

Prior to Start Works / Construction

1. General: All relevant permits and certificates required by national law must be obtained and copies held by the Contractor *prior* to any works commencing (Quarry, Environment Permits etc.).

2. Community Consultation

- ✓ Contractor to undertake joint contractor and community consultation (induction) at least 7 days in advance of start of physical works with each affected community. Community consultation will include:
 - Confirmation of any site constraints and community requirements such as limits to access, timing of works;
 - Information including scope of works and work program;
 - Awareness training and information on the potential impacts of construction work including the workforce and related health and safety issues (machinery, infectious diseases such as COVID 19);
 - Details of the GRM and how to lodge a grievance.
- ✓ Erect signs at each end of work site with construction information and Contractor contact details including contact phone numbers.

3. Temporary Occupation of Land Arrangements

- ✓ Prior to construction, the Contractor shall secure written landowner consent for any temporary storage of materials and equipment or other use.
- ✓ The Contractor shall negotiate with landowners for any temporary land use required outside of the road reserve (for road rehabilitation subprojects).
- ✓ Prior to use of land or facilities, the Contractor will undertake a pre-construction condition survey to document existing conditions.
- ✓ Only aggregate and sand sourced from a licensed supplier or quarry permit supply will be used for works.
- ✓ Contractor to obtain any quarry permits for aggregates or evidence permitted supply. A Quarry Management Plan will need to be produced by the Contractor, and approved by MIA-PIU.
- ✓ Ensure locally sourced aggregate is sourced under appropriate permit from approved quarry sources and are operating in accordance with GoK Law. Prior to any quarries being selected for the KOIRAP project, public consultation will be completed with any affected

parties, particularly with the correct land owners to secure access to site and resource extraction. Consultations will be done under the direction of the MIA-PIU and Island Councils.

4. Public Health and Safety, Nuisance

- ✓ All work, storage and other sites to be suitably marked and where appropriate fenced prior to works starting.
- ✓ Signage erected at all active work sites.
- ✓ Where access is temporarily affected, the Contractor shall notify the affected parties of the disruption at least 7 days prior.
- ✓ Location of underground services and other structures: Before work commences, the location of certain underground services to be established where there is any risk that the excavation work may interfere with these services (e.g., water, electricity, etc.). All digging to locate an underground service should be carefully carried out by hand approaching the service from the side. Mechanical excavating equipment should never be used to locate services.

5. Workers Health and Safety

- ✓ Provide induction training and be issued with personal protective equipment (PPE) prior to starting work, including the preparation of and establishment of all work and other sites.
- ✓ Comply with all national and good practice regulations and GIIP regarding workers' safety, such as OHS section of the World Bank Environmental and Health and Safety Guidelines (EHSGs) on Construction and Decommissioning.
- ✓ Assign a health and safety officer at site, who will have the authority to issue directives for the purpose of maintaining the health and safety of all personnel authorized to enter and / or work on the site.
- ✓ Undertake training (prepared by MIA-PIU) to meet standards for the proper operation and use of equipment. Island Councils (E&S Focal Point) will confirm this measure prior to commencement of works.
- ✓ Other trainings: (i) how to prepare site specific safety plans that is compliant with the World Bank Environmental and Health and Safety Guidelines (EHSGs) on Construction and Decommissioning, (ii) health and safety documentation including incident reporting requirements; (iii) lifting and materials handling techniques in construction and renovation projects; (iv) use of temporary fall prevention devices; and (v) use of control zones and safety monitoring systems to warn workers of their proximity to fall hazard zones.
- ✓ Adopt emergency response plan outlined in the ESMP (prepared by MIA-PIU) to cope with risk and emergency (e.g., injuries, fire, storm surge, cyclone, COVID-19 outbreak)

- ✓ Record next of kin and emergency contact details for all workforce members.
- ✓ Follow the requirements of legislation including Employment and public health.
- ✓ Ensure that Employees are informed of their rights.
- ✓ Not use child labor.
- ✓ Not discriminate based on gender, race, age, employment or occupation.
- ✓ Not use trafficked or forced labor.
- ✓ Set up record keeping and document management system for ESHS risk management including all community meetings, compliance and non-compliance, records and performance requirements.

