

South Asia Co-operative Environment
Programme (SACEP) Plastic free Rivers and Seas
for South Asia (P171269)

ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN
OF RECYCLING HUB IN JEMINA

GRANTEE : BHUTAN ECOLOGICAL SOCIETY - BHUTAN

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Environmental and Social Management Plan (ESMP) Reimagining Effective Partnerships for Tackling Plastic Waste & River Pollution - Bhutan Ecological Society

Environmental and social risks and impacts are strongly linked to subproject location and scope of activities. This Environmental and social management plan is linked to the the subproject activities involved in establishment of recycling Hub including construction of the UR Brick production shed, construction of a recycling material storage, an office/meeting room, male/female toilet, a breastfeeding space and partial roofing modification of the existing shelter for accommodation of the PET Pelletizer machine. During the production phase activities will be production of UR bricks and PET pellets.

Establishment and Operation of Recycling Hub at Bjemina

1. Subproject Information

Subproject Title:	Establishment and Operation of Recycling Hub in Jemina
Estimated Cost:	USD 255,186
Start/Completion Date:	4th July, 2024 - 31st Jan, 2025

2. Site/Location Description

The Plastic Wastes Recycling Hub will be located at the Jemina Industrial Estate in Thimphu District, 35 kilometers away from the Thimphu Municipality. The site is allocated by the Department of Industry (DoI), Ministry of Industries, Commerce and Employment (MoICE) amidst all types of manufacturing, fabrication, woodworks and construction material producing industries. Accessibility to Jemina Industrial Estate is by road bifurcating from Thimphu-Phuentsholing highway at Khasadrapchu. The Industrial Estate is about 15 kilometers from Khasadrapchu, crossing Thimphu river and following the Jemina Chhu (stream) towards upstream. The Industrial Estate was established in early 2000 purposely to keep away the industrial growth from the urban settlement of Thimphu to mitigate Environment and Social impacts.

There are scattered rural settlements in the locality but fully demarcated with hollow bricks and stone masonry walls from the Industrial Estate. Jemina Chhu/stream flows about 200 meters downhill in the valley from the industrial estate/recycling hub. No other water bodies flow through the industrial estate except for the stormwater drainages from the individual industries. There is a specific 33/11Kv power substation for hydro-electricity supply to the Industrial Estate and all industrial setups have easy access to 3-phase power supply lines. The next-door industries that the Recycling Hub has is a metal fabrication workshop and a woodworks industry on the upper hillside with the industrial access road running in between. A Hollowbricks manufacturing factory is on the downhill boundary of the recycling Hub.

At one end of the land, there is a small existing structure/shed with concrete flooring and plinth protection. The foundation is built with Random Rubble Masonry (RRM), and the superstructure features CGI sheet walls and roofing supported by a wooden roof truss.

The climatic conditions in the location are not very different from other parts of Thimphu. Almost at the same altitude (2360 masl) to the southern zone of Thimphu Municipality, Babesa, Jemina has a narrower valley. Rainfall patterns and seasons are also similar to Dechencholing and Motithang. Entire Thimphu Dzongkhag (District) including Jemina experiences dry months from December to March with rainfall as

low as 20 millimeters (0.79 inch) a month and as high as 220 millimeters (8.7 inches) in the monsoon months of July-September. Annual rainfall recordings on average can be nearly 650 mm (25.6 inches).



The map showing the land location- [Jemina Recycling Hub](#)

(The geographical coordinates for the location are 27.4241139° North latitude and 89.5517486° East longitude)

3. Subproject Description and Activities

The main function of the Plastic Recycling Facility is to manufacture recycled UR Bricks and Plastic pellets and catering to the national/regional/global demand for recycled products and raw materials.

This project activity on-site includes:

3.1 Construction phase

All constructions are within one fenced area of 69.2 decimals space allocated by the DoI at Jemina Industrial Estate. Ground leveling therefore, is for all constructions that include; UR Bricks production facility, Office/meeting room, Breastfeeding room and Male/Female Toilets. The PET pellet production facility will be set up in the existing shelter, with a partial height modification of the shelter to accommodate the pelletizer machine

3.1.1 Construction of UR BRICKs production facility

Construction activity includes:

1. Clearing of land includes removal of topsoil (average depth 150mm). No vegetation clearing required since the site has already been developed and does not have any existing vegetation.
2. Gardening and flowers and tree planting along the boundary fencing
3. Construction of UR Bricks Facility includes foundation trench digging, providing and Laying stone soling, Plain Cement Concrete (PCC), Masonry stone wall in cement mortar up to plinth level, Reinforced Cement Concrete (RCC) in plinth beam and Hollow Bricks wall in superstructure. Doors and windows in mixed conifer wooden frames and roof truss structures. Pre-painted Corrugated Sheet for roofing with cement distemper and paintings and wooden distemper and paintings. Traditional artifacts and paintings are not necessary in industrial structures.
4. PCC Flooring on stone soling inside the shelter with RCC machine foundation blocks as per the design of the machines.
5. Electric wiring and fittings
6. Plumbing and sanitaryware fitting

3.1.2 Modification of the existing shed to set up PET pellet production facility

The existing shed, which will be partially modified to set a PET pallet production facility, features a total concrete flooring with plinth protection and RRM foundation in the sub-structure and CGI sheet walls and roofing with wooden roof truss in the superstructure. The partial roofing structure will increase in height of the partial truss and roofing sheets. No other additional super or sub-structure construction is necessary.

