ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED BECO JAZEERA HYBRID POWER PLANT, MOGADISHU, SOMALIA

PROJECT

Somali Electricity Sector Recovery Project (SESRP) (P173088)

ELECTRICITY SERVICE PROVIDER

Benadir Energy Company

JANUARY 2024

DRAFT ESIA REPORT

DISCLAIMER:

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Acronyms and Abbreviations

AC	:	Alternating Current
ADR	:	Alternative Dispute Resolution
AfDB	:	African Development Bank
ALARP	:	As-low-as-reasonably-possible
BESS	:	Battery Energy Storage Systems
CO	:	Carbon Monoxide
CO2	:	Carbon Dioxide
CSO	:	Civil Society Organization
DC	:	Direct Current
DIN	:	German Institute for Standardization
DOD	:	Depth of Discharge
DoECC	:	Directorate of the Environment and Climate Change
DRE	:	Distributed Renewable Energy
E&S	:	Environment and Safety
EHSG	:	Environment, Health and Safety Guidelines
ELV	:	Extra-low voltage
ESF	:	Environmental and Social Framework
ESIA	:	Environmental and Social Impact Assessment
ESMF	:	Environmental and Social Management Framework
ESMP	:	Environmental and Social Management Plan
ESP	:	Electricity Services Provider
ESS	:	Environmental and Social Standards
FGS	:	Federal Government of Somalia
FMS	:	Federal Member State
FRS	:	Federal Republic of Somalia
GBV	:	Gender-based Violence
GDP	:	Gross Domestic Project
GHG	:	Greenhouse Gas
GN	:	Guidance Notes
GRM	:	Grievance Redress Mechanism
HD	:	Horizon Development
HIV/AIDS	:	Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
ICP	:	Informed Consultation and Participation
IDO	:	Industrial Diesel Oil
IDP	:	Internally Displaced Persons
IEC	:	International Electro technical Commission
ILO	:	International Labour Organization
INDCs	:	Intended Nationally Determined Contributions
ITCZ		Inter-Tropical Convergence Zone
JTC	:	Joint Technical Committee
LV	:	Low Voltage
MoEWR	:	Ministry of Energy and Water Resources
MW	:	Megawatt
NAPA	:	National Adaptation Program of Action on Climate Change
NDP	:	National Development Plan
BECO	:	Benadir Energy Company
NO2	:	Nitrogen Oxide
NT	:	Near-threatened
OHS	:	Occupational Health and Safety
PAP	:	Project Affected Persons
PIU	:	Project Implementation Unit
PMP	:	Power Master Plan
PPE	:	Personal Protective Equipment

PV	:	Photovoltaic
PWD	:	People with Disability
RAP	:	Resettlement Action Plan
REF	:	Renewable Energy Factor
RPF	:	Resettlement Policy Framework
SCADA	:	Supervisory Control and Data Acquisition
SDG	:	Sustainable Development Goal
SEA/SH	:	Sexual Exploitation and Abuse and Sexual Harassment
SEP	:	Stakeholder Engagement Plan
SESRP	:	Somali Electricity Sector Recovery Project
SME	:	Small and Medium Enterprise
SO2	:	Sulphur Dioxide
SRP		Social Responsibility Programmes
TV	:	Television
UNCCD	:	UN Convention to Combat Desertification
UNFCC	:	United Nations Framework Convention on Climate Change
UNFPA	:	United Nations Fund for Population Activities
UNHSP	:	United Nations Human Settlements Programme
USAID	:	United States Agency for International Development
UV	:	Ultraviolet
VMG	:	Vulnerable and Marginalized Groups
VU	:	Vulnerable
WB-ESS	:	World Bank Environmental and Social Standards
WBG	:	World Bank Group

Executive Summary

(i) The Somali Electricity Sector Recovery Project (SESRP) and Accelerating Sustainable and Clean Energy Access Transformation in Somalia (ASCENT) are the projects implemented by the Ministry of Energy and Water Resources (MoEWR). SESRP aims to increase access to lower cost cleaner electricity supply and to re-establish electricity supply industry while ASCENT aims to increase access to sustainable and clean energy through private sector participation in Somalia. Benadir Energy Company (BECO) is one of the electricity services providers (ESP) participating in the SESRP project, and intends to establish a new hybrid power plant in Dharkenley District, approximately 26km from Mogadishu City.

(ii) The SESRP and ASCENT have the following components:

SESRP	*Component 1*	:	Sub-transmission and distribution network reconstruction, reinforcement, and operations efficiency in the major load centers of Mogadishu and Hargeisa.
	Component 2	:	Hybridization and battery storage systems for mini grids.
	Component 3	:	Stand-alone solar off-grid access to public institutions (Health and Education).
	Component 4	:	Institutional Development and Capacity Building.
ASCENT	*Component 1*	:	Distributed Renewal Energy (DRE) with Solar PV (SPV) and Battery Energy Storage Systems (BESS) in the capital city of Mogadishu and other major load centers in the Federal Members States (FMS).
	Component 2	:	Electricity Distribution Network Rehabilitation and Reinforcement of the mini grids serving the Mogadishu capital city area and other FMS major load centers.
	Component 3	:	Sector Capacity and Institution Enhancement and Project Implementation Support.

(iii) BECO currently has an installed capacity of 175MW, made up of 62% from diesel generators, 31% from solar PV, and 7% from BESS. Under the proposed SESRP arrangement, BECO will build a new and modern hybrid power plant in Dharkenley District, while the MoEWR will provide overall project coordination and oversight during the planning and implementation phases, including environmental and social safeguards due diligence and implementation. The combined technical committee (BECO and MoEWR) will be in charge of implementing the project during the building and operation phases.

(iv) The main objective of this ESIA was to examine both positive and negative effects of the proposed hybrid power plant in Dharkenley District on the people, their property and the environment particularly in the Project Area, and proposed measures to mitigate the negative impacts and enhance positive impacts during the construction, operation and decommissioning phases of the project.

(v) This ESIA study followed World Bank's environmental and social standards (ESS) guidelines, national legislations, and international best practices. It focused on understanding the project background, preliminary designs, and implementation plan. Data was collected through both qualitative and quantitative methods, including literature reviews and physical observations, photography, check lists, interviews, and stakeholder consultation. Primary data was collected through interviews, discussions, photography, observations, and checklists to understand the environmental, socio-economic, and cultural setting of the project site and surrounding area.

Project Description and Context

(i) The proposed Hybrid power plant (2°01’1.49”N, 45°18’12.78”E) in the south-eastern part of Benadir Administration Region within Dharkenley District; neighboring Lower Shabelle. The area is sparsely populated, relatively flat land and is renowned for agricultural activities involving cultivation of different crops.

The feasibility study recommends solar PV modules of 610W (211,575 pcs), inverter transformers (330kVA (371pcs), power conditioning units for batteries (bi-directional) (330kVA (256pcs), BESS (4.45MVA, 79pcs), step up transformers on PV side (6.8MVA, 21 pcs), and step up transformers on BESS side (6.8MVA, 15 pcs). The plant is expected to operate for 25 years, and shall be decommissioned thereafter. Given the functionality of the BESS will expire after 17 years, to ensure continued BESS functionality, a battery replacement plan will be implemented, including procuring and installing new batteries, recycling expired batteries, and allocating funds for replacement. This will be coordinated with routine maintenance to minimize downtime and allow for the adoption of newer, more efficient technologies.

Legal and Regulatory Framework

(i) The Federal Government of Somalia (FGS) has lacks of well-developed environmental laws due to political instability over many decades. However, the Provisional Constitution of Somalia is explicit on safe and clean environment for the citizens. Additionally, a new Environmental Protection and Management Act (2020) is meant to spearhead environmental management in the Federal Republic of Somalia (FRS). Additionally, the FRS is in the process of developing several other regulations under the environmental protection law. From the reviews, the proposed power plant does not conflict with any of the existing legal and regulatory frameworks of the FRS.

(ii) The BRA has several By-laws that govern the region's administrative, legal, and regulatory framework, addressing urban planning, environmental management, infrastructure development, public health, and security, promoting sustainable development and quality of life. The by-laws would be relevant in all phases of the proposed project from construction, operation to decommissioning phases. From the analysis, the proposed project does not conflict with any of the existing by-laws of the BRA.

(iii) The World Bank's latest environmental and social standards (ESS) and guidance notes were analyzed to determine if a proposed project triggered any other ESS. The ESIA aimed to provide guidance for environmental and social assessment of WB-financed projects, improve decision-making, ensure sustainable options, and properly consult affected people. The ESIA revealed that the proposed project would have both negative and positive impacts on the environment and social spheres, highlighting the importance of sound and sustainable project options. From the analysis, the proposed project will not trigger ESS5 and ESS7. However, ESS6 and ESS8 would be relevant. For instance, for ESS6 the proposed project would be located in an area that is less than 7km from the course of River Shebelle – an area that occasionally hosts different species of fauna, including migratory species. The ESS8 would be relevant to the project because of chance find that could require the development of appropriate guidelines. The project is expected to comply with ESS1, ESS2, ESS3, ESS4 and ESS10 at different stages during the project cycle.

(iv) The FRS is a signatory to a number of international treaties, conventions and agreements that include legally binding commitments to protect the environment and to ensure the sustainable management of natural resources. For this ESIA, the following multilateral agreements to which FRS is a signatory were reviewed, and their relevance to the proposed project analyzed: The United Nations Convention on biological diversity (CBD); The UN Framework Convention on Climate Change (UNFCCC); The UN Convention to Combat Desertification (UNCCD). Convention on the Conservation of Migratory Species of Wild Animals (ratified 1985); Protocol concerning Regional cooperation in Combating Pollution by Oil and other Harmful Substances in Cases of Emergency; Sustainable Development goals and Agenda 2063 in Africa; and International Labour Organization Agreements.

Analysis of Alternatives

(i) Two sites were under consideration – the existing power plant in Jazeera area in Dharkenley District. The analysis of alternatives compared Jazeera site, which has adequate space for the proposed new hybrid power infrastructure, with the proposed new site located in Dharkenley District (approximately 5km away from the proposed Jazeera Power) that lacks sufficient space for expansion. While the Jazeera Site

would leverage existing infrastructure and minimize space constraints could limit future growth and operational efficiency. On the other hand, the alternative site provided no ample room for investment, that could allow for optimized layout and future scalability. Careful consideration of long-term benefits, costs, and operational efficiency were crucial in determining the best option for sustainable power generation. It is in this regard that the proposed new site in Jazeera Area was selected.

(ii) The proposed project's site was selected based on a number of factors, including high solar irradiation levels, proximity to grid infrastructure, and land that is flat, stable, and free of environmental or legal conflicts. The proposed site is also aligned with energy demand centers in Mogadishu, and this would minimize transmission losses. Socioeconomic aspects, such as community acceptance and minimal impact on local livelihoods were crucial, alongside regulatory compliance and potential government incentives. Lastly, logistical ease, economic viability, and environmental sustainability would ensure the site's long-term success.

(iii) The No Project Option was deemed least preferred due to socio-economic and environmental factors. It would continue diesel generator-based electricity generation (currently standing at over 60%), causing GHG emissions, and affecting local economies due to lack of affordable, clean, and reliable electricity supply. This would also hinder employment opportunities and hinder the Benadir Administrative Region and FRS from meeting energy requirements, thereby affecting the overall socio-economic status of target communities.

Environmental and Social Baseline

(i) The Dharkenley District of BRA and its surrounding areas are classified as arid to semi-arid, with long periods of drought and minimal rainfall. Like the rest of Benadir Administrative Region, the Dharkenley District is not particularly diverse in diverse topography. The Region is located in the coastal lowland, with average elevation of only nine meters above the sea level and extensive flat areas rising gently from the sea level and inland. The Region is part of the “central coastal basin” which is mainly recharged through direct rainfall. The coastal belt comprises a variety of rocks including limestone, sandstone, marls and clay, sand, coral limestone, and sandstones, as well as a wide system of coastal sand dunes with the soil closest to the shore being pure loose marine sand. Permeability of the soils is generally high. These also describe geological characteristics of the Dharkenley District.

Land Use Land Cover (LULC) changes in the Benadir region are rapidly changing because of the increasing interaction of human activates with the environment as the population increases. However, there is no published evidence on this phenomenon.

(ii) The general area has the potentials to be rich in biodiversity because of its proximity to a critical habitat (River Shebelle), which is less that 7km away, but the species assemblages in the District and along the lower sections of River Shebelle have not been documented. No designated protected conservation area is within radius of 10km of the project’s footprint and as such, the project's impact on flora and fauna in the area would not be significant. The flora species such as Egyptian Thorn (*Vachellia nilotica*), Gum Arabica (*Acacia Senegal*), Umbrella Thorn (*Acacia tortilis*), and various seasonal and perennial shrubs and undergrowth exist in and around the proposed hybrid Power Plant site. Faunal species such as Giant Leopard Tortoise (*Stigmochelys pardalis*), Guenther's dik-dik (*Madoqua guentheri*), African Hare (*Lepus microtis*) and Unstriped Ground Squirrel (*Xerus rutilus*) occur in the area. Based on analysis of fauna and flora species whose distribution ranges fall within Dharkenley District of Somalia, none of the species is listed in the International Union for the Conservation of Nature (IUCN) threat categories as critically endangered (CR), endangered (EN), near-threatened (NT) or vulnerable (VU). Some herbaceous plants and grasses thrive during short rainy seasons, providing fodder for livestock.

(iii) The Dharkenley District – the proposed Jazeera hybrid power plant location is a significant economic hub with diverse activities, and an increasing population. The land tenure and ownership systems are characterized by a mix of informal and formal systems, with a few social amenities within a 5km radius. The Dharkenley District has a sizable informal economy, small-scale traders, and informal service providers, contributing significantly to the local economy. Despite socioeconomic challenges like poverty, unemployment, and inadequate infrastructure, efforts are underway to rebuild and develop the

District, with international aid and development initiatives playing a crucial role. Social infrastructure (e.g., healthcare and education facilities) in the proposed project area would be served effectively by the proposed project.

Assessment of Impacts

DESCRIPTION	RECOMMENDED MITIGATION MEASURES
Construction Phase	
Landscape and visuals	• Erect a fence around the power plant.
Soil, groundwater and surface water contamination	• Scoop and correctly dispose contaminated soil. • No vehicle maintenance and service shall be done at project site • Ensure waste water generated is drained into approved drainage facilities • Contractor to develop an oil-spill containment plan. • Construction vehicles must be maintained in good state. • Care must be exercised not to spill any fossil fuels
Air quality (Dust)	• Suppress dust during dry periods by use of water sprays. • Stockpiles of excavated soil should be palliated dry or windy conditions. • Restrict speed on loose surface roads during dry or dusty conditions • Keep stockpiles compacted and re-vegetate as soon as possible. • Ensure all the personnel use PPEs. • Cover construction trucks moving materials to prevent material dust emissions. • Burning of woody debris & construction waste to be prohibited.
Air quality (Vehicle exhaust emissions)	• Senstize drivers to avoid/minimize vehicle idling to lower emissions. • Maintain all machinery order to minimum emissions of CO NO2, SO2, PM
Noise & vibration	• Train workers on the importance of noise control and best practices on noise. • Provide appropriate PPEs to workers during construction activities. • Inform nearby communities in advance about scheduled high-noise activities. • Establish a monitoring program to regularly measure noise and vibration levels. • Establish a GRM for community to report noise or vibration disturbances. • Ensure regular maintenance of machinery to reduce noise emissions. • Employ modern equipment fitted with noise-reduction technologies • Restrict construction activities to daylight hours (e.g., 7:00 AM to 6:00 PM).
Biodiversity (Fauna)	• An ecologist shall be hired to coordinate the fauna monitoring. • Ensure wildlife-friendly designs for infrastructures. • Limit all vehicle movements to designated roads with speed of 15-20 km/h. • Site clearing work/earthwork shall be carried out during the dry season. • Site preparation shall minimize clearing of vegetation and topsoil. • Temporary-use areas shall be restored and revegetated • Undertake a supplementary biodiversity assessment on fauna in the area
Biodiversity (Flora)	• Re-vegetation including planting of trees around the plant/facility • Ensure proper demarcation of the project site for all construction works. • Designate access routes and parking areas
Soil erosion	• Avoid ground-breaking during the seasons of high rainfall to avoid erosion. • Ensure spoil from excavations is arranged according to the various soil layers. • Monitor exposed soils to ensure that any incidents of erosion are controlled. • Monitoring of areas of exposed soil during rainy seasons. • Use silt traps where necessary
Wastes (Solid wastes)	• Use of durable materials to avoid regular replacements – avoid waste generation • Segregate waste • Re-use of materials where possible • Recovery of materials remains and return to stores • Provide litter collection facilities such as bins • Proper disposal of waste in line with solid waste regulation • Proper budgeting to avoid waste generation • Manage all the wastes in accordance with internationally accepted standards. • Handle and label all hazardous products properly to avoid ground contacts • Dispose hazardous waste through a approved waste handler • Contractor to put in place and comply with a site waste management plan
Wastes (Liquid wastes)	• Vehicles and equipment must be serviced regularly to avoid leaks. • The waste oil or used oil must be disposed-off appropriately. • Store all hazardous materials in compliance with local regulations. • Scoop all top toils for disposal incase of leaks. • Refuelling and maintenance of vehicles will not take place at the construction site. • Provide sanitary waste facilities for both genders clearly marked • Keep accurate documentation of fuel and oil storage volumes/transfer activities. • Install oil-water separators in drainage systems to remove oil from stormwater.

DESCRIPTION	RECOMMENDED MITIGATION MEASURES
	• Ensure proper training for staff on handling and use of oils. • Disposal of waste through septic tanks • Develop and implement spill management plan with clear procedures • Develop and implement a detailed Spill Prevention Plan (SPP) • Create awareness for the employees on procedures of dealing with spills/leaks • All chemicals should be stored within the bunded areas and clearly labelled.
Water consumption	• Source and utilize a sustainable and reliable water supply for all project phases • Ensure prudent use of available water • Consultations with the project local committee on water use to avoid conflicts with the community
Energy Consumption	• Monitor all energy usage during construction and set reduction targets. • Ensure responsible electricity use through staff sensitization of staff. • Ensure proper planning of transportation of materials for efficient fuel usage
Impact to livelihoods from grazing land access restrictions	• Regularly engage the local community and address ant emerging concerns. • Provide alternative water points for livestock near the construction area. • Establish a grievance redress mechanism to address any conflicts or complaints • Coordinate with the local herders and farmers to grazing routes or areas.
Archaeology and cultural heritage	• Establish a clear protocol for halting construction activities upon a chance find. • Ensure proper documentation of all chance finds. • Engage a qualified archaeologist for any early identification of chance finds. • Develop and implement a Chance Finds Procedures
Trespassing of unauthorized personnel	• Maintain records of any person who comes to site • Hazard communication • Fencing off the construction site to keep of unauthorized personnel • Ensure proper barricading • Controlled access to the site only with prior approval
Worker influx – Incoming Workforce	• Establish and operationalize an effective GRM accessible to community members. • Prompt payment of workers as per the contractual agreements/terms. • Raise awareness among local community and workers on cordial working relation • Respect for community values/culture. • Sensitize workers regarding engagement with local community. • Tap into the local workforce to the extent possible to reduce labour influx.
Gender-based violence	• Ensure that Code conducts are singed by all employers in the contracts. • Establish Workers GRM with multiple channels including SEA/H channels. • Implement a code of conduct signed by all those with physical presence on site. • Prepare SEA/SH Prevention/Response Action Plan, to manage the SEA/SH risks.
Labour disputes	• Set up a transparent GRM to handle all complaints/disputes in a timely manner. • Implement non-discrimination policies to ensure equal treatment for all. • Establish worker welfare systems to represent concerns & promote dialogue. • Establish mechanisms to guarantee fair/timely payment of wages and benefits. • Ensure that all workers receive clear contracts outlining their rights, responsibilities, wages, benefits, working hours, and terms of employment. • Ensure full compliance with local labor laws.
Child and forced labour	• Adhere to all the ESS 2 provisions and FRS Employment Act on forced labour. • Compliance with the national labor laws and labour management practices. • Do not allow children at the project site. • Implement and monitor the employment register regularly. • Put visible signage on site “No Jobs for children” • Report any form of forced labour at the site.
Security risks	• Use surveillance systems/CCTV cameras to monitor critical areas in real-time. • Provide workers with security training and response protocols to threats. • Provide workers with ID badges and restrict entry to authorized personnel only. • Maintain constant with local authorities on security updates in the area. • Implement strict access control protocols, including sign-in procedures. • Hire licensed security to provide 24/7 site surveillance, patrols, and monitoring. • Have security response teams on standby to address any security emergencies. • Engage all stakeholders to understand and address local security concerns. • Develop a security incident response plan including emergencies procedures. • Conduct a comprehensive risk assessment to identify specific security threats. • Collaborate with local law enforcement/security agencies to enhance security.
Occupational Health and safety Impacts	• Workers coming to the site should be knowledgeable on safety precautions • Use skilled personnel for activities which demand skills/technical tasks • Undertake risk assessment and implement mitigation measures appropriately • Provide safe drinking water for workers • Provide appropriate PPE to all workers. • Establish safety committees • Engagement of trained first aider on site

DESCRIPTION	RECOMMENDED MITIGATION MEASURES
	• Availability of equipped first aid box on site
Community health and safety risks	• The contractor is impressed upon not to set a construction camp on site. • Provide awareness materials on HIV/AIDS transmission and prevention. • Informing workers on local cultural values and health matters. • Ensure equal treatment of workers • Create awareness to the community on risks associated with construction works. • Allowing migrant workers time to be with their families
Fire Hazards	• 'No smoking' signs shall be posted at the construction site • A fire risk assessment/evacuation be prepared and posted across site. • Create awareness to the construction workers on potential fire hazards • Designate an assembly point • No smoking shall be done on construction site • Provision of firefighting equipment on site during construction.
Traffic risk	• Use traffic signs, barriers, and cones to guide construction and local traffics. • Install speed bumps/ traffic-calming measures on roads near the site. • Erect temporary road signs warning local road users near the site. • Engage with local communities to raise awareness about safety measures. • Enforce strict speed limits for vehicles within the site and designated routes. • Develop and implement a Traffic Management Plan (TMP). • Designate safe parking and loading zones for all construction vehicles.
Risks related to Inadequate stakeholder engagement	• The grievance redress committee to include representatives from the community. • Sensitize stakeholders on SEP and GRM. • Prepare and implement a GRM to deal with grievances. • Prepare a SEP that is proportionate to subproject and the identified stakeholders. • In line with the SEP, undertake adequate consultations prior to construction.
Inadequate grievances management	• Provide for confidential reporting under the GRM • Implement a workers and community GRM. • Ensure proportionate representation of VMGs in the local grievances committee. • Constitute a Local Grievances Committee is in consultation with stakeholders
Operation Phase	
Landscape and visual	• Fence off the power plant.
Soil, groundwater and surface water contamination	• No vehicle maintenance and service shall be done at project site • Ensure that potential sources of petro-chemical pollution protected from leaks. • Ensure proper design of drainage system to minimize contaminated run-off. • Develop and implement oil-spill containment plan as part of the EPRP.
Flood risks	• Raise foundations of the solar panels and ensure well designed concrete base • Ensure drainage channels are free of any obstruction at all times. • Create flooding diversions and or spill ways to divert water from the plant • Construct more channels and or expand existing ones
Air quality (Dust)	• Plant trees around the plant to act as wind breakers/decrease dust pollution • Ensure planting of grass around and within the facility compound
Air quality (Vehicle and exhaust emissions)	• Maintain all machinery in good to minimum emissions of CO, NO2, SO2. • Regularly monitor and report emissions data as part of EHS compliance.
Noise & vibration	• Use sound-absorbing materials within the BESS housing units. • Use quieter, high-efficiency fans and cooling systems with lower noise outputs. • Regularly service and maintain fans, inverters, and other equipment • Install sound barriers or walls around the BESS unit to deflect or absorb noise. • Equip the BESS unit with vibration isolators to reduce vibrations/noise
Biodiversity (Fauna)	• An ecologist shall be hired to coordinate the fauna monitoring. • Bird deterrents will be installed to prevent collisions with solar panels. • Ensure wildlife-friendly designs for infrastructures. • Undertake a supplementary biodiversity assessment and develop BMP • Undertake regular monitoring and report on biodiversity
Biodiversity (Flora)	• Re-vegetation including planting of trees around the plant/facility • Develop and implement and invasive species management plan.
Soil erosion	• Concrete only the required area and leave the rest of the land with grass • Construct rain water harvesting system on buildings and install adequate storages • Construct the drainage system in a way to follow natural water channels • Landscape the power plant with grass in all open areas • Monitor exposed soil during rainy seasons for proper erosion control.
Wastes (Solid)	• Emphasis on prudent waste generation and give priority to reduction at source • Operator to contract a licensed waste handler to collect and dispose solid waste • Provide waste handling facilities such as labelled waste bins • Undertake solid waste management awareness to operators

DESCRIPTION	RECOMMENDED MITIGATION MEASURES
	Damaged solar panels and hazardous wastes • Dispose hazardous waste through a approved waste handler • Ensure proper labelling and handling of all hazardous products/wastes. • Ensure segregation from other waste streams
Wastes (Liquid)	*Sanitary wastes* • Provide adequate sanitary waste facilities for both genders clearly marked • Disposal of waste through septic tanks *Oils from vehicles* • All vehicles and equipment must be kept in good state to avoid leaks. • Create awareness for the employees on procedures of handling spills and leaks • Refuelling and maintenance of vehicles will not take place at the construction site. *Chemicals* • All chemicals should be stored within the bunded areas and clearly labelled detailing the nature and quantity of chemicals within individual containers. *Accidental fuel and oil spill* • Ensure quick response to hazardous materials' spill by a trained response team. • Establish proper waste management protocols for the disposal of used oil, fuel, and filters from equipment maintenance activities. • Implement a regular environmental monitoring program to check for any signs of contamination in soil, groundwater, and surface water near the plant. • Install oil-water separators in drainage systems to manage oil from stormwater.
Water consumption	• Any water leaks through damaged pipes and faulty taps should be fixed promptly. • Ensure prudent use of water. • Install water-conserving automatic taps.
Energy consumption	*Lightings* • Conduct periodic energy audits to evaluate lighting energy consumption. • Install an energy-efficient lighting system • Integrate lighting controls into the plant's energy management system to monitor and optimize energy use in real-time. • Regularly review and adjust the hybrid power system's configuration to optimize the balance between solar and BESS. • Replace conventional lighting with energy-efficient LED bulbs • Utilize daylight sensors to adjust indoor lighting levels based on the amount of natural light, reducing the need for artificial lighting during the day.
Impact to livelihoods from grazing land access restrictions	• Conduct regular monitoring of the livelihoods of affected pastoralists. • Continue consultations with local communities to assess alternatives. • Establish and maintain a grievance redress mechanism • Install livestock water points at strategic locations near alternative grazing areas. • Provide alternative livelihood opportunities for pastoralists • Support the development of pasture improvement projects
Trespassing of unauthorized personnel	• Fencing off the facility to keep of illegal access to the power plant. • Ensure controlled access to the site only with prior approval • Maintain records of any person who comes to site
Worker influx – Incoming Workforce	• Design separate worker accommodations for local and incoming workers. • Develop and implement waste management systems in all accommodation areas. • Encourage use of local suppliers of good and services to support local economy. • Ensure both the workforce and the local community have access to GRM. • Establish and enforce a strict code of conduct for incoming workers. • Maintain links with local communities to address any concerns on worker influx. • Prioritize the hiring of local workers to reduce the need for incoming workforce.
Gender-based violence	*GBV- SEA and SH* • Develop and implement a GRM that ensures confidential reporting of GBV cases. • Ensure that all employees sign Code conducts on GBV in employment contracts. • Establish Workers GRM with multiple channels including SEA/H channels. • Implement a code of conduct signed by all those with physical presence on site. • Prepare a SEA/SH Prevention/Response Action Plan, to manage the SEA/SH risks. *Inaccessibility of project benefits to VMGs and other vulnerable individuals due to affordability challenges* • Ensure VMGs individuals have to ensure they equally benefit from the project.
Labour disputes	• Conduct regular worker feedback surveys to understand any emerging disputes. • Ensure all employees have clear and legally binding employment contracts. • Ensure full compliance with national labor laws. • Establish an accessible and transparent GRM for all workers' disputes. • Implement fair and transparent disciplinary procedures.

DESCRIPTION	RECOMMENDED MITIGATION MEASURES
	• Maintain open communication between management and workers. • Promote equal opportunities and non-discriminatory hiring practices. • Set up a monitoring system to track and evaluate labor relations.
Child and forced labour	• Adhere to the ESS 2 provisions and FRS Employment Laws. • Ensure compliance with the national labor laws management practices. • Put visible signage on site "No Jobs for children" "Do not allow children". • Report any form of forced labour at the site.
Risks related to poor or inadequate stakeholder engagement (Conflict)	*Risks related to Inadequate stakeholder engagement* • Ensure timely and prior disclosure of project all project information. • Prepare a SEP that is proportionate to the identified stakeholders. • Prepare and implement a GRM to deal with all grievances. • Sensitize stakeholders on SEP and GRM. • The grievance redress committee to include representatives from the community. *Inadequate grievances management* • Work closely with the GRM committee members in solving the conflicts • Solve all conflicts/grievances at the earliest time possible • Monitoring the pattern of grievances to come up will long term measures • Ensure all grievances are logged and closed • Engage the community members and other stakeholders in a timely manner • Employ from the community to the extent possible
Occupational health and Safety	• All workers operating the project site must be equipped with appropriate PPEs. • Annual EHS audits should be done • Ensure all operators are skilled on firefighting management • Ensure only qualified staff are employed to work in the facility
Community health and safety risks	*Public Health Impacts* • Informing workers on local cultural values and health matters. • Allowing migrant workers time to be with their families • Ensure equal treatment of workers. *Shocks and electrocutions* • Develop and implement a reporting system for all safety risk and incidences. • Inspect the wiring of the houses before connecting power • Refraining from individual illegal extensions of power lines to other houses • Require community to engage a certified technician to do wiring in the premises • Undertake safety awareness campaigns to the community • Use of quality materials while wiring *Public Health Impacts –HIV/AIDs* • Allowing migrant workers time to be with their families • Sensitize workers and the community on prevention and mitigation of HIV/AIDS and other sexually transmitted diseases, through staff awareness and awareness campaigns for the community
Fire hazards	• 'No smoking' signs shall be posted within the power plant area • A fire Assembly point shall be identified and clearly marked at the facility • Develop and create awareness on fire management and response plans • Install and ensure the facility has proper and well-serviced firefighting equipment. • Install detection/alarm systems that can detect fire should be and installed • Workers especially operators of the plant must be trained on fire management
Security risks	• Continue engaging local communities to minimize any emerging hostility. • Deploy trained security personnel to guard the site 24/7. • Develop and periodically review contingency plans for worst-case scenarios, such as armed attacks, civil unrest, or natural disasters. • Ensure proper access control measures - only allowing authorized personnel. • Implement a vetting process for all employees to minimize risk of insider threats. • Maintain a secure perimeter with robust fencing of the site. • Maintain and regularly update a comprehensive security incident response plan • Maintain close coordination with local law enforcement and security agencies • Monitor local security developments and adjust security protocols accordingly.
Decommissioning Phase	
Impacts on landscape and visual	• Provide regular updates to stakeholders on decommissioning progress. • Install informational signs explaining the decommissioning process. • Implement a revegetation plan using native plants and vegetation. • Ensure proper management of all waste materials to prevent visual pollution. • Create a decommissioning plan that includes minimizing any visual impacts. • Conduct regular cleanup to remove any unsightly materials.

DESCRIPTION	RECOMMENDED MITIGATION MEASURES
Impacts on biological environment	• Develop and implement detailed site restoration plans. • Develop habitat protection plans to protect sensitive habitats, such as wetlands. • Ensure proper disposal of waste materials to prevent any harmful pollution. • Implement erosion control measures to prevent sediment runoffs. • Implement noise control measures to minimize disturbance to local wildlife. • Monitor and manage invasive species to prevent their spread in disturbed areas. • Undertake habitat restoration using native plants to promote ecosystem recovery. • Work with environmental specialists to implement effective mitigation measures.
Solid Waste Generation	• Safe transportation to the disposal sites / designated area • Hazardous waste must be disposed by approved waste handler • Ensure proper segregation of waste streams - hazardous and non-hazardous. • Ensure proper handling and storage of all demolition materials. • Ensure adequate collection and storage of waste on site • Demolition contractor to adhere to the various manufacturer's guidelines.
Wastes (liquid)	• Use environmentally friendly materials that generate less hazardous liquid wastes. • Provide training for staff on liquid waste handling to minimize risks. • Maintain an inventory of chemicals and hazardous substances. • Maintain accurate records of liquid waste management and disposals. • Identify opportunities for the reuse or recycling of liquid waste materials. • Establish temporary storage facilities for all liquid wastes to prevent leaks/spills. • Establish an emergency contact list and response procedures. • Ensure that all liquid wastes are disposed by licensed waste disposal facilities. • Develop a detailed liquid waste management plan outlining all procedures. • Conduct a comprehensive assessment to identify/categorize all liquid waste.
Noise and Vibration	• Demolish mainly during the day when most of the neighbours are out working. • Limit pickup trucks and other small equipment to a minimum idling time and observe a common-sense approach to vehicle use and encourage workers to shut off vehicle engines whenever possible. • Use quiet equipment (i.e., equipment designed with noise control elements).
Air quality (dust)	• Conduct regular inspections to identify potential sources of dust emissions. • Enforce speed limits for vehicles to reduce dust emissions from vehicle traffic. • Engage with local communities to inform them about decommissioning activities. • Implement soil stabilization techniques to minimize dust from disturbed areas. • Plan for site restore vegetation restoration to prevent dust generation. • Use water sprays or misting systems to dampen surfaces and reduce dust.
Air quality (vehicle fumes)	• Conduct scheduled checks to ensure emission controls. • Establish a reporting system for emissions data to track progress. • Implement a regular maintenance schedule for all vehicles to minimize emissions. • Train drivers/equipment operators on practices that limit emissions.
Water Resources	• Use temporary storage solutions to manage water supplies and reduce waste. • Provide training for personnel on water conservation practices. • Implement systems to recycle and reuse water for various tasks. • Implement measures to prevent leaks and spills from water storage. • Develop a water management plan that minimize water consumption. • Conduct assessment to evaluate water needs & identify reduction opportunities.
Impacts on Occupational health and safety	• Provide first aid facilities and ensure that trained personnel are available to respond to medical emergencies on-site. • Implement measures to control noise and vibration levels during decommissioning activities, such as using quieter equipment and scheduling high-noise activities appropriately. • Establish EPRP for incidents such as fires, chemical spills, and medical emergencies, and ensure all workers are trained in these procedures. • Ensure that all workers are equipped with appropriate PPE. • Ensure that all contractors and subcontractors adhere to the same occupational health and safety standards as the main contractor. • Develop and enforce safe work practices and standard operating procedures for decommissioning tasks, including equipment handling, dismantling, and waste disposal. • Conduct regular safety inspections to address potential hazards promptly. • Conduct a thorough occupational health and safety risk assessment.
Impact to livelihoods from grazing land access restrictions	• Engage with local communities to discuss the decommissioning process and gather feedback on their concerns and suggestions regarding grazing land access. • Invest in community development programs that provide alternative income-generating opportunities, such as skills training or support for small businesses. • Involve local leaders and organizations in the planning and implementation of mitigation measures to enhance community acceptance and participation.
Trespassing of unauthorized personnel	• Define and communicate restricted access hours during which the site is closed to unauthorized personnel. • Hold regular community engagement meetings to discuss security concerns and gather feedback

DESCRIPTION	RECOMMENDED MITIGATION MEASURES
	on improving site safety. • Install clear and visible warning signs around the site indicating that it is a restricted area and unauthorized entry is prohibited. • Partner with local community leaders and organizations to promote site security and encourage community members to report unauthorized access.
Worker influx – Incoming Workforce	• Consult with and involve local community in the decommissioning activities. • Establish and operationalize an effective GRM accessible to community members. • Include gender considerations in employment opportunities. • Prompt payment of workers as per the contractual agreements/terms. • Provide appropriate compensation for work done. • Respect for community values/culture. • Sensitize workers regarding engagement with local community. • Tap into the local workforce to the extent possible to reduce labour influx.
Gender-based violence	• Ensure that Code conducts on GBV are singed by all employers. • Establish Workers GRM with multiple channels including SEA/H channels. • Implement a code of conduct signed by all those with physical presence on site. • Prepare an SEA/SH Prevention/Response Action Plan, to manage SEA/SH risks.
Inadequate grievances management	• Implement a worker's grievances mechanism. • Ensure proportionate representation of VMGs in the local grievances committee. • Constitute a Local Grievances Committee is in consultation with all community segments, and incorporates the existing local dispute resolution mechanism.
Risks related to Inadequate stakeholder engagement	• Collaborate with local leaders and community organizations to facilitate trust-building and effective engagement with the community. • Develop a stakeholder engagement strategy that outlines the objectives, methods, and timelines for engaging with different stakeholders throughout the decommissioning process. • Ensure that women and vulnerable groups are actively involved in stakeholder engagement processes, addressing any barriers they may face in participation. • Organize public consultations and forums to solicit feedback from stakeholders, ensuring their voices are heard and concerns are addressed. • Provide regular updates and reports to stakeholders on the progress of decommissioning activities and how stakeholder feedback has influenced decisions.
Child and forced labour	• Report any form of forced labour at the site. • Put visible signage on site "No Jobs for children"; "Do not allow children". • Compliance with the national labor laws and labour management practices. • Adhere to the ESS 2 provisions and FRS Employment Laws.
Security risks	• Provide training on risk mitigation strategies for all personnel involved in the decommissioning activities. • Implement strict access control procedures to limit entry to authorized personnel only, including the use of identification badges or passes. • Establish partnerships with local law enforcement and security agencies to enhance overall security coordination and response. • Employ trained security personnel to monitor the site, control access, and respond to security incidents as they arise. • Conduct a thorough security risk assessment to identify potential threats.
Community health and safety risks	• Implement sustainable decommissioning practices that prioritize community health and safety while minimizing environmental impacts. • Implement measures to minimize noise pollution during decommissioning. • Implement dust suppression measures, such as regular watering of the site, to minimize dust emissions that can affect community health. • Establish a feedback mechanism that allows community members to report health and safety concerns related to the decommissioning process. • Ensure proper waste management practices to prevent contamination of land and water resources, which could impact community health. • Engage with local communities regularly to gather feedback, address concerns, and provide updates on decommissioning activities and safety measures. • Develop and communicate an emergency response plan that includes protocols for medical emergencies, environmental incidents, and community evacuations if necessary. • Develop a traffic management plan to control vehicle movement to and from the site, reducing risks of accidents and ensuring safe access for the community. • Conduct a comprehensive assessment to identify potential health and safety risks to the local community during the decommissioning process.
Fire hazards	• Conduct a comprehensive fire risk assessment to identify potential fire hazards associated with decommissioning activities and materials. • Create a fire safety plan that outlines prevention measures, emergency response protocols, and responsibilities for all personnel involved in decommissioning. • Ensure an adequate supply of water is readily available for firefighting purposes, including water tanks or ponds if necessary.

DESCRIPTION	RECOMMENDED MITIGATION MEASURES
	• Ensure the availability of adequate firefighting equipment, such as fire extinguishers, hoses, and water sources, in easily accessible locations throughout the site. • Establish communication and coordination with local fire services to ensure a rapid response in case of a fire emergency. • Establish fire breaks or cleared areas around the site to help prevent the spread of fire. • Minimize the accumulation of combustible waste materials on-site and establish a routine waste removal process. • Provide fire safety training for all workers, covering fire prevention, emergency procedures, and the proper use of firefighting equipment. • Store flammable materials in designated, secure areas away from ignition sources, following appropriate storage guidelines. • Use clear signage to indicate fire exits, assembly points, and locations of firefighting equipment throughout the site.

Estimated budget for the implementation of the ESMP

The total estimated budget for the implementation of the Environmental and Social Management Plan (ESMP) is projected at approximately USD 265,700. This budget covers a range of activities essential to ensuring compliance with environmental and social safeguards throughout the construction and operation phases. Key components include monitoring environmental impacts such as air quality, noise, and waste management, community engagement initiatives to address concerns and mitigate risks like gender-based violence (GBV) and occupational health and safety, capacity building for local stakeholders, and periodic reporting to regulatory bodies.

Stakeholder Analysis, Public Consultations and Disclosure

All the stakeholders engaged expressed strong support for the proposed hybrid power plant, acknowledging its potential to drive sustainable development in an area with significant agricultural potential. Generally, the project is viewed as a critical intervention to improve energy access and stimulate economic growth in both the district and the entire BRA, which could enhance the region's overall productivity and livelihoods. However, participants emphasized the importance of strictly adhering to the Environmental and Social Management Plan (ESMP) to mitigate potential negative environmental impacts and ensure that the project aligns with sustainability principles.

A recurring theme during the consultations was the demand for prioritizing local employment opportunities. Stakeholders underscored the need to ensure that the community benefits from the project's job creation potential, advocating for capacity-building initiatives to equip locals with the necessary skills. This preference reflects a broader desire to ensure inclusive economic benefits, fostering local ownership and reducing potential conflicts over workforce decisions.

Furthermore, stakeholders called on the investor to extend support toward improving physical and social infrastructure within the community. Recommendations included contributions to better roads, schools, and healthcare facilities, which are essential for maximizing the project's overall socio-economic impact. By addressing these community priorities, the project has the potential to gain even greater local buy-in, creating a model for sustainable and socially responsible energy investments.

Conclusion and recommendations

Conclusion

- This study found that negative social and environmental impacts can be mitigated, while positive impacts benefit the community. The project proponent, implementing entity, and contractor must adhere to environmental and social management plans, obtain permits, and have qualified personnel. ESIA proposes adequate mitigation measures.
- The ESIA analysis shows that the proposed power plant will have positive impacts on the FGS, BRA Region governments, and residents, including increased clean energy, employment, investment, and improved living standards. However, it also poses potential negative impacts like noise, dust, soil erosion, and increased resource demand.
- The Environmental and Social Management Plan (ESMP) has been developed to ensure sustainability of project activities from construction to decommissioning. It provides a general outlay of activities, associated

impacts, mitigation action plans, and monitorable indicators. Implementation timeframes and responsibilities are defined, and cost estimates for recommended measures are provided. A monitoring plan highlights environmental performance indicators, allowing for continuous review of operational and maintenance activities to identify trends in degradation or improvement and propose mitigation measures.

- The ESIA indicates that the proposed project will yield significant socio-economic benefits, a significant improvement over the "NO development option." Stakeholders agree it's overdue, and potential adverse impacts can be mitigated. The project will adhere to industry norms and standards, ensuring environmental sustainability. Mitigation measures will be integrated to comply with national and World Bank requirements.

Recommendations

The MoEWR and BECO are advised to implement the ESMP, conduct statutory EHS Audits during all the phases of the project, including regular evaluation of the project site's environmental performance against the recommended measures and targets outlined in this report. On the basis of the findings from this ESIA, the following specific recommendations can be made:

- Adherence to the mitigation measures as spelt out in the ESMP and monitoring of the same is mandatory to ensure environmental and social sustainability of the project.
- Undertake a supplementary biodiversity assessment and develop a biodiversity management plan (BMP) to be implemented during the full project cycle
- Contractor to ensure grievance redress mechanism is established and operational before commencement of the operation.
- Contractor to undertake habitat restoration programmes through planting of indigenous vegetation in all cleared areas to promote environmental sustainability
- Cultivate and maintain a good working relationship with the community members, and all other relevant stakeholders.
- Diligence on the part of the contractor and proper supervision by the MoEWR and BECO is crucial for mitigating the potential impacts and ensuring environmental, health, safety, and efficient operation of the project.
- EHS Audits shall be carried annually or as prescribed by the FGS Authority during the operational phase.
- Ensure social inclusion of the vulnerable groups by paying attention to the most vulnerable and provide ready boards as spelt out
- Stakeholder engagement to the carried out throughout the construction and operation and decommissioning phases.
- The BECO and the contractor shall adhere to relevant legal and regulatory framework to ensure compliance and success of the project.

Authorization opinion

The Horizon Development (HD) believes that this ESIA report provides enough information for decision-making on the project. It has been shown that the proponent's preferred alternatives and technological alternatives are generally acceptable. The ESIA has also identified essential mitigation measures to limit project impacts. The HD believes that the applicant's proposal should be approved on environmental grounds, provided essential mitigation measures are implemented. The HD believes that the anticipated negative impacts can be effectively mitigated, and that the proposed project does not pose a significant threat to environment and social aspects. The project should therefore be allowed to proceed.

1.0. Introduction

1.1. PROJECT BACKGROUND

Since 2012, Somalia has been working to achieve political stability and reconstruction. However, the aftermath of the conflict has left the electricity sector fragmented and inefficient[1]. The current national installed capacity of 276 MW in main load centres across the country is insufficient to meet present demand. A combination of high costs and irregular supply compound the electricity generation, transmission, and distribution has made Somalia ranked among the worst in the world for electricity affordability[2,3]. To address these difficulties, the Federal Government of Somalia obtained World Bank funding to support the efforts to increase access to cleaner and cheaper electricity supply and to re-establish the electricity supply industry through SESRP and ASCENT projects. The SESRP and ASCENT Development Objectives are to increase access to lower cost and cleaner electricity supply in the project areas and to re-establish the electricity supply industry in different load centres within the Federal Republic of Somalia". The Ministry of Energy and Water Resources (MoEWR) with a designated Project Implementation Unit (PIU) coordinate the SESRP and ASCENT projects. Overall, SESRP and ASCENT projects aim to support the Federal Government of Somalia (FGS) initiative of ensuring increased electricity access to the citizens.

The SESRP and ASCENT projects align with the country's Ninth National Development Plan (NDP-9) for 2020-2024 by contributing to key objectives such as economic diversification, infrastructure development, and energy access. In particular, NDP-9 emphasizes the importance of sustainable energy solutions to support economic growth and improve living standards. By integrating renewable energy sources, such as solar, with conventional power systems, the SESRP and ASCENT will help to reduce reliance on expensive imported fossil fuels, increase energy security, and promote environmental sustainability. The SESRP and ASCENT also support efforts to expand energy infrastructure, which is crucial for fostering industrial growth, job creation, and poverty reduction, in line with the development plan's broader goals of inclusive and resilient development. Table 1 summarizes the components of SESRP and ASCENT projects.

Table 1-1: Summary of SESRP and ASCENT projects components

SESRP	**Component 1:** Sub-transmission and distribution network reconstruction, reinforcement, and operations efficiency in the major load centers of Mogadishu and Hargeisa.
	Component 2: Hybridization and battery storage systems for mini grids.
	Component 3: Stand-alone solar off-grid access to public institutions (Health and Education).
	Component 4: Institutional Development and Capacity Building.
ASCENT	**Component 1:** Distributed Renewal Energy (DRE) with Solar PV (SPV) and Battery Energy Storage Systems (BESS) in the capital city of Mogadishu and other major load centers in the Federal Members States (FMS).
	Component 2: Electricity Distribution Network Rehabilitation and Reinforcement of the mini grids serving the Mogadishu capital city area and other FMS major load centers.
	Component 3: Sector Capacity and Institution Enhancement and Project Implementation Support.