During Construction Works

1. Vegetation – clearance and removal, erosion protection

- ✓ Vegetation clearance will be kept to a minimum and sediment and erosion control measures put in place immediately.
- ✓ No earth works shall be undertaken during periods of heavy rainfall.
- ✓ All cleared ground shall have temporary erosion control measures in place.
- ✓ Areas of exposed soil shall be minimized and grass-seeded and/or re-vegetated and stabilized after completion of earthworks.
- ✓ Topsoil and cleared vegetation shall be mulched and stockpiled for later re-use.
- ✓ All materials storage or stockpiles, temporary or for the project duration shall have temporary runoff / sediment control structures in place. Drainage at all works sites will be designed and constructed to ensure no damage to land or property from ongoing discharges. Despite mitigation measures, if there is damage to land or property, these will be compensated by the contractor.
- ✓ All imported machinery and construction materials shall be thoroughly checked to prevent any transportation of invasive or alien species (plant, insect or animal such as snakes, rats or mice) to the island.
- ✓ Prior to demobilization at end of construction works, all construction vehicles shall be thoroughly cleaned and washed to remove soil and vegetative materials. Particular attention shall be paid to wheel arches and undercarriage of vehicles and machinery.

2. Site Management

- ✓ Waste management separation and dedicated waste storage areas required at all work sites.
- ✓ Waste management will meet all legislated requirements and for materials that cannot be disposed of locally segregated and store for removal from the island and disposed of at designated landfill.
- ✓ Burning of any plastics or general rubbish is prohibited.
- ✓ Fuels and other chemicals shall be contained in fully covered bunds of a size that can contain at least 110% of the volume of the largest container.
- ✓ All work sites to be kept tidy, waste materials suitably sorted, grass cut etc. at all times.

- ✓ Pollution control materials (spill kits) to be prepared and available at any water courses, coastal areas or fuel and chemical storage area.
- ✓ Dust suppression equipment to be available for all sites.

3. Public Health and Safety, Nuisance

- ✓ Vehicular and pedestrian access along the road and to adjacent properties is maintained throughout construction except for essential works.
- ✓ Signage and barriers in place at all sites.
- ✓ Temporary signage and barriers (fences) are to be used to prevent the public especially children from entering the sites.
- ✓ Construction activities shall be limited to daylight hours Monday through Saturday or as agreed directly with surrounding community and chiefs.
- ✓ No construction between 1800 and 0700 or on Sundays or public holidays and the times agreed with surrounding communities.
- ✓ The Contractor's health and safety plan outreach and awareness activities for communities on prevention of spread of communicable diseases, including Covid-19 taking place.
- ✓ Dust:
 - Masks must be available for workers during dust generating activities
 - Manage speed of transportation of vehicles on unsealed roads, particularly when passing through settlement.
 - Use closed/covered vehicles for transportation of construction materials
 - Any vehicle which is overloaded (exceed designed load limit) or is not covered properly shall be refused entry to the construction sites or material shall be refused delivery (if not to the construction sites).
 - Cover or wet down stockpiles containing materials (e.g., sand and topsoil) when not actively being used. Wetting of stockpiles is allowed but due to freshwater constraints should be kept to a minimum.
 - Identify and locate waste storage sites, stockpile sites and equipment at least 100 m away from any residential settlements, water bodies, streams or rivers, to minimize impacts on the environment and nearby population.
 - All equipment including crushers, aggregate processors, generators etc. should / if possible, be located in the quarry pit to minimize dust emissions. Ensure all equipment is serviced and issued with warrant of fitness (as required). Any machinery deemed to be polluting the air must be replaced (or fixed) on instruction by the PIU and / or Island Councils.
- ✓ Emergency Prevention and Management:
 - Site emergency response plan (outlined in the site-specific ESMP; prepared by MIA-PIU) is posted in prominent positions in all work areas and on all equipment. The procedure shall provide clear directions on (i) how to respond with safety and

environment related emergencies on site; (ii) locations of first aid kits and fire containment equipment; and (iii) list of all emergency contacts.

