold of 200-250m from any turbine, beyond which there is no significant risk from ice fragments<sup>10</sup>. The IFC suggests that 300m is sufficient<sup>11</sup>. With the situation being considered as very unlikely and consequence being minor damage to a passing by vehicle, the impact is considered to be **negligible** to merit mitigation measures.

### 6.4.4 Operation: Spring Flood and Ground Fire

Because all the project components are located at elevated areas and all the turbines and roads are on the top of the very small water shed, this **risk does not exist**. Ground fires occur rarely and do not extend far due to gaps in vegetation cover. No fires were reported by the questioned locals at the WPP area. The nearest fire occurred in 2012 three kilometers south of the turbine 4. It stretched north 700m

<sup>10</sup> Moregan et al. (1998). *Wind Turbine Icing and Public Safety - A Quantifiable Risk?* Colin Moregan and Ervin Bossanyi Garrad Hassan and Partners Limited: European Commission (DGXII)

<sup>11</sup> Environmental, Health, and Safety Guidelines for Wind Energy. International Finance Corporation, 2007

from the source. The locals do not practice ignition for grass regeneration. Thus the **risk of ground fire** damaging the WPP infrastructure is considered to be **negligible**.

#### 6.4.5 Operation: Sulfur Hexafluoride Release from Circuit Breakers

SF<sub>6</sub> gas is a valuable commodity and thus will not be released routinely but may be let out during maintenance and repair or in less likely event of a shortcut or fire. No more than 20% of gas is thought to be able to escape during repair as the safety valves will sense pressure drop and close the gas vessels. However, all volume escapes either through safety valves or a specially weakened part of the chamber in case of an unusually strong shortcut. The volume of the chamber in an 110kV breaker is about 95L. Considering that SF<sub>6</sub> global warming potential is 23 900 times higher than of CO<sub>2</sub><sup>12</sup>, a 20% release from a 110kV breaker would correspond to  $95 \times 0.2 \times 23900 = 454\ 100\text{m}^3$  or 816 tons of CO<sub>2</sub> (as per <http://www.icbe.com>, a tone of CO<sub>2</sub> occupies 556.2m<sup>3</sup>). Taking into account the corresponding to the plant activity CO<sub>2</sub> emission reduction of 728 tons per day (see Section 6.8.1), such release would negate just over one day of the plant effort in the country greenhouse contribution reduction. Thus, **no action is thought to be needed** to reduce this risk. The 35kV breakers has vacuum in the chambers.

### 6.5 KEY UNCERTAINTIES AND DATA GAPS

The main gap is in incomplete observation of birds, bats and other animals on the site. Therefore completion of through the year observations has been requested.

The consultant was not provided with a complete transportation plan but only the transportation route survey that lacked several key items:

- Indication of exact trailer that will carry each part and statement of the wheel pair load;
- Maps of sharp turns with indication of the oversize parts trailer passage and alterations required on the two lane roads and Zhanatas streets;
- Maps showing location of the steep rises and descends on R43 and R44 roads;
- Bridges condition and maximum load;
- Arrangement for hastening checks on the way and radio contact with escort cars;
- Critical segments passing schedule;

These issues should be addressed in the plan and impact re-evaluated.

If the best practice of LED 590nm wavelength light is decided not to be used, then additional observations should be conducted to identify impact on birds, bats and insects from the conventional lights. Impact confirmation should be done during the operational monitoring suggested in Table 12.

### 6.6 ALTERNATIVES IMPACT COMPARISON

Alternatives of location, scale, layout, mode of operation and materials used were considered by the Company mainly on the technical, logistical and financial criteria as significant impact on migratory birds was excluded at the early stages of development and no other major environmental or social impacts was expected. The do-nothing option was not considered.

Alternative location of the turbines, switchgear rooms and transformer was constrained by the technical needs and changed insignificantly as the design progressed. The connecting powerline had to pass the Kazfosfat quarry along the road and thus options for its location were also limited.

