

# Initial Environmental Examination

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Project Number: 52224-001  
July 2018

## Total Eren Access M-KAT Solar Power Project (Kazakhstan)

Prepared by EcoSocio Analysts LLC.

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**M-KAT SOLAR POWER PLANT  
ENVIRONMENTAL AND SOCIAL ANALYSIS**



July 2018

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## ABBREVIATIONS AND CURRENCY CONVERSION

ADB	Asian Development Bank
CLO	Community Liaison Officer
CSR	Corporate Social Responsibility Program
EBRD	European Bank for Reconstruction and Development
EIA	Environmental impact assessment conducted to the local requirements and standards
ESAP	Environmental and Social Action Plan
HSE	Health Safety and Environment
ILO	International Labour Organization
NRMO	Natural Resource Management Office of the Regional Council
OVOS	Environmental Impact Assessment based on Russian standards
PR	Performance Requirement of the EBRD Environmental and Social Policy
SPP	Solar photovoltaic power plant Aquila Solar
SEP	Stakeholder Engagement Plan

For financial figures an exchange rate KZT335/\$ is used in this report

## EXECUTIVE SUMMARY

The European Bank for Reconstruction and Development (EBRD) and the Asian Development Bank (ADB) are considering providing financing to the SPV MKAT Green LLP (the Company) for the construction and operation of a 100MWac solar photovoltaic power plant M-KAT (SPP) in Zhambyl Region. The project sponsors are Access Infra Central Asia and Total Eren SA (the Sponsors). The SPP will have 401 760 sun-tracking PV panels, 32 inverters and 32 substations that are connected to the high voltage substation from where a 12km 220kV powerline will run to a transit national network substation. An open switch unit will be constructed at this substation. The plant is expected to generate 229 000 MWh/year for the designed 25 years of the operation.

The Project has been assigned by the EBRD the Category B. This environmental and social assessment (ESA) 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. According to ADB Safeguard Policy Statement the Project is category B for environment, C for Involuntary Resettlement, and C for Indigenous Peoples. The possible impacts are site specific and reversible in nature, mitigation measures can be organized promptly.

To date the project was in full compliance with the local requirements but lacked archaeological survey of powerline and access road corridors and open power distribution unit (ORU) area. The feasibility study has been approved by the State Technical Expertise and the EIA has been approved by the State Environmental Expertise. To obtain this, approvals had been obtained from various regulatory bodies. Archaeological survey reported no finds. Two public meetings, conducted in Shu and Alga, raised no critical questions and approved the project.

The 500ha land plot allocated for a solar power plant, 10m x 3.7km access road and 16m x 11km powerline corridors have been leased by the district council to MKAT for 49 years on 29.05.2017. The 30x160m open redistribution unit area has been acquired for ownership. For the powerline route, agreements with 5 land tenants (4 local farms and an Almaty based company) have been achieved through one off payments. Only one farmer has recently developed part of his and the neighbour land (48ha) to grow fodder. The other land has not been used or developed by the tenants. Lease of the power line route was finalized between MKAT and the district council on 12.06.2018.

In Kazakhstan, reduction in pastures is the usual impact from a utility-scale solar plant. Here, despite fencing large part of the State Reserve land used by the locals for pasture, the impact is considered to be low for 2 main reasons: 1. The fenced area is poorly vegetated grassland that is used only in spring and beginning of summer and 2. The locals consider non-intensive husbandry as hard and risky business with marginal profit and would readily change to a proper job or intensive husbandry with the livestock being kept indoors. The livestock is kept by many in two adjacent villages and in the suburbs of Shu but the numbers are small and increase is only natural. Moreover, the access to the rest of the pasture land has not been obstructed though the passage distance has increased from 5.5 to 6.8km. Access to the pasture for the west herd and Sauytbek herds has not been affected.

Worker accommodation is not thought to be an issue as most of the workers are expected to be local and travel to work daily. Impact of the project traffic is thought to be low but with the assumption that the railway will be used for most of the transportation.

The site vegetation and animals are typical for pastures with no endangered species. It is noted that at the southern part of the powerline route, there are turtle and bird species that are designated for protection. However, these species are considered not to be affected by the powerline construction or its presence. Equipment moving and earthwork will remove vegetation on approximately 10% of the fenced area but vegetation is expected to reappear within the next vegetative season and no wind erosion is envisaged. Removal of livestock will allow vegetation progression towards more natural composition.

The project benefit 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. Few jobs will be

created for the local unskilled labour but presence of the SPP may lead to knowledge transfer and encouragement of the targeted education among the local school graduates. Indirect benefits are expected to be minimal or none. Communication with the affected parties identified in the stakeholder engagement plan prepared by the consultant will be maintained according to the plan.

Given the need to maintain social dialogue and 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 Alga Public Governance Council and the Rural Area 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 EBRD Performance Requirements and ADB's safeguards policy and social requirements, namely, the 2009 Safeguards Policy Statement, 2001 Social Protection Strategy, the 1998 Gender and Development Policy; and the 2011 Public Communications Policy 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 line with the Bank's Performance Requirements.

EBRD Performance Requirements	ADB Policies & Requirements	Impacts and Issues	ESAP Action
1 Environmental and Social Appraisal and Management	2009 SPS SR1 Environment	Overall compliance expected but risk that the EBRD requirements may not be transferred to the subcontractors	EHS system to include contractors and subcontractors
2 Labour and Working Conditions	2009 SPS SR1 Environment 2001 SPS on core labor standards	Overall compliance expected but small risk of insufficient management of subcontractors, particularly conditions in rented accommodation	Account for subcontractors in HR management system. Monitor working conditions and audit workers accommodation regularly to ensure compliance with the EBRD Minimum Accommodation Requirements
3 Pollution Prevention and Abatement	2009 SPS SR1 Environment	Overall compliance expected	Develop waste management plan including broken solar panels utilization
4 Health and Safety	2009 SPS SR1 Environment	Overall compliance expected	Develop and implement EHS management systems and contractor management
5 Involuntary Resettlement and economic displacement	2009 SPS SR2 Involuntary Resettlement	A graveyard and irrigation channel were within the initial land allocation plan for the solar power plant, but these areas will be carved out and excluded in the final fencing of the SPP to avoid displacement impacts. The land plot is free from any structures or economic activities and used only for non-intensive pasturing in Spring and early Summer. Land Deeds obtained to all project components. Affected existing tenants along powerline agreed on their land deeds alteration and one time compensated for lost land. No physical or significant economic displacement for the 5 tenants. The five tenants to obtain their revised lease documents from the Land Management Office. Kazvodkhoz has permitted the powerline to cross Kuygen canal, other utility companies confirmed to have no utilities along the powerline route.	Assist the 5 tenants obtain the amended lease/land deed from the land management office for free. Project to monitor and include in the Annual Environment and Social Monitoring report. Fencing of 489 hectares out of the 500-hectare leased land to exclude the graveyard, the water channel and any village asset.
6 Biodiversity Conservation and Sustainable Natural Resource Management	2009 SPS SR1 Environment	Site is not designated for protection. Two fauna species designated for protection registered along the powerline route will not be affected. PV panels are not reflective to produce 'Lake Effect' but some damage to soil without altering vegetation. Groundwater is proposed to be extracted for the routine cleaning of panels.	Enforce driving along surfaced with chip rock passages and make vehicle parking area as small as possible. Prohibit staff and contractor hunting, poaching and chasing of animals.

EBRD Performance Re-requirements	ADB Policies & Re-requirements	Impacts and Issues	ESAP Action
			Develop a water use reduction plan (should water be used for cleaning panels).
7	Indigenous Peoples 2009 SPS SR3 Indigenous Peoples	The nearest settlements to the project are inhabited by Kazakhs. There are no communities which meet EBRD's and ADB SPS criteria to be considered as Indigenous Peoples.	None
8	Cultural Heritage SR1 Environment	Archaeology of powerline and access road corridors and ORU area have not been surveyed to date. Visual impact on Sauytbek graveyard visitors will not be significant as the plant fence will be 270m away. Graveyard expansion towards the plant will be stopped by the irrigation channel.	Conduct additional archaeological surveys
10	Information Disclosure and Stakeholder Engagement 2009 SPS 2011 PCP	Local residents may miss on employment opportunities created by the project. Perceived project impacts may deviate from the actual impacts if not communicated	Need for ongoing social dialogue, SEP and NTS

### 3 PROJECT DESCRIPTION

The 100MWac solar photovoltaic power plant M-KAT (SPP or the project) will have 401 760 sun-tracking PV panels (that will rotate ±55° horizontally and vertically), 32 inverters and 32 substations that are connected to the high voltage substation from where a 12km 220kV powerline will run to a transit 220kV national network substation. An open switch unit will be constructed at this substation. The plant is planned to be installed on the part of the 500ha land plot allocated for a solar power plant 2km west of Shu town - the center of Shu District of Zhambyl Region.

The 500ha land plot allocated for a solar power plant, 10m x 3.7km access road and 16m x 12km powerline corridors were leased for 49 years on 29.05.2017. The 30x160m open redistribution unit area was acquired for 48 years ownership on 12.06.2018. For the powerline route, agreements with 5 land tenants were achieved from April to June 2018 through one off payments to change tenure right for the 16m wide corridor. Permits for crossing of the existing infrastructure (the channel, railway spur, gas pipeline, telephone cable etc.) have been obtained from the relevant legal and state entities.

The construction is planned to last for 12 months and proceed in the following way. A 3.7km access road will be built from the A358 on its entry to Shu along the existing field road used by three farms and a mechanical base. The road crosses the Levoberezhnyy Irrigation Canal and the unused underground pipeline. All the allocated for the plant land will be fenced with a 2.1m high wire mesh fence with a gap underneath for small animal passage. Leveling earthwork will not be required. Excess ground from the cable trenches will be used to fill dry irrigation channels and shallow depressions. Three main internal roads will be paved and inter-panel roads compacted with chip rock. The panel polls will be driven into the ground with tractor mounted pneumatic hammers. Then panels and other equipment assembling, cables lying and wiring will start. Welding and painting is not expected to be needed as almost all components will be prefabricated requiring only assembling. Concrete foundations will be made only under the HV area transformers and buildings and substations.

To avoid the 147ha land plot designated for another 50MW solar plant, the powerline will run at the right angle for 1km before turning towards the KEGOK substation. One main turn is made on the line to minimise the number of the land plots it has to cross. With the Kuigen canal and chemical plant railway spur crossing, six-seven anchor foundation towers are expected to be needed with the associated earthwork. Holes for the polls will be drilled with minimum damage to the ground around them.

Depending on the time available for construction, from 200 to 400 contractor workers are expected to be involved in construction, out of them from 150 to 350 are expected to be local unskilled workers.. After the commissioning, four specialists, including a Site Manager, an Engineer and 2 Technical Staff will maintain the power plant, 3 will provide cleaning services and 3 will guard it in shifts. In the undesirable for the operation situation when abrasiveness of dust does not allow dry cleaning of the panels and water cleaning is to be used, around 6 additional local unskilled workers will be required for the dry period of the year to clean the solar panels.

Equipment and some materials will be supplied by a short access road mainly from a railway spur in Shu. As no decision is made on the spur to use, it is assumed that the closest to the access road spur (400m) will be used. It is expected that no more than one truck will pass along the road each 15 min. The locally made material and consumables will be transferred via the tarmac roads through Shu streets with low flow of mainly local traffic.

Construction subcontractors adherence to EHS and labour protection requirements will be controlled by an independent 'owners engineer'. Potable and technical water will be brought in tanks from Alga village well that can accommodate the estimated need of 400m<sup>3</sup> for the whole construction period. Waster will be stored in 36m<sup>3</sup> underground concrete sump. Sewage will be collected into a 3.2m deep and Ø1.5m concrete well with sealed bottom that will hold 11 days discharge. For the construction period

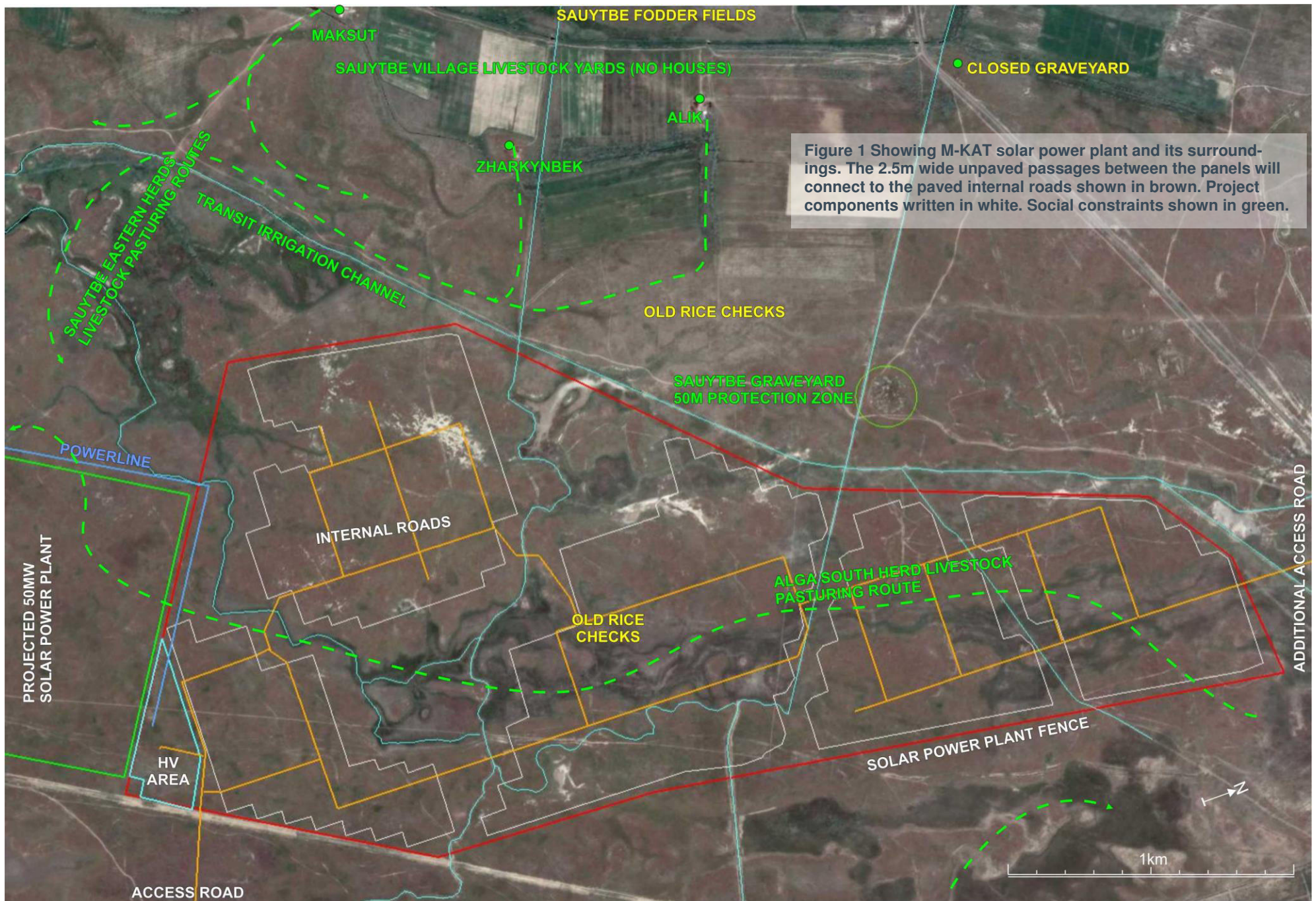


Figure 1 Showing M-KAT solar power plant and its surroundings. The 2.5m wide unpaved passages between the panels will connect to the paved internal roads shown in brown. Project components written in white. Social constraints shown in green.