- Scheduling work outside of the Cyclone season, where practical. And ensure that resources in place to support any emergency evacuation and response required, in the event an extreme weather event is identified.
 - The evacuation will include a safe shut-down of machines, power to the site, and securing of all premises.
- ✓ Traffic Management Plan (TMP):
- Implement traffic management plan (TMP), outlined in the ESMP, to ensure smooth traffic flow and safety for workers, passing vehicles and pedestrian.
 - Prohibit the use of engine breaking close to and through communities and inhabited areas
 - Regulate working hours for the haul vehicle/trucks
 - Signs and other appropriate safety features will be used to indicate construction works are being undertaken.
 - Care must be taken during the construction period to ensure that disruptions to pedestrian access and school vehicle traffic are minimized and that access to villages either side of the causeways is maintained at all times.
 - Island Councils and village officials will be consulted in the event that access to a village has to be disrupted for any short periods of time and temporary access arrangements made.
 - Construction vehicles will use local access roads, or negotiate access with land owners, rather than drive across vegetation or agricultural land, to obtain access to material extraction sites.
 - Where local roads are used, they will be reinstated to their original condition after the completion of work.
 - The road will be kept free of debris, spoil, and any other material at all times;
 - Provision of adequate protection to the general public in the vicinity of the work sites, including advance notice of commencement of works, installing safety barriers if required by villagers, and signage or marking of the work areas.

4. Worker Health and Safety

- ✓ Workers, at no cost to them, shall be provided with appropriate personal protective equipment (PPE) and site supervisor will ensure the equipment is used.
- ✓ The Contractor will provide first aid facilities at work sites and potable water supplies, toilets and hand washing facilities.
- ✓ Implement emergency response plan to cope with risk and emergency (e.g., injuries, fire, storm surge, cyclone, COVID-19 outbreak).
- ✓ Comply with all national and good practice regulations and GIIP regarding workers' safety, such as OHS section of the World Bank Environmental and Health and Safety Guidelines (EHSGs) on Construction and Decommissioning.
- ✓ Take preventive measures to prevent accidents, such as:
 - Implementing good house-keeping practices, such as the sorting and placing loose construction materials or demolition debris in established areas away from foot paths.

- Locating electrical cords and ropes in common areas and marked corridors.
 - Planning and segregating the location of vehicle traffic, machine operation, and walking areas, and controlling vehicle traffic through the use of one-way traffic routes, establishment of speed limits, and on-site trained flag- people wearing high-visibility vests or outer clothing covering to direct traffic.
 - Ensuring moving equipment is outfitted with audible back- up alarms.
 - Use of temporary fall protection measures in scaffolds and out edges of elevated work surfaces, such as handrails and toe boards to prevent materials from being dislodged.
 - Provide PPE and other safety measures as appropriate during works such as safety glasses with side shields, face shields, hard hats, hi-vis vests and safety shoes with non-slip soles, first aid kits, restricted access zones, warning signs, overhead protection against falling debris.
- ✓ ACM heights, and other toxic substances:
- Handling and disposal of Asbestos containing material (ACM) or other toxic substances shall be performed and disposed in accordance to Asbestos Protocol prepared for KOIRAP (Annex 8 of ESMF).
 - No ACM will be used for renovation works.

5. Water Quality and Pollution Control

- ✓ Contractor shall follow sediment control measures to ensure sediment doesn't enter waterways or coastal marine area.
- ✓ Stockpile locations and mitigations to be located at least 30 meters away from any seasonal or permanent waterways
- ✓ No washing of concrete in waterways (wash at least 30 meters from any waterways or marine environment).
- ✓ No washing of plant or equipment or dumping of any types of wastes in any waterway.

6. Hazardous Substances

- ✓ All hazardous substances and chemicals to be clearly marked and labelled and stored, handled and disposed of in accordance with the material safety data sheet (MSDS). This register will be updated regularly.
- ✓ Storage of all hazardous substances and chemicals (including fuel) in bunded and covered areas and at least 30m from watercourses and/or the coast and any habitations.
- ✓ Have adequate spill kits readily available and clearly labelled on the work site and train workers in their use, application and spill clean-up procedures.
- ✓ Prior to initiation of building renovation activities, a hazardous building assessment should be conducted to assess the presence of asbestos will need to be removed or isolated. Refer and apply the Asbestos Protocol (Annex 8 of the ESMF).

- ✓ Collect and properly dispose of small amount of maintenance materials such as oily rags, oil filters, used oil, etc.
- ✓ Never dispose spent oils on the ground and in water courses as it can contaminate soil and groundwater (including drinking water aquifer).

7. Waste Management

- ✓ The Contractor shall manage and minimize all wastes throughout the contract on a daily basis, and ensure all worksites are maintained in a tidy condition with grass cut.
- ✓ No illegal dumping of wastes.
- ✓ At all work sites, waste shall be separated into different waste types for appropriate disposal
- ✓ Dumping of any waste and burning of inorganic wastes or hydrocarbons (plastic, oils etc.) is strictly prohibited.

