

Bhutan for Life Environmental and Social Management Plan for Phrumsengla National Park

(2022)

1. Introduction

(A) Project Background

The Bhutan for Life (BFL) project aims to ensure a robust network of protected areas and biological corridors that secures human well-being, biodiversity conservation and increase climate resilience in Bhutan. The project provides a 14-year financial bridge that allows for immediate improvement in the management of Bhutan's protected areas for climate resilience, and the prompt delivery of mitigation, adaptation and biodiversity gains, while the country gradually ratchets up its own financing resources.

BFL seeks to achieve the following objectives:

- Help Bhutan remain carbon neutral by increasing forest and vegetative cover within the Protected Area System;
- Enhance the socio-economic wellbeing of communities in and in the vicinity of the PAS through climate-informed natural resources management;
- Maintain stable, thriving and diverse populations of key species contributing toward national and global biodiversity goals;
- Strengthen organizational, institutional, and financial capacity for effective management of PAS.

BFL includes five components that reflect these goals, divided into 16 milestones (or outputs) and over 80 detailed activities.

(B) Scope of ESMP

The preparation of this Environmental and Social Management Plan (ESMP) was required in order to manage the environmental and social impacts through and specific mitigation actions required to implement the project in accordance with the requirements of WWF's Social Safeguards Integrated Policies and Procedures (SIPP), the project's Environmental and Social Management Framework (ESMF), and applicable national legislation and regulations.

The ESMP provides an overview of the environmental and social baseline conditions on the routes of the proposed second segment of the project, summarizes the potential impacts associated with the proposed activities and sets out the management measures required to mitigate any potential negative impacts.

This ESMP will be implemented by BFL focal person in each park authority (PA) and biological corridor (BC), and by the contractor to be commissioned by each PA/BC for the project.

(C) Purpose of ESMP

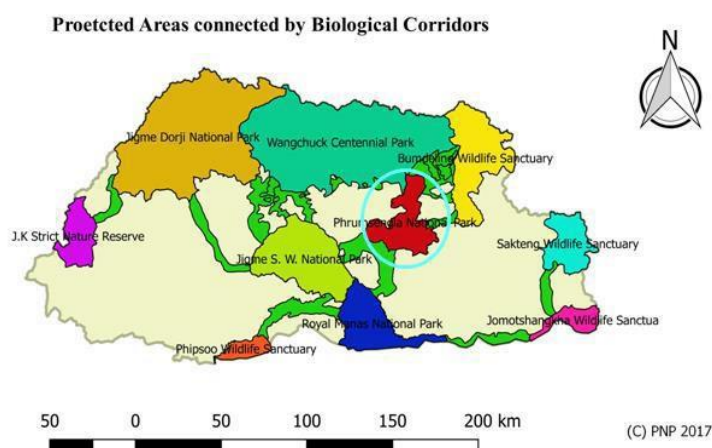
This Site-Specific ESMP is a project-specific source document detailing the environmental and social protection requirements to mitigate and minimize the adverse impacts. The ESMP's primary purpose is to ensure that the environmental requirements and social commitments associated with the project are carried forward into implementation and operational phases of the project and are effectively managed. The specific objectives of this ESMP are as hereunder:

- Minimizing any adverse environmental, social and health impacts resulting from the project activities;
- Conducting all project activities in accordance with the relevant RGoB Laws and WWF's safeguard operational policies and guidelines;
- Preventing environmental degradation as a result of either individual subprojects or their cumulative effects;
- Enhancing the positive environmental and social outcomes of project activities;
- Ensuring that the proposed mitigation measures are feasible and cost-efficient;
- Providing an Action Plan to ensure that the project impact mitigation measures are properly implemented and monitored;
- Ensuring that all stakeholders are engaged in the project activities' preparation and implementation, and their concerns are fully addressed.

2. Environmental and Socio-Economic Conditions:

(a) Geological and topographical conditions

Phrumsengla National Park (PNP) was known as Thrumshingla National Park (TNP) ever since it was notified in 1993 with an area of 768 km². In 2000, the area of was extended towards north with inclusion of large track of suitable tiger habitats. The park was renamed as PNP in 2014 and the total area was revised to 906 km² with the development of new zonation guide line, 2020. However, the physical features were not altered for a prime reason to signify and interlink the conservation paradigm with inherited local communities' culture. PNP has been implementing conservation activities for last one and a half decades. The conservation is based on the ten-year periodic conservation management plan (2019-2029). The purpose of establishment of the park was to conserve the temperate ecosystem of central region in Bhutan's Protected Area (PA) landscape. The park was fully operationalized in 2000 with joint funding support from Royal Government of Bhutan (RGoB) and World Wildlife Bhutan Program. PNP



is a ‘linchpin’ of Bhutan’s Biological Corridor Complex (B2C2) landscape. **Figure 1**
Location of Phrumsengla National Park

The park is connected to Jigme Singye Wangchuck National Park (JSWNP), Royal Manas National Park (RMNP), Bumdeling Wildlife Sanctuary (BWS) and Wangchuck Centennial National Park (WCNP) through a string of Biological Corridors (Figure 1). Heterogeneous geomorphology and wide range of elevation attributes to formation of special habitats for wildlife in PNP. The elevation ranges from 900 masl (sub-tropical broad-leaved forest) to about 4500 masl (Alpine meadows) (Figure 2 a). Of this, the major portion, >78% of the total area is above 2500 masl. Slope classes are evenly distributed in terms of area coverage (Figure 2 b).