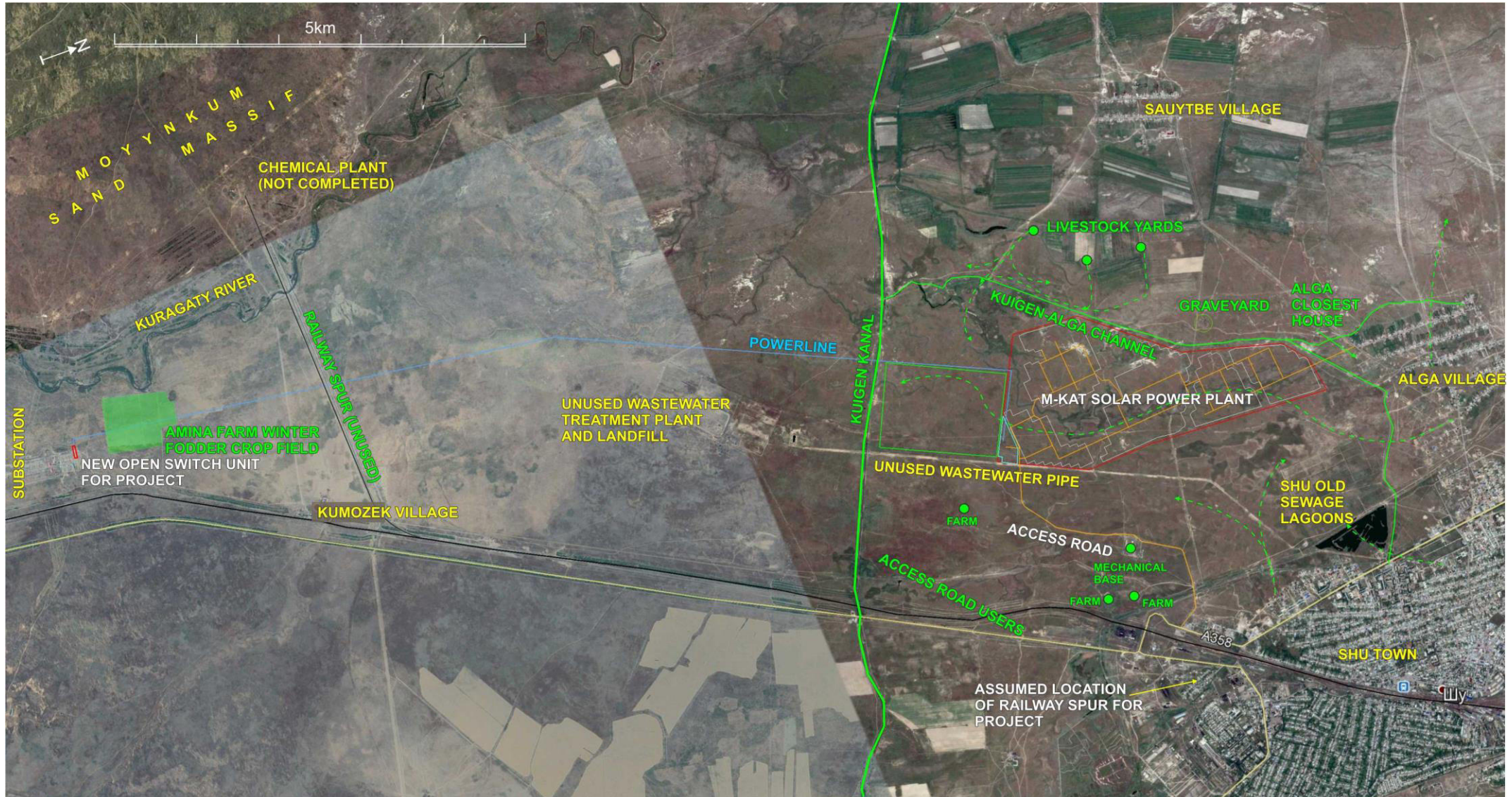


Figure 2 Overview map. Project components are written in white. Social constraints are shown in green.

158m<sup>3</sup> of sewage is expected to be generated. The well will be emptied by the Shu wastewater treatment facility tank truck to the Shu wastewater retention lagoons. Both, the sump and well will be used during the operation period.

During operation the solar panels will either be dry cleaned by a special machine 2 to 4 times a year or, if not effective, washed with 2-4 liter of water per panel. Each panel will be then washed on average 3 times a year. As from 746 to 1500m<sup>3</sup> may be required for one run, the company is reviewing an option of a water well installation at the site. The company has already obtained the well installation permit. Vegetation trimming will not be needed.

To counteract impact on waterfowl from collision with the panels (so called Lake Effect), the panels surface is texturised and anti-reflective coating is added to them.

## 4 LEGAL AND INSTITUTIONAL REQUIREMENTS

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According to The EBRD classification the project corresponds to category B. The relevant to the project Environmental and Social Policy Performance Requirements are 1-6, 8 and 10. PR8 applies due to absence of archaeological survey for the powerline route and the plans for earthwork that may uncover archaeological artefacts. PR7 (Indigenous Peoples) is not relevant because there are no indigenous people present. PR9 does not apply to the project because no financial intermediaries are involved.

The ADB Safeguard Requirements (SR) 1 applies to the project. The SR1 on Environmental Safeguards is relevant to the project as it requires use of a screening process for each project to determine the appropriate extent and type of environmental assessment. Apart from environmental requirements, such as conducting environmental assessment, preparing mitigation measures and applying pollution prevention and control techniques, the SR1 partially covers social requirements to carry out consultation with affected people, ensure timely information disclosure and provide workers with safe and healthy working conditions. The requirements on social performance are very limited in the SR1, but their full scope is covered by other ADB social policies relevant for the project and described below.

ADB SPS SR 2 does not apply as involuntary resettlement is not expected since the land is a vacant State Reserve land with no users. The nearest settlement is inhabited mostly by Kazakhs and the remaining population does not meet the ADB SPS criteria to be considered as indigenous people. SR4 requirements on existing facilities is being applied because allocation of land is in process and will be finalized in a few months. As such, a social due diligence or social audit has been conducted on past or ongoing land procurement. The audit report assessed and confirmed that there are no physical or economic displacements impacts, impacts on ethnic minorities or indigenous peoples.

Social requirements, including Social Protection Strategy 2001, Public Communications Policy 2011, Policy on Gender and Development 1998 are similar with the EBRD social requirements and are fully covered by the PRs.

The ADB's Social Protection Strategy (SPS) 2001 covers five major elements including labor market policies, social insurance programs, social assistance and welfare service programs for vulnerable groups, micro and area-based schemes to address vulnerability, and child protection. The SPS is relevant to the project as it focuses on improved employment, which is the major source of economic support for most workers and their families. It highlights the need to mitigate the employment risks by providing income support in the event of illness, disability, work injury, maternity, unemployment and old age. ADB's Social Protection Strategy requires that ADB Borrowers and their contractors and subcontractors comply with applicable labor laws in relation to the Project, and take measures to comply with the core labor standards.

The stakeholders' engagement is to be carried out in accordance with the ADB 2009 SPS which requires meaningful consultation with affected people. Meaningful consultation is a process that (i) begins early in

the project preparation stage and is carried out on an ongoing basis throughout the project cycle; (ii) provides timely disclosure of relevant and adequate information that is understandable and readily accessible to affected people; (iii) is undertaken in an atmosphere free of intimidation or coercion; (iv) is gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups; and (v) enables the incorporation of all relevant views of affected people and other stakeholders into decision making, such as project design, mitigation measures, the sharing of development benefits and opportunities, and implementation issues. The Project will engage with communities, groups, or people affected by projects about the impacts and the management measures. For instance, where a project will likely have an impact on access whether it will be restricted or affect their daily economic activities, the Project will need to inform and consult the communities on changes in access as a result of the project. Furthermore, the Project will comply with the Public Communications Policy which requires proactive disclosure on the ADB website. The Policy requires the client to provide relevant environmental, resettlement, and indigenous people information to affected people in a timely manner, in an accessible place and in a form and language(s) understandable by them.

The Policy on Gender and Development 1998 aims to ensure that gender issues are considered at all appropriate stages of the project cycle and to explore opportunities to address some of the new and emerging issues for women, as well as build the capacity of women through conducting various trainings and workshops.

Being the hazard category 4, the project environmental performance is controlled by the Natural Resource Management Office of the Regional Council (NRMO). Health and safety issues are controlled by the regional Emergency Department and the Consumer Rights Protection Department. The regional department of the Ministry of Labor and Social Security controls adherence to the worker rights and working conditions. These bodies are entitled to review all current and historic HSE documentation that has to be retained for 5 years.

Emissions discharges and waste volumes are calculated in the environmental impact assessment report (EIA) only for construction using the personnel, machinery and material specifications and approved methodologies. The positive conclusion on the EIA acts as a permit for the calculated pollution. The Emission Permit is not required for the construction phase but the construction contractor is to have such permit from the Natural Resource Management Office of the Regional Council for its machinery fleet. As the operation will generate negligible amount of pollution and waste, the NRMO will not ask for an Emission Permit, Environmental Protection Plan or an Environmental Operational Control Program with the Monitoring Plan in it. The possible emission of a potent greenhouse gas Sulphur hexafluoride (SF<sub>6</sub>) from high voltage circuits breakers is not accounted and not regulated.

The construction of a solar power plant is not included in the list of economic activities, which require public participation and/or consultation in decision making process as per the Order of the Minister of energy of the Republic of Kazakhstan of June 10, 2016 No. 240. An EIA developer may recommend to conduct such consultation if it identified significant direct impact on environmental of human health. The State Environmental Expertise may also request consultation to be carried out if it disagrees with the EIA developer on the severity of identified impacts. The district council may also request the developer to conduct consultation with the local public before it issues the land lease deed. This is normally done when the council thinks that the interests of the informal users of this land may be affected. If conducted, public consultation is to start from a public note in two local newspapers and placing the EIA to a public domain. The consultation ends in 20 days after a public meeting with the meeting minutes that summarize the consultation results. The minutes are submitted with the EIA for the State Environmental Review. The EBRD and ADB require disclosure of the project impact information, stakeholders engagement and provision of an effective grievance handling mechanism for the whole duration of the loan.

The State Reserve land (usually the land not suitable for traditional agriculture or pasturing) can be leased to legal entities. 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. Article 48 states that for the energy projects land plots that are in the State reserve can be provided without tenders or auctions. The district council Land Management Office is responsible for providing land plots for the projects with renewable energy sources (RES) in accordance with the Law "On supporting the Use of RES" #165-IV from July 4, 2009. Stakeholder consultation for such allocation of the State Reserve land is not required.

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). The State body can also unilaterally change the land plot constraints 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 500ha plot, the powerline corridor and access road right of way the annual payment is \$13 000.

SanPiN 2.2.1/2.1.1.1200-03 specifies sanitary protection zone for rural area graveyards as 50m. The EBRD ES Policy PR8.6 states that cultural object are those that have historical, religious, aesthetic or other cultural significance by this including a modern graveyard.

## 5 COMPLIANCE STATUS

The Company is in full compliance with the Kazakhstan requirements. The detailed design and local EIA (OVOS) has been approved by the required authorities. The main site archaeological survey and two public meetings have been conducted. In the international terms, the EIA lacks adequate project description (describes only the substation) socio-economics and natural living resources baseline and impacts assessment. Table 1 summarizes project compliance with the local, EBRD, EU, and ADB requirements.

**Table 1 EBRD PR and ADB Safeguards Requirement compliance status.** PC-partial compliance, FC-full compliance, NA-not applicable.