8. Incident Reporting

Contractor to notify Island Councils (E&S Focal Point) of any health and safety incident or accident related to KOIRAP activities which has, or is likely to have, a significant adverse effect on the environment, the affected communities, the public or workers. In cases of incident or accident, provide sufficient detail indicating immediate measures taken or that are planned to be taken to address it, and any information provided by any contractor and supervising entity as appropriate. Subsequently, prepare a report on the incident or accident and propose any measures to prevent its recurrence. The contractor's report is then submitted by Island Councils to MIA-PIU. Minor incidents will be reported to the World Bank in the six-monthly reports and major incidents will be reported to the World Bank within 48 hours of occurring.

The investigation report should include: (a) date and location of incident, (b) summary of events, (c) immediate cause of incident, (d) underlying cause of incident, (e) Root cause of incident (f) immediate action taken, (g) corrective actions, (h) recommendations for further improvement, and (i) monitoring of the implementation of corrective actions.

Subprojects Specific

In addition to the above provisions, the following ESCOPs are Subprojects specific.

1. Buildings: Rehabilitation or Minor Extension of Existing Facilities

- ✓ Provide adequate drainage in the buildings' immediate surroundings to avoid standing water. Possible insect disease vectors and unsanitary conditions may develop due to inadequate drainage.
- ✓ Maximize natural light and ventilation systems to minimize artificial light needs; use large windows for bright and well-ventilated rooms.
- ✓ If not part of the existing building, it is recommended to provide sanitary facilities such as toilets with a septic tank, and basins for hand-washing.
- ✓ Safety features (such as fire detection and alarm, fire suppression and control, and first aid) should be made available and properly installed for public buildings construction.

2. Rural Roads: Rehabilitation or Maintenance within Existing Alignment

Protect slopes from erosion and landslides by the following measures:

- ✓ Plant locally available, fast-growing grass on slopes prone to erosion. These grasses help stabilize the slope and protect soil from erosion by rain and runoff. Locally available species possessing the properties of good growth, dense ground cover and deep root shall be used for stabilization.
- ✓ Provide interceptor ditch, particularly effective in the areas of high intensity rainfall and where slopes are exposed. This type of ditch intercepts and carries surface run-off away from erodible areas and slopes before reaching the steeper slopes, thus reducing the potential surface erosion.
- ✓ For steep slopes, a stepped embankment (terracing) is needed for greater stability.
- ✓ Rocks (riprap) can be used in addition to protect the slope.

3. Small Bridges

Erosion protection: The main method of slope and erosion protection is the construction of gabions (gravity walls that support embankments or slopes which have a potential to slip) and ordinary stone pitching.

- ✓ Gabions:

- The slope of gabions should be in the ratio of at least 1 vertical: 2 horizontal. Flatter slopes may be adopted depending on the site terrain.
 - The filling of the gabions should be from strong and competent rock which is laid very closely packed to maximize the weight.
 - Bracing wire should be used to prevent the gabion bulging out. The bracing wire should be placed at each third of the gabion height.
 - The gabions should be firmly anchored into the ground by founding the gabions below the expected scour depth level.
 - In cases where stone pitching is not provided, the top layer should be covered by soil to encourage the growth of grass and the stabilization of the slopes.
- ✓ Stone pitching: may be provided as the only erosion protection measure in those cases where the erosion potential is deemed minimal. Stone pitching is not very resistant to strong water current and is mainly used as the top finish on gabion walls.

4. Culverts

- ✓ Place large stones at the outlet of the culvert to prevent erosion.
- ✓ Keep the culvert inlets free from sand and gravel – the water must flow through the culvert.
- ✓ Ensure that the water of the adjacent road sections can flow freely into the roadside ditch.
- ✓ Build a sand trap upstream of the culvert to prevent accumulation at culvert inlets (sand traps will have to be cleaned periodically).