Selection of the location was constrained by the need to be close or within the corridor in which the required speed and frequency of winds are present, close to the existing road and to the national grid and on the ground that is owned by the State and that would allow excavation of 2.8m deep pits for the turbines foundation. All the possible options along the Karatau Ridge wind corridor is thought to generate

<sup>12</sup> [http://www.ipcc.ch/publications\\_and\\_data/ar4/wg1/en/ch2s2-10-2.html](http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html). Intergovernmental Panel on Climate Change. 2007.

similar environmental and social impact but placing the windfarm further northwest would have shortened the distance to the important birds areas.

The top end of the scale was considered in terms of the available capacity of the nearest substation to accept additional load. The bottom end was decided on calculation of profitability as the logistics complexity and construction cost would remain practically the same for a smaller scale plant. Smaller turbines with higher output have also been selected on financial terms although logistics of transportation became more complex. Considering the remoteness of the windfarm, the turbines scale makes little difference in terms of environmental and social impact. The plant substation scale depended on the turbines total output and KEGOC requirements.

Selection of the materials and equipment used was made on the base of the cost and complexity of the delivery logistics. Envision turbines were preferred over six other offers: Alstom, General Electric, Goldwind, Siemens, Acciona and Gamesa. The other materials were sources from various suppliers, for which selection the 'perform as specified' criteria was added. The suppliers themselves decided on the transportation routes and gave prices with 'to the door' the delivery. Environmental and social aspects of the reviewed options were not considered. To date, only the road for transportation the turbines parts from China was selected. Its review showed that the route will produce the least disturbance on the way and will require minimum alteration of the existing infrastructure.

Two alternatives for the oversize equipment transportation have been considered: 1) via railway; 2) via motorway. More environmentally sound railway option was excluded because the available platforms could not hold the blades longer than 50m. The conducted road survey does not identify and evaluate all the risks on the way of the oversize equipment carrying traffic. Therefore, the impact of this alternative is considered to be high despite that the contractor has already transported the WPP components to the sites in Kazakhstan.

The operation mode options were reviewed from the point of view of turbines components integrity preservation and cost optimisation. The cut-out and the cut in speed was determined by the turbines supplier. The guards, maintenance and control staff has to work round the clock in shifts while the cleaning and office staff can work normal hours.

The plant layout was designed to minimise effect of wind shadows created by the neighboring turbines in respect of the prevailing wind direction and speed. For this, 5 rotor diameters distance between turbines were maintained.

## 6.7 CUMULATIVE IMPACT OF WINDFARMS IN THE AREA

Zhanatas is in the wind corridor with large potential for wind and solar power development. Several wind power projects along the Karatau Ridge came short of development for the lack of financial feasibility and investors. This situation may change in the future and number of wind farms may appear in continuation of Zhanatas windfarm along the Ulken-Aktau Mountains and elsewhere along the Ridge. The cumulative visual impact appears **when two windfarms can be viewed by a sensitive viewer together**. Currently, the consultant could not find sensitive viewers in the vicinity of the project. The newcomers will not associate themselves with the original landscape, and are likely to place less value to it. But because of uncertainty related to changes in this vulnerability in time, cumulative visual impact from appearance of wind turbines on the suitable elevations east, west and north of Zhanatas windfarm is valued as **low to medium**.

The rest of cumulative impact, **from** appearance of the **turbines that could not be viewed together**, will depend on the overall attitude to the wind power projects in the country. If the projects bring no tangible benefits to the local communities, it may be perceived by the rural residents as nonsense and intrusion into traditional landscapes without vertical structures that can be observed on the approach to Zhanatas from the Karatau Ridge. The district councils (that makes final decision on the land allocation)

negotiate the company input into the local society but mainly after the windfarm has been in operation for some time.

In terms of impact on the land use, the same councils also made decision on the land allocated for the windfarms. In most of the cases the State Reserve land has been allotted. It is unlikely that in the future vicinity significant acquisition of other land will occur. Thus, the windfarms will not be associated with land access losses.