PR ref.	PR Requirement	Score	Comment/Gaps	Recommendation	ESAP #
<b>1 Assessment and Management of Environmental and Social Impacts and Issues (ADB SR 1)</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.					
1.1	Environmental and Social Assessment	FC	EIA gaps are filled in this report	-	
1.2-1.4	Environmental and Social Management system, policy and plan	Risk of PC	ESMS, policy and plan may not be developed	Establish an ESMS , policy and plan	1.1, 1.3
1.5	Organisational capacity	Risk of PC	Capacity may be insufficient	Provide additional human resources if the technical/site manager cannot implement ESAP, SEP and Grievance Redress Mechanism	1.1
1.6; 2.9	Supply chain management	Risk of PC	Tier 1 supplier of panels used but its HSE performance not known	Request from the suppliers available information on PV cells production EHS impact and impact mitigation measures taken by them and their suppliers	1.4 6.2

PR ref.	PR Requirement	Score	Comment/Gaps	Recommendation	ESAP #
1.7	Project monitoring	FC exp.	-	-	
<b>2 Labour and Working Conditions (ADB SR 1. Environment and Social Protection Strategy)</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					
2.1	Human resource policies and working relationships	Risk of PC	Contractor policy exists but may not be passed to subcontractors	Incorporate human resource policy in subcontractors management practices and disclose it to subcontractor workers	2.3
2.2-2.3	Child and forced labour, non-discrimination and equal opportunity	FC Expected	These provisions are included in the Company and Contractor policies and effectively controlled through the contracts and by Kazakhstan labour inspectors		
2.4	Workers Organizations	Risk of PC	Subcontractors workers may not be represented	Ensure that contractor and its subcontractors have a worker representative	2.1
2.5	Wages, benefits, working conditions and accommodation	Risk of PC	Subcontractors working conditions and payments may not comply with PR	Request the contractor to monitor subcontractors working conditions and timely disbursement of wages.	2.2
2.6	Retrenchment	NA	Collective redundancy of ~200 local unskilled workers expected after construction completion but this retrenchment requirement does not apply to the contractor and subcontractor workers		
2.7	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.	2.1
2.8	Non-Employee Workers	Risk of PC	See 2.5		
2.10	Security Personnel Requirements	Risk of PC	Instruction on dealing with intruders may not be developed	Develop instruction to guards on handling trespassers and conflicts especially with vulnerable groups of population	4.4
<b>3 Resource Efficiency and Pollution Prevention and Control (ADB SR 1. Environment)</b>					
Summary: Potential for small and localized air pollution and contamination of ground with oil products if no measures are taken. Sizeable amount of water may be used for panels washing without water saving arrangements					
3.1	Resource efficiency	Risk of PC	Very limited resources are used during construction and operation but water use reduction plan will be needed if water is used for panels washing	Develop water use reduction plan if water is used for panels washing	3.4
3.2	Air emissions	Risk of PC	Equipment smoke emission control may not be included in the internal audit	Include control of excessive smoke in the internal audit checklist	3.1
3.3	Waste waters	NA	Little wastewater will be taken to Shu wastewater treatment plant. No wastewater from panels cleaning, no chemicals used		
3.4	Greenhouse	NA	No emission at operation, small and short construction emission		

PR ref.	PR Requirement	Score	Comment/Gaps	Recommendation	ESAP #
gases					
3.5	Water	Risk of PC	Water may be used to wash panels. Akadyr has ample supply of potable water but water use reduction plan is still needed	Develop water use reduction plan	3.4
3.6	Wastes	Risk of PC	Waste management plan may not be developed	Develop waste management plan to include broken solar panels utilization and safe waste oil storage. Request the contractor to provide waste memos to ensure appropriate disposal location and methods, and to include this requirement in the agreement with subcontractors.	3.2
3.7	Hazardous substances and materials	Risk of PC	Oil storage may not have secondary containment and trays may not be used when refilling machinery	Apply appropriate and cost-effective pollution prevention and control technologies and techniques. Arrange secondary containment to the required size and trays	3.3
<b>4 Health and Safety (ADB SR 1. Environment)</b>					
Summary: Company and EPC contractor have an OHS management system, but EPC contractor may not be able to control subcontractors OHS performance or enforce PPE on on site effectively					
4.1	Occupational health and safety	Risk of PC	Full local compliance expected but subcontractors HS performance may not be controlled effectively. For high voltage work, there is a risk that safety culture instruments may not be applied to eliminate risk of rare accidents with severe consequences Work site specifics may be overlooked Local electrical safety rules lack provisions for IWA	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 regular HS audits At least for HV work, 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 provisions for an individual electrician working alone (IWA)	4.1 4.2
4.2	Community health and safety	FC	Community activities far from site. Project traffic will not affect road users	None additional but see 2.9	4.4
4.3	Infrastructure, building, and equipment design and safety	Risk of PC	Unusually strong ground fire with strong wind may surpass a standard fire protection belt around the site and damage panels	Ensure that the fire protection belt width is at least 4m at the northern part of the site and 5m at the southern end where grass is thicker and higher. Plough the belt before each summer	4.3
4.4	Hazardous materials safety	Risk of PC	No hazardous materials stored at site Emergency power diesel generator will have small fuel tank	Request and control that oil drums are stored on a sheltered and bunded pad. Ensure that contractor controls fuel tank drivers use of trays under refueling couplings and that places of small repairs of	3.2

PR ref.	PR Requirement	Score	Comment/Gaps	Recommendation	ESAP #
			that not required designated actions but construction equipment refueling will occur on the ground	machinery have leakage containment and swapping material	
4.5	Services safety	NA	Services do not pose risks and impacts on workers or community H&S		
4.6	Traffic and road safety	NA	Traffic on access road will be small and only 400m of A356 will be used for bringing parts from railway spur		
4.7	Natural hazards	NA	Region seismicity 7 Richter Scale, floods and ground fire not considered likely, dust storms do not damage infrastructure. Extreme cold not recorded.		
4.8	Exposure to disease	NA	No rodents or other disease carrying animals present, no large influx of non-local workers		
4.9	Emergency preparedness and response	Risk of PC	Fire belt around SPP may not be maintained	Ensure sufficient width of the belt and plough it each summer	4.3
<b>5 Land Acquisition, Involuntary Resettlement and Economic Displacement (ADB SR 2)</b>					
Summary: SPP site is State Reserve land without legal users. Depressions that are used in Spring and early Summer for non-intensive pasture of Alga village south herd and two small herds from Shu town not planned to be fenced and may be used by the village for grazing but the Land Acquisition Closure Report for 5 affected land users is not prepared.					
5.1-5.3	Avoid or minimize displacement and compensate for it	Risk of PC	The land plot is free from any structures or economic activities but non-intensive seasonal pasturing. Land Deeds obtained to all project components and tenants along powerline compensated. All the five tenants have received the one time compensation to release a part of their leased land and have signed an agreement with the Shu District Office. 5 tenants will be able to use the original land with the only restriction of the capital tower structures installation in the power-line corridor. Land released from the original lease was less than 10%. Land Acquisition Closure Report for 5 affected land users is not prepared	Prepare Land Acquisition Closure Report including: a. Project summary b. It needs to confirm or otherwise that payments were made in line with PR5 requirements/national laws.	5.1
5.2	Consultation with affected by acquisition	FC	Public note published, two public meetings conducted in Shu and Alga and project approval received. Tenants affected by the powerline right of way acquisition have been consulted, compensated and their consent obtained		
5.4	Grievance	Risk of	Mechanism may not	Employ designated CLO and Implement	10.1

PR ref.	PR Requirement	Score	Comment/Gaps	Recommendation	ESAP #
	mechanism	PC	be implemented	SEP. Grievances received will be addressed through the established GRM and process for each grievance will be documented.	
5.5-5.7	Livelihood restoration plan	NA	Not required unless in the future complaint received on major changes in livestock and they are found to be attributed to pasture acquisition		
<b>6 Biodiversity and Living Natural Resources (ADB SR 1. Environment)</b>					
Summary: Impact is expected to be of low significance if internal traffic is managed					
6.1-6.2	Assessment Conservation	FC	Area is considered to have low ecological value. Flora and fauna studied within this assessment showed low sensitivity to project impact.		
6.3	Sustainable management	Risk of PC	Vegetation may be destroyed on more than 10% of site if driving not regulated. Removal of salt cedar shrubs may cause increased soil salinity and wind erosion	Preserve frail soil by driving along designated surfaced with chip rock passages and making vehicle parking area as small as practically possible. Monitor vegetation reinstatement at damaged areas and soil for sign of wind erosion. If noted, apply effective erosion abatement measures.	6.1 6.2
<b>7 Indigenous Peoples (ADB SR 3)</b>					
Summary: Project area has no communities which meet EBRD's criteria to be considered as Indigenous Peoples					
7.1	Indigenous Peoples	NA	Area inhabited by more than 90 well integrated nationalities and ethnic groups See Table 5 -. None of them fall under ADB SPS SR3		
<b>8 Cultural Heritage (ADB SR 1. Environment)</b>					
Summary: No finds of artefacts in SPP site but archaeology of powerline and access road corridors and ORU area have not been surveyed.					
8.1-8.3	Assessment and Management of Impacts Consultation with affected communities and other stakeholders Project's use of cultural heritage	Risk of PC	Archaeology of powerline and access road corridors and ORU area have not been surveyed to date	1. Check that construction contractors conduct archaeological surveys 2. If archaeological sites are found, consider the line relocation from the sites protection zone. Fence and mark the sites. Inform locals about the sites and their protection status 3. If impact on sites is unavoidable exclude sites from the State Protection List, conducting the full detailed archaeological survey and excavation. 4. Develop and require the earthwork conducting subcontractors to follow the chance find procedures	8.1
<b>10 Information Disclosure and Stakeholder Engagement (ADB SR 1, SR 2, and SR3)</b>					
Summary: A project specific stakeholder engagement plan, grievance mechanisms is developed as part of this ESDD. The Company appointed CLO that would disclose information and establish communication with relevant parties. SEP and grievance mechanism as part of it will disclosed.					
10.1	Stakeholder engagement plan	FC	SEP developed	Employ designated CLO and implement SEP.	10.1, 10.2
10.2	Operational grievance mechanism	FC	Grievance Mechanism developed	Establish and implement grievance mechanism as part of SEP. Grievances received will be addressed through the established GRM and process for each grievance will be documented.	10.1
<b>Overall Compliance</b>					



PR ref.	PR Requirement	Score	Comment/Gaps	Recommendation	ESAP #
<p>Summary: The Company's performance is in full compliance with national legislation but will require additional archaeological survey by contractor. The project is consistent with the State policy towards promotion of renewable energy sources, legal requirements and other plans for the area of influence. It fulfils the main strategic plan to eliminate regional deficit in energy to allow its further development. There is only risk of partial compliance with ADB and EU requirements if control over subcontractors EHS performance is inadequate. ADB and EU stakeholder engagement requirements are expected to be fulfilled as the project progresses</p>					
National ESHS, re-requirements		PC expected	All required documentation, permits and reports to regulatory bodies in place, no records of fines or litigations but additional archaeological survey required		
EU ESHS requirements		Risk of PC	Control over subcontractors' EHS management system may be inadequate	Establish policy and procedures for managing and monitoring the performance of subcontractors	1.4

## 6 EXISTING ENVIRONMENTAL AND SOCIO-ECONOMIC CONDITIONS

### 6.1 CLIMATIC CONDITIONS

Very continental climate is arid with short spells of deep frosts (down to - 45°C) and very hot summer spells (up to +47°C). Annual precipitation is <250mm. Most of it falls in spring. The average monthly air temperature in January is -5-9°C and in July +25-27°C.

**Table 2 Wind rose and average monthly wind speed**

Direc tion	January		July	
	%	m/s	%	m/s
N	4	2.4	14	2.6
NE	37	4.2	30	3.3
E	28	3.7	15	3.1
SE	8	2.6	5	2.4
S	4	2.5	4	2.7
SW	4	2.7	5	3.1
W	8	4.0	9	3.3
NW	7	1.9	15	3.2

### 6.2 GEOMORPHOLOGY GEOLOGY AND SOIL

The SPP site is located in Shu Depression in the Kuragaty and Shu rivers flood plain. The Kuragaty River channel moved 8km to the west but its former channels remain at the SPP site in the form of almost imperceptible elongated shallow depressions. Some contain water in early spring. Several unused irrigation channels emanate from these depressions and from one channel transiting the site from Kuigen canal to Alga village vegetable patches. The rest of the area is flat with slight inclination (2m/km) to the north and north-east from 461.5m to 454.3m altitude.

The geological structure of the territory consists of Upper Quaternary-modern alluvial (produced by a river) sands, sandy silts and silts. During drilling at the site, three distinct layers have been identified under the top soil (figures show the layers thickness):

1. fine and very fine to dusty wet to saturated yellow-grey sand with medium density sandy silt and silt interbeds 0.3-4.9m;
2. plastic yellow-grey sandy silt with medium density fine sand interbeds 0.4-1.1m
3. non-subsiding plastic wet yellow-grey silt with fine sand interbeds 0.4-2.4m.

Depth of freezing for fine sands and sandy silts is 110cm and 90cm for loams. The depth of penetration of the zero isothermal line into the soil for fine and silty sands is 158cm, for sandy silts - 125 cm and for silts -105cm.

The area seismicity is 7 on the Richter Scale. No geologically valuable structures and economically viable deposits exist under or close to the site or the powerline route. A sand deposit has been reported under the north-east corner of the allocated for the SPP land by the Zhambyl Region Natural Resources and Nature Use Management Office. The district council has taken this information into consideration when issuing the land deeds for the SPP and the housing estates planned east of the SPP. The decision was based on the three factors: 1) the deposit is small and sand property is not optimal for use; 2) the deposit development would damage the land which can be used more effectively; 3) the district has considerable stock of better quality sand in the other better positioned deposits.