5. Water Supply: Construction or Rehabilitation of Rainwater Harvesting

- ✓ Rainwater storage reservoir should be intact, connected to roof gutter system, with all faucets and piping intact.
- ✓ If distribution pipes are attached into the storage reservoir, install the distribution pipes 10cm above the storage/tank bottom for better use of the storage capacity.
- ✓ Cover must be fitted tightly onto the top of the storage reservoir to avoid overheating and growth of algae (from direct sunlight), and to prevent insects, solid debris and leaves from entering the storage tank.
- ✓ A ventilation pipe with fly screen should be placed in the cover to help aerate the tank/reservoir which is necessary for good water quality.
- ✓ Roof gutters need to be cleared regularly, as bird and animal faeces and leaf litter on roofs or guttering can pose a health risk if they are washed into the reservoir tank.
- ✓ Reservoir tanks need an overflow so that in time of really heavy rain, the excess water can drain away. The overflow should be designed to prevent backflow and stop vermin/rodents/insects entering the system. A good design will allow the main storage

tank to overflow at least twice a year to remove build-up of floating sediment on the top of the stored water and maintain good water quality.

6. Water Supply: Infiltration Galleries

- ✓ Prevent water entering the excavation through the use of cut off trenches
- ✓ Pumping rate must not exceed the soil infiltration rate to prevent surface ponding
- ✓ Minimize the area stripped and the amount of vegetation removed
- ✓ Wash water from cement and concrete should never be allowed to enter the natural environment as both cement and concrete have a strong alkaline base and can have a serious detrimental effect on environment.
- ✓ Strict guidelines govern the use and storage of oil and construction chemicals on site. If required, only small volumes of potentially harmful substances should be stored close to watercourses. Storage must be housed in a secondary containment system on an impermeable material/surface. The storage area must be away from any high-risk areas such as a well or spring and located above the flood water level. Provisions such as sand should be put in place and stored close to the hazardous substances for the event of a spill.

7. Water Supply: Pipelines water sources

- ✓ PVC water transmission and distribution piping need to be buried underground (coverage 50cm minimum) to prevent pipe against external damage (e.g., passing vehicles, solar UV radiation, etc.). Exposing PVC pipe to UV radiation causes the plasticizer in the PVC pipe to evaporate resulting in loss of integrity and becoming brittle.
- ✓ Pipe shall be laid in a straight line, over a constantly falling slope.
- ✓ When conditions do not allow piping to be buried (i.e., pipe is used above ground), then metal pipe must be used, and supported/braced as excessive movement may lead to leaks and breaks.
- ✓ Outlet pipes and fittings from water storage/basin shall not be PVC pipe due to exposure to solar UV/sunlight. Metal piping and fittings are preferred

8. Sanitation Facility

A safe sanitation system is defined as a system that separates human excreta from human contact at all steps of the sanitation service chain from toilet capture and containment through emptying, transport, treatment (in-situ or off-site) and final disposal. Sanitation interventions should be coordinated with water and hygiene measures to maximize the health benefits of sanitation.

Toilets:

- All toilets must have a septic tank to provide primary treatment of fecal waste.
- PVC pipe used to connect pour-flush toilet to a septic tank must be buried underground or covered over (with cement) for protection and to prevent exposure to sunlight.
- Metal pipe is a preferred choice to be used as the gas vent pipe on septic tanks. Never use PVC pipe as it is unable to withstand long-term exposure to sunlight.
- Septic tanks must have a vent pipe to prevent the build-up of gas inside the chamber and shall have a 'manhole' that provides access inside the tank if needed.
- A toilet should be at least 20 meters from water sources (well, spring, river).

Septic Tanks:

- Septic tanks must have a vent pipe to prevent the build-up of gas inside the chamber and shall have a 'manhole' that provides access inside the tank if needed.
- Ensure that the septic tanks have two chambers: first chamber is for settling of sludge, and the second chamber is for aerobic treatment. These chambers will generally treat wastewater better. Partially treated septic tank effluent can pollute groundwater and surface water.
- Do not discharge septic tank effluent to an open drain or other surface water. The effluents need to be treated before final disposal. This may be achieved through: (i) an underground leachfield, (ii) a vegetated leachfield, or (iii) a pit for soaking away.

9. Solid Waste Disposal

- ✓ Solid waste depots/disposal need to be located on hard-standing areas that prevent waste entering surface or groundwater.
- ✓ Waste depots/storage/disposal should be contained, sealed and/or roofed/covered to prevent stormwater contamination. Wastes need to be emptied regularly.