1.1.1. Component 2: Hybridization and BESS for Mini-grid

This component under SESRP supports the enhancement of the capacities of electricity services providers (ESPs) to supply clean and affordable electricity to the consumers in the targeted load centres spread across the FGS. BECO is one of the key ESPs participating in Component 2 of the project and has made progress towards meeting the general requirements for enhanced production of clean and affordable electricity. For instance, BECO has already undertaken relevant feasibility studies and acquired adequate space to set up a hybrid power plant in Dharkenley District in BRA, and approximately 26km in the outskirts of Mogadishu City. Under the proposed arrangement, the MoEWR will provide overall coordination of the project and oversight during planning and implementation of the project. This will include overall coordination and oversight for safeguards due diligence,

[1] https://www.trade.gov/country-commercial-guides/somalia-energy-and-electricity
[2] https://www.trtworld.com/opinion/somalia-encourages-foreign-investments-to-fix-its-energy-crisis-12788824
[3] https://sominvest.gov.so/wp-content/uploads/Energy-Sector-Study.pdf

and implementation. BECO will be responsible for the implementation of the project during construction, operation and decommissioning phases.

An Environmental and Social Impact Assessment (ESIA) study is necessary under SESRP and ASCENT to ensure compliance with international and national environmental and social safeguards. The ESIA study is meant to evaluate potential impacts on the environment, communities, and local economies, identifying risks such as pollution, land use conflicts, biodiversity loss, and social concerns like labour conditions and community health and safety. Given the World Bank's stringent environmental and social standards, the ESIA ensures that the project adheres to best practices for mitigating negative impacts while enhancing positive outcomes, such as improved energy access and economic development. Additionally, the ESIA facilitates stakeholder engagement, ensuring that the concerns of local communities and other stakeholders are considered throughout the project lifecycle.

1.1.2. Justification for the ESIA

Conducting an Environmental and Social Impact Assessment (ESIA) for the proposed hybrid power plant project in Somalia, funded by the World Bank, is critical to ensuring that the project adheres to the World Bank's Environmental and Social Framework (ESF) and global best practices, and the existing national legal and regulatory frameworks. The ESIA helps to identify, predict, and mitigate potential environmental and social risks, such as air and water pollution, habitat disruption, labour conditions, and community health and safety. By doing so, it promotes sustainability, safeguards the well-being of local communities, and ensures compliance with national environmental regulations. Furthermore, the ESIA fosters transparency and stakeholder engagement, building community support for the project and ensuring that development benefits, such as increased energy access and economic growth, are balanced with responsible environmental stewardship and social equity.

1.2. OBJECTIVES OF THE ESIA

The main objective of this ESIA was to examine both positive and negative effects of the proposed hybrid power plant on the people, their property, and the environment particularly in the Project Area (Dharkenley District and the surroundings). The ESIA study further proposed measures to mitigate the negative impacts and enhance positive impacts during the construction, operation and decommissioning phases of the project. Directly linked to the main objectives were the specific objectives that included:

- Present an outline of the project background,
- Establish the environmental baseline conditions of the project area and review all available information and data related to the project,
- Identify key areas for environmental, social, health and safety concerns as well as the anticipated impacts associated with the proposed project implementation and commissioning,
- Undertake detailed analysis of project alternatives
- Undertake public consultations with the potentially affected peoples and other interested parties
- Establish a comprehensive environmental and social management plan (ESMP) covering the construction, operation and decommissioning phases of the project,
- Preparation of a comprehensive Project Report in accordance with the World Bank ESS1 guidelines and submission to the MoEWR for further instructions and/or approval.

1.3. SCOPE OF THE ESIA STUDY

The ESIA scope largely covered the following areas:

- Baseline Conditions: Environmental setting (climate, topography, geology, hydrology, ecology, water resources, sensitive areas, baseline information, etc.); socio-economic activities in the surrounding areas (land use, human settlements, economic activities, institutional aspects, water demand and use, health and safety, public amenities, etc.), and infrastructural issues (roads, water supplies, drainage systems, power supplies, etc.).
- Legal and policy framework: Focusing on the relevant national and WBG's EHSG in general and those relevant to power generation and supply in particular. The analysis further focused on the review of FGS and BRA laws and regulations relevant to the proposed project.
- Interactive approach was adopted for the immediate neighbourhood in discussing relevant issues including among others: land use aspects, project acceptability, social, cultural and economic aspects.
- Identification of Environmental impacts namely physical impacts, biological impacts and Legal Compliance.

- Development of ESMP for the proposed hybrid power plant.

1.4. TERMS OF REFERENCE FOR THE ESIA

The HD was assigned the task of carrying out Environmental and Social Impact Assessment of the proposed hybrid power plant. The scope covered various activities related to; project planning activities, construction works of the proposed development, which included all activities necessary to construct, operate, and decommissioning of the project. The output of this work is a comprehensive Environmental Impact Assessment project, which will aid MoEWR and the financiers in deciding on the project. The report is also in meant to ensure compliance with the World Bank's ESF - the proponent's development partners. The ESIA experts conducted the study guided by the following terms of reference:

- Establish the suitability of the proposed site/location to set up the hybrid power plant.
- A concise description of the legal and regulatory frameworks relevant to the project, description of the technology, procedures and processes to be used, in the implementation of the project.
- A description of the potentially affected environment/social economic and cultural setting of the project area.
- Consultation with stakeholders including the potentially project affected persons (PAPs).
- A description of positive and negative impacts of the project on the environmental, health, safety and social cultural aspects of the community
- Analysis of alternatives including project site, design and technologies
- Identification of the most appropriate mitigation measures/interventions against negative impacts during construction, operation and decommissioning.
- Development of an Environmental and Social Management Plan proposing the measures for eliminating, minimizing or mitigating adverse impacts on the environment and society, including the cost, timeframe and responsibility to implement the measures.

1.5. ESIA APPROACH AND METHODOLOGY

The approach chosen in undertaking this study considered World Bank's ESS guidelines, existing national legislations and guidelines relevant to the project; and international best practices. The study largely involved the understanding of the project background, the preliminary designs and the implementation plan. The approach and methodology applied during the study enabled collection of both primary and secondary data. Qualitative and quantitative methods of data collection were employed. Secondary data was obtained through literature reviews while primary data was obtained through physical observations, photography, checklists, interviews and stakeholders' consultation.

1.5.1. Key Activities Undertaken During the ESIA

The ESIA study for the proposed hybrid power plant involved a comprehensive assessment of both environmental and social impacts. Baseline environmental and socioeconomic surveys and analysis were done to gather data/information from both primary and secondary sources. Stakeholder engagement was crucial, with consultations held with different stakeholders, including the local communities, government bodies, and other stakeholders to gather input and address concerns. Risk assessments were performed to identify potential environmental and social impacts, and mitigation measures were developed to ensure compliance with regulations and minimize adverse effects, promoting sustainable development in the region.

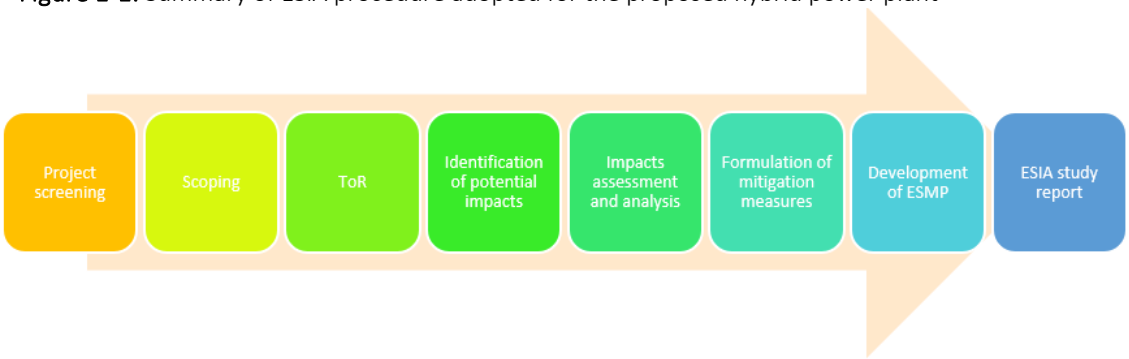
In summary, the following key activities undertaken during the study:

- Physical inspections of the proposed project area and site
- Literature review of relevant documents
- Stakeholder consultations with different stakeholders and project-affected persons
- Gathering environmental and socio-economic data of the area by use of checklist
- Continuous discussions with the stakeholders and accessing other sources of information on the proposed project details, the site planning and implementation plan,
- Photography and interviews with people in the immediate neighbourhood.
- Evaluation of the activities around the site and the environmental setting of the wider area.
- Report writing and submission.

The initial stage of this assessment was project screening. Other considerations made during this stage included a preliminary assessment of the environmental sensitivity of the proposed project area/site. This screening indicated that the proposed hybrid power plant falls under Category B (Moderate Impacts) – a project that has potential adverse environmental and social impacts that are site-specific, reversible, and can be mitigated with standard procedures. As such, a more focused Environmental and Social Impact Assessment (ESIA), including the development of an Environmental and Social Management Plan (ESMP) with specific mitigation measures. Figure 1.1 summarizes the basic steps used in developing this ESIA. The details can be described as follows:

- Step 1: Project concepts: The project details regarding; scope, design, implementation, tests, commissioning were first analysed. A feasibility study report was obtained and analysed.
- *Step 3: Project Screening:* Details about baseline conditions and potential environmental and social impacts were collected through desktop study, stakeholder consultations, site visits, photography, and inductive methods.
- *Step 4: Identification of Potential Environmental and Social Impacts:* The Potential Environmental impacts were identified, Classified and magnitude determined.
- *Step 5: Impact Assessment and Consultations:* The Environmental and Social Impacts were analysed, assessed and discussed in details involving consultations with the BECO and other stakeholders.
- *Step 6: Formulation of Mitigation measures:* Mitigation measures to ameliorate or minimize the potential Environmental and Socio – economic impacts were formulated for the entire project life.
- *Step 7: Development of an Environmental & Social Management and Monitoring Plan:* An E&SMMP for the project life was developed indicating parameters to be monitored, persons responsible, timing and costs involved.

Figure 1-1: Summary of ESIA procedure adopted for the proposed hybrid power plant



1.5.2. Desk Study and Literature Review

The main objective was to gather and analyse existing information relevant to the environmental and social impacts of the proposed hybrid power plant through secondary data sources with a clear focus on environmental conditions, social demographics, regulatory frameworks, and previous relevant studies. The study involved gathering information and data from several sources including government reports, academic research, industry reports, non-governmental organizations' reports, local publications and other relevant reports from the World Bank. We utilized academic databases (e.g., Google Scholar, JSTOR) and government and industry repositories to find relevant documents; and online Sources - search for relevant information on organizational websites, online journals, and other credible sources. From the information and data gathered, we undertook review and analyses that focused on summarizing key findings from each source, focusing on the relevance to the proposed power plant's impacts, identifying common themes, and gaps in information. This was followed with comparative analyses that focused on comparing our findings with other similar projects to assess potential impacts and mitigation strategies. The regulatory review focused on examining the existing regulations and guidelines (national, state and World Bank) to ensure compliance and identify necessary permits and approvals. Some of the documents reviewed included the feasibility study documents, various FRS legislations, World Bank safeguard policies, project frameworks (ESMF and RPF), topographical maps, Google Earth/maps, and other relevant documents, including targeted studies commissioned by BECO such as geotechnical studies and the MoEWR among other documents.

A critical literature review of secondary data focused on the followings:

- Relevant legislation and institutional framework governing the proposed project
- Licenses and permits requirements and conditions.

- Types of waste likely to be generated.

Documents relevant to the proposed development were reviewed.

1.5.3. Environmental and Social Baseline Assessments

To gain a better understanding of the environmental, socio-economic and cultural setting of the project site and it's surrounding the ESIA team needed to gather primary data. This entailed collection of the data using various tools and methods. Interviews, discussions, photography and observations and checklists are some of the methods employed in gathering the data needed from different stakeholders.

1.5.4. Public Consultations

The aim of the PC was to ensure that the opinions of all relevant stakeholders interested in a proposed project such as project affected persons, and the public in the vicinity of the proposed project are considered during project planning, design, construction, operation and decommissioning phases. The consultations also presented an opportunity for the community to raise issues and concerns pertaining to the project. Public consultations were conducted using standardized questionnaires and key informant interview guides. An interactive approach was adopted for discussing relevant information key among them being neighbourhood issues, project acceptability, social, cultural and economic aspects, and environmental Impacts.

1.5.5. Assessment of Physical and Chemical Parameters

No in-situ sampling of air, noise, soil analysis and water quality analysis. The assessment of physical chemical parameters relied mainly on secondary information gathered from literature for Mogadishu as gathered during the desktop studies for soil[4], air[5,6] noise[7,8] and water quality[9,10]. The most recent topographic and geotechnical study commissioned by BECO for the new project site was also a key reference document

1.6. TARGET GROUP FOR THE ESIA REPORT

The ESIA Report has been prepared for use by different stakeholders to be involved in the construction and operation of the proposed project. This report contains useful information on policies and procedures to be adhered to, implementation modalities, analysis of potential environmental and social impacts and suggested mitigation measures at various stages of project activities. The information will be useful in planning, implementation, management and maintenance of the project.

In this regard, the report is useful to the following stakeholders:

- Engineers to be involved in preparation of designs and plans for the proposed hybrid power plant.
- Contractors to be engaged in the construction works for the project
- MoEWR and other relevant FGS and Benadir Administrative Region Government ministries and agencies.
- Funding agencies
- Project affected persons and other stakeholders

1.7. KEY ASSUMPTIONS

The Experts made the following assumptions in preparing this ESIA:

[4]Farah, M. I., & Hassan, S. K. (2020). Soil degradation and land-use changes in semi-arid regions: A case study from Gaalkacyo, Somalia. African Journal of Soil Science, 8(2), 97-110. https://doi.org/10.1000/ajss.2020.12345

[5]Ali, F. Y., & Ibrahim, R. H. (2019). Air quality monitoring in urban centers of Somalia: Case study of Gaalkacyo city. Environmental Research and Policy Review, 22(4), 112-125. https://doi.org/10.1080/xxxx

[6]Mahmoud, A. S. (2018). Air pollution levels and public health implications in northern Somalia: Evidence from Gaalkacyo. International Journal of Environmental Science, 13(5), 77-89. https://doi.org/10.1111/ijes.2018.00099

Noise Quality Studies

[7]Omar, N. M., & Farah, A. H. (2021). Noise pollution and its effects on the urban environment: A study in Gaalkacyo, Somalia. Journal of Urban Environmental Studies, 14(2), 65-78. https://doi.org/10.1007/surbes.2021.01422

[8]Abdullahi, I. J. (2017). Noise levels and their impact on public health in Gaalkacyo city, Somalia. Environmental Health Perspectives, 19(3), 101-115. https://doi.org/10.1097/ehp.2017.10109

[9]Yusuf, H. A., & Ahmed, B. H. (2016). Evaluation of groundwater quality in Gaalkacyo, BRA, Somalia. Water Resources and Hydrology, 27(3), 245-260. https://doi.org/10.1002/wrh.2016.12321

[10]Mohamed, S. I., & Warsame, H. A. (2015). Impact of human activities on water quality in the Nugaal Valley: Case of Gaalkacyo, Somalia. Journal of Water Quality Management, 9(1), 33-47. https://doi.org/10.1007/wqm.2015.01017

- All the technical data and information provided by the proponent, implementing and the specialists are accurate and up-to-date
- The design features will be put in place to minimize risks from external factors which could threaten the integrity of the facility which include: risks from other natural calamities; measures to minimize threats or damage from third parties e.g., terrorist attack
- The BECO and the Contractor will implement the measures in the proposed ESMP
- The BECO will undertake monitoring to track the implementation of the ESMP to ensure that management measures are effective to avoid, minimize and mitigate impacts and that corrective action will be undertaken to address shortcomings and/or non-performances.

2.0. Project Description and Context

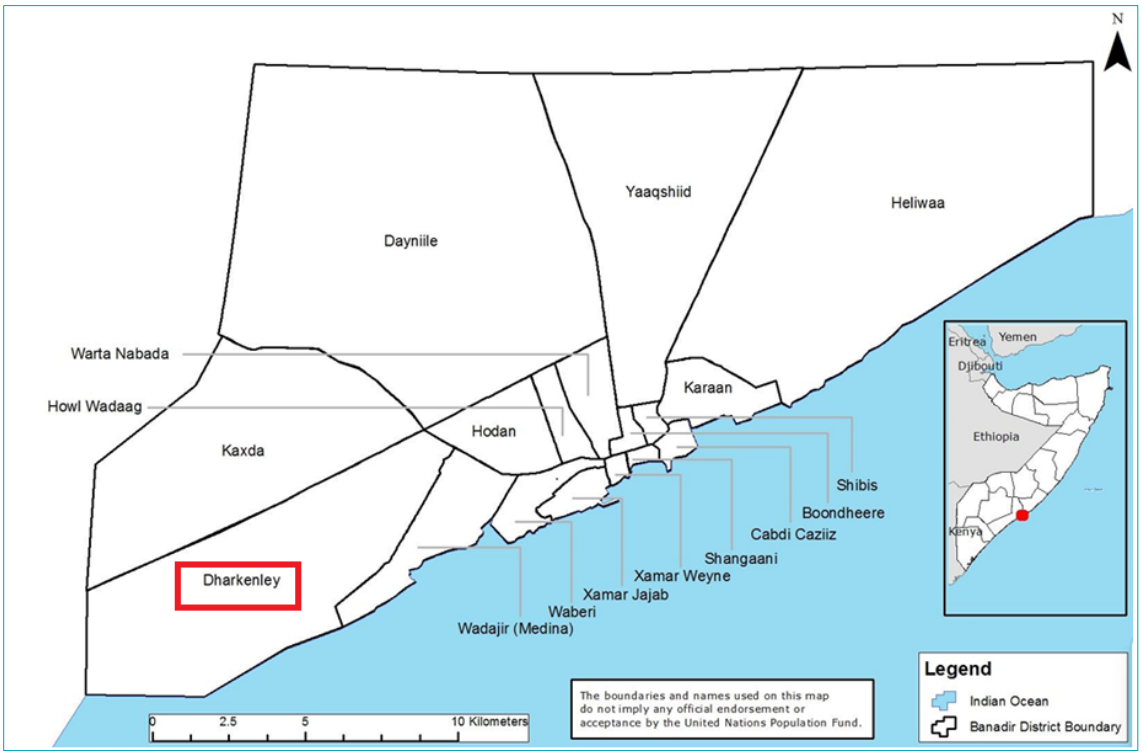
2.1. OVERVIEW

This section provides an overview of the present design for the proposed BECO Jazeera Hybrid Power Plant on the south-eastern outskirts of Mogadishu City's Dharkenley District. The description is mostly based on preliminary project designs, conversations with project engineers, field observations, feasibility studies, interviews, and available project documents provided by BECO and MoEWR.

2.2. LOCATION OF THE SITE

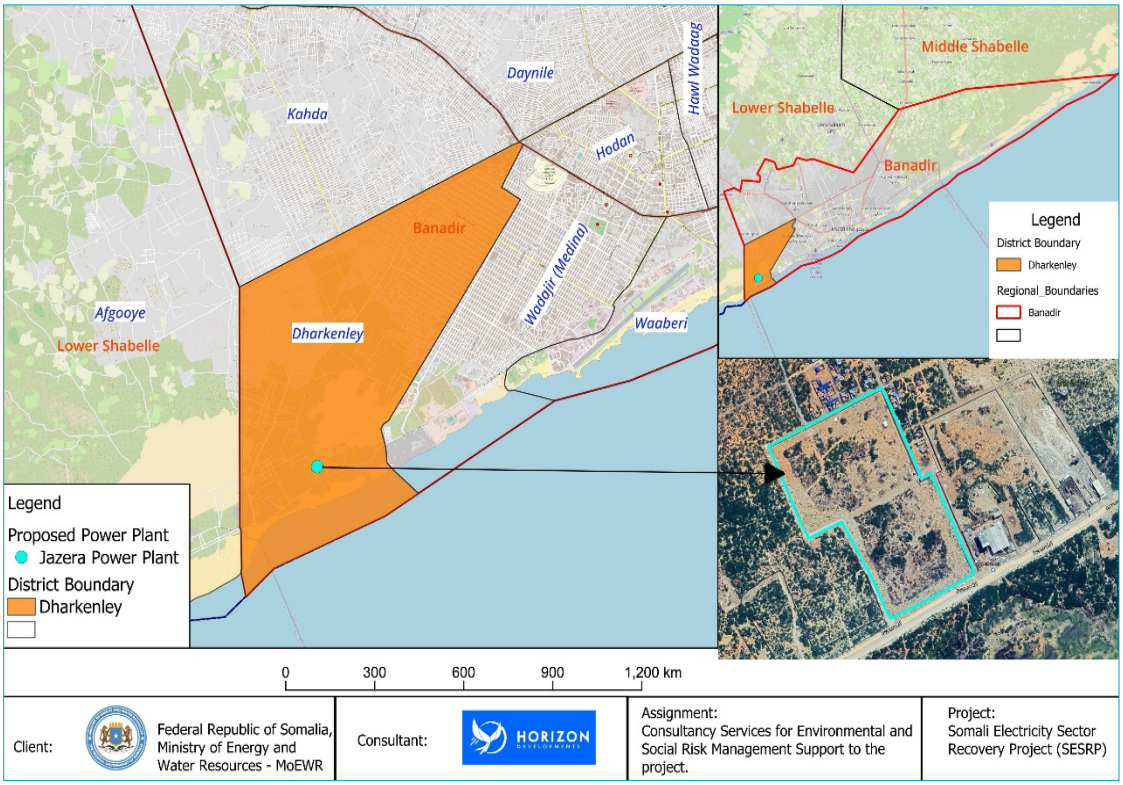
The projected BECO Jazeera Hybrid Power Plant (2°01'1.49"N, 45°18'12.78"E) will be built on the south-eastern outskirts of Mogadishu City in the Dharkenley District of the Benadir Administrative Region (Figure 2.1 & 2.2). The project site is in an open area with few towns nearby. Jazeera area is located in the south-eastern section of Dharkenley District of the Benadir region. The Project Site is roughly 26 km south of the proposed BECO substation in the Hamarweyne neighbourhood of Mogadishu City. The proposed power plant's total direct and indirect areas are projected to be within a 2km and 5km radius, respectively.

Figure 2-1: The location of Dharkenley District in Benadir Administration Region, Somalia



Source: https://uaps2019.popconf.org/uploads/190455

Figure 2-2: Location of the project BECO Jazeera Hybrid Power Plant site in the south-eastern outskirts of Mogadishu City, Somalia



2.3. PROJECT SITE AND SURROUNDINGS DESCRIPTIONS

Consultations with the local community indicated that the land is solely owned by BECO and has been acquired legally through willing seller-willing buyer arrangement. No objections were raised by the community about acquisition of the land by BECO for the development of the power plant. There was no evidence of the community using the area for watering their livestock. Pockets of vegetation comprising mainly of *Acacia-commifora bushes*, and plant species characteristic of coastal hinterland of Somalia[11] such as grass, perennial and sub-shrubs steppe (*Steppa graminosa, Perennierbosa esuffruticosa*), xerophyllous open woodland (arid zones) (*Boscaglia xerofila rada*), xerophyllous open woodland (semi-arid zones) (*Boscaglia xerofila*), and savanna - coastal formations (*Formazioni costiere*). The proposed site for the hybrid power plant will be located in a sparsely populated area characterized by vast open spaces. The landscape is largely undeveloped but is predominantly used for crop farming benefiting mainly from the nearby River Shebelle. The proposed project could promote local socio-economic opportunities, and will necessitate careful planning to balance community needs, land use priorities, and environmental management.

2.4. DESCRIPTION OF THE PROPOSED POWER PLANT

2.4.1. Overview

BECO, the largest electricity service provider in Somalia and Mogadishu City, operates as a vertically operated utility company that provides all services required for delivering electricity to end users. It powers major critical installations such as airports, ports, hospitals, factories, government institutions, diplomatic missions, and embassies. BECO has set clear plans for 2024-2033 to achieve a cumulative installed capacity of 227MW by 2033, focusing on renewable energy sources like BESS and PV solar. The company plans to upgrade its transmission network voltage from 33kV to 132kV to improve power transfer capability and reactive power stability, involving the addition of hundreds of kilometers of distribution. According to power generating data provided by the BECO for the period January 2021 to December 2023, diesel-powered generation is the still most prevalent and dominating source of power, accounting for around 71%, followed by 28% Solar PV and approximately 1% BESS.

[11] Pichi-Sermolli, R.E.G. 1957. Una carta geobotanica dell'Africa Orientale. Webbia 8, 129 pp

The proposed BECO Jazeera Hybrid Power Plant fits in the strategic vision of the company, and is expected to contribute to the current power generation mix by injecting additional power from the renewable energy sources. Under the proposed new hybrid power plant, BECO will require a new Supervisory Control and Data Acquisition (SCADA) system to control and monitor the operations of the new hybrid power plant. The new SCADA system shall be able to give preference to the generation sources to supply the load in the order of priority starting with solar PV (first priority) and batteries (second priority).

The anticipated investment in a new site will not trigger ESS5, ESS6, or ESS7, but ESS8 may be applicable if a chance find is discovered during the construction phase. Immediate steps should be taken to preserving any cultural assets, such as halting building activity around the find, hiring a heritage consultant, notifying authorities and local communities, and developing a protocol for future chance finds. This proactive approach respects and protects cultural heritage, aligning with ESS8 objectives and fostering responsible development practices. Overall, it would be important that the proposed project comply with ESS1, ESS2, ESS3, ESS4, ESS6, ESS8 and ESS10 guidelines during all the project phases from construction, and operation to decommissioning. In addition, compliance with the Federal State of Somalia and by-laws for the BRA need to be complied with in this new venture. Based on the feasibility study, the proposed project is category B as per the World Bank guidelines, and as such required environmental and social impact assessments.

2.4.2. Proposed Power Generation Capacity

A hybrid power plant consisting of solar PV and battery storage is proposed for the WB financing. The feasibility study recommends solar PV modules of 610W (211,575 pcs), inverter transformers (330kVA (371pcs), power conditioning units for batteries (bi-directional) (330kVA (256pcs), BESS (4.45MVA, 79pcs), step up transformers on PV side (6.8MVA, 21 pcs), and step up transformers on BESS side (6.8MVA, 15 pcs). Under the proposed arrangement, the project financing from the WB will not focus on any kind of diesel generators as a source of power generation. The Jazeera power plant is expected to operate for a period of twenty-five (25) years, after which it shall be decommissioned. The design for power evacuation and transmission from the proposed power plant has been completed

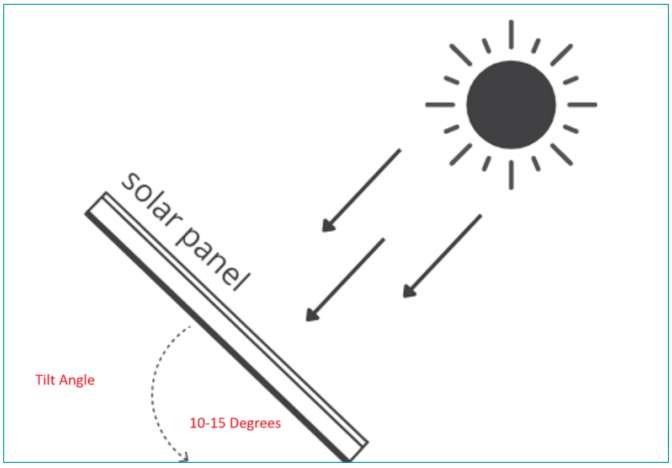
2.4.3. Architecture and Basic Design Specifications

The proposed BECO Jazeera Hybrid Power Plant will be built in accordance with International Electro Technical Commission (IEC) standards. It will include the installation of solar panels and BESS. The solar panels will link to the batteries via underground cables. The PV plant and battery capacity will be sized based on solar resources. In addition to the Design Architecture, the project site will contain a site office, a Control Room, and a guardhouse. The Solar PV hybrid system will consist of a centralised photovoltaic plant connected to a 3-phase 400V AC busbar line, which will also connect the multi-mode battery inverters.

2.4.4. Placement of the Solar PV Arrays

The PV array module support structure will be installed on the ground and have a concrete base. The support must have a tilt angle of 10°-15° from the horizontal (Figure 2.3). The support frame shall be made of either lightweight aluminium or galvanised steel, and it must be simple to install, maintain, and disassemble at the end of its life cycle. Cables used in solar PV systems must have a voltage rating, a temperature rating greater than 40°C above ambient temperature, be UV and water resistant, and be multithreaded. The PV inverter must be of the current source grid-tied type, capable of converting DC to AC Sinusoidal current. String inverters must be mounted indoors or outside under cover and suitable for desert environments.

Figure 2-3: Illustration sketch of the proposed tilt angle of the solar panels placement at the power plant



2.4.5. Powerhouse

The battery, multi-mode inverter, and all monitoring equipment will be put indoors with appropriate air ventilation per the manufacturer's specifications. Thus, a powerhouse or a containerised solution must be installed in accordance with the equipment manufacturer's requirements. All electrical boards and LV protection systems will be installed indoors.

2.4.6. Multi-mode Inverter

The Multi-Mode Inverter's primary role shall be to alter the instantaneous power consumed from the source based on the battery voltage. The solar priority function must be operated using an algorithm that automatically adjusts the input limit current. If there is sufficient energy on the DC side, the input limit current is reduced from its initial value.

2.4.7. Battery

Lithium-ion battery technology, which has a longer lifespan, less weight, and smaller size, is proposed for use at the BECO Jazeera power plant. The nominal voltage is not required; nevertheless, the voltage class (ELV or LV) controls the room's electrical isolation and accessibility. All batteries shall have a rated capacity of 2.16V at the C10 discharge rate, a monthly self-discharge of less than 5%, and at least 85% Coulombic efficiency. They will also have an energy conversion efficiency of at least 85% when new and charged to more than half of their capacity. The battery cycle life for discharge/charge regular cycles down to 80% DOD exceeds 1500 cycles.

2.4.8. Power Evacuation and Distribution

The power generated from BECO Jazeera Hybrid Power Plant will be evacuated through the proposed 4No circuits (2 circuits being an OHL and the other 2 UG). It will be then connected to a new proposed substation in Jazeera about 26KM away from the new power plant. A new 4No circuit of (double circuits each for OHL & UG) shall leave out and head towards the distribution substations of Hamarweyne and Macow in the city where further distribution shall be undertaken towards network distribution feeders to carry power to various distribution lines, which provides power to end users. Every possible measures will the taken to ensure that the TL and DL associated with the Jazeera Site do not trigger ESS5. For safety, transmission line shall be well marked, protected by grounding systems, and equipped with appropriate warning signs. Regular inspections and maintenance are essential to identify potential hazards like encroaching vegetation or structural damage, while public education on staying clear of power lines enhances overall safety.

2.5. THE PROJECT SITE

2.5.1. Site Ownership

The proposed project site is under the legal ownership of BECO. No compulsory land acquisition, displacement or resettlement is anticipated.

2.5.2. Access to the Project Site

The main road linking the site from Mogadishu is the Jazeera Road running along the coastal belt from the City towards the south (Figure 2-4). It is however, recommended that the power plant have one access road branching off from Jazeera Road approximately 26km from the proposed Hamarweyne BECO substation to be used during construction and operation phases. It is advisable that BECO constructs and maintains a new road to the Jazeera site to enhance access during the entire project cycle.

Figure 2-4: Location of the proposed BECO Jazeera Hybrid Power Plant in Dharkenley District of Benadir Region

2.6. PROJECT ACTIVITIES

A contractor selected through a bidding process will carry out the power plant's final design and construction. BECO and MoEWR will supervise construction to verify that all work is completed according to specifications. This is to ensure that excellent work is completed. It is anticipated that the proposed site will be modified during construction to accommodate the power plant and associated structures. This project's tasks include site clearance and levelling, civil works and construction of utilities and structures for the facilities, as well as the installation and connection of the power plant.

2.6.1. Construction Phase Activities

All construction activities, including ground preparation, earth moving, materials delivery, building, walling, roofing, and the installation of amenities (power, water, communication equipment, etc.), fittings (doors, windows, safety provisions, etc.), will be carried out by competent personnel obtained through contractors, ensuring a consistent high standard of finish and excellent value for money.

2.6.1.1. Outline of the construction activities

Construction activities will involve the following:

- The contractor shall perform site investigations in good time to ensure appropriate designs and construction is done on a sound engineering basis.
- Storage and utilization of materials
- Solid waste collection and commissioning of the plant.
- Site preparation (ground-breaking, clearance of vegetation, preparation of a site office and stores, fencing to avoid intrusion)
- Remedying of defects after functional tests
- Procurement of construction materials and delivery of the same to the site
- Post construction clean–up, restoration and landscaping of site

- Load testing
- Installation of the solar panels
- Disposal of any soil that could is not required, excavations/earth moving, filling and foundation laying
- Construction of fuel storage tank
- Completion of the plant
- Civil, mechanical, and electrical works
- Cabling
- Building works, trampling and removal of construction wastes

During construction, the contractor shall observe safety and shall erect warning signs to warn on any potential hazards, ensure proper and efficient use of Personal Protective equipment (PPE) for all on site and observe safe work procedures.

2.6.1.2. Construction materials, equipment and services

All materials to be used in construction of this project shall be of high quality in line with the international standards. Sufficient materials and equipment shall be purchased and stored on site to avoid wastage.

2.6.1.3. Input materials and equipment & machinery

Work and construction operations must use high-quality construction materials and techniques to assure excellent work, occupational and public safety, and environmental protection. Construction will require the following inputs and equipment:

- Welding machines, wheelbarrows
- Water
- Timber (e.g., doors and frames, fixed furniture, etc.),
- Solar panels
- Sand
- Raw construction materials (sand, cement, natural building stone blocks, hard core, gravel, concrete among others).
- Poles
- Plumbing equipment
- Paints, solvents, whitewash, etc.,
- Meters
- Lorries
- Lightning arrestors and steel structure members
- Labour force (of both skilled and unskilled workers).
- Hardcore
- Glass
- Excavators
- Electrical equipment
- Conductors
- Concrete mixers
- Bus bars, switch gears, circuit breakers
- Building stones

2.6.1.4. Use of services and resources

- *Water:* Water will be necessary for potable usage, as well as for foundation construction and other purposes. Instead of using the community's water resources, the contractor will source water elsewhere. One important alternative is for the contractor to sink a borehole to deliver water throughout the project's phases. During building activities, water will be utilised mostly for sanitary support services (particularly for workers), palliating soil piles to suppress dust, drinking, and other purposes. Cleaning solar panels normally requires 2-4 litres each panel. To estimate the water consumption for solar panel cleaning, multiply the total number of solar panels by 3.5 litres to get the total volume each cleaning session.

- *Labor:* The contractor(s) will determine the size and mix of the workforce. The contractors will follow all applicable employment laws in the FGS and maintain compliance with the World Bank's ESS2. It is recommended that the contractor recruit unskilled labour from within the district.

- *Sewerage:* The sewage flow is expected to be insignificant throughout the building phase. On-site sanitation will consist of a serviceable facility that will be serviced on a periodic basis.

- *Electricity:* Electricity will be required for the proposed project's development and operation. During construction, the contractor must have portable diesel generators on hand for fabrication and welding as needed, although BECO will provide electricity for operations.

2.6.1.5. Construction supervision and safety

Throughout the construction phase, supervision shall be carried out by the BECO to ensure:

- Any work involving deep excavations, elevated heights and lifting heavy loads, poses a number of risks to personnel. The contractor shall develop a worksite plan before commencement of each of the construction. This will ensure that personnel are equipped with the correct protective clothing and equipment and are ready to work safely while also safeguarding the environment.
- Emergency response procedures are in place and all workers are aware of them like in case of fire.
- Motorized equipment is checked to ensure that they are in good working condition, safe to use and produce minimal noise levels and reduced smoke emission.
- Proper disposal of waste material and toilet facilities are provided for construction workers.
- Provision of first aid kit and firefighting equipment (portable cylinders) and placement at strategic positions for access.
- Workers shall be provided ablutions facilities and changing rooms.
- Workers use personal protective equipment (such as hand gloves, helmets, safety shoes, earmuffs, overalls and dust coats) at all times as is appropriate.

2.6.2. Operation Phase Activities

BECO shall run and maintain the power plant. During the project's operation period, no unauthorised person shall have access to the power plant. This is consistent with BECO policy, which is to safeguard the safety of both employees and the public. Routine maintenance must be carried out under the supervision of authorised BECO personnel. Throughout the project's life cycle, the BECO must follow all EHSG guidelines and any other applicable regulations in the FRS.

2.6.3. Decommissioning Phase Activities

BECO shall submit a decommissioning plan to relevant authorities in the FRS in good time prior to decommissioning. The decommissioning plan should include a restoration plan. At the decommissioning/demolition phase, the following activities will take place;

- Demolish and carefully handle components that contain oil and fuels
- Demolish and remove all the concrete works
- Ensure proper handling of the demolished materials and have an authorized and guided transportation and disposal away from human settlement, water bodies and wildlife conservation areas.
- Given that the lifetime of a lithium-ion battery is expected to expire after 17 years yet the power plan is to operate for 25 years, a replacement plan will be implemented to ensure continued functionality. This shall include procuring and installing new batteries or upgraded storage technologies, safely recycling or disposing of expired batteries in line with environmental regulations, and allocating funds for the replacement. Battery replacement shall be coordinated with routine maintenance to minimize downtime. Additionally, this shall present an opportunity to adopt newer, more efficient technologies that could enhance the plant's performance for the remainder of its operational life.
- Removal of electrical fittings, bus bars and steel poles/structures
- Removal of Solar panels and their associated switching equipment’s

3.0. Policy, Legal and Regulatory Framework

3.1. OVERVIEW

This section gives the legal and regulatory framework relevant to the proposed project. Due to FRS's political instability, there is a lack of well-developed environmental laws and administrative frameworks. As a result, environmental and natural resources management matters have been managed using existing statutes. FRS is now working on strengthening its environmental management systems. For instance, a draft environmental and social impact assessment and audit regulations has been finalized[12]. Despite recent constitutional reforms defining natural resources and ecosystem services as public assets, significant gaps remain in environmental legislation implementation in the FRS. Based on evaluations and reviews, several federal and BRA by-laws were relevant and will apply to the project. Additionally, the WB ESS applicable to the project were reviewed and their relevance described.

3.1. NATIONAL LAWS AND REGULATORY FRAMEWORK

3.1.1. Provisional Constitution of Somalia

The Provisional Constitution of Somalia, which was ratified in 2012, emphasizes the value of safeguarding the environment and managing the country's natural resources, particularly in Articles 25, 44, and 45 (which deal with the environment, natural resources, and land, respectively). Relevant provisions include:

- Article 25 guarantees Somali citizens' rights such as a share of the nation's natural resources, protection from excessive exploitation, a healthy environment, and protection from pollution and harmful materials.
- Article 44 mandates the federal government to prioritize environmental protection, conservation, and preservation, preventing harm to natural biodiversity and the ecosystem.
- Article 45 encourages the Somali people to actively participate in the development, execution, management, conservation, and protection of natural resources and the environment.

The Constitution provides for the protection of workers' rights, non-discrimination, human rights promotion, and defence against gender discrimination and GBV in the workplace. Articles 11 ("Equality"), 14 ("Slavery, Servitude, and Forced Labour"), 15 ("Liberty and Security of the Person"), 24 ("Labour Relations"), and 27 ("Economic and Social Rights") contain important clauses.

- According to Article 11, "all citizens shall have equal rights and duties before the law, regardless of sex, religion, social or economic status, political opinion, clan, disability, occupation, birth, or dialect." In addition, it says that "even if the actor did not intend this effect, discrimination is deemed to occur if the effect of an action impairs or restricts a person's rights." It further states that the official on the grounds of age, race, colour, tribe, ethnicity, culture, dialect, gender, birth, handicap, religion, political opinion, occupation, or wealth shall subject no one to discrimination and that this prohibition applies to all official programs.
- "A person may not be subjected to slavery, servitude, trafficking, or forced labour for any purpose," according to Article 14.
- Every person has the right to physical integrity, security, and personal liberty, according to Article 15. "The prohibition of all forms of violence, including any form of violence against women, torture, or inhumane treatment" is one of the provisions that falls under this category.
- Article 24 states that "all workers, particularly women, have a special right of protection from sexual abuse, segregation, and discrimination in the workplace." It also enshrines everyone's right to fair labour relations. All labour laws and practices must adhere to the principle of gender equality in the workplace. It also guarantees every worker the freedom to organize and become a member of a trade union, to go on strike, and to negotiate collectively with employers, trade unions, and employees on labour-related matters.
- People's access to clean, drinkable water, healthcare, social security, and the realization of their constitutional rights is upheld by Article 27. Additionally, it says, "It shall be ensured that minorities who have long faced discrimination, women, the elderly, and people with disabilities get the necessary support to realize their socio-economic rights."

[12]Ministry of Environment and Climate Change (2024). Final draft environmental and social impact assessment and audit regulations. Ministry of Environment and Climate Change, Mogadishu, Federal Republic of Somalia.

Relevance
The proposed project aligns with Somalia's Provisional Constitution by proposing mitigation measures for social, health, safety, and environmental issues for sustainable development. It aims to produce clean, reliable electricity, enhancing the FRS objectives of reducing global warming through reduced greenhouse gas emissions in electricity generation.

3.1.2. Federal and State Regulations on Environmental, Health, and Safety

Somalia is developing its environmental laws and policies, with a National Environmental Policy and National Environmental Act drafted by the FGS and approved by the Cabinet in February and November 2020 respectively. These documents require Parliament authorization and have no set schedule. The MoECC is drafting national environmental policies, regulations, and laws, including Environmental Quality Standards, Sectoral Environmental Assessments, Environmental Impact Assessments, and Environmental Audits, to coordinate ESIA activities in the FRS. There is consensus at both national and state levels that international standards and best practices should serve as a foundation for conducting ESIA.

Relevance
BECO and contractors are required to adhere to environmental and quality standards as per the draft national environment act. They must develop and implement a formal construction health and safety plan, establish a health and safety committee, ensure workers undergo medical examinations, and ensure equipment is serviced properly. They must also conduct a fire risk assessment, develop an emergency preparedness and response plan (EPRP), implement mitigation measures to prevent nuisance dust impact on neighbouring properties, and observe existing provisions in the FRS on traffic management of construction vehicles as guided by the ESMP. These measures are crucial to ensure the safety and quality of the project.

3.1.3. Somalia's Ninth National Development Plan

Somalia's ninth National Development Plan (NDP-9)[13], covering the period 2020-2024, identifies recurrent drought, climate change and environmental degradation as major causes of poverty and food insecurity in Somalia. The NDP-9 prioritizes environmental management, gender and social equity. It focuses on increasing energy supply, particularly from renewable sources, and energy market regulatory reform. Unregulated power production poses a major economic and environmental challenge, leading to high electricity prices and forest destruction. Access to energy is crucial for economic growth and poverty reduction, and the NDP-9 prioritizes investment in the energy sector and energy market regulation. Somalia intends to implement the Power Master Plan (PMP) with support from the World Bank, increasing the supply of renewable energy and establishing regulatory bodies to enhance market efficiency. The PMP highlights the need to diversify energy portfolios and lessen reliance on fossil fuels while identifying supply-side issues such as inadequate capacity for the production of power. Particularly for women and young people, renewable energy can speed inclusive growth and create jobs.

Relevance
The proposed project supports the NDP-9 aims of increasing electricity generation capacity from renewable resources and reducing tariffs, thereby contributing to human and economic development.

3.1.4. Environmental Protection and Land Use Policy and Regulation

Somalia's environmental protection and natural resources are under limited federal oversight, with the National Environmental Policy and Act approved by the Cabinet but not yet passed by Parliament. A Climate Change Policy has been developed, but standards and regulations for pollution prevention, waste management, water quality, air quality, and noise have not been formulated or approved. Land use policy and regulation oversight mechanisms are also lacking.

Relevance
The proposed project will contribute to protection of the environment and climate change mitigation by increasing electricity generation capacity, especially by working towards focusing more on solar electricity production systems thereby reducing GHG emissions.

[13]The NPD-9 is available here: http://mop.gov.so/wp-content/uploads/2019/12/NDP-9-2020-2024.pdf

3.1.5. Labour and Employment Law

The Labour Code of Somalia (Law No. 65, adopted in 1972), governs labour and working conditions, including employment contracts, terms and conditions, remuneration, occupational health and safety, trade unions, labour authorities, and maternity leave. The code is currently being reviewed to align with the Provisional Constitution and International Labour Organization (ILO) conventions. The Federal Ministry of Labour and Social Affairs is reviewing the revised draft, which was finalized in February 2019 and awaits Parliamentary approval. The current Labour Code remains in effect until the revised code becomes law. The State laws on labour and employment are also under review to align them to the Provisional Constitution and ILO standards.

Relevance

The proposed project must adhere to the Labour Code (1972), ILO conventions, and the Provisional Constitution during construction and operation phases. BECO and contractors must follow existing labor laws, including amendments, and ensure employee management. They must maintain insurance, conduct accident investigations, and conduct pre-employment and medical examinations. They must also prevent child labor and abuse.

3.1.6. Policy and Law on Gender Equality and GBV

Gender Based Violence (GBV) remains one of the most serious threats to the health and safety of women and girls globally. The situation is dire in Somalia where women are girls are at more risk of rape, Intimate Partner Violence (IPV), early and forced marriage and FGM. The Somalia context is fraught with GBV and protection concerns, especially for women and girls[14]. For example, a recent study on GBV in Somalia[15] found out that 18.5% of the women and girls in the IDP camps had experienced gender-based violence in the last 12 months. Further investigation into the nature of the violence revealed that 44.0% of the violence against women and girls were physical assaults, followed by psychological abuse (24.8%), forced marriage (18.8%), attempted rape (7.2%), rape (4.0%) and denial of resources (1.6%). The study showed that about half (57.7%) of that violence were committed by intimate partners or relatives, mostly (60.6%) during the daytime. Moreover, a little over half (57.7%) of the victims were over 20 years old, and 43.7% of them experienced assault more than once.

The Federal Council of Ministers approved Somalia's National Gender Policy (2016). The Policy aims to promote gender equality and sustainable human development by valuing women and men's contributions in economic empowerment, education, health, and political transformation. The policy outlines gender priorities in health, education, economic empowerment, and political participation. Prioritizing rural areas, the policy focuses on creating economic opportunities for both genders, including vocational, entrepreneurs, and skills enhancement programs and training for women and men, including those with disabilities. The FGS has drafted the Sexual Offenses Bill (2017) with support from the UN, which has been tabled with the Parliament and is still under review. The pre-existing Penal Code (1962) includes some provisions relevant to addressing GBV, including criminalizing rape, but it does not provide an adequate legal framework for dealing with GBV cases[16]. In practice, most GBV cases are dealt with by the customary system.

Relevance

In the absence of appropriate measures, the project can exacerbate gender inequalities and sexual and gender-based violence. In adherence to this policy, measures will be put in place to ensure gender inclusivity in decision-making, employment opportunity and access to the energy generated by the project, and mitigate social risks including sexual and gender-based violence, and any form of discriminations.

3.1.7. Somalia's Power Master Plan, 2018

Developed by government of Somalia in coordination with the World Bank, the PMP seeks to create an enabling environment for independent power producers and the policy, legal and regulatory framework for the sector.

Relevance

The proposed project will be a forerunner for independent renewable power producers and will serve as a model for similar renewable energy plants in other locations in Somalia.

[14] file:///C:/Users/pc/Downloads/GBV%20Bulletin%20Apr%20-%20Jun%202018%20Final-1.pdf
[15] Hassan, A.D., Mohamed M.D. & Bashir, S.H. (2023). Prevalence, patterns, and determinants of gender-based violence among women and girls in IDP camps, Mogadishu-Somalia. Journal of Migration and Health, Volume 8. https://doi.org/10.1016/j.jmh.2023.100193.
[16] See UNDP, UN Women, and UNFPA, 2018. Somalia Gender Justice and the Law. Available at https://www.undp.org/content/dam/somalia/docs/Project_Documents/Womens_Empowerment/Gender%20in%20Somalia%20Brief%202.pdf for a review of the Penal Code (1962) provisions relevant to GBV.