### 6.3 SURFACE AND GROUND WATER AND ITS QUALITY

The Shu River is 7.7km east of the site. Its flow is regulated by several dams and fresh water is taken to irrigate the fields 10-15km from its course. The closest to the SPP is the 45km<sup>2</sup> Tasutkol Dam. The 18.4km unlined ground canal Kuigen (former Novotroitskiy) flows 1.6 km to the south of the SPP area to irrigate about 800ha around Sauytbek village on which livestock fodder crops are grown. It emanates from Levo-berezhnyy canal that flows from another small dam on the river. A channel that flows from Kuigen canal to Alga village vegetable patches passes 70m west of the SPP fence.

The Kuragaty River separates the Shu town area from Moyynkum Sand Massive. It is 10-15m wide and 0.3-0.6m deep with sandy bed and mildly saline water. It initially flew through the SPP site but with time migrated 8km west. But at the substation to which the SPP is planned to be connected, it comes 1km

close to the open distribution unit. The river valley has notably thicker vegetation than the SPP site area but it is used only by small numbers of Salamat village livestock and by Sauytbek village livestock when the grass north of Kuigen canal dries out.

Water from the canal and channel feeds the groundwater that flows from the mountains. During the geological drilling of 59 wells at the site in May 2018 to the depth of 5m, the groundwater appeared at depths of 2.2-4.8m, depending on the altitude. This induces the ground water level increase at the SPP site by ~0.5 m from May to September. As the maximum groundwater level is reached in June, the maximum possible level with the influence of the canal is thought to be 1.2-3.8m. The aquifer is located in fine and very fine sands, silts and sandy silts. The groundwater is fresh with (total dissolved solids = 0.7-0.9 g/L), non-corrosive but very hard. The chemical composition is sodium-chloride(-)/hydrocarbonates(+).

## 6.4 ECOLOGY AND BIOTIC RESOURCES

Biodiversity and ecological value of the SPP and the powerline right of way area is low mainly due to arid climate, saline soil and prolong non-intensive pasturing. Most of the SPP site is covered with annual cereals and various non-palatable to the livestock weeds. The powerline right of way has similar composition but vegetation becomes thicker as the line comes closer to the Kuragaty River mainly due to higher groundwater availability. Ephemers and ephemeroids are almost absent. The recorded iris could not be identified to the species level but it was certainly not a protected kind. The exception is vegetation along the Kuigen Canal and a 6000m span of Kuigen-Alga irrigation channel where it joins with a depression made by the old course of the Kuragaty River. *Elaeagnus* tree, tamarix shrub and various water vegetation grows here. In the powerline corridor, tamarisk also grows along the dry channels.

Visual observations of animals conducted on 4-5 June 2018 at the SPP site and along the powerline route allowed to conclude that neither of the area are the key habitat for the identified animals mainly due to low value of food stock and seasonality of water presence in the irrigation channels. Spring birds migration ended at the time but presence of migratory birds in the area is unlikely as the main route lies 9km east along the Shu River

**Table 3 The SPP site and powerline right of way vegetation**

Family	Tribe (common)	Species
Elaeagnaceae	-	<i>Elaeagnus oxycarpa</i>
Tamaricaceae	- (salt cedar)	<i>Tamarix ramosissima</i>
Amaranthaceae	Axyrideae	<i>Ceratocarpus arenarius</i>
Amaryllidaceae	Allieae	<i>Allium caesium</i>
Iridoceae	Irideae	<i>Iris sp.</i>
Nitrariaceae	- (wild rue)	<i>Peganum harmala</i>
Fabaceae	- (Camel thorn)	<i>Alhagi maurorum</i>
Cyperaceae	- (Sedges)	<i>Carex sp.</i>
Asteraceae	Anthemideae	<i>Tanacetum vulgare</i>
		<i>Artemisia sp.</i>
	Cardueae	<i>Carduus acanthoides</i>
		<i>Acroptilon repens</i>
		<i>Cirsium arvense</i>
		<i>Onopordum acanthium</i>
Cichorieae	<i>Tragopogon sp.</i>	
Brassicaceae	Alysseae	<i>Alyssum turkestanicum</i>
	Descurainieae	<i>Descurainia sophia</i>
	Lepidieae	<i>Cardaria draba</i>
Poaceae	Sub: Arundinoideae	<i>Phragmites australis</i>
	Cynodonteae	<i>Aeluropus littoralis</i>
	Bromeae	<i>Bromus japonicus</i>
	Hordeae	<i>Elytrigia repens</i>
		<i>Eremopyrum orientale</i>
		<i>Hordeum bogdanii</i>
		<i>Aegilops cylindrica</i>
	Poeae	<i>Poa bulbosa</i>
Stipeae	<i>Achnatherum splendens</i>	
Convolvulaceae	Convolvuleae	<i>Convolvulus arvensis</i>
Lamiaceae	SubLamioideae	<i>Eremostachys sp.</i>
Polygonaceae	Persicarieae	<i>Persicaria hydropeper</i>
Rosaceae	Potentilleae	<i>Potentilla sp.</i>
Scrophulariaceae	Scrophularieae	<i>Verbascum soongoricum</i>
Thymelaeaceae	-	<i>Diarthron vesiculosum</i>

<sup>1</sup>. The proximity of the river determines presence of waterfowl like ruddy shelduck and gadwall that comes to feed at the channels and lakes formed by the channel water in small depression. When the channels dry out, waterfowl move back to the Shu and Kuragaty River valleys and the Kuigen Canal. All recorded birds could nest in the area although many of the recorded birds like rooks, kestrels, magpies and night-ingales can nest only on the trees and shrubs. Out of them only nests of rooks and magpies have been recorded on the trees along the irrigation channels.

Relatively hard fine sands and shallow groundwater resulted and practical absence of borrowers in the studied area although several borrows of ground termites were noted throughout the SPP site and along the powerline. Sparse desert vegetation at the north of the SPP site determined low number and diversity of the animals which concentrate along the irrigation channels and the trees and shrubs along them.

**Table 4 Birds recorded at the SPP site and along the powerline route 4-5 June 2018 with fair weather, 70% of feather clouds and slight eastern breeze. IUCN Category: LC-Least Concern, NT - Near Threatened. Note that Oystercatcher is common in Kazakhstan and not in the Kazakhstan Red Book.**

Order	Family	Species	Common Name	IUCN category	Numbers SPP	P.line	Presence in the area
Anseriformes Ducks	Anatidae	<i>Tadorna ferruginea</i>	Ruddy Shelduck	LC	14		Summer
		<i>Anas platyrhynchos</i>	Mallard	LC	6	5	
		<i>Anas strepera</i>	Gadwall	LC	1		
Falconiformes Pray birds	Accipitridae	<i>Milvus migrans</i>	Black Kite	LC	6		Summer
	Falconidae	<i>Falco tinnunculus</i>	Kestrel	LC		2	
Galliformes Hens	Phasianidae	<i>Perdix perdix</i>	Grey Partridge	LC	1		Resident
		<i>Phasianus colchinus</i>	Pheasant	LC	1		
Gruiformes Cranes	Otididae	<i>Tetrax tetrax</i>	Little Bustard	NT		2	
Charadriiformes	Recurvirostridae	<i>Himantopus himantopus</i>	Black-winged Stilt	LC	2		Summer
	Haematopodidae	<i>Haematopus ostralegus</i>	Oystercatcher	NT	3		
	Sternidae	<i>Sterna hirundo</i>	Common Tern	LC	1		
Coraciiformes	Coraciidae	<i>Coracias garrulus</i>	Roller	LC	1	2	
Passeriformes Sparrow like	Alaudidae	<i>Melanocorypha calandra</i>	Calandra Lark	LC		9	Resident
		<i>Sturnus vulgaris</i>	Starling	LC	10		
	Sturnidae	<i>Sturnus roseus</i>	Rose-coloured Starling	LC	85		
		<i>Acridotheres tristis</i>	Common Mynah	LC	15		
	Corvidae	<i>Pica pica</i>	Magpie	LC	3		
Corvidae	<i>Corvus frugilegus</i>	Rook	LC	200	150	Summer	
	<i>Corvus corone</i>	Carrion Crow	LC	7	4	Resident	
Emberizidae	<i>Emberiza bruniceps</i>	Red-headed Bunting	LC		5	Summer	

Although both the SPP area and the powerline route are quite remote from the human disturbance, the powerline passes over somewhat quieter area with less interference from the cattle herds and absence of transport. As a result, two IUCN Red Book species have been noted there: vulnerable Central Asian Tortoise (*Testudo horsfieldii*) at the Kuigen Canal and a pair of near threatened Little Bustards 3km from the Kuragaty River the nearest settlement (Salamat) and the A-358 highway. Sensitivity of the other noted birds to disturbance is low. Many noted species are accustomed to human and see residential areas and agricultural fields as food source.

The SPP site is considered to be modified habitat as per the ADB SPS habitat classification as the natural habitat has been altered through historical and current agricultural activities.

<sup>1</sup> Gavrilov E.I. Seasonal bird migration on the territory of Kazakhstan. Alma-Ata, 1979. P. 252

## 6.5 AIR QUALITY AND NOISE

Air quality is good and noise level is ambient. The main air pollutants in the area are chimneys of the Alga village houses that burn charcoal in winter. With the planned connection to the gas mains, emission from these sources will be significantly reduced. The EU LV and the WHO Guideline for ambient air quality gives the criteria for annual average as  $40\mu\text{g}/\text{m}^3$  for  $\text{NO}_2$ ;  $20\mu\text{g}/\text{m}^3$  for  $\text{PM}_{10}$  and  $20\mu\text{g}/\text{m}^3$  as the 24hour average for  $\text{SO}_2$ . In the same climatic zone 175km north of the site at the Balkhash Lake shore and 1.3-2km from the main road these concentrations were measured as 1.3, 9 and  $<1.08\mu\text{g}/\text{m}^3$  respectively. The ambient noise was  $L_{Aeq}=44-50\text{dB(A)}$  and  $L_{Amax}=59-61\text{dB(A)}$  which is below the maximum permitted in Kazakshstan residential areas for the night and day time - 55 and 70dB(A) respectively <sup>2</sup>.

## 6.6 GROUND CONDITIONS

Neither ground contamination, nor waste heaps or suspected burials have been noted on or around the site and along the powerline and access road routes. There were also no signs of top soil wind or water erosion or overgrazing even at the northern border which is only 800m from Alga village. Few shallow depressions formed by the old river channel have been used to grow rice in the distant past. If any chemicals were used, they have likely diluted and decomposed to harmless for the environment concentrations and chemicals. Several irrigation channels used to bring water into the adjacent to the depressions areas have silted up and do not contain water any time of the year. Examination of the channels did not suggest possibility of contamination transfer from elsewhere in the past.

## 6.7 SOCIO-ECONOMIC AND CULTURAL ISSUES

### 6.7.1 Regional level

The 144 300km<sup>2</sup> Zhambyl Region is located in the basin of Shu and Talas rivers. It borders with Karatau mountain 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.

The region is an industrial-agrarian, in the first half of 2016 18.7% of the gross regional product falls on industry, 7.0% - agriculture, 18.4% - transport and communications, 6.3% - construction, 12.0% - trade, 37.6% - other industries.

The region is a unique base of phosphorites and fluorites. The region is rich in non-ferrous metals, barite, coal, cover, ornamental and technical stones, building materials

In 2017 child mortality was 8.2 per 1000. The main cause of infant mortality are from conditions originating in the perinatal period – 45%. The next most common death causes are congenital anomalies – 28%, accidents-9.2 %, infectious and parasitic diseases – 3.7% and pulmonary diseases – 2.7%

There are 3 national nature reserves on the territory of the region: Ecosite, Berikkara, Karakunuz and Andasay

**Table 5 Zhambyl Region ethnic composition**

Ethnicity	Quantity	%
Kazakhs	811323	72,6
Russians	111203	9,9
Dungan	57245	5,1
Turks	33841	3,0
Uzbeks	28063	2,5
Kurds	15263	1,4
Azerbaijanians	12580	1,1
Kyrgyzs	10356	0,9
Tatars	8881	0,8
Koreans	8777	0,8
Germans	4346	0,4
Ukrainians	2961	0,3
Uyghurs	2800	0,3
Chechens	2231	0,2
Greeks	992	0,1
Tajiks	726	<0.1
Belorusians	409	<0.1
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<sup>2</sup> The measurements were conducted by EcoSocio Analysts LLC for a year in 2016-2017 using the first grade nose meter, diffusion tubes and a PM10 meter.

With more than 90 nationalities and ethnic groups the region is dominated by Kazakh (72.6%) (Table 55). 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 12.7 per 1000. The main cause of infant mortality are 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%.

## 6.7.2 Local Level

The 12 030 300 ha Shu district contains 18 rural areas and Shu town municipality whose councilors are appointed by the district councilor. The nearest to the SPP site settlements are Shu town and Alga/Sauytbek villages.

**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	nodata
Mortality	7.74	7.37	6.93	6.19	6.59	6.54	nodata
Marriages	9.06	9.62	8.81	6.59	7.24	7.02	nodata
Divorces	1.96	2.29	2.38	1.41	2.22	2.25	nodata

### 6.7.2.1 Shu Town

The town is inhabited by 36 115 people. It was established in 1928 as a Turkestan-Siberia railway station. It is now a major junction with the railway (and especially the locomotive repair depot) being the major employer. The other large employers line sugar and milk products plants have shut down. As unemployment is high, many use the town bazaar to earn living. People come from district center – Tole bi village to sell here generating income for private taxi drivers and hotels. The property and catering market is also vibrant in town for this reason. Despite high competition for the consumer and low income, food prices are comparable to those in Almaty.

The 32 000km<sup>2</sup> Shu River valley has sufficient water, fertile land and warm climate – ideal conditions for agriculture but because the irrigation system is in dire condition, much of the land is not used. Wild cannabis grows on 4 000km<sup>2</sup> of the valley (the World Drug Report, 2006). The irrigated areas are used for growing beet root, water melons, corn, sunflower and grains. Kazakhstan has a program for revamping and upgrading the irrigation system.

