APPENDIX 8B

List of Specific Mitigation Measures

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Table 1 SPECIFIC MITIGATION MEASURES FOR PHYSICAL COMPONENTS – ROAD AND BYPASSES-

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM01	Geomorphology and Topography	Construction	Avoidance	Entire AoI	Avoid off-road vehicular traffic
PHY-MM01b	Geomorphology and Topography	Construction	Avoidance (Erosion control)	Bridge construction areas	Conduct bridge construction activities keeping away from and avoiding any interactions with river slopes and riverbanks, ensuring that all construction activities with potential to affect their stability occur at a safe distance.
PHY-MM01c	Geomorphology and Topography	Construction	Minimisation (Erosion control)	Bridge construction areas	Check stability of banks in rivers and streams close to the construction areas before starting the construction of bridges and transversal drainage (box culverts and pipe culverts) and apply protective measures against potential landslides and banks collapse if considered needed.
PHY-MM02	Geomorphology and Topography	Construction	Avoidance	Main road Access roads	Avoid uncontrolled discharge of stormwater from drainage network in correspondence of roads.
PHY-MM03	Geomorphology and Topography	Construction	Avoidance	Borrow Pits Landfill Camp	Avoid uncontrolled dumping of excavated material during the construction of deposit areas.
PHY-MM04	Geomorphology and Topography	Construction	Minimisation	Right of Way	A detailed topographic model of the construction areas is necessary to define the road slope and the embankment slope to minimise the risk of landslides.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM05	Geomorphology and Topography	Construction	Minimisation	Entire AoI	Minimise the extension of land levelling and excavation areas.
	Landscape & Visual	Construction	Minimisation	Entire AoI	
	Hydrology and Surface Water	Construction	Minimisation	Entire AoI	
PHY-MM05a	Geomorphology and Topography	Construction	Minimisation	Right of Way	Where possible, implement mechanical ripping in hard rock excavation areas to avoid the use of explosives.
PHY-MM05b	Geomorphology and Topography	Construction	Minimisation	Right of Way (Blasting locations)	A specific blasting plan will be prepared and implemented at each blasting location along the ROW, which will define charging procedures, blasting ratios, blasting tests, type of detonators to be used and the like.
PHY-MM05c	Geomorphology and Topography	Construction	Minimisation	Right of Way (Blasting locations)	Prioritise the use of hydraulic hammers or other mechanical methods instead of secondary blast (plaster blasting), so to improve rock fragmentation and minimise fly-rock risks.
PHY-MM05d	Geomorphology and Topography	Construction	Avoidance	Right of Way (Blasting locations)	Do not perform blasting simultaneously at two locations.
PHY-MM05e	Geomorphology and Topography	Construction	Minimisation	Right of Way (Blasting locations)	Provide structural support or restrict access to areas where the risk of rock fall / collapse has been identified after blasting.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM05f	Geomorphology and Topography	Construction	Minimisation	Right of Way (Blasting locations)	Carry out post-blast inspections immediately after blasting is completed. Carry out further periodical inspections of the rocky roadside slopes in the blasted areas. Identify and implement protective measures in case that risk of rock falls is detected.
PHY-MM05g	Geomorphology and Topography	Construction	Minimisation	Right of Way (Blasting locations)	Use active measures (such as rock bolts, netting, gabions etc.) to mitigate against slip, collapse, cliff face shedding, where the risk of rock fall / collapse has been identified during pre or post blasting geotechnical reports, only if signs of instability become evident. In such a case, appropriate corrective actions will be implemented in accordance with best geotechnical engineering practices.
PHY-MM06	Geomorphology and Topography	Construction	Minimisation	Right of Way (Embankments)	Minimise erosion of artificial embankments and levelled areas by means of erosion control techniques and erosion protection devices (e.g. grassing of embankments, gravel cover and the like).
	Hydrology and Surface Water	Construction	Minimisation	Right of Way (Embankments)	
PHY-MM07	Hydrology and Surface Water	Construction	Minimisation (water flows control)	Drainage structures	During the warranty period (up to one year after construction) check the stability of drainage infrastructures against stormwater runoff and / or high-water flows and correct as needed in case defects such as too much debris deposits or pits close to the drainage structures are observed.
PHY-MM08	Geomorphology and Topography	Construction	Minimisation	Entire AoI	Schedule the construction period to properly take into consideration the rainy season.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM09	Geomorphology and Topography	Construction	Restore	Entire AoI	Reinstate deposit areas by means of a final soil cover that will be revegetated with local grasses and shrubs.
	Landscape & Visual	Construction	Restore	Entire AoI	
PHY-MM10	Geomorphology and Topography	Construction	Restore	Entire AoI	Restore incipient erosion on slopes along the road and in correspondence to excavation areas.
	Landscape & Visual	Construction	Restore	Entire AoI	
PHY-MM11	Geomorphology and Topography	Construction	Avoidance	Entire AoI	During rainy season. Avoid working in heavy rainy days and perform continuous analysis of the soil stability and working conditions to prevent problems related to excessive runoff, landslides, floods and security). Take extra precautions in handling hazardous materials and identify the activities that cannot be performed in rainy days.
PHY-MM12	Geomorphology and Topography	Construction	Avoidance	Entire AoI	Avoid uncontrolled stockpiling of excavated material.
	Hydrology and Surface Water	Construction	Avoidance	Entire AoI	
	Hydrogeology and Groundwater	Construction	Avoidance	Entire AoI	
	Air Quality	Construction	Avoidance	Entire AoI	