3.1.8. Energy Policy and Regulations

Currently, the FGS lacks both an energy sector regulatory framework and an energy policy. However, the FGS has made the creation of an energy policy, strategy, and regulatory framework a top priority, in accordance with the NPD-9 and Power Master Plan (PMP), and a number of laws and rules are being developed. Currently, the responsibility for managing the energy industry rests with the Federal Ministry of Energy and Water Resources (MoEWR). A draft Energy Policy was created by the MoEWR in 2018, and in order to give the industry a complete framework, they are currently working on an Energy Act and Regulations. The World Bank, African Development Bank (AfDB), and United States Agency for International Development (USAID) are some of the main partners supporting the implementation of the PMP and providing technical assistance to the FGS in the energy sector. In the absence of regulations, standards and codes of practice, there is little mechanism to vet and enforce ESP services quality, health and safety standards. This is further compounded by the limited capacity of federal and state institutions to develop, enforce and monitor the sector. Currently, the Federal and State MoEWR are mandated to issue operating licenses to power plant. However, there are no licensing guidelines and there is not yet any legal basis to regulate their operations once licenses are granted.

Relevance

- *The proposed project shall align it operations to the Somalia's Power Masterplan[17] and ensure that they operate within the principles of the existing energy policy and regulations. The proposed project is relevant in the sense that it will provide sustainable and reliable energy supply, including applying measures to protect and conserve the environment during its construction and operation phases. MoEWR will work closely with BECO to ensure the project complies with the current energy policy and regulations, and any amendments thereof.*
- *The proposed project is in line with the energy policy and regulations in the following ways: (i) the proponent (BECO) has identified and designated a site for the proposed project, and the proposed project is aligned the Somalia Power Masterplan. Additionally, and in collaboration with the MoEWR, there is technical capacity to undertake the project under SESRP.*

3.1.9. Somalia's Intended Nationally Determined Contributions (INDCs), 2015

Somalia, despite the prolonged civil conflict and least development status, has a great potential to achieve sustainable development and to contribute in the reduction of Green House Gases (GHG). There are already signs of recovery that could utilize renewable energy, including solar, wind, hydropower and geothermal energy resources. There are some development initiatives in solar energy utilization in the capital Mogadishu and some cities in Puntland and Somaliland. In addition, there are considerable renewable energy potential throughout Somalia as indicated by a recent report of Federal Government of Somalia (FGS) and the African Development Bank (AfDB), (FGS, AfDB, 2015). The solar energy potential ranges from 5 to 7 kWh/day with over 310 sunny days in a year, which amounts to 2500 to 3000 hours of sunshine per annum.

Relevance

The project will reduce GHG emissions, helping Somalia meet its Paris Agreement commitments.

3.1.10. Customary Legal System and Sharia law

Somalia's legal system comprises of civil law, sharia law, and customary law. The Provisional Constitution (2012) defines the country's federal structure and hierarchy of laws. The customary legal system in Somalia, known as the *xeer* system, is crucial for land rights and resource management due to weak formal regulation. This system governs property, enforces contracts, and resolves disputes. Despite variations across regions and clans, it is applicable in most of the country. The *xeer* system is compensatory, majoritarian, and uses clan insurance to protect against violations. Elders act as judges or mediators, considering precedent and custom. The customary *xeer* system also handles most cases of sexual violence and GBV. The FGS and some Federal Member States are making efforts to reintroduce law courts, but the capacity of and trust in the formal justice system remains weak, and the customary system functions in parallel to state law. A number of customary practices go against basic human rights standards and serve to re-victimize GBV survivors, for example, crimes of rape are commonly resolved through the marriage of the victim to the perpetrator, and revenge and honour killings are tolerated[18]. Numerous cultural and institutional barriers limit women's access to justice, including fear of punishment, reprisals and harassment for reporting GBV incidents, and social stigma[19].

[17] https://moewr.gov.so/wp-content/uploads/2020/07/Master_plan1.pdf
[18] See UNDP, UN Women, and UNFPA, 2018 for further discussion of how the customary system handles GBV cases as well as other barriers to access to justice for GBV survivors.
[19] UNDP, UN Women, and UNFPA, 2018.

Relevance

- *The power plant is required to operate under the existing customary laws within the states where their projects are located. They are further expected to respect the existing customary laws in handline their relationships with all the stakeholders they engage in their areas of operation.*
- *The land proposed for the project has been legally acquired by BECO under willing buyer-willing seller. Additionally, the land's tenure falls under customary land rights. BECO will observe all the relevant provisions of the customary legal systems and sharia laws related to land management (as appropriate) in all phases of the project.*

3.2. Benadir Administrative Region By-Laws and Guidelines

3.2.1. Overview

Benadir Regional Administration (BRA) is a local government entity, established in law and enshrined in clause 1(b) of article 48 of the Constitution of the Federal Republic of Somalia, which relates to the structure of the state. Benadir is one of the 18 administrative divisions of Somalia established at independence in 1960. Benadir itself is comprised of 17 administrative districts that make up the city of Mogadishu, which is also capital of the federal republic. The BRA bears the dual responsibility of managing the affairs of the region as well as the municipality of Mogadishu. Thus, its administrative head is also the governor of the region as well as mayor of the city. Law Number 6 relates to local government and its older version, Law 19, clearly defines the mandates to provide basic services to the city of Mogadishu, including health services. The BRA has established environmental management guidelines to promote sustainable development and safeguard natural resources. These guidelines encompass the supervision of waste management systems, including landfill operations, and the efficient transportation of waste to prevent contamination of air, land, and water sources. They also involve the development and implementation of new waste disposal schemes, ensuring compliance with current legislation, and engaging with residents and community groups to address waste management concerns. Additionally, the BRA has set up a public complaints committee to handle environmental and waste-related issues and has formulated environmental policies to govern the management of the environment.

3.2.2. Benadir Administrative Region Waste Management Policy (2016)

The BRA Waste Management Policy (2016) provides a comprehensive framework aimed at addressing waste management challenges in BRA, Somalia. It emphasizes the need for effective waste collection, transportation, and disposal systems, with a focus on minimizing environmental pollution and health hazards. The policy promotes waste reduction, recycling, and the safe handling of hazardous materials, while encouraging community participation and private sector involvement in waste management initiatives. It also seeks to strengthen institutional capacity, legal frameworks, and public awareness to foster sustainable waste management practices that protect both human health and the environment. The functions of this policy law include:

- Supervision of waste management schemes, such as at landfill sites;
- Supervision of the transportation of waste to ensure that it takes place efficiently without contaminating air, land or water sources;
- Assistance with the development, promotion and implementation of new waste disposal schemes;
- Ensuring compliance with current legislation in the transportation, handling and disposal of waste;
- Consultations with residents, community groups, housing associations and traders' associations about waste management issues, identify their requirements and provide appropriate solutions
- Establishment of a public complaints committee that deals with environmental and waste complaints;
- Establishment and implementation of environmental policies that govern management of the environment

Relevance

The policy emphasizes waste reduction, proper handling, and disposal of hazardous materials, and the importance of minimizing pollution. By adhering to these guidelines, the power plant can manage its waste streams responsibly, prevent environmental contamination, and align with best practices for waste management. This alignment not only helps in complying with regulatory requirements but also supports broader environmental protection goals and contributes to sustainable development in the region.

3.2.3. Benadir Administrative Region Interim Legal Framework on Employment and Livelihoods

The framework was developed through close collaboration with a wide range of stakeholders, including the Mayor and Vice-mayor of Mogadishu; the President's Office; the Prime Minister's Office; the Ministries of Justice, Public Works, and Natural Resources; technical experts in urban planning, engineering, and law; and representatives from civil society. The stakeholders agreed on five priority components that support SECIL's main aims (employment generation and improved livelihoods in Mogadishu):

- Investment, business, and employment law
- Urban services and standards law
- Good governance laws and rights
- Building regulations
- Civil society and professional associations law

These five legal instruments present a sound legal framework that strengthens investment, business, and employment law and enables the regional administration to apply and enforce laws that positively influence investment and development in the Benadir Region. The ratification and endorsement of this new legal framework increases the accessibility of the laws and ensures that they are equitable and benefit the general populace. The participatory approach adopted throughout the development of these laws has increased ownership and acceptance, allowing these basic principles to serve as a springboard for the establishment of further national-level laws and regulations.

Relevance

This framework emphasizes job creation, equitable hiring, and compliance with labour standards, ensuring that employment opportunities generated by the project benefit local communities. The power plant can align with these guidelines by prioritizing local hiring, adhering to fair wages, and offering skills development programs, thereby fostering economic growth and reducing unemployment in the region. Furthermore, compliance with the framework will strengthen community relations and ensure the project contributes positively to regional development objectives.

3.2.4. Benadir Administrative Region Road, Sewage and Drainage Works Guidelines

In the Benadir Region of Somalia, policies and regulations governing roads, the Benadir Regional Administration (BRA) primarily manages sewage, and drainage systems. The Department of Roads, Sewage and Drainage Works oversees the infrastructure development, including roads, and has established strategic plans to guide these efforts. This department is tasked with the daunting responsibility of Roads, Sewerage and Drainage works, including mapping of the road sewerage and drainage reserves; construction and maintenance of roads sewerage and drainage; and maintenance of water flows systems in the city. However, there is a noted lack of comprehensive regulations specifically addressing sanitation and sewage systems within the city. Although the BRA's Environment & Waste Management Department supervises waste management schemes and enforces environmental policies, but challenges persist due to limited technical capacity and resources. Additionally, the Somali National Infrastructure Strategy (2019–2063) acknowledges the absence of sewerage systems in urban areas, including the seventeen districts within BRA, highlighting the need for substantial improvements in infrastructure to meet the demands of a growing population.

Relevance

These guidelines provide a framework for constructing and maintaining access roads, managing stormwater, and addressing waste disposal, which are essential for the power plant's operational efficiency and environmental compliance. Proper road infrastructure will facilitate the transportation of construction materials and maintenance equipment, while effective drainage and sewage systems will mitigate flooding risks and environmental pollution. Aligning with these regulations will enhance the project's sustainability, minimize community disruptions, and support the broader infrastructural goals of the Benadir Region.

3.2.5. Benadir Administrative Region Urban Planning and Engineering Guidelines

The Benadir Regional Administration (BRA) governs urban planning and engineering in the Benadir Region through policies and by-laws designed to promote sustainable urban development and efficient land use. The Urban Planning and Engineering Department oversees land surveying, GIS mapping, and the implementation of spatial land use strategies, the formulation, review and implementation of the national spatial land use and management policy and strategies; the preparation and reviewing of the Regional Districts physical development plan; renewable energy generation; energy regulation and reticulation; electricity and gas reticulation, amongst others. More importantly, the department ensures that the infrastructure projects align with regional development goals and policies. These policies emphasize coordinated development to avoid land-use conflicts

and support renewable energy initiatives, making them particularly relevant to the proposed hybrid power plant in Dharkenley District. By aligning with BRA's urban planning frameworks, the project can ensure compliance with zoning regulations, minimize disruptions to local communities, and contribute to sustainable energy solutions that integrate with the region's broader urban and industrial development objectives.

Relevance

These guidelines provide a framework for land use planning, zoning, and the integration of infrastructure within the broader urban fabric, ensuring that developments align with regional growth objectives. For the hybrid power plant, adherence to these guidelines will help prevent land-use conflicts, ensure the project's compatibility with existing and future infrastructure, and minimize environmental and social impacts. By aligning with these standards, the project can support sustainable urban development while addressing the region's energy needs.

3.2.6. Benadir Administrative Region Health Management Guidelines

The Benadir Regional Administration (BRA) oversees health policies and regulations in the Benadir Region, focusing on formulating health policies, regulating health services, and managing national referral health facilities. The Health Directorate is responsible for implementing these policies, ensuring the provision of quality healthcare services to the population. The Directorate of Health performs three key functions namely: formulation of a health policy, health regulation and national referral Health facilities. The proposed hybrid power plant in Jazeera is pertinent to these health policies, as reliable electricity is essential for the operation of health facilities, including hospitals and clinics. Improved power supply can enhance healthcare delivery by ensuring consistent lighting, refrigeration for vaccines and medicines, and the operation of medical equipment, thereby supporting the BRA's objectives to improve health services and outcomes in the region.

Relevance

These guidelines emphasize the importance of managing environmental and health risks, promoting sanitation, and ensuring access to healthcare services in development projects. For the hybrid power plant, adherence to these guidelines is essential to mitigate potential health risks such as air quality impacts, noise pollution, and waste management during construction and operation. Additionally, the project can contribute positively by enhancing healthcare infrastructure through improved electricity reliability, supporting local health facilities, and aligning with regional health objectives to safeguard the well-being of workers and surrounding.

3.3. THE WORLD BANK ESS AND GUIDELINES

3.3.1. World Bank ESS and Relevance to the Project

The World Bank is implementing Environmental Social Frameworks (ESF) to promote green, resilient, and inclusive development. The ESF emphasizes environmental and human rights protections, labor, inclusion, gender, climate change, biodiversity, community health, and stakeholder involvement. It uses a risk-based approach, allowing for more monitoring and resources for complex projects. The ESF also focuses on developing national environmental and social management systems, enhancing borrower capacity, and encouraging openness and stakeholder participation through timely information disclosure, continuous consultations, and effective grievance processes. The consultant referred to the latest environmental and social standards for new projects. Table 3.1 summarizes the ESS from the perspectives of triggers and relevance considering the outcomes from the present ESIA.

Table 3-1: The ESS triggers and relevance to the proposed Hybrid Power Plant

ESS	Triggered?	Relevance
ESS1: Assessment and Management of Environmental and Social Risks and Impacts	Yes	Compliance with ESS1 requirements will help the proposed project to minimize adverse environmental and social effects, and promote sustainable development outcomes. By commissioning this ESIA, the proponent is cognisant of the need to comply with the ESS1 requirements
ESS2: Labor and Working Conditions	Yes	Compliance with ESS2 requirements will help project ensure the well-being of workers, protect the health and safety of local communities, and minimize risks associated with project implementation.
ESS3: Resource Efficiency and Pollution Prevention and Management	Yes	The operation of the power plant may result in increased air emissions and waste generation throughout the project, as well as their potential impacts. Additionally, during construction and operation phases, different sets of materials will be used, and this would require prudent resource efficiency and waste management.
ESS4: Community Health and Safety	Yes	Predicated on the assumption that the proposed project and its associated activities such as power transmission, construction and the associated equipment and exposure to local community are expected to have potential

ESS	Triggered?	Relevance
		hazards with impacts of different strengths on community health and safety. The proponent will be required to comply with all the provisions of ESS4
ESS5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	No	ESS5 ensures that any land acquisition or restrictions on land use for the solar plant are conducted in a manner that minimizes displacement and provides fair compensation and resettlement assistance to affected communities. By adhering to ESS5, the project proponents can mitigate social risks, ensure the equitable treatment of displaced persons, and align the project with international best practices for social sustainability. This helps in fostering community acceptance and reducing potential conflicts, thereby contributing to the overall success and long-term viability of the proposed solar PV project. However, this would only be possible once the transmission and access roads associated with the project are demarcated.
ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	No	The proposed project will be undertaken in an area that has already been modified through human activities. The area not within the distribution range of any species listed in the IUCN threat categories. Additionally the proposed site is not located within seven (7) kilometre radius of any critical terrestrial or aquatic ecosystem. While the proposed solar power plant is located in an area that does not trigger the WB's ESS6, compliance with ESS6 will still be essential to ensure sustainable development and biodiversity conservation. Adhering to ESS6 will demonstrate a commitment to best practices in environmental stewardship, minimize potential future risks from any unanticipated impacts on flora, fauna, or ecosystem services, and ensure alignment with broader international and national environmental standards. Furthermore, compliance will enhance the project's social license to operate by addressing stakeholder concerns and promoting transparency and accountability in managing environmental risks.
ESS7: Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities	No	Predicated on the assumption that the project area has no indigenous people who may be affected by the project
ESS8: Cultural Heritage	Yes	Predicated on the assumption that there may be cultural artefacts or resources in the project area. It is acknowledged that these may be affected, particularly during the execution of civil works for new lines and hybridization activities. By adhering to ESS8, the project proponent will be required to engage with any affected communities, implement measures to avoid or mitigate impacts on cultural heritage, and ensure that any necessary alterations are conducted respectfully and in accordance with local and international guidelines. This not only preserves cultural heritage but also fosters positive relationships with local communities, enhancing the project's social license to operate.
ESS9: Financial Intermediaries	No	This standard will not apply because SESRP is fully funded directly by WB without involving financial intermediaries.
ESS10: Stakeholder Engagement and Information Disclosure	Yes	The proposed project, much like any other development initiative, encompasses stakeholders—individuals or groups with an interest in or potential impact from the project. It is crucial to furnish them with comprehensive information about the project, establish relationships, and provide an opportunity for them to offer feedback. Considering their interests and concerns during the planning and preparation stages is integral to fostering a collaborative and inclusive project environment.

3.3.2. Resettlement Policy Framework (RPF) for SESRP Projects

A resettlement policy framework report was prepared following World Bank ESS5 policy on involuntary resettlement. The RPF states that SESRP component 2 (SESRP, hybridization and battery storage systems for mini-grids) may require land acquisition. The Framework further seeks to avoid, manage, and/or mitigate potential risks arising out of damage to assets, disruption to work, temporary negative impacts on livelihoods and/or in the unlikely case of displacement. The RPF proposes guidelines to develop a Resettlement Action Plan (RAP) and propose an implementation framework for RAP to mitigate such effects. The RPF states that involuntary resettlement and land acquisition will be avoided where feasible, or minimized or compensated where it cannot be eliminated. Where involuntary resettlement and land acquisition are unavoidable, resettlement and compensation activities will be conceived and executed as sustainable development programs, providing resources to give people affected by the project (PAPs) the opportunity to share project benefits.

Relevance

While the project will not trigger ESS5, the Resettlement Policy (RPF) is still an important document as manages resettlement social impacts by consulting and compensating displaced persons, establishing guidelines for assessing impacts, designing mitigation strategies, and facilitating stakeholder engagement, promoting sustainable development and social equity. These will be critically important in the expected TL and the access road.

3.3.3. Comparison between the World Bank and FGS Legislations Relevant to the Project

The World Bank and the Federal Government of Somalia aim to ensure sustainable development through environmental and social governance in power energy projects. However, their frameworks differ in scope and enforcement mechanisms. The World Bank's Environmental and Social Framework (ESF) provides comprehensive guidelines, such as Environmental and Social Standard 1 (ESS1), which mandates detailed environmental and social assessments (ESIAs) to identify, evaluate, and mitigate risks. Somalia's environmental legislation is relatively nascent and focuses on national priorities under frameworks like the BRA Environmental Policy and Environmental Management Acts. The World Bank's standards often act as a complement, setting higher benchmarks and providing funding-linked compliance incentives. This comparison aims to identify gaps and propose recommendations.

Table 3-2: Comparison between the key WB Environmental and Social Framework relevant to the project and the FGS legislations

World Bank ESFs	FRS laws	Comparison	Recommendation
ESS1 requires screening to determine level of environmental and social assessment to be done. An ESIA is prepared before project implementation ESIA is needed once determination had been established and should be prepared identifying all environmental and social impacts and mitigation measures proposed to address the impacts	• The environmental law requires screening of project to determine level of environmental and social assessment to be done • An ESIA is required once determination is done • ESIA is needed once determination had been established and should be prepared identifying all environmental and social impacts and mitigation measures proposed to address the impacts	• Similar both require screening • Similar-both require ESIA depending on the project impacts	Screening has been done and the project is established as medium risk which requires and ESIA ESIA is prepared in line with ESIA regulations and refers to WB safeguard policies
ESS5 Land Acquisition and Involuntary resettlement should be avoided wherever possible or minimized and exploring all alternatives	• Somalia's transitional constitution emphasizes that Land shall be held, used and managed in an equitable, efficient, productive and sustainable manner. The Federal Government shall develop a national land policy, which shall be subject to constant review. That policy shall ensure: (a) Equity in land allocation and the use of its resources; (b) The guarantee of land ownership and registration; (c) That land is utilised without causing harm to the land; (d) That any land and property dispute is resolved promptly and satisfactorily for all; (e) That the amount of land that a person or a company can own is specified; (f) That the land and property market is regulated in a manner that prevents violations of the rights of small land owners; and (g) That the Federal Member States may formulate land policies at their level. • No permit may be granted regarding the permanent use of any portion of the land, sea or air of the territory of the Federal Republic of Somalia. The Federal Parliament shall enact a law regulating the size, timeline and conditions of permits of land use. The Federal Government, in consultation with the Federal Member States and other stakeholders, shall regulate land policy, and land control and use measures (Art. 43).	• **Similar-** displacement in projects should be avoided to the extent possible by exploring alternatives.	WB policy is more elaborate than the FRS Law.

World Bank ESFs	FRS laws	Comparison	Recommendation
ESS7 on indigenous people seeks to promote the inclusion of these group in development project and especially through consultation to ensure they also share in the project benefits and ensure negative impacts do not disproportionately fall on them The policy requires these groups to be consulted separately to enhance their participation	• Article 11 of the Constitution regarding nondiscrimination and equality sets forth that ' All citizens, regardless of sex, religion, social or economic status, political opinion, clan, disability, occupation, birth or dialect shall have equal rights and duties before the law. Discrimination is deemed to occur if the effect of an action impairs or restricts a person's rights, even if the actor did not intend this effect. The State must not discriminate against any person on the basis of age, race, colour, tribe, ethnicity, culture, dialect, gender, birth, disability, religion, political opinion, occupation, or wealth. All State programs, such as laws, or political and administrative actions that are designed to achieve full equality for individuals or groups who are disadvantaged, or who have suffered from discrimination in the past, shall be deemed to be not discriminatory'(Art. 11). It is also stated in Article 27 regarding economic and social rights that 'it shall be ensured that women, the aged, the disabled and minorities who have long suffered discrimination get the necessary support to realize their socio-economic rights'. • No provisions regarding indigenous rights.	• **Similar**-both seek to promote inclusion of these group so that they do can share the projects benefits and ensure that negative impacts of the project do not fall on them disproportionately • WB needs a social assessment to be conducted	WB policy more elaborate and the two are being used to compliment
Project affected persons should be meaningfully consulted and be given opportunities to participate in planning and implementing of projects and especially where there is resettlement	• Article 26 regarding the right to property states that every person has the right to own, use, enjoy, sell, and transfer property. The state may compulsorily acquire property only if doing so is in the public interest. Any person whose property has been acquired in the name of the public interest has the right to just compensation from the State as agreed by the parties or decided by a court.	• Both are similar	Consultation has been done and will be progressed in line with the two WB policy and FRS legislations.

3.4. International Conventions/Agreements Ratified by the Federal Republic of Somalia (FRS)

The FRS is a signatory to a number of international treaties, conventions and agreements that include legally binding commitments to protect the environment and to ensure the sustainable management of natural resources. These include:

3.4.1. The United Nations Convention on biological diversity (CBD), 1992

Article 8 – In-situ conservation (d) Promoting protection of ecosystems, natural habitats and maintenance of viable populations of species in natural surroundings (j) Respecting, preserving and maintaining knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity and promote their wider application.

Relevance

Hybrid power plants, while promoting renewable energy and reducing emissions, can pose risks to local biodiversity. Compliance with the Convention on Biological Diversity (CBD) requires assessing and mitigating these impacts, ensuring sustainable energy development and habitat protection.

3.4.2. The UN Framework Convention on Climate Change (UNFCCC) (ratified in 2009).

The primary objective of the Convention is to stabilize greenhouse gas concentrations "at a level that would prevent dangerous anthropogenic (human induced) interference with the climate system." Somalia submitted its new climate action plan (Intended Nationally Determined Contribution) to the UNFCCC in 2015. Somalia has

also developed the National Adaptation Program of Action on Climate Change (NAPA), which includes a climate risk assessment[20].

Relevance

The project will provide over 50% electricity generation from solar array replacing existing diesel power generation and thereby cutting GHG emissions.

3.4.3. The UN Convention to Combat Desertification (UNCCD) (ratified in 2002).

The Convention combats desertification in those countries that experience serious droughts and/or desertification. Somalia has developed a National Action Programme for the UNCCD[21].

Relevance

To comply with the UNCCD, it is essential that the project integrates sustainable land management practices, minimizes soil erosion, and rehabilitates affected areas post-construction. The hybrid power plant could also positively contribute to combating desertification by reducing reliance on unsustainable energy sources, which can lead to deforestation and land degradation. By aligning with the UNCCD's goals, the plant can promote energy development while protecting and restoring ecosystems, ensuring that the project contributes to land conservation and sustainable use of natural resources.

3.4.4. Convention on the Conservation of Migratory Species of Wild Animals (ratified 1985).

This Convention aims to protect those species of wild animals that migrate across or outside national boundaries from becoming endangered. The Convention on the Conservation of Migratory Species of Wild Animals (CMS), ratified by Somalia in 1985, is highly relevant to the proposed hybrid power plant in Dharkenley District, particularly due to its potential impacts on migratory species in the region. The CMS aims to conserve migratory species and their habitats across borders, promoting sustainable development while minimizing threats to these species. Given the proximity of the proposed power plant to critical River Shebelle, the project must ensure that it does not disrupt migratory routes or degrade habitats used by these species. Adherence to the CMS requires implementing mitigation measures to safeguard migratory species. This will ensure that the power plant development aligns with international conservation commitments while supporting regional biodiversity protection efforts.

Relevance

Hybrid power plants, especially large-scale installations, can pose risks to migratory birds and other wildlife through habitat disruption, collisions with infrastructure, and changes to the local environment. To adhere to the principles of the CMS, the proposed hybrid power plant will adopt a design layout of the solar panels by implementing bird-friendly infrastructure designs, and monitoring wildlife movements. Aligning the project with the CMS support global biodiversity conservation efforts, ensuring that the solar power development is environmentally responsible and sustainable.

3.4.5. Protocol Concerning Regional Cooperation in Combating Pollution by Oil and other Harmful Substances in Cases of Emergency (ratified 1988).

Combats pollution by oil and other harmful substances by enhancing measures for responding to pollution emergencies on a national and regional basis.

Relevance

The proposed hybrid power plant, despite generating clean energy, may involve pollution risks due to machinery use, hazardous substance transportation, and spills. The project will align with protocol by developing contingency plans and implementing best practices to minimize environmental risks, promoting regional cooperation and environmental stewardship.

3.4.6. Sustainable Development Goals (SDGs) and Agenda 2063 in Africa

Key targets of the SDG 7 – Ensure access to affordable, reliable, sustainable and modern energy for all – are by 2030, ensure universal access to affordable, reliable and modern energy services

Relevance

[20]The Somalia National Adaptation Programme of Action: https://www.wiomsa.org/download/national-adaptation-programme-of-action-somalianapa/

[21]The Somalia National Action Programme on UNCCD: https://knowledge.unccd.int/sites/default/files/naps/2018-06/NAP%20Full%20Report%20-%20Final%2023%20May%20digital.pdf

Implementation of the project will contribute increased Renewable energy generation capacity in Somalia. This is one barrier to increasing affordable access to electricity. However, the project, in itself, will not automatically increase access to electricity for households as this also depends on the tariffs, distribution networks, and regulatory frameworks that are beyond the scope of the project itself. It is hoped that the project will generate interest in and incentivize complementary investment and intervention in the energy sector by the government, development partners, and private sector in Benadir Administrative Region to expand access to electricity in the city. It is also hoped that it will provide a model for hybrid power plants in other locations within Somalia.

3.4.7. International Labour Organization Agreements

Somalia is also a signatory to the International Labour Organization (ILO) Conventions that include legally binding commitments relevant to labour and employment conditions and the social aspects of the project. These include commitments to equal opportunities for women in employment, ending violence and harassment in the workplace, workplace health and safety, and ending child and forced labour, among other areas. Some of the relevant provisions of the ILO that the Country has ratified include:

- Discrimination (Employment and Occupation) Convention (No. 111) (ratified in 1961).
- Forced Labour Convention (No.29) (ratified in 1960).
- Freedom of Association and Protection of the Right of Organize Convention (No. 87) and Right to Organize and Collective Bargaining Convention (No.98) (ratified in 2014).
- Abolition of Forced Labour Conventions (No. 105) (ratified in 2014).
- Worst Forms of Child Labour Convention (No. 182) (ratified in 2014).
- Violence and Harassment Convention (No 190) (ratified in 2021).
- The Tripartite Consultation (International Labour Standards) Convention (No. 144) (ratified in 2021).
- The Occupational Safety and Health Convention (No. 155) and Promotional Framework for Occupational Safety and Health Convention (No. 187) (ratified in 2021).
- Private Employment Agencies Convention (No. 181) (ratified in 2021).
- The Migration for Employment Convention (Revised) (No. 97) and Migrant Workers (Supplementary Provisions) Convention (No. 143) (ratified in 2021).

Relevance

The project will follow ILO conventions ratified by Somalia, ensuring equal opportunities, non-discriminatory employment practices, workplace health and safety standards, and compliance with local and international practices. Contractors and suppliers will also have a human rights policy and standard employment terms for casual and temporary workers.

4.0. Analysis of Alternatives

4.1. OVERVIEW

This chapter outlines the project's several alternatives. The alternatives include the "no-go/do nothing" option, alternative construction materials and technology, alternative sites, and alternative energy sources identified throughout the ESIA process. Environmental assessment is primarily reliant on discovering and evaluating alternatives. It provides decision-makers with information that enables them to thoroughly investigate the best answers to development plans. Alternatives compare and contrast the environmental implications and consequences of various means to achieve the same goal.

4.2. RELOCATION OPTION

The proposed project aims to improve electrification and accessibility for established customers and consumers. The Jazeera site was chosen due to factors such as high solar irradiation levels, proximity to the proposed grid infrastructure, flat, stable land, and alignment with energy demand centers. Socioeconomic aspects, regulatory compliance, and environmental sustainability were also considered. However, BECO currently lacks alternative sites in the general area. The project's scale and size may take time to complete, and the project's electrification needs were met by the chosen site. Despite considering several alternatives, the relocation to a different area is not a viable option due to these concerns and assessment.

4.3. ZERO OR NO PROJECT ALTERNATIVE

The No Project option for the planned project indicates that the status quo is preserved. This is the best option from an extreme environmental standpoint because it ensures no impact with existing conditions. This approach, however, will result in significant losses for both BECO and the growing number of customers in Mogadishu City and the neighbouring areas. The target majority of consumers will lack access to a clean and stable electrical supply, and the FGS's goals of providing dependable, clean, and affordable electricity to stimulate economic growth, investment possibilities, and improved public services may not be realised. The No Project Option is the least preferred from the socio-economic and partly environmental perspective due to the following factors:

- The targeted consumers will forgo the desired electricity supply in the area;
- The socio-economic status of target communities the local economy would remain unchanged due to lack of affordable, clean and reliable electricity supply;
- The BRA and FRS will be impeded in achieving the objectives of the PMP in meeting the energy requirements.
- Opening up the area for investors will not occur as anticipated;
- Generation of employment opportunities through expansion of business activities that would have been spurred by availability of affordable and reliable electric power will not occur
- Electricity generation relying on diesel generators with the accompanying GHG emissions will continue;
- Community health benefits that come with electricity will not be realized;
- The objectives of the FGS's efforts towards achieving NDP-9 will not be realized.

From the analysis above, it becomes apparent that the no project alternative means no project to the local people and the FGS, and the benefits outlined above and other indirect benefits that would accrue from construction of the proposed project.

Conclusion

It is thereby concluded that the 'do-nothing' option is not a good option economically and should therefore be discouraged and rejected. It is therefore imperative for BECO to establish a new Hybrid Power Plant at the proposed site and supply clean and affordable electricity to Mogadishu City and surrounding areas.

4.4. ALTERNATIVE SOURCES OF ENERGY

4.4.1. Thermal Power Generation

Mogadishu and neighboring territories could benefit from increased thermal power through the installation of more diesel gensets. However, this would increase the use of diesel, which currently generates 250-300 litres of Industrial Diesel Oil daily, contradicting the Paris Agreement targets for achieving clean energy.

4.4.2. Wind Power Generation

Wind power generation, while a valuable renewable energy source, has several limitations compared to the proposed hybrid power plant. Wind power is highly dependent on geographic location, and suitable sites for wind

farms are limited (areas with consistent and strong winds) in the Benadir Administrative Region. Wind energy is more variable and unpredictable because wind speeds tend to fluctuate significantly within short time frames, leading to inconsistent power generation[22,23,24,25]. Wind turbines can cause significant environmental and wildlife risks due to their visual and noise impacts, high initial capital costs, and need for substantial infrastructure. They also require regular maintenance and sophisticated grid management for reliable operation. Additionally, wind power generation requires energy storage or backup systems, and large land tracts, which can lead to land use conflicts.

4.5. ANALYSIS OF ALTERNATIVE CONSTRUCTION AND TECHNOLOGY

An analysis of alternative construction materials and technology for a hybrid power plant incorporating solar PV and Battery Energy Storage Systems (BESS) highlights the importance of sustainability, efficiency, and cost-effectiveness. Advanced materials like high-efficiency bifacial solar panels and recyclable glass-glass modules offer enhanced durability and energy yield while minimizing environmental footprints. For BESS, the exploration of lithium iron phosphate (LiFePO4) batteries—known for their longer life cycle, safety, and recyclability—can improve the system's sustainability compared to traditional lithium-ion batteries. Inverter and transformer technologies can leverage silicon carbide (SiC) components to reduce energy losses and operational costs. Additionally, adopting modular and prefabricated construction techniques can streamline installation, reduce labor-intensive processes, and minimize site disturbances, making the plant more adaptable to remote locations while adhering to environmental and social standards.

4.6. SOLID WASTE MANAGEMENT ALTERNATIVES

Solid waste management alternatives for a hybrid power plant focusing on solar PV and Battery Energy Storage Systems (BESS) should prioritize waste minimization, recycling, and environmentally responsible disposal. For solar PV, end-of-life panels can be managed through extended producer responsibility (EPR) programs, where manufacturers reclaim and recycle materials like silicon, aluminum, and glass. Emerging technologies, such as thermal and mechanical recycling processes, enable the recovery of critical materials like silver and cadmium from panels. For BESS, proper management of lithium-ion batteries involves refurbishing viable cells for secondary use, implementing closed-loop recycling systems to recover metals like lithium, cobalt, and nickel, and adhering to international e-waste standards. On-site waste segregation, reuse of packaging materials, and partnering with certified recyclers further support sustainable solid waste management. Comprehensive planning and community engagement are also essential to address waste-related social and environmental concerns effectively.

4.7. SELECTED ALTERNATIVES

The new site provides an optimised layout and future scalability, although it may incur greater expenditures and higher transmission losses. The transmission line was chosen based on variables such as distance, cost, grid stability, capacity requirements, terrain, geographical limits, and technological complexity. For dependable and predictable energy supply, a hybrid energy system was preferred over a pure solar power plant. The BESS maximises renewable energy utilisation while maintaining grid stability and dependability by utilising existing infrastructure.

Conclusion

A hybrid power plant was located approximately 26km from the proposed existing BECO Sub-station in Hamarweyne was selected for consideration. It is therefore imperative for BECO to establish a new Hybrid Power Plant at the proposed site and supply clean and affordable electricity to Mogadishu City and surrounding areas.

[22]Archer, C. L., & Jacobson, M. Z. (2005). Evaluation of global wind power. Journal of Geophysical Research: Atmospheres, 110(D12). https://doi.org/10.1029/2004JD005462

[23]Rawn, B., Østergaard, J., & Rosas, P. A. C. (2007). Variability of large-scale wind power from a Danish perspective. Wind Energy, 10(1), 21-28. https://doi.org/10.1002/we.208

[24]Holttinen, H. (2005). Hourly wind power variations in the Nordic countries. Wind Energy, 8(2), 173-195. https://doi.org/10.1002/we.144

[25]Sorensen, P., & Cutululis, N. A. (2004). Variability and predictability of large-scale wind energy production. Risø National Laboratory.

5.0. Environmental and Social Baseline

This section gives a complete overview of the biophysical and socioeconomic background of the proposed project region, allowing for an assessment of its environmental and social impacts. It includes project-specific information as well as regional baseline data to provide context.

5.1. LOCATION

The proposed BECO Jazeera Hybrid Power Plant (2°01'1.49"N, 45°18'12.78"E) shall be located in the south-eastern part of Benadir Administration Region within Dharkenley District; neighboring Lower Shabelle. The project site is in an open area with sparse settlements on a land acquired by BECO for the project.

5.2. ENVIRONMENTAL SETTING

5.2.1. Climatic Information

5.2.1.1. Rainfall

The climate in the Benadir Administrative Region is tropical arid to dry and sub-humid, and is influenced by the north-easterly and south-easterly air flows of the Intertropical Convergence Zone (ITCZ) over the Ethiopian highlands[26]. North-easterly and south-easterly air masses meet in the Intertropical Front (ITF) and raise air upwards to produce rain. The annual movements of the ITCZ from north to south across Africa and back again, give rise to four different seasons in the State like rest of Somalia, comprising two distinguishable rainy seasons alternating with two marked dry seasons[27], as follows:

- Gu: March to June (MAMJ), the main rainy season, like for all over Somalia
- Xagaa: July to September, littoral showers, but dry and cool in the hinterland
- Deyr: September to December (SOND), second rainy season, like for all over Somalia
- Jilaal: January to March, longer dry season, like for all over Somalia

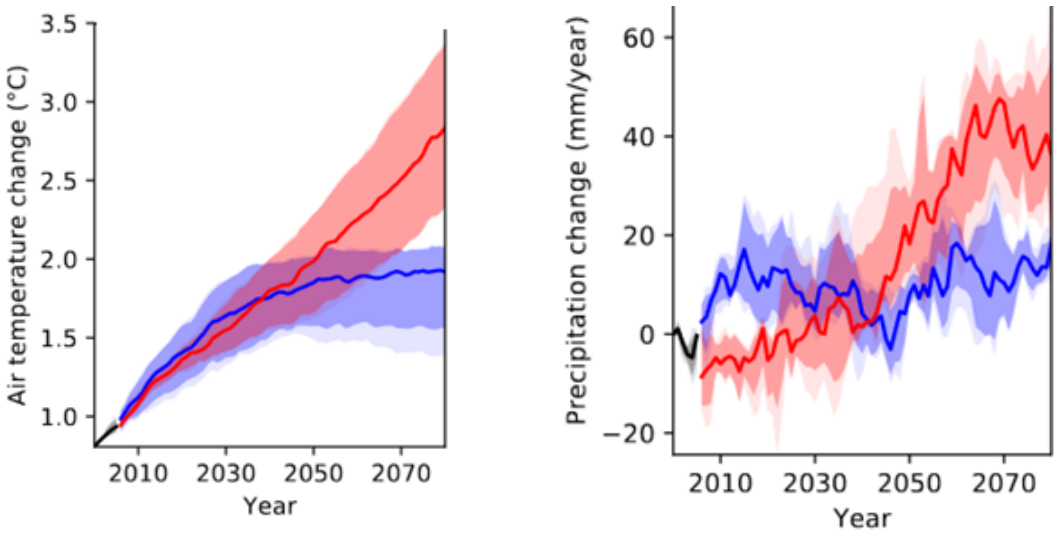
Rainfall in the region is erratic, with a bimodal pattern except in the northern riverine areas close to the coast where some showers may occur even during the Xagaa. Peak rainfall months are centred around Gu season, March to June (MAMJ) and Deyr Season, September to December (SOND). Rainfall amounts and intensity in BRA is generally 200mm – 300mm annually. However, some parts of Ceel D Heer receive between 300mm - 400mm of rainfall annually. Intense, short rainstorms characterize rainfall. The region has a high inter-annual rainfall variation and is subject to recurrent drought of different severity every 4-5 years. Like much of Somalia, precipitation in the Benadir Administrative Region will likely increase in the long run (until 2070), with a stronger and more continuous increase under RCP6.0 than under RCP2.6 (Figure 5-1b).

5.2.1.1. Temperature

The climatic conditions of Dharkenley District (Benadir Administrative Region) in Somalia are influenced by its geographic location and topography, resulting in a semi-arid to arid climate. BRA experiences high temperatures throughout much of the year. The hottest months are typically from May to September, with temperatures often exceeding 35°C during the day[28]. Cooler temperatures are observed from December to February, but even then, daytime temperatures can still be warm. As a result of increasing greenhouse gas (GHG) concentrations, air temperature over much of Somalia, including Benadir Administrative Region is very likely to rise by 1.4 to 3.4°C by 2070 relative to the year 1876, depending on the future GHG emissions scenario[29] (Figure 5-1a).

Figure 5-1: The projected temperature and precipitation in Somalia, including the Benadir Administrative Region
(a) Temperature (b) Precipitation

[26] Oduori, S., Vargas, R. & Alim, M. 2007. Land Use Characterisation of a Selected Study Area in Somaliland. FAO-SWALIM. Project Report No. L-04. Nairobi, Kenya
[27] FAO-SWALIM (2010). Somalia Water and Land Information Management (2010). Atlas of the Juba and Shabelle Rivers in Somalia. Nairobi: FAO-SWALIM. Available from http://www.faoswalim.org/subsites/River_Atlas_Files/River_Atlas_Documents/index.html
[28] International Institute of Tropical Agriculture, "Agroecological Zones," 2024. [Online]. Available: https://csi.maps.arcgis.com/apps/MapSeries/index.html?appid=7539d22ab46147ce9888589aea4b1a11. [Accessed May, 30 2024].
[29] Chen, D., M. Rojas, B. H. Samset, K. Cobb, A. Diongue Niang, P. Edwards, S. Emori, S. H. Faria, E. Hawkins, P. Hope, P. Huybrechts, M. Meinshausen, S. K. Mustafa, G. K. Plattner, A. M. Tréguier, "Framing, Context, and Methods. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.," IPCC, 2021



Source: https://weatheringrisk.org/sites/default/files/document/220214_SomaliaClimateRiskProfile-05.pdf

5.2.1.2. Air Quality

Air pollution is on the rise majorly because of the encroachment on the environment and from the different dangerous GHG emissions released by the different industries around Benadir Region, especially Mogadishu[30]. Overall, the environmental management in Benadir Region is not to the best standards, and has over the years been neglected leading to increased levels of air pollution and negative climate change in the country[31]. The prevailing environmental health situation in the Region that is associated with high levels of household air pollution is linked to absence of a very strong government to enforce or implement different legislations aimed at managing air pollution in the city.

5.2.1.3. Topography and Features

Much of the District is made up of large stretches of flat or moderately sloping plains. These plains are usually arid or semi-arid, with scant flora including prickly shrubs and grasslands. Plains are essential for pastoralism. In addition, the terrain is eroded by both wind and runoff. The geology and soils in and around the proposed power plant, as well as throughout Somalia's Dharkenley District, are diverse and dynamic, reflecting the region's complex geological history and environmental conditions. The District's principal soil types are sandy, clayey, alluvial, and volcanic soils, which are common along eastern African coastlines, particularly in places with little vegetation cover. Sandy soils are well drained but frequently low in fertility and organic matter.

5.2.1.4. Geology and Soils

The Benadir Region of Somalia, including Dharkenley District, is characterized by sedimentary formations, particularly limestone, which is primarily of coral origin. This limestone forms a significant portion of the coastal terrain and reflects the region's marine sedimentary history. The limestone formations are porous and permeable, contributing to groundwater storage but also making the region susceptible to karst processes like sinkhole formation. The soils in the Benadir Region are predominantly sandy, low in fertility, but suitable for specific types of agriculture when irrigation is provided. However, the region's arid climate and sparse vegetation cover contribute to soil erosion and limits natural soil development. Despite these constraints, the soils support urban settlements and limited agricultural activities where water resources are accessible.

5.2.1.5. Water Resources and Hydrology

The Benadir Region of Somalia, including Dharkenley District, relies on limited and variable water resources due to its arid to semi-arid climate and low annual rainfall, which averages 400-500 mm per year. The primary sources of water are shallow groundwater aquifers, replenished mainly by seasonal rainfall and influenced by the permeability of the region's underlying limestone geology. These aquifers are highly vulnerable to over-extraction, salinization, and contamination, particularly in coastal areas where seawater intrusion is a growing concern. Surface water is virtually absent in the region, with no permanent rivers or lakes; however, temporary streams

[30] Abdulshakur, A.D, Mohamed M.G., Abdisalam A.A. & Nur R.A. (2022). Monitoring and Evaluation of Air Quality: A Case Study of Mogadishu, Somalia. International Journal of Research and Innovation in Applied Science (IJRIAS) Volume VII, Issue IX, 31-35.
[31] Gatari, M. J. (2019). First WHO Global Conference on Air Pollution and Health: A Brief Report. Clean Air Journal, 29(1), 77.

and runoff during the rainy season provide short-lived water resources. Hydrologically, the Dharkenley District depends heavily on rainwater harvesting and wells for domestic and agricultural needs, as no major perennial rivers flow through the area. Urban expansion and increased water demand in Benadir Region have strained existing resources, with limited infrastructure for water supply and sanitation exacerbating challenges. Efforts to manage water resources sustainably are essential to address the risks of water scarcity, pollution, and the impacts of climate change, which further threaten the region's fragile hydrological balance.

5.2.2. Biophysical Environment

5.2.2.1. Flora and fauna

Dharkensley District exhibits a semi-arid climate with sparse but ecologically significant vegetation. The flora is characterized by hardy species adapted to low rainfall and high temperatures. Acacia species, such as *Acacia nilotica* and *Acacia tortilis*, dominate the landscape, providing shade and serving as a critical resource for local livestock. These are interspersed with drought-resistant shrubs like *Commiphora* and *Boswellia,* which are valued for their aromatic resins used in traditional practices and global markets. Grasses like *Cenchrus ciliaris* and *Chloris gayana* grow in patches, contributing to grazing lands for pastoral communities. Seasonal watercourses, or wadis, support denser vegetation, including *Tamarindus indica* and *Ziziphus mauritiana,* offering vital ecological services like soil stabilization and food for wildlife. The fauna of the District reflects its semi-arid environment, with species that thrive under harsh climatic conditions. Mammals such as dik-diks, warthogs, and jackals are commonly observed, while domesticated camels, goats, and sheep play an essential role in the livelihoods of local communities. Birdlife is diverse, with species like the Somali ostrich, hornbills, and various raptors inhabiting the area, contributing to its ecological balance. Reptiles, including geckos and monitor lizards, are also prevalent. Despite human activity and urban encroachment, the district retains pockets of biodiversity, though increasing habitat loss and climate change pose significant threats. Conservation efforts and sustainable land management are crucial to preserving this delicate ecological balance.

5.2.2.2. Vulnerability to Climate Change

Most of the Benadir Region, including Dharkenley District is highly susceptible to climate change due to its semi-arid climate, fragile ecosystems, and socio-economic challenges. Extreme weather events like droughts, erratic rainfall, and floods pose significant threats to water availability, agriculture, and livestock, crucial for pastoralist communities. Droughts are increasing, leading to water scarcity, crop failure, and depletion of grazing land, causing food insecurity and population displacement. The region's limited infrastructure and weak governance exacerbate its vulnerability, with poor access to climate-resilient resources and increasing desertification. Climate change also increases conflict risks over dwindling resources, contributing to social instability. The CORDEX Africa multi-model median projections indicate that the number of extreme heat days in which maximum daytime temperatures exceed 400C is likely to increase in South Central Somalia including Benadir Administrative Region. Each year, by the 2030s, the region could experience between 4 and 30 days of temperatures exceeding this threshold, predominantly during February-April[32,33].