The modification process involved:

7. Removal of partial roofing and roof truss frames.
8. Increasing the height of the roof truss with provision & fixing of additional steel tubes for cutting, joining and welding into required height and fixing the CGI sheet walls.
9. Providing and laying new roofing sheets (PPGI)
10. Procurement, Transport and Installation of required pelletizer machinery.
11. A PET washing unit will be installed inside the existing shed

3.1.2.1 Setting up PET Washing unit

12. An 800-liter PET washing unit with a daily water consumption of 3,200 liters will be established inside the existing shed. Realignments of the machine positions and minor re-setting of machines may be necessary as requirement
13. A separate washing facility is strongly recommended for PET Pellets and UR Bricks production. Using the same washing line for UR Bricks and PET pellets production is not perceived as a safe practice. High grade (quality) pellets raw material washing in the same washing facility for UR Bricks highly risk contamination. UR Bricks raw materials need not be as clean as Pellet raw materials.
14. Construction of outlet drain with PCC and Bricks or laying of PVC pipes to connect the flow of wastewater to the wastewater treatment facility.

3.1.3 Construction of wastewater treatment units

3.1.3 Construction of Wastewater Treatment Unit for Production Process Effluent includes:

- Construction of a skimming tank and a sand bed screening tank for grease and solids removal.
- Primary and secondary a wastewater treatment plant especially for the wastewater discharge from PET Pelleting washing facility will be designed and established. The treatment capacity will align with the washing line's water consumption of 3,200 liters.

3.1.4 Modification activities for the wastewater Treatment for Sanitary Facilities includes;

- Renovation of the existing septic tank.
- Renovation of the existing soak pit.
- Connecting toilet black water outlets to the Septic tank and to the soak pit.

3.2 Operational phase

1. **Receiving raw materials:** Under the project, segregated plastic waste will be collected from waste storage facilities located at the two project sites. These facilities will act as collection points for households, businesses, and waste management centers.
2. **Sorting :** The collected plastic waste will be transported to the recycling hub where it will be further sorted and segregated based on the type of plastic, namely PET, HDPE, LDPE and PP and stored until usage. These plastic waste will be then used to produce the following two products.

3.2.1 Production of UR Bricks

Following process is involved in the production of UR bricks:

1. **Cleaning:** HDPE, LDPE and PP are used for UR brick production. The sorted plastic waste undergoes manual cleaning to eliminate contaminants like dirt, labels, or residual substances.
2. **Shredding followed by Washing:** Plastic waste is then fed to the shredder and shredded into small pieces or flakes to increase the surface area and make it easier to clean. These flakes will be transferred into the washing unit for cleaning and drying.
3. **Melting:** The shredded plastic or flakes are melted at controlled temperatures, converting it into a molten form. Adjusting the temperature according to the specific melting points of different plastics ensures proper melting without degradation.
4. **Molding:** The molten plastic is transferred into molds or extrusion machines to give it the desired shape of plastic bricks. Injection molding, compression molding, or extrusion molding techniques are used based on the specific requirements.
5. **Cooling and Solidification:** The molded plastic bricks are allowed to cool and solidify, ensuring they retain their shape and structural integrity. Natural air cooling is employed for cooling purposes.
6. **Quality check:** Testing of the UR bricks to ensure that it meets the national standards by the Bhutan Standards Bureau for certification.
7. **Distribution:** UR bricks are stored and then transported for distribution to end-users for utilization.

3.2.2. Production of plastic pellets.

The following process is involved in the production of PET pellets.

1. **Cleaning:** PET bottles are used for pellet production. The sorted plastic waste undergoes manual cleaning to eliminate contaminants like dirt, labels, or residual substances.
2. **Shredding followed by Washing:** PET waste is then fed to the shredder and shredded into small pieces or flakes to increase the surface area and make it easier to clean. These flakes will be transferred into the washing unit for cleaning and drying.
3. **Pelletization :** Dried dry pet flakes are then fed into an extrusion machine to ensure that heats the

flakes to its melting point and forces it through a die to form PET pellets.