The town has well developed facilities: 6 entertainment centers, a cinema theater, two hospitals and a day clinic, 6 kindergartens and 11 schools. Utilities include running water at each house but despite being on the Shu River and availability of water meters, water is in short supply. Wastewater is collected from all public buildings and most of the houses. A new wastewater treatment plant with treated water checks and domestic waste landfill has been established 2.5km south of the SPP site near the powerline route. Natural gas has become available 4 years ago but some houses cannot afford to be connected (\$1800) and use electricity for cooking and charcoal for heating (\$300/year).

The closest objects to the SPP site is the Shu wastewater channel that touches the southeast corner of the substation area and goes further to the new sewage treatment plant with treated water lagoons 200m east of the powerline route. A mechanical base located 1.2km east of the site is in dormant condition. These facilities and a small farm 1.8km east will benefit from the SPP access road.

### 6.7.2.2 Alga and Sauytbek (Alga 2) Villages

With its 301 houses, Alga village is the center of Alga rural area includes 5 villages with 3 588 inhabitants (1 841 men and 1747 women). Out of them 1 682 are economically active of which 1005 are employed. Others are considered to be self-employed. Only two are registered as unemployed. There are 540 retired, 54 disabled and 87 women are in maternity leave. Out of 819km<sup>2</sup> of the rural area only 19km<sup>2</sup> are irrigated by Kuigen, Asha, Lugovoy, Zhaysan and Kylshaly canals. The irrigated fields are used to grow

mainly fodder and in much lesser scale sugar beet, potato, fruits and vegetable. Small private business includes production of foam, concrete blocks, windows and milk products.

Only Alga village with 112 houses is located near the SPP site (565m) but Sauytbek and Alga is viewed as one community. Alga has a mosque, day clinic for 20 patients a day and post office. Sauytbek has new public house for 100 seats, library and a small first aid room. Two schools (for 100 and 274 pupils) teach in Kazakh only. Despite young adults migration to Shu and other cities, high birth rate ensures rapid growth of the population of which practically all are Kazakh of Kapshak tribe. There are few oralmans families that returned from Karakalpak region of Uzbekistan and some from Iran and China. At the time of the assessment they could not be located but the interviewed specialists of the rural area council, two school directors and the chairman of the Public Governance Council stated that they came some time ago, received \$20 000 settling-in allowance, do not have any difficulties and are fully integrated in the local community. Reportedly, they know the legislation and are represented in the local governing bodies.

The main sources of income are the agriculture, intensive husbandry, State jobs and jobs in private companies in Shu and elsewhere. Traditional non-intensive husbandry is developed as the villages enjoy unusually high availability of the State owned pasture land around them. About 37% of the houses keep some livestock. However, due to high competition at the market place from the increasing number of intensive husbandry farms, high financial risk related mainly to the cost of the livestock medical treatment, income from such husbandry is marginal. As a result, the residents keep as much livestock as they can manage themselves without external help. Despite the presence of the State assistance to agriculture in obtaining low interest and interest free loans, only one out of 5 interviewed traditional husbandry farmers took a small loan to buy livestock. The non-intensive husbandry farmers have more livestock and may employ an assistant.

A typical house in Alga would keep 1-2 cows, 0-50 sheep and goats and 0-2 horses. Only few interviewed had up to 6 cows, 200 sheep and 8 horses. This livestock is collected each morning by four herders (two for each village) and taken to four directions: mainly to the northwest but also some to the south in Alga and mainly to the north and west but also to the southeast in Sauytbek. The herds usually have 60-80 cows and 200-2000 sheep and goats. Two small herds (~50 cows and 300 sheep each) move towards the SPP area daily from Shu. Horses are let out by themselves. Herds of 18-25 horses has been noted 1 and 7km south of the SPP site along the powerline route. To prevent damage to fodder crops around Sauytbek, the village horses movement is restricted by hobbling. The SPP area is used mainly until early summer before the grass withers and the irrigation channels dry out. The grass south of the site along the powerline becomes progressively lusher as the route falls into the Kuragaty River plain. Here, a herd of 160 calves from Sauytbek was found.

Milk, some milk products and meat are sold wholesale to the dairy plant 100km away and less to the Shu food market. The Alga residents have about 0.3ha gardens each, where most of them grow vegetables and plant trees. Water comes from two channels that pass from Kuigen Canal: one through Sauytbek and one through the SPP site. The channel water is insufficient to irrigate the surrounding the village land. Sauytbek area takes water from the same channel but is closer to it. Water is sufficient to harvest fodder crops like medic, clover and barley 3 times in a season. Smaller Sauytbek is therefore orientated to fodder retail than to the non-intensive husbandry.

Ground fires, that are common in summer, can destroy sizable areas of grassland and thus require efforts to minimise the affected area. The main preventative measure used is ploughing but the belts observed are not wide enough and are not managed well to be considered as an effective barrier. Grass is thought to be the main cause of these fires and frequent winds are the main fire spreading force.

Out of utilities running water is available but in Sauytbek the pipelines and the water well pump and tower are in very poor conditions. For absence of meters water is provided twice a day for 1 or 2 hours to prevent gardens watering with potable water.

During the Soviet time the villagers were engaged in the sugar beet growing for the Shu plant. Plans exist to build a new plant in the place of the old plan ruins and renew beet production. For this the Soviet irrigation system is planned to be repaired to bring water to previously irrigated fields. Plans also are to dig new channels to grow melon and watermelon that become progressively profitable with the improvement of the local roads quality.

The villages have 3 graveyards: one closed in between the villages and one at each village that are being used. After initial assessment the Sauytbek graveyard that fell inside the allocated for the SPP land plot, have been excluded from it and now is at 275m from the planned position of the SPP fence. No other culturally important objects exist around the site.

### 6.7.3 Powerline Corridor Land Tenants

The 500ha land plot allocated for a solar power plant, 10m x 3.7km access road and 16m x 12km powerline corridors have been leased for 49 years. The open redistribution unit 30x160m area has been acquired for 48 years ownership. For the powerline route, agreements with 5 land tenants (4 local farms and an Almaty based company) have been achieved through one off payments. Only one farmer has recently developed part of his and the neighbour land (48ha) to grow winter fodder crops. The other land has not been used or developed by the tenants.

### 6.7.4 Consultation with Stakeholders to Date

The consultation with stakeholders is in full compliance with the RoK requirements. Application for the land was submitted to the district council which redirected it to its Land Management Office. The Office reviewed availability and issued a 3 year lease to conduct land surveys with the requirement to conduct public consultation. A public note was sighted in the local newspaper Shu Dolina two weeks before the first meeting in Shu Cinema Park Entertainment Center on March 9 2016. The meeting attended 13 people. The town council representative, the designer, EIA developer and the project managing company representative conducted the meeting. It was stated that the feasibility study was to be available for examination by the public. After two hours of the project presentation, no questions or comments arose and the attendees voted unilaterally for the project.

The second meeting was conducted on 28.04.2017 in Alga village school hall. It was attended by 42 residents and lead by the same representative of the town council with the presence of the Alga councilor and the project managing company representative. Without much discussion, questions or comments, attendees voted for the project.

Once the surveys and public consultation have been completed, the land management plan was submitted to the Office with the application for 49 years lease. After the Office positive decision on the land, the documents where sent to the Technical Inventory Bureau for registration. The Bureau issued the lease contract which is then registered in the Ministry of Justice.

Five land tenants from which land the 16m wide powerline corridor was extracted, were consulted by M-KAT local representative, and an agreement for compensation was achieved.



## 7 PROJECT IMPACT ASSESSMENT

### 7.1 CONSTRUCTION

#### 7.1.1 Air Quality, Noise and Vibration

During construction the air quality will be reduced locally with diesel combustion products and some dust. Painting will be minimal as most of the components will be galvanized or pre-painted. The components will be bolted rather than welded. Considering the distance to the houses (1.2km) and the expected wind turbulence for most of the construction period, the impact of these pollutants will not be discernible from the ambient conditions and well below the maximum permitted for the residential area.

Tractor mounted pneumatic hammers that drive the panel polls into the ground may generate up to 110 dB(A) pulse noise at source. Because the ground is soft and porous, each hammering session will be short. The wind will deflect direct propagation of this noise to the houses. Noise from the heavy earth moving equipment and dump trucks is expected to be below 85dB(A) at source. The area is flat and thus will require minimal earthwork. This noise will dissipate to the background level at about 100m from this equipment. Noise from the other equipment e.g. cranes and forklifts will be considerably lower.

No rodents have been recorded on the SPP site. The ground dwelling lizards and termites will be tolerant to the ground vibration and will not migrate with the appearance of human and noisy machinery.

**To bring this form of impact to negligible level**, workers that assist pneumatic hammer should be provided with head cans and their application controlled.

#### 7.1.2 Vegetation and Soil

Ground leveling will be minimal and confined to the old dry irrigation channels. Vegetation cleaning will not be required as practically all SPP territory lacks shrubs or trees. The vulnerable to disruption is only the vegetation along a 600m span of the Kuigen-Alga irrigation channel where trees and shrubs create important for this area ecological niche.

The machinery passing in between the panel rows, panel blocks, material and equipment storage, office and main transformer areas will destroy almost all vegetation in this areas but no water or wind erosion of the disturbed ground is expected. As these corridors will not be paved and will not be used intensely, vegetation is likely to recover within a season.

Due to presence of a fuel station at the entry to the SPP access road, there is no need to store diesel at the site. Being a valuable commodity, oil is likely to be stored in drums in the locked containers. However, waste oil drums may be placed on the ground unprotected from rain and overturn by reversing vehicles. Thus, ground may be contaminated with hydrocarbons leaked during the motor equipment refueling or if waste oil drums are overturned or punctured. Considering that the access road will be built before the construction, risk of overturn and leakage of a diesel tank truck associated with the project on the way from a fuel station is thought to be negligible.

The powerline construction will require earthwork to level the ground for driving along the route and for about 6-7 anchor towers foundation. Once created, the powerline road is likely to remain visible as it will be used for inspections. Digging ground to 3.5m depth, bringing the spare parts, assembling insulators and erecting the towers will result in vegetation being stripped at 10-15m distance from the tower (0.05-0.08ha). At the polls vegetation will be stripped in a cross-like pattern with 10-15m long and 3-9m wide hands. Due to the ground composition, vegetation stripping will not cause desertification, significant wind erosion or increase in soil salinity. Revegetation by annual plants is expected in the first season. The

succession will not be the same as in the adjacent land but with time the pioneer plants will gradually give way and the composition will equalised with the surrounding vegetation.

Sensitivity	2	Only small sensitive span of the irrigation channel that can be avoided
Magnitude	2	Expected minor soil compaction and destruction on up to 10% of the total area but natural revegetation is possible
<b>Significance</b>	<b>4</b>	<b>Low</b>

In addition to standard measures for impact reduction, the following is suggested to reduce impact significance:

- Control the contracted fuel tank truck condition and its use of trays under the refueling couplings;
- Construct of a waste oil pad with impermeable surface and shelter and provide leakage swapping material for small repairs of the machinery.
- Avoid excessive damage by early surfacing the access road, driving along designated passages and making vehicle parking area as small as practically possible.

### 7.1.3 Ground Contamination and Wastes

No fuel and oil will be used or stored at site but a fuel tank truck will fill up the heavy machinery at the place. Without secondary containment minor leakages may occur.

The volume of waste generated during construction will be small (Table 7). Inert construction waste (mainly packaging material and wooden pallets) will be disposed to the Shu town licensed landfill just southeast of the site. Some of this material will be utilized by the landfill. Because the area does not have an engineered hazardous waste disposal site, this waste may end up in the Shu landfill. Due to low volumes the impact is considered to be close to **negligible** but some cost effective measures would still be appropriate:

- Ensure that the fuel tank truck has and uses trays under the hose couplings and has spill containment and collection equipment.
- Check that the contractor has a subcontract with a licensed hazardous waste disposal site, regular inspect onsite hazardous waste storage containers; Find ways to recycle components of broken panels.

### 7.1.4 Social Impacts

#### 7.1.4.1 Land Use

Effect of the SPP fence on available pasture area is evaluated for the operation. As construction is planned to be started in autumn when the site will still not be fenced, no impact on the pasturing is expected. Later in the year the livestock will not be let out. No additional to the fenced area will be used during construction.

The 10m x 3.7km access road construction corridor is occupied by the existing field road used by 3 farms and mechanical base. No restriction of their access to the road is expected. The 16m wide powerline corridor and the 30x160m area of the open redistribution unit is used by 2-4 herds from adjacent villages. The tenants of 5 land plots (4 local farms and an Almaty based company) through which the powerline passes, do not use their land. The exception is a 48ha plot recently cultivated by Amina Farm to grow fodder crops. Two polls that are planned to be placed on this plot will compact ground along the powerline corridors and at the polls

**Table 7 Estimated construction waste expected quantity and elimination methods. Hazardous waste highlighted in pink, undefined methods shown in red.**

Waste name	Quantity, kg	Elimination method
Used oil	450L	Disposal site not defined
Oiled cloth	18kg	
Oiled ground	1,2t	
Scrap metal	120kg	Recovery by «Kazvtorchermet»
Broken panels	6-18	Recycling possibility not examined
Inert solid waste	24 000kg	Shu landfill (fenced guarded but without sealed bottom and burial)
Domestic waste	13 500	
Sewage	Small volume	Shu sewage evaporation lagoons

in a cross-like pattern with 10-15m long and 3-9m wide hands. Because the polls planting is expected in autumn, the farmer can be notified not to cultivate and plant seeds in these areas before the polls are set. The other land has not been used or developed by the tenants.