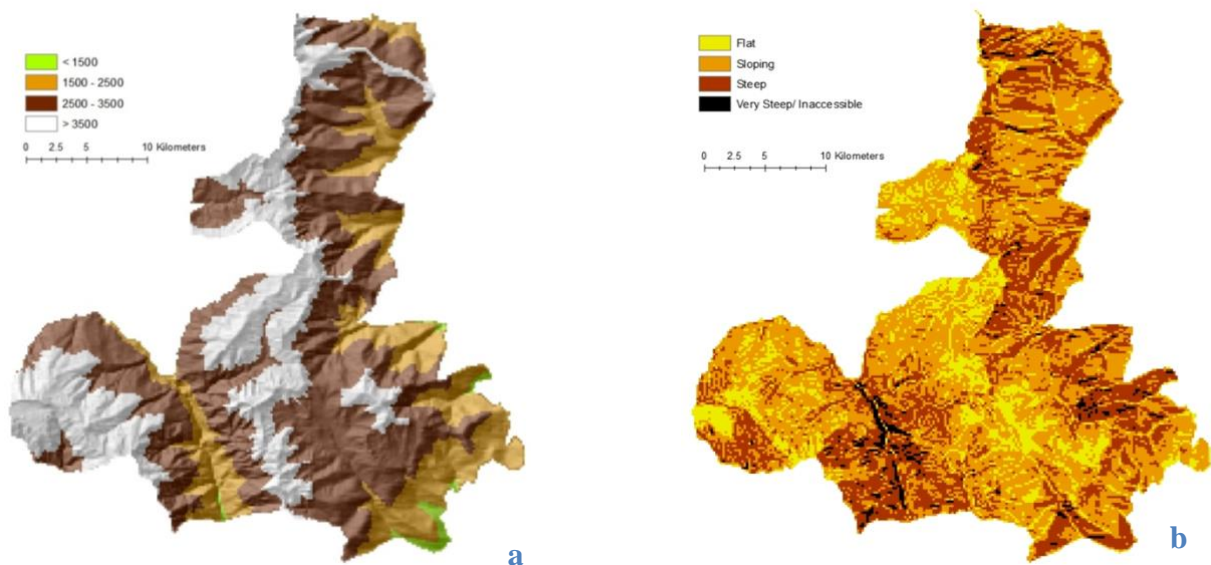


Figure 1: a. Elevation class and b. Slope class

(b) Climatic conditions

With vast variation of altitudinal ranges, Phrumsengla National Park experiences wide range of temperatures as well. The northern part of the park has -21°C minimum and 13 °C maximum temperatures and in the south-eastern has low of 8 °C and high of 28 °C. The annual average rainfall in the northern part is 700 mm and the lower elevation receives up to 1500 mm.

(c) Hydrological conditions

Despite being smallest national park, PNP serves as vital watershed area for two major river systems, Kuri chu to its left flank and chamkhar chu to its right flank. Apart from that there are numerous springs and tributaries that feeds the major river systems. The rich biodiversity of the park itself is a good indication of intact natural resources like water resources.

(d) Flora and fauna

PNP with wide range of elevation range from sub-tropical broadleaved to the alpine ecosystem holds high conservation value and significance for about 1000 species of plants with over 161 species of trees, 274 shrubs and 316 herbs. The park is a significant repository of floral diversity (TNP, 2008) more than 154 species have been identified for having medicinal values, 21 species as endemic to Bhutan, and two species endemic to PNP (*Rubus sengorensis*

and *Lobelia nubigena*). The park is home to one globally threatened species (Vulnerable) *Rhododendron dalhousiae* var. *rhabdotun* and critically endangered species at local context or in Bhutan; *Podocarpus neriifolius* (Dorji, Y.; 2010). The park is fundamentally significant for conservation of its large tracts of old East Himalayan Silver Fir forest and extensive cover of pristine cool broadleaved forests in the central region of the country. Maximum area of PNP is comprised of fir forest with 267.16 km² followed by mixed conifer and broadleaf forests with 256.47 km² and 238.25km² respectively. Meadows and scrub with 27.43 km² and 48.33 km² also significantly contribute for several forms of life in the park. Therefore, PNP is a prime refuge for many threatened flora and fauna thriving across varied vegetation zones in central region of the country's protected area landscape.

More than 70 species of mammals, about 364 species of birds, and some 55 species of butterflies are recorded in the park. Most recently (August, 2020) the park have recorded National butterfly (Ludlow's Bhutan Swallowtail, *Bhutanitis ludlow*) for the first time. Camera trap picture of a male tiger was captured for the first time in Bhutan on 22nd May 2000 from the PNP in Peeme'. Other than tiger, there are several globally significant species as per IUCN Red List of Threatened Species, 2019.