4. **Quality check** : Closely monitor the extrusion process to ensure the production and consistency of the PET pellets. Testing of the PET pellets to ensure that it meets the national standards by the Bhutan Standards Bureau for certification.
5. **Distribution**: PET pellets are packaged and stored and then transported for distribution to end-users for utilization

4. ESMP Matrix:

4.1 Risk and Impacts, Mitigation, Monitoring¹ for Construction Phase

Anticipated E&S Risks & Impacts	Risk Mitigation & Management Measures	Impact Mitigation		Impact/Mitigation Monitoring			Mitigation & monitoring cost
		Location/ Timing/ Frequency	Responsibility	Parameter to be monitored	Methodology, including Location and Frequency	Responsibility	
Risk of soil erosion due to land clearing and excavation activities.	Implement erosion control measures such as silt fences. Construction of two retaining walls; one around 37 to 40 meters long Random Rubble Masonry (RRM) in cement mortar to serve as the outer fencing/retaining wall as well the soil backfilling base wall at the lower end of the lower table land, and a Reinforced Cement Concrete (RCC) retaining wall of about 32 meters length to retain the slope of the upper table land.	At the site during the excavation phase (02 months) and during construction of the walls.	Project Manager(GIN) and Contractor	Signs of erosion (slope slipping or ground sinking)	Weekly visual inspections of the sign of erosion at site	BES Env Consultant Env Technical Specialist UNOPS	USD 42000 included in the project construction cost.
Dust and mud generated from site development and trench digging, potentially affecting air quality, and local water bodies and also leading to respiratory issues, eye irritation, and other health problems among workers	Regularly sprinkling/spraying water to settle down in work areas and roads during site development and trench digging and during construction of structures.	At the site before the commencement of the construction phase and during the construction	Project Manager(GIN) /Project Officer(BES)	Signs of erosion and sediment deposition in and around the construction site. Respiratory sickness prevalence and persistence with the Hub workers and the	Weekly spot checks in high-activity construction areas. Weekly inspection of PPE usage	Env Consultant BES Env Technical Specialist UNOPS	USD 400 included in the Project Cost.

¹ Overall monitoring will be done by the PIU (By the Environment and Social Development Specialist, PIU, SACEP and Environmental Specialist, UNOPS)

Anticipated E&S Risks & Impacts	Risk Mitigation & Management Measures	Impact Mitigation		Impact/Mitigation Monitoring			Mitigation & monitoring cost
		Location/ Timing/ Frequency	Responsibility	Parameter to be monitored	Methodology, including Location and Frequency	Responsibility	
	<p>Construction materials will be appropriately covered to prevent the leakage</p> <p>Use of appropriate Personal Protective Equipment (PPE), including face masks, goggles, gumboots and protective clothing, to shield workers from dust and mud.</p> <p>Stabilize exposed soil by using temporary coverings like tarps or planting grass to reduce mud generation.</p> <p>Construction of the silt fence and two retaining walls to prevent erosion and sedimentation runoff reaching local streams or rivers.</p>	phase when necessary		<p>neighboring factory workers.</p> <p>Use of PPEs by workers</p> <p>Number of reported injuries or health issues related to dust and mud exposure.</p>			
Emissions from construction machinery could contribute to air pollution.	<p>Selection of machinery with low emissions to minimize environmental impact</p> <p>Machines to be maintained in optimal condition to minimize emissions</p> <p>Provision of suitable PPE for the operators and helpers.</p>	At the site during construction period (03 months)	Project Manager(GIN) /Project Officer(BES)	<p>Use of PPES by operators and helpers such as gloves, goggles, and masks.</p> <p>Annual emission test results</p>	<p>Weekly and adhoc inspections of the use of PPEs at site</p> <p>Reviewing emission test results</p>	<p>Env Consultant BES</p> <p>Env Technical Specialist UNOPS</p>	USD 100 included in the Project Cost.