**7.1.4.2 Equipment and Parts Transportation**

There will be no impact from noise dust and vibration from the equipment and materials transfer to the site. Most of it will be brought to the railway spur 400m from the access road starting point. The 3.7km access road passes a dormant material base on its way to the SPP. There are no housing or other enterprises on the way. It is expected that no more than one truck will pass along the road each 15 min.

There will be no obstacles or risks to the local drivers or damage to the road surface. The entry to the Oktabrsiya Street from the spur will be to the right without crossing the upcoming traffic lane as the street allow only the right turn there. After the U-turn the trucks will slip to the right onto the project assess road. The road police assistance may be required for arrangement of oversize equipment trucks turn left on the street entry. This street span has no residential houses, schools, play grounds etc. and the traffic intensity is relatively low.

Thus transportation impact is considered to be **negligible**.

**7.1.4.3 Workers Influx**

Out of maximum 400 construction staff, around 350 panels assembling workers are expected to be employed from Shu and the near settlements. Under the supervision, they can perform the main volume of work of assembling of the panels and cables lying. Few others are expected to be hosted in various accommodations in Shu that will comply with the EBRD Minimum Accommodation Requirements. These workers will mainly be men, but their presence in Shu and at the isolated site will have no gender related impact as they are mostly local and gender ratio will not be disturbed. Use of Illegal, forced or child labour will be controlled by the local labour protection inspector and immigration police and thus the associated impact is unlikely. The Company will emphasise the principles of the ore labor standards including the prohibition on child labor and forced labor as well as compliance with national labor laws in the construction contract and include relevant checks in the internal audits. Considering that the Company will extend its existing practices over contractors control to this project, this form of impact is thought to be **low**.

Sensitivity	3	Moderate due to locals partial dependency on livestock for subsistence and general progressive reduction in pasture land as residential and industrial areas grow and agriculture recovers. Low impact on individual livelihoods as cost of herding the Alga south herd to longer distance may increase slightly. No discernable long term effect on the local economy
Magnitude	2	Low
<b>Significance</b>	<b>6</b>	<b>Low</b>

The risk of accidents is evaluated in the next section. The mitigation measures shall include:

- Considering railway transportation before employing automobile transport as the option that will produce the least environmental and social impact;
- During the access road construction, retain passage over or next to it including existing bridge over the Levoberezhnyy Canal;
- Attempt to set powerline polls on the cultivated area before winter crop is to be seeded.

**7.2 OPERATION**

**7.2.1 Environmental Impacts**

Impact on waterfowl from collision with the panels (so called 'lake effect') is considered to be negligible because the panels surface is texturised and covered with anti-reflective coating. Considering the

available studies on this issue <sup>3</sup> and the site ecological conditions, this is considered to be sufficient measures. Although birds use the Shu River during migration as an orientation, waterfowl composition observed during the site assessment after spring migration (Table 1Table 4) suggests that only species tolerant to human presence use these water bodies (small lakes along the river, the Shu old wastewater lagoon and irrigation canals and channels) that are also at some distance from the panels.

Fencing does not impact the animals that have been observed or expected to be present at or around the site. Erecting the fence with a gap near the ground will further ensure unobstructed passage of small animals.

Vegetation degradation from overgrazing along the SPP fence is not expected because the shepherds use the SPP area mainly in spring and early summer and have alternative pastures albeit further away. Without grazing and fires, vegetation inside the SPP fence is likely to change to its more natural composition with reappearance if the plants that are normally destroyed by pasturing. Weeds will not be able to compete for water and nutrients with the extended roots of grasses and cereals. This natural succession may need to be disturbed only in few places with wetter ground where occasional grass cutting may be required.

Panels will change microclimate under and in front of them. Light, temperature, wind speed, humidity and water availability will be altered. A UK study <sup>4</sup> found that total above-ground plant biomass was four times higher in the gap areas compared with under the PV arrays where there were also significantly fewer species. The gap areas were more dominated by forbs and legumes compared with under the PV arrays. No such a study is available for arid climate but our initial observations in the second and third vegetative season at the first commercial solar power plant in Kazakhstan Burnoye suggests considerably smaller differences. As the panels allow the light through and cut shortwave radiation (Weinstock and Appelbaum 2009), the plants that are less protected from sun rays and evaporation from leaves and stems may establish. It should be noted that the difference will not be abrupt as the panels shadow different areas during the day and over the seasons.

Soil properties did not vary in the cited study and are not expected to change during the operation.

Providing food remains will be properly stored, birds number and composition will unlikely change significantly thus panels soiling by larger birds like crows and gulls is unlikely. With no grass cutting food source and options for nesting of birds will not change. Swifts and swallows may occupy under roof spaces but will not use solar panels stands reachable to foxes.

Security lighting will attract insects and insect eaters like bats but considering absence of places suitable for bats roosting at or around the site and low lighting intensity, this will not have a discernible effect on the local ecology.

Sensitivity	3	Medium due to locals partial dependency on livestock for subsistence, soil erosion sensitivity is low
Magnitude	2	Low
<b>Significance</b>	<b>6</b>	<b>Low</b>

To prevent wind soil erosion, monitor vegetation reinstatement, if bare taches remain after the second vegetative season apply seeds and watering.

<sup>3</sup> Walston L.J. Jr *et.al.* A preliminary assessment of avian mortality at utility-scale solar energy facilities in the United States. Renewable Energy 92 (2016) 405-414.

<sup>4</sup> Armstrong A. *et. al.* (2016) Solar park microclimate and vegetation management effects on grassland carbon cycling. Environmental Research Letters, 11(7):074016,

## 7.2.2 Social Impact

The operation will require few low skilled workers that are likely to be employed from Alga or Shu. Job opportunities or vacancies will be disseminated or posted in areas and avenues where men and women local labor force can access information. Several skilled workers may be brought in from elsewhere at the beginning but with time, it is likely that the locals can qualify for the skilled work positions. There will be no increase in the local traffic as the only regular supply will be water and a tank truck is expected to do only 3-6 hulls a month.

### 7.2.2.1 Possible Groundwater Use

Water may be used for panels cleaning if a more economic solution is not found. The company obtained permit to install two groundwater extraction wells at the site to cater for this need. The nearest to these wells Alga well is 3km away and is thought not to be affected by the water obstruction at the site. With the currently reviewed approach of gradual cleaning by small number of panel cleaners employed for the entire dry period, daily water use will **not be significant**.

### 7.2.2.2 Land Use

Pasture reduction is not expected to be critical as the area around the site will remain to be available for pasturing of relatively small number of livestock. Assessment of the historic, current and perspective use of land in and around the SPP suggested low impact on few domestic livestock of Alga and Sauytbek less now but more in the future when the Shu and Alga housing will gradually take more pasture land east and north of the SPP site. Historically the site supported marginal agriculture with high labour expenditure for bringing water in. With the increase in the labour value, it is highly unlikely that the old rice pads found in the old river course depressions will be re-established. Significant increase in irrigation water availability is not expected as the water flow of the Shu River is regulated throughout its length and revamping agriculture upstream is likely to take any extra water available. As non-intensive husbandry is risky and brings marginal profit, it is likely that the livestock that uses the area will not increase significantly. Efforts are likely to be focused on more profitable non-pasturing intensive husbandry and fodder growing on the fields where the existing irrigation system can be maintained at low cost.

The channel from the Kuigen canal to Alga vegetable patches is not maintained regularly but such channels are known to become overgrown and get clogged with silt. A standard approach to cleaning is to pass along the channel with an excavator, which place the extracted ground behind itself making a mound at one side of the channel will be possible only at the spans where trees are not present. For a short span with trees an excavator has to have space for entry inside the dry channel. In both methods an area to place the extracted ground is required.

A field road from Alga village to the pasture land will be cut at the northwest corner of the site fence. The relief and land condition allow for this road to move 200m west and continue along the site fence for 1.6km to rejoin the existing road.

## 7.2.3 Landscape and Visual Impact

Whilst the landscape of the site is rural, it does not possess unique aesthetic value is not wild or of a nature that justifies special designation. To a bypasser the plant will represent a change from an empty field to a landscape with 2.2m high inclined dark grey plastic panels and white containers behind a 2m mesh fence. Depending on the distance, it will be seen from all sides as a 0-2m high grey massive. The area has no vintage points from which a panorama with the entire plant can be observed.

The most sensitive place for visual impact from the plant is 1.3ha Sauytbek graveyard located 270m west of the SPP fence. SanPiN 2.2.1/2.1.1.1200-03 specifies sanitary protection zone for rural area graveyards

as 50m. Taking analogy from landscape protection of cultural heritage sites <sup>5</sup> where 200m zone applies, it could be assumed that there will be no visual impact on the graveyard visitors. With time the graveyard may propagate towards the plant but the irrigation channel would stop it 100m from the fence. Whoever is to set the new graves, he would be aware of the plant presence and would have an option to bury at the larger Alga graveyard.

Three farmers 0.8km east of the panels will not see the plant behind the trees that grow along Kuigen-Sauytbek channel. The passersby along the Sauytbek-Alga road will see the panels at 0.6km distance at the eye level. Providing that the plant is not associated with loss of pasture land or irrigation water, the viewers are likely to be either indifferent to the change or have a positive association with this source of renewable energy.

The panels do not reflect sunlight and cannot blind the drivers and the mentioned viewers. The impact of birds perceiving the panels as a lake is assessed in the environmental section above.

Sensitivity	0	Negligible on Sauytbek graveyard visitors and Sauytbek and Alga drivers-by
Magnitude	2	Long lasting impact to which the local community is able to adapt, no discernable long term effect of the local or regional economy, limited visual impact but no change in life quality
Significance	0	None

### 7.3 CLOSURE AND DECOMMISSIONING

The area can be brought practically to its original condition within several month of non-intensive disassembling. Almost all parts of the plant can be reused or recycled. The other parts will constitute non-hazardous waste that can be disposed locally. Disturbed ground above the excavated cable trenches is likely to be covered with annual vegetation in the first vegetative season because of import of seeds from the adjacent plants and higher moisture retention potential of the disturbed land. It is expected that a full or at least half of a vegetative period will be available for the vegetation to establish before the fence is taken down and grazing reestablishes on the land. A 5x5m reinforced concrete plate is likely to remain after the step up transformer is removed. The other strip foundations will be excavated.

Air pollution will be considerably less than during construction because decommissioning would involve less equipment and the work will not have tight timescale.

### 7.4 KEY UNCERTAINTIES AND DATA GAPS

The only gap that remains is presence of archaeological or cultural heritage objects along the access road and powerline routes. This gap is planned to be filled by the road and powerline construction sub-contractors in the frame of their contractual obligations. The EPC contractor is to check implementation.

### 7.5 ALTERNATIVES IMPACT COMPARISON

As no major environmental or social impact was expected from the development, the planners mainly used technical and financial criteria to funnel down the alternatives of location, scale, layout, mode of operation and materials used.

The do-nothing option was not considered. Absence of the plant power fed to a large transit substation would not make much difference neither for the network nor for the local population. If any power aspect limits the development of the local economy, it is the local substations and transformers power and conditions. However, absence of the project will make more difficult for Kazakhstan to fulfil its commitments to GHG emissions reduction and retain its dependency on fossil fuel.

<sup>5</sup> Article 2.5 and 2.10 of the Rules for determining the site protection, constraining construction and landscape protection zones around the history-cultural heritage sites and for the mode of the zones use. Government of RK #1218 from 28.10.2011.

Selection of the location was constrained by the list of the sites for which the Energy Ministry has agreed to ensure the fixed tariff. Out of them the largest site with the best sun irradiance was selected in the region with the largest energy deficit and poor mix of energy sources.

The equipment selection alternatives were constrained by the need to use effective and reliable (in terms of longevity and production as specified) components to satisfy the investors requirements. Sun-tracking panels generate power more consistently through the day and take less area per MW produced. In environmental terms both constraints are more preferable but exclude use of Kazakhstan suppliers of panels. It should be noted that an EPC contractor will be obliged to seek procurement of 20-25% of goods and services locally which should at least partially counteract the negative effect of exclusion of the local panel producers.

Layout alternatives are constrained by the east-west orientation of the panel rows. The selected tight placement of the panels with minimal additional infrastructure takes less pasture area and generates minimal visual impact if any sensitive viewer is present around it.

Time slack was put in the construction schedule to avoid night work, which is expected to be employed only in the exceptional circumstances that cause major delay in work. The other modes of operation will follow international standards for labour protection, which implementation will be controlled by an independent 'owners engineer'.

For equipment transportation the balance between the highway and the railway is made in favour of the latter when possible which is environmentally sound. Initially the second access road from Alga village was considered for construction period but because its use would impact on the Alga streets integrity and the residents well being and safety, this option was dropped.

Two connection alternatives were reviewed: to the nearest substation and directly to the national grid. The selected connection to the substation will allow easier power management by the grid operator and better control of safety during repair works. In the current location direct connection does not result in a shorter powerline and thus does not reduce visual or other impacts related to a high voltage line.

## 7.6 RISK ASSESSMENT

### 7.6.1 Construction

The probability of accidents occurring while overtaking slow moving trucks with the plant equipment in thought to be negligible as it is expected that the railway will be used for the bulk of the equipment and the distance between the railway spur that is likely to be used and the access road is 400m.

Extreme storms have not been observed in the area. The panels are also designed to withstand gusting winds to 50m/sec

Risk of diesel fuel ignition while fueling the equipment on the dry grass is negligible, considering the fuel property and that the equipment will be refueled by a tank truck driver trained by a fuel supplier. However, small spills during machinery refueling may occur fairly frequently. Spilling diesel on already prone to ignition dry grass increase risk of ground fire.