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM13	Hydrology and Surface Water	Construction	Avoidance	Right of Way Borrow pits Laydown areas	Minimise dust production from temporary stockpiles of excavated material.
	Air Quality	Construction	Avoidance	Right of Way Borrow pits	
PHY-MM14	Air Quality	Construction	Avoidance	Entire AoI	Use covered heavy vehicles to carry materials with the potential to generate dust.
PHY-MM15	Air Quality	Construction	Avoidance	Entire AoI	Avoid unfavourable weather conditions (dry season and high wind speed) to reduce the potential for dust generation.
PHY-MM16	Air Quality	Construction	Minimisation	Entire AoI	Use water suppression techniques to reduce dust emissions from the transport of material on unpaved roads.
PHY-MM17	Air Quality	Construction	Minimisation	Entire AoI	In dry periods dirty roads should be sprayed with water to reduce dust.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM18	Air Quality	Construction	Minimisation	Construction camp	At Project facilities use of controls such as wheel washing systems at site exits to prevent deposition of dust inside site installation area.
PHY-MM19	Air Quality	Construction	Minimisation	Construction camp	Remove mud from wheels and bodies of haulage plant before they enter Project facilities;
PHY-MM20	Air Quality	Construction	Minimisation	Entire AoI	Ensure the use of vehicles and machinery with low emissions, that conform to emission norms.
PHY-MM21	Air Quality	Construction	Minimisation	Entire AoI	Ensure periodic maintenance of machinery with combustion engines.
PHY-MM22	Air Quality	Construction	Minimisation	Entire AoI	Apply a speed limit on dirty road within and outside the site.
PHY-MM22a	Soil and Land Use	Operation	Minimisation (emission to atmosphere)	Right of Way	Parking or stopping vehicles along the road leaving the engine on will be prohibited
PHY-MM22b	Soil and Land Use	Operation	Minimisation (emission to atmosphere)	Drainage infrastructures Bridges	Apply speed limits to sections of the road across swamp forests, swamp areas and rivers.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM22c	Soil and Land Use	Operation	Minimisation (emission to atmosphere)	Right of Way	Parking or stopping vehicles near watercourses and waterbodies along the road will be prohibited and clearly indicated. Parking and stopping spots for vehicles will be indicated and marked clearly.
PHY-MM23	Soil and Land Use	Construction	Avoidance (hazardous materials)	Entire AoI	Avoid release of hazardous materials, wastes and/or oil. Hazardous materials including fuel must be stored in specific prepared areas away from potential runoff and waterways.
PHY-MM24	Soil and Land Use	Construction	Avoidance (hazardous materials)	Entire AoI	If contamination of land is suspected or confirmed, the cause of the uncontrolled release will be identified (whether the cause is current or historical and whether the contamination is originated on or off the Construction site).
PHY-MM25	Soil and Land Use	Construction	Avoidance (hazardous materials)	Entire AoI	Discussions will take place before construction for the "potentially contaminant" areas adjacent or on the Road. Local authorities will be contacted to clarify who would be responsible for taking mitigating measures in case of contamination detected.
PHY-MM26	Soil and Land Use	Construction	Avoidance (hazardous materials)	Entire AoI	Any soil contamination caused by Project activities and/or originating within the construction site will be contained and then remedied to avoid further releases and associated adverse impacts.
PHY-MM27	Soil and Land Use	Construction	Avoidance (hazardous materials)	Entire AoI	Any other soil contamination not caused by Project activities and not originated in the Construction site will have to be handled according to Cameroon regulatory requirements.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM29	Soil and Land Use	Construction	Avoidance (hazardous materials)	Entire AoI	Any contaminated soil within the Construction site area will be removed and disposed of as hazardous waste material. The contaminated soil will be stored separately from other types of wastes in a closed temporary hazardous waste storage area with leak-proof floor and covered with a shelter. The waste will be transported by a licensed company to a licensed recovery site (e.g. licensed bio-treatment facilities) or disposal company (e.g. licensed hazardous waste landfills or incinerators). Recovery will be preferred if technically feasible and if such facilities are available.
	Hydrology and Surface Water	Construction	Avoidance (hazardous materials)	Camp Right of Way Borrow pits Laydown areas Bridge construction areas	
	Hydrogeology and Groundwater	Construction	Avoidance (hazardous materials)	Camp Right of Way Borrow pits Laydown areas Bridge construction areas	
PHY-MM30	Hydrology and Surface Water	Construction	Minimisation	Entire AoI	Filter surface run-off water to reduce turbidity and sediments prior to discharge.
PHY-MM31	Soil and Land Use	Construction	Minimisation (topsoil excavating and stockpiling)	Right of Way (excavation areas) Access roads Borrow Pits Bridge construction areas Laydown areas	Topsoil will be recovered prior to start excavating operations by scarifying topsoil and stockpiling the material at designated locations.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM32	Soil and Land Use	Construction	Minimisation (topsoil excavating and stockpiling)	Right of Way (excavation areas) Access roads Borrow Pits Bridge construction areas Culverts construction areas Laydown areas	Topsoil stockpiles will be: • designed and managed in a manner that will minimise surface damage and not obstruct natural drainage; • protected from erosion due to water runoff and infestation by weeds; • not exceed 1.3 m in height; • stockpiles will be covered with plastic canvas to prevent soil loss and the slope will not exceed 5%. Storage time within the stockpile will be as short as possible less than 1 year and preferably less than 6 months.
PHY-MM33	Soil and Land Use	Construction	Minimisation (topsoil excavating and stockpiling)	Access roads Borrow Pits Bridge construction areas areas Laydown areas	Before stockpiled topsoil is reused for reinstatement purposes, the top half meter of the stockpile should be thoroughly mixed with the deeper soil to ensure that living organisms are distributed throughout the topsoil material at the time of final placement.
PHY-MM34a	Soil and Land Use	Construction	Minimisation (vegetation and topsoil removal)	Right of Way (excavation areas) Borrow Pits Access roads Bridge assembling areas Laydown areas Toll, counting and weighing stations	Based on the preconstruction vegetation inventory, treat any tree that will not be transported off site for timber market sale or for use by communities, so that it is mulched on site and the remains mixed with the soil in the immediate surroundings.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM34a	Waste and Wastewater	Construction	Minimisation (vegetation and topsoil removal)	Right of Way (excavation areas) Borrow Pits Access roads Bridge assembling areas Laydown areas Toll, counting and weighing stations	Based on the preconstruction vegetation inventory, treat any tree that will not be transported off site for timber market sale or for use by communities, so that it is mulched on site and the remains mixed with the soil in the immediate surroundings.
PHY-MM35	Soil and Land Use	Construction	Minimisation (topsoil excavating and stockpiling)	Access roads Borrow pits Bridge construction areas	Removed topsoil will be moved and stored in a proper area at the Project Site to be used for reclamation after construction.
	Landscape & Visual	Construction	Minimisation (topsoil excavating and stockpiling)	Entire AoI	
PHY-MM36	Soil and Land Use	Construction	Minimisation (topsoil excavating and stockpiling)	Right of Way (excavation areas) Access roads Borrow Pits	Topsoil will not be mixed with subsoil or rock-like topsoil materials and will be stored on geotextile sheeting and will be marked clearly as ‘Topsoil’ in French and English.
PHY-MM37	Soil and Land Use	Construction	Minimisation (topsoil excavating and stockpiling)	Access roads Borrow Pits Bridge construction areas areas Laydown areas Landfill	In order to reuse the topsoil on site at a later stage soil needs to be stored in temporary stockpiles to minimise the surface area occupied. The topsoil also should not be positioned adjacent to ditches, water courses, future excavations and other construction activities. Only the topsoil that is absolutely necessary for the construction will be stripped.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM38	Soil and Land Use	Construction	Minimisation (topsoil excavating and stockpiling)	Entire AoI	Areas with a topsoil depth less than 15 cm deep will be identified in the approved soil stripping procedure and the appropriate measures will be taken. Topsoil will not be stripped in the area that will be used to store topsoil or subsoil.
PHY-MM39	Soil and Land Use	Construction	Minimisation (topsoil excavating and stockpiling)	Right of Way (excavation areas) areas Borrow Pits	The subsoil will be excavated from some construction locations. Subsoil can be returned to the excavated area. If subsoil would not be returned to the excavated area, it should be managed as per local requirements. Subsoil that will be reused will be placed in stockpiles and on geotextile layers.
PHY-MM40	Soil and Land Use	Construction	Minimisation (topsoil excavating and stockpiling)	Right of Way (excavation areas) Borrow Pits Access roads Bridge construction areas Laydown areas	The creation of surplus excavated material will be minimised as far as practicable, for example by use of rock-trenching machines. All material that is excavated will be re-used to the maximum extent practicable. A waste minimisation statement will be produced that justifies the extent to which surplus material will be minimised and reuse maximized.
PHY-MM41	Soil and Land Use	Construction	Minimisation (Erosion control)	Right of Way (Embankments) Access roads Landfill	Cover excavated piled material and soils by tarpaulins or gravel. Cover the ground by impermeable material and ensure slope of the soil piles not over 5%.
	Hydrology and Surface Water	Construction	Minimisation (Erosion control)	Right of Way (Embankments) Access roads Landfill	