1. Tiger *Panthera tigris* (Endangered)
2. Red Panda *Ailurus fulgens* (Endangered)
3. Musk Deer *Moschus chrysogaster* (Endangered)
4. Wild Dog *Cuon alpinus* (Endangered)
5. Takin *Budorcas taxicolor* (Vulnerable)
6. Himalayan Black Bear *Ursus thibetanus lanigarr* (Vulnerable)
7. Asian Small-clawed Otter *Aonyx cinereus*(Vulnerable)
8. Clouded Leopard *Neofelis nebulosa* (Vulnerable)
9. Asiatic Golden Cat *Catapuma temminckii* (Near Threatened)

Attributed by wide range of elevation and diverse vegetation, the park has rich diversity of birds. Of more than 364 avian species recorded, three are vulnerable, six near-threatened and eight are restricted range species. Significant avifauna species of conservation interest for Phrumsengla National Park are Chestnut-breasted partridge (*Arborophila mandellii*), Rufous-necked hornbill (*Aceros nipalensis*) and Beautiful nuthatch (*Sitta formosa*) listed vulnerable under IUCN list. PNP also records herpetofauna, fish and butterfly species. There are 3 species of amphibians, 12 speciesof reptiles, 4 species of lizards, and 7 species of fish.

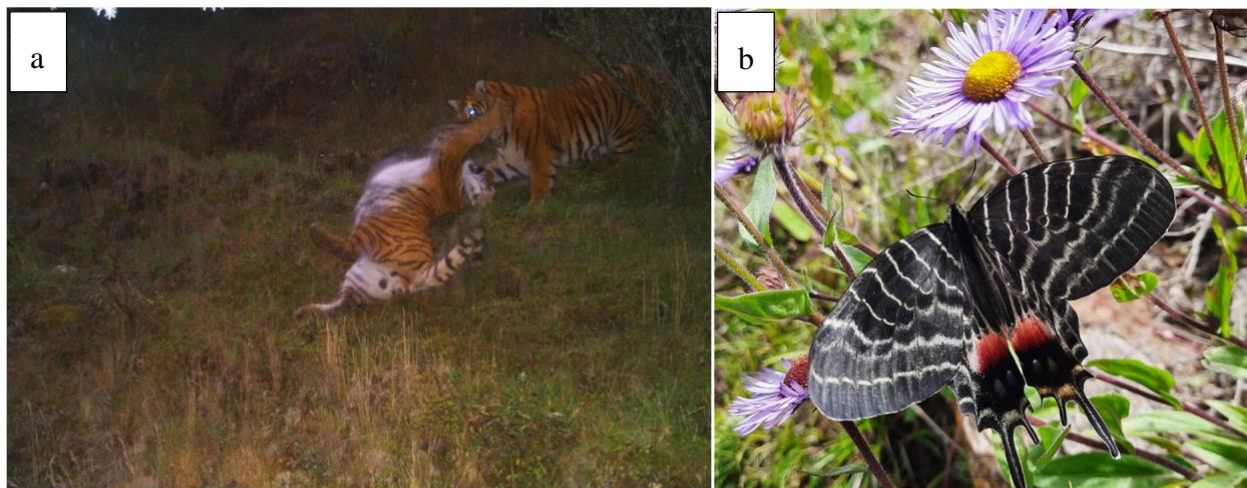


Figure 3: Two tigers of PNP, a. *Panthera tigris* and b. *Bhutanitis ludlow* (National butterfly)

(e) Socio-economic conditions

The park has about 6,000 inhabitants from 1,165 households living in 32 villages. Administratively, PNP spread across ten Gewogs viz Chumey, Ura and Tang Gewogs of Bumthang Dzongkhag, Saleng and Tsamang Gewogs under Mongar Dzongkhag, Jarey, Metsho and Gangzur gewogs under Lhuentse Dzongkhag, and Shingkar and Nangkor gewogs under Zhemgang Dzongkhag. Two villages enclaved inside the park are Sengor village (29 households), Saleng gewog and Bhim-Tharpaling (4 households), Chumey gewog under Mongar and Bumthang Dzongkhag respectively. These people are agro-pastoralist and mainly depend on forest for grazing their cattle. Over 75 percent of the park area is under registered grazing grounds and most of the park residence relies mainly on livestock produces for their livelihood.

3. Planned activities in Year 2022

Activities that are planned in PNP in 2022 includes the following:

1. Maintenance of staff quarter at head office, Ura and Phawan Range.

Budget: Nu. 1.5M

Timeline: Jan-June 2022.

Location: PNP Ura, HQ and Phawan Park Range Office.

The long-time built structures dated even before the inception of the park (staff quarter at HQ) and desperately needs maintenance. Currently all staff quarter have one common room for kitchen and living room, which makes them too inconvenient and congested. The proposed budget will be utilized to construct a separate kitchen attached to their quarter where ever there is space and carry out few minor maintenance work of the quarters like toilet and wiring. The construction of kitchens will be done with locally available materials such as timber, stone, sand, and cement as shown in the sample photo (Fig. 1).

Similarly, the flooring of Phawan range's staff quarter is made up of planks which is rotten and needs to be removed and cemented. Phawan being at lower altitude, wooden structures gets rotten quickly and durability is put to question. The planned activity sites are located on stable, gentle to flat sloped terrain. Since the activity is maintenance of existing structures, no disturbance to surrounding land is required. Neither the surrounding topography foresees any adverse effect on the proposed activity. There are 21hh residing within the planned activity

site, 17 at head office, Ura and 4 at Phawan range office occupied all by the staff. Since all the residence are forestry staff and they all depend on government jobs for daily sustenance.

The planned activity worth of **Nu. 1.5M** will be tendered out to the community contractor and implemented from January to June 2022. A maximum of 10 local people will be engaged through the registered community contractor and they will be using the space to camp within the office compound. The resources like water, space and electricity will be arranged from the office. The maintenance works do not have any interference with the habitat of wildlife since there is no evidence of wildlife presence within the campus. Nevertheless, the activity is going to disturb the daily chores of resident's family by sound of machines and dusts from the carpentry works.