ANNEX 4. Environmental and Social Code of Practice (ES COP) – O&M

A. WATER SUPPLIES

1. Infiltration Galleries:

- ✓ Twice a year inspect the facility. Particular attention should be paid to the catchment area of gallery, especially with shallow galleries.
- ✓ Water quality testing should be done twice a year, once in the wet season and once in the dry season.
- ✓ Water sustainability assessment that includes water usage, aquifer replenishment and salinization will be closely monitored and conducted annually by MIA-PIU to ensure volumes do not exceed the sustainable yields per annum

2. Rain Water Harvesting:

- ✓ Bucket style rain heads: Remove leaves and debris from catchment area and brush or hose off screen as required to prevent blockages and decomposing vegetation.
- ✓ Enclosed rain heads: Remove leaves and debris from cover and brush or hose off screen as required to ensure optimal performance.
- ✓ Roof, gutters and gutter mesh: Quarterly clean and remove leaves and debris as required to preserve water quality and quantity; trim back overhanging branches and vegetation as required; consider installing gutter mesh for easier maintenance.
- ✓ Tank overflow screens or flap valves: Every 6 months clean as appropriate to ensure optimal functioning; ensure there are no holes that mosquitoes could enter; ensure there are no obstructions blocking your tank outlets.
- ✓ Stored rainwater: Annually complete water quality testing using appropriate testing processes
- ✓ Rainwater tank: Every 2 years, remove accumulated sediment and/or sludge from base of tank for improved water quality; repair any cracks, holes or gaps.
- ✓ Visually check system when it is raining to ensure gutters are not overflowing, downpipes are not blocked or leaking, and rainwater is flowing to the tank. At the beginning of every season, you should clean roof gutters, clean any leaf diverters, clean the strainer at the entry to the tank and on the overflow of the tank. Replace screen if damaged so mosquitos do not enter,

B. SANITATION

1. Toilet:

- ✓ Toilet design, construction, use and maintenance should ensure that users are safely separated from excreta.
- ✓ The toilet slab and pan or pedestal should be constructed using durable material that can be easily cleaned.
- ✓ The toilet superstructure needs to prevent the intrusion of rainwater, stormwater runoff, animals and insects.
- ✓ Toilet design should include provision of culturally- and context-appropriate facilities for cleansing, handwashing and menstrual hygiene management.
- ✓ Toilets need to be well maintained and regularly cleaned.

2. Containment – storage/treatment:

- ✓ Where groundwater is used as a drinking-water source, a risk assessment should ensure that there is sufficient vertical and horizontal distance between the base of a permeable container, soak pit or leach field and the local water table and/or drinking-water source (allowing at least 15 m horizontal distance and 1.5 m vertical distance between permeable containers and drinking-water sources is suggested as a rule of thumb).
- ✓ When any tank or pit is fitted with an outlet, this should discharge to a soak pit, leach field or piped sewer. It should not discharge to an open drain, water body or open ground.

3. Treatment:

- ✓ Regardless of the source (i.e., wastewater from sewer-based technologies or faecal sludge from on-site sanitation) both the liquid and solid fractions require treatment before end use/disposal.
- ✓ The treatment facility should be designed and operated according to the specific end use/disposal objective and operated using a risk assessment and management approach to identify, manage and monitor risk throughout the system.

C. ROADS & CULVERTS

1. Roads

- ✓ Check road surface for cracks, potholes or any other damage
- ✓ Repair potholes: dig out bigger area, fill with granular material and compact well
- ✓ Check surface for standing water after rains
- ✓ Check road shoulders for overgrown vegetation
- ✓ Check that road shoulders have not settled but slope to top of drain

2. Culverts

- ✓ Check culvert, including inlet & outlet for sediment and debris
- ✓ Check culvert inlets & outlets for erosion and scouring
- ✓ Check culvert headwalls for damage
- ✓ Check ditches for erosion, overgrown vegetation, debris, sediment or blockage

Issues	Why	How
Grasses or weeds are growing on the road surface	<ul style="list-style-type: none"> ✓ Grass and plant roots will slowly damage and break up the road ✓ The road surface can NOT drain freely to the ditches ✓ Grass is an indicator of poor or lacking maintenance 	<ul style="list-style-type: none"> ✓ Remove all vegetation and any topsoil, including plant roots regularly ✓ Build a new crown with a new gravel surface layer and compact it.
The road surface should NOT be like a lawn	<ul style="list-style-type: none"> ✓ Grass and plant roots will slowly damage and break up the road ✓ The road surface can NOT drain freely to the ditches ✓ Heavy grass growth on shoulders may block drainage from road to ditches ✓ Grass is an indicator of poor or lacking maintenance 	<ul style="list-style-type: none"> ✓ Remove all vegetation and any topsoil, including plant roots regularly ✓ Build a new crown with a new gravel surface layer and compact it