Considering that soil is fairly permeable for diesel and groundwater can be as close as 2m, some part of a medium size spill may enter the groundwater. Some of it will be digested by bacteria in situ within couple of years. The remaining part will be smeared in the unsaturated zone as a result of groundwater level fluctuation and will also be digested by bacteria albeit this may take tens of years. Likelihood of such spills entering the Alga deep water well 3km downstream is none.

Probability	1	Ground fire is highly unlikely but may occur at some time under normal operating conditions
Consequence	3	Material damage to equipment and stored on the ground parts
<b>Significance</b>	<b>3</b>	<b>Low</b>

### 7.6.2 Operation: Ignition and Fire

The transformer fire is unlikely due to the used electric shortcut protection devices. If it occurs, fire can be controlled and put down by the Shu fire brigade based 7km away from the site. The Shu fire brigade has fire foam and can use the site firewater reservoir. However, ignition of dried grasses mainly from glass fragments and bottles is common in June-August. Ground fires spreads fast and wide and with sufficient wind can cross roads and small channels. To prevent such fire propagation a fire protection belt will be arranged around the SPP fence and firefighting procedures developed. However, the belt often is made to narrow to stop fire propagation.

Probability	1	Ground fires entry to site highly unlikely but may occur at some time under normal operating conditions
Consequence	3	Localised damage to panels and electric equipment due to quick detection and ability to put down fire
<b>Significance</b>	<b>3</b>	<b>Low</b>

The suggested mitigation measure is therefore to:

Ensure that the fire protection belt width is at least 4m at the northern part of the site and 5m at the southern end where grass is thicker and higher.

## 7.7 PROJECT BENEFITS

### 7.7.1 Environmental Benefits

The main environmental benefit will be in reduction of Kazakhstan contribution to climate change and air pollution. To calculate this reduction for the plant that generates 229 000 MWh/year for the designed 25 years of the operation, the national GHG emission factor ( $EF_{grid}$ ) of 1.355  $t_{CO_2}/MWh$  for grid electricity generation is used<sup>6</sup>. The reduction is therefore expected to be:

$$1.355 t_{CO_2}/MWh * 229\,000\, MWh/y * 25\, years = 7\,757\,375\, tons\, CO_2$$

The corresponding reduction in air pollutants emission will be: for each MW produced is expected to be  $SO_2=60t$  and  $NO_x=40t$ . Therefore, the total reduction of  $SO_2$  and  $NO_x$  emission for the expected operation period of 18 years will be 1080t and 720t respectively as per below calculation:

$$SO_{2\,total} = 60t/y * 229\,000 * 25\, years = 343\,500\,000\, tons$$

$$NO_{x\,total} = 40t/y * 229\,000 * 25\, years = 229\,000\,000\, tons$$

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 fuels to the global warming. Allowing semi natural vegetation and the associated animal activities to reestablish within the plant fence will be beneficial but this effect will disappear on re-establishment of grazing after the plant decommissioning.

<sup>6</sup> EBRD Methodology for Assessment of Greenhouse Gas Emissions Guidance for consultants working on EBRD-financed projects



### 7.7.2 Socio-economic Benefits

The important by temporary benefit will be for 12 construction months from employment of 200 unskilled and semi-skilled workers from Kazakhstan. There will also be some transfer of knowledge to the local contractors and additional employment during decommissioning.

Little direct employment is expected to be available for the local community during operation. The only unqualified workers on the plant are several guards and cleaners and possibly 6 panel cleaners. The guards may also be employed from elsewhere to avoid deviance based on familial connections.

There will be no improvement in the local power supply quality and reliability as it is reported to be good already and the local powerlines and transformers that are the main limit for improvement will not be affected.

In the long term more local jobs may be created because sufficient energy availability will not retard further economic development in the area. A very minor long term benefit may be from encouragement of the school graduates to obtain appropriate education to qualify for an electrician position at the plant.

## 8 EHS AND STAKEHOLDER MANAGEMENT AND MONITORING FRAMEWORK

The EHS and social performance of the project contractors and subcontractors will clearly be fundamental in the successful management of this project. The monitoring and control program shall be developed as an integral part of the EHS and Stakeholder Management System (EHSSMS). A framework for this program is proposed in Table 8. The program should aim to validate the predicted EHSS impacts and to be subject to review. At the construction stage the Company site manager shall regularly record and report deviations from the prescribed by the contractor agreement EHSS requirements and required corrective actions and control timely implementation of these actions. The monitoring of the adherence of the plant operation to the legislative and the EBRD performance requirements and ADB requirements shall be carried out throughout the life of the project.

**Table 8 Environmental control and monitoring framework with the key performance indicators (KPIs).**

Media / Issue	What to Monitor/Control?	Reporting Frequency / Responsible	Key Performance Indicators
<b>Construction</b>			
Air pollution	Excessive smoke from machinery	Daily/Site Manager	Less than 2 records a week, each rectified within 2 days
Soil and vegetation	Driving on site and off site is conducted along designated passages Visual hydrocarbon contamination at the machinery parking area Overspills and leaks at oil and waste oil storage	Cover in weekly work activity reports	No oil stains larger than few drops, vegetation stripped <10% of the site
Stakeholders and workers	Adherence to the SEP for stakeholders and grievance mechanism for the project personnel	Monthly CLO	Information boards are intact and displayed information is up-to-date and as per SEP requirements. Grievance database is maintained and replies are within the set maximum response period
<b>Operation</b>			
Soil and Vegetation	Vegetation rehabilitation inside the plant fence	Monthly/Site Manager	Oiled waste disposed separately Vegetation appeared from seeds bank the next season, no large bare patches or signs of erosion
ESAP	Adherence to the ESAP	End of year / Company	Full compliance with ESAP scope and schedule

## 9 CORPORATE SOCIAL RESPONSIBILITY PROGRAM

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Considering that the Alga and Sauytbek residents will lose access to the fenced 489ha and may not gain from the project in a long term, a Corporate Responsibility Program (CSR) should be developed and agreed with the representatives of these stakeholders to share development benefits to the people. It is suggested to set a budget for the CSR development and implementation during construction and annual contributions 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 all Alga and Sauytbek 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 CSR and the needs with the Alga Rural Area Council and the Public Governance Council and provide them with information on the budget. The Company should use the following criteria for a need qualifying for the CSR funding:

1. Action cost fits the allocated to the CSR 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.

For instance, making shading shelters at the meeting ground of the Sauytbek school to protect children from strong sun, helping the Alga school to provide heating to the one storey classrooms once the school is connected to gas, or financing the school graduates obtainment of an appropriate for the need of the plant education can be reviewed as options. The CSR will also consider programs that would benefit the vulnerable people, including women and girls.

## APPENDIX 1 DETAILS OF PERSONS CONSULTED

The following stakeholders were interviewed:

- |  |  |
|--|--|
| • Alga rural area council specialists                      | Kayrat and Zulfiya                       |
| • Public Governance Council Chairman                       | Amankan                                  |
| • Director Sauytbek school                                 | Klara Baubekova                          |
| • Director of Alga school                                  | Dana Tileuzhanova                        |
| • Alga day clinic chief doctor                             | Zhanar Bayzakova                         |
| • Farmers of Alga and Sauytbek                             | Sabit, Zhankhyrbek, Alik, Maksut         |
| • Herders of Alga and Sauytbek herds                       | Nurkhanat, Maksut, Alik, Zhankyn-<br>bek |
| • Head of Shu branch of Tarazvodkhoz (irrigation channels) | Adel Kapanov                             |
| • M-Kat land acquisition specialist                        | Zair Orudzhov                            |
| • Land department chief specialist                         | Aidos Smagulov                           |
| • Architecture department specialist                       | Zeinola Samashev                         |
| • Veterinary department chief vet                          | Abdumarat Daurenbekov                    |

Local residents from Alga and Sauytbek villages were asked individually and in the focus groups although ability to form gender segregated focus groups was limited. The individuals natives included women, unemployed and retired.

The questioned were asked whether they knew of the project and if so, what did they know. What ongoing problems they had; what impact and benefits for themselves did they see from the project? The stakeholder engagement and grievance handling mechanisms expected to be established on the project was explained and opinions where asked on its effectiveness. The most appropriate places for the project information disclosure were identified.

The following questions were asked during the interviews:

- What ongoing problems do you have apart from the project?
- Are there any interruptions to electricity?
- Name any improvement/deterioration that happened in the past 5 years in the village.
- How long have you been living here? Where do the new settlers come from?
- What is the main source of income? Do you have problems with unemployment in the village?
- What do you think are the impacts and benefits from the project?
- Do you think the stakeholder engagement mechanism will be able to take your opinion into account? What is the most appropriate place to post information about the project?
- How do you feel about the project? Do you approve of it in general?

## APPENDIX 2 REVIEWED DOCUMENTS

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1. Local EIA (OVOS) and preEIA for M-KAT Solar Power Plant construction and Natural Resource Management Office ecological expertise positive conclusions on them;
  2. State Technical Review of the feasibility study;
  3. State land rental deeds for SPP;
  4. Technical conditions for connection
  5. Alga rural area passport and general plan for development
  6. Veterinary data
  7. Shu district and Shu town cadastral maps
  8. Lists of vulnerable families from the rural area council and the schools
  9. List of Alga rural area enterprises
  10. SPP preliminary layout from 02.03.2018
  11. Powerline plan approved by 5 crossed land plots tenants and authorities
  12. Substation plan
  13. Archaeological Survey
  14. Topographical survey
  15. Geological survey
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## **M-KAT SOLAR POWER PLANT**

### **Environment and Social Management Plan**

Revision 0

September 2018

#### **1 ENVIRONMENTAL MANAGEMENT**

The anticipated environmental and social impacts of the Project will be avoided, minimized or mitigated by implementing generally recognized good practices as well as preventive and control measures as detailed in the environmental and social management plan (ESMP) below. The ESMP includes mitigation and monitoring measures applicable during the construction, operation and decommissioning phases of the project.

In parallel, an Environmental and Social Action Plan (ESAP), that has been developed according to the relevant Lender Requirements as well as other international guidelines and standards, highlights the most urgent steps for implementation of the impacts mitigation measures given in this ESMP.

#### **2 INSTITUTIONAL AND ORGANIZATIONAL ARRANGEMENTS**

M-KAT Green LLP is a new company created specifically for this project. The site manager will be responsible for the day-to-day implementation of the project and the appointed site EHS manager will be responsible for the development and implementation of site specific environmental, social, and health and safety management plans. M-KAT Green LLP is responsible for undertaking the project in accordance with the initial environmental examination (IEE), the ESAP, and for implementing the ESMP in line with local and national regulations, ADB's Safeguards Policy Statement (2009), ADB's Social Protection Strategy (2001), and EBRD's Environmental and Social Policy Performance Requirements (2014).

During construction the EPC Contractor and via it the subcontractors performance will be managed through M-KAT EHS Regulations. This regulation includes a contractor screening process, the requirement to include EHS principles in contractor contracts, and the regular monitoring of EHS requirement compliance during project implementation. Day-to-day performance of contractors will be managed by the site manager.

#### **3 CAPACITY DEVELOPMENT AND TRAINING MEASURES**

As part of the site induction and training program, site workers will be made aware of and trained in the implementation of the site environmental, social, health and safety management plans, and labor standards and rights. Training will target all staff levels, ranging from the management and supervisory personnel to skilled and unskilled personnel (including contractors). The scope of the training will include general environmental awareness, and the requirements of the IEE, ESAP, ESMP, SEP, HR Policy and labor rights, and health and safety plan. The training will be conducted by the appointed site EHS manager, and other relevant specialist staff as required. In addition, power plant staff will be trained in first aid delivery.

To ensure that the project is implemented in accordance with the EHS and social requirements, the following will be undertaken:

- The EHS manager will be trained in ISO 14001 and 45000 standards to enable the development and implementation of an adequate Environmental, Health and Safety and Stakeholder Management System and the required associated plans for the project.
- A community liaison officer will be employed and (trained if required) to implement and monitor the Stakeholder Engagement Plan (SEP), corporate social responsibility program (CSR), gender commitments, and grievance redress mechanism effectively.

#### **4 REVIEW AND AMENDMENTS**

- The project ESMP is a social and environment management tool which shall be reviewed periodically (at least once in 2 years) to address changes in the project design, life cycle processes and activities, organization and regulatory requirements.

#### **5 ENVIRONMENT AND SOCIAL MANAGEMENT PLAN**

The ESMP is presented in the Table below. The identified mitigation measures will be adopted by the Company Solar LLP and imposed as conditions of contract of the subcontractors employed for respective phases of the project. The mitigation measures suggested during operation will be made part of the regular maintenance and monitoring schedule.

The ESMP includes the following:

- Mitigations suggested for adverse environmental and social impacts and associated risks;
- Management tools and techniques for the implementation of environmental impacts and risk mitigation measure;
- Monitoring and reporting of requirements and mechanisms for the effective implementation of the suggested mitigation measures.