5.2.2.3. Waste Management

Informal and undeveloped systems, emphasising infrastructural and governance issues mark waste management in BRA, Somalia. The majority of waste is dumped in open areas or burned, which contributes to environmental degradation and public health problems. Recycling initiatives are limited, and there is little public or institutional support for sustainable waste management strategies. Addressing these issues necessitates improved infrastructure, policy enforcement, and community engagement. Private enterprises are active in waste collection and disposal, but contracts with governments are frequently limited, limiting greater investments in technical equipment. Overall, waste, drainage, and sewage systems in the BRA while some businesses have made private waste collection agreements with companies at a fee[34]. While the BRA is tasked with collection and disposal of waste from the city, the Ministry of Natural Resources oversees dumping sites. Only two official dumping sites

[32]Gutiérrez, J.M., Jones, R.G., Narisma, G.T., Alves, L.M., Amjad, M., Gorodetskaya, I.V, Grose, M., Klutse, N.A.B., Krakovska, S., Li, J., Martínez-Castro, D., Mearns, L.O., Mernild, S.H., Ngo-Duc, T., van den Hurk, B., & Yoon, J.H. (2021). 'Interactive Atlas', in Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, eds. V. Masson-Delmotte, P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, et al. (Cambridge University Press). http://interactive-atlas.ipcc.ch/.

[33]World Bank. (2024). Health and Climate Change. https://www.worldbank.org/en/topic/health/brief/health-and-climate-change

[34]World Bank, Somalia Urbanization Review (2021:88)

are known in the BRA: Qashinweyne in Karan and Kaawo in Madina[35]. The provision of waste management services in the BRA follows the pattern of a stratified organization of the society in the BRA, where wealth and social status are key determinants of access to waste disposal. Private companies charge up to USD 7 for collection and disposal of waste – a fee much above the reach of the urban poor and displaced communities, corresponding to roughly a month's rent[36].

5.2.2.4. Water Scarcity and Flood Risk

Dharkenley District has an arid to semi-arid environment, resulting in water scarcity for both domestic and agricultural purposes. Limited groundwater resources and over-extraction exacerbate water scarcity. Despite this, the district faces flood threats, particularly during the Gu and Deyr rainy seasons. Inadequate flood management infrastructure and poor drainage systems worsen the problems. To solve these difficulties, comprehensive water resource management approaches are required, with a focus on sustainable water access and flood resilience.

5.2.2.6. Land Use and Land Cover Characterization

Dharkenley District in Somalia has a diverse land use and land cover that reflects socioeconomic activity and ecological characteristics. Urban and peri-urban regions have grown significantly, frequently encroaching on traditional grazing. Population growth, urbanisation, and environmental concerns are all causing significant changes to land cover. Overgrazing practices have caused soil erosion. Urban expansion and informal settlements have transformed natural and agricultural land into built-up regions, limiting green space and disrupting the hydrological equilibrium. Sustainable development relies heavily on effective land use planning and management practices.

5.2.2.8. Environmental Management Challenges

The Dharkenley District in Somalia has significant environmental difficulties as a result of growing urbanisation, climate change, and inadequate infrastructure. Water scarcity, pollution, soil erosion, desertification, droughts, floods, and urban development have all contributed to widespread pollution and land degradation. Overgrazing and irresponsible agricultural methods have exacerbated these problems. Urbanisation has transformed natural ecosystems into built-up regions, limiting green space and increasing flooding dangers. These problems, along with low capacity for environmental governance, need an urgent focus on sustainable practices and infrastructure to mitigate climate change consequences and improve the quality of life for Dharkenley District residents.

5.3. SOCIO-ECONOMIC SETTING

5.3.1. Overview

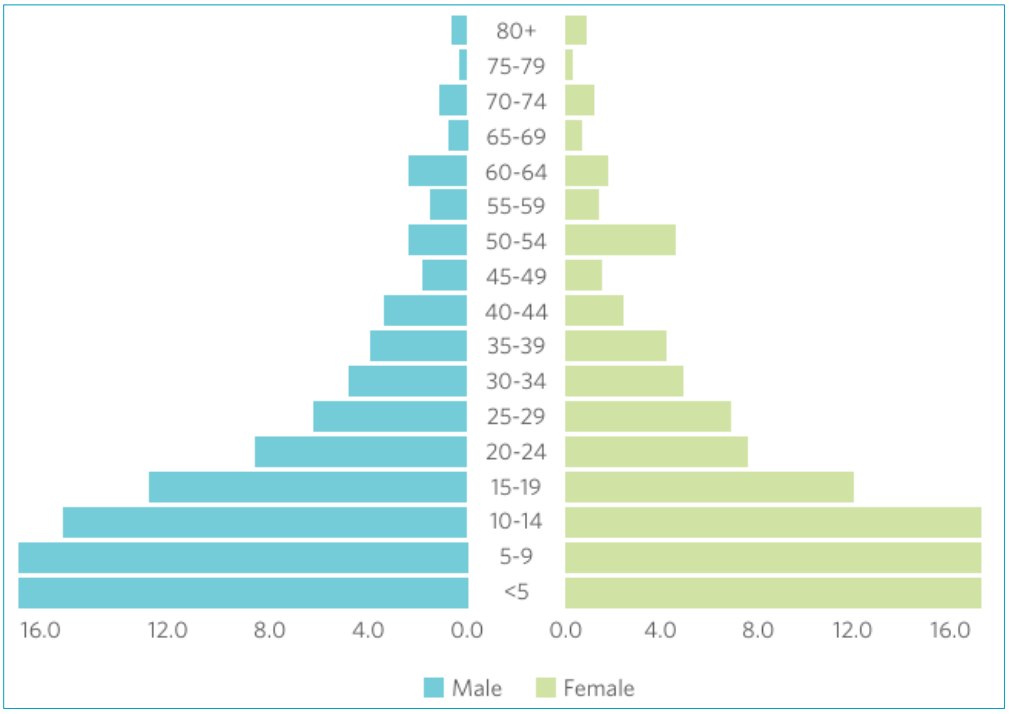
Dharkenley District, a residential and peri-urban area, consists mostly of residential areas with a mix of enterprises such as subsistence farming, livestock husbandry, and small-scale trading. However, obstacles such as water scarcity, land degradation, and limited infrastructure impede its growth. The district is mainly dependent on informal economies and is influenced by Mogadishu's economic dynamics. Despite these problems, Dharkenley is gradually urbanising, with enlarged commercial areas and basic amenities contributing to its socioeconomic development.

5.3.2. Population

Benadir Administrative Region, including Dharkenley District has a total estimated population of 3,171,391 people[37]. Dharkenley District has a vibrant and diversified population that is quickly rising as a result of urbanisation and rural migration. The population consists primarily of ethnic Somali clans, with a mix of pastoralists, small-scale farmers, traders, and labourers. This section of the BRA has seen an increase in informal settlements. Sixty-four percent of Benadir's population is under the age of 20, with 78 percent under the age of 30. Young individuals aged 15 to 29 make up 26% of household members, whereas older persons (65 and up) make up only 3% (Figure 5-2).

[35]Abdikadir Ahmed Omar, Md. Sahadat Hossain and Mst. Mahmuda Parvin (2018:22-26) Study on Knowledge, Attitude and Practices towards the Solid Waste Management in Karan District, Mogadishu Somalia.
[36]Tana and IIED, Shelter Provision in Mogadishu: Understanding Politics for a More Inclusive City (2019:29)
[37]https://fsnau.org/downloads/Somalia-2024-Post-Gu-Acute-Food-Insecurity-Rural-Urban-and-IDP-Population-Stressed-Crisis-and-Emergency-%28Projection-Oct-Dec-2024%29.pdf

Figure 5-2: BRA population distribution by age and sex



Source: Somalia National Bureau of Statistics (Formerly Directorate of National Statistics, Federal Government of Somalia), Benadir Regional Report 2020, Somali Health and Demographic Survey (SHDS)

5.3.3. Gender-based Violence

Gender-based violence (GBV) in Benadir Region is a widespread issue, exacerbated by conflict, displacement, and socio-cultural factors. Women and girls are particularly vulnerable to violence, including domestic abuse, sexual violence, and traditional practices like female genital mutilation. Prolonged conflict has eroded protective mechanisms for women, while gender inequalities and poverty exacerbate the risk. Displacement has placed many women and children in vulnerable living conditions, often in overcrowded settlements with limited access to legal support or healthcare. Despite progress in women's political representation, socioeconomic barriers still hinder their participation in the economic sector.

Table 5-1: Percentage of women aged 15-49 years who have experienced physical violence since the age of 12 in the BRA

Background characteristic	Percentage who have ever experienced physical violence since age 12	Often	Sometimes	often or sometimes	Total number of Women
Age					
15-19	14.4	4.9	3.5	8.4	651
20-24	15.2	4.0	4.4	8.4	429
25-29	15.7	4.4	3.6	8.0	413
30-34	14.5	1.7	5.3	6.9	303
35-39	15.9	1.7	6.4	8.2	233
40-44	14.3	2.1	4.3	6.4	140
45-49	17.4	1.2	3.5	4.7	86
Current marital status					
Never-married	3.5	1.2	0.8	2.1	641
Married	9.7	2.0	3.0	4.9	1,313
Divorced	1.5	0.3	0.4	0.6	234
Widowed	0.4	0.1	0.1	0.2	67
Education					
No Education	16.3	3.5	4.8	8.3	1,473
Primary	16.5	4.3	4.3	8.6	303
Secondary	11.5	3.8	2.9	6.7	312
Higher	8.4	1.8	3.0	4.8	167
Wealth quintile					
Lowest	26.8	6.4	8.6	15.0	220
Second	11.0	2.2	3.6	5.8	417
Middle	15.4	3.8	3.8	7.5	637
Fourth	13.0	3.0	3.0	5.9	539
Highest	15.2	3.8	5.2	9.0	442
Total	15.1	3.5	4.3	7.8	2,255

5.3.4. Administration and Ethnic Groups

BRA comprises the 17 administrative districts of the capital Mogadishu, which make it, by far, the most populated administrative region in Somalia. The seventeen (17) districts include: Cabducasiis; Daarusalaam; Jazeera; Dharkenley; Garasbaaley; Gubadley; Haliwaa; Hodan; Kaaraan; Kaxda; Shibis; Waaberi; Wadajir; Warta Nabadda; Xamarjajab; Xamarweyne; and Yaaqshiid. In terms of sizes, Dharkenley, Daarusalaam, Haliwaa, Gubadley, Garasbaaley, Kaxda and Dharkenley as the largest districts while Xamaweyne is the smallest. The dominant clan family is the Hawiye, with several sub-clans. Other Somali clans also reside in the city, although with the 'status of guests and limited rights', and several mixed neighbourhoods exist. The Darood clan family – which dominates over some neighbourhoods - and minorities such as Dir, Digil-Mirifle, Yibr (Sab) and Sheikhal, for example, are present. The significant number of IDPs has contributed to the heterogenic ethnic make-up of the city.

5.3.5. Economy and Poverty

5.3.5.1. Local Economy

The local economy in Benadir Region, notably Dharkenley District, is predominantly dominated by commerce, services, and informal sectors, with agriculture and cattle playing an important role. Dharkenley, a residential and peri-urban neighbourhood near Mogadishu, is influenced by small-scale agriculture and livestock rearing. Trade and small companies cater to the rising population's demands, while remittances from the Somali diaspora fund consumption and expenditures in education and healthcare. Despite infrastructure issues, minimal industrialisation, and environmental concerns, Dharkenley's closeness to Mogadishu allows for economic expansion through informal trade and services.

5.3.5.2. Poverty and Social Services

Poverty is a major concern in the Benadir Region, notably in Dharkenley District, Somalia, where many families lack access to basic amenities and economic possibilities. The district has high unemployment rates, especially among young people, and relies heavily on informal economies. Many residents lack access to clean water, sanitation, healthcare, and education. Rapid urbanisation and population increase have strained social services, resulting in gaps in infrastructure and public service delivery. Poverty affects vulnerable populations disproportionately, including women and children, needing urgent reforms in public services and poverty alleviation efforts.

5.3.5.3. Productive Sector (Agriculture, Livestock, Commerce and Trade)

A mix of agriculture, livestock, and commerce characterizes the productive sector in Dharkenley District, though it is shaped by both opportunities and challenges. Livestock farming, especially goats and cattle, is also a key component of the district's economy, providing income and food security for many families. In addition, trade and commerce are increasingly important, driven by the district's proximity to Mogadishu, Somalia's economic hub. Dharkenley District is home to small retail shops, local markets, and businesses that cater to the needs of its growing population, often engaging in informal trade. Despite these productive activities, the sector faces challenges such as limited infrastructure, water scarcity, and soil degradation, which affect agricultural productivity. However, the district's location within the broader economic dynamics of Benadir Region provides opportunities for growth, especially through trade and services linked to the capital.

5.3.5.4. Health Sector

The health sector Dharkenley District has severe issues due to a lack of infrastructure and facilities. The region's healthcare system is undeveloped, with a scarcity of medical staff and resources, limiting access to quality care. The high burden of communicable diseases, including as malaria, TB, and cholera, puts additional strain on the system. The health sector in Brazil is recovering, with modest state health service delivery and a significant private sector accounting for 60% of health services. The redesigned Essential Package of Health Services (EPHS) emphasizes six main areas: access to care, reproductive, maternal, and newborn health, and no communicable diseases. However, childhood hunger and low immunisation rates remain problems.

5.3.5.5. Road Transport Sector

The road transportation sector in the Benadir region is vital for economic activity and connectivity but faces numerous challenges. The road transportation is the region is characterized by public transportation as the main method of mobility. Intra-city travel (in Mogadishu) is comprised of mainly minibuses, three-wheelers, taxis, among others. The common preferred type is the 14-seater minibuses (locally known as BL) that mostly operate on fixed routes. These minibuses are popularly considered a convenient, affordable, and accessible option. Also preferred are the Bajaj intracity three wheelers, which are available on customer demand and have a wider coverage than the minibuses as they can navigate neighbourhoods with bad road infrastructure. Public transport is dominated by the private sector, in both formal and informal measure. It is essentially self-regulated as private transport associations, cooperatives, and companies, oversee provision and management of the service. There is no government-run or government-subsidised public transportation system. The Federal government’s priority is directed towards aspects such as investments and maintenance, where investment is predominantly directed towards development and rehabilitation of road infrastructure.

The BRA region's road network suffers from poor maintenance, limited infrastructure, and the impact of prolonged conflict, resulting in uneven access to transportation and high travel costs. In Dharkenley District, located on the periphery of Mogadishu, road infrastructure is particularly underdeveloped, with unpaved and deteriorated roads dominating the area. This limits mobility for residents, affects trade, and hampers access to essential services like healthcare and education. Seasonal rains exacerbate the situation, often rendering roads impassable and isolating parts of the district. Despite these challenges, ongoing reconstruction efforts in Mogadishu and its surroundings provide an opportunity to extend improvements to Dharkenley, ensuring better integration into the regional transportation network and fostering socio-economic development.

5.3.5.6. Housing Sector

The housing sector in the BRA ranges from makeshift shelters in informal settlements to modern urban developments, with significant disparities in quality and access. Dharkenley District, located on the outskirts of Mogadishu, has seen an influx of internally displaced persons (IDPs) seeking refuge from conflict and natural disasters, resulting in the proliferation of informal settlements. Many residents in Dharkenley live in overcrowded and poorly constructed housing, lacking access to basic utilities such as clean water, sanitation, and electricity. Meanwhile, limited urban planning and weak enforcement of land use regulations have led to unorganized and unsafe residential areas. While efforts by humanitarian organizations have provided some support, sustainable housing solutions and improved infrastructure remain critical to addressing the growing needs of Dharkenley's population.

5.3.5.7. Information, Communication and Technology

The ICT sector in the BRA has witnessed remarkable growth over the past decade, driven by private sector innovation and the increasing demand for connectivity in a recovering economy. Mobile telecommunications, internet services, and digital platforms have become integral to commerce, education, and social interaction. However, the development of ICT infrastructure in peripheral areas such as Dharkenley District remains limited. While residents have access to mobile networks and basic internet services, coverage can be unreliable, and affordability poses a challenge for many households. The lack of ICT facilities, such as computer labs in schools or public access centers, further hinders digital literacy and innovation in the district. Despite these challenges, the district holds potential for ICT expansion, with increasing interest from private investors and the growing recognition of technology as a catalyst for social and economic development. Addressing infrastructure gaps and promoting digital inclusion in Dharkenley could significantly enhance opportunities for its residents.

5.3.5.8. Education

A mix of progress and persistent challenges marks the education sector in the BRA. At large, the Benadir region is served by a combination of formal and informal education systems. Within the formal, there are two education systems which determine the type of education delivered; the 8-4 system[38], which is formalised and used in public schools2, and the 9-3 system3 mainly used by Islamic religious institutions and communities (such as the Quranic schools) and provides religious education for children focused on the study of the Quran and related subjects. As of 2020, the most attended education facilities in Mogadishu and surrounding areas included, primary mixed school for boys and girls, Quranic school for boys, Quranic school for girls, and secondary mixed school for boys and girl[39]s. Considerable efforts have been made of the years to rebuild the education system after years of conflicts. This has led to increased school enrolment and the establishment of private and community-based schools leading to an increase in enrolment (Table 5-2). However, access to quality education remains uneven. For example, twenty-four percent of female and 21 percent of male household members have had primary education. Fourteen percent of women have attained secondary education, compared to 17 percent of men (Table 5-3 and Table 5-4). Dharkenley District is experiencing substantial deficiencies in educational infrastructure and resources. Schools in Dharkenley frequently lack enough facilities, trained teachers, and necessary learning resources, limiting the delivery of quality education. Many children, particularly those living in internally displaced persons (IDP) camps, are unable to attend school owing to poverty, instability, and cultural differences. Despite these obstacles, the district has made some progress through NGO-led initiatives and government assistance targeted at expanding access to school and boosting literacy. Long-term investment in education infrastructure and teacher training is crucial for meeting the expanding needs of Dharkenley's population.

[38] 8-4 system: 8 years in primary, 4 years in secondary, 2-4 years post secondary
[39]MOECHE (2015). Federal Government of Somalia National Policy of Education. 2015-2030.

Table 5-2: Overall education attainment by households pooled by age in the BRA

Background characteristic	Educational attainment of the household members					Total	Number of household members
	No education	Primary[1]	Secondary[2]	Higher education	Don't know		
Age							
6-9	90.0	10.0	0.0	0.0	0.0	100	1,331
10-14	50.3	41.7	7.6	0.0	0.4	100	1,654
15-19	25.8	22.2	37.7	13.4	0.9	100	1,106
20-24	25.8	15.1	22.2	35.9	1.1	100	644
25-29	40.0	17.9	21.5	20.4	0.2	100	442
30-34	47.3	14.9	19.6	16.4	1.8	100	275
35-39	60.9	14.5	15.9	6.8	1.9	100	207
40-44	59.2	15.5	18.3	6.3	0.7	100	142
45-49	49.4	16.9	19.3	12.0	2.4	100	83
50-54	52.7	19.5	20.7	5.9	1.2	100	169
55-59	50.0	12.9	20.0	15.7	1.4	100	70
60-64	64.4	10.3	14.9	9.2	1.1	100	87
65+	74.5	5.1	11.2	8.2	1.0	100	98
Total	**52.2**	**22.3**	**15.6**	**9.3**	**0.7**	**100.0**	**6,308**

[1] Completed 8th grade at the primary level

[2] Completed 12th grade at the secondary level

Source: BHDS (2020)

Table 5-3: Overall education attainment of male by households pooled by age in the BRA

Background characteristic	Educational attainment of the male household members					Total	Number of males
	No education	Primary[1]	Secondary[2]	Higher education	Don't know		
Age							
6-9	88.8	11.2	0.0	0.0	0.0	100.0	734
10-14	48.8	43.9	7.0	0.0	0.4	100.0	855
15-19	25.3	21.5	37.1	14.9	1.2	100.0	590
20-24	22.5	10.1	25.9	40.0	1.4	100.0	355
25-29	31.4	12.3	27.3	28.6	0.5	100.0	220
30-34	41.5	13.4	20.7	21.3	3.0	100.0	164
35-39	56.5	9.7	20.2	10.5	3.2	100.0	124
40-44	60.0	11.0	19.0	9.0	1.0	100.0	100
45-49	49.0	12.2	22.4	16.3	0.0	100.0	49
50-54	48.8	13.8	27.5	10.0	0.0	100.0	80
55-59	44.9	8.2	22.4	22.4	2.0	100.0	49
60-64	53.2	12.9	19.4	12.9	1.6	100.0	62
65+	71.4	3.2	14.3	9.5	1.6	100.0	63
Total	**50.2**	**21.0**	**16.7**	**11.3**	**0.8**	**100.0**	**3,445**

[1] Completed 8th grade at the primary level

[2] Completed 12th grade at the secondary level

Source: BHDS (2020)

Table 5-4: Overall education attainment of female by households pooled by age in the BRA

Background characteristics	Educational attainment of the female household members					Total	Number of females
	No education	Primary[1]	Secondary[2]	Higher education	Don't know		
Age							
6-9	91.5	8.5	0.0	0.0	0.0	100.0	597
10-14	51.9	39.3	8.3	0.0	0.5	100.0	799
15-19	26.4	23.1	38.4	11.6	0.6	100.0	516
20-24	29.8	21.1	17.6	30.8	0.7	100.0	289
25-29	48.6	23.4	15.8	12.2	0.0	100.0	222
30-34	55.9	17.1	18.0	9.0	0.0	100.0	111
35-39	67.5	21.7	9.6	1.2	0.0	100.0	83
40-44	57.1	26.2	16.7	0.0	0.0	100.0	42
45-49	50.0	23.5	14.7	5.9	5.9	100.0	34
50-54	56.2	24.7	14.6	2.2	2.2	100.0	89
55-59	61.9	23.8	14.3	0.0	0.0	100.0	21
60-64	92.0	4.0	4.0	0.0	0.0	100.0	25
65+	80.0	8.6	5.7	5.7	0.0	100.0	35
Total	**54.6**	**23.9**	**14.3**	**6.7**	**0.5**	**100.0**	**2,863**

[1] Completed 8th grade at the primary level

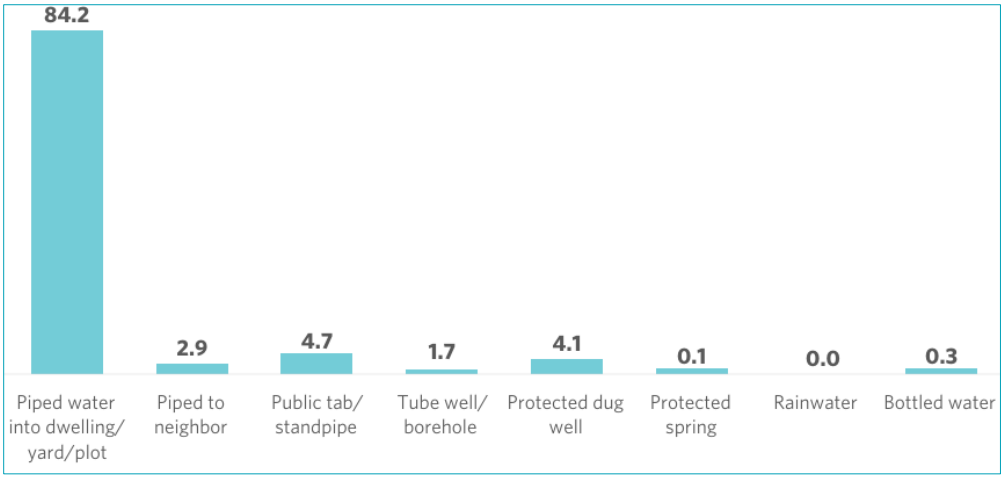
[2] Completed 12th grade at the secondary level

Source: BHDS (2020)

5.3.5.9. Water, Sanitation and Hygiene

Benadir Administrative Region in Somalia faces significant challenges in the WASH (Water, Sanitation, and Hygiene) sector. The BRA has low average rainfall and is highly affected by climate change, leading to recurring droughts, short rainfall seasons, floods, and water scarcity crises. The water and sanitation system in Benadir, including Mogadishu City is old with no recurring funds to ensure maintenance and repair. Currently, eighty-Four percent of population in Benadir have access to piped water into their dwelling, yard or plot (Figure 5-3). One percent of households travel for at least 30 minutes or more to get water. Thirty one (31%) percent (Table 5-5) of the households in the BRA, including Dharkenley District treat their water before drinking it with the most common method of common method of water treatment being bleaching/chlorination, used by thirty percent of households.

Figure 5-3: Status of water access in the BRA, including Dharkenley District



Source: BHDS (2020)

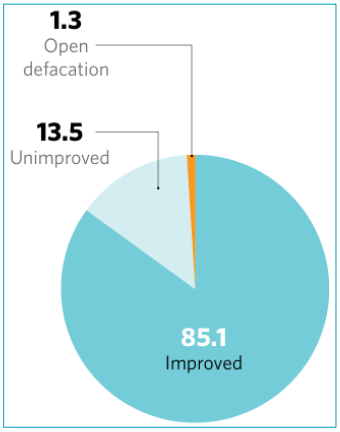
Table 5-5: Treatment of household drinking water by households in the BRA

Water treatment method	Households	Population
Water treatment prior to drinking[1]		
Boiled	2.7	2.9
Bleach/chlorine added	29.6	30.9
Strained through cloth	0.2	0.2
Ceramic, sand or other filter	0.1	0.1
Solar disinfection	0.2	0.1
Let it stand and settle	0.1	0.1
Other treatment	0.1	0.0
No treatment	68.0	66.6
Don't Know	31.5	32.9
Percentage using an appropriate treatment method	31.2	32.5
Population	1,720	11,985
Respondents may report multiple treatment methods so the sum of treatment may exceed 100 percent.		
[1] Appropriate water treatment methods include boiling, bleaching, straining, filtering and solar disinfecting		

Source: BHDS (2020)

Waste disposal system in the BRA is not well developed with the part of the BRA, especially Mogadishu City sanitation systems owned by BRA. The other part is privately owned and managed[40]. The Federally funded system is marred with minimally coordinated legal, regulatory and policy frameworks, with huge gaps in human, financial and logistical resources. Overall, 85 percent of households in Benadir use sanitation facilities with sanitation services that would be considered as improved toilet facilities (Figure 5-4). However, 51 percent of households have access to basic sanitation services (improved toilet facilities that are not shared with other households).

Figure 5-4: Characteristic household sanitation facilities in the BRA, including Dharkenley District



5.3.6. Energy Sector and Electricity Generation Status

Private sector actors, who operate both diesel-powered and hybrid mini grids using a combination of wind and solar energy sources supply over 90% of the energy system in Somalia[41]. Benadir Electric Company (BECO), formed in 2014, is the leading large-scale provider, covering 80% of Mogadishu's electricity needs[42]. BECO is the largest electricity utility in Somalia, created out of 70 independent power producers (IPPs), mostly entrepreneur-owned or NGO-owned diesel-powered minigrids, with a growing focus on renewable energy sources. Other dominant private companies include Blue Sky Energy and Mogadishu Power Supply Company. The UN mandated and international peace support operations offices also play a crucial role in Somalia's energy sector, as they are the largest consumers of energy and generate half of the country's energy. The Ministry of Energy and Water Resources (MoEWR) oversees the maintenance and regulation of the energy sector, but the sector faces challenges such as an unregulated environment, capacity issues, and limited budget. The energy sector in Somalia is highly competitive among commercial service providers. Recently, efforts have been made to improve the

[40] World Bank, Somalia Urbanization Review, 2021
[41] 'Energy Sector Needs Assessment', FGS and AfDB, Aug 2015, p.11
[42] Hagmann, T., Sarkar, A., Aboker, A., Mohamed, J., Wasuge, M., Ibrahim, M.H., Mohamed, Y. and Bradbury, M. (2018). Drivers, Governance and Political Economy of Urbanization in Somalia: Review and Research Gaps. Rift Valley Institute.

regulatory environment through the introduction of national policies such as the Energy Policy (2019) and an Electricity Bill (2020), and an Energy Act, to establish the guidelines to administer regulation, tariff structuring, permit licensing and consumer protection[43].

5.3.7. Law and Order

Somalia's justice sector is pluralistic, with a combination of legal systems and institutions. The Constitution remains ambiguous, and member states and Benadir adopt their own constitutions, Ministry of Justice, legislations, and court mandates. Justice actors include the police, army, international actors, private security providers, and neighborhood policing committees. Dharkenley District, located on the outskirts of Mogadishu, faces fluctuating levels of insecurity, disrupting daily life and hindering development efforts. Despite local administrations and community policing initiatives, challenges such as weak governance, limited law enforcement capacity, and displaced populations continue to strain the district's stability. Strengthening local governance and investing in community-driven conflict resolution mechanisms is essential for long-term peace. Despite progress, criminal activities pose significant threats, and the local police force faces limitations in personnel and resources.

5.3.8. Proposed Project Impact on the Local Economy

The BECO Jazeera Hybrid Power Plant in the Benadir region is expected to significantly impact the local economy, particularly in Dharkenley District. The project, which integrates solar PV and battery energy storage, promises a stable and reliable power supply, reducing dependency on costly diesel generators. This will lower operational costs for small businesses, stimulate entrepreneurship, and attract investment. Enhanced electricity availability will support sectors like healthcare, education, and small-scale manufacturing, promoting economic development. The project could generate employment opportunities, providing jobs and boosting household incomes. It also has the potential to foster long-term economic growth by providing better access to modern energy solutions, reducing energy poverty, and supporting digital connectivity. However, effective stakeholder engagement, equitable job distribution, and mitigation measures are required for its success.

[43]Abdullahi, M., Githinji, M., Sosis, K. and Kahinga, E. (2021). Stand Alone Solar (SAS): Market Update (2021). Tetra Tech International Development. Pp 10

6.0. Assessment of Impacts

6.1. OVERVIEW

This section explores the interaction between the proposed BECO Jazeera Hybrid Power Plant and various physical, biological, and social environments, as well as infrastructure and utilities, to understand the potential effects on resources and receptors. The interactions are grouped according to the project life cycle phases to better understand the risks and implications. In the context of the assessments, the project site refers to the area where the solar PV field and BESS will be constructed and fenced, while the project area encompasses the project site and its surroundings, and the study area is the wider area of influence, including the entire Dharkenley District and the entire BRA.

Criteria for assessing the significance of impacts stemed from the following key elements:

- The magnitude (including nature, scale and duration) of the change to the natural or socioeconomic environment (e.g. an increase in erosion, or an increase in employment opportunities), expressed, wherever practicable, in quantitative terms. The magnitude of all impacts is viewed from the perspective of those affected by considering the likely perceived importance as understood through stakeholder engagement;
- The nature and sensitivity of the impact receptor (physical, biological, or human). Where the receptor is physical, the assessment considered the quality, sensitivity to change and importance of the receptor. For a human receptor, the sensitivity of the household, community or wider societal group was considered along with their ability to adapt to and manage the effects of the impact; and
- The likelihood (probability) that the identified impact will occur. This is estimated based upon experience or evidence that such an outcome has previously occurred.

For this assessment, significance has been defined in Table 6.1 based on five levels.

Table 6-1: Categories of significance

Category	Significance
Negligible impacts (or Insignificant impacts)	Negligible impacts (or Insignificant impacts) are where a resource or receptor (including people) will not be affected in any way by a particular activity or the predicted effect is deemed to be 'negligible' or 'imperceptible' or is indistinguishable from natural background variations.
Minor	An impact of minor significance ('Minor impact') is one where an effect will be experienced, but the impact magnitude is sufficiently small (with or without mitigation) and well within accepted standards, and/or the receptor is of low sensitivity/value.
Moderate	An impact of moderate significance ('Moderate impact') is one within accepted limits and standards. Moderate impacts may cover a broad range, from a threshold below which the impact is minor, up to a level that might be just short of breaching a legal limit. Clearly to design an activity so that its effects only just avoid breaking a law and/or cause a major impact is not best practice. The emphasis for moderate impacts is therefore on demonstrating that the impact has been reduced to a level that is ALARP (as-low-as-reasonably-possible). This does not necessarily mean that 'Moderate' impacts have to be reduced to 'Minor' impacts, but that moderate impacts are being managed effectively and efficiently.
Major	An impact of major significance ('Major impact') is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors. An aim of ESIA is to get to a position where the Project does not have any major residual impacts, certainly not ones that would endure into the long-term or extend over a large area. However, for some aspects there may be major residual impacts after all practicable mitigation options have been exhausted.

For environmental impacts the significance criteria used in this ESIA is shown in Table 2.2.

Table 6-2: Overall significance criteria for environmental impacts

Receptor sensitivity	Impact Magnitude		
	Low	Medium	High
Low	Minor	Minor	Moderate
Medium	Minor	Moderate	Major
High	Moderate	Major	Major

The social impact assessment considers stakeholder perceptions as crucial as actual impacts. This concept is explicitly included in the evaluation of significance. Impacts of significant stakeholder concern may raise the

significance rating, prompting more rigorous mitigation measures. Addressing stakeholder perceptions is crucial to avoid reputational damage and loss of a 'social license to operate'. Therefore, addressing stakeholder perceptions is essential for effective social impact assessment.

6.2. THE ENVIRONMENT AND SOCIAL COMPONENTS AFFECTED BY THE PROJECT

The Project implementation may affect the different environmental components as listed in Table 6.3

Table 6-3: Environmental and social components likely to be affected by the proposed project

Components Affected		
Physical	**Biological**	**Social/human**
Surface water	Aquatic ecosystem	Public health and safety
Ground water	Terrestrial wildlife	Occupational health and safety
Air quality and climate	Woodlands	Labor related issues
Geology and soils	Agriculture and livestock	Land use and land ownership
Noise and vibration		Household Income
Energy		Landscape and aesthetics
		Vulnerable groups
		Community stability
		Cultural and historical sites

IMPACTS DURING CONSTRUCTION PHASE

This section identifies and assesses the anticipated positive and negative impacts within the solar plant and surrounding areas during the construction phase. For each positive impact, enhancement measure is proposed, for negative impacts, a set of mitigation and monitoring measures are identified to avoid and minimize adverse impacts as outlined in Section 6 of this ESIA report.

6.2.1. Positive Impacts

6.2.1.1. National, Local and Regional Economy

The project seeks to stimulate the BRA economy by acquiring and supplying materials and services from BRA and FRS-based businesses, including as earth-moving equipment, labourers, logistical services, and worker accommodation camps. Other companies will provide solar panel components, support structures, and wiring. This will boost local, regional, and national economic growth by procuring services and supplies during construction operations.

Impact	National, local & regional economy
Type of impact	Positive
Type of effect	Direct & Indirect
Duration	Short-term as it is expected during the construction
Reversibility	Reversible as it will be only limited to the construction phase.
Receptor Sensitivity	Medium as the businesses involved will benefit directly from the increased revenue.
Magnitude	Medium as a number of local and regional businesses may be involved in the supply chain.
Significance of the impact without mitigation	Minor

5.2.1.2. Employment and Other Economic Opportunities

Construction projects will offer both skilled and unskilled employment opportunities, with the majority of unskilled and semi-skilled jobs being filled by local communities. This will increase skill transfer from contractors and alleviate unemployment in the area. The project will also provide new income revenues and services, resulting in a trickledown effect on the economy. Enhancements include BECO prioritizing local communities in job allocation, ensuring non-discriminatory employment, and providing equal opportunities for both men and women. The exact number of workers employed is unknown.

Impact	National, local & regional economy
Type of impact	Positive
Type of effect	Direct & Indirect
Duration	Short and long-term as it is expected during the construction and operation phases.
Reversibility	Reversible as it will be only limited to the construction and operation phases.

Receptor Sensitivity	Medium as the businesses involved will benefit directly from the increased revenue.
Magnitude	Medium as a number of local and regional businesses may be involved in the supply chain.
Significance of the impact without mitigation	Minor

6.2.2. Negative Impacts

6.2.2.1. Impacts on Biophysical Environment

6.2.2.1.1. Landscape and Visual

Site preparation will include the installation of project components such as transmission lines, access roads, storage buildings, and other auxiliary facilities. Land clearing, ground leveling, excavation, and grading are all required. Modified ground surfaces, as well as construction equipment and machinery, will cause visual alterations on the project site.

Impact	Landscape and visual
Type of impact	Negative
Type of Effect	Direct
Duration	Long-term: The effects will commence from the start of construction and thereafter-permanent changes in visual character will occur, including into operations.
Reversibility	Irreversible until the entire Project infrastructure is decommissioned.
Receptor Sensitivity	Low on the basis that there is no international or national tourism receptors in the area, and the land has little, if any aesthetic value.
Magnitude	Low – the changes to the visual condition of the land will occur within the Project Site and will be noticeable across the surrounding area.
Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Negligible

6.2.2.1.2. Soil, Groundwater and Surface Water Contamination

The building of a hybrid power plant in Jazeera area, Dharkenley District, Benadir region, could endanger surface and groundwater resources if not adequately managed. Excavation, site grading, and the use of heavy machinery may cause soil erosion, sedimentation, and surface water contamination. The storage and usage of building materials may also cause inadvertent spills or leaks, contaminating water supplies. Increased water consumption may strain local water supplies, creating water scarcity concerns. To reduce these dangers, stringent erosion control methods, secure storage facilities, and effective water management procedures are required.

Impact	Soil, ground water and surface water contamination
Type of impact	Negative
Type of effect	Direct as it will affect soil only
Duration	Short-term changes in soil character and chemical composition may occur, but long-term consequences are unlikely unless major contamination is cleaned up.
Reversibility	Reversible as localized spills and soil compacted areas can be cleaned and restored.
Receptor Sensitivity	Low – the quality of the soil is not unique in the area and does not have significant agricultural value.
Magnitude	Low as site construction activities will be restricted to occur only in the Project Site
Significance of the impact without mitigation	Moderate
Significance of the impact with mitigation	Minor

6.2.2.1.3. Flood Risks

The development of a hybrid power plant in Jazeera, Dharkenley District, may worsen flood risks if suitable mitigating measures are not implemented. Land clearing, excavation, and site grading can disrupt natural drainage patterns, resulting in increased surface runoff and localised flooding, particularly after heavy rains. The removal of vegetation can limit the land's ability to absorb water, increasing flood hazards in nearby regions. Improper storage of building materials and debris can also clog drainage systems, exacerbating the issue. Furthermore, insufficient stormwater management systems during construction may cause water pooling and damage to adjacent properties and infrastructure.

Impact	Flood Risks
Type of impact	Negative
Type of Effect	Direct
Duration	Long-term if changes to natural drainage patterns are introduced, although this will be avoided to the extent possible.
Reversibility	Reversible: Changes to natural drainage flows are likely to be reversible as they could

	be restored once the site is decommissioned and restored.
Receptor Sensitivity	Medium – nearby land users that could be impacted from changes in drainage flows.
Magnitude	Low as the generation of floodwater is seasonal although could impact receptors outside of the Project Site located within the Project Area.
Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Minor.

6.2.2.1.4. Air Quality

Dust

Activities such as land clearing, excavation, and the movement of heavy machinery on unpaved surfaces are primary sources of dust. The dry climate of the region further exacerbates the spread of airborne particles, which can travel to nearby communities, affecting residents, especially those with respiratory conditions. Dust accumulation may also affect local vegetation, reducing photosynthetic activity and potentially harming agricultural activities. Furthermore, excessive dust can impair visibility, creating safety hazards for workers and vehicles on-site.

Impact	Air quality (Dust)
Type of impact	Negative
Type of effect	Direct
Duration	Short term as it is limited to construction phase only
Reversibility	Reversible given that air quality would revert back to baseline conditions after construction works is completed
Receptor sensitivity	Low given that there are no settlements adjacent to the Project Site.
Magnitude	Medium given that the generation of dust is limited to the Project Site, and the area is not prone to large-scale wind-blown erosion.
Significance of the impact without mitigation	Moderate
Significance of the impact with mitigation	Minor

Vehicle exhaust emissions

Exhaust emissions, primarily from vehicles and construction machinery, are expected to increase SO2, NO2, CO, and CO2. There are few receptors (settlements) within 500 m of the project site, thus the impact size and sensitivity will be medium, resulting in a moderate impact significance. Emission factors, which calculate pollutant discharge per unit of fuel consumed, differ depending on fuel quality, engine efficiency, and operational load. Compliance with international air quality standards will consequently be critical, and the implementation of monitoring systems and emission control technology can assist prevent negative environmental effects. Addressing these characteristics is crucial for reducing the machine's footprint and maintaining air quality in the project region.

Impact	Air quality (Vehicle exhaust emissions)
Type of impact	Negative
Type of Effect	Direct
Duration	Short term/long-term as it is limited to construction and operation phases.
Reversibility	Irreversible given that air quality will be impacted over a long period of time, especially during operation phase of the project
Receptor Sensitivity	Low given that there are no settlements adjacent to the Project Site.
Magnitude	Medium
Significance of the impact without mitigation	Moderate
Significance of the impact with mitigation	Minor

6.2.2.1.5. Noise and vibrations

The use of heavy machinery, equipment such as excavators and generators, and activities like drilling, piling, and material transportation are key sources of noise and vibrations. These disturbances can disrupt the daily lives of nearby residents, particularly in areas with schools, healthcare facilities, or residential zones. Prolonged exposure to high noise levels may lead to stress, sleep disturbances, and other health issues. Vibrations from construction activities can also potentially damage structures, particularly in poorly built or older buildings, and disturb the local fauna.

Impact	Noise and vibrations
Type of impact	Negative
Type of Effect	Direct
Duration	Short term as it is limited to construction phase
Reversibility	Reversible given that Noise and vibrations levels will rapidly revert to baseline

	conditions after construction works is completed
Receptor Sensitivity	Low given that there are no permanent/temporary settlements adjacent to the Project Site.
Magnitude	Medium given that the generation of Noise and vibrations is likely to be limited to the use of construction machinery and earth movements.
Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Negligible

6.2.2.1.6. Biodiversity

Fauna

The disturbance from construction activities, such as land clearing, excavation, and machinery operation, may lead to habitat loss and fragmentation, displacing local wildlife species. The increased human activity and associated pollution could also stress nearby wildlife, particularly species sensitive to disturbances.

Impact	Fauna
Type of impact	Negative
Type of effect	Direct and indirect as it will affect fauna/flora
Duration	Long term as impacts will persist throughout the operating period
Reversibility	Reversible: some species could be displaced from the project site during construction.
Receptor Sensitivity	Medium - no known presence of endangered species in the study area
Magnitude	Medium as site construction activities will be restricted only in the project site. Fauna could move away to similar habitats in the adjacent areas.
Significance of the impact without mitigation	Moderate
Significance of the impact with mitigation	Minor

Flora

The proposed solar PV and other associated facilities and structures will need the removal of existing vegetation (mostly grass and trees) during development. Although the project would be located in a sparsely vegetated area, the site visit revealed several pockets of vegetation, dominated primarily by *Acacia tortilis* and *Salvadora persica*. However, the extent and significance of the impact will be immediate, lasting, and small.

Impact	Flora
Type of impact	Negative
Type of effect	Direct and indirect as it will affect fauna/flora
Duration	Long term as impacts will persist throughout the operating period
Reversibility	Reversible: Vegetation restoration activities can be undertaken during the operation phase.
Receptor sensitivity	Low – no documented presence of endangered flora species
Magnitude	Low-to-medium: Vegetation clearance will be restricted only for the targeted sections of the Project site earmarked for installation of solar panels, and the accompanying infrastructure, including ancillary facilities.
Significance of the impact without mitigation	Moderate
Significance of the impact with mitigation	Minor

6.2.2.1.7. Soil Erosion

During construction, excavation activities will expose soil, resulting in wind erosion and surface runoff during rainfall. This is unavoidable given the loose soil conditions at the project site. Furthermore, the property is mostly level, with slight slopes in some areas. It is thus susceptible to soil erosion, particularly during rainy seasons. The impact will be small because construction activities will be limited to certain sites on the project site.

Impact	Soil erosion
Type of impact	Negative
Type of effect	Direct and indirect as the project site is located in an area prone to soil erosion
Duration	Short term as it will likely occur only during construction phase.
Reversibility	Reversible: Proper mitigation measures will ensure the impact is minimized. Additionally, the agents of erosion tend to be seasonal and spatial.
Receptor sensitivity	Low – the project site is located in an area with low agricultural activities so eroded soil will not cause eutrophication/alter water quality of any nearby surface water resources in the Project Area.
Magnitude	Low – soil disturbance and loosening will be restricted only for the targeted sections of the Project site earmarked for installation of solar panels, and the accompanying infrastructure, including ancillary facilities.
Significance of the impact without mitigation	Moderate
Significance of the impact with mitigation	Minor

6.2.2.1.8. Wastes

Solid waste generation

Solid waste is predicted to be generated during the project's construction phase, which includes site preparation, civil works, and excavation spoil. Materials used include mortar, wood, paper, waste paper wrappings, conductor offcuts, masonry chips, and leftover foods. Mismanaged solid waste can be a public nuisance, contaminate the land, and provide breeding grounds for vermin. Authorised companies will collect hazardous garbage such as used oil, lubricants, paint cans, and solvents. Solid waste during building is predicted to be insignificant due to the majority of materials used in construction activities.

Impact	Solid wastes
Type of impact	Negative
Type of effect	Direct and indirect as the project will involve the use of different sets of materials during construction.
Duration	Short term as it will likely occur only during construction phase.
Reversibility	Reversible: Proper mitigation measures will ensure the impact is minimized.
Receptor sensitivity	Low
Magnitude	Medium
Significance of the impact without mitigation	Moderate
Significance of the impact with mitigation	Minor

Liquid waste generation

Wastewater, including black and grey water from toilets and sanitation facilities, is predicted because of worker sanitation. Sealed septic tanks will be erected on the property and evacuated to a wastewater treatment plant in Mogadishu City. Seepage from spilt fuels and oils, as well as mechanical leaks, can all have a negative impact on groundwater, potentially contaminating it. Generally, due to the localised area of impact, the overall significance of the connected impacts, particularly on water quality, is seen as modest, provided that the requisite mitigation/management measures are undertaken.

Impact	Liquid wastes
Type of impact	Negative
Type of Effect	Direct
Duration	Short Term during construction phase.
Reversibility	Water abstraction is expected to be reversible.
Receptor Sensitivity	Low as such utilities are expected to be able to handle project requirements
Magnitude	Low
Significance of the impact without mitigation	**Minor**
Significance of the impact without mitigation	**Negligible**

6.2.2.2. Impacts on Infrastructure and Utilities

6.2.2.2.1. Water Consumption

The demand for water during construction activities, such as dust suppression, concrete mixing, and the operation of machinery, could place additional pressure on the already limited water supplies in the area. Additionally, inefficient water management practices could result in the contamination of surface and groundwater from runoff or wastewater generated during construction.

Impact	Water consumption
Type of impact	Negative
Type of Effect	Direct
Duration	Short term and long-term as the water will be required during both construction and operation phases
Reversibility	Reversible as water resources in general can be considered rechargeable
Receptor sensitivity	Medium due to importance of water supply conditions within the project area. Additionally, BECO will invest in its own borehole for the project activities
Magnitude	Low as water requirements are considered relatively low during the construction phase of the project
Significance of the impact without mitigation	**Minor**
Significance of the impact with mitigation	**Negligible**

6.2.2.2.2. Energy Consumption

The heavy machinery and equipment necessary for excavation, grading, and other building activities will consume significant amounts of power and fuel, potentially increasing demand for the region's already restricted energy supplies. This increased energy consumption may cause a depletion of available energy for local areas, affecting

businesses, residences, and key services like healthcare and education. Furthermore, reliance on diesel generators during construction may exacerbate the region's energy consumption difficulties, resulting to increased greenhouse gas emissions and local air pollution.

Impact	Energy consumption
Type of impact	Negative
Type of Effect	Direct
Duration	Short term and long-term as energy will be required during both construction and operation phases
Reversibility	Reversible with proper mitigation measures
Receptor sensitivity	Low but BECO will be required to implement energy saving measures at the project site during construction and operation phases.
Magnitude	Low as energy requirements are considered relatively low during the construction phase of the project
Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Negligible

6.2.2.3. Impacts on Social Environment

6.2.2.3.1. Impact to Livelihoods from Agricultural and Grazing Land Access Restrictions

The solar power plant will be erected on private land. This project will reduce potential grazing lands because the property will be permanently secured, limiting pastoralists' ability to use the site for grazing. This would increase competition for remaining grazing pastures in the Jazeera area of Dharkenley District and nearby areas, resulting in land degradation and the loss of grazing livelihoods.