<p>Plant and root growth will break up the road surfaces</p>	<ul style="list-style-type: none"> ✓ Grass and plant roots will slowly damage and break up the road ✓ The road surface can NOT drain freely to the ditches ✓ Heavy grass growth on shoulders may block drainage from road to ditches ✓ Grass is an indicator of poor or lacking maintenance 	<ul style="list-style-type: none"> ✓ Remove grass and weeds including the roots regularly ✓ Build a new crown with a new gravel layer and compact it well
<p>Ponding water because it cannot drain to the ditches</p>	<ul style="list-style-type: none"> ✓ Water standing on the surface will seep into the road body ✓ This weakens the base and sub-base of the road ✓ Potholes will start where there is ponding water 	<ul style="list-style-type: none"> ✓ Dig a hole of ca. 10cm depth and fill it again with stones ✓ Compact well and put a gravel layer on top ✓ Repair larger areas than spots only
<p>Ponding water cannot drain to the ditches</p>	<ul style="list-style-type: none"> ✓ Water stays on the surface because it cannot flow to ditches ✓ Ponding water weakens the road structure as seeps in ✓ Potholes will start where there is ponding water 	<ul style="list-style-type: none"> ✓ Dig out twice the size of the "pothole" to a depth of at least 20cm and fill it with angular stones (quarry or broken rock) ✓ Compact well and put a compacted layer of granular material on top ✓ Repair larger areas, not just the "potholes" themselves
<p>Once the asphalt surface starts breaking up potholes will appear</p>	<ul style="list-style-type: none"> ✓ Water standing on the road surface shows there is no drainage, probably because of a lack of a crown or cross slope ✓ Ponding water can damage the base and sub-base ✓ Potholes slow down traffic and are hard on all vehicles 	<ul style="list-style-type: none"> ✓ Remove existing asphalt layer to sub-base level ✓ Check stability and compaction of sub-base ✓ Put an new layer of asphalt to seal road surface ✓ If possible / necessary, repair a larger area at once ✓ When repairing larger areas, cut a straight line to existing surface ✓ Add new asphalt layer and leave a joint (1cm) to the existing asphalt surface, then fill the joints with bitumen when new asphalt layer has cooled off
<p>Potholes may also happen due to bad compaction, especially close to structures</p>	<ul style="list-style-type: none"> ✓ Potholes weaken the road base and sub-base ✓ The compaction on both sides of a structure, such as a culvert, should be done very well to avoid settlements, potentially causing potholes ✓ Heavy load vehicles can also cause potholes ✓ Rounded stone material in the road body can also cause potholes because the stones are not interlocking 	<ul style="list-style-type: none"> ✓ Dig out the pothole to double its size to get a better connection to the remaining road surface ✓ Fill the pothole with granular material and compact well ✓ Consider setting load restrictions on the road

<p>A pothole starts small but if left may cause the road surface to break up entirely</p>	<ul style="list-style-type: none"> ✓ Water seeps through the asphalt surface and softens the road base ✓ The surface settles and breaks up, causing more potholes ✓ The traffic running over the pothole will keep enlarging it ✓ Tires of vehicles will be damaged, even causing flat tires 	<ul style="list-style-type: none"> ✓ Repair the pothole as soon as possible after the rainy season ✓ Cut the asphalt edges to a smooth line ✓ Dig out material to sub-base level and clean out all loose material ✓ Fill up with granular material and compact well ✓ Seal with asphalt surface – minimum thickness 5 cm
<p>Concrete surface: The edges of the concrete must be protected by a road shoulder</p>	<ul style="list-style-type: none"> ✓ Unprotected concrete edges will easily be damaged by traffic ✓ Heavy vehicles are more likely to damage edges of road slab ✓ Broken edges could cause cracking and break-up of concrete surface ✓ Road shoulder is also needed for vehicles to pull over to the side 	<ul style="list-style-type: none"> ✓ For missing shoulder: Clean surface to sub base and add a new gravel material - then compact well, preferably with a roller ✓ Make sure the moisture content of the material is right for optimal compaction – not too dry and not too wet ✓ The compaction must be done carefully to avoid damaging the concrete ✓ If necessary, restrict very heavy loads that could damage the concrete slab from using the road