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM42	Soil and Land Use	Construction	Minimisation (employees' awareness)	Entire AoI	Workers must be informed about practices for soil contamination prevention and soil management and reinstatement.
PHY-MM43	Soil and Land Use	Construction	Minimisation (employees' awareness)	Entire AoI	Hold training to all employees to ensure awareness of the importance of soil quality in the area and how uncontrolled refuelling and maintenance can affect it .
PHY-MM44	Soil and Land Use	Construction	Minimisation (employees' awareness)	Entire AoI	Keep records of employees training involved in soil contamination prevention and soil management and reinstatement and made records available for review. Adhere to procedures on mitigation measures for fuel and oil storage and handling and spill prevention control measures.
PHY-MM45	Soil and Land Use	Construction	Minimisation (hazardous material)	Camp Refuelling areas	Store hazardous materials as fuel in pavemented areas. Ensure spill kit for emergency is available where hazardous materials are stored.
	Hydrology and Surface Water	Construction	Minimisation (hazardous material)	Camp Tool, counting and weighing stations	
	Hydrogeology and Groundwater	Construction	Minimisation (hazardous material)	Camp Tool, counting and weighing stations	
PHY-MM46	Soil and Land Use	Construction	Minimisation (hazardous material)	Entire AoI	Consider the option to use less hazardous materials prior to purchasing them.
	Hydrology and Surface Water	Construction	Minimisation (hazardous material)	Entire AoI	
	Hydrogeology and Groundwater	Construction	Minimisation (hazardous material)	Entire AoI	