Anticipated E&S Risks & Impacts	Risk Mitigation & Management Measures	Impact Mitigation		Impact/Mitigation Monitoring			Mitigation & monitoring cost
		Location/ Timing/ Frequency	Responsibility	Parameter to be monitored	Methodology, including Location and Frequency	Responsibility	
	Regular emission testing of the machineries						
Oil spillage could contribute to soil pollution.	<p>Machines to be maintained in optimal condition to minimize leakages</p> <p>Usage of spill kits for spillage control and cleaning.</p> <p>Care must be taken to minimize fuel spillage while refueling the machines. Fuels to be stored in yards with full space plastic/turpoline/rubber matting. Machines to be refuelled within the storage yard and not at work sites.</p>	Within the workspace during operation of machines in construction. in construction for the UR Bricks and PET Pelleting factories.	Contractor/GI N site Engineer/BES Project Officer	<p>Regular documentation of maintenance activities and checks for leakages or faults.</p> <p>Number and severity of reported spills and the response time for cleanup.</p>	<p>Weekly inspection at site</p> <p>Reviewing records</p>	<p>Env Consultant BES</p> <p>Env Technical Specialist UNOP</p>	USD 100 included in the project cost.
Increased risk of accidents due to construction activities and machinery operation.	<p>Safety briefing to workers every morning before the start of the work for the day.</p> <p>Cautionary reminders fixing sign boards at the site</p> <p>Provision of suitable PPEs</p>	At the site during construction period (03 months)	Contractor/ Project Manager(GIN) /Project Officer(BES)	<p>Number of accidents recorded</p> <p>Use of PPE</p> <p>Availability of sign boards</p>	<p>Monthly safety audits of the site to ensure that PPEs are worn and procedures followed.</p> <p>Reviewing Accident registry</p>	<p>Env Consultant BES</p> <p>Env Technical Specialist UNOPS</p>	USD 300 included in the project cost.
Improper handling of heavy loads and use of machinery resulting in accidents,	Usage of mechanical lifting aids and training of personnel on health and safety	The application of safety facilities like mechanical	Project Manager(GIN) /Project Officer(BES)	Proper usage of mechanical lifting aids,	Weekly inspection	Env Consultant BES	USD 250 included in the project cost.

Anticipated E&S Risks & Impacts	Risk Mitigation & Management Measures	Impact Mitigation		Impact/Mitigation Monitoring			Mitigation & monitoring cost
		Location/ Timing/ Frequency	Responsibility	Parameter to be monitored	Methodology, including Location and Frequency	Responsibility	
causing injuries to workers and damage to equipment.	<p>Provide instruction for workers on the safe handling of heavy loads and the proper use of machinery</p> <p>Ensure that all workers wear appropriate PPE, such as helmets, gloves, and safety boots, while handling heavy loads or operating machinery.</p>	lifting aids has to be continuous during the transport and installation phases. (03 months)		<p>best practice of operators and workers</p> <p>Number of accidents recorded</p> <p>Use of PPEs</p>	Reviewing Accident registry and training records	Env Technical Specialist UNOPS	
Electrical Hazards during Electric Wiring/Plumbing	<p>Proper insulation and grounding of electrical systems</p> <p>Usage of certified materials and standard procedures for plumbing and sanitary fittings.</p>	At the site during construction period (03 months)	Project Manager(GIN) /Project Officer(BES)	<p>Compliance with electrical codes</p> <p>Condition and effectiveness of insulation materials around electrical wiring.</p>	Weekly inspections of areas with electrical wiring right after installations and before systems are energized to ensure proper insulation, grounding, and safe installation of electrical systems, with monthly follow-up inspections	<p>Env Consultant BES</p> <p>Env Technical Specialist UNOPS</p>	USD 5300 included in the project construction cost

Anticipated E&S Risks & Impacts	Risk Mitigation & Management Measures	Impact Mitigation		Impact/Mitigation Monitoring			Mitigation & monitoring cost
		Location/ Timing/ Frequency	Responsibility	Parameter to be monitored	Methodology, including Location and Frequency	Responsibility	
Risk of injuries to workers due to exposure to hazards such as moving machinery, and machine malfunctioning potentially leading to cuts, bruises, sprains, or injuries.	<p>Usage of machineries in good working conditions</p> <p>Inspection and maintenance of equipment to prevent malfunctions</p> <p>Ensuring proper use of PPEs</p> <p>Emergency response procedures in place including first aid training and readily available first aid facilities</p>	At the site during the whole construction period	Contractor and Project Manager(GIN)	<p>PPE usage</p> <p>equipment safety, and emergency response readiness. (Regulation on OHS for Construction Industry 2022)</p> <p>Inspection and maintenance record of the equipment</p>	<p>Weekly inspections of the construction site during working hours with formal checks at the start of shifts to ensure workers are using appropriate PPE.</p> <p>Weekly inspections for potential malfunctions that could lead to injuries.</p>	<p>Env Consultant BES</p> <p>Env Technical Specialist UNOPS'</p>	USD 250 included in the project cost.
Generation of construction waste	<p>Waste will be segregates and stored in a proper designated shred prior to disposal</p> <p>Reuse of materials as much as possible.</p> <p>The excavated material will be used for ground preparation</p>	Throughout construction period at site	Contractor and Project Manager(GIN)	<p>Amount of waste accumulated</p> <p>Amount of waste reused, recycled and disposed</p> <p>Waste segregation and storing practice</p>	During and at the end of the construction phase by weekly	<p>Env Consultant BES</p> <p>Env Technical Specialist UNOPS</p>	USD 1000 included in the project cost

Anticipated E&S Risks & Impacts	Risk Mitigation & Management Measures	Impact Mitigation		Impact/Mitigation Monitoring			Mitigation & monitoring cost
		Location/ Timing/ Frequency	Responsibility	Parameter to be monitored	Methodology, including Location and Frequency	Responsibility	
	Selling of the recyclable wastes to the scrap dealers. Other waste will be handover to the municipality for disposal						