The said activity poses few social or environmental impact that need to be mitigated such as sound pollution from the use of machines (powerchain and plainer), emission from machines, waste generation from the works, dust pollution from the cement works and worker health safety like clean drinking water, hand gloves and safety helmet must be considered while implementing the activity.



Fig:1 Sample of kitchen to be attached on staff quarter in Head office, Ura.

Potential social and environmental impacts of the activity are:

- Waste: Generation of waste as a result of maintenance work.
- Noise disturbance: Possible noise disturbance as a result of outdoor equipment usage and transportation vehicles driving around the construction site.
- Air quality: Dust as a result of maintenance works like cement works and possible emissions from transportation vehicles.
- Workers' health safety and covid-19 related risk.
- Conflict between temporary workers and local communities

4. Mitigation Measures for Environmental and Social Impacts.

Potential impact	Impact scale	Proposed mitigation measures	Responsible Party	Costs (million)
<i>Activity 1: Maintenance of staff quarter at head office, Ura and Phawan Range.</i>				Nu. 1.5
Waste: Generation of waste as a result of maintenance work.	Short term minor	<p><i>Pre-maintenance:</i> requirements for appropriate waste management should be included in the bidding documents, as a precondition for the contractor's selection.</p> <p><i>During maintenance:</i></p> <ul style="list-style-type: none"> • Identification and segregation of the different waste types at the activity site (soil, asphalt, food, etc.) basically degradable and non-degradable; • Ensure that camps are located away from existing stream, and that no discharge from camps is made into nearby water bodies; • Proper containers/waste bins should be provided at the project site; • Dumping waste shall be prohibited on fragile slopes, forests, religious or other culturally sensitive areas or areas where livelihood is derived; • Collection, transportation and final disposal of all waste should be undertaken regularly weekly. • Possible hazardous waste (motor oils, vehicle fuels, etc.) should be collected separately and disposed by contractor to areas identified by concerned authority, such as National All construction materials should be covered during the transportation to avoid waste dispersion; • All construction materials should be covered during the transportation to avoid waste dispersion. • Burning of construction waste should be prohibited. • The options for reuse/recycling of the generated waste should be taking into consideration (e.g. excavated soil, etc.). 	<p>-BFL focal person in PNP.</p> <p>-Community contractor</p>	

		<p><i>After maintenance:</i></p> <ul style="list-style-type: none"> • All waste shall be removed from the project site. 		
<p>Noise disturbance: <i>Possible noise disturbance as a result of outdoor equipment usage and transportation vehicles driving around the construction site.</i></p>	Short term minor	<p><i>Pre-maintenance:</i> requirements to limit noise pollution should be included in the bidding documents, as a precondition for the contractor’s selection</p> <p><i>During Maintenance;</i></p> <ul style="list-style-type: none"> • Minimize the use of chainsaw and planer on projects site to reduce sound disturbance on residence and emission effect. • Vehicles that are excessively noisy shall not be operated until corrective measures have been taken. • The maintenance work should not be permitted during the nights, the operations on site shall be restricted to the hours 7am—7pm; • Earplugs and protecting devices shall be provided to workers on site if necessary. 	<p>-BFL focal person in PNP.</p> <p>-Community contractor</p>	
<p>Air quality: <i>Dust as a result of maintenance works like cement works and possible emissions from transportation vehicles.</i></p>	Short term minor	<p><i>Pre-maintenance:</i> requirements to limit emissions should be included in the bidding documents, as a precondition for the contractor’s selection</p> <p><i>During maintenance:</i></p> <ul style="list-style-type: none"> • Maintenance site, transportation routes and materials handling sites should be water-sprayed on dry and windy days. • Maintenance materials should be stored in appropriate and covered places to minimize dust. • Before allowing vehicles on site, fitness and emission test documents of the vehicle shall be produced. • Vehicle loads likely to emit dust need to be covered. • Workers should wear protective masks if dust appears. • Vehicle speed should be restricted within the maintenance site. 	<p>-BFL focal person in PNP.</p> <p>-Community contractor</p>	

		<ul style="list-style-type: none"> • Regular maintenance of the vehicles and construction machinery should be performed in order to reduce any leakages of motor oils, emissions and dispersion of pollutant. • Burning of debris or construction waste must be prohibited. 		
<i>Workers' health safety and covid-19 related risk.</i>	Short term minor	<ul style="list-style-type: none"> • Comply with the workers' health and safety guidelines. • Access to health facilities for the workers pre and during construction activities need to be available and ensure first aid kit is available at maintenance site all the time- Basic health unit (BHU) needs to be available in walkable distance or the workers need to be checked once in a month by authorized medical doctor. • Ensure that no underage workers, or children are engaged. • Ensure decent working conditions, including an appropriate salary, working hours, accommodation and other essential amenities as per the Operational Health and Safety. • Ensure that workers are employed on the principle of equal opportunity and fair treatment, and there is no discrimination with respect to any aspects of the employment relationship, such as recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, and disciplinary practices. • Implement a grievance mechanism for workers (and their organizations, where they exist) to raise workplace concerns- the worker with grievance shall report in their grievance to Range/beat/ HQ or gewog office. All workers shall be briefed about the GRM before the starting the work. • Follow Covid safety protocols circulated by Ministry of Health (MoH). 	-BFL focal person in PNP. -Community contractor	
<i>Conflict between temporary workers and local communities</i>	Short term minor	<ul style="list-style-type: none"> • Workers shall be made aware of local culture and traditions, as well as the legal consequences of harassment and intimidation, especially with regards to sexual. • Local communities shall be made aware of the engagement of temporary workers in project sites. • Strict monitoring shall be carried out to ensure conflicts are minimized. 	-BFL focal person in PNP. -Community contractor	