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM47	Soil and Land Use	Construction	Minimisation (hazardous material)	Entire AoI	Communicate spill response plan to concerned personnel and conduct training to respond emergencies.
	Hydrology and Surface Water	Construction	Minimisation (hazardous material)	Entire AoI	
	Hydrogeology and Groundwater	Construction	Minimisation (hazardous material)	Entire AoI	
PHY-MM48	Soil and Land Use	Construction	Minimisation (hazardous material)	Camp Refuelling areas	Any soil contaminated by spillages during handling fuel and other hazardous liquids will be removed from the site for suitable treatment and/or disposal.
PHY-MM49	Soil and Land Use	Construction	Minimisation (topsoil removal)	Right of Way (excavation areas) Borrow Pits Access roads Bridge construction areas Laydown areas	Preserve topsoil characteristics in areas of special sensitivity (e.g. low soil thickness, soils prone to erosion). Establish depth of topsoil before stripping, if necessary, carrying out a survey, to correct the needed stripping depth.
PHY-MM50	Soil and Land Use	Construction	Restore	Access roads	Restore slopes where incipient erosion is observed along access roads.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM51	Soil and Land Use	Construction	Restore	Access roads Borrow Pits Bridge construction areas Laydown areas Right of Way (Embankments)	Restore areas around the Project site with native vegetation to reinstate the original conditions.
PHY-MM51	Landscape & Visual	Construction	Restore	Entire AoI	Restore areas around the Project site with native vegetation to reinstate the original conditions.
	Soil and Land Use	Construction	Minimisation (vegetation and topsoil removal)	Borrow pits	
PHY-MM51b	Soil and Land Use	Construction	Restore	Borrow pits	The terrain excavated in borrow pits located in forested areas will be refilled, stripped and stored topsoil replaced and replanted with native surrounding vegetation within 6 months after borrow pit closing.
PHY-MM51c	Soil and Land Use	Construction	Restore	Access roads Borrow Pits Bridge construction areas Laydown areas Right of Way (Embankments)	For high sensitivity areas, implement a revegetation plan which contemplates the habitat to be restored, and which will include periodical monitoring.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM52	Soil and Land Use	Construction	Restore	Access roads Borrow Pits Bridge construction areas Laydown areas Right of Way (Embankments)	Enrich topsoil at specific locations with new clean soil to improve the soil quality and give the revegetation effort adequate nutrients
PHY-MM52a	Soil and Land Use	operation	Restore	Borrow Pits restoration	In the restored borrow pits, enrich topsoil with new clean soil to improve soil quality and give the revegetation effort adequate nutrients. If needed, replace unsuccessful trees or shrub plantation
PHY-MM53	Soil and Land Use	Operation	Avoidance	Right of Way	Ensure that environmental-friendly vegetation control measures (e.g. biological or mechanical) are used for maintenance of the green rows along the road where practical and avoid the use of herbicides.
	Hydrology and Surface Water	Operation	Avoidance	Right of Way	
	Hydrogeology and Groundwater	Operation	Avoidance	Right of Way	
PHY-MM54	Soil and Land Use	Operation	Avoidance (transport on roads)	Entire AoI	In case materials with the potential to result in dust generation is needed for periodic maintenance of the roads, all loaded Project-related heavy vehicles will be covered at all times, except during unloading and loading, to prevent dust emissions during transport in accordance with relevant road regulations.
	Air Quality	Operation	Avoidance (transport on roads)	Entire AoI Toll, counting and weighing stations	