4.2 Risk and Impacts, Mitigation, Monitoring² for Operation phase

Anticipated E&S Risks & Impacts	Risk Mitigation & Management Measures	Impact Mitigation		Impact/Mitigation Monitoring			Mitigation & monitoring cost
		Location/ Timing/ Frequency	Responsibility	Parameter to be monitored	Methodology, including Location & Frequency	Responsibility	
Dust generation leads to respiratory issues during the loading raw materials into the processing machines	Enforcement of Personal Protection Equipment (PPEs). Sprinkling/spraying water as appropriate for dust settlement.	Inside Hub throughout the operation time.	(Project Manager) GIN	.Use of PPES Air quality Worker's sickness cases	Site visit Monthly health checkups. Quarterly Air quality testing.	Env Consultant BES Env Technical Specialist UNOPS	USD 500 included in the project cost.

² Overall monitoring will be done by the PIU (By the Environmental and safeguard officer SACEP PIU and Environmental specialist, UNOPS)

Anticipated E&S Risks & Impacts	Risk Mitigation & Management Measures	Impact Mitigation		Impact/Mitigation Monitoring			Mitigation & monitoring cost
		Location/ Timing/ Frequency	Responsibility	Parameter to be monitored	Methodology, including Location & Frequency	Responsibility	
Potential for fluid/grease leakages leading to burns, infections, water and soil contamination	<p>Strict enforcement of the use of PPEs</p> <p>Usage of spill kits for spillage control and cleaning</p> <p>Installation of proper flooring in the factory to prevent fluids or grease from coming into contact with the ground.</p>	Inside the whole factory (throughout the operation time)	Project Manager (GIN)	<p>Use of PPEs</p> <p>Availability and use of spill kits</p> <p>Worker's injury cases.</p>	<p>Quarterly workers health checkup</p> <p>Proper cleaning of the flooring in the workplace.</p>	<p>Env Consultant BES</p> <p>Env Technical Specialist UNOPS</p>	USD 300 included in the project cost.
Vapors from melting and molding of UR Bricks may pose health risks from inhaling and skin contacts	<p>Installation of a chimney in the UR and PET pellet production facilities.</p> <p>Adequate ventilation will be ensured</p> <p>Use of PPEs will be strictly enforced.</p>	Inside Hub throughout the operation time.	Project Manager (GIN)	<p>Air quality</p> <p>Use of PPEs by workers</p> <p>Monthly health checkups</p> <p>Workers injury cases</p>	<p>Monthly inspections</p> <p>Record reviewing</p>	<p>Env Consultant BES</p> <p>Env Technical Specialist UNOPS</p>	USD 700 included in the project cost.
Heat generation from melting and molding processes in UR Bricks production potentially causes working inconveniences and fire risks	<p>Adequate ventilation, fans, will be ensured,</p> <p>Use of appropriate PPEs</p> <p>Fire Fighting facilities like fire extinguishers/fire hydrants will be installed</p>	Inside Hub throughout the operation time.	Project Manager (GIN)	<p>Temperature and effectiveness of ventilation systems (fans, exhausts) to manage heat levels.</p> <p>Availability and functionality of fire extinguishers, fire</p>	<p>Bi-weekly monitoring during production hours to ensure temperatures remain within safe limits.</p> <p>Review records and documents during site visits</p>	<p>Env Consultant BES</p> <p>Env Technical Specialist UNOPS</p>	USD 840 included in the project cost.

Anticipated E&S Risks & Impacts	Risk Mitigation & Management Measures	Impact Mitigation		Impact/Mitigation Monitoring			
		Location/ Timing/ Frequency	Responsi bility	Parameter to be monitored	Methodology, including Location & Frequency	Responsibility	Mitigation & monitoring cost
	<p>Bi-annual emergency evacuation drills to test the effectiveness of the evacuation plan and ensure worker readiness.</p> <p>Safety drills and training session will be conducted for workers</p>			<p>hydrants, and other fire fighting facilities</p> <p>Availability of Emergency evacuation plan</p> <p>Records of fire safety drills and training sessions conducted for workers.</p>	<p>Interviewing workers to assess the effectiveness of the training programs and ensure that safety protocols are being followed</p>		
<p>Workers may experience injuries from various incidents including moving machinery parts, heavy lifting, sharp edges, and slip-and-fall accidents. Common injuries include cuts, bruises, sprains, and fractures.</p>	<p>Comprehensive safety training programs will be provided for all employees</p> <p>Ensuring the proper use of PPEs.</p> <p>Regular inspection of equipment will be conducted to prevent malfunctions.</p> <p>Emergency response procedures will be established, including first aid training for employees and the provision of readily available first-aid facilities.</p>	<p>At the site during the whole operation period</p>	<p>Project Manager (GIN)</p>	<p>Workers health related issues and complaints</p> <p>Number of accident recorded in accident registry</p> <p>Availability of First aid facilities</p> <p>Records of training sessions conducted for workers.</p>	<p>Monthly inspection</p> <p>Reviewing accident registry and training records</p> <p>Interviewing workers to assess the effectiveness of the training programs and ensure that safety protocols are being followed</p>	<p>Env Consultant BES</p> <p>Env Technical Specialist UNOPS</p>	<p>USD 1500 included in the project cost</p>