5. ESMP Implementation Arrangements.

The implementation of project activities will be carried out by the BFL focal person in PNP. The focal person will be responsible for compliance with all procedures outlined in this ESMP, as well as compliance with any requirements to obtain clearances, permits, approvals, or consent documents from relevant authorities and stakeholders.

This ESMP should be part of the contract that the PA will sign with the Contractor(s) for implementation of the planned activities in PNP for the year 2022. The Contractor is obligated to perform all proposed preventive or mitigation environmental and social measures in this plan and to keep the evidence of any documents related to applying these measures (e.g., letter asking the municipality for disposal of inert waste, records on OHS information session performed for all workers before start of activities, all developed EHS plans, etc.). An OHS information session should be organized by the Contractor for all workers prior start of the project activities and before any specific tasks with high health risks.

The PNP's Supervising Engineer needs to monitor the implementation of proposed measures by the Contractor and Contractor's subcontractors with visual checking, reviewing the records of evidence that the measures have been applied and ask the Contractor to apply the measures as soon as possible. Non-compliances should be recorded and the report on any non-compliances should be reported to the ESS officer immediately, and the ESS officer will report it to the PCU (M&E Officer). Each non-compliance should be closed with appropriate measure/s and the evidence should be kept.

Disbursement of project funds to the PA will be contingent upon their full compliance with the safeguards requirements.

6. ESMP Monitoring Arrangements

Protocol for monitoring of activities under this ESMP will be carried out as follow;

SI#	Activities	Monitoring team	Timeline		Location	Means of Verification
			Start	Complete		
1	Maintenance of staff quarter at head office, Ura and Phawan Range.	Field Focal	March, 2021	June, 2022	Ura and Phawan	Field visit (Maintenance sites), Monthly progress report with photographic evidences.
		ESS focal	April, 2022	May, 2022		

1. Maintenance of staff quarter at head office, Ura and Phawan Range.

Monitoring by implementing entities:

- Field visits—at least weekly
- Monthly reports by the implementing entities submitted to ESS officer

Monitoring by ESS officer at PCU:

- Field monitoring by ESS officer – monitoring of the work once during the implementation and through field report from IAs after completion of the work.
- Reports by ESS officer to BFL Fund Secretariat – Annual report submitted to the BFL Fund Secretariat in January, 2023.

Bi-annual reports of the Secretariat to WWF US (as part of mid-year and final APRs)

7. Capacity Need and Budget

Activities under this ESMP will be implemented by the BFL focal person, supervising engineer/staff, and a contractor that will employ workers as mentioned in the contract agreement.

- *The budget for each of the activities is:*

Sl#	Activity	Amount (Nu.)	Budget for ESS mitigation
1	Maintenance of staff quarter at head office, Ura and Phawan Range.	1500000	Included within the activity budget.
Total		1500000	

8. Consultation and Disclosure Mechanisms

The maintenance of staff quarter at head office, Ura and Phawan Range really don't need consultation because the activity is going to be implemented on institutional land and there is no direct involvement of local community with the activity. However, the selected community contractor will be briefed on the ESMP compliance and families of staff will also be informed on the activity to avoid unnecessary conflicts later.

9. Stakeholder Engagement Plan

The only stakeholder involved in this activity will be the community contractor and residents of the park.

Maintenance of staff quarter at head office, Ura and Phawan Range.

- a. Dates of consultation: Feb, 2022.
- b. Agenda: Awarding of work to community contractor.
- c. Location: PNP, HQ

Annexure

BFL: OCCUPATIONAL HEALTH AND SAFETY STANDARDS

Employers and supervisors are obliged to implement all reasonable precautions to protect the health and safety of workers. Implementing entities should hire contractors that have the technical capability to manage the occupational health and safety issues of their workers, extending the application of the hazard management activities through formal procurement agreements.

This section provides guidance and examples of reasonable precautions to implement in managing principal risks to occupational health and safety. It is based on the IFC's Environmental, Health, and Safety Guidelines (April 30, 2007)¹ and the Occupational Health and Safety Guidelines of Bhutan's Construction Development Corporation Ltd., which relies on the national Regulation on Occupational Health, Safety and Welfare 2012, Regulation on Working Conditions 2012 and Labour Act 2007, and in compliance to Sl. No. 21 of Regulation on Occupational Health, Safety and Welfare 2012.

1. General Facility Design and Operation

Integrity of Workplace Structures

Permanent and recurrent places of work should be designed and equipped to protect occupational health and safety:

- Surfaces, structures and installations should be easy to clean and maintain, and not allow for accumulation of hazardous compounds.
- Buildings should be structurally safe, provide appropriate protection against the climatic conditions, and have acceptable light and noise conditions.
- Fire resistant, noise-absorbing materials should, to the extent feasible, be used for cladding on ceilings and walls.
- Floors should be level, even, and non-skid.
- Heavy oscillating, rotating or alternating equipment should be located in dedicated buildings or structurally isolated sections.