Impact	Impact to livelihoods from grazing land access restrictions
Type of impact	Negative
Type of effect	Direct
Duration	Long Term as such impact will occur during construction and continue into the operation phase as the boundary fence will still be present.
Reversibility	Irreversible as land area will be changed into a solar PV project development which no longer can be used for grazing and agriculture
Receptor Sensitivity	Low as the proposed project site is a private property
Magnitude	Low as the number of pastoralists active is relatively low
Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Negligible

6.2.2.3.2. Archaeology and Cultural Heritage

The site study and interactions with stakeholders and local communities around the project site revealed that there are no remnants or signs of historical or prehistoric settlement. However, site preparation and earthwork activities for the construction of PV arrays and other Project components, such as central inverters, underground transmission lines, internal road network, buildings, and so on, may result in coincidental finds of prehistoric or historical artefacts.

Impact	Archaeology and cultural heritage
Type of impact	Negative
Type of effect	Direct
Duration	Short term as it is limited to the construction phase only
Reversibility	Could be irreversible as if sites are damaged or disturbed
Receptor Sensitivity	Low as the likelihood of such discoveries is low
Magnitude	Medium given that if sites are discovered they could be of value and importance
Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Negligible

6.2.2.3.3. Trespassing of Unauthorized Personnel

Construction activities may pose health and safety risks to locals. Unauthorized entry into the project site by curious locals, contractors without authorization and even herdsmen, especially excavation-area working areas can result in injury or fatality.

Impact	Trespassing of unauthorized personnel
Type of impact	Negative
Type of effect	Direct
Duration	Short term as it is expected during the construction phase only
Reversibility	Could be irreversible as it could result in potential permanent health and safety impacts
Receptor Sensitivity	High on the basis that safety is the Project's highest priority.

Magnitude	Low given distance of any nearby settlements or villages
Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Negligible

6.2.2.3.4. Worker Influx – Incoming Workforce

The predicted implications from the influx of workers and the establishment of the living camp are comparable to those analysed during the construction phase. In particular, the inflow of workers may put a strain on existing infrastructure, particularly water and sanitation systems, as well as cause road accidents and other negative consequences of the project's increased traffic (dust, noise, vibrations, and pollution). Furthermore, the presence of a high number of workers, primarily men, may contribute to the spread of contagious diseases as well as gender-based violence.

Impact	Worker influx
Type of impact	Negative
Type of Effect	Direct
Duration	Short term as it is expected during the construction phase only
Reversibility	Could be irreversible as it could result in potential irreversible risks on health and safety
Receptor Sensitivity	High on the basis that safety is the Project's highest priority.
Magnitude	High as over 200 workers are expected to engaged directly or indirectly during the construction phase with over 60% being locals.
Significance of the impact without mitigation	Moderate
Significance of the impact with mitigation	Minor

6.2.2.3.5. Gender-based Violence

If adequate safeguards are not applied during the construction phase of the proposed hybrid power plant in Jazeera, it may contribute to gender-based violence (GBV). The arrival of a big, primarily male workforce may increase the danger of gender-based violence, particularly among women and girls in adjacent villages. Workers' temporary lodging in camps or accommodation areas may enhance their vulnerability to exploitation, harassment, or other types of violence, particularly if there is insufficient security, supervision, or awareness of GBV dangers. The social dynamics of a large-scale building project may also exacerbate tensions, since local women may be marginalized or excluded from economic prospects, leading to sentiments of frustration and power imbalances.

Impact	Gender-based violence
Type of impact	Negative
Type of Effect	Direct
Duration	Short term as it is expected during the construction phase only
Reversibility	Could be irreversible as it could result in potential irreversible risks on health and safety of the victims
Receptor Sensitivity	High on the basis that safety is the Project's highest priority.
Magnitude	Medium
Significance of the impact without mitigation	Moderate
Significance of the impact with mitigation	Minor

6.2.2.3.6. Labour Disputes

Labour disputes during the construction phase can have a substantial influence on both the project and the surrounding neighbourhood. Wage disparities, bad working conditions, unequal employment possibilities, and confrontations between local workers and outside labourers can all lead to such problems. These disagreements can cause work stoppages, delays in project timetables, increased expenses, and significant harm to relationships between project developers and local populations. Furthermore, labour unrest can heighten tensions inside the workplace, lowering morale and productivity. Labour disputes, if not managed appropriately, can exacerbate broader societal issues, such as security hazards and disruptions to local lives. Effective communication, fair labour standards, and conflict resolution methods are critical for mitigating these effects.

Impact	Labour disputes
Type of impact	Negative
Type of Effect	Direct
Duration	Short term during the construction phase
Reversibility	Reversible with appropriate mitigation measures
Receptor Sensitivity	High on the basis that it can disrupt timelines for construction activities.
Magnitude	Medium
Significance of the impact without mitigation	Moderate

Significance of the impact with mitigation	Minor

6.2.2.3.7. Child and Forced Labour

Underage and forced labour during construction can have serious effects for the project and the surrounding community. Child employment exposes children to hazardous situations, denies them an education, and creates long-term suffering. Forced labour exploits vulnerable people, violating their human rights, creating dangerous conditions, and contributing to socioeconomic inequality. These behaviors can tarnish the project's brand, undermine investor trust, and disrupt operations owing to employee dissatisfaction and low productivity.

Impact	Child and forced labour
Type of impact	Negative
Type of Effect	Direct
Duration	Short term during construction phase
Reversibility	Reversible with appropriate mitigation measures
Receptor Sensitivity	High on the basis that it violates human rights
Magnitude	Low
Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Minor

6.2.2.3.8. Security

The Benadir Region of Somalia experiences security concerns such as insurgent group threats, local disputes, and criminal activity. These hazards could have an impact on the building phase of a proposed hybrid solar power plant, resulting in delays, increased costs, and potential personnel injuries. To reduce these dangers, developers must work with local authorities, build strong security standards, and engage with the community to ensure that the project runs smoothly.

Impact	Security
Type of impact	Negative
Type of Effect	Direct
Duration	Short-term as it is expected during the construction phase only
Reversibility	Could be irreversible as it could result in potential irreversible risks on health and safety
Receptor Sensitivity	Medium given that could result in potential health and safety risks
Magnitude	Low given distance of any nearby settlements or villages
Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Minor

6.2.2.3.9. Occupational Health and Safety

Workers will face occupational health and safety risks during the construction phase. Such risks include slips and falls, tool use, being struck by objects, moving machinery, working in confined spaces, exposure to chemicals, hazardous materials, sunny conditions, high temperatures, and electric shocks and burns when touching live components. These risks enhance the likelihood of injury or death because of an accident. The influence on occupational health and safety during the construction phase is estimated to be moderately significant. All construction operations will be limited to the project site, resulting in high sensitivity and low magnitude.

Impact	Occupational health & safety
Type of impact	Negative
Type of effect	Direct
Duration	Short Term as it is expected during the construction phase only
Reversibility	Could be irreversible as it could result in potential irreversible risks on health and safety
Receptor Sensitivity	High as safety s the Project's highest priority.
Magnitude	Low given that it is generally controlled throughout general best practice measurements
Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Negligible

6.2.2.3.10. Community Health and Safety Risks

The influx of personnel, increased traffic, and heavy machinery operations may raise the likelihood of accidents and injuries, both on-site and in the surrounding neighborhood. Dust, noise, and pollutants from building activities may cause respiratory problems and other health issues for adjacent inhabitants, particularly vulnerable groups such as children, the elderly, and those with pre-existing diseases. Furthermore, disruptions to local infrastructure, such as roads or water supply systems, could impede access to critical services and exacerbate

public health problems. The presence of hazardous materials, such as fuels, lubricants, and chemicals used in construction, increases the potential of unintentional spills or pollution, which can impact the surrounding ecosystem and water quality.

Impact	Community health and safety risks
Type of impact	Negative
Type of effect	Direct
Duration	Short-term as it is expected during the construction phase only
Reversibility	Could be irreversible as it could result in potential irreversible risks on health and safety
Receptor Sensitivity	Medium as safety is the Project's highest priority.
Magnitude	Medium
Significance of the impact without mitigation	Moderate
Significance of the impact with mitigation	Minor

6.2.2.3.11. Fire Hazards

During construction of the project, fire hazards are likely to occur especially when precaution measures are not taken to account. Smoking is one of causes of fires and this can happen if cigarette butts are left carelessly. Additionally, keeping of fuels onsite during construction can be a potential cause of fire. This impact is evaluated to be of moderate significance. All the construction activities will be confined at the project site hence high sensitivity and low magnitude.

Impact	Fire hazards
Type of impact	Negative
Type of effect	Direct
Duration	Short-term during the construction phase.
Reversibility	Could be irreversible as it could result in potential irreversible risks
Receptor sensitivity	High as safety s the Project's highest priority.
Magnitude	Low given that it is generally controlled throughout general best practice measurements
Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Negligible

6.3. IMPACTS DURING OPERATION PHASE

6.3.1. Positive Impacts

6.3.1.1. Employment Creation

The project's operating phase will generate job possibilities. Opportunities will include unskilled, semi-skilled, and skilled jobs. These will include security officers as well as people who will run and maintain the Mini-grid. Employment will increase skill transfer. The impact is small because it will employ workers to manage the station. The recommended enhancing strategies include BECO prioritising the local community when allocating job possibilities, ensuring that job opportunities are not discriminatory, and providing equal opportunity for men and women in employment.

6.3.1.2. Reduction of Pollution Associated with Thermal Power Generation

BECO plans to establish a hybrid power plant to reduce its reliance on thermal power generation and reduce greenhouse gas emissions. The plant, which combines solar PV and BESS is expected to significantly reduce emissions compared to the existing diesel power plant. Solar energy can replace a significant portion of diesel-generated electricity, potentially cutting GHG emissions by up to 40-60% depending on the plant's operational capacity. The Battery Energy Storage System (BESS) enhances efficiency by storing excess solar energy for later use. This transition not only lowers carbon emissions but also reduces the plant's overall environmental footprint, contributing to long-term sustainability goals. The proposed hybrid power plant is expected to be a reliable and affordable solution for consumers and organizations.

6.3.1.3. Improved Quality of Life

Electricity access at the household and school level will enable children to study longer hours and access education programs through radio and TV channels. This will also enable schools to utilize information technology and communication. Enhancements include connecting more learning institutions and partnering with the Benadir Administrative Region government for street lighting. Electricity access will improve communication, charging mobile phones, and provide households with information for decision-making. The maiden project aims to supply

solar power due to increasing demand in Mogadishu, Benadir Administrative Region, and the FRS.

6.3.2. Negative Impacts

6.3.2.1. Impacts on Biophysical Environment

6.3.2.1.1. Landscape and Visual

The project, visible on site and near amenities, will create visual impacts through solar panels, varying in aesthetic perception from perceived burdens to visually appealing changes.

Impact	Landscape and visual
Type of impact	Negative
Type of effect	Direct and Indirect
Duration	Long term as it will be relevant all throughout operation phase
Reversibility	Irreversible as visual impacts will be relevant all throughout the operation phase
Receptor Sensitivity	Low given that the location of the project in an otherwise rural setup with a few settlements.
Magnitude	Low given that project will be visible within immediate vicinity and up to some kilometers
Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Negligible

6.3.2.1.2. Soil, Groundwater and Surface Water Contamination

During the operation phase of the proposed power plant, soil, ground, and surface water contamination risks will typically be low. However, the contamination will arise from specific issues such as improper handling or disposal of hazardous materials, like cleaning chemicals or transformer oils. Leaks or spills from equipment, including inverters and transformers, and accidental fuel/oil spills may introduce harmful substances like heavy metals, which can infiltrate the soil and potentially reach groundwater. Additionally, inadequate stormwater management could lead to runoff that carries pollutants into nearby surface water bodies, potentially affecting water quality and aquatic ecosystems downstream. Effective containment, waste management, and pollution prevention practices are essential to mitigate these risks.

Impact	Soil, ground water and surface water contamination
Type of impact	Negative
Type of effect	Direct as it will affect soil only
Duration	Short-term changes in soil character and chemical composition may occur, but long-term consequences are unlikely unless major contamination is cleaned up.
Reversibility	Reversible as localized spills and soil compacted areas can be cleaned and restored.
Receptor Sensitivity	Low – the quality of the soil is not unique in the area and does not have significant agricultural value.
Magnitude	Low as site the contamination is likely to occur only in a few restricted locations within the Project Site.
Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Minor

6.3.2.1.3. Flood Risks

The installation of solar panels and associated infrastructure could alter the natural flow of water across the land, especially if large portions of the site are covered by impermeable surfaces, such as access roads or maintenance areas. In the event of heavy rainfall, water may accumulate in areas where drainage is insufficient, leading to localized flooding. This could cause soil erosion, damage to infrastructure, and potential disruption to the surrounding environment and communities. Additionally, improper management of water runoff from the site could lead to increased flooding in downstream areas, exacerbating the risk of damage to local properties and agricultural land.

Impact	Flood risk
Type of impact	Negative
Type of Effect	Direct
Duration	Long-term if changes to natural drainage patterns are introduced, although this will be avoided to the extent possible.
Reversibility	Changes to natural drainage flows are likely to be reversible as they could be restored once the site is decommissioned and restored.
Receptor Sensitivity	Low – nearby land users that could be impacted from changes in drainage flows.
Magnitude	Low as the generation of floodwater is seasonal although could impact receptors outside of the Project Site located within the Project Area.

Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Negligible

6.3.2.1.4. Air Quality

Dust

Dust emissions from a solar power plant in Jazeera Area, Dharkenley District, could be a concern due to the dry, semi-arid climate. The movement of maintenance vehicles, workers, and equipment may disturb soil, causing dust to be generated. The barren land between panels may also be susceptible to wind erosion, affecting air quality and potentially causing respiratory issues for vulnerable populations. To mitigate dust emissions, regular watering of access roads, planting vegetation between panels, and well-designed routes are essential.

Impact	Air quality (Dust)
Type of impact	Negative
Type of effect	Direct
Duration	Short term as it is limited to construction phase only
Reversibility	Reversible given that air quality would revert back to baseline conditions.
Receptor sensitivity	Low
Magnitude	Low-to-medium given that the generation of dust is expected to be from extent sources during the operation phase.
Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Negligible

Vehicle and exhaust emissions

During the operation phase of a hybrid power plant, exhaust and fumes from vehicles. Maintenance vehicles, such as those used for cleaning solar panels, inspecting equipment, and transporting personnel, emit pollutants such as nitrogen oxides, carbon monoxide, and particulate matter, which can degrade local air quality. These emissions can lead to respiratory problems, particularly in vulnerable populations like children and the elderly. Nitrogen oxides and sulfur oxides also contribute to acid rain and ground-level ozone, further degrading air quality and harming local ecosystems.

Impact	Air quality (Vehicles and exhaust emissions)
Type of impact	Negative
Type of Effect	Direct
Duration	Short term as it is limited to construction phase only
Reversibility	Reversible given that air quality would revert back to baseline conditions.
Receptor Sensitivity	Low given that there are no settlements adjacent to the Project Site.
Magnitude	Low
Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Minor

6.3.2.1.5. Noise and vibrations

Noise and vibrations pollution during the operation phase will generally be minimal. However, some Noise and vibrations sources can still affect the surrounding environment. These include the hum of electrical equipment like transformers and inverters, as well as occasional Noise and vibrations from maintenance activities, such as vehicle movement or cleaning processes. Due to the Project Area's typically quiet, even low-level Noise and vibrations may be noticeable to nearby communities or wildlife. While the Noise and vibrations levels are unlikely to exceed harmful thresholds, implementing sound-dampening measures, scheduling maintenance during daytime hours, and maintaining equipment in good condition can help mitigate any potential disturbances, ensuring the plant operates with minimal impact on local Noise and vibrations levels.

Impact	Noise and vibrations
Type of impact	Negative
Type of Effect	Direct
Duration	Short term as it is limited to a few occasions associated with particular activities with the Project Site.
Reversibility	Reversible given that Noise and vibrations levels will be temporal and will rapidly revert to baseline conditions.
Receptor Sensitivity	Low given that there are no permanent/temporary settlements adjacent to the Project Site.
Magnitude	Low given that the generation of Noise and vibrations is likely to be limited to the project site
Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Negligible

6.3.2.1.6. Biodiversity

Fauna

The effects on local fauna can vary, although they will often be minor. The presence of solar panels will change the natural ecosystem by diminishing foliage cover, which may harm the grazing species in the region. The solar panels themselves can also cause behavioral changes in some animals, as they may reflect light or create temperature differentials, and the "lake effect"[44,45,46] which could negatively affect avifauna by creating the "*lake effect*". , The "lake effect" of solar power plants refers to the reflective properties of large solar panel arrays, which can resemble water bodies to migratory birds. This visual illusion may cause birds to attempt landing on the panels, mistaking them for lakes or wetlands. As a result, birds can collide with the panels or exhaust themselves searching for water, leading to injury or death. This effect can be particularly concerning for migratory species that rely on specific water bodies during their long journeys. In areas like Mogadishu, where migratory routes pass through, the "lake effect" could negatively impact local and migratory bird populations. Mitigation measures, such as using less reflective materials or creating visual deterrents, are crucial to minimizing the ecological impact on bird species. Additionally, the proposed power plant infrastructure, such as fencing, may limit animal movement across their natural ranges, potentially disrupting migration patterns or access to water and food sources. However, the overall impact is expected to be low-medium, especially with mitigation measures in place, such as habitat restoration around the plant and designing wildlife-friendly access points. Careful monitoring of local fauna will also help minimize the long-term ecological impact.

Impact	Fauna
Type of impact	Negative
Type of effect	Direct and indirect as it will affect fauna/flora
Duration	Long term as impacts will persist throughout the operating period
Reversibility	Irreversible: some species could be displaced from the project site during construction.
Receptor Sensitivity	Low - No NT and VU fauna species in and around the project area.
Magnitude	Low-medium as site operation activities will be restricted only in the project site. Fauna could move away to similar habitats in the adjacent areas while others become habituated.
Significance of the impact without mitigation	Moderate
Significance of the impact with mitigation	Minor

Flora

Hybrid power plants can significantly impact local flora by altering land use and causing soil erosion and habitat loss. The panels' shading can also affect understory plant growth. However, long-term mitigation can be achieved through resilient ground cover plants or grasses. Proper planning and management practices, including buffer zones and regular vegetation assessments, are essential to minimize adverse effects and promote ecological balance. Overall, these measures can help maintain a healthy ecosystem.

Impact	Flora
Type of impact	Negative
Type of effect	Direct and indirect as it will affect fauna/flora
Duration	Long term as impacts will persist throughout the operating period
Reversibility	Reversible: Vegetation restoration activities can be undertaken during the operation phase, including the management of invasive plant species such as *Prosopis juliflora*, *Solanum incanum* and *Datura stramonium* that occur in the Study Area.
Receptor sensitivity	Low – no documented presence of endangered flora species
Magnitude	Low – Vegetation regeneration and restoration will ensure most open locations in the Project Site recover.
Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Minor

[44]Barros, A. J. D., & Barros, A. (2017). Ecological impacts of solar power plants: A review. Renewable and Sustainable Energy Reviews, 67, 47-58. https://doi.org/10.1016/j.rser.2016.08.046

[45]Wiggins, K., & Athey, J. (2019). Assessing the impact of solar arrays on local bird populations: The case of desert environments. Ecology and Evolution, 9(10), 6008-6020. https://doi.org/10.1002/ece3.5235

[46]Zeppel, M. J. B., & Murray, B. R. (2021). Solar power and its effects on avian species: An analysis of recent data. Journal of Renewable Energy, 16(1), 45-60. https://doi.org/10.1080/15435075.2021.1942649

6.3.2.1.7. Soil erosion

During the operation phase of a solar power plant in Jazeera Area, soil erosion could still be a concern, especially if the land surrounding the solar panels is left bare or poorly managed. While solar panels themselves may cover a significant portion of the land, the areas between the panels may remain exposed to the elements, particularly in regions like Dharkenley where the climate is dry and prone to wind and rain. Without adequate vegetation or ground cover to protect the soil, water runoff during rainfall could erode the soil between the panels, leading to the loss of topsoil and degradation of the land over time. Additionally, maintenance activities, such as the movement of vehicles or equipment across the site, could further disturb the soil, increasing erosion risks.

Impact	Soil erosion
Type of impact	Negative
Type of effect	Direct and indirect as the project site is located in an area prone to soil erosion
Duration	Short term as it will likely occur only during construction phase.
Reversibility	Reversible: Proper mitigation measures will ensure the impact is minimized. Additionally, the agents of erosion tend to be seasonal and spatial.
Receptor sensitivity	Low – the project site is located in an area with low agricultural activities so eroded soil will not cause eutrophication/alter water quality of any nearby surface water resources in the Project Area.
Magnitude	Low – the solar panels will provide protection by reducing the impact of wind and water on the Project Site's soil surface.
Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Minor

6.3.2.1.8. Wastes

Solid waste generation

The project's operation phase will generate modest solid waste, primarily from routine maintenance activities and occasional equipment repairs. To minimize environmental impact, a robust waste management plan including recycling and proper disposal practices is essential. Procedures for handling and recycling materials, reducing single-use items, and regular waste audits will help minimize waste impact and promote sustainability. Construction and municipal waste will be handled by the nearest approved disposal facility, ensuring the nearest facility is available for disposal.

Impact	Solid wastes
Type of impact	Negative
Type of effect	Direct and indirect as the project will involve the use of different sets of materials during construction.
Duration	Short term as it will likely occur only during construction phase.
Reversibility	Reversible: Proper mitigation measures will ensure the impact is minimized.
Receptor sensitivity	Low – the project site is located in an area with no adjacent settlements.
Magnitude	Low
Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Minor

Liquid waste generation

Liquid waste generation during the operation phase is expected to be minimal, but it still requires careful management. Potential sources include runoff from solar panel cleaning processes and small amounts of wastewater from maintenance facilities or sanitary systems. Improper handling can lead to soil or water contamination. To mitigate risks, best practices for wastewater management, including using environmentally friendly cleaning agents, proper containment and treatment, and regular inspection of drainage systems, are essential. Seepage from spilled fuels and oils and leaking machinery can negatively impact groundwater water, potentially leading to contamination. The overall significance of related impacts, especially on water quality, is considered minor, provided necessary mitigation and management measures are implemented.

Impact	Waste water
Type of impact	Negative
Type of Effect	Direct
Duration	Short Term as it is limited to the construction phase only
Reversibility	Water abstraction is expected to be reversible.
Receptor Sensitivity	Low as such utilities are expected to be able to handle project requirements
Magnitude	Low as waste generated from project is expected to be relatively minimal
Significance of the impact without mitigation	Minor
Significance of the impact without mitigation	Negligible

6.3.2.2. Impacts on Infrastructure and Utilities

6.3.2.2.1. Water Consumption

During the operation phase, water consumption will be used mainly for operation activities, including cleaning of solar panels. On average, cleaning solar panels typically requires about 2-4 litres of water per panel. In arid regions like Benadir where water resources are scarce, this amount of water used for these cleaning operations can be a concern. Efficient water management practices, such as using minimal amounts of water and employing alternative cleaning methods like dry or semi-dry techniques, can help reduce water consumption. Additionally, capturing and reusing rainwater or implementing water-saving technologies can further mitigate the impact on local water resources.

Impact	Water consumption
Type of impact	Negative
Type of Effect	Direct
Duration	Short term and long-term as the water will be required during both construction and operation phases
Reversibility	Reversible as water resources in general can be considered rechargeable
Receptor sensitivity	Medium due to importance of water supply conditions within the project area. Additionally, BECO will invest in its own borehole for the project activities
Magnitude	Low as water requirements are considered relatively low during the operation phase of the project
Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Minor

6.3.2.2.2. Energy Consumption

Energy consumption will be relatively low, especially for ancillary systems such as inverters, control systems, and monitoring equipment, as well as maintaining the infrastructure, including lighting and security systems. However, the hybrid power plant, while integrating renewable energy sources such as solar with Battery Energy Storage Systems (BESS).

Impact	Energy consumption
Type of impact	Negative
Type of Effect	Direct
Duration	Short term and long-term as energy will be required during both construction and operation phases
Reversibility	Reversible with proper mitigation measures
Receptor sensitivity	Low but BECO will be required to implement energy saving measures at the project site during construction and operation phases.
Magnitude	Low as energy requirements are considered relatively low during the operation phase of the project
Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Minor

6.3.2.3. Impacts on Social Environment

6.3.2.3.1. Impact to Livelihoods from Grazing Land Access Restrictions

During the operation phase of a proposed Hybrid Power Plant, access restrictions to grazing land will impact local livelihoods, particularly for communities dependent on livestock. The installation of solar panels and associated infrastructure may limit the availability of traditional grazing areas, reducing the space available for livestock feeding and potentially impacting animal health and productivity. The impact significance of trespassing and unauthorised access is expected to be minor to negligible.

Impact	Impact to livelihoods from grazing land access restrictions
Type of impact	Negative
Type of Effect	Direct
Duration	Long-term the potentials of grazing within the Project Site will be gone permanently.
Reversibility	Irreversible
Receptor sensitivity	Low
Magnitude	Low
Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Minor

6.3.2.3.2. Trespassing of Unauthorized Personnel

The risk of trespassing by unauthorized personnel into the Project Site can pose several challenges, but is expected to be minimal during the operation phase of the Project. Unauthorized access to the site can lead to safety hazards, including potential accidents or injuries due to unfamiliarity with the equipment and operational protocols. Additionally, there is a risk of vandalism, theft, or damage to valuable components such as solar panels and electrical systems.

Impact	Trespassing of unauthorized personnel
Type of impact	Negative
Type of Effect	Direct
Duration	Short term depending on security measures at the site.
Reversibility	Reversible with proper mitigation measures
Receptor sensitivity	Low
Magnitude	Low
Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Negligible

6.3.2.3.3. Worker Influx – Incoming Workforce

The influx of workers and their accommodation needs could impact the local community and infrastructure. With a reliable power supply, investments in other sectors may increase, leading to increased demand for housing and services. To mitigate these impacts, BECO must plan for appropriate workforce accommodation, such as on-site housing or temporary lodging solutions. Engaging with the local community and incorporating residents into the workforce can balance demands and benefits, ensuring the influx contributes to the local economy without straining resources.

Impact	Worker influx – Incoming Workforce
Type of impact	Negative
Type of Effect	Direct
Duration	Short term and long-term as some workers are likely to permanently settle in the Project Area
Reversibility	Reversible with proper mitigation measures
Receptor sensitivity	Low because of homogenous nature of the local Somali communities.
Magnitude	Low-to-medium
Significance of the impact without mitigation	Moderate
Significance of the impact with mitigation	Minor

6.3.2.3.4. Gender-based Violence

The operation phase of BECO Jazeera Hybrid Power Plant may increase the risk of gender-based violence, despite a reduced scale compared to the construction phase. The presence of long-term employees could perpetuate unequal gender relations, affecting the community's social fabric and vulnerable groups' well-being. Inadequate monitoring, weak enforcement of workplace policies, and community awareness programs could exacerbate these risks. Effective operational protocols and ongoing engagement are crucial.

Impact	Gender-based violence
Type of impact	Negative
Type of Effect	Direct
Duration	Short term and long-term as some workers are likely to permanently settle in the Project Area
Reversibility	Reversible with proper mitigation measures
Receptor sensitivity	High
Magnitude	Low-to-medium
Significance of the impact without mitigation	Moderate
Significance of the impact with mitigation	Minor

6.3.2.3.5. Labour Disputes

Labor disputes can significantly affect the project's performance and the local community. These disputes can lead to strikes, disrupting the plant's operations and affecting power reliability. Financial losses for operators and negative impacts on local businesses and residents are also expected. Prolonged disputes can damage relationships, fostering mistrust and tension, and increase the risk of violence or unrest. Addressing these disputes promptly is crucial for the plant's smooth operation and the well-being of the local community.

Impact	Labour disputes
Type of impact	Negative

Type of Effect	Direct
Duration	Short term
Reversibility	Reversible with appropriate mitigation measures
Receptor Sensitivity	High on the basis that it can disrupt power plant operations
Magnitude	Medium
Significance of the impact without mitigation	Moderate
Significance of the impact with mitigation	Minor

6.3.2.3.6. Child and Forced Labour

Child and forced labor risks during the operation phase can have severe consequences on the workforce and community. These risks undermine socio-economic structures, perpetuate poverty and inequality, and expose children to hazardous working conditions. Forced labor, often involving coercion or deception, violates human rights and creates fear among workers. These practices can damage the power plant's reputation, deter investors, and increase regulatory scrutiny. Addressing these issues through ethical labor practices, community engagement, and effective monitoring systems is crucial for ensuring the integrity of the hybrid power plant's operations and fostering a safe, equitable work environment.

Impact	Child and forced labour
Type of impact	Negative
Type of Effect	Direct
Duration	Short term
Reversibility	Reversible with appropriate mitigation measures
Receptor Sensitivity	High on the basis that it violates human rights
Magnitude	Medium
Significance of the impact without mitigation	Moderate
Significance of the impact with mitigation	Minor

6.3.2.3.7. Risks Related to Poor or Inadequate Stakeholder Engagement (Conflict)

Inadequate stakeholder engagement during the operation phase can lead to negative impacts, such as strained relationships, overlooked environmental concerns, and potential opposition to the project. This can result in protests, delays, and legal challenges, disrupting power supply and increasing costs. Inadequate engagement can also damage trust, damage the plant's reputation, and hinder future collaboration. Continuous, transparent, and inclusive stakeholder engagement is crucial for the plant's smooth operation and long-term success.

Impact	Risks related to poor or inadequate stakeholder engagement (Conflict)
Type of impact	Negative
Type of Effect	Direct
Duration	Short term and long-term as community/stakeholders' engagements need to be a continuous and regular exercise.
Reversibility	Reversible with proper mitigation measures
Receptor sensitivity	Low but BECO will be required to implement stakeholders' engagements programmes.
Magnitude	Low-to-medium depending on implementation of mitigation measures.
Significance of the impact without mitigation	Moderate
Significance of the impact with mitigation	Minor

6.3.2.3.8. Occupational Health and Safety

During the operation phase of the proposed solar PV, workers are likely to face occupational health and safety risks such as slips and falls, working at heights, using powered and hand-held tools, trench work, working in sunny conditions and high temperatures, and exposure to electric shocks and burns.

Impact	Occupational health and safety
Type of impact	Negative
Type of Effect	Direct
Duration	Long term as it is expected during the entire operation phase
Reversibility	Could be irreversible as it could result in potential irreversible risks on health and safety
Receptor Sensitivity	High given that could result in potential health and safety risks to the workforce.
Magnitude	Low given that it is generally controlled throughout general best practice measurements
Significance of the impact without mitigation	Moderate
Significance of the impact with mitigation	Minor

6.3.2.3.9. Community Health and Safety Risks

The operation phase of a plant may have minimal impacts on community health and safety, but it is crucial to manage potential accidents, noise, and vibrations. Safety protocols, such as staff training and strict operational procedures, can help minimize these risks. Regular inspections and clear communication about emergency procedures are also essential. By implementing these mitigation measures, the impact on workers and residents will be minimal to negligible.

Impact	Community health and safety risks
Type of impact	Negative
Type of effect	Direct
Duration	Short-term & long-term
Reversibility	Could be irreversible as it could result in potential irreversible risks on health and safety
Receptor Sensitivity	High as safety is the Project's highest priority.
Magnitude	High as the number of road movements could be substantial when compared to the existing situation.
Significance of the impact without mitigation	Moderate
Significance of the impact with mitigation	Minor

6.3.2.3.10. Fire Hazards

Because of the presence of electrical equipment and the dry, arid climate, fire risks are a serious concern on the Project Site. Poor ventilation, insufficient fire suppression systems, and exposure to heat or electrical sparks all increase these dangers. To reduce these hazards, BECO must follow strict safety regulations, such as adequate fuel storage methods, regular inspections, and well-maintained firefighting equipment. Other precautions include frequent electrical system inspections, the installation of fire detection and suppression equipment, and easy access for emergency personnel. Implementing firebreaks and managing vegetation near the facility can help to lessen fire hazards.

Impact	Fire hazards
Type of impact	Negative
Type of effect	Direct
Duration	Short-term as it is expected that appropriate measures on fire suppression will be implemented during the operation phase
Reversibility	Could be irreversible as it could result in potential irreversible risks
Receptor sensitivity	High as safety s the Project's highest priority.
Magnitude	Low given that it is generally controlled throughout general best practice measurements
Significance of the impact without mitigation	Moderate
Significance of the impact with mitigation	Minor

6.4. KEY IMPACTS DURING THE DECOMMISSIONING

In the event that the PV farm is completely decommissioned, decommissioning procedures may involve disconnecting the various Project components (PV array, central inverter stations, substation, etc.) for reuse, recycling, or, if these choices are not available, final disposal. In addition, the internal road network will be rebuilt, and gates and fences will be removed. Generally, the projected impacts throughout the decommissioning phase are comparable to those considered during the building phase. As a result, the assessment of consequences for receptors and mitigation identified during the building phase is presumed to apply in this phase. This covers implications on landscape and visual, biological environment, infrastructure and utilities, waste management, and occupational health and safety.

6.4.1. Positive Impacts

6.4.1.1. Employment Opportunities

Once the project has served its purpose it will then be decommissioned. This will involve demolition and removal of the facility. During demolition, unskilled, semi-skilled and skilled employment opportunities will be available to the public.

6.4.1.2. Site Rehabilitation

After demolition of the proposed project, rehabilitation of the project site will be carried out to restore it to its original status or to a better state than it was. This will include replacement of topsoil and re-vegetation, which

will lead to restoration of the visual, vegetative and aesthetic state of the site.

6.4.2. Negative Impacts

6.4.2.1. Impacts on Biophysical Environment

6.4.2.1.1. Impacts on Landscape and Visual

Site activities will include the decommissioning of arrays and the various Project components, including transmission cables, access roads and internal road network, storage buildings, etc. From the start of decommissioning activities, visual changes will occur from the modified ground surface and the presence of construction equipment and machinery (excavators, trucks, front end loaders, compactors, and others).

Impact	Landscape and visual
Type of impact	Negative
Type of Effect	Direct
Duration	Short-term: The effects will commence from the start of decommissioning and thereafter permanent restoration in visual character will occur.
Reversibility	Irreversible
Receptor Sensitivity	Low
Magnitude	Low
Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Minor

6.4.2.1.2. Impacts on Biological Environment

The decommissioning phase entails dismantling and removing security perimeter fencing, buildings and access tracks required for operation, electrical infrastructure (transformers, an on-site substation, and transmission lines connected to the power grid), and solar panel arrays and their structural components. Many of the same methods and equipment utilized during construction are used in the decommissioning phase. In general, the projected implications during the decommissioning phase are comparable to those considered during the building phase.

Impact	Biological environment
Type of impact	Negative
Type of Effect	Direct and indirect as it will affect Fauna /Flora
Duration	Short Term as impacts will be limited to the decommissioning period.
Reversibility	Reversible: some species could be removed from the site after decommissioning.
Receptor Sensitivity	Low
Magnitude	Medium as site decommissioning activities will be restricted only in the project site. Fauna could move away to similar habitats in the surrounding activities also.
Significance of the impact without mitigation	Moderate
Significance of the impact with mitigation	Minor

6.4.2.1.3. Solid Waste Generation

The decommissioning phase will generate various solid wastes. The waste will contain the materials used in construction including concrete, metal, wood, glass, paints, adhesives, sealants and fasteners, conductors, poles solar panels and batteries. Although demolition waste is generally considered as less harmful to the environment since they are composed of inert materials, there is growing evidence that large quantities of such waste may lead to release of certain hazardous chemicals into the environment. The impact will be of major significance due to high magnitude and medium receptor sensitivity. The batteries and panels need to be disposed in a specific way, in accordance to the manufacturer's guidelines and relevant national and EHSG regulations.

Impact	Solid wastes
Type of impact	Negative
Type of effect	Direct and indirect as different sets of materials from decommissioning will be available
Duration	Short term as it will likely occur only during decommissioning phase.
Reversibility	Reversible: with proper mitigation measures
Receptor sensitivity	Low
Magnitude	Low-medium
Significance of the impact without mitigation	Moderate
Significance of the impact with mitigation	Minor

6.4.2.1.4. Noise and Vibration

The demolition activities will significantly deteriorate the acoustic environment at the project site and in the adjacent areas. This will be due to the noise and vibrations generated by demolition activity. The impact

importance has been determined to be minor due to the low impact magnitude and middling receptor sensitivity.

Impact	Noise and vibrations
Type of impact	Negative
Type of Effect	Direct
Duration	Short term as it is limited to a few occasions associated with particular activities.
Reversibility	Reversible given that Noise and vibrations levels will be temporal and will rapidly revert to baseline conditions.
Receptor Sensitivity	Low
Magnitude	Low given that the generation of Noise and vibrations is likely to be limited to the use of decommissioning machinery and earth movements.
Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Negligible

6.4.2.2. Impacts on Infrastructure & Utilities

6.4.2.2.1. Water Resources

Water requirements for the decommissioning phase are low and are limited to sanitary use by site personnel (drinking, showering, etc.) and the decommissioning activities such as cleaning of machinery and equipment, dust control, etc. The source of water for the decommissioning phase is likely to be the same as that used for the construction stage.

Impact	Water resources
Type of impact	Negative
Type of Effect	Direct
Duration	Short-term as it is limited to the decommissioning phase
Reversibility	Reversible as water resources in general can be considered rechargeable
Receptor Sensitivity	Medium due to importance of water supply conditions within the area
Magnitude	Low as water requirements are considered relatively low
Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Negligible

6.4.2.3. Impacts on Social Environment

6.4.2.3.1. Impacts on Occupational Health and Safety

Workers encounter occupational health and safety concerns during the decommissioning phase as a result of their onsite work. Slips, falls, heights, tool use, being struck, moving equipment, working in confined spaces, chemical and hazardous material exposure, bright situations, high temperatures, and electric shocks while contacting live components are among the hazards.

Impact	Occupational health & safety
Type of impact	Negative
Type of effect	Direct
Duration	Short Term as it is expected during the decommissioning phase only
Reversibility	Could be irreversible as it could result in potential irreversible risks on health and safety
Receptor Sensitivity	High as safety s the Project's highest priority.
Magnitude	Low given that it is generally controlled through best practices
Significance of the impact without mitigation	Moderate
Significance of the impact with mitigation	Minor

6.4.2.3.2. Impact to Livelihoods from Grazing Land Access Restrictions

Livestock herders may face severe economic hardship if access to customary grazing sites is limited or hampered by decommissioning efforts. This can lead to lower livestock productivity, increased feed costs, and potential land-use disputes, particularly in regions where pastoralism is a major source of revenue and sustenance. The limits may also lead to overgrazing in other regions, harming the ecology and lowering long-term land fertility. To reduce these impacts, it is critical to engage local communities early on, provide alternate grazing options, and ensure that decommissioning plans include measures to restore and rehabilitate the land for future use.

Impact	Impact to livelihoods from grazing land access restrictions
Type of impact	Negative
Type of effect	Direct
Duration	Short term because the decommissioning activities will take a shorter period.
Reversibility	Reversible as land area will be changed into other land use activites, including grazing.
Receptor Sensitivity	Low
Magnitude	Low

Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Minor

6.4.2.3.4. Trespassing of Unauthorized Personnel

Decommissioning activities may pose health and safety risks to locals. Unauthorized entry into the project site by curious locals, contractors without authorization and even herdsmen, especially excavation-area working areas can result in injury or fatality.

Impact	Trespassing of unauthorized personnel
Type of impact	Negative
Type of effect	Direct
Duration	Short term
Reversibility	Could be irreversible as it could result in potential permanent health and safety impacts
Receptor Sensitivity	Low
Magnitude	Low
Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Negligible

6.4.2.3.5. Worker Influx – Incoming Workforce

The decommissioning phase of workforce accommodation can have negative impacts on the local community and environment. The sudden increase in the population can strain resources like water, food, and healthcare services, leading to competition. Temporary accommodation camps may cause environmental degradation, improper waste disposal, and pressure on land use. The social fabric maybe disrupted, causing tensions, security risks, and conflicts. Poorly managed worker camps can exacerbate these issues. Proper planning and adequate facilities are crucial to mitigate these negative effects.

Impact	Worker influx
Type of impact	Negative
Type of Effect	Direct
Duration	Short term
Reversibility	Could be irreversible as it could result in potential irreversible risks on health and safety
Receptor Sensitivity	High on the basis that safety is the Project's highest priority.
Magnitude	Low
Significance of the impact without mitigation	Moderate
Significance of the impact with mitigation	Minor

6.4.2.3.6. Gender-based Violence

The primarily male workforce and the stress of decommissioning activities can exacerbate power imbalances and vulnerabilities, increasing the risk of sexual harassment, exploitation, and abuse, particularly among women and girls. Inadequate supervision, restricted reporting channels, and inadequate implementation of protective measures all lead to GBV events. Preventive measures such as robust policies, awareness training, and support services are critical to community safety and a safe decommissioning process.

Impact	Gender-based violence
Type of impact	Negative
Type of Effect	Indirect
Duration	Short term as it is expected during the decommissioning period only
Reversibility	Could be irreversible as it could result in potential irreversible risks on health and safety of the victims
Receptor Sensitivity	High on the basis that safety is the Project's highest priority.
Magnitude	Medium
Significance of the impact without mitigation	Moderate
Significance of the impact with mitigation	Minor

6.4.2.3.7. Labour Disputes

Labour disputes during the decommissioning phase can have a considerable influence on both the project's completion and the local economy. Workers may be concerned about job security, severance pay, or contract termination, which can lead to salary, benefit, and working conditions issues. These disagreements can stall decommissioning activities, raise project costs, and disrupt the community. Unresolved disputes can raise tensions among employees, management, and local stakeholders, lowering morale and productivity. Effective conflict resolution and communication tactics are critical for mitigating these issues.

Impact	Labour disputes
Type of impact	Negative
Type of Effect	Indirect
Duration	Short term during the decommissioning phase
Reversibility	Reversible with appropriate mitigation measures
Receptor Sensitivity	High on the basis that it can disrupt timelines for decommissioning activities.
Magnitude	Medium
Significance of the impact without mitigation	Moderate
Significance of the impact with mitigation	Minor

6.4.2.3.8. Child and Forced Labour

If correct measures are not followed throughout a project's decommissioning phase, child and forced labour may occur. This increases the vulnerability of marginalized groups, such as children, who may be vulnerable to coercion, exploitation, or harmful working conditions. Child labour deprives young people of education and development possibilities, whereas forced labour breaches human rights and dignity. Unethical behaviour can hurt individuals, the project's reputation, and community confidence. Strict monitoring and respect to labour regulations and ethical standards are critical for avoiding these problems and ensuring a fair and safe workplace.

Impact	Child and forced labour
Type of impact	Negative
Type of Effect	Indirect
Duration	Short term during decommissioning phase
Reversibility	Reversible with appropriate mitigation measures
Receptor Sensitivity	High on the basis that it violates human rights
Magnitude	Medium
Significance of the impact without mitigation	Moderate
Significance of the impact with mitigation	Minor

6.4.2.3.9. Security

Benadir region has security difficulties such as intermittent rebel attacks, local conflicts, and crime. The decommissioning phase may involve security hazards, such as theft, vandalism, or sabotage. The flood of temporary workers and job losses might cause societal instability. A reduction in on-site security personnel at this phase may expose the project to unauthorized entry, raising the risk of accidents or sabotage. These security challenges could cause delays, financial losses, and disruptions to the decommissioning process. To reduce these dangers, it is critical to maintain strong security standards, ensure proper site management, and engage with local stakeholders to prevent potential disputes.

Impact	Security
Type of impact	Negative
Type of Effect	Direct
Duration	Short-term as it is expected during the construction phase only
Reversibility	Could be irreversible as it could result in potential irreversible risks on health and safety
Receptor Sensitivity	Medium
Magnitude	Low
Significance of the impact without mitigation	Minor
Significance of the impact with mitigation	Negligible

6.4.2.3.10. Community Health and Safety Risks

The decommissioning phase can pose significant health and safety risks to communities due to dust, noise, and air pollution from demolition work, material transportation, and waste handling. Improper disposal of hazardous materials can also contaminate soil and water resources, posing long-term environmental and health risks. The movement of heavy machinery and vehicles can increase accidents and injuries. To protect community health and safety, strict environmental measures, proper waste management practices, and transparent communication with local stakeholders are essential.

Impact	Community health and safety risks
Type of impact	Negative
Type of effect	Direct
Duration	Short-term as it is expected during the decommissioning phase only
Reversibility	Could be irreversible as it could result in potential irreversible risks on health and safety
Receptor Sensitivity	High as safety is the Project's highest priority.

Magnitude	Medium
Significance of the impact without mitigation	Moderate
Significance of the impact with mitigation	Minor

6.4.2.3.11. Fire Hazards

Decommissioning increases fire hazards due to equipment dismantling and combustible materials. Inadequate fire prevention measures can cause injuries, property loss, and environmental damage. Fire outbreaks disrupt activities, delay project timelines, and strain emergency response resources. Robust fire safety protocols, risk assessments, and personnel training are crucial.

Impact	Fire hazards
Type of impact	Negative
Type of effect	Direct
Duration	Short-term during the decommissioning phase.
Reversibility	Could be irreversible as it could result in potential irreversible risks
Receptor sensitivity	High
Magnitude	Low
Significance of the impact without mitigation	Moderate
Significance of the impact with mitigation	Minor

6.5. SUMMARY OF THE IMPACTS

The tables below provide a summary of the key impacts of the Project on the physical, biological, and social environment and infrastructure and utilities during the construction, operation and decommissioning phases. The final specific plan and monitoring requirement for the project is annexed to the ESIA while all inputs will be completed.