Anticipated E&S Risks & Impacts	Risk Mitigation & Management Measures	Impact Mitigation		Impact/Mitigation Monitoring			
		Location/ Timing/ Frequency	Responsibility	Parameter to be monitored	Methodology, including Location & Frequency	Responsibility	Mitigation & monitoring cost
Potential breakdowns and failures of machinery leading to operational disruptions, safety hazards, and delays.	<p>Timely maintenance of machinery and keep records</p> <p>Perform routine inspections to identify and address potential issues before they lead to breakdowns</p> <p>Ensure that all equipment is operated by trained personnel.</p>	Inside Hub throughout the operation time.	Project Manager (GIN)	<p>Functionality/efficiency of machines</p> <p>Qualification of the operators</p>	<p>Monitoring maintenance records (monthly)</p> <p>Training record and experience of the operators</p>	<p>Env Consultant BES</p> <p>Env Technical Specialist UNOPS</p>	USD 500 included in the project cost
Excessive noise and vibration from machinery leading to hearing loss, increased stress levels, and other health issues for workers.	<p>Regular maintenance of machinery to reduce noise levels</p> <p>use of PPEs such as earplugs or earmuffs</p> <p>Implementation of vibration control measures; fixing properly the machines onto the foundations, proper tightening of the joints and holders, setting up in chamber enclosure with appropriate mufflers for crushers.</p> <p>Noise level will be maintained at 75dB(A) at</p>	At the site during the whole operation period	Project Manager (GIN)	<p>Noise level</p> <p>Use of PPEs</p> <p>Implementation of vibration control measures</p>	<p>Monthly noise level monitoring using sound level meters</p> <p>Site visit</p>	<p>Env Consultant BES</p> <p>Env Technical Specialist UNOPS</p>	<p>USD 200 included in the project cost</p> <p>USD 500 included in the project construction cost</p>

Anticipated E&S Risks & Impacts	Risk Mitigation & Management Measures	Impact Mitigation		Impact/Mitigation Monitoring			
		Location/ Timing/ Frequency	Responsibility	Parameter to be monitored	Methodology, including Location & Frequency	Responsibility	Mitigation & monitoring cost
	Day-time and 65dB(A) at night-time						
Improper handling or disposal of solid waste leading to soil, water contamination and affecting the visual appeal of the hub.	<p>waste generated during operations and domestic waste will be separately collected and will be managed separately</p> <p>Proper segregation and disposal of solid waste will be maintained</p> <p>Recycling and reusing where possible</p> <p>Non-recyclable waste will be handover to the municipality</p> <p>Regular waste audits and adherence to waste management protocols.</p> <p>A 30m buffer will be maintained from the water resource at all the time</p>	At the site during the whole operation period	Project Manager (GIN)	Quantity and type of solid waste produced and disposed	<p>Monthly waste audits, Segregation record in the waste storage and processing areas.</p> <p>Waste handover and disposal records</p>	<p>Env Consultant BES</p> <p>Env Technical Specialist UNOPS</p>	USD 9500 included in the project cost
Potential for community disruption and negative impacts on local quality of	Stakeholder communities including the relevant government agencies and local residents through the	Intermittently every 1-2	Project Manager (GIN) & Project	Number of complaints and action to address	Quarterly community surveys within the neighboring community	Env Consultant BES	USD 1700 included in the project cost

Anticipated E&S Risks & Impacts	Risk Mitigation & Management Measures	Impact Mitigation		Impact/Mitigation Monitoring			Mitigation & monitoring cost
		Location/ Timing/ Frequency	Responsibility	Parameter to be monitored	Methodology, including Location & Frequency	Responsibility	
life due to project operations and activities.	<p>local government (LG) leaders have been consulted on the project concept. Through such a process the Environment clearance was granted and location of the recycling plant allocated within the Industrial estate at Jemina. In the operation, no residential communities are in close vicinity. It will be neighboring/adjacent sister industries who will be the affected communities. Continuous consultation, awareness and training will be undertaken with the neighboring industrial communities.</p> <p>A project's Grievance Redress Mechanism (GRM) will be established and details will be shared with the community</p>	months during construction and operations phase	Officer(BES) Communication officer	community feedback	<p>areas and facility perimeter</p> <p>Reviewing records of complain</p>	Env Technical Specialist UNOPS	
Occupational health and safety and unhygienic conditions due to inadequate sanitation practices.	<p>Implementation of comprehensive health and safety management plans,</p> <p>Regular health check-ups for workers</p>	Daily at the Recycling hub	Project Manager (GIN) & Project Officer(BES)	Worker health and safety compliance (OHS Regulations and Welfare 2022).	Monthly health and safety audits at the recycling hub to assess compliance with health	<p>Env Consultant BES</p> <p>Env Technical Specialist UNOPS</p>	USD 25000 included in the project construction cost.