Severe Weather and Facility Shutdown

- Workplace structures should be designed and constructed to withstand the expected elements for the region and have an area designated for safe refuge (e.g., in case of earthquake).

Workspace and Exit

- The space provided for each worker, and in total, should be adequate for safe execution of all activities, including transport and interim storage of materials and products.

Fire Precautions

The workplace should be designed to prevent the start of fires. Other essential measures include:

- The workplace shall be provided with adequate means of protection and escape in case of fire.
- The workplace shall be provided with adequate number of relevant fire extinguishers.
- Workers shall wear shoes without iron or steel nails or any other exposed ferrous materials which is likely to cause sparks by friction.
- Smoking, lightening, or carrying of matches, lighters or smoking materials shall be prohibited within and around the construction sites.
- All other precautions, as are reasonably practicable, shall be taken to prevent initiation of ignition from all other possible sources such as open flames, frictional sparks, overheated surfaces of machinery or plant, chemical or physical, chemical reaction and radiant heat.
- At every workplace adequate provision of water supply for firefighting shall be provided and maintained.
- Facilities shall be equipped with firefighting equipment (e.g., fire extinguishing bottle). The equipment should be maintained in good working order and be readily accessible. It should be adequate for the

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<https://www.ifc.org/wps/wcm/connect/1d19c1ab-3ef8-42d4-bd6b-cb79648af3fe/2%2BOccupational%2BHealth%2Band%2BSafety.pdf?MOD=AJPERES&CVID=1s62x8l>.

dimensions and use of the premises, equipment installed, physical and chemical properties of substances present, and the maximum number of people present.

- Manual firefighting equipment shall be easily accessible and simple to use.
- Fire extinguishers and emergency alarm systems that are both audible and visible should be in place.
- Fire exits should be identified and marked in Dzongkha and English- all workers should be made aware of the fire exits.

Lavatories and Showers

- Adequate lavatory facilities (toilets and washing areas) should be provided for the number of people expected to work in the facility (one for at least one for every 20 workers). Toilet facilities should also be provided with adequate supplies of water and soap and also be connected to sewerage system.

Potable Water Supply

- Adequate supplies of clean drinking water should be provided to workers at the work site.

Clean Eating Area

- Where there is potential for exposure to substances poisonous by ingestion, suitable arrangements are to be made for provision of clean eating areas where workers are not exposed to the hazardous or noxious substances.

Lighting

- Workplace should receive adequate natural light and if required supplemented with artificial illumination to promote worker's safety and enable safe equipment operation.
- Emergency lighting of adequate intensity should be provided in case of failure of the powerline.

Safe Access

- Passageways for pedestrians and vehicles within and outside buildings should be segregated and provide for easy, safe, and appropriate access.
- Equipment and installations requiring servicing, inspection, and/or cleaning should have unobstructed, unrestricted, and ready access.
- Covers need to be provided where ever necessary, if there is risk of falling of overhead object.
- Measures to prevent unauthorized access to dangerous areas should be in place.

First Aid

- The employer should ensure that qualified first-aid can be provided at all times. A sufficient number of first aid boxes or cupboards shall be provided and maintained so as to be readily available during all working hours, provided that the distance of the nearest first aid box or a cupboard shall be not more than 200m from any working place.
- First aid kits include all equipment outlined in Annex 1 to these Guidelines.
- Each first aid box or a cupboard shall be distinctly marked "FIRST AID"

Air Supply

- Workplace should have adequate ventilation for fresh air

2. Information Provision on Occupational Health and Safety (OHS)

2. The Contractor is responsible to hold an information session to familiarize all workers with the OHS procedures specified in these guidelines, in order to ensure they are apprised of the basic site rules of work at / on the site and of personal protection and preventing injury to fellow workers.
3. The information session should consist of basic hazard awareness, site-specific hazards, safe work practices, and emergency procedures for fire, evacuation, and natural disaster, as appropriate. Any site-specific hazard or color coding in use should be thoroughly reviewed as part of orientation training.

3. Physical Hazards

Physical hazards represent potential for accident or injury or illness due to repetitive exposure to mechanical action or work activity.

Rotating and Moving Equipment

Injury or death can occur from being trapped, entangled, or struck by machinery parts due to unexpected starting of equipment or unobvious movement during operations. Recommended protective measures include:

- Designing machines to eliminate trap hazards and ensuring that extremities are kept out of harm's way under normal operating conditions. Examples of proper design considerations include two-hand operated machines to prevent amputations or the availability of emergency stops dedicated to the machine and placed in strategic locations.
- Where a machine or equipment has an exposed moving part or exposed pinch point that may endanger the safety of any worker, the machine or equipment should be equipped with, and protected by, a guard or other device that prevents access to the moving part or pinch point. Guards should be designed and installed in conformance with appropriate machine safety standards.

Noise

- No worker should be exposed to a noise level greater than 90 dB(A) for a duration of more than 8 hours per day without wearing ear plugs/ear muffs.
- Exposures to impulsive or impact noise shall not exceed 140dB(A).
- For every 3 dB(A) increase in sound levels from the permissible limit of noise, the 'allowed' exposure period or duration should be reduced by 50 percent.
- Where it is not practicable to reduce the noise, the employer must limit the duration of time persons employed or working in the workplace are exposed to the noise so that such persons are not exposed to excessive noise.
- Prior to the issuance of hearing protective devices as the final control mechanism, use of acoustic insulating materials, isolation of the noise source, and other engineering controls should be investigated and implemented, where feasible.
- Periodic medical hearing checks should be performed on workers exposed to high noise levels.