The negative image of the wind power as a whole can also arise in the society from publications about the road accidents or major disturbance to the traffic and infrastructure during the oversize and heavy parts transportation. Expressions of negative attitude will be retarded by the State, which is committed to increase the share of the power generated from renewable sources in order to maintain and improve its international recognition. But to exclude possibility of public unrest related to the wind power projects, the State will oblige the local councils to demand from these projects investments into the social infrastructure. Thus, 'attitudal' cumulative impact is likely to be kept **neutral or positive**.

## 6.8 PROJECT BENEFITS

### 6.8.1 Reduction of Kazakhstan Contribution to Climate Change and Air Pollution

The main environmental benefit will be in reduction of Kazakhstan contribution to climate change and air pollution. To calculate this reduction, the following data was used. The P90<sup>13</sup> factor was used to correlate the annual output. Thus, annual output is expected to be 350GWh x 0.9 = 315GWh. The national GHG emission factor for grid electricity generation (EF<sub>grid</sub>) is 844g<sub>CO2</sub>/kWh<sup>14</sup> or 0.844t<sub>CO2</sub>/MWh. The annual reduction is therefore expected to be 315 000 MWh x 0.844 t<sub>CO2</sub>/MWh = 265 860tCO<sub>2</sub>.

When burning 1t of coal in Kazakhstan grid electricity generation network, 13-25kg of SO<sub>2</sub> and 7-11kg of NO<sub>x</sub> are thought to be released<sup>15</sup> (the lower values of 13 and 7kg are accepted for this calculation). To calculate the associated with the project reduction, emission per MWh needs to be found. With the coal high calorific value taken as 29.3MJ/kg<sup>16</sup>, 29.3GJ of heat is released from burning a ton of coal. Because 1GJ = 0.2777MWh<sup>17</sup>, 8.13MWh of heat will be released for each ton. The below calculation shows that for each MWh produced, 0.0016t of SO<sub>2</sub> and 0.00086t of NO<sub>x</sub> is emitted:

$$\frac{13\text{kg}_{SO_2}}{8.13\text{MWh}} = 1.6\text{kg or } 0.0016\text{t of } SO_2/\text{MWh}$$

$$\frac{7\text{kg}_{NO_x}}{8.13\text{MWh}} = 0.86\text{kg or } 0.00086\text{t of } NO_x/\text{MWh}$$

Therefore, the total annual reduction of SO<sub>2</sub> and NO<sub>x</sub> emission is expected to be 500t and 270t respectively as per below calculation:

$$SO_{2\text{ total}} = \frac{0.0016\text{t}_{SO_2}}{\text{MWh}} * 315\ 000 \frac{\text{MWh}}{\text{y}} = 504\ \text{tons}$$

$$NO_{x\text{ total}} = \frac{0.00086\text{t}_{NO_x}}{\text{MWh}} * 315\ 000 \frac{\text{MWh}}{\text{y}} = 270\ \text{tons}$$

As an induced positive impact, making an example of renewable energy source profitability may encourage others to invest in similar projects elsewhere and by this reduce the contribution of traditional

<sup>13</sup> So called exceedance probability P90, which denotes the level of annual wind-driven electricity generation that is forecasted to be exceeded 90% of the year.

<sup>14</sup> Green Economy Transition Handbook, EBRD, 2018 page 51 based on a study carried out by Lahmayer International in 2012, which is still subject to approval;

<sup>15</sup> [https://forbes.kz/process/probing/pyil\\_vekov](https://forbes.kz/process/probing/pyil_vekov)

<sup>16</sup> <https://www.calc.ru/126.html>

<sup>17</sup> <https://www.translatorscafe.com/unit-converter/ru/energy/2-14/>



fuels to the global warming. Allowing natural vegetation to re-establish within the Park fence will be beneficial but this effect will disappear on re-establishment of grazing after the plant decommissioning.