Anticipated E&S Risks & Impacts	Risk Mitigation & Management Measures	Impact Mitigation		Impact/Mitigation Monitoring			Mitigation & monitoring cost
		Location/ Timing/ Frequency	Responsi bility	Parameter to be monitored	Methodology, including Location & Frequency	Responsibility	
	<p>Provision of adequate sanitary facilities, cleaned dining space , access to safe drinking water and routine cleaning to maintain hygienic conditions..</p> <p>Provide safety training programs and briefings.</p> <p>Provision of safety kits, first aid kits, and emergency health services to address any incidents promptly.</p> <p>Use of appropriate PPEs</p> <p>Fire Fighting facilities like fire extinguishers/fire hydrants will be installed</p> <p>Bi-annual emergency evacuation drills to test the effectiveness of the evacuation plan and ensure worker readiness.</p>			<p>Availability of sanitary facility, cleaned dining space and safe drinking water.</p> <p>Cleaning checklist</p> <p>Use of PPE by workers</p> <p>Medical check up records of workers</p> <p>Availability and usage of safety kits, first aid kits, and emergency health services.</p> <p>Availability and functionality of fire extinguishers, fire hydrants, and other fire fighting facilities</p> <p>Availability of Emergency evacuation plan</p> <p>Records of fire safety drills and training</p>	<p>and safety management plans.</p> <p>Annual health check-ups for workers to monitor and address any health issues related to their work environment.</p> <p>Quately Employee surveys</p> <p>Review records and documents during site visits</p>		<p>USD 250 included in the project cost</p>

Anticipated E&S Risks & Impacts	Risk Mitigation & Management Measures	Impact Mitigation		Impact/Mitigation Monitoring			Mitigation & monitoring cost
		Location/ Timing/ Frequency	Responsibility	Parameter to be monitored	Methodology, including Location & Frequency	Responsibility	
				sessions conducted for workers			
Water discharged from washing, and cleaning of plastic could include potential water contamination due to the presence of microplastics, chemicals in the discharged water.	<p>Installation of an effective wastewater treatment system including primary and secondary treatment options along with microplastic treatment, to ensure proper water quality before discharge.</p> <p>Regularly monitoring the quality of discharged water to ensure it meets environmental standards and prevent pollution of nearby water bodies or groundwater.</p>	Discharged water from the unit will be continually treated and tested at the site (Quarterly)	Project Manager (GIN)	<p>Chemical composition, presence of contaminants in the discharge water</p> <p>Following water quality parameters to be tested:PH, Oil and grease, pesticide residue, Total Suspended Solids (TDS), Biochemical Oxygen Demand(BOD), Phosphate & Sulphate, Turbidity & microplastic.</p>	Quarterly sampling and laboratory analysis from the discharge points	<p>Env Consultant BES</p> <p>Env Technical Specialist UNOPS</p>	USD 500 included in the project cost.
Risk of soil and water contamination from untreated toilet wastewater, leading to potential public health hazards and environmental degradation.	Connection to the municipal sewage system of Jemina Industrial estate, ensuring proper treatment and disposal of toilet wastewater to prevent contamination and health risks.	At the discharge points from toilets during the installation of toilets	Project Manager (GIN)	Black water discharge from any discharge points	Monthly inspections of the site	<p>Env Consultant BES</p> <p>Env Technical Specialist UNOPS</p>	USD 1000 included in the project construction cost.