Vibration

In any workplace where persons are at work in any process or operation which involves exposure to vibration which may constitute a risk to their health, it shall be the duty of the employer to provide, so far as is reasonably practicable, effective means to reduce the vibration.

Electrical

Exposed or faulty electrical devices, such as circuit breakers, panels, cables, cords and hand tools, can pose a serious risk to workers. Overhead wires can be struck by metal devices, such as poles or ladders, and by vehicles with metal booms. Vehicles or grounded metal objects brought into close proximity with overhead wires can result in arcing between the wires and the object, without actual contact. Recommended actions include:

- Marking all energized electrical devices and lines with warning signs
- Locking out (de-charging and leaving open with a controlled locking device) and tagging-out (warning sign placed on the lock) devices during service or maintenance
- Checking all electrical cords, cables, and hand power tools for frayed or exposed cords and following manufacturer recommendations for maximum permitted operating voltage of the portable hand tools
- Double insulating / grounding all electrical equipment used in environments that are, or may become, wet; using equipment with ground fault interrupter (GFI) protected circuits
- Protecting power cords and extension cords against damage from traffic by shielding or suspending above traffic areas
- Appropriate labeling of service rooms housing high voltage equipment ('electrical hazard') and where entry is controlled or prohibited
- Establishing "No Approach" zones around or under high voltage power lines
- Conducting detailed identification and marking of all buried electrical wiring prior to any excavation work
- Every person who is working on an electric supply line or apparatus or both shall be provided with tools and devices such as gloves, rubber shoes, and safety belts, ladders, earthing devices, helmets, line testers, hand lines whichever is relevant for protecting him/her from mechanical and electrical injury.

Eye Hazards

Solid particles from a wide variety of industrial operations, and/or a liquid chemical spray may strike a worker in the eye causing an eye injury or permanent blindness. Recommended measures include:

- Use of machine guards or splash shields and/or face and eye protection devices, such as safety glasses with side shields, goggles, and/or a full-face shield. Frequent checks of these types of equipment prior to use to ensure mechanical integrity is also good practice.
- Where machine or work fragments could present a hazard to transient workers or passers-by, extra area guarding or proximity restricting systems should be implemented, or PPE required for transients and visitors.

Welding / Hot Work

Welding creates an extremely bright and intense light that may seriously injure a worker's eyesight. In extreme cases, blindness may result. Additionally, welding may produce noxious fumes to which prolonged exposure can cause serious chronic diseases. Recommended measures include:

- Provision of proper eye protection such as welder goggles and/or a full-face eye shield for all personnel involved in, or assisting, welding operations. Additional methods may include the use of welding barrier screens around the specific work station.

Working Environment Temperature

Exposure to hot or cold working conditions in indoor or outdoor environments can result temperature stress-related injury or death. Use of personal protective equipment (PPE) to protect against other occupational hazards can accentuate and aggravate heat-related illnesses. Extreme temperatures in permanent work environments should be avoided through implementation of engineering controls and ventilation. Where this is not possible, such as during short-term outdoor work, temperature-related stress management procedures should be implemented which include:

- Monitoring weather forecasts for outdoor work to provide advance warning of extreme weather and scheduling work accordingly
- Providing temporary shelters to protect against the elements during working activities or for use as rest areas
- Use of protective clothing
- Providing easy access to adequate hydration such as drinking water or electrolyte drinks.

Ergonomics, Repetitive Motion, Manual Handling

Injuries due to ergonomic factors, such as repetitive motion, overexertion, and manual handling, take prolonged and repeated exposures to develop, and typically require periods of weeks to months for recovery. These OHS problems should be minimized or eliminated to maintain a productive workplace. Controls may include:

- Use of mechanical assists to eliminate or reduce exertions required to lift materials, hold tools and work objects, and requiring multi-person lifts if weights exceed thresholds (adult man- 50kg, adult female- 25kg)
- Selecting and designing tools that reduce force requirements and holding times, and improve postures
- Incorporating rest and stretch breaks into work processes, and conducting job rotation
- Implementing quality control and maintenance programs that reduce unnecessary forces and exertions

Working at Heights

Fall prevention and protection measures should be implemented whenever a worker is exposed to the hazard of falling more than two meters; into operating machinery; into water or other liquid; into hazardous substances; or through an opening in a work surface. Fall prevention / protection measures may also be warranted on a case-specific basis when there are risks of falling from lesser heights. Fall prevention may include:

- Installation of guardrails with mid-rails and toe boards at the edge of any fall hazard area
- Proper use of ladders and scaffolds by trained workers
- Use of fall prevention devices, including safety belt and lanyard travel limiting devices to prevent access to fall hazard area, or fall protection devices such as full body harnesses used in conjunction with shock

absorbing lanyards or self-retracting inertial fall arrest devices attached to fixed anchor point or horizontal life-lines

- Appropriate training in use, serviceability, and integrity of the necessary PPE
- Inclusion of rescue and/or recovery plans, and equipment to respond to workers after an arrested fall

Illumination

Work area light intensity should be adequate for the general purpose of the location and type of activity, and should be supplemented with dedicated work station illumination, as needed. Controls should include:

- Use of energy efficient light sources with minimum heat emission
- Undertaking measures to eliminate glare / reflections and flickering of lights
- Taking precautions to minimize and control optical radiation including direct sunlight.
- Exposure to high intensity UV and IR radiation and high intensity visible light should also be controlled
- Controlling laser hazards in accordance with equipment specifications, certifications, and recognized safety standards. The lowest feasible class Laser should be applied to minimize risks.