**Table 1 M-KAT Solar Power Plant Environment and Social Management Plan**

Issue for Mitigation	Mitigation Measures	Monitoring / Reporting	Responsible Party	Estimated Cost and Source
<b>CONSTRUCTION</b>				
Waste generation and disposal	Develop a Waste Management Plan (WMP) to include broken and decommissioned solar panels utilization. The WMP should be consistent with the reuse-reduce-recycle-recover-safe disposal management hierarchy.	Development of an adequate WMP prior to commencement of construction.	Company	Included in construction costs
	Request the contractor to provide waste memos to ensure appropriate disposal location and methods, and to include this requirement in the agreement with subcontractors.	Inspection and collation of waste disposal documentation throughout the project cycle.		
Ground contamination	Request and control that oil drums are stored on a sheltered and bunded pad. Ensure that contractor controls fuel tank drivers use of trays under refuelling couplings and that places of small repairs of machinery have leakage containment and swapping material	Routine monitoring during construction.	Construction supervisor	Included in construction costs
	In case of any spillage: Localization of the spilled material and immediate cleaning of the contaminated area.			
	Do not store hazardous materials (e.g. fuel, engine oil, paint, chemicals, lubricants, etc.) on site. If this cannot be avoided store these materials within sealed, bunded and roofed areas. Installation of secondary containment for storing liquid materials is recommended.	Routine monitoring during construction	Site manager and construction supervisor	
Biodiversity impacts	Prohibit staff and contractors from hunting, poaching and harassing wildlife.	Inclusion in the site code of behavior.	Site manager	Included in construction costs
Soil quality and erosion impacts	Enforce driving along surfaced with chip rock passages and make vehicle parking area as small as possible.	Design and order of construction minimise risk of damage. Subcontractors contracts and performance audit checklist include this	Site manager	Included in construction costs

Issue for Mitigation	Mitigation Measures	Monitoring / Reporting	Responsible Party	Estimated Cost and Source
		requirement.		
	Monitor vegetation reinstatement at damaged areas and soil for sign of wind erosion. If noted, apply effective erosion abatement measures.	Monitoring information is inserted in Annual ES Report to EBRD		
Worker health and safety impacts	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 regular HS audits	Reporting OHS documentation that shows that subcontractors HS performance effectively controlled		
	At least for HV work, add site specific risk assessments in the local permit-to-work system and enforce register of near misses with their in depth internal analysis	Daily monitoring during HV work	EHS manager	Included in construction and operational costs
	For operation stage develop safety provisions for an individual electrician working alone	Monitor implementation of the provision		
	Ensure that the fire protection belt width is at least 4m at the northern part of the site and 5m at the southern end where grass is thicker and higher. Plough the belt before each summer	Reporting OHS documentation that shows that subcontractors HS performance effectively controlled	Site manager	
	Develop and implement a site-specific Health, Safety and Environment Management Plan (HSEMP) for the construction phase.	The plan is developed and implemented prior to the commencement of project material transportation.	EHS manager	Included in construction costs
	As per national legislation for workers noise levels shall be kept below 85 dB (A). Provide hearing protection devices to all workers, when necessary.	Reporting OHS documentation that shows that subcontractors HS performance effectively controlled	EHS manager and construction supervisor	
	Provide workers with appropriate protective equipment (PPE)			
Request the EPC contractor and its	Monitoring information is inserted in Annual ES			



Issue for Mitigation	Mitigation Measures	Monitoring / Reporting	Responsible Party	Estimated Cost and Source
	subcontractors to follow the EBRD Minimum Accommodation Requirements when selecting accommodation for the workers	Report to EBRD		
Community health and safety impacts	Develop and implement a site-specific Health, Safety and Environment Management Plan (HSEMP) for the construction phase.	Adequate plan developed. Daily monitoring during construction. Compliance to be included as part of the annual E&S monitoring review and report.	EHS manager and construction supervisor	Included in construction costs
Employment and working conditions	<p>Include EBRD and ADB EHS and social protection requirements into tender documentation and contracts.</p> <p>Select contractors that demonstrate adequate EHS and labor management capability.</p> <p>Ask contractors to obtain all required EHS permits and develop an EHS plan agreeable to the Company before starting any activities.</p> <p>Include in Contractor’s contract a provision on compliance with national and local labor laws and measures to comply with the core labor standards.</p> <p>Provide employment to women during construction period (total of about of 200 to 400 workers during construction) —At least 5% of total workers during construction (10-20 women)</p> <p>Facilitate participation of women in relevant staff trainings—100% women staff are provided relevant staff trainings</p> <p>HR policy to include provision on sexual harassment—Provision on sexual harassment to be reflected in the project company’s HR policy</p>	<p>Adequate plan developed.</p> <p>Tender documents include EHS requirements. Criteria for assessing contractors EHS and labor management capabilities established. Contractor EHS plan approved by the Company.</p> <p>Annual E&amp;S monitoring review and report to include number of workers employed disaggregated by sex and position, number of workers from surrounding local communities, compliance to national and local labor laws and to core labor standards, and grievances raised by workers.</p>	Company Contractor (preparation of EHS plan)	Included in construction costs
	Include environmental mitigation measures and EHS principles in the Contractors’ work in accordance with international standards	Proof provided of EPC Contractor capability.	Design Consultant, External and	Included in construction costs

Issue for Mitigation	Mitigation Measures	Monitoring / Reporting	Responsible Party	Estimated Cost and Source
	and EBRD / ADB requirements.		internal resources, contractors.	
	<p>Emphasize prohibition of illegal, forced and child labor use by the contractor and subcontractors.</p> <p>Audit the contractor's adherence to the EHS aspects of the contract, ensure timely correction of deviations</p>	<p>Audit reports to demonstrate compliance prior to and during construction.</p>	EHS manager	Included in construction costs
	<p>Ensure that contractor has a worker representative and a human resource policy which is disclosed to workers.</p> <p>Develop a grievance mechanism with ability to complain anonymously, records of satisfaction in the given answer and explanation to unsatisfied worker where to take their grievance further</p> <p>Produce annual report on implementation of grievance mechanism, types of grievances and resolutions.</p>	<p>Workers aware of this mechanism. Anonymous complaints have been registered and addressed. complaints have been registered and addressed. Company to log and document all grievances received and gathered.</p> <p>Annual report on grievance mechanism available.</p>	Contractor as required by EHS manager	Included in construction costs
Land acquisition, involuntary resettlement, economic displacement	<p>Prepare Land Acquisition Closure Report including: project summary, socio-economic and vulnerability status of 5 land tenants, whose rights to land have been purchased, minutes of the meetings/consultations held with tenants, entitlement matrix as per PR5 (including legislative requirements) Evidence and timing of the payment; conclusions and recommendations: It needs to confirm or otherwise that payments were made in line with PR5 requirements/national laws.</p>	<p>No complaints or non-compliances. Included in the annual reports to the funding banks.</p>	Site manager	Included in construction costs
	<p>Monitor (and help facilitate) that the 5 tenants obtain their amended lease agreements and land deeds.</p>	<p>Status of issuance of the revised land deeds obtained from Shu land office. Report in the Annual E&amp;S Monitoring Report</p>	Site Manager/ CLO	Included in operational costs

Issue for Mitigation	Mitigation Measures	Monitoring / Reporting	Responsible Party	Estimated Cost and Source
	Fencing of 489 hectares out of the 500-hectare leased land to exclude the graveyard, the water channel and any village asset.	Monitor and report as part of the Annual E&S Progress Report	Management, design contractors, contractors	
Stakeholder Engagement and Community Programs	Implement and monitor the Stakeholder Engagement Plan Develop and implement with relevant stakeholders the Corporate Social Responsibility Program (CSR) CSR Program to consider activities that benefit women and girls. Design and implement CSR activities/community projects that benefit women, children and girls and/or reduce burden on women involving women beneficiaries.	Document all stakeholder engagement conducted, status of implementation of the SEP and CSR and report in the Annual E&S Monitoring Report.	Site Manager/ CLO	Included in construction costs
Physical and cultural heritage	Check that powerline, ORU and access road construction contractors conduct archaeological surveys b. If archaeological sites are found, consider the line relocation from the sites protection zone. Fence and mark the sites. Inform locals about the sites and their protection status c. If impact on sites is unavoidable exclude sites from the State Protection List, conducting the full detailed archaeological survey and excavation. d. Develop and require the earthwork conducting subcontractors to follow the chance find procedures	Ensure that archaeological survey by licensed contractor in place Letters to local councils with information on sites available. Approval documents for actions for the sites that will be under the project's impact A Ensure that chance find procedures management plan is in place and adhered to by the subcontractors		Included in construction costs
<b>OPERATION</b>				
Waste generation and disposal	Implement the WMP including the reuse and recycling of plant components. Comply with the reuse-reduce-recycle-recover-safe	Routine monitoring. Compliance to be included as part of the E&S monitoring review and report.	EHS manager	Included in operational costs

Issue for Mitigation	Mitigation Measures	Monitoring / Reporting	Responsible Party	Estimated Cost and Source
	<p>disposal management hierarchy.</p> <p>Request and retain waste memos to ensure appropriate disposal location and methods, and to include this requirement in the agreement with subcontractors.</p>	<p>Inspection and collation of waste disposal documentation throughout the project cycle.</p>	<p>EHS manager</p>	<p>Included in operational costs</p>
<p>Ground contamination</p>	<p>Do not store hazardous materials (e.g. fuel, engine oil, paint, chemicals, lubricants, etc.) on site. If this cannot be avoided store these materials within sealed, bunded and roofed areas. Installation of secondary containment for storing liquid materials is recommended.</p>	<p>Routine monitoring during operations. Compliance to be included as part of the E&amp;S monitoring review and report.</p>	<p>EHS manager</p>	<p>Included in operational costs</p>
<p>Soil quality and erosion impacts</p>	<p>Preserve frail soil by driving along designated surfaced with chip rock passages and making vehicle parking area as small as practically possible.</p>	<p>Routine monitoring of vegetation reinstatement at damaged areas and soil for signs of wind erosion. If noted, apply effective erosion abatement measures.</p> <p>Compliance to be included as part of the annual E&amp;S monitoring review and report.</p>	<p>Site manager</p>	<p>Included in operational costs</p>
<p>Biodiversity impacts</p>	<p>Allow vegetation on site to flourish naturally except in areas required to be kept clear to minimize damage to the panels and for fire protection (around the fence).</p> <p>Minimize light pollution during warm period nights</p> <p>Prohibit staff and contractors from hunting, poaching and harassing wildlife.</p>	<p>Routine monitoring. Compliance to be included as part of the E&amp;S monitoring review and report.</p> <p>Inclusion in detailed design and routine monitoring during operations</p> <p>Inclusion in the site induction training or site code of behavior.</p>	<p>Site manager</p> <p>Design contractor, site manager</p> <p>Site manager</p>	<p>Included in operational costs</p>
<p>Worker health and safety impacts</p>	<p>Develop safety provisions for an individual electrician working alone (IWA), if working alone is unavoidable</p>	<p>IWA provisions are documented and implemented prior to commencement of operations.</p>	<p>EHS manager</p>	<p>Included in operational costs</p>
<p>Community health and safety impacts</p>	<p>Prepare site specific health and safety and emergency response plans for construction and operation and disclose it to relevant stakeholders.</p>	<p>Ensure that the developed plan includes all possible events and stakeholders are informed prior to the commencement of construction.</p>	<p>Site manager and EHS manager</p>	<p>Included in construction and operational costs</p>

Issue for Mitigation	Mitigation Measures	Monitoring / Reporting	Responsible Party	Estimated Cost and Source
Employment and working conditions	<p>Ensure that the company, contractor and its subcontractors have a worker representative and a human resource policy which is disclosed to workers.</p> <p>HR policy to include provision on sexual harassment. Provision on sexual harassment reflected in the project company’s HR policy and disseminated to workers</p> <p>Provide employment to women during operations phase. At least 25%of total staff during operations are women</p> <p>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.</p> <hr/> <p>Produce annual report on implementation of grievance mechanism, types of grievances and resolutions, and compliance with national labor laws and core labor standards.</p> <p>Request the contractor to monitor subcontractors working conditions and timely disbursal of wages</p> <hr/> <p>Develop Contractor and Suppliers Management Plan applicable to all subcontractors and core suppliers. If temporary accommodation is used, the plan should follow the IFC/EBRD Worker Accommodation Guidelines (Appendix 1) and national sanitary standards.</p>	<p>Annual E&amp;S monitoring review and report to include number of workers employed disaggregated by sex and position, number of workers from surrounding local communities, compliance to national and local labor laws and to core labor standards, and grievances raised by workers.</p>	<p>Company, Site manager, and EHS manager</p>	<p>Included in operational costs</p>
Stakeholder Engagement and Community Programs	<p>Implement and monitor the Stakeholder Engagement Plan</p> <p>Develop and implement with relevant stakeholders the Corporate Social</p>	<p>Document all stakeholder engagement conducted, status of implementation of the SEP and CSR and report in the Annual E&amp;S Monitoring Report.</p>	<p>Site Manager/ CLO</p>	<p>Included in operational costs</p>

Issue for Mitigation	Mitigation Measures	Monitoring / Reporting	Responsible Party	Estimated Cost and Source
	<p>Responsibility Program (CSR). It is to consider activities that benefit women and girls. —Design and implement CSR activities/community projects that benefit women, children and girls and/or reduce burden on women involving women beneficiaries.</p>			
	<p>Community Liaison Officer to monitor and engage with the herders and rural councilor on any unanticipated environmental or social impacts (including economic displacement due to impacts on pasture lands); Assessment of these unanticipated impacts and development of livelihood assistance activities, if required.</p>	<p>Document all stakeholder engagement conducted, status of implementation of the SEP report in the Annual E&amp;S Monitoring Report.</p>	<p>Site Manager/ CLO</p>	<p>Included in operational costs</p>
<p>The use of extraction water</p>	<p>Develop water use reduction plan if water is used for panel cleaning</p>	<p>Inspection of water use documents</p>	<p>EHS manager</p>	<p>Included in operational costs</p>
<b>DECOMMISSIONING</b>				
<p>Waste generation and disposal</p>	<p>Implement the WMP including the reuse and recycling of plant components. Comply with the reuse-reduce-recycle-recover-safe disposal management hierarchy.</p>	<p>Daily monitoring during decommissioning. Compliance to be included as part of the E&amp;S monitoring review and report. Ensure that waste chains of custody is available.</p>	<p>EHS manager and decommissioning contractor</p>	<p>Included in decommissioning costs</p>
	<p>Request the contractor to provide waste memos to ensure appropriate disposal location and methods, and to include this requirement in the agreement with subcontractors.</p>	<p>Inspection and collation of waste disposal documentation throughout decommissioning.</p>	<p>EHS manager</p>	<p>Included in decommissioning costs</p>