Anticipated E&S Risks & Impacts	Risk Mitigation & Management Measures	Impact Mitigation		Impact/Mitigation Monitoring			Mitigation & monitoring cost
		Location/ Timing/ Frequency	Responsibility	Parameter to be monitored	Methodology, including Location & Frequency	Responsibility	
Potential for environmental contamination with suspended particles and health impacts due to the release of microplastics from the recycling process.	<p>Collection and containment systems to capture microplastics during the recycling process.</p> <p>Disposal of microplastics according to local Bhutan environmental regulations, i.e., Environmental standards, 2020.</p>	Daily monitoring of microplastic levels, regular maintenance of collection systems, and adherence to disposal procedures	Project Manager (GIN) & Project Officer(BES)	Contaminant levels, and adherence to Environmental standards, 2020.	Monthly measurement of the amount of microplastic captured	<p>Env Consultant BES</p> <p>Env Technical Specialist UNOPS</p>	USD 500 included in the project cost.
Risk of emotional, physical, and social harm due to sexual exploitation, abuse (SEA), and sexual harassment (SH), potentially leading to a toxic work environment and long-term psychological effects on affected workers.	<p>A secure and confidential complaint box and worker grievance mechanism.</p> <p>Appointment of a designated point for both genders and an effective referral mechanism</p> <p>Provide regular training on preventing SEA and SH, ensuring a safe and respectful workplace.</p>	At site during operational phase	Project Manager (GIN) & Project Officer(BES)	<p>Complaint received vs actions taken in response to complaints</p> <p>Number of trainings conducted</p> <p>Nominated focal points in contact with workers</p>	<p>Monthly inspection of the site</p> <p>Quarterly Employee surveys</p> <p>Reviewing training records</p>	<p>Env Consultant BES</p> <p>Env Technical Specialist UNOPS</p>	USD 1500 included in the project cost

Anticipated E&S Risks & Impacts	Risk Mitigation & Management Measures	Impact Mitigation		Impact/Mitigation Monitoring			
		Location/ Timing/ Frequency	Responsi bility	Parameter to be monitored	Methodology, including Location & Frequency	Responsibility	Mitigation & monitoring cost
				Workers response to the existing mechanism			

5. Capacity Development & Training

Capacity development and training for the Recycling Plant workers on Environment and Social safety, especially to the new recruitments, for an effective construction and operation of the Hub will include;

- 1) Training on use of PPEs and safeguards, first aid, emergency preparedness, fire drills, etc.,
- 2) Training on recognizing, preventing and responding to state of emergencies, risks to occupational health safety, social disgruntlement/complains from the community, workplace disharmony, etc.,
- 3) Awareness and understanding of gender based violence and discrimination,
- 4) Training on machine operations and time to time updating the technological know-how capacities, especially whenever there is changes or updating of machineries, equipments and facilities; operational procedures, process steps (receiving plastic raw materials at the hub site to shredding, to washing, to production of UR Bricks and PET Pellets, cooling, drying, packing, stacking, storing, to marketing,
- 5) Training on workplace compounding, quality controls, housekeeping, ES protection and monitoring and very importantly on waste management within the plant and the wastewater treatment needs and processes, prior to disposal to the open environment.
- 6) Training on Initial Environment and Social Assessment (IESA) of the recycling plant and framing of Standard Operating Procedures (SOP) for monitoring and responses will be an added value and have sustainable impact not only in the ES impacts responses but also in maintaining the quality of the products.

6. Implementation Schedule and Cost Estimates

Recycling Hub operation is expected to begin by October 2024.

Sl no.	Description	Timeline	Cost(in USD)
1	Mitigation measures: During construction stage (PPE, OHS, First aid facilities, Social and sanitary facilities, Tree planting, vacuum cleaners, mopping, etc proposed to mitigate the impacts of the above activities)	July - Dec, 2024	1000
2	Machine installation (PPE, Noise Measurements, proper fixture of the machines in the ground to avoid vibrations)	July - Oct, 2024	500
3	Facility operation and management(regular maintenance of machines, Waste Management and disposal cost, Fire extinguishers, first aid , vacuum cleaner, mops for cleaning, hazard sign boards, addressing social and gender base activities, PPE, OHS)	July - Nov, 2024	7090
4	Wastewater treatment and Analysis	Aug - Nov, 2024	500
5	Capacity development and training	till 31st Jan, 2025	500
6	Installation of a chimney in the UR and PET pellet production facilities to	Nov - Dec, 2024	700

	ensure adequate ventilation will be ensured		
7	Regular monitoring to adherence to waste management protocols.	July - Jan,2024	10500
8	Implement erosion control measures such as silt fences and construction of two retaining walls		42000
9	Establish Grievance Redress Mechanism (GRM)	Sept - Nov, 2024	1700
10	Proper insulation and grounding of electrical systems Usage of certified materials and standard procedures for plumbing and sanitary fittings	July - Jan, 2025	5300
11	Provision of proper gender assigned restroom and adequate sanitary facilities, cleaned dining space , access to safe drinking water and routine cleaning to maintain hygienic conditions.	July - Jan, 2025	25000

7. Attachments

[Environment clearance](#)

[Land approval from the department of industry](#)

[Letter form Ministry of economic affairs](#)

[Construction approval](#)

IV. Review & Approval

Prepared By



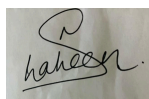
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Yeshey Penjor

Position: Environment Consultant

Date: 8 Sep 2024

Reviewed By:



Nusrat Shaheen,

Position: Technical Specialist Environment
Bhutan

Date 8 Sep 2024



Approved By: Kapila Mahesh Rajapaksha

Position: Environment and Social Development
Specialist PIU -SACEP

Date 11th Sep 2024