4. Personal safety equipment for workers

All workers are equipped with the following personal safety equipment: helmet, gloves, ordinary boots and reflective vest.

Workers that are exposed to dust should also be provided with eye protection glasses and face mask. Workers that are exposed to noise should be provided with ear plugs. Workers that need to work in the dark should be provided with hand and cap lamps.

Workers are instructed regarding safety equipment as follows:

- Always wear complete set of protective wear.
- Do not wear loose clothing, such as overhang shirt, jackets, mufflers etc.
- Tuck shirt and jacket well.
- Secure helmet with belt under the chin.
- Tuck the bottom sleeves of trouser inside safety boot.
- Dress with reflector

5. Standards for workers' accommodation²

1. General living facilities

- The location of the facilities is designed to avoid flooding or other natural hazards
- The living facilities are located within a reasonable distance from the worksite.
- Transport is provided to worksite safe and free if the accommodation is reasonably far from the worksite.
- The living facilities are built using adequate materials, kept in good repair and kept clean and free from waste and refuse.

2. Drainage

- The site is adequately drained.

3. Heating, air conditioning, ventilation and light

- Living facilities are provided with adequate heating, ventilation, and light systems including emergency lighting.

² Based on Workers' accommodation: processes and standards—A guidance note by IFC and the EBRD (August 2009): https://www.ifc.org/wps/wcm/connect/60593977-91c6-4140-84d3-737d0e203475/workers_accomodation.pdf?MOD=AJPERES&CACHEID=ROOTWORKSPACE-60593977-91c6-4140-84d3-737d0e203475-jqetNIh

4. Water

- Workers have easy access to a supply of clean/ potable water in adequate quantities.
- The quality of the water complies with national/local requirements and is regularly monitored.
- Tanks used for the storage of drinking water are constructed and covered to prevent water stored therein from becoming polluted or contaminated.
- The quality of the drinking water

5. Wastewater and solid waste

- Wastewater, sewage, food and any other waste materials are adequately discharged in compliance with national and/or international standards and without causing any significant impacts on camp residents, the environment or surrounding communities.
- Specific containers for waste collection are provided and emptied on a regular basis.

6. Rooms/dormitories facilities

- Rooms/dormitories are kept in good condition. They are aired and cleaned at regular intervals.
- Rooms/dormitories are built with easily cleanable flooring material.
- Rooms/dormitories and sanitary facilities are located in the same buildings.
- Residents are provided with enough space.
- The number of workers sharing the same room/dormitory is minimized.
- Doors and windows are lockable and provided with mosquito screens when necessary.
- Separate sleeping areas are provided for men and women.
- A separate bed is provided for every worker and use of double deck bunks is minimized.
- Workers are provided with comfortable mattresses. Workers may be expected to use their own pillows and bed linens.
- Adequate facilities for the storage of personal belongings are provided.
- Separate storages for work clothes and PPE and depending on condition, drying/airing areas are provided.

8. Sanitary and toilet facilities

- Sanitary and toilet facilities are constructed from materials that are easily cleanable.
- Sanitary and toilet facilities are cleaned frequently and kept in working condition.
- Toilets, showers/bathrooms and other sanitary facilities are designed to provide workers with adequate privacy including ceiling to floor partitions and lockable doors.
- Separate sanitary and toilet facilities are provided for men and women.
- Toilet and shower facilities are conveniently located and easily accessible.
- Toilet facilities are environmentally friendly (e.g., pit toilet) and sewage is not disposed into the worksite.
- Open defecation in the vicinity of project sites should be prohibited.
- An adequate number of hand wash basins and showers/bathrooms facilities are provided.

9. Cooking and laundry facilities

Cooking and laundry facilities should be available for workers at the worksite or in close vicinity to it. These facilities should be kept in clean and sanitary conditions.

Annex 1. Contents of first aid box or cup-boards

The first aid boxes or cup-boards shall be distinctively marked with white cross on a green background and shall contain the following equipment:

1. Small sterilized dressings (12)
2. Medium size sterilized dressings (6)
3. Large size sterilized dressings (6)
4. Large size sterilized burn dressings (6)

5. (1/2 oz.) Sterilized cotton wool (6 packets)
6. (2oz.) Bottle containing a two per cent alcoholic solution of iodine (1)
7. (2oz.) Bottle containing Betadine (antiseptic solution) having the dose and mode of administration indicated on the label (1)
8. Roll of adhesive plaster (1)
9. A snake bite lancet (1)
10. Torch light (1)
11. Pair of scissors (1)
12. Tablets Aspirin (5gms) 2 dozen
13. Burn Ointment (2 tubes)
14. Dettol (2 phial, about 2 ozs)
15. Bandages 4 inches wide
16. Bandages 2 inches wide
17. Triangular bandages (2)
18. Packets of safety pins (1)
19. A supply of suitable splint