6.5.1. Construction Phase

Table 6-4: Summary of key impacts during the Construction phase of the solar plant

Impact	Attribute	Type of effect	Duration	Reversibility	Receptor Sensitivity	Magnitude	Significance without mitigation	Significance with mitigation
Impacts on biophysical environment	Landscape and visual	Direct	Long term	Irreversible	Low	Medium	Minor	Negligible
	Soil, ground and surface water contamination	Direct	Short term	Reversible	Low	Low	Moderate	Minor
	Flood risk	Direct	Long term	Reversible	Medium	Low/medium	Low	Minor
	Air quality (Dust)	Direct	Short term	Reversible	Low	Medium	Moderate	Minor
	Air quality (vehicle exhaust emissions)	Direct	Short-term	Reversible	Low	Medium	Moderate	Minor
	Noise and vibrations	Direct	Short term	Reversible	Low	Medium	Minor	Negligible
	Biodiversity (Fauna)	Direct	Long-term	Irreversible	Low	Low/medium	Moderate	Minor
	Biodiversity (Flora)	Direct	Long-term	Reversible	Low	Low/medium	Moderate	Minor
	Soil erosion	Direct/indirect	Short-term	Reversible	Low	Low	Minor	Minor
	Wastes (solid wastes)	Direct/indirect	Short-term	Reversible	Low	Low	Moderate	Minor
	Wastes (liquid wastes)	Direct	Short-term	Reversible	Low	Low	Minor	Negligible
Impacts on infrastructure and utilities	Water consumption	Direct	Short-term	Reversible	Medium	Low	Minor	Negligible
	Energy consumption	Direct	Short-term	Reversible	Low	Low	Minor	Negligible
Impacts on social environment	Impacts on livelihoods from agricultural and grazing land access restrictions	Direct	Long term	Irreversible	Low	Low	Minor	Negligible
	Archaeology and cultural heritage	Direct	Short term	Irreversible	Low	Medium	Minor	Negligible
	Trespassing of unauthorized personnel	Direct	Short term	Irreversible	High	Low	Minor	Negligible
	Worker influx – Incoming Workforce	Direct	Short term	Irreversible	High	Medium	Moderate	Minor
	Gender-based violence	Direct	Short term	Irreversible	High	Medium	Moderate	Minor
	Labour disputes	Direct	Short term	Irreversible	High	Medium	Moderate	Minor
	Child and forced labour	Direct	Short term	Irreversible	High	Medium	Moderate	Minor
	Security	Direct	Short term	Irreversible	Medium	Low	Minor	Minor
	Occupational health and safety	Direct	Short term	Irreversible	High	Low	Minor	Negligible
	Community health and safety risks	Direct	Short term	Irreversible	Medium	Low	Moderate	Minor
	Fire hazards	Direct	Short-term	Irreversible	High	Low	Minor	Negligible

6.5.2. Operation Phase

Table 6-5: Summary of key impacts during the Operation phase of the solar plant

Impact	Attribute	Type of effect	Duration	Reversibility	Receptor Sensitivity	Magnitude	Significance without mitigation	Significance with mitigation
Impacts on biophysical environment	Landscape and Visual	Direct/indirect	Long term	Irreversible	Low	Low	Minor	Negligible
	Soil, groundwater and surface water contamination	Direct	Short-term	Reversible	Low	Low	Minor	Minor
	Flood risks	Direct	Long term	Reversible	Low	Low	Minor	Minor
	Air quality (Dust)	Direct	Short-term	Reversible	Low	Low	Minor	Negligible
	Air quality (Vehicle exhaust emissions)	Direct	Short-term	Reversible	Low	Low	Minor	Minor
	Noise and vibrations	Direct	Short-term	Reversible	Low	Low	Minor	Negligible
	Biodiversity (Fauna)	Direct/indirect	Long-term	Irreversible	Low	Low	Moderate	Minor
	Biodiversity (Flora)	Direct/indirect	Long-term	Reversible	Low	Low	Minor	Minor
	Soil erosion	Direct/indirect	Short-term	Reversible	Low	Low	Minor	Minor

Impact	Attribute	Type of effect	Duration	Reversibility	Receptor Sensitivity	Magnitude	Significance without mitigation	Significance with mitigation
	Wastes (Solid wastes)	Direct/indirect	Short-term	Reversible	Low	Low	Minor	Minor
	Wastes (Liquid wastes)	Direct	Short-term	Reversible	Low	Low	Minor	Negligible
Impacts on infrastructure and utilities	Water consumption	Direct	Short/long-term	Reversible	Medium	Low	Minor	Minor
	Energy consumption	Direct	Short/long-term	Reversible	Low	Low	Minor	Minor
Impacts on social environment	Impacts to livelihoods from grazing land access restrictions	Direct	Long term	Irreversible	Low	Low	Minor	Minor
	Trespassing of unauthorized personnel	Direct	Short-term	Reversible	Low	Low	Minor	Negligible
	Worker influx-Incoming Workforce	Direct	Short/long-term	Reversible	Low	Low	Moderate	Minor
	Gender-based violence	Direct	Short/long-term	Irreversible	High	Low/medium	Major	Minor
	Impact to livelihoods from grazing land access restrictions	Direct	Long-term	Irreversible	Low	Low	Minor	Minor
	Trespassing of unauthorized personnel	Direct	Short-term	Reversible	Low	Low	Minor	Negligible
	Worker influx – Incoming Workforce	Direct	Short/long-term	Reversible	Low	Low-medium	Moderate	Minor
	Labour disputes	Direct	Short-term	Reversible	High	Medium	Moderate	Minor
	Child and forced labour	Direct	Short-term	Reversible	Medium	Medium	Moderate	Minor
	Risks related to poor or inadequate stakeholder engagement (conflicts)	Direct/indirect	Short/long-term	Reversible	Medium	Low/medium	Moderate	Minor
	Occupational health and safety	Direct	Long-term	Irreversible	High	Low	Moderate	Minor
	Community health and safety risks	Direct	Short/long-term	Irreversible	High	Low	Moderate	Minor
	Fire hazards	Direct	Short-term	Irreversible	High	Low	Moderate	Minor

6.5.3. Decommissioning

Table 6-6: Summary of key impacts during the decommissioning phase of the solar plant

Impact	Attribute	Type of effect	Duration	Reversibility	Receptor Sensitivity	Magnitude	Significance without mitigation	Significance with mitigation
Impacts on biophysical environment	Landscape and visual	Direct	Short term	irreversible	Low	High	Minor	Minor
	Biological environment	Direct/indirect	Short term	Reversible	Low	Medium	Moderate	Minor
	Solid waste generation	Direct/indirect	Short-term	Reversible	Low	Low	Moderate	Minor
	Noise and vibration	Direct	Short-term	Reversible	Low	Medium	Minor	Negligible
Impacts on infrastructure and utilities	Water utilities	Direct	Short-term	Reversible	Medium	Low	Minor	Negligible
Impacts on social environment	Occupational health and safety	Direct	Short term	Irreversible	High	Low	Moderate	Minor
	Impact to livelihoods from agricultural and grazing land access restrictions	Direct	Short term	Irreversible	High	Low	Minor	Minor
	Trespassing of unauthorized personnel	Direct	Short term	Irreversible	High	Low	Minor	Negligible
	Worker influx – Incoming Workforce	Direct	Short term	Irreversible	High	Low	Moderate	Minor
	Gender-based violence	Indirect	Short term	Irreversible	High	Low	Moderate	Minor
	Labour disputes	Indirect	Short term	Irreversible	High	Low	Moderate	Minor
	Child and forced labour	Direct	Short term	Irreversible	High	Low	Moderate	Minor
	Security	Direct	Short term	Irreversible	High	Low	Minor	Negligible
	Community health and safety risks	Direct	Short term	Irreversible	High	Low	Moderate	Minor
	Fire hazards	Direct	Short term	Irreversible	High	Low	Moderate	Minor

6.6. Assessment of Cumulative Impacts

The Environmental and Social Impact Assessment (ESIA) considered the cumulative impacts (Table 6.7) that could result from the additional impacts of other existing and/or planned developments in the area.

Table 6-7: Summary of key cumulative impacts for the proposed power plant project

Attribute	Cumulative Impacts
Landscape and visual	The construction of a hybrid power plant may modify the area's natural topography and aesthetics, thus reducing the landscape's scenic value. The development may also alter community perspectives, with some seeing it as progress and others seeing it as a threat to traditional land use norms.
Land Use	The project's solar panels could decrease traditional livestock grazing land, potentially leading to land tenure conflicts. However, it could also generate economic opportunities, but requires careful management to ensure equitable access. Proactive land use planning and stakeholder engagement are crucial for preserving traditional practices.
Biodiversity	Impacts are primarily related to the construction period. The project may cause habitat loss or fragmentation as a result of land removal for infrastructure, notably in grazing and natural vegetation areas. Construction-related disturbances, such as noise, dust, and increased human activity, may displace wildlife and damage biodiversity. Over time, the plant's roads and villages may encroach on natural ecosystems, exacerbating the effects. Changes in biodiversity may have an impact on natural resource-dependent livelihoods, such as pastoralism, as well as community ties with the local environment.
Air quality and noise	The construction and operation phases of a hybrid solar power plant can have significant environmental and social impacts on air quality and noise. Dust emissions from land clearing, vehicular movement, and material handling, combined with diesel-powered machinery, could temporarily degrade air quality. Noise pollution may disturb communities and wildlife, potentially affecting respiratory health and reducing quality of life.
Infrastructure and utilities	The proposed hybrid power plant is expected to have transformative environmental and social impacts. It will improve local infrastructure, stimulate economic growth, and provide social services. However, increased demand for utilities during construction could strain resources, potentially affecting households and businesses. The influx of workers and secondary developments may also put pressure on transportation networks and sanitation systems. Proactive planning, including utility upgrades and equitable resource allocation, is crucial to maximize project benefits while mitigating adverse impacts.
Socio-economic conditions	The cumulative environmental and social impacts of the hybrid power plant on socioeconomic conditions are both substantial and multifaceted. The project will boost local economic development by creating jobs during construction and operation, stimulating businesses, and improving access to reliable electricity, which can enhance productivity and quality of life. It may also attract further investments in infrastructure, education, and healthcare, contributing to long-term socioeconomic advancement. However, the influx of workers and new developments may strain local resources, increase the cost of living, and potentially lead to land use conflicts or social tensions.
Occupational health and safety	The hybrid power plant's environmental and social impacts on occupational health and safety are significant, especially during construction and operation. Construction activities involve heavy machinery, elevated work, and exposure to dust, noise, and hazardous materials. Operation risks arise from handling battery systems and electrical equipment, requiring strict safety protocols. The large workforce may strain local healthcare services and maintain inconsistent safety standards. Robust occupational health and safety management systems are crucial.
Community health, safety, and security	The construction and operation phases of a project may introduce health risks like pollution, noise, and traffic accidents, affecting nearby communities. The influx of workers could strain healthcare services and housing, raise infectious disease concerns, and create social tensions. Additionally, infrastructure like roads and powerlines could expose local communities to security risks, including unauthorized access. Proactive community engagement, robust health and safety measures, and enhanced security protocols are crucial to mitigate these impacts.

7.0. Mitigation, Monitoring and Reporting

This section discusses the mitigation measures for the proposed solar power plant project, which aims to harness renewable energy and promote sustainable development in the Benadir Administrative Region. It outlines the monitoring and reporting requirements for these measures, which are pooled according to the project phases – construction, operation, and decommissioning. The mitigation measures address issues such as community health, soil erosion, biodiversity conservation, energy consumption, and solid waste management. The monitoring and reporting requirements ensure consistent implementation, compliance, and swift response to unforeseen impacts, ensuring the plant can operate sustainably while contributing positively to the region's energy needs.

Table 7-1: Mitigation measures, monitoring and reporting during the construction, operation and decommissioning phases for the proposed BECO Jazeera Power Plant

IMPACT CATEGORY	DESCRIPTION	RECOMMENDED MITIGATION MEASURES	PROJECT PHASE	MONITORING INDICATOR
Impacts on biophysical environment	Landscape and visuals	• Erect a fence around the power plant.	Construction	• Presence of a perimeter fence
	Soil, groundwater and surface water contamination	• Scoop and correctly dispose contaminated soil. • No vehicle maintenance and service shall be done at project site • Ensure waste water generated is drained into approved drainage facilities • Contractor to develop an oil-spill containment plan. • Construction vehicles must be maintained in good state. • Care must be exercised not to spill any fossil fuels	Construction	• Records of any leakages from construction equipment/ vehicles. • Oil spill containment plan. • Provision of fuel/oil drip and spill trays
	Air quality (Dust)	• Suppress dust during dry periods by use of water sprays. • Stockpiles of excavated soil should be palliated dry or windy conditions. • Restrict speed on loose surface roads during dry or dusty conditions • Keep stockpiles compacted and re-vegetate as soon as possible. • Ensure all the personnel use PPEs. • Cover construction trucks moving materials to prevent material dust emissions. • Burning of woody debris & construction waste to be prohibited.	Construction	• Visual Observation of dust Provision of PPEs especially masks
	Air quality (Vehicle exhaust emissions)	• Senstize drivers to avoid/minimize vehicle idling to lower emissions. • Maintain all machinery order to minimum emissions of CO NO2, SO2, PM	Construction	• Engine maintenance records • Inspection of stacks
	Noise & vibration	• Train workers on the importance of noise control and best practices on noise. • Provide appropriate PPEs to workers during construction activities. • Inform nearby communities in advance about scheduled high-noise activities. • Establish a monitoring program to regularly measure noise and vibration levels. • Establish a GRM for community to report noise or vibration disturbances. • Ensure regular maintenance of machinery to reduce noise emissions. • Employ modern equipment fitted with noise-reduction technologies • Restrict construction activities to daylight hours (e.g., 7:00 AM to 6:00 PM).	Construction	• Noise levels-Records of noise measurements done by contractor within the project area and at distances of 30m from the Hybrid power plant
	Biodiversity (Fauna)	• An ecologist shall be hired to coordinate the fauna monitoring. • Ensure wildlife-friendly designs for infrastructures. • Limit all vehicle movements to designated roads with speed of 15-20 km/h. • Site clearing work/earthwork shall be carried out during the dry season. • Site preparation shall minimize clearing of vegetation and topsoil. • Temporary-use areas shall be restored and revegetated • Undertake a supplementary biodiversity assessment on fauna in the area	Construction	• Full implementation of biodiversity management plan for the project • Regular biodiversity monitoring and reporting
	Biodiversity (Flora)	• Re-vegetation including planting of trees around the plant/facility • Ensure proper demarcation of the project site for all construction works. • Designate access routes and parking areas	Construction	• Number of trees cleared • Planted trees
	Soil erosion	• Avoid ground-breaking during the seasons of high rainfall to avoid erosion. • Ensure spoil from excavations is arranged according to the various soil layers.	Construction	• Assess size of rills or Gulleys forming from accelerated run off from compacted areas

IMPACT CATEGORY	DESCRIPTION	RECOMMENDED MITIGATION MEASURES	PROJECT PHASE	MONITORING INDICATOR
		• Monitor exposed soils to ensure that any incidents of erosion are controlled. • Monitoring of areas of exposed soil during rainy seasons. • Use silt traps where necessary		
	Wastes (Solid wastes)	• Use of durable materials to avoid regular replacements – avoid waste generation • Segregate waste • Re-use of materials where possible • Recovery of materials remains and return to stores • Provide litter collection facilities such as bins • Proper disposal of waste in line with solid waste regulation • Proper budgeting to avoid waste generation • Manage all the wastes in accordance with internationally accepted standards. • Handle and label all hazardous products properly to avoid ground contacts • Dispose hazardous waste through a approved waste handler • Contractor to put in place and comply with a site waste management plan	Construction	• Presence of well-maintained receptacles and centralized collection points.
	Wastes (Liquid wastes)	• Vehicles and equipment must be serviced regularly to avoid leaks. • The waste oil or used oil must be disposed-off appropriately. • Store all hazardous materials in compliance with local regulations. • Scoop all top toils for disposal incase of leaks. • Refuelling and maintenance of vehicles will not take place at the construction site. • Provide sanitary waste facilities for both genders clearly marked • Keep accurate documentation of fuel and oil storage volumes/transfer activities. • Install oil-water separators in drainage systems to remove oil from stormwater. • Ensure proper training for staff on handling and use of oils. • Disposal of waste through septic tanks • Develop and implement spill management plan with clear procedures • Develop and implement a detailed Spill Prevention Plan (SPP) • Create awareness for the employees on procedures of dealing with spills/leaks • All chemicals should be stored within the bunded areas and clearly labelled.	Construction	• Engine maintenance records • Oil spill containment plan • Presence of separate and clean washrooms for both the gents and ladies
Impacts on infrastructure and utilities	Water consumption	• Source and utilize a sustainable and reliable water supply for all project phases • Ensure prudent use of available water • Consultations with the project local committee on water use to avoid conflicts with the community	Construction	• Water usage records
	Energy Consumption	• Monitor all energy usage during construction and set reduction targets. • Ensure responsible electricity use through staff sensitization of staff. • Ensure proper planning of transportation of materials for efficient fuel usage	Construction	• Energy consumption records

IMPACT CATEGORY	DESCRIPTION	RECOMMENDED MITIGATION MEASURES	PROJECT PHASE	MONITORING INDICATOR
Impacts on social environment	Impact to livelihoods from grazing land access restrictions	• Regularly engage the local community and address ant emerging concerns. • Provide alternative water points for livestock near the construction area. • Establish a grievance redress mechanism to address any conflicts or complaints • Coordinate with the local herders and farmers to grazing routes or areas.	Construction	• Number of Alternative Grazing Routes/Areas Established. • Frequency of Community Consultations. • Grazing Land Access Complaints. • Usage of Alternative Grazing Areas. • Incidence of Conflict Over Grazing Access. • Changes in Grazing Patterns.
	Archaeology and cultural heritage	• Establish a clear protocol for halting construction activities upon a chance find. • Ensure proper documentation of all chance finds. • Engage a qualified archaeologist for any early identification of chance finds. • Develop and implement a Chance Finds Procedures	Construction	• Stratigraphic Soil profile reports during excavation • Fully developed artefact recovery protocols • Discovery of human burials reports during excavation. • Regulatory Compliance reporting under Somali Heritage Laws.
	Trespassing of unauthorized personnel	• Maintain records of any person who comes to site • Hazard communication • Fencing off the construction site to keep of unauthorized personnel • Ensure proper barricading • Controlled access to the site only with prior approval	Construction	• Presence of a controlled access and records of every person accessing the site
	Worker influx – Incoming Workforce	• Establish and operationalize an effective GRM accessible to community members. • Prompt payment of workers as per the contractual agreements/terms. • Raise awareness among local community and workers on cordial working relation • Respect for community values/culture. • Sensitize workers regarding engagement with local community. • Tap into the local workforce to the extent possible to reduce labour influx.	Construction	• Records of employees/updated employee register. • Number of local community employees and external employees/ updated employee register.
	Gender-based violence	• Ensure that Code conducts are singed by all employers in the contracts. • Establish Workers GRM with multiple channels including SEA/H channels. • Implement a code of conduct signed by all those with physical presence on site. • Prepare SEA/SH Prevention/Response Action Plan, to manage the SEA/SH risks.	Construction	• Minutes of awareness creation sessions for the community and workers on GBV-SEA/SH. • Code of conduct signed by all those with physical presence on site. • GRM that ensures confidentiality of GBV cases in place. • Documented referral services for survivors. • Grievances raised, aggrieved persons and status on resolution etc
	Labour disputes	• Set up a transparent GRM to handle all complaints/disputes in a timely manner. • Implement non-discrimination policies to ensure equal treatment for all. • Establish worker welfare systems to represent concerns & promote	Construction	• Number of grievances filed and time taken to resolve them. • Frequency of labor disputes. • Health and safety violations.

IMPACT CATEGORY	DESCRIPTION	RECOMMENDED MITIGATION MEASURES	PROJECT PHASE	MONITORING INDICATOR
		dialogue. • Establish mechanisms to guarantee fair/timely payment of wages and benefits. • Ensure that all workers receive clear contracts outlining their rights, responsibilities, wages, benefits, working hours, and terms of employment. • Ensure full compliance with local labor laws.		• Worker turnover rate and compliance with working hours and overtime rules. • Labor law compliance audits • Worker welfare committee activities.
	Child and forced labour	• Adhere to all the ESS 2 provisions and FRS Employment Act on forced labour. • Compliance with the national labor laws and labour management practices. • Do not allow children at the project site. • Implement and monitor the employment register regularly. • Put visible signage on site "No Jobs for children" • Report any form of forced labour at the site.	Construction	• Updated employment register indicating locals employed, their ages, national identification numbers etc. • Grievances raised, aggrieved persons and status on resolution etc. • Number of reported cases of forced labour.
	Security risks	• Use surveillance systems/CCTV cameras to monitor critical areas in real-time. • Provide workers with security training and response protocols to threats. • Provide workers with ID badges and restrict entry to authorized personnel only. • Maintain constant with local authorities on security updates in the area. • Implement strict access control protocols, including sign-in procedures. • Hire licensed security to provide 24/7 site surveillance, patrols, and monitoring. • Have security response teams on standby to address any security emergencies. • Engage all stakeholders to understand and address local security concerns. • Develop a security incident response plan including emergencies procedures. • Conduct a comprehensive risk assessment to identify specific security threats. • Collaborate with local law enforcement/security agencies to enhance security.	Construction	• Number of security incidents and response time to security incidents. • Compliance with security protocols. • Incidents of unauthorized site access. • Grievances related to security. • Community engagement on security issues. • Security risk assessments. • Coordination with local law enforcement. • Security equipment functionality. • Frequency of security audits.
	Occupational Health and safety Impacts	• Workers coming to the site should be knowledgeable on safety precautions • Use skilled personnel for activities which demand skills/technical tasks • Undertake risk assessment and implement mitigation measures appropriately • Provide safe drinking water for workers • Provide appropriate PPE to all workers. • Establish safety committees • Engagement of trained first aider on site • Availability of equipped first aid box on site	Construction	• Records of any near misses, incident, and accidents. • Records of corrective actions implemented if there was an accident.
	Community health and safety risks	• The contractor is impressed upon not to set a construction camp on site. • Provide awareness materials on HIV/AIDS transmission and prevention. • Informing workers on local cultural values and health matters.	Construction	• Number of awareness creation sessions conducted. • Availability of and distribution of condoms

IMPACT CATEGORY	DESCRIPTION	RECOMMENDED MITIGATION MEASURES	PROJECT PHASE	MONITORING INDICATOR
		• Ensure equal treatment of workers • Create awareness to the community on risks associated with construction works. • Allowing migrant workers time to be with their families		
	Fire Hazards	• 'No smoking' signs shall be posted at the construction site • A fire risk assessment/evacuation be prepared and posted across site. • Create awareness to the construction workers on potential fire hazards • Designate an assembly point • No smoking shall be done on construction site • Provision of firefighting equipment on site during construction.	Construction	• Records of any Fire incidences • Fire equipment and evacuation plan
	Traffic risk	• Use traffic signs, barriers, and cones to guide construction and local traffics. • Install speed bumps/ traffic-calming measures on roads near the site. • Erect temporary road signs warning local road users near the site. • Engage with local communities to raise awareness about safety measures. • Enforce strict speed limits for vehicles within the site and designated routes. • Develop and implement a Traffic Management Plan (TMP). • Designate safe parking and loading zones for all construction vehicles.	Construction	• Number of traffic incidents. • Traffic management plan compliance. • Speed limit violations. • Traffic safety training attendance. • Community complaints related to traffic. • Emergency response time to traffic incidents. • Community awareness programs on traffic safety. • Use of alternative routes by construction vehicles.
	Risks related to Inadequate stakeholder engagement	• The grievance redress committee to include representatives from the community. • Sensitize stakeholders on SEP and GRM. • Prepare and implement a GRM to deal with grievances. • Prepare a SEP that is proportionate to subproject and the identified stakeholders. • In line with the SEP, undertake adequate consultations prior to construction.	Construction	• Availability of and implementation of the Stakeholder Engagement Plan. • Number of stakeholder consultations held • Record of stakeholder consultations held (minutes of meetings and list of participants). • Information disclosed, to whom it was disclosed (Men, women, PWD, youth, vulnerable individuals and households etc., methods and languages used in the disclosure (culturally appropriate and accessible), grievances raised and status on resolution etc. • Concerns raised and actions raised.
	Inadequate grievances management	• Provide for confidential reporting under the GRM • Implement a workers and community GRM. • Ensure proportionate representation of VMGs in the local grievances committee. • Constitute a Local Grievances Committee is in consultation with stakeholders	Construction	• Local Grievances Committee in place, composition of committee, awareness of community and workers on project and worker GRMs, updated GRM logs, types of grievances • Availability of grievance redress process • Number of grievances reported • Number of grievances resolved in a timely

IMPACT CATEGORY	DESCRIPTION	RECOMMENDED MITIGATION MEASURES	PROJECT PHASE	MONITORING INDICATOR
				manner • Number of grievances escalated to national courts and the World Bank Grievances Redress Service and Inspection Panel.
Impacts on biophysical environment	Landscape and visual	• Fence off the power plant.	Operation	• Presence of a perimeter fence
	Soil, groundwater and surface water contamination	• No vehicle maintenance and service shall be done at project site • Ensure that potential sources of petro-chemical pollution protected from leaks. • Ensure proper design of drainage system to minimize contaminated run-off. • Develop and implement oil-spill containment plan as part of the EPRP.	Operation	• Oil spill containment plan. • Provision of fuel/oil drip and spill trays
	Flood risks	• Raise foundations of the solar panels and ensure well designed concrete base • Ensure drainage channels are free of any obstruction at all times. • Create flooding diversions and or spill ways to divert water from the plant • Construct more channels and or expand existing ones	Operation	• Provision of drainage system • Raised foundations for the structures
	Air quality (Dust)	• Plant trees around the plant to act as wind breakers/decrease dust pollution • Ensure planting of grass around and within the facility compound	Operation	• Visual inspection
	Air quality (Vehicle and exhaust emissions)	• Maintain all machinery in good to minimum emissions of CO, NO2, SO2. • Regularly monitor and report emissions data as part of EHS compliance.	Operation	• Engine maintenance records • Inspection of stacks
	Noise & vibration	• Use sound-absorbing materials within the BESS housing units. • Use quieter, high-efficiency fans and cooling systems with lower noise outputs. • Regularly service and maintain fans, inverters, and other equipment • Install sound barriers or walls around the BESS unit to deflect or absorb noise. • Equip the BESS unit with vibration isolators to reduce vibrations/noise	Operation	• Noise levels-Records of noise measurements done by contractor within the project area and at distances of 30m from the Hybrid power plant
	Biodiversity (Fauna)	• An ecologist shall be hired to coordinate the fauna monitoring. • Bird deterrents will be installed to prevent collisions with solar panels. • Ensure wildlife-friendly designs for infrastructures. • Undertake a supplementary biodiversity assessment and develop BMP • Undertake regular monitoring and report on biodiversity	Operation	Full implementation of biodiversity management plan for the project Regular biodiversity monitoring and reporting
	Biodiversity (Flora)	• Re-vegetation including planting of trees around the plant/facility • Develop and implement and invasive species management plan.	Operation	• Number of trees cleared • Planted trees
	Soil erosion	• Concrete only the required area and leave the rest of the land with grass • Construct rain water harvesting system on buildings and install adequate storages • Construct the drainage system in a way to follow natural water channels • Landscape the power plant with grass in all open areas • Monitor exposed soil during rainy seasons for proper erosion control.	Operation	• Assess size of rills or Gulleys forming from accelerated run off from compacted areas • Provision of a drainage system and a rain water harvesting system
	Wastes (Solid)	• Emphasis on prudent waste generation and give priority to reduction at source	Operation	• Presence of well-maintained receptacles and centralized collection points.

IMPACT CATEGORY	DESCRIPTION	RECOMMENDED MITIGATION MEASURES	PROJECT PHASE	MONITORING INDICATOR
		• Operator to contract a licensed waste handler to collect and dispose solid waste • Provide waste handling facilities such as labelled waste bins • Undertake solid waste management awareness to operators *Damaged solar panels and hazardous wastes* • Dispose hazardous waste through a approved waste handler • Ensure proper labelling and handling of all hazardous products/wastes. • Ensure segregation from other waste streams		
	Wastes (Liquid)	*Sanitary wastes* • Provide adequate sanitary waste facilities for both genders clearly marked • Disposal of waste through septic tanks *Oils from vehicles* • All vehicles and equipment must be kept in good state to avoid leaks. • Create awareness for the employees on procedures of handling spills and leaks • Refuelling and maintenance of vehicles will not take place at the construction site. *Chemicals* • All chemicals should be stored within the bunded areas and clearly labelled detailing the nature and quantity of chemicals within individual containers. *Accidental fuel and oil spill* • Ensure quick response to hazardous materials' spill by a trained response team. • Establish proper waste management protocols for the disposal of used oil, fuel, and filters from equipment maintenance activities. • Implement a regular environmental monitoring program to check for any signs of contamination in soil, groundwater, and surface water near the plant. • Install oil-water separators in drainage systems to manage oil from stormwater.	Operation	• Presence of separate and clean washrooms for both the gents and ladies. • Engine maintenance records • Oil spill containment plan • Records of all accidental spills and number of Liters
Impacts on infrastructure and utilities	Water consumption	• Any water leaks through damaged pipes and faulty taps should be fixed promptly. • Ensure prudent use of water. • Install water-conserving automatic taps.	Operation	• Water usage records
	Energy consumption	*Lightings* • Conduct periodic energy audits to evaluate lighting energy consumption. • Install an energy-efficient lighting system • Integrate lighting controls into the plant's energy management system to monitor and optimize energy use in real-time.	Operation	• Solar Energy Generation (kWh/month): • Battery Energy Storage System (BESS) Utilization (cycles/month). • Lighting Energy Consumption (kWh/month).

IMPACT CATEGORY	DESCRIPTION	RECOMMENDED MITIGATION MEASURES	PROJECT PHASE	MONITORING INDICATOR
		• Regularly review and adjust the hybrid power system's configuration to optimize the balance between solar and BESS. • Replace conventional lighting with energy-efficient LED bulbs • Utilize daylight sensors to adjust indoor lighting levels based on the amount of natural light, reducing the need for artificial lighting during the day.		• Carbon Emissions (tons of CO2/month).
Impacts on social environment	Impact to livelihoods from grazing land access restrictions	• Conduct regular monitoring of the livelihoods of affected pastoralists. • Continue consultations with local communities to assess alternatives. • Establish and maintain a grievance redress mechanism • Install livestock water points at strategic locations near alternative grazing areas. • Provide alternative livelihood opportunities for pastoralists • Support the development of pasture improvement projects	Operation	• Number of complaints from affected communities (monthly). • Access routes to grazing lands (percentage maintained). • Community satisfaction with alternative grazing lands (% satisfaction). • Community engagement and participation (number of meetings/year). • Conflict or dispute incidents (number reported/year).
	Trespassing of unauthorized personnel	• Fencing off the facility to keep of illegal access to the power plant. • Ensure controlled access to the site only with prior approval • Maintain records of any person who comes to site	Operation	• Presence of a controlled access and records of every person accessing the site
	Worker influx – Incoming Workforce	• Design separate worker accommodations for local and incoming workers. • Develop and implement waste management systems in all accommodation areas. • Encourage use of local suppliers of good and services to support local economy. • Ensure both the workforce and the local community have access to GRM. • Establish and enforce a strict code of conduct for incoming workers. • Maintain links with local communities to address any concerns on worker influx. • Prioritize the hiring of local workers to reduce the need for incoming workforce.	Operation	• Number of local workers employed (% of total workforce). • Community grievances related to workforce behavior (number of grievances/month). • Community interaction incidents (number reported/month). • Local business engagement (percentage of local suppliers engaged). • Worker turnover rate (%). • Worker welfare program implementation (% of programs implemented). • Community consultation meetings held (number/year).
	Gender-based violence	*GBV- SEA and SH* • Develop and implement a GRM that ensures confidential reporting of GBV cases. • Ensure that all employees sign Code conducts on GBV in employment contracts. • Establish Workers GRM with multiple channels including SEA/H channels. • Implement a code of conduct signed by all those with physical presence on site. • Prepare a SEA/SH Prevention/Response Action Plan, to manage the SEA/SH risks.	Operation	• Minutes of awareness creation sessions for the community and workers on GBV-SEA/SH. • Documented referral services for survivors. • Interventions to enable those vulnerable access project benefits. • Number of complaints raised by VMGs/vulnerable individuals regarding access to project services.

IMPACT CATEGORY	DESCRIPTION	RECOMMENDED MITIGATION MEASURES	PROJECT PHASE	MONITORING INDICATOR
		Inaccessibility of project benefits to VMGs and other vulnerable individuals due to affordability challenges • Ensure VMGs individuals have to ensure they equally benefit from the project.		
	Labour disputes	• Conduct regular worker feedback surveys to understand any emerging disputes. • Ensure all employees have clear and legally binding employment contracts. • Ensure full compliance with national labor laws. • Establish an accessible and transparent GRM for all workers' disputes. • Implement fair and transparent disciplinary procedures. • Maintain open communication between management and workers. • Promote equal opportunities and non-discriminatory hiring practices. • Set up a monitoring system to track and evaluate labor relations.	Operation	• Number of Labor Disputes Raised (disputes/month): • Grievances Resolved Within Agreed Timeframe (%): • Worker Turnover Rate (%). • Number of Grievances Filed Regarding Wages or Compensation (grievances/month). • Number of Labor Dispute Awareness Campaigns (number/year).
	Child and forced labour	• Adhere to the ESS 2 provisions and FRS Employment Laws. • Ensure compliance with the national labor laws management practices. • Put visible signage on site "No Jobs for children" "Do not allow children". • Report any form of forced labour at the site.	Operation	• Number of child labor incidents reported (incidents/month). • Number of forced labor incidents reported (incidents/year). • Grievances related to child or forced labor (number of grievances/year). • Community outreach and awareness campaigns on child labor (campaigns/year). • Compliance with international labor standards (compliance level). • Social audits conducted (number of audits/year). • Local community feedback on employment practices (satisfaction level).
	Risks related to poor or inadequate stakeholder engagement (Conflict)	*Risks related to Inadequate stakeholder engagement* • Ensure timely and prior disclosure of project all project information. • Prepare a SEP that is proportionate to the identified stakeholders. • Prepare and implement a GRM to deal with all grievances. • Sensitize stakeholders on SEP and GRM. • The grievance redress committee to include representatives from the community. *Inadequate grievances management* • Work closely with the GRM committee members in solving the conflicts • Solve all conflicts/grievances at the earliest time possible • Monitoring the pattern of grievances to come up will long term measures • Ensure all grievances are logged and closed • Engage the community members and other stakeholders in a timely manner	Operation	• Availability of and implementation of the Stakeholder Engagement Plan. • Number of stakeholder consultations held • Record of stakeholder consultations held (minutes of meetings and list of participants). • Availability of grievance redress process.

IMPACT CATEGORY	DESCRIPTION	RECOMMENDED MITIGATION MEASURES	PROJECT PHASE	MONITORING INDICATOR
		• Employ from the community to the extent possible		
	Occupational health and Safety	• All workers operating the project site must be equipped with appropriate PPEs. • Annual EHS audits should be done • Ensure all operators are skilled on firefighting management • Ensure only qualified staff are employed to work in the facility	Operation	• Provision of PPEs and WIBA cover • Environmental audit reports
	Community health and safety risks	*Public Health Impacts* • Informing workers on local cultural values and health matters. • Allowing migrant workers time to be with their families • Ensure equal treatment of workers. *Shocks and electrocutions* • Develop and implement a reporting system for all safety risk and incidences. • Inspect the wiring of the houses before connecting power • Refraining from individual illegal extensions of power lines to other houses • Require community to engage a certified technician to do wiring in the premises • Undertake safety awareness campaigns to the community • Use of quality materials while wiring *Public Health Impacts –HIV/AIDs* • Allowing migrant workers time to be with their families • Sensitize workers and the community on prevention and mitigation of HIV/AIDS and other sexually transmitted diseases, through staff awareness and awareness campaigns for the community	Operation	• Number of awareness creation sessions conducted. • Records of awareness sessions conducted • Incidences report • Number of awareness creation sessions conducted. • Availability of and distribution of condoms
	Fire hazards	• 'No smoking' signs shall be posted within the power plant area • A fire Assembly point shall be identified and clearly marked at the facility • Develop and create awareness on fire management and response plans • Install and ensure the facility has proper and well-serviced firefighting equipment. • Install detection/alarm systems that can detect fire should be and installed • Workers especially operators of the plant must be trained on fire management	Operation	• Provision of serviced fire equipment, evacuation plan and safety signages • Records of fire safety training
	Security risks	• Continue engaging local communities to minimize any emerging hostility. • Deploy trained security personnel to guard the site 24/7. • Develop and periodically review contingency plans for worst-case scenarios, such as armed attacks, civil unrest, or natural disasters. • Ensure proper access control measures - only allowing authorized personnel. • Implement a vetting process for all employees to minimize risk of insider threats. • Maintain a secure perimeter with robust fencing of the site. • Maintain and regularly update a comprehensive security incident response	Operation	• Number of security incidents reported (incidents/month): • Number of security audits conducted (audits/year): • Community engagement activities held (number/year): • Incidents of violence or threats against staff (number/year). • Collaboration with local law enforcement (number of meetings/year).

IMPACT CATEGORY	DESCRIPTION	RECOMMENDED MITIGATION MEASURES	PROJECT PHASE	MONITORING INDICATOR
		plan • Maintain close coordination with local law enforcement and security agencies • Monitor local security developments and adjust security protocols accordingly.		• Number of partnerships established with security ngos (active partnerships).
Impacts on biophysical environment	Impacts on landscape and visual	• Provide regular updates to stakeholders on decommissioning progress. • Install informational signs explaining the decommissioning process. • Implement a revegetation plan using native plants and vegetation. • Ensure proper management of all waste materials to prevent visual pollution. • Create a decommissioning plan that includes minimizing any visual impacts. • Conduct regular cleanup to remove any unsightly materials.	Decommissioning	• Photographic documentation: • Vegetation health monitoring: • Number of complaints: • Soil erosion assessment: • Public awareness programs participation. • Community engagement metrics.
	Impacts on biological environment	• Develop and implement detailed site restoration plans. • Develop habitat protection plans to protect sensitive habitats, such as wetlands. • Ensure proper disposal of waste materials to prevent any harmful pollution. • Implement erosion control measures to prevent sediment runoffs. • Implement noise control measures to minimize disturbance to local wildlife. • Monitor and manage invasive species to prevent their spread in disturbed areas. • Undertake habitat restoration using native plants to promote ecosystem recovery. • Work with environmental specialists to implement effective mitigation measures.	Decommissioning	• Biodiversity surveys. • Community engagement records. • Erosion and sedimentation rates. • Flora and fauna species lists. • Habitat quality assessments. • Invasive species monitoring. • Vegetation health monitoring.
	Solid Waste Generation	• Safe transportation to the disposal sites / designated area • Hazardous waste must be disposed by approved waste handler • Ensure proper segregation of waste streams - hazardous and non-hazardous. • Ensure proper handling and storage of all demolition materials. • Ensure adequate collection and storage of waste on site • Demolition contractor to adhere to the various manufacturer's guidelines.	Decommissioning	• Presence of well-maintained receptacles and centralized collection points
	Wastes (liquid)	• Use environmentally friendly materials that generate less hazardous liquid wastes. • Provide training for staff on liquid waste handling to minimize risks. • Maintain an inventory of chemicals and hazardous substances. • Maintain accurate records of liquid waste management and disposals. • Identify opportunities for the reuse or recycling of liquid waste materials. • Establish temporary storage facilities for all liquid wastes to prevent leaks/spills. • Establish an emergency contact list and response procedures. • Ensure that all liquid wastes are disposed by licensed waste disposal facilities. • Develop a detailed liquid waste management plan outlining all procedures.	Decommissioning	• Liquid waste generation quantities. • Soil contamination assessments. • Incidence of spills and leaks. • Liquid waste management plan compliance. • Public reporting and complaints. • Community engagement metrics. • Volume of recovered reusable liquids.

IMPACT CATEGORY	DESCRIPTION	RECOMMENDED MITIGATION MEASURES	PROJECT PHASE	MONITORING INDICATOR
		• Conduct a comprehensive assessment to identify/categorize all liquid waste.		
	Noise and Vibration	• Demolish mainly during the day when most of the neighbours are out working. • Limit pickup trucks and other small equipment to a minimum idling time and observe a common-sense approach to vehicle use and encourage workers to shut off vehicle engines whenever possible. • Use quiet equipment (i.e., equipment designed with noise control elements).	Decommissioning	• Noise levels-Records of noise measurements done by contractor within the project area and at distances of 30m from the project site
	Air quality (dust)	• Conduct regular inspections to identify potential sources of dust emissions. • Enforce speed limits for vehicles to reduce dust emissions from vehicle traffic. • Engage with local communities to inform them about decommissioning activities. • Implement soil stabilization techniques to minimize dust from disturbed areas. • Plan for site restore vegetation restoration to prevent dust generation. • Use water sprays or misting systems to dampen surfaces and reduce dust.	Decommissioning	• Community complaints and feedback. • Cumulative dust impact assessment. • Effectiveness of dust control measures. • Health impact assessments. • Long-term dust emission trends. • Post-activity dust cleanup reports. • Public awareness programs participation. • Soil and vegetation dust monitoring. • Traffic patterns and impact assessment. • Visual assessment of dust levels.
	Air quality (vehicle fumes)	• Conduct scheduled checks to ensure emission controls. • Establish a reporting system for emissions data to track progress. • Implement a regular maintenance schedule for all vehicles to minimize emissions. • Train drivers/equipment operators on practices that limit emissions.	Decommissioning	• Community complaints and feedback. • Cumulative emission impact assessment: • Environmental compliance audits. • Health impact assessment reports. • Long-term emission trends. • Maintenance records of vehicles.
Impacts on Infrastructure & Utilities	Water Resources	• Use temporary storage solutions to manage water supplies and reduce waste. • Provide training for personnel on water conservation practices. • Implement systems to recycle and reuse water for various tasks. • Implement measures to prevent leaks and spills from water storage. • Develop a water management plan that minimize water consumption. • Conduct assessment to evaluate water needs & identify reduction opportunities.	Decommissioning	• Community feedback • Compliance with water usage regulations: • Impact on local water resources: • Mitigation measure implementation records. • Water consumption efficiency • Water recycling rates: • Water usage quantities and supply.
Impacts on social environment	Impacts on Occupational health and safety	• Provide first aid facilities and ensure that trained personnel are available to respond to medical emergencies on-site. • Implement measures to control noise and vibration levels during decommissioning activities, such as using quieter equipment and scheduling high-noise activities appropriately. • Establish EPRP for incidents such as fires, chemical spills, and medical emergencies, and ensure all workers are trained in these procedures. • Ensure that all workers are equipped with appropriate PPE. • Ensure that all contractors and subcontractors adhere to the same occupational health and safety standards as the main contractor.	Decommissioning	• Incident reporting and tracking. • Health and safety training participation. • Personal protective equipment (PPE) compliance. • Safety audits and inspections. • First aid response records. • Compliance with safety regulations. • Incident investigation reports.

IMPACT CATEGORY	DESCRIPTION	RECOMMENDED MITIGATION MEASURES	PROJECT PHASE	MONITORING INDICATOR
		• Develop and enforce safe work practices and standard operating procedures for decommissioning tasks, including equipment handling, dismantling, and waste disposal. • Conduct regular safety inspections to address potential hazards promptly. • Conduct a thorough occupational health and safety risk assessment.		
	Impact to livelihoods from grazing land access restrictions	• Engage with local communities to discuss the decommissioning process and gather feedback on their concerns and suggestions regarding grazing land access. • Invest in community development programs that provide alternative income-generating opportunities, such as skills training or support for small businesses. • Involve local leaders and organizations in the planning and implementation of mitigation measures to enhance community acceptance and participation.	Decommissioning	• Conflict incidence reports. • Community meetings and feedback. • Long-term livelihood trends.
	Trespassing of unauthorized personnel	• Define and communicate restricted access hours during which the site is closed to unauthorized personnel. • Hold regular community engagement meetings to discuss security concerns and gather feedback on improving site safety. • Install clear and visible warning signs around the site indicating that it is a restricted area and unauthorized entry is prohibited. • Partner with local community leaders and organizations to promote site security and encourage community members to report unauthorized access.	Decommissioning	• Incident reports of trespassing. • Visitor logs. • Community awareness programs. • Community feedback on security. • Stakeholder engagement effectiveness. • Reporting mechanisms for trespassing.
	Worker influx – Incoming Workforce	• Consult with and involve local community in the decommissioning activities. • Establish and operationalize an effective GRM accessible to community members. • Include gender considerations in employment opportunities. • Prompt payment of workers as per the contractual agreements/terms. • Provide appropriate compensation for work done. • Respect for community values/culture. • Sensitize workers regarding engagement with local community. • Tap into the local workforce to the extent possible to reduce labour influx.	Decommissioning	• Records of employees/updated employee register. • Number of local community employees and external employees/ updated employee register.
	Gender-based violence	• Ensure that Code conducts on GBV are singed by all employers. • Establish Workers GRM with multiple channels including SEA/H channels. • Implement a code of conduct signed by all those with physical presence on site. • Prepare an SEA/SH Prevention/Response Action Plan, to manage SEA/SH risks.	Decommissioning	• Minutes of awareness creation sessions for the community and workers on GBV-SEA/SH. • Code of conduct signed by all those with physical presence on site. • GRM that ensures confidentiality of GBV cases in place. • Documented referral services for survivors. • Grievances raised, aggrieved persons and status on resolution etc

Impact Category	Description	Recommended Mitigation Measures	Project Phase	Monitoring Indicator
	Inadequate grievances management	• Implement a worker's grievances mechanism. • Ensure proportionate representation of VMGs in the local grievances committee. • Constitute a Local Grievances Committee is in consultation with all community segments, and incorporates the existing local dispute resolution mechanism.	Decommissioning	• Local Grievances Committee in place, composition of committee, awareness of community and workers on project and worker GRMs, updated GRM logs, types of grievances • Availability of grievance redress process • Number of grievances reported • Number of grievances resolved in a timely manner • Number of grievances escalated to national courts and the World Bank Grievances Redress Service and Inspection Panel.
	Risks related to Inadequate stakeholder engagement	• Collaborate with local leaders and community organizations to facilitate trust-building and effective engagement with the community. • Develop a stakeholder engagement strategy that outlines the objectives, methods, and timelines for engaging with different stakeholders throughout the decommissioning process. • Ensure that women and vulnerable groups are actively involved in stakeholder engagement processes, addressing any barriers they may face in participation. • Organize public consultations and forums to solicit feedback from stakeholders, ensuring their voices are heard and concerns are addressed. • Provide regular updates and reports to stakeholders on the progress of decommissioning activities and how stakeholder feedback has influenced decisions.	Decommissioning	• Frequency of stakeholder meetings. • Documentation of stakeholder concerns. • Follow-up actions on feedback. • Community representation in decision-making. • Collaboration with local organizations. • Long-term engagement strategies.
	Child and forced labour	• Report any form of forced labour at the site. • Put visible signage on site "No Jobs for children"; "Do not allow children". • Compliance with the national labor laws and labour management practices. • Adhere to the ESS 2 provisions and FRS Employment Laws.	Decommissioning	• Number of reported cases of forced labour. • Updated employment register indicating locals employed, their ages, national identification numbers etc. • Grievances raised, aggrieved persons and status on resolution etc.
	Security risks	• Provide training on risk mitigation strategies for all personnel involved in the decommissioning activities. • Implement strict access control procedures to limit entry to authorized personnel only, including the use of identification badges or passes. • Establish partnerships with local law enforcement and security agencies to enhance overall security coordination and response. • Employ trained security personnel to monitor the site, control access, and respond to security incidents as they arise. • Conduct a thorough security risk assessment to identify potential threats.	Decommissioning	• Incident reports. • Access control measures. • Response time to security incidents. • Training of security personnel. • Community security awareness programs. • Stakeholder feedback on security. • Analysis of security trends. • Feedback from security personnel.

Impact Category	Description	Recommended Mitigation Measures	Project Phase	Monitoring Indicator
	Community health and safety risks	• Implement sustainable decommissioning practices that prioritize community health and safety while minimizing environmental impacts. • Implement measures to minimize noise pollution during decommissioning. • Implement dust suppression measures, such as regular watering of the site, to minimize dust emissions that can affect community health. • Establish a feedback mechanism that allows community members to report health and safety concerns related to the decommissioning process. • Ensure proper waste management practices to prevent contamination of land and water resources, which could impact community health. • Engage with local communities regularly to gather feedback, address concerns, and provide updates on decommissioning activities and safety measures. • Develop and communicate an emergency response plan that includes protocols for medical emergencies, environmental incidents, and community evacuations if necessary. • Develop a traffic management plan to control vehicle movement to and from the site, reducing risks of accidents and ensuring safe access for the community. • Conduct a comprehensive assessment to identify potential health and safety risks to the local community during the decommissioning process.	Decommissioning	• Health incident reports. • Community health assessments. • Feedback mechanisms for community concerns. • Community satisfaction surveys. • Communication of health risks. • Injury rate monitoring. • Environmental health audits. • Documentation of community feedback.
	Fire hazards	• Conduct a comprehensive fire risk assessment to identify potential fire hazards associated with decommissioning activities and materials. • Create a fire safety plan that outlines prevention measures, emergency response protocols, and responsibilities for all personnel involved in decommissioning. • Ensure an adequate supply of water is readily available for firefighting purposes, including water tanks or ponds if necessary. • Ensure the availability of adequate firefighting equipment, such as fire extinguishers, hoses, and water sources, in easily accessible locations throughout the site. • Establish communication and coordination with local fire services to ensure a rapid response in case of a fire emergency. • Establish fire breaks or cleared areas around the site to help prevent the spread of fire. • Minimize the accumulation of combustible waste materials on-site and establish a routine waste removal process. • Provide fire safety training for all workers, covering fire prevention, emergency procedures, and the proper use of firefighting equipment. • Store flammable materials in designated, secure areas away from ignition sources, following appropriate storage guidelines. • Use clear signage to indicate fire exits, assembly points, and locations of firefighting equipment throughout the site.	Decommissioning	• Fire incident reports. • Fire risk assessments. • Documentation of fire hazards. • Monitoring of flammable materials storage. • Documentation of community feedback on fire safety.