### 6.8.2 Socio-economic Benefits

For the time of the construction and decommissioning, the local contractors will gain specific knowledge, employment and entrepreneurial opportunities will be generated for the locals. Yet, women may not be given sufficient opportunity to participate in the project. To rectify this, the following is suggested:

Arrange sufficient number of meetings with women in Zhanatas and nearby villages to identify the jobs that can be performed by them and assess their interest and capability to participate in the project. Agree with the EPC contractor the % or number of women to be employed and specific training to be provided and control fulfillment of the set quota. Submit all the meetings outcomes to the lender banks. For the operation, define women involvement quota, fulfill it and reassess once a year for the options to increase it.

In the long term, 4 benefits are expected: 1) increase revenue for the local and national budget; 2) overall power supply reliability improvement; 3) some local jobs and 4) early example of renewable energy source profitability that may encourage other developers to invest in similar projects elsewhere and by this generate jobs. Few local non-skilled workers will be employed (preliminary a secretary and a cleaner) but some local school graduates may be encouraged to obtain education that will allow them to apply for the more qualified jobs of the electricians and operators.

## 7 HSE AND SOCIAL MANAGEMENT, CONTROL AND MONITORING FRAMEWORK

The environmental and social performance of all the project contractors will clearly be fundamental in the successful environmental and social management of this project. Environmental controls shall be part of the Company Environmental Management System (EMS). The environmental monitoring program should be developed as an integral part of the EMS. A framework program is proposed in Table 12. The program should aim to validate the predicted environmental and social impacts and to be subject to review. Deviations should be recorded and reported and corrective actions issued for any non-compliance. The monitoring should be carried out throughout the life of the project and should be checked against the legislative and the AIIB ES policy requirements.

**Table 12 Environmental and social control and monitoring framework with the key performance indicators.**

Media / Issue	What to Monitor/Control?	Reporting Frequency	Key Performance Indicators
<b>Construction</b>			
Soil, ground, vegetation	Visual hydrocarbon contamination at the machinery parking area Overspills and leaks at septic tanks Areas of stripped vegetation	Cover in weekly work activity reports	No oil stains larger than few drops, vegetation at one site is stripped on less than 300m <sup>2</sup> in total
Workers and local roads users	Project, contractors and subcontractors adherence to national labor code and core labor standards Contractor's adherence to the traffic management plan		Compliance with labor laws and standards; grievance redress mechanism is used by workers and is effective. No breaches of shift and rest durations. Workers are discouraged from working during rest time. No accidents due to driver falling asleep. Traffic management plan violation notes: <10 in the first month, <2 in following months.
Stakeholders	Adherence to the grievance mechanism for stakeholders and the project personnel CSR/P preparation and implementation	Monthly HSE Manager	Information boards are intact and displayed information is up-to-date and covers SEP requirements. SEP consultations documented. Grievance database is maintained and replies are within the set maximum response period. CSR/P implemented timely and in full.

Media / Issue	What to Monitor/Control?	Reporting Frequency	Key Performance Indicators
<b>Operation</b>			
Ground	Revegetation effectiveness.	Each October /HSE Manager	At all stripped areas there are signs of vegetation recovery at the end of warm season, no signs of erosion
Animals	Birds and bats mortality		Annual mortality per 10MW is within the industry statistics for the given turbines: 100 bats, 20 birds and 1 pray bird or <1% of the population of protected species using the site <sup>18</sup>
Stakeholders	Adherence to the grievance mechanism for stakeholders and the project personnel	Monthly/ HSE Manager	Information boards are intact, contain up-to-date information according to SEP. Grievances and consultations documented. Grievance database is maintained and replies are within the set response period.
CSRP	CSRP implementation	Each year/CLO	CSRP implemented in full
ESMP	Adherence to the ESMP		Full compliance with ESMP scope and schedule

## 8 CORPORATE SOCIAL RESPONSIBILITY PROGRAM

Considering that the local residents will not gain from the project in a long term and to ensure some social benefit from the project, a Corporate Responsibility Program (CSRP) should be developed and agreed with the representatives of these stakeholders. It is suggested to set a budget for the Program implementation during construction and an annual contribution during the operation. A long term sustainable improvements should be favoured over serving acute needs that may be provided by other financing sources.

The program is to enable Zhanatas village residents, to 'buy into the project' i.e. to ensure that some benefit from it can be obtained irrespective whether there is an impact on them or not. The Company shall discuss the CSRP and the needs with the Zhanatas Public Governance Council and provide them with information on the budget. The Company should use the following criteria for an action to qualify for the CSRP funding:

1. Action cost fits the allocated to the CSRP budget and accounts for other needs;
2. Action does not overlap with the State programs;
3. Action benefit is sustainable;
4. Action benefits the local community and is not biased to a particular group or person unless the group is agreed to be vulnerable and in need of additional to the existing help;
5. Action benefits women, children and girls or reduce burden on women.

<sup>18</sup> Wind Turbine Interactions with Birds, Bats, and their Habitats: A Summary of Research Results and Priority Questions. National Wind Coordinating Collaborative ([www.nationalwind.org](http://www.nationalwind.org)), Spring 2010.

## APPENDIX 1 DETAILS OF PERSONS CONSULTED

Companies		
Zhanatas VES LLP	Almagambetov Yerlan	Director
China Power International Development Ltd	Che Cheng	Manager of international cooperation department
Asian Infrastructure Investment Bank	Sun Lei	Regional manager
	Ziwei Liao	Senior private sector operations specialist
Alatau Energo Project LLP	Medvedev Vitaly	Senior project designer
Erdan individual entrepreneurship	Oralbay Erdan	Archaeologist
Zhanatas town		
Sarysu District council	Daryabekov S.	Agriculture department director
	Uzakbayev Erbolat	Land relations department director
	Azhibekov Nurzhan	Land relations department senior specialist
	Shalabayev Beisen	Businesses department director
	Mizenbayev M.	Chief of veterans union
	Orymbayev Zh	Public governance council

During the site assessment, the Consultant interviewed residents of Zhanatas, Burkitbayev, Ushbas, Aktogay and Syzdykbayuly villages and Zharasbek farm owner to identify the visual impact of turbines on their wellbeing. Residency duration, age of the family members, their occupation and daily routine, the livestock number and composition and grazing route, focus of attention, intangible assets and intrinsic and aesthetic value of the landscape around them were identified. Then the project was described and the turbines appearance on the horizon was explained emphasizing the size and blade rotation. The Consultant asked whether they knew about the project and had any related reservations and perceived impacts and whether they approve the project. The panoramas taken from their places of visual value (e.g. house and yurt entry bench, vegetable patch) with the juxtaposed turbines were sent to their smartphones and their opinion of the impact was asked. As none of them expressed any concern, the Consultant asked the interviewees to inform him if the actual view will differ from the predicted significantly.

The Consultant also interviewed 4 out of 7 land tenants whose land plots are crossed by the WPP and whose contacts could be obtained in the given time. Consultant asked how the land seizure procedures were conducted and what they heard about the Project. Additionally, the history of their land plots arrangement, use and the livestock number and grazing routes were identified.

## APPENDIX 2 REVIEWED DOCUMENTS

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1. EPC contractor EHS management and ISO documents
2. Road test for WPP components transportation
3. Feasibility study
4. Detailed design
5. WPP layout
6. Wind turbine coordinates
7. Wind turbine passport
8. Topographical maps
9. General presentation
10. Geological report for WPP components
11. Preliminary EIA, EIA
12. Archaeological survey and excavation reports
13. Information on Zhanaaryk rural area, Turkestan rural area
14. Report on public hearings
15. Land use map 1:25000 with the area taken by WPP and the affected land tenants agreement to the land seizure.
16. Land deeds
17. Land plots list crossed by WPP
18. Land plots arrangement agreement map
19. Protocol of meetings with farm enterprises (non-signed)
20. Drilling photos
21. Workforce plan
22. AIIB Environmental and Social Framework
23. IFC Performance standards on Environmental and Social Sustainability
24. IFC EHS guidelines on Wind Energy