8.0. Environmental and Social Management Plan

The proposed project's environmental and social management plan (ESMP) is a comprehensive framework for mitigating and monitoring negative environmental and social impacts (Table 8-1). It outlines the implementation of the plan in each project phase, assigning responsibilities to various actors, and setting specific timeframes for mitigation measures. The ESMP ensures compliance with environmental and social policies, guidelines, and legislation, and assesses emerging non-anticipated impacts. It also maintains best practices in environmental, social health, and safety, adhering to environmental laws and WB policies.

8.1. THE ESMP IMPLEMENTATION TOOLS

The implementation of the proposed ESMP will be the responsibility of the MoEWR, BECO and the Contractors as the main players. To facilitate the implementation, several tools to be used in shall be used.

8.1.1. Construction Phase

The contractor will develop focused management plans to address specific environmental and social concerns as recommended by the ESMP, as well as any other emerging challenges on the ground. Before mobilising to the site, the contractor must prepare and have these plans authorised by the MoEWR. Construction management plan, rehabilitation and site closure plan, local recruitment plan, workplace health and safety plan, community safety plan, emergency management and response plan, SEA/SH prevention and response plan, stakeholder engagement management plan, grievance redress mechanism, and labour influx management plan.

8.1.1.1. Construction Management Plan

The construction management plan for the proposed project shall include the following elements:

- *Management of fuels and other hazardous materials:* The Contractor shall comply with all applicable laws, regulations, permit and approval conditions and requirements relevant to the storage, use, and proper disposal of hazardous materials.
- *Management of the construction site:* The contractor shall prevent littering and the random discard of any solid waste on or around the construction site. The contractor shall manage other solid and liquid waste.
- *Fire prevention and management:* The Contractor shall take all necessary precautions to prevent fires caused either deliberately or accidentally during construction process. The Contractor shall prepare a fire prevention and fire emergency plan as a part of the plans to be submitted to MoEWR and BECO.
- *Management of air quality:* The Contractor shall institute appropriate measures to minimize or avoid air quality impacts. This shall be achieved through formulation of air quality management plan.
- *Neighbouring landowner and occupier relations:* The Contractor shall respect the property and rights of neighbouring landowners and occupiers at all times and shall treat all persons with deliberate courtesy. The Contractor shall respect any special agreements between the MoEWR/BECO and the neighbours e.g., the wayleaves agreements signed between MoEWR/BECO and landowners will need to be respected by the Contractors.
- *Complaints register:* The Contractor shall establish and maintain a register for periodic review by the MoEWR/BECO that logs all the complaints raised by the neighbours or the general public about construction activities. The register shall be regularly updated, and records maintained including the name of the complainant, his/her domicile and contact details, the nature of the complaint and any action taken to rectify the problem.
- *Construction control:* The construction control for the proposed project shall cover control of access and materials supply. The Contractor shall prepare a method statement including plans for all construction activities for approval by the supervising contractor and the MoEWR/BECO.

8.1.1.2. Rehabilitation and Site Closure Plan

After completion of construction activities, the contractor shall clear the site of construction materials and dispose wastes as recommended in the ESMP. The contractor shall remove all temporary works on the construction site and grow grass or any other indigenous vegetation on areas that are not covered by the installations to control erosion.

8.1.1.3. Local Recruitment Plan

The contractor will prepare a local recruitment plan to guide on recruitment of locals. The plan shall pay attention or adhere to Employment Act of both the FRS, BRA Governments and the WB ESS2. In designing the local recruitment plan contractor shall: wherever possible, give priority to qualified local people when hiring employees, ensure all community segments - men, women, vulnerable individuals, minority clans, and VMGs.

8.1.1.4. Workplace Health and Safety Plan

The contractor, MoEWR, and BECO shall implement a workplace health and safety plan to minimize diseases contracted by construction workers. Key measures shall include providing appropriate PPE, training employees, employing qualified staff, providing First Aid Kits, and creating awareness on safe work procedures. The contractor will manage accidents through an emergence response plan, including emergency contact information. Health and safety performance will be continuously monitored and procedures reviewed to eliminate risk as much as possible.

8.1.1.5. Community Health and Safety Plan

The community health and safety plan shall be developed and implemented by the contractor. The Community health and safety plan shall include:

- Adherence to the existing FRS and BRA by-laws and regulations, and the WB ESS4.
- The contractor to ensure that construction work is undertaken in manner not likely pose risks to community health and safety.
- The contractor shall undertake an independent risk assessment prior to any construction activity. The findings of this assessment will inform the development of a community safety plan and create awareness to the community on the same.

8.1.1.6. Emergency Preparedness and Response Plan

The Contractor shall develop an emergency plan that will enable rapid and effective response to all types of environmental emergencies in accordance with recognized national and international standards. The emergency plan shall include establishment of a network of communication between the Contractor and emergency services including police, ambulance services, and fire brigades among others.

8.1.1.7. SEA/SH Prevention and Response Plan

The contractor is tasked with creating a SEA/SH Prevention and Response Action Plan, including a Confidentiality Guaranteed Method (GRM) and an Accountability and Response Framework. The plan will include measures for preventing and responding to GBV impacts, such as equitable employment opportunities and equal pay. The contractor will also prepare and implement a GBV management plan, sensitizing community members and subproject workers to potential SEA and SH impacts. They will also map GBV service providers and document referral services for survivors.

8.1.1.8. Stakeholder Engagement Plan

A Stakeholder Engagement Plan is a formal approach to communicate with project stakeholders to achieve their support for the project. The SEP is a useful tool for managing communications between the contractor and other stakeholder. The plan prepared shall specify the frequency and type of communications, media, contact persons, and locations of communication events. For this assignment, the Contractor shall apply the SEP already developed by the MoEWR as part of the SESRP, and modify where necessary to meet the local unique challenges.

8.1.1.9. Grievance Redress Mechanism

The contractor is required to inform all PAPs about how to register grievances, including land and environmental concerns. They will be informed about the dispute resolution process, which will be impartial and timely. Alternative Dispute Resolution (ADR) approaches will be preferred, based on customary rules, arbitration, or third-party mediation. PAPs and stakeholders have the right to access the World Bank Redress Service (GRS) and the World Bank Inspection Panel at no cost. The principles of grievance mechanism management include resolving complaints quickly, at the lowest possible level, and promptly on site.

A grievance redress mechanism and a grievance redress committee (GRC) shall be established in a culturally appropriate manner in consultation with the community. The GRM committee will have the following roles:

- Log the grievances

- Maintain records of the GRC meetings and grievances
- Resolve the grievances to the extent possible.

Proposed grievance procedures

For this particular project, the following grievance procedures are proposed:

(i) *Registration* - Community members can inform the contractor about concerns directly and if necessary, through third parties. Once a complaint has been received, it will be recorded in a complaints log or data system. The log will be kept in hardcopy or electronic form. All reported grievances will be categorized, assigned priority, and routed as appropriate.

(ii) *Grievance log book*: The grievance logbook will ensure that each complaint has an individual reference number, and is appropriately tracked and recorded actions are completed. The information to be recorded shall include:
- Name, age, gender of complainant;
- Date the complaint was reported;
- Date the grievance logged;
- Action taken;
- Date information on proposed corrective action sent to complainant (if appropriate);
- The date the complaint was closed; and
- Date response was sent to complainant.

(iii) *Sorting and Processing* - This step determines whether a complaint is eligible for the grievance mechanism and its seriousness and complexity. All the complaints/grievances shall be screened. However, this will not involve judging the substantive merit of the complaint. The following guide will be used to determine whether a complaint is eligible or not:
- The complaint/grievance pertains to the power plant project.
- The issues raised in the complaint/grievance fall within the scope of issues the grievance mechanism is authorized to address.

Ineligible complaints/grievances may include those where:
- The complaint is clearly not power plant project -related.
- The nature of the issue is outside the mandate of the grievance mechanism.
- The complainant/grievance has no standing to file.
- Other project or organizational procedures are more appropriate to address the issue.

(iv) *Closing out and escalation:* Project-related grievances will be addressed and closed out as appropriate. The GRM will provide a channel for escalation e.g., through legal redress.

(v) Monitoring and evaluation: The proponent MoEWR/BECO will monitor all the activities of the stakeholder engagement and grievance management activities.

It should be noted that if complainants are not satisfied with the grievance process, even after arbitration, they have the right to present their complaint through the legal (FRS and or Benadir Administrative Region) systems. However, it is expected that most disputes will be resolved at the lowest level through the GRC. Since most disputes/grievances are likely to arise during the Construction and operation period, the contractor's Environmental and Social Safeguard team specifically the Community Liaison Officer will work closely with the community to be able to resolve disputes. The responsibilities of the Community Liaison Officer shall include:

- Monitor day to day implementation of the project
- Address grievances as they arise on the project
- A member of the GRC to respond on issues that may have been brought to the attention of the committee before escalating to other relevant entities.
- Escalate grievances internally to get a lasting solution

World Bank Grievances Redress Mechanism

The World Bank has established 2 grievance redress mechanisms that provide avenues for individuals and communities to submit complaints directly if there is belief that they have been, or are likely to be, adversely affected by a World Bank-funded project. In this project PAPs and other stakeholders have the right to know and access at no cost these GRMs as described below.

- World Bank Grievances Redress Service: The Grievance Redress Service (GRS) is an avenue for individuals and communities to submit complaints directly to the World Bank if they believe that a World Bank-supported

project has or is likely to have adverse effects on them, their community, or their environment. The GRS enhances the World Bank's responsiveness and accountability to project-affected communities by ensuring that grievances are promptly reviewed and addressed. Complaints must be in writing and addressed to the GRS and sent through the following methods namely:

(a) Online by accessing the online form;
(b) Sending an Email to grievance@worldbank.org; or
(c) Submitting a letter to the World Bank Headquarters in Washington D.C., United States or World Bank Kenya County Office.

- World Bank Inspection Panel: The Inspection Panel is an independent complaints mechanism for people and communities who believe that they have been, or are likely to be, adversely affected by a World Bank-funded project. The Panel is an impartial fact-finding body, independent from the World Bank management and staff, reporting directly to the Board. The Inspection Panel process aims to promote accountability at the World Bank, give affected people a greater voice in activities supported by the World Bank that affect their rights and interests, and foster redress when warranted. In September 2020, the Board updated the resolution that created the Panel and added to the Panel functions. At the same time, the Board approved a resolution establishing the World Bank Accountability Mechanism (AM). The new AM began operations in early 2021 and houses the Panel to carry out compliance reviews and a new Dispute Resolution Service (DRS), which will give complainants another way to have their concerns addressed. Contacts for registration of complaints to the IP are; Tel: +1 202 458 5200; email:ipanel@worldbank.org.

8.1.1.10. Labour Influx Management Plan

The purpose of this plan shall be to provide a clear set of actions and responsibilities for the control of impacts linked to in-migration within the Project's area of influence. This plan will be regularly reviewed and updated to reflect revised Project design, socio-economic changes and learning experienced during its implementation. The objectives of this plan shall be to:

- Monitor the scale of project induced in-migration into the project area and specific in-migration;
- Support Benadir Administrative Region Government and communities to manage both internal and external immigration into the project area; and
- Mitigate and manage any negative impacts and enhance and promote any positive impact related to labour influx.

The plan shall consider these measures:
Prepare and Implement a Labour Management Plan (LMP) with policies and measures for ensuring that:

(i) Any sub-contractors and workers are sensitised on:
  (a) Benadir Administrative Region/FRS labour laws
  (b) Benadir Administrative Region/FRS child labour laws
  (c) FRS/International forced labour laws

(ii) Enforce:
  (a) The Code of conduct
  (b) Benadir Administrative Region/FRS labour laws
  (c) Benadir Administrative Region/FRS child labour laws
  (d) FRS/International forced labour laws

8.1.2. Operation Phase

The operation phase of the proposed project will be mainly power supply, line maintenance and clearing of wayleaves. BECO under the supervision of MoEWR shall be responsible for all the mitigation measures for negative impacts during the operation phase. This will be done by implementation of the following steps: inspections, corrective action and reporting

8.1.3. Decommissioning Phase

The rehabilitation and decommissioning management plan shall include the following:
(i) Planning for Closure
  (a) The MoEWR (the proponent) shall investigate practical options for closure of the facility at least one year before decommissioning and submit a report to relevant FRS and BRA authorities.

(b) The MoEWR and BECO shall develop rehabilitation and decommissioning plan in conjunction with relevant stakeholders at least one year before the end of facility's operations.
(c) The MoEWR and BECO shall explore options of re-use and recycling of the facility's components/structures.

(ii) The decommissioning
(a) The MoEWR and BECO shall take into consideration the health and safety of personnel, contractors, neighbours and the public during the planning and implementation of the demolition process.
(b) The MoEWR and BECO shall undertake a further survey to identify any contaminated areas and remediate them accordingly.

(iii) Post Closure
The MoEWR and BECO shall ensure that the facility's site is free of impacts associated with the closure and demolition. In this regard, the MoEWR and BECO shall develop, rollout and implement a monitoring plan to include:
(a) Monitoring of the rehabilitated site to confirm whether progress is satisfactory.
(b) Outline of how land improvement and future land use will be affected by the past operations and decommissioning of the associated infrastructure.

8.2. MONITORING

A systematic process of collecting, analyzing, and using information to track project's progress will be critical in all project phases. This will involve monitoring of routine performance evaluations and periodic reviews. During the construction phase, BECO will monitor contractor activities to ensure compliance with ESMP management measures. During the operation phase, BECO will monitor facility operations, conduct EHS audits, and ensure compliance with environmental, health, and social issues. Some of the key variables to be monitored shall include:

- *Safety*: hours worked, recordable incidents and corresponding root cause analysis (lost time incidents, medical treatment cases), first aid cases, high potential near misses, and remedial and preventive activities required (for example, revised job safety analysis, new or different equipment, skills training, and so forth).
- *Environmental incidents and near misses*: environmental incidents and high potential near misses and how they have been addressed, what is outstanding, and lessons learned.
- *Major works*: those undertaken and completed, progress against project schedule, and key work fronts (work areas).
- *E&S inspections and audits*: to include date, inspector or auditor name, and records reviewed, major findings, and actions recommended and implemented.
- *Workers*: number of workers, indication of origin (expatriate, local, nonlocal nationals), gender, age and skill level (unskilled, skilled, supervisory, professional, management).
- *Training on E&S issues*: including dates, number of trainees, and topics.
- *Footprint management*: details of any work outside boundaries or major off-site impacts caused by ongoing construction—to include date, location, impacts, and actions taken.
- *External stakeholder engagement*: highlights, including number of formal and informal meetings, and information disclosure and dissemination—to include a breakdown of women and men consulted and themes coming from various stakeholder groups, including vulnerable groups (e.g., disabled, elderly, children, etc.).
- *Details of any security risks*: details of risks the contractor may be exposed to while performing its work—the threats may come from third parties external to the project.
- *Worker grievances*: details including occurrence date, grievance, and date submitted; actions taken and dates; resolution (if any) and date; and follow-up yet to be taken—grievances listed should include those received since the preceding report and those that were unresolved at the time of that report.
- *External stakeholder e.g., community grievances*: grievance and date submitted, action(s) taken and date(s), resolution (if any) and date, and follow-up yet to be taken—grievances listed shall include those received since the preceding report and those that were unresolved at the time of that report. Grievance data shall be age and gender-disaggregated.
- Major changes to contractor's environmental and social practices.
- *Deficiency and performance management*: actions taken in response to previous notices of deficiency or observations regarding E&S performance and/or plans for actions to be taken—these should continue to be reported until BECO determines the issue is resolved satisfactorily.

Table 8-1: The Environmental and social management plan (ESMP) for the proposed BECO Jazeera Hybrid Power Plant

Impact Category	Description	Recommended Mitigation Measures	Responsibility	Monitoring Indicator	Monitoring Frequency	Estimated Cost (USD)
Contraction Phase						
Impacts on biophysical environment	Landscape and visuals	• Erect a fence around the power plant.	Contractor	• Presence of a perimeter fence	One-off	As per the construction budget
	Soil, groundwater and surface water contamination	• Scoop and correctly dispose contaminated soil. • No vehicle maintenance and service shall be done at project site • Ensure waste water generated is drained into approved drainage facilities • Contractor to develop an oil-spill containment plan. • Construction vehicles must be maintained in good state. • Care must be exercised not to spill any fossil fuels	BECO Contractor	• Records of any leakages from construction equipment/ vehicles. • Oil spill containment plan. • Provision of fuel/oil drip and spill trays	Quarterly	5,500
	Air quality (Dust)	• Suppress dust during dry periods by use of water sprays. • Stockpiles of excavated soil should be palliated dry or windy conditions. • Restrict speed on loose surface roads during dry or dusty conditions • Keep stockpiles compacted and re-vegetate as soon as possible. • Ensure all the personnel use PPEs. • Cover construction trucks moving materials to prevent material dust emissions. • Burning of woody debris & construction waste to be prohibited.	Contractor BECO	• Visual Observation of dust Provision of PPEs especially masks	Quarterly	4,500
	Air quality (Vehicle exhaust emissions)	• Senstize drivers to avoid/minimize vehicle idling to lower emissions. • Maintain all machinery order to minimum emissions of CO NO2, SO2, PM	Contractor BECO	• Engine maintenance records • Inspection of stacks	Biannually	3,000
	Noise & vibration	• Train workers on the importance of noise control and best practices on noise. • Provide appropriate PPEs to workers during construction activities. • Inform nearby communities in advance about scheduled high-noise activities. • Establish a monitoring program to regularly measure noise and vibration levels. • Establish a GRM for community to report noise or vibration disturbances. • Ensure regular maintenance of machinery to reduce noise emissions. • Employ modern equipment fitted with noise-reduction technologies • Restrict construction activities to daylight hours (e.g., 7:00 AM to 6:00 PM).	Contractor BECO	• Noise levels- Records of noise measurements done by contractor within the project area and at distances of 30m from the Hybrid power plant	Quarterly	4,500

IMPACT CATEGORY	DESCRIPTION	RECOMMENDED MITIGATION MEASURES	RESPONSIBILITY	MONITORING INDICATOR	MONITORING FREQUENCY	ESTIMATED COST (USD)
	Biodiversity (Fauna)	• An ecologist shall be hired to coordinate the fauna monitoring. • Ensure wildlife-friendly designs for infrastructures. • Limit all vehicle movements to designated roads with speed of 15-20 km/h. • Site clearing work/earthwork shall be carried out during the dry season. • Site preparation shall minimize clearing of vegetation and topsoil. • Temporary-use areas shall be restored and revegetated • Undertake a supplementary biodiversity assessment on fauna in the area	BECO Contractor	• Full implementation of biodiversity management plan for the project • Regular biodiversity monitoring and reporting	Monthly	5,500
	Biodiversity (Flora)	• Re-vegetation including planting of trees around the plant/facility • Ensure proper demarcation of the project site for all construction works. • Designate access routes and parking areas	BECO Contractor	• Number of trees cleared • Planted trees	Quarterly	6,500
	Soil erosion	• Avoid ground-breaking during the seasons of high rainfall to avoid erosion. • Ensure spoil from excavations is arranged according to the various soil layers. • Monitor exposed soils to ensure that any incidents of erosion are controlled. • Monitoring of areas of exposed soil during rainy seasons. • Use silt traps where necessary	BECO Contractor	• Assess size of rills or Gulleys forming from accelerated run off from compacted areas	Monthly	4,500
	Wastes (Solid wastes)	• Use of durable materials to avoid regular replacements – avoid waste generation • Segregate waste • Re-use of materials where possible • Recovery of materials remains and return to stores • Provide litter collection facilities such as bins • Proper disposal of waste in line with solid waste regulation • Proper budgeting to avoid waste generation • Manage all the wastes in accordance with internationally accepted standards. • Handle and label all hazardous products properly to avoid ground contacts • Dispose hazardous waste through a approved waste handler • Contractor to put in place and comply with a site waste management plan	BECO Contractor	• Presence of well-maintained receptacles and centralized collection points.	Weekly	8,500
	Wastes (Liquid wastes)	• Vehicles and equipment must be serviced regularly to avoid leaks. • The waste oil or used oil must be disposed-off appropriately. • Store all hazardous materials in compliance with local regulations. • Scoop all top toils for disposal incase of leaks. • Refuelling and maintenance of vehicles will not take place at the	BECO Contractor	• Engine maintenance records • Oil spill containment plan • Presence of	Weekly	5,500

Impact Category	Description	Recommended Mitigation Measures	Responsibility	Monitoring Indicator	Monitoring Frequency	Estimated Cost (USD)
		construction site. • Provide sanitary waste facilities for both genders clearly marked • Keep accurate documentation of fuel and oil storage volumes/transfer activities. • Install oil-water separators in drainage systems to remove oil from stormwater. • Ensure proper training for staff on handling and use of oils. • Disposal of waste through septic tanks • Develop and implement spill management plan with clear procedures • Develop and implement a detailed Spill Prevention Plan (SPP) • Create awareness for the employees on procedures of dealing with spills/leaks • All chemicals should be stored within the bunded areas and clearly labelled.		separate and clean washrooms for both the gents and ladies		
Impacts on infrastructure and utilities	Water consumption	• Source and utilize a sustainable and reliable water supply for all project phases • Ensure prudent use of available water • Consultations with the project local committee on water use to avoid conflicts with the community	BECO Contractor	• Water usage records	Monthly	3,000
	Energy Consumption	• Monitor all energy usage during construction and set reduction targets. • Ensure responsible electricity use through staff sensitization of staff. • Ensure proper planning of transportation of materials for efficient fuel usage	BECO Contractor	• Energy consumption records	Monthly	3,500
Impacts on social environment	Impact to livelihoods from grazing land access restrictions	• Regularly engage the local community and address ant emerging concerns. • Provide alternative water points for livestock near the construction area. • Establish a grievance redress mechanism to address any conflicts or complaints • Coordinate with the local herders and farmers to grazing routes or areas.	BECO	• Number of Alternative Grazing Routes/Areas Established. • Frequency of Community Consultations. • Grazing Land Access Complaints. • Usage of Alternative Grazing Areas. • Incidence of Conflict Over Grazing Access. • Changes in Grazing Patterns.	Quarterly	4,000
	Archaeology and cultural heritage	• Establish a clear protocol for halting construction activities upon a chance find.	Contractor BECO	• Stratigraphic Soil profile reports	Weekly	4,500

Impact Category	Description	Recommended Mitigation Measures	Responsibility	Monitoring Indicator	Monitoring Frequency	Estimated Cost (USD)
		• Ensure proper documentation of all chance finds. • Engage a qualified archaeologist for any early identification of chance finds. • Develop and implement a Chance Finds Procedures		during excavation • Fully developed artefact recovery protocols • Discovery of human burials reports during excavation. • Regulatory Compliance reporting under Somali Heritage Laws.		
	Trespassing of unauthorized personnel	• Maintain records of any person who comes to site • Hazard communication • Fencing off the construction site to keep of unauthorized personnel • Ensure proper barricading • Controlled access to the site only with prior approval	Contractor	• Presence of a controlled access and records of every person accessing the site	Monthly	2,500
	Worker influx – Incoming Workforce	• Establish and operationalize an effective GRM accessible to community members. • Prompt payment of workers as per the contractual agreements/terms. • Raise awareness among local community and workers on cordial working relation • Respect for community values/culture. • Sensitize workers regarding engagement with local community. • Tap into the local workforce to the extent possible to reduce labour influx.	BECO Contractor	• Records of employees/updated employee register. • Number of local community employees and external employees/ updated employee register.	Quarterly	5,500
	Gender-based violence	• Ensure that Code conducts are singed by all employers in the contracts. • Establish Workers GRM with multiple channels including SEA/H channels. • Implement a code of conduct signed by all those with physical presence on site. • Prepare SEA/SH Prevention/Response Action Plan, to manage the SEA/SH risks.	BECO Contractor	• Minutes of awareness creation sessions for the community and workers on GBV-SEA/SH. • Code of conduct signed by all those with physical presence on site. • GRM that ensures confidentiality of GBV cases in place. • Documented referral services for	Quarterly	6,000

Impact Category	Description	Recommended Mitigation Measures	Responsibility	Monitoring Indicator	Monitoring Frequency	Estimated Cost (USD)
				survivors. • Grievances raised, aggrieved persons and status on resolution etc		
	Labour disputes	• Set up a transparent GRM to handle all complaints/disputes in a timely manner. • Implement non-discrimination policies to ensure equal treatment for all. • Establish worker welfare systems to represent concerns & promote dialogue. • Establish mechanisms to guarantee fair/timely payment of wages and benefits. • Ensure that all workers receive clear contracts outlining their rights, responsibilities, wages, benefits, working hours, and terms of employment. • Ensure full compliance with local labor laws.	BECO Contractor	• Number of grievances filed and time taken to resolve them. • Frequency of labor disputes. • Health and safety violations. • Worker turnover rate and compliance with working hours and overtime rules. • Labor law compliance audits • Worker welfare committee activities.	Quarterly	4,500
	Child and forced labour	• Adhere to all the ESS 2 provisions and FRS Employment Act on forced labour. • Compliance with the national labor laws and labour management practices. • Do not allow children at the project site. • Implement and monitor the employment register regularly. • Put visible signage on site “No Jobs for children” • Report any form of forced labour at the site.	BECO Contractor	• Updated employment register indicating locals employed, their ages, national identification numbers etc. • Grievances raised, aggrieved persons and status on resolution etc. • Number of reported cases of forced labour.	Biannually	5,000
	Security risks	• Use surveillance systems/CCTV cameras to monitor critical areas in real-time. • Provide workers with security training and response protocols to threats. • Provide workers with ID badges and restrict entry to authorized personnel only. • Maintain constant with local authorities on security updates in the	Contractor BECO	• Number of security incidents and response time to security incidents. • Compliance with security protocols. • Incidents of	Monthly	5,800

Impact Category	Description	Recommended Mitigation Measures	Responsibility	Monitoring Indicator	Monitoring Frequency	Estimated Cost (USD)
		area. • Implement strict access control protocols, including sign-in procedures. • Hire licensed security to provide 24/7 site surveillance, patrols, and monitoring. • Have security response teams on standby to address any security emergencies. • Engage all stakeholders to understand and address local security concerns. • Develop a security incident response plan including emergencies procedures. • Conduct a comprehensive risk assessment to identify specific security threats. • Collaborate with local law enforcement/security agencies to enhance security.		unauthorized site access. • Grievances related to security. • Community engagement on security issues. • Security risk assessments. • Coordination with local law enforcement. • Security equipment functionality. • Frequency of security audits.		
	Occupational Health and safety Impacts	• Workers coming to the site should be knowledgeable on safety precautions • Use skilled personnel for activities which demand skills/technical tasks • Undertake risk assessment and implement mitigation measures appropriately • Provide safe drinking water for workers • Provide appropriate PPE to all workers. • Establish safety committees • Engagement of trained first aider on site • Availability of equipped first aid box on site	Contractor	• Records of any near misses, incident, and accidents. • Records of corrective actions implemented if there was an accident.	Weekly	3,500
	Community health and safety risks	• The contractor is impressed upon not to set a construction camp on site. • Provide awareness materials on HIV/AIDS transmission and prevention. • Informing workers on local cultural values and health matters. • Ensure equal treatment of workers • Create awareness to the community on risks associated with construction works. • Allowing migrant workers time to be with their families	Contractor BECO	• Number of awareness creation sessions conducted. • Availability of and distribution of condoms	Monthly	4,500
	Fire Hazards	• 'No smoking' signs shall be posted at the construction site • A fire risk assessment/evacuation be prepared and posted across site. • Create awareness to the construction workers on potential fire hazards • Designate an assembly point • No smoking shall be done on construction site • Provision of firefighting equipment on site during construction.	Contractor	• Records of any Fire incidences • Fire equipment and evacuation plan	Weekly	3,500

Impact Category	Description	Recommended Mitigation Measures	Responsibility	Monitoring Indicator	Monitoring Frequency	Estimated Cost (USD)
	Traffic risk	• Use traffic signs, barriers, and cones to guide construction and local traffics. • Install speed bumps/ traffic-calming measures on roads near the site. • Erect temporary road signs warning local road users near the site. • Engage with local communities to raise awareness about safety measures. • Enforce strict speed limits for vehicles within the site and designated routes. • Develop and implement a Traffic Management Plan (TMP). • Designate safe parking and loading zones for all construction vehicles.	Contractor BECO	• Number of traffic incidents. • Traffic management plan compliance. • Speed limit violations. • Traffic safety training attendance. • Community complaints related to traffic. • Emergency response time to traffic incidents. • Community awareness programs on traffic safety. • Use of alternative routes by construction vehicles.	Weekly	4,000
	Risks related to Inadequate stakeholder engagement	• The grievance redress committee to include representatives from the community. • Sensitize stakeholders on SEP and GRM. • Prepare and implement a GRM to deal with grievances. • Prepare a SEP that is proportionate to subproject and the identified stakeholders. • In line with the SEP, undertake adequate consultations prior to construction.	BECO	• Availability of and implementation of the Stakeholder Engagement Plan. • Number of stakeholder consultations held • Record of stakeholder consultations held (minutes of meetings and list of participants). • Information disclosed, to whom it was disclosed (Men, women, PWD, youth, vulnerable individuals and households etc.,	Quarterly	5,500

Impact Category	Description	Recommended Mitigation Measures	Responsibility	Monitoring Indicator	Monitoring Frequency	Estimated Cost (USD)
				methods and languages used in the disclosure (culturally appropriate and accessible), grievances raised and status on resolution etc. • Concerns raised and actions raised.		
	Inadequate grievances management	• Provide for confidential reporting under the GRM • Implement a workers and community GRM. • Ensure proportionate representation of VMGs in the local grievances committee. • Constitute a Local Grievances Committee is in consultation with stakeholders	Contractor BECO	• Local Grievances Committee in place, composition of committee, awareness of community and workers on project and worker GRMs, updated GRM logs, types of grievances • Availability of grievance redress process • Number of grievances reported • Number of grievances resolved in a timely manner • Number of grievances escalated to national courts and the World Bank Grievances Redress Service and Inspection Panel.	Monthly	4,500
Operation Phase						
	Landscape and visual	• Fence off the power plant.	BECO	• Presence of a perimeter fence	On-off	As per the operation budget

IMPACT CATEGORY	DESCRIPTION	RECOMMENDED MITIGATION MEASURES	RESPONSIBILITY	MONITORING INDICATOR	MONITORING FREQUENCY	ESTIMATED COST (USD)
Impacts on biophysical environment	Soil, groundwater and surface water contamination	• No vehicle maintenance and service shall be done at project site • Ensure that potential sources of petro-chemical pollution protected from leaks. • Ensure proper design of drainage system to minimize contaminated run-off. • Develop and implement oil-spill containment plan as part of the EPRP.	BECO	• Oil spill containment plan. • Provision of fuel/oil drip and spill trays	Quarterly	5,800
	Flood risks	• Raise foundations of the solar panels and ensure well designed concrete base • Ensure drainage channels are free of any obstruction at all times. • Create flooding diversions and or spill ways to divert water from the plant • Construct more channels and or expand existing ones	BECO	• Provision of drainage system • Raised foundations for the structures	Biannually	4,500
	Air quality (Dust)	• Plant trees around the plant to act as wind breakers/decrease dust pollution • Ensure planting of grass around and within the facility compound	BECO	• Visual inspection	Biannually	2,500
	Air quality (Vehicle and exhaust emissions)	• Maintain all machinery in good to minimum emissions of CO, NO2, SO2. • Regularly monitor and report emissions data as part of EHS compliance.	BECO	• Engine maintenance records • Inspection of stacks	Quarterly	3,500
	Noise & vibration	• Use sound-absorbing materials within the BESS housing units. • Use quieter, high-efficiency fans and cooling systems with lower noise outputs. • Regularly service and maintain fans, inverters, and other equipment • Install sound barriers or walls around the BESS unit to deflect or absorb noise. • Equip the BESS unit with vibration isolators to reduce vibrations/noise	BECO	• Noise levels- Records of noise measurements done by contractor within the project area and at distances of 30m from the Hybrid power plant	Quarterly	4,000
	Biodiversity (Fauna)	• An ecologist shall be hired to coordinate the fauna monitoring. • Bird deterrents will be installed to prevent collisions with solar panels. • Ensure wildlife-friendly designs for infrastructures. • Undertake a supplementary biodiversity assessment and develop BMP • Undertake regular monitoring and report on biodiversity	BECO	Full implementation of biodiversity management plan for the project Regular biodiversity monitoring and reporting	Quarterly	4,500
	Biodiversity (Flora)	• Re-vegetation including planting of trees around the plant/facility • Develop and implement and invasive species management plan.	BECO	• Number of trees cleared • Planted trees	Quarterly	5,500
	Soil erosion	• Concrete only the required area and leave the rest of the land with grass • Construct rain water harvesting system on buildings and install adequate storages • Construct the drainage system in a way to follow natural water	BECO	• Assess size of rills or Gulleys forming from accelerated run off from compacted areas	Biannually	4,000

Impact Category	Description	Recommended Mitigation Measures	Responsibility	Monitoring Indicator	Monitoring Frequency	Estimated Cost (USD)
		channels • Landscape the power plant with grass in all open areas • Monitor exposed soil during rainy seasons for proper erosion control.		• Provision of a drainage system and a rain water harvesting system		
	Wastes (Solid)	• Emphasis on prudent waste generation and give priority to reduction at source • Operator to contract a licensed waste handler to collect and dispose solid waste • Provide waste handling facilities such as labelled waste bins • Undertake solid waste management awareness to operators *Damaged solar panels and hazardous wastes* • Dispose hazardous waste through a approved waste handler • Ensure proper labelling and handling of all hazardous products/wastes. • Ensure segregation from other waste streams	BECO	• Presence of well-maintained receptacles and centralized collection points.	Quarterly	5,000
	Wastes (Liquid)	*Sanitary wastes* • Provide adequate sanitary waste facilities for both genders clearly marked • Disposal of waste through septic tanks *Oils from vehicles* • All vehicles and equipment must be kept in good state to avoid leaks. • Create awareness for the employees on procedures of handling spills and leaks • Refuelling and maintenance of vehicles will not take place at the construction site. *Chemicals* • All chemicals should be stored within the bunded areas and clearly labelled detailing the nature and quantity of chemicals within individual containers. *Accidental fuel and oil spill* • Ensure quick response to hazardous materials' spill by a trained response team. • Establish proper waste management protocols for the disposal of used oil, fuel, and filters from equipment maintenance activities. • Implement a regular environmental monitoring program to check for any signs of contamination in soil, groundwater, and surface water near the plant. • Install oil-water separators in drainage systems to manage oil from	BECO	• Presence of separate and clean washrooms for both the gents and ladies. • Engine maintenance records • Oil spill containment plan • Records of all accidental spills and number of Liters	Quarterly	4,000

IMPACT CATEGORY	DESCRIPTION	RECOMMENDED MITIGATION MEASURES	RESPONSIBILITY	MONITORING INDICATOR	MONITORING FREQUENCY	ESTIMATED COST (USD)
		stormwater.				
Impacts on infrastructure and utilities	Water consumption	• Any water leaks through damaged pipes and faulty taps should be fixed promptly. • Ensure prudent use of water. • Install water-conserving automatic taps.	BECO	• Water usage records	Monthly	3,500
	Energy consumption	*Lightings* • Conduct periodic energy audits to evaluate lighting energy consumption. • Install an energy-efficient lighting system • Integrate lighting controls into the plant's energy management system to monitor and optimize energy use in real-time. • Regularly review and adjust the hybrid power system's configuration to optimize the balance between solar and BESS. • Replace conventional lighting with energy-efficient LED bulbs • Utilize daylight sensors to adjust indoor lighting levels based on the amount of natural light, reducing the need for artificial lighting during the day.	BECO	• Solar Energy Generation (kWh/month): • Battery Energy Storage System (BESS) Utilization (cycles/month). • Lighting Energy Consumption (kWh/month). • Carbon Emissions (tons of CO2/month).	Monthly	3,500
Impacts on social environment	Impact to livelihoods from grazing land access restrictions	• Conduct regular monitoring of the livelihoods of affected pastoralists. • Continue consultations with local communities to assess alternatives. • Establish and maintain a grievance redress mechanism • Install livestock water points at strategic locations near alternative grazing areas. • Provide alternative livelihood opportunities for pastoralists • Support the development of pasture improvement projects	BECO	• Number of complaints from affected communities (monthly). • Access routes to grazing lands (percentage maintained). • Community satisfaction with alternative grazing lands (% satisfaction). • Community engagement and participation (number of meetings/year). • Conflict or dispute incidents (number reported/year).	Biannually	2,500
	Trespassing of unauthorized personnel	• Fencing off the facility to keep of illegal access to the power plant. • Ensure controlled access to the site only with prior approval	BECO	• Presence of a controlled access and records of every	Weekly	2,500

Impact Category	Description	Recommended Mitigation Measures	Responsibility	Monitoring Indicator	Monitoring Frequency	Estimated Cost (USD)
		• Maintain records of any person who comes to site		person accessing the site		
	Worker influx – Incoming Workforce	• Design separate worker accommodations for local and incoming workers. • Develop and implement waste management systems in all accommodation areas. • Encourage use of local suppliers of good and services to support local economy. • Ensure both the workforce and the local community have access to GRM. • Establish and enforce a strict code of conduct for incoming workers. • Maintain links with local communities to address any concerns on worker influx. • Prioritize the hiring of local workers to reduce the need for incoming workforce.	BECO Contractor	• Number of local workers employed (% of total workforce). • Community grievances related to workforce behavior (number of grievances/month). • Community interaction incidents (number reported/month). • Local business engagement (percentage of local suppliers engaged). • Worker turnover rate (%). • Worker welfare program implementation (% of programs implemented). • Community consultation meetings held (number/year).	Annually	3,000
	Gender-based violence	*GBV- SEA and SH* • Develop and implement a GRM that ensures confidential reporting of GBV cases. • Ensure that all employees sign Code conducts on GBV in employment contracts. • Establish Workers GRM with multiple channels including SEA/H channels. • Implement a code of conduct signed by all those with physical presence on site. • Prepare a SEA/SH Prevention/Response Action Plan, to manage the SEA/SH risks.	BECO	• Minutes of awareness creation sessions for the community and workers on GBV-SEA/SH. • Documented referral services for survivors. • Interventions to enable those vulnerable access	Quarterly	3,500

Impact Category	Description	Recommended Mitigation Measures	Responsibility	Monitoring Indicator	Monitoring Frequency	Estimated Cost (USD)
		Inaccessibility of project benefits to VMGs and other vulnerable individuals due to affordability challenges • Ensure VMGs individuals have to ensure they equally benefit from the project.		project benefits. • Number of complaints raised by VMGs/vulnerable individuals regarding access to project services.		
	Labour disputes	• Conduct regular worker feedback surveys to understand any emerging disputes. • Ensure all employees have clear and legally binding employment contracts. • Ensure full compliance with national labor laws. • Establish an accessible and transparent GRM for all workers' disputes. • Implement fair and transparent disciplinary procedures. • Maintain open communication between management and workers. • Promote equal opportunities and non-discriminatory hiring practices. • Set up a monitoring system to track and evaluate labor relations.	BECO	• Number of Labor Disputes Raised (disputes/month): • Grievances Resolved Within Agreed Timeframe (%): • Worker Turnover Rate (%). • Number of Grievances Filed Regarding Wages or Compensation (grievances/month). • Number of Labor Dispute Awareness Campaigns (number/year).	Biannually	2,500
	Child and forced labour	• Adhere to the ESS 2 provisions and FRS Employment Laws. • Ensure compliance with the national labor laws management practices. • Put visible signage on site "No Jobs for children" "Do not allow children". • Report any form of forced labour at the site.	BECO	• Number of child labor incidents reported (incidents/month). • Number of forced labor incidents reported (incidents/year). • Grievances related to child or forced labor (number of grievances/year). • Community outreach and awareness campaigns on child labor (campaigns/year).	Biannually	3,500

IMPACT CATEGORY	DESCRIPTION	RECOMMENDED MITIGATION MEASURES	RESPONSIBILITY	MONITORING INDICATOR	MONITORING FREQUENCY	ESTIMATED COST (USD)
				• Compliance with international labor standards (compliance level). • Social audits conducted (number of audits/year). • Local community feedback on employment practices (satisfaction level).		
	Risks related to poor or inadequate stakeholder engagement (Conflict)	*Risks related to Inadequate stakeholder engagement* • Ensure timely and prior disclosure of project all project information. • Prepare a SEP that is proportionate to the identified stakeholders. • Prepare and implement a GRM to deal with all grievances. • Sensitize stakeholders on SEP and GRM. • The grievance redress committee to include representatives from the community. *Inadequate grievances management* • Work closely with the GRM committee members in solving the conflicts • Solve all conflicts/grievances at the earliest time possible • Monitoring the pattern of grievances to come up will long term measures • Ensure all grievances are logged and closed • Engage the community members and other stakeholders in a timely manner • Employ from the community to the extent possible	BECO	• Availability of and implementation of the Stakeholder Engagement Plan. • Number of stakeholder consultations held • Record of stakeholder consultations held (minutes of meetings and list of participants). • Availability of grievance redress process.	Quarterly	5,000
	Occupational health and Safety	• All workers operating the project site must be equipped with appropriate PPEs. • Annual EHS audits should be done • Ensure all operators are skilled on firefighting management • Ensure only qualified staff are employed to work in the facility	BECO	• Provision of PPEs and WIBA cover • Environmental audit reports	Weekly	4,000
	Community health and safety risks	*Public Health Impacts* • Informing workers on local cultural values and health matters. • Allowing migrant workers time to be with their families • Ensure equal treatment of workers. *Shocks and electrocutions* • Develop and implement a reporting system for all safety risk and	BECO	• Number of awareness creation sessions conducted. • Records of awareness sessions conducted • Incidences report	Quarterly	4,500

IMPACT CATEGORY	DESCRIPTION	RECOMMENDED MITIGATION MEASURES	RESPONSIBILITY	MONITORING INDICATOR	MONITORING FREQUENCY	ESTIMATED COST (USD)
		incidences. • Inspect the wiring of the houses before connecting power • Refraining from individual illegal extensions of power lines to other houses • Require community to engage a certified technician to do wiring in the premises • Undertake safety awareness campaigns to the community • Use of quality materials while wiring *Public Health Impacts –HIV/AIDs* • Allowing migrant workers time to be with their families • Sensitize workers and the community on prevention and mitigation of HIV/AIDS and other sexually transmitted diseases, through staff awareness and awareness campaigns for the community		• Number of awareness creation sessions conducted. • Availability of and distribution of condoms		
	Fire hazards	• 'No smoking' signs shall be posted within the power plant area • A fire Assembly point shall be identified and clearly marked at the facility • Develop and create awareness on fire management and response plans • Install and ensure the facility has proper and well-serviced firefighting equipment. • Install detection/alarm systems that can detect fire should be and installed • Workers especially operators of the plant must be trained on fire management	BECO	• Provision of serviced fire equipment, evacuation plan and safety signages • Records of fire safety training	Monthly	3,500
	Security risks	• Continue engaging local communities to minimize any emerging hostility. • Deploy trained security personnel to guard the site 24/7. • Develop and periodically review contingency plans for worst-case scenarios, such as armed attacks, civil unrest, or natural disasters. • Ensure proper access control measures - only allowing authorized personnel. • Implement a vetting process for all employees to minimize risk of insider threats. • Maintain a secure perimeter with robust fencing of the site. • Maintain and regularly update a comprehensive security incident response plan • Maintain close coordination with local law enforcement and security agencies • Monitor local security developments and adjust security protocols accordingly.	BECO	• Number of security incidents reported (incidents/month): • Number of security audits conducted (audits/year): • Community engagement activities held (number/year): • Incidents of violence or threats against staff (number/year). • Collaboration with local law enforcement	Weekly	3,200

Impact Category	Description	Recommended Mitigation Measures	Responsibility	Monitoring Indicator	Monitoring Frequency	Estimated Cost (USD)
				(number of meetings/year). • Number of partnerships established with security ngos (active partnerships).		
Decommissioning Phase						
Impacts on biophysical environment	Impacts on landscape and visual	• Provide regular updates to stakeholders on decommissioning progress. • Install informational signs explaining the decommissioning process. • Implement a revegetation plan using native plants and vegetation. • Ensure proper management of all waste materials to prevent visual pollution. • Create a decommissioning plan that includes minimizing any visual impacts. • Conduct regular cleanup to remove any unsightly materials.	BECO Contractor	• Photographic documentation: • Vegetation health monitoring: • Number of complaints: • Soil erosion assessment: • Public awareness programs participation. • Community engagement metrics.	One-off	Decommissioning budget
	Impacts on biological environment	• Develop and implement detailed site restoration plans. • Develop habitat protection plans to protect sensitive habitats, such as wetlands. • Ensure proper disposal of waste materials to prevent any harmful pollution. • Implement erosion control measures to prevent sediment runoffs. • Implement noise control measures to minimize disturbance to local wildlife. • Monitor and manage invasive species to prevent their spread in disturbed areas. • Undertake habitat restoration using native plants to promote ecosystem recovery. • Work with environmental specialists to implement effective mitigation measures.	Contractor	• Biodiversity surveys. • Community engagement records. • Erosion and sedimentation rates. • Flora and fauna species lists. • Habitat quality assessments. • Invasive species monitoring. • Vegetation health monitoring.	Weekly	4,200
	Solid Waste Generation	• Safe transportation to the disposal sites / designated area • Hazardous waste must be disposed by approved waste handler • Ensure proper segregation of waste streams - hazardous and non-hazardous.	Contractor BECO	• Presence of well-maintained receptacles and centralized	Monthly	5,400

Impact Category	Description	Recommended Mitigation Measures	Responsibility	Monitoring Indicator	Monitoring Frequency	Estimated Cost (USD)
		• Ensure proper handling and storage of all demolition materials. • Ensure adequate collection and storage of waste on site • Demolition contractor to adhere to the various manufacturer's guidelines.		collection points		
	Wastes (liquid)	• Use environmentally friendly materials that generate less hazardous liquid wastes. • Provide training for staff on liquid waste handling to minimize risks. • Maintain an inventory of chemicals and hazardous substances. • Maintain accurate records of liquid waste management and disposals. • Identify opportunities for the reuse or recycling of liquid waste materials. • Establish temporary storage facilities for all liquid wastes to prevent leaks/spills. • Establish an emergency contact list and response procedures. • Ensure that all liquid wastes are disposed by licensed waste disposal facilities. • Develop a detailed liquid waste management plan outlining all procedures. • Conduct a comprehensive assessment to identify/categorize all liquid waste.	Contractor BECO	• Liquid waste generation quantities. • Soil contamination assessments. • Incidence of spills and leaks. • Liquid waste management plan compliance. • Public reporting and complaints. • Community engagement metrics. • Volume of recovered reusable liquids.	Monthly	4,500
	Noise and Vibration	• Demolish mainly during the day when most of the neighbours are out working. • Limit pickup trucks and other small equipment to a minimum idling time and observe a common-sense approach to vehicle use and encourage workers to shut off vehicle engines whenever possible. • Use quiet equipment (i.e., equipment designed with noise control elements).	Contractor BECO	• Noise levels- Records of noise measurements done by contractor within the project area and at distances of 30m from the project site	Weekly	2,500
	Air quality (dust)	• Conduct regular inspections to identify potential sources of dust emissions. • Enforce speed limits for vehicles to reduce dust emissions from vehicle traffic. • Engage with local communities to inform them about decommissioning activities. • Implement soil stabilization techniques to minimize dust from disturbed areas. • Plan for site restore vegetation restoration to prevent dust generation. • Use water sprays or misting systems to dampen surfaces and reduce dust.	BECO Contractor	• Community complaints and feedback. • Cumulative dust impact assessment. • Effectiveness of dust control measures. • Health impact assessments. • Long-term dust emission trends.	Weekly	3,500

IMPACT CATEGORY	DESCRIPTION	RECOMMENDED MITIGATION MEASURES	RESPONSIBILITY	MONITORING INDICATOR	MONITORING FREQUENCY	ESTIMATED COST (USD)
				• Post-activity dust cleanup reports. • Public awareness programs participation. • Soil and vegetation dust monitoring. • Traffic patterns and impact assessment. • Visual assessment of dust levels.		
	Air quality (vehicle fumes)	• Conduct scheduled checks to ensure emission controls. • Establish a reporting system for emissions data to track progress. • Implement a regular maintenance schedule for all vehicles to minimize emissions. • Train drivers/equipment operators on practices that limit emissions.	BECO Contractor	• Community complaints and feedback. • Cumulative emission impact assessment: • Environmental compliance audits. • Health impact assessment reports. • Long-term emission trends. • Maintenance records of vehicles.	Weekly	2,500
Impacts on Infrastructure & Utilities	Water Resources	• Use temporary storage solutions to manage water supplies and reduce waste. • Provide training for personnel on water conservation practices. • Implement systems to recycle and reuse water for various tasks. • Implement measures to prevent leaks and spills from water storage. • Develop a water management plan that minimize water consumption. • Conduct assessment to evaluate water needs & identify reduction opportunities.	Contractor BECO	• Community feedback • Compliance with water usage regulations: • Impact on local water resources: • Mitigation measure implementation records. • Water consumption efficiency • Water recycling rates: • Water usage quantities and supply.	Monthly	3,000

Impact Category	Description	Recommended Mitigation Measures	Responsibility	Monitoring Indicator	Monitoring Frequency	Estimated Cost (USD)
Impacts on social environment	Impacts on Occupational health and safety	• Provide first aid facilities and ensure that trained personnel are available to respond to medical emergencies on-site. • Implement measures to control noise and vibration levels during decommissioning activities, such as using quieter equipment and scheduling high-noise activities appropriately. • Establish EPRP for incidents such as fires, chemical spills, and medical emergencies, and ensure all workers are trained in these procedures. • Ensure that all workers are equipped with appropriate PPE. • Ensure that all contractors and subcontractors adhere to the same occupational health and safety standards as the main contractor. • Develop and enforce safe work practices and standard operating procedures for decommissioning tasks, including equipment handling, dismantling, and waste disposal. • Conduct regular safety inspections to address potential hazards promptly. • Conduct a thorough occupational health and safety risk assessment.	Contractor BECO	• Incident reporting and tracking. • Health and safety training participation. • Personal protective equipment (PPE) compliance. • Safety audits and inspections. • First aid response records. • Compliance with safety regulations. • Incident investigation reports.	Monthly	2,000
	Impact to livelihoods from grazing land access restrictions	• Engage with local communities to discuss the decommissioning process and gather feedback on their concerns and suggestions regarding grazing land access. • Invest in community development programs that provide alternative income-generating opportunities, such as skills training or support for small businesses. • Involve local leaders and organizations in the planning and implementation of mitigation measures to enhance community acceptance and participation.	BECO Contractor	• Conflict incidence reports. • Community meetings and feedback. • Long-term livelihood trends.	Quarterly	2,800
	Trespassing of unauthorized personnel	• Define and communicate restricted access hours during which the site is closed to unauthorized personnel. • Hold regular community engagement meetings to discuss security concerns and gather feedback on improving site safety. • Install clear and visible warning signs around the site indicating that it is a restricted area and unauthorized entry is prohibited. • Partner with local community leaders and organizations to promote site security and encourage community members to report unauthorized access.	BECO Contractor	• Incident reports of trespassing. • Visitor logs. • Community awareness programs. • Community feedback on security. • Stakeholder engagement effectiveness. • Reporting mechanisms for trespassing.	Weekly	2,500

Impact Category	Description	Recommended Mitigation Measures	Responsibility	Monitoring Indicator	Monitoring Frequency	Estimated Cost (USD)
	Worker influx – Incoming Workforce	• Consult with and involve local community in the decommissioning activities. • Establish and operationalize an effective GRM accessible to community members. • Include gender considerations in employment opportunities. • Prompt payment of workers as per the contractual agreements/terms. • Provide appropriate compensation for work done. • Respect for community values/culture. • Sensitize workers regarding engagement with local community. • Tap into the local workforce to the extent possible to reduce labour influx.	BECO Contractor	• Records of employees/updated employee register. • Number of local community employees and external employees/ updated employee register.	Quarterly	3,500
	Gender-based violence	• Ensure that Code conducts on GBV are singed by all employers. • Establish Workers GRM with multiple channels including SEA/H channels. • Implement a code of conduct signed by all those with physical presence on site. • Prepare an SEA/SH Prevention/Response Action Plan, to manage SEA/SH risks.	BECO Contractor	• Minutes of awareness creation sessions for the community and workers on GBV-SEA/SH. • Code of conduct signed by all those with physical presence on site. • GRM that ensures confidentiality of GBV cases in place. • Documented referral services for survivors. • Grievances raised, aggrieved persons and status on resolution etc	Quarterly	2,500
	Inadequate grievances management	• Implement a worker's grievances mechanism. • Ensure proportionate representation of VMGs in the local grievances committee. • Constitute a Local Grievances Committee is in consultation with all community segments, and incorporates the existing local dispute resolution mechanism.	BECO	• Local Grievances Committee in place, composition of committee, awareness of community and workers on project and worker GRMs, updated GRM logs, types of grievances • Availability of	Quarterly	2,500

Impact Category	Description	Recommended Mitigation Measures	Responsibility	Monitoring Indicator	Monitoring Frequency	Estimated Cost (USD)
				grievance redress process • Number of grievances reported • Number of grievances resolved in a timely manner • Number of grievances escalated to national courts and the World Bank Grievances Redress Service and Inspection Panel.		
	Risks related to Inadequate stakeholder engagement	• Collaborate with local leaders and community organizations to facilitate trust-building and effective engagement with the community. • Develop a stakeholder engagement strategy that outlines the objectives, methods, and timelines for engaging with different stakeholders throughout the decommissioning process. • Ensure that women and vulnerable groups are actively involved in stakeholder engagement processes, addressing any barriers they may face in participation. • Organize public consultations and forums to solicit feedback from stakeholders, ensuring their voices are heard and concerns are addressed. • Provide regular updates and reports to stakeholders on the progress of decommissioning activities and how stakeholder feedback has influenced decisions.	BECO	• Frequency of stakeholder meetings. • Documentation of stakeholder concerns. • Follow-up actions on feedback. • Community representation in decision-making. • Collaboration with local organizations. • Long-term engagement strategies.	Quarterly	3,500
	Child and forced labour	• Report any form of forced labour at the site. • Put visible signage on site “No Jobs for children”; “Do not allow children”. • Compliance with the national labor laws and labour management practices. • Adhere to the ESS 2 provisions and FRS Employment Laws.	BECO Contractor	• Number of reported cases of forced labour. • Updated employment register indicating locals employed, their ages, national identification numbers etc. • Grievances raised, aggrieved persons	Quarterly	4,000

Impact Category	Description	Recommended Mitigation Measures	Responsibility	Monitoring Indicator	Monitoring Frequency	Estimated Cost (USD)
				and status on resolution etc.		
	Security risks	• Provide training on risk mitigation strategies for all personnel involved in the decommissioning activities. • Implement strict access control procedures to limit entry to authorized personnel only, including the use of identification badges or passes. • Establish partnerships with local law enforcement and security agencies to enhance overall security coordination and response. • Employ trained security personnel to monitor the site, control access, and respond to security incidents as they arise. • Conduct a thorough security risk assessment to identify potential threats.	BECO Contractor	• Incident reports. • Access control measures. • Response time to security incidents. • Training of security personnel. • Community security awareness programs. • Stakeholder feedback on security. • Analysis of security trends. • Feedback from security personnel.	Weekly	3,500
	Community health and safety risks	• Implement sustainable decommissioning practices that prioritize community health and safety while minimizing environmental impacts. • Implement measures to minimize noise pollution during decommissioning. • Implement dust suppression measures, such as regular watering of the site, to minimize dust emissions that can affect community health. • Establish a feedback mechanism that allows community members to report health and safety concerns related to the decommissioning process. • Ensure proper waste management practices to prevent contamination of land and water resources, which could impact community health. • Engage with local communities regularly to gather feedback, address concerns, and provide updates on decommissioning activities and safety measures. • Develop and communicate an emergency response plan that includes protocols for medical emergencies, environmental incidents, and community evacuations if necessary. • Develop a traffic management plan to control vehicle movement to and from the site, reducing risks of accidents and ensuring safe access for the community. • Conduct a comprehensive assessment to identify potential health and	BECO	• Health incident reports. • Community health assessments. • Feedback mechanisms for community concerns. • Community satisfaction surveys. • Communication of health risks. • Injury rate monitoring. • Environmental health audits. • Documentation of community feedback.	Quarterly	4,000

IMPACT CATEGORY	DESCRIPTION	RECOMMENDED MITIGATION MEASURES	RESPONSIBILITY	MONITORING INDICATOR	MONITORING FREQUENCY	ESTIMATED COST (USD)
		safety risks to the local community during the decommissioning process.				
	Fire hazards	• Conduct a comprehensive fire risk assessment to identify potential fire hazards associated with decommissioning activities and materials. • Create a fire safety plan that outlines prevention measures, emergency response protocols, and responsibilities for all personnel involved in decommissioning. • Ensure an adequate supply of water is readily available for firefighting purposes, including water tanks or ponds if necessary. • Ensure the availability of adequate firefighting equipment, such as fire extinguishers, hoses, and water sources, in easily accessible locations throughout the site. • Establish communication and coordination with local fire services to ensure a rapid response in case of a fire emergency. • Establish fire breaks or cleared areas around the site to help prevent the spread of fire. • Minimize the accumulation of combustible waste materials on-site and establish a routine waste removal process. • Provide fire safety training for all workers, covering fire prevention, emergency procedures, and the proper use of firefighting equipment. • Store flammable materials in designated, secure areas away from ignition sources, following appropriate storage guidelines. • Use clear signage to indicate fire exits, assembly points, and locations of firefighting equipment throughout the site.	BECO Contractor	• Fire incident reports. • Fire risk assessments. • Documentation of fire hazards. • Monitoring of flammable materials storage. • Documentation of community feedback on fire safety.	Weekly	3,500
TOTAL						**265,700**

8.3. THE ESMP IMPLEMENTATION ARRANGEMENTS

The specific roles and responsibilities of proponent, implementing agency, supervision consultant and contractor are as indicated in Table 8-2.

Table 8-2: The ESMP implementation arrangements for the proposed BECO Jazeera Power Plant

Entity	Roles and responsibilities
Proponent - MoEWR	The MoEWR will provide overall coordination and oversight of the project. MoEWR will be responsible for overall responsibility for safeguards due diligence, and compliance monitoring. The MoEWR will also provide funding for the project planning and implementation.
Project Implementation Unit	The MoEWR has already put in place a Project Implementation Unit (PIU) to guide implementation of the project. In the PIU Environmental and Social issues are spearheaded by an Environmental and Social Expert whose role is to coordinate and oversee implementation of safeguards. HD consulting firm has been contracted to provide environmental and social backstopping services during the project implementation.
BECO	BECO will be responsible for implementation and operation of the project on behalf of the MoEWR. Some of the key responsibilities include but not limited to are; • BECO will supervise construction works through a supervision consultant and also directly • Monitoring the progress of the project in terms of the safeguards and technical aspects. • Monitoring of the ESMP implementation • Ensuring the project is on course in terms of timelines • BECO to hire an E&S specialist to support with the management of risks
Benadir Administrative Region Government	The Benadir Administrative Region Government is a key stakeholder in this project. The roles of the Benadir Administrative Region Government shall include giving relevant approvals needed, solving grievances that cannot be sorted at project level, monitoring progress of the project among others.
FRS and BRA Ministries or departments of Environment	Shall be responsible for approval of ESIA and EHS reports and licensing. Additionally, the ministries shall be free to check progress of implementation of ESMP.
E&S supervising consultant	• The E&S supervising consultant shall prepare quarterly supervision reports detailing environmental, health, social and safety compliance on quarterly basis amongst other technical aspects • Ensure the project adheres to all environmental and social impact assessment (ESIA) recommendations, national regulations, and international standards such as the World Bank ESS. • Oversee the implementation of mitigation measures for environmental, social, and community health and safety risks identified during the ESIA, including soil erosion, waste management, biodiversity protection, and labour influx. • Supervise the proper execution of the ESMP during the construction phase, ensuring contractors comply with the stipulated environmental and social safeguards. • Conduct regular field inspections and audits to assess the environmental and social performance of the contractors and identify non-compliance issues. • Prepare and submit periodic environmental and social monitoring reports to the MoEWR, regulatory bodies, and the World Bank. • Coordinate the training of train project staff and contractors on environmental and social management procedures, including waste handling, safety protocols, and community engagement. • Support the contractor and client is development of EPRP, and oversee emergency preparedness and response plans for potential environmental and social incidents, ensuring swift action to mitigate impacts. • Ensure that gender-based violence (GBV) risk mitigation measures and other labour-related guidelines are implemented on-site, particularly in managing the labour influx and worker-community relations. • Liaise with local and regional environmental authorities in Mogadishu to ensure compliance with the Benadir Administrative Region Environmental Policy (2014) and the Benadir Administrative Region Environmental Management Act (2016). • Continuously identify potential environmental and social risks throughout the construction phase and recommend adaptive management strategies as needed.
Contractor	• Implementation of the contractor related aspects of the ESMP and regularly (monthly) reporting • The contractor on his part will have to appoint an EHS officer and a Social Specialist to coordinate and report on the ESMP implementation respectively. • The contractor to engage a Community Liaison Officer to act as a link between the community and the contractor and support the Social Specialist. • The contractor will also have the obligation of managing the E&S risks related to his/her operations. • Maintaining the required level of stakeholder engagement and communication, including providing project schedule information to the public, accepting and resolving public grievances, advertising and hiring local workers. • Maintain a working grievance redress mechanism. • The contractor is to comply with all regulations and laws at the Benadir Administrative Region and FRS levels level and other relevant regulations and laws • The contractor shall refer to ESIA recommendations and the ESMP when preparing the contractors-ESMP and the specific plans • The contractor shall provide water required for use in connection with the works including the work of subcontractors and shall provide temporary storage tanks, if required

Entity	Roles and responsibilities
	• The contractor shall make his own arrangements for sanitary conveniences for his workers. Any arrangements so made shall be in conformity with the public health requirements for such facilities and the contractor shall be solely liable for any infringement of the requirements. • The contractor shall be responsible for all the actions of any subcontractors whom s/he subcontracts. • The contractor shall take all possible precautions to prevent nuisance, inconvenience or injury to the neighbouring properties and to the public generally, and shall use proper precaution to ensure the safety of the community • All work operations, which may generate noise, dust, vibrations, or any other discomfort to the workers and/or visitors of the client and the local community, must be undertaken with care, with all necessary safety precautions taken. • The contractor shall take all effort to muffle the noises from his tools, equipment and workmen to not more than 70dBA • The contractor shall upon completion of working, remove and clear away all plant, rubbish and unused materials and shall leave the whole site in a clean and tidy state to the satisfaction of the MoEWR and BECO. He shall also remove from the site all the liquid and solid wastes. • No blasting shall be permitted without the prior approval of the MoEWR and the relevant Benadir Administrative Region authorities. • Borrow pits will only be allowed to be opened up on receipt of permission from the approving authorities. • The standard of workmanship shall not be inferior to the MoEWR and WB Standards. No materials for use in the permanent incorporation into the works shall be used for any temporary works or purpose other than that for which it is provided. Similarly, no material for temporary support may be used for permanent incorporation into the works. • Disposing of the waste generated during construction phase activities shall be done in accordance to the ESMP. • The contractor EHS officer will report on ESMP implementation during construction period. The aspect to be reported by the contractor will include safety issues i.e. hours worked, recordable incidents and corresponding Root Cause Analysis (lost time incidents, medical treatment cases), first aid cases, incidents and accidents, potential near misses, and remedial and preventive activities required (for example, revised job safety analysis, new or different equipment, skills training etc.); Environmental incidents and near misses; noncompliance incidents with permits and national law; Training on E&S issues (dates, number of trainees, and topics); Details of any security risks; Worker & External stakeholder grievances and E&S inspections by contractor, including any authorities.

9.0. Stakeholder Analysis, Public Consultations and Disclosure

9.1. OVERVIEW

The stakeholder consultation process for the proposed BECO Jazeera Hybrid Power Plant project aimed to gather and address concerns, expectations, and feedback from potential affected communities. This process was part of ESIA good practice and a requirement for the World Bank's environment and social standards (ESS10). Stakeholders were defined as individuals or groups directly or indirectly affected by the project. The process was fair and inclusive, using tools like questionnaires, key informant interview guides, and focused group discussion guides. The two principal categories of stakeholders were potentially affected communities, identified based on their interaction with the project site, and potentially affected communities, which were identified based on their understanding of the project's location and administrative setup. Stakeholders identified were:

- Business operators: Local business owners, particularly those in industries that may be affected by the project.
- Community-based organizations (CBOs): Local non-governmental organizations and community groups active in the area.
- Gender advocacy groups:
- Local communities: Representatives from households in Mogadishu City and surrounding villages
- Local Government: Benadir Regional Administration
- Civil Society
- Representatives of Office of the Prime Minister:
- Representatives from the Ministry of Environment and Climate Change

9.2. OBJECTIVES OF THE STAKEHOLDERS' CONSULTATIONS

The key objectives of the stakeholder consultation process were:

- To inform stakeholders about the proposed BECO Jazeera Hybrid Power Plant project, including its scope, potential adverse impacts, and benefits.
- To gather stakeholder concerns, opinions, and expectations regarding the project.
- To understand community dynamics, relations, and the broader social and economic context of the communities and the possible impacts of this Project.
- To build a constructive dialogue between the project developers and local communities, government entities, and other interested parties.
- To ensure that stakeholder input is incorporated into project planning and implementation, in compliance with best practices and regulatory requirements.
- To facilitate transparency and inclusive participation of community members in the project so they can voice their concerns and views regarding the project design and its project impacts, and to ask questions.

The consultation process was conducted through a combination of structured questionnaires, key informant interviews and focus group discussions. HD Expert teams in close collaboration with the BECO and local communities' representatives facilitated the consultations. Information about the proposed power plant was disseminated to ensure all participants had a clear understanding of the project's scope and objectives.

9.3. SUMMARY OF KEY FEEDBACKS FROM STAKEHOLDERS

Table 9.1 summarizes the key outcomes from the engagement with the stakeholders. Most stakeholders support the proposed hybrid power plant, recognizing its potential benefits in affordable, clean energy, job creation, and local economic development. However, gender differences in opinions suggest the project's direct economic benefit to BECO may be more significant.

All stakeholder groups agreed that the BECO should maintain continued, transparent communication throughout the project's construction and operating phases. Stakeholders emphasised the significance of providing regular

updates on construction activity, any disruptions, and the plant's environmental and social performance. Communities want the ESP to establish open lines of contact to keep them informed.

While the majority of stakeholders expressed support for the project, there were some worries about potential disruptions during construction, such as dust, noise, and increased traffic. They anticipate that BECO will implement mitigation measures and keep them updated on any substantial changes or delays.

Local stakeholders, particularly youth and women's groups, emphasised the project's importance in creating jobs. They expressed interest in the project's local recruitment, training, and skill development opportunities during both the building and operational phases. Some parties have raised worry about the project's long-term environmental and socioeconomic implications. They advocated for ongoing monitoring and reporting on the plant's environmental footprint, including any effects on water supplies, air quality, and land usage.

Table 9-1: Summary of feedbacks from stakeholders engaged during the ESIA study for the proposed BECO Jazeera Power Plant

Stakeholder category	Summary of interests and concerns
Business Operator	The project will improve energy access, enhance livelihoods through job creation and reduction in carbon emission. However, potential adverse impacts include water pollution and health and safety risks. Mitigation measures should include proper waste handling, community engagement and consultation, and establishing an effective feedback mechanism.
Business Operator-Raabax Business Centre	The project is environmentally friendly and will generate benefits to the community. It will increase business hours because of lighting and also create employment. Waste generated should be recycled and staff should be provided with PPE. Stakeholder engagement should be done and communication contacts should be maintained.
Elder	The project will be beneficial as it will supply electricity to support business enterprises. While no significant risks are associated with the project, concerns may arise from individuals claiming the company has taken their land. To address such issues, the proponent should collaborate with local elders to resolve conflicts amicably.
Government Institution-Ministry of Environment and Climate Change	The project offers numerous benefits, including increased access to energy, enhanced security, and job creation. However, potential adverse impacts include water and air pollution, land contamination from waste disposal, and safety risks. To address these concerns, the proponent should implement a clear awareness strategy, engage stakeholders effectively, and use traditional mediation techniques to build social cohesion through dialogue. Additionally, a third-party EIA agent should be hired to monitor the implementation of mitigation measures during the project's execution.
Government Institution- Social Affairs Benadir Region	The project is climate-friendly and expected to reduce electricity costs, improve health and livelihoods, create employment, and provide business opportunities through the procurement of solar equipment. However, it may affect natural resources, which should be managed through sustainable practices.
Government Institution-Office of the Prime Minister	The project is expected to have positive impacts, including contributing to economic development. However, it may pose environmental and safety risks during construction. Mitigation measures, such as implementing robust safety protocols and environmental management plans, should be put in place to address these concerns.
International NGO- ICRC	The project is expected to benefit the entire city by creating job opportunities and improving access to electricity. Given that it is a solar project, potential adverse impacts are minimal. However, the proponent should prioritize developing environmental protection measures and a comprehensive stakeholder engagement plan to ensure the project's success and inclusivity.
NGO	The project is highly beneficial, with no significant environmental risks anticipated. It is expected to lower electricity costs, create employment opportunities, and support local businesses through the procurement of goods and services. Additionally, the project is environmentally friendly, contributing to sustainable development.
NGO- Alight	The project is expected to lower electricity costs, support small businesses, and reduce air pollution. However, potential impacts from construction and operation activities must be addressed. Active stakeholder engagement and clear, consistent communication throughout the project are crucial to its success.
NGO- DRC	The project will generate clean energy, reducing reliance on charcoal and lowering air pollution. It will also enhance livelihoods through job creation. However, potential adverse impacts include water pollution from solar batteries, significant land use, and health and safety risks. Mitigation measures should include proper waste handling and recycling, strict adherence to safety protocols, transparent information sharing, and establishing an effective feedback mechanism.
NGO-CARE	The project is expected to have several positive impacts, including improved safety through better lighting at night, income generation, reduced air pollution, and conservation of natural resources, particularly trees. To maximize its benefits, the project should prioritize enhanced community engagement.
NGO-SRCS	The project is beneficial and has no environmental risks. It is anticipated to lower the cost of electricity.
Community-based organizations	Local communities in the Jazeera area of Banadir Region, Somalia, are primarily interested in the proposed solar power plant's potential to provide reliable electricity, create job opportunities, and contribute to local economic development. They expect the project to be implemented in a socially and

	environmentally responsible manner, addressing concerns such as equitable employment, community health and safety, and minimal disruption to their livelihoods and natural surroundings.
Gender Advocacy Groups	Gender advocacy groups are keen to see the proposed solar power plant promote gender equity by prioritizing women's participation in employment and decision-making opportunities. They expect the project to integrate gender-sensitive measures, including addressing potential risks of gender-based violence, ensuring fair treatment of women workers, and enhancing access to project benefits for women in the community.
Youth groupings/associations	Youth groupings/associations are anticipating enhanced employment opportunities, skills development, and access to reliable energy, while expecting inclusive decision-making and mitigation of environmental and social impacts.
Women Groups Representatives	The project will create job and business opportunities and provide access to cheap electricity. The adverse impacts include waste generation, diseases from foreign workers, fire safety risks, electrocution. The proponent should consider constructing underground distribution/transmission lines and conduct broader stakeholder engagement.
Internally displace persons (IDPs)	The IDPs are interested in the proposed solar power plant's potential to provide job opportunities and improve access to reliable energy, which could enhance their livelihoods and living conditions. They expect the project to address their specific needs by prioritizing inclusive hiring practices, minimizing any risks of further displacement, and delivering tangible community benefits.

9.4. EXPECTED COMMITMENTS BY BECO

BECO has committed to ongoing stakeholder consultations throughout the project lifecycle, establishing public communication channels like social media and local radio updates. They will also implement detailed plans to minimize disruptions, including dust control, noise management, and traffic regulation measures. A grievance mechanism will be established to address any concerns raised by the community during the project. These actions aim to ensure timely and accessible information for all stakeholders.

9.5. CONCLUSION

The stakeholder consultation process for the proposed BECO Jazeera hybrid power plant in Mogadishu City concluded well, with stakeholders expressing broad support for the project. However, stakeholders have emphasised the significance of ongoing information exchange and engagement throughout the project's duration. The BECO team recognises this expectation and committed to maintaining open and consistent communication with all stakeholders to ensure that their concerns are addressed and that the project benefits the local community and environment.

10.0. Conclusion and Recommendations

10.1. CONCLUSION

- This study found that negative social and environmental impacts can be mitigated, while positive impacts benefit the community. The project proponent, implementing entity, and contractor must adhere to environmental and social management plans, obtain permits, and have qualified personnel. ESIA proposes adequate mitigation measures.
- The ESIA analysis shows that the proposed power plant will have positive impacts on the FGS, BRA Region governments, and residents, including increased clean energy, employment, investment, and improved living standards. However, it also poses potential negative impacts like noise, dust, soil erosion, and increased resource demand.
- The Environmental and Social Management Plan (ESMP) has been developed to ensure sustainability of project activities from construction to decommissioning. It provides a general outlay of activities, associated impacts, mitigation action plans, and monitorable indicators. Implementation timeframes and responsibilities are defined, and cost estimates for recommended measures are provided. A monitoring plan highlights environmental performance indicators, allowing for continuous review of operational and maintenance activities to identify trends in degradation or improvement and propose mitigation measures.
- The ESIA indicates that the proposed project will yield significant socio-economic benefits, a significant improvement over the "NO development option." Stakeholders agree it's overdue, and potential adverse impacts can be mitigated. The project will adhere to industry norms and standards, ensuring environmental sustainability. Mitigation measures will be integrated to comply with national and World Bank requirements.

10.2. RECOMMENDATION

The MoEWR and BECO are advised to implement the ESMP, conduct statutory EHS Audits during all the phases of the project, including regular evaluation of the project site's environmental performance against the recommended measures and targets outlined in this report. On the basis of the findings from this ESIA, the following specific recommendations can be made:

- Adherence to the mitigation measures as spelt out in the ESMP and monitoring of the same is mandatory to ensure environmental and social sustainability of the project.
- Undertake a supplementary biodiversity assessment and develop a biodiversity management plan (BMP) to be implemented during the full project cycle
- Contractor to ensure grievance redress mechanism is established and operational before commencement of the operation.
- Contractor to undertake habitat restoration programmes through planting of indigenous vegetation in all cleared areas to promote environmental sustainability
- Cultivate and maintain a good working relationship with the community members, and all other relevant stakeholders.
- Diligence on the part of the contractor and proper supervision by the MoEWR and BECO is crucial for mitigating the potential impacts and ensuring environmental, health, safety, and efficient operation of the project.
- EHS Audits shall be carried annually or as prescribed by the FGS Authority during the operational phase.
- Ensure social inclusion of the vulnerable groups by paying attention to the most vulnerable and provide ready boards as spelt out
- Stakeholder engagement to the carried out throughout the construction and operation and decommissioning phases.
- The BECO and the contractor shall adhere to relevant legal and regulatory framework to ensure compliance and success of the project.

10.3. AUTHORIZATION OPINION

The Horizon Development (HD) believes that this ESIA report provides enough information for decision-making on the project. It has been shown that the proponent's preferred alternatives and technological alternatives are

generally acceptable. The ESIA has also identified essential mitigation measures to limit project impacts. The HD believes that the applicant's proposal should be approved on environmental grounds, provided essential mitigation measures are implemented. The HD believes that the anticipated negative impacts can be effectively mitigated, and that the proposed project does not pose a significant threat to environment and social aspects. The project should therefore be allowed to proceed.

11.0. Annexes

ANNEX 11.1. LAND OWNERSHIP DOCUMENT FOR THE PROPOSED PROJECT SITE

ANNEX 11.2. PUBLIC CONSULTATION QUESTIONNAIRES

BECO JAZEERA ESIA-List of Attendances-1	1/18/2025 6:22 PM	Microsoft Edge PDF ...	316 KB
BECO JAZEERA ESIA-List of Attendances-2	1/18/2025 6:00 PM	Microsoft Edge PDF ...	672 KB
BECO JAZEERA-ESIA KII0001	12/2/2024 7:43 AM	Microsoft Edge PDF ...	13,371 KB
BECO JAZEERA-ESIA-KII0002	1/18/2025 6:02 PM	Microsoft Edge PDF ...	11,704 KB
BECO JAZEERA-ESIA-KII0003	1/18/2025 5:59 PM	Microsoft Edge PDF ...	17,417 KB
BECO JAZEERA-ESIA-KII0004	1/20/2025 9:32 AM	Microsoft Edge PDF ...	5,793 KB
BECO-JAZEERA-ESIA-FGD	12/9/2024 7:38 PM	Microsoft Edge PDF ...	3,597 KB

ANNEX 11.3. FOCUS GROUP DISCUSSIONS

Environmental and Social Assessment Checklist

Project Name: BECO Jazeera Hybrid Power Plant	District/City: Mogadishu
Project Location: BRA	Nature/Size: ESP
Type of activity: (Hybrid power plant)	
Name & Signature of Evaluator: SAAD ADAN AIDED	Date of Field Evaluation: 07 December 2024

Item		Appraisal	Risk / Significance rating					
		Yes/No	None	Low	Moderate	Substantial	High	Unknown
1. Environmental Screening (ESS3 and ESS6)								
Will the project generate the following impacts?								
1.1	Loss of trees	Yes				√		
1.2	Soil erosion/siltation in the area	No						
1.3	Pollution to land by diesel, oils etc.	Yes		√				
1.4	Dust emissions	No						
1.5	Solid and liquid wastes	Yes		√				
1.5	Borrow pits and pools of stagnant water	No						
1.6	Rubble/heaps of excavated soils	No						
1.7	Emergence of wildfire	yes		√				
1.8	Invasive tree species	No						
1.9	Long term depletion of water	No						
1.10	Exposure to hazardous chemicals including PCBs	No						
1.11	Nuisance from noise or smell	Yes		√				
1.12	Loss of soil fertility	No						
1.13	Generation of hazardous waste including solar batteries	Yes		√				
1.14	Cross through, located within or nearby environmentally sensitive areas (e.g., national parks, intact natural forests, wetlands, etc.)?	No						
1.15	Cause poor water drainage and increase the risk of water-related diseases such as malaria or bilharzias?	No						
1.16	Risk of exposing the workers to extremely hazardous working conditions.	Yes		√				
2. Social Screening (ESS5)								
Will the project generate the following negative social and economic impacts?								
2.1	Loss of land by households	No						
2.2	Loss of properties –houses, structures	No						
2.3	Loss of perennial trees, fruit trees by households	No						
2.4.	Loss of crops by people	No						
3. ESS2, ESS4, ESS5, ESS7, ESS8								
3.1	Loss of access to river/forests/grazing area	No						
3.2	Impact heritage site, graveyard land	No						
3.3	Conflicts over use of local water resources	No						
3.4	Disruption of important pathways, footpath/roads	Yes		√				
3.5	Loss of communal facilities – mosques	No						
3.6	Loss of livelihood system	No						
3.7	Risk of encouraging child labour	No						
3.8	Risk of workers to extreme exposure for GBV	No						
3.9	Spread of HIV/AIDS and other STI's	No						
3.10	Risk of GBV/SEA/SH to the affected communities	No						
3.11	Risk associated with Security personnel	No						

Item	Appraisal	Risk / Significance rating					
	Yes/No	None	Low	Moderate	Substantial	High	Unknown
4: Impacts on Historically underserved groups/Ethnic minorities	No						

Categorisation & Recommendations:
After compiling the above, determine which risk category the sub-project falls under based on the environmental risk categories: High, Substantial, Moderate and Low risk. If the sub-project falls under "Substantial, Moderate or low" risk categories, proceed to identify the category of the sub-project based on the National EIA guidelines issued.

World Bank ESF Categorisation

Place tick in applicable	Category	Details
	High Risk	Sub-project of the Somalia Electricity Sector Recovery Project (SESRP) likely to fall under "High Risk" rating. In the likely event that subproject falls under "High Risk" the Environmental and social Assessment should be conducted in accordance with the World Bank Environmental and Social Standards (ESSs) by preparing an ESIA study report.
	Substantial Risk	Sub-project of the Somalia Electricity Sector Recovery Project (SESRP) likely to fall under "Substantial Risk" rating. In the likely event that subproject falls under "Substantial Risk" the Environmental and Social Assessment of the subproject should be conducted in accordance with any requirements of the ESSs that the Bank deems relevant to such subprojects by preparing an ESIA study report.
	Moderate Risk	Environmental and Social Assessment of the subproject should be conducted in accordance with any requirements of the ESSs that the Bank deems relevant to such subprojects by preparing an ESMP.
	Low Risk	Sub-project is not subject to environmental assessment as no potential impacts are anticipated.

Focus Group Discussion Guide – Youths/Associations

FGD Youth /Association		
Facilitator Instructions: The purpose of the meeting is to gather information on the socio-economic situation of the youth in terms of participation in decision making, employment, recreation and aspirations. There should be no more than 10 participants. Keep the discussion focused and please probe for explanations for responses (what, where, when, why, how). Take lots of pictures. The Federal Government of Somalia has secured a grant from the World Bank to implement the Somali Electricity Sector Recovery Project (SESRP). The SESRP is implemented by the Ministry of Energy and Water Resources (the MoEWR). The Project Development Objective is to increase access to lower-cost and cleaner electricity supply in the project areas and to re-establish the electricity supply industry. We are conducting an environmental and social impact study for Component 1 of the project, focusing on the sub-transmission and distribution network reconstruction, reinforcement, and operations efficiency in the major load centers of Mogadishu and Hargeisa. The purpose of this study is to collect comprehensive information to comprehend the potential impacts of the project and solicit feedback from stakeholders.		
Section A: General Information		Responses
1	Date and time of meeting	07 December 2024
2	Name of facilitators (inc note taker)	Saad Adan Aided
3	Region/District	Dharkenley District
4	Name of Village	
5	Number/gender of participants	Males: 7 Females:4
Section B: The Project		
1	Have you heard of the project before? How/when/where (if not please explain) Do you feel that you understand the project?	Yes, but lack detailed or official communication.
2	What do you think could be the positive impacts of the project on youth, so that people benefit?	Provide a reliable, stable power supply.
3	What other impacts to you think that the project could have on the youth and communities?	Business opportunities.
4	How do you think that the project could minimize or avoid negative impacts?	Establishing a comprehensive mitigation plan.
5	Do you have any questions/comments regarding the project?	Will the project contribute to a reduction in the cost of electricity?
Section C: Overview		
1.	If a youth group- When was your youth group established? Why was it established?	No formally registered youth groups in the area
2.	What are the key priorities among the youth? What are the main issues faced? Why?	The youth desire to have insecurity challenges addressed to enable investment in other sectors thrive. This will support job creation endeavors..

3.	To what extent do the youth play a role in decision making? Do they feel that their voices are heard? What are the main areas where they would like their opinions to be heard?	Elders make most decisions. In the present set-up, the youths have minimal roles in decision-making.
4.	What programmes are in place to help the youth? How successful have they been?	No formally known youth programmes known in the area.
Section D: Education		
1.	How many of the youth have completed secondary education?	No official data available.
2.	How many of the youth have been to vocational school and have qualifications? What subjects do these apply?	None of the youths has been in a vocational training facility.
3.	What skills to the youth feel they have that enable them to work?	Vocational trainings would be ideal.
Section E: Unemployment		
1.	How many of the youth do not have a full-time salaried job?	Most youth in Dharkenley District are unemployed.
2.	Why do the unemployed youth not have a job? What are they doing to find a job? Are there any barriers to finding work? What are these?	Little investment in job creation.
Section F: Employment		
1.	How many of the youth are working? How many are self-employed and how many work for an employer?	Some youth have formal employments.
2.	What are the main jobs that the youth have?	Not described
Section G: Aspirations		
1.	What aspirations/goals do the youth have? How are they planning to achieve those goals? What, if any, are the main barriers to achieving their goals? How can they overcome these barriers?	More and better participation in national and community development.
Section H: Recreation		
1.	What do the youth do in their spare time? Where do they go?	Various forms of entertainment, such as football.
2.	Do they feel that they have an active social life or is there more that needs to be done to encourage them to engage in recreational/social activities? Explain response	The security environment in BRA have limited the youth participation in recreational activities.
Section I: Please insert any observations/comments regarding the meeting here		
1.	Comments/observations (what went well/not so well, was everyone participating, were there any vulnerabilities, how motivated were the youth to participated during the meeting?)	Little trust among participants.

Focus Group Discussion Guide- Female

FGD Female
Facilitator Instructions: The purpose of the meeting is to gather information on women's role in the household, livelihoods/jobs, health issues, challenges, perceptions on quality of life, education options for children, health care and project perceptions. Introduce yourselves, the project and explain the purpose of the meeting. Gather a representative sample of a maximum of 10 women that include a combination of youth, elderly and disabled where appropriate. Keep the discussion focused and please probe for explanations for responses (what, where, when, why, how). Take lots of pictures. Ensure everyone participates in the discussion. The Federal Government of Somalia has secured a grant from the World Bank to implement the Somali Electricity Sector Recovery Project (SESRP). The SESRP is implemented by the Ministry of Energy and Water Resources (the MoEWR). The Project Development Objective is to increase access to lower-cost and cleaner electricity supply in the project areas and to re-establish the electricity supply industry. We are conducting an environmental and social impact study for Component 1 of the project, focusing on the sub-transmission and distribution network reconstruction, reinforcement, and

operations efficiency in the major load centers of Mogadishu and Hargeisa. The purpose of this study is to collect comprehensive information to comprehend the potential impacts of the project and solicit feedback from stakeholders. *Show the participants the layouts/models*		
Section A: General Information		Responses
6	Date and time of meeting	07 December 2024
7	Name of facilitators (inc note taker)	Saad Adan Aided
8	Name of Region Region/District	Dharkenley District, BRA
9	Number of participants	6
10	Describe the demographics / composition of the group (age range, ethnicity and any vulnerabilities)	Between 20 – 40 and all Somali community and no disability or other type of vulnerability.
11	Number of female headed households in the group? What is the main reason for this?	Not provided Most women in Jazeera area are involved in family domestic chores.
Section B: The Project		
6	Have you heard of the project before? How/when/where Do you feel that you understand the project? (if not please provide an explanation and show the site map)	The participants had general knowledge of the project but expressed uncertainty about it.
7	What is your view on the project? How do you think that the project could impact women in the community positively and negatively?	The women unanimously agreed on the project's benefits for themselves and the wider community.
8	How do you think that the project could minimize or avoid negative impacts on women and the community?	Provide employment opportunities for women.
9	Do you have any questions/comments regarding the project?	**No**
Section C: Role of Women		
1	What roles do women typically undertake in the community? Please consider this in terms of the home and livelihoods. How many hours a day do women work? what time do they typically start and finish their daily activities?	Many women work long hours managing domestic household responsibilities.
2	Do you think that men and women have equal opportunities in the community, workplace and education?	**No**
3	What resources do women mainly have control of compared to men? (eg land, assets, equipment) Please explain response	Women typically manage the day-to-day household budgets.
4	Do women feel safe in the community? Are there any particular crimes that are common in the community? Have you experienced any conflicts in the community? Explain responses	Yes. Concerns about GBV Yes, mostly brought about by insecurity.
5	How do women receive information about local issues and developments, news etc in the community?	Most of information is received informally.
6	Do women rely on each other for support? What type of support? (eg childcare, someone to talk to, income generation etc).	Yes, women have form social groupings.
Section D: Institutions / Community Development		
1	How are women represented in the community (eg is there a female head/leader who champions their interest)? Do women contribute in decision making within the community? Are women represented at important meetings? If not, do men discuss decisions with you?	Yes, some women participate in advocacy championing women rights.
2	Do you have any women's traditional/cultural groups? What are they called? What is the purpose of these groups?	No traditional women groups are known to exist in the area.
3	Are there any other local associations in the area that they are aware of? If so, which ones.	No
4	Are any Non-Governmental Organisations working here? If yes – which ones and what do they do? How successful have the projects been?	Yes, many NGOs operate in the area
Section E: Economy/Income Generation		
1	What could women do to have greater economic opportunities in this area?	Formation of socioeconomic groups.
2	Do you have access to a bank/credit/savings account? If so, is it your own personal account or a joint account? Do women have their own money at disposal? What do they spend it on most frequently?	Most women operate small businesses, but most rely on their spouses.

3	Does your family receive support from remittance or other support from family members working elsewhere?	Yes, remittance from relatives
Section F: Land Use		
1	What the main land based activities that women undertake? Please complete the seasonal calendar at the back of the form.	Most women are housewives.
2	What are the main crops that you grow? What % are for household consumption and what % do you sell? If you sell crops, where do you sell them?	No data
3	What are the main animals that people keep in the community? Is this a subsistence activity or an income-generating activity?	Large and small stocks (camel, goats, sheep, poultry)
4	Do you collect natural resources (eg timber, herbs, firewood and roofing, fruits, etc) for subsistence and domestic use? Where do you get these from? Explain the uses. Explore issues related to charcoal production as well as commercial extraction of natural resources	A few community members collect timber and other natural resources.
5	Where does the community buy and sell agricultural produce? How far is the nearest market? What is the name of the market?	Local markets in Jazeera and Mogadishu city.
6	Have you experienced any conflicts in the community in relation to land? Who was involved? What was the issue? How was it resolved? Are conflicts frequent? (explain response)	Yes, solutions are normally sought through elders.
Section G: Education, Literacy and Training		
1	How would you describe accessibility and quality of education for children in your community? How far are they (KM)? what are the names/levels of schools accessed	Education is costly, and unaffordable for many.
2	Do most females in the community go to school? What level do they generally complete up to? Explain responses. Are there factors that prevent girls from continuing education? Has anyone in the community complete vocational training or university? What subjects? (explore issues of girl child work/labour verses education.	Few girls attend and complete schools at all levels.
3	Can girls/women in the community generally read and write?	Literacy rates are low for women Dharkenley District.
Section H: Health		
1	How and where do you access healthcare?? Do the services available meet your needs?	Best facilities are located mainly in Mogadishu, approximately 30km away.
2	What are the top 3 health problems that girls and women face in the settlement? Please explain the reason for each of the health issues Are there any particular times of the year where these issues are more challenging than others?	Girls and women challenges are associated with culture and socioeconomics.
3	Are there any environmental issues that affect health in the community (e.g. water quality, sanitary conditions etc) Please explain	In the area we rely on ground water which is increasingly getting scarce.
4	If someone in the household is ill, how do you usually treat him/her? How do you treat sick elderly, children, men and women? Are there any disabled people in the community that require care?	Yes, they are treated and are always taken care of by families

Section I: Access to Water						
1	Where do you get your water for drinking, cooking, bathing and for livestock?		Description of water source	Walking distance from dwelling (KM)	Collection method (if applicable)	Description of quality/colour/taste/smell
		Drinking:	Borehole	Out of the town	Piped	Hard water
		Cooking:	Borehole	Out of the town	Piped	Hard water
		Washing dishes:	Borehole	Out of the town	Piped	Hard water
		Bathing:	Borehol	Out of the town	Piped	Hard water
		Livestock:	Borehole	Out of the town	Piped	Hard water
		Irrigation:				
2	Do you have to treat drinking water? If so, how?		No			
3	If the community has a borehole, do they know when it was installed? Who installed it? How deep it is? How is it operated?		No			

4	Is anyone in the community or a community water committee responsible for managing boreholes or other water sources in the community? Who? How well does this work?	No		
Section J: Sanitation and Hygiene				
1	What type of toilet facilities do households have? (eg community or private/household, ventilated pit latrine, un-ventilated pit latrine, hole in the ground, no latrine/use the bush etc)	Yes, pit latrines of different types		
2	Do the toilet facilities have light?	No		
Hygiene & Waste				
3	How / where do people dispose of household waste? (Burn, dump, put in the river or sea, other- specify)	No clear disposal procedures exist.		
Section K: Access to Power				
1	What energy source do you use? Where are each of these sources these located (eg grid connection from the house, firewood, charcoal, kerosene, gas, solar etc?	Type	Source of energy/power	Location
		Lighting:	BECO	In town
		Keeping warm:	BECO	
		Cooking:	Gas, firewood, charcoal	
		Heating water:	none	
		Charging mobile phones:	Solar, BECO	
		Cooling food:	BECO	
2	Do you face any challenges regarding access to power? Please explain?		The current tarrifs are unaffordable to many residents.	
Section L: Transport and Communication				
1	What are the main forms of transportation used within the community? Please describe the quality/accessibility of transportation in the community		Vehicles, tuktuks.	
2	Is there telecommunication services in the area		Hormuud Telcom	
Section M: Cultural heritage				
1	What are the sacred/ historical or religious sites in the area? Are these accessible to women? Where are they located?		There are no such places,	
2	What are the main festivals or rituals undertaken in the community by women? Give details		International women's day and eid festivals and some other days that people celebrate	
Section N: Insert photos here				

ANNEX 11.4. STAKEHOLDERS' ENGAGEMENT PHOTO LOGS

Photo 1: View of the representatives of the women groups engaged during the stakeholders consultations

Photo 2: View of the representatives of the youth groups engaged during the stakeholders consultations

Photo 3: View of the representative of the community elders engaged during the stakeholders consultations

Photo 4: View of the Engineer from the Ministry of Energy and Water Resources engaged during the stakeholders consultations

Photo 5: View of the official from the Ministry of Environment and Climate Change engaged during the stakeholders consultations

Photo 6: View of the official from the Ministry of Public Works engaged during the stakeholders consultations

Photo 7: View of the official from the Ministry of Energy and Water Resources engaged during the stakeholders consultations

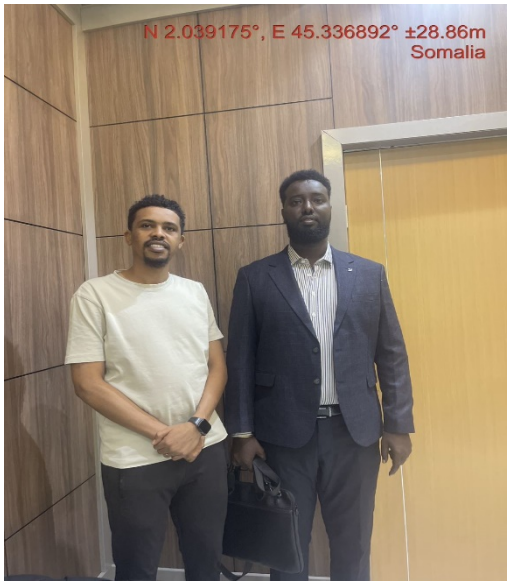


Photo 8: View of the representative of the local NGOs engaged during the stakeholders consultations