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM55	Air Quality	Operation	Minimisation	Entire AoI Toll, counting and weighing stations	Ensure that all equipment & vehicles used for roads maintenance activity are in good condition and are well maintained
	Soil and Land Use	Operation	Minimisation (Operating vehicles / machinery)	Entire AoI	
PHY-MM56	Soil and Land Use	Operation	Minimisation (Operating vehicles / machinery)	Entire AoI	Ensure that all equipment & vehicles comply with emission norms. Use diesel with low sulphur content.
	Air Quality	Construction	Minimisation	Entire AoI	
PHY-MM56b	Air Quality	Operation	Minimisation	Entire AoI	Ensure that ambient air quality at critical receptors along the road remain below the WHO AAQ limits; to do so, define a network of points to be regularly monitored so that any exceedance is promptly detected, and adequate corrective measures are taken.
PHY-MM57	Soil and Land Use	Operation	Minimisation (employees' awareness)	Entire AoI Toll, counting and weighing stations	Build awareness and capacity among employees and contractors working on site to ensure that mitigation measures are understood and implemented.
	Landscape and Visual quality	Operation	Minimisation	Entire AoI	
	Hydrology and Surface Water	Operation	Minimisation (employees' awareness)	Entire AoI Toll, counting and weighing stations	
	Hydrogeology and Groundwater	Operation	Minimisation (employees' awareness)	Right of Way Toll, counting and weighing stations	
PHY-MM58	Soil and Land Use	Operation	Minimisation (herbicide use)	Entire AoI	Use certified personnel responsible for the application of herbicides in the maintenance of the green rows along the road. Where such

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
	Hydrology and Surface Water	Operation	Minimisation (herbicide use)	Entire AoI	certifications are not required or not possible, apply equivalent training to prevent soil contamination.
	Hydrogeology and Groundwater	Operation	Minimisation (herbicide use)	Entire AoI	
PHY-MM60	Soil and Land Use	Construction	Minimisation (spills)	Entire AoI	Appropriate spill and emergency response equipment must be made available along the road, with particular emphasis on quick response in areas of higher ecological sensitivity. This will also include equipment to clean up and drain any contaminating liquid and firefighting water.
		Operation	Minimisation (spills)		
	Hydrology and Surface Water	Construction	Avoidance (spills)	Entire AoI	
	Hydrology and Surface Water	Operation	Avoidance (spills)	Main villages along the route	
	Hydrogeology and Groundwater	Construction	Avoidance (spills)	Entire AoI	
	Hydrogeology and Groundwater	Operation	Avoidance (spills)	Main villages along the route	
PHY-MM61	Soil and Land Use	Operation	Avoidance (spills)	Toll, counting and weighing stations Right of Way	Hold Spill Response Kits, including absorbent materials, at secure, clearly signposted locations. Provide instructions with the kits and train personnel in their use.
	Hydrology and Surface Water	Operation	Avoidance (spills)	Toll, counting and weighing stations Right of Way	
	Hydrogeology and Groundwater	Operation	Avoidance (spills)	Toll, counting and weighing stations Right of Way	

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM62	Soil and Land Use	Operation	Minimisation (spills)	Entire AoI	Any spillages will be immediately contained on site and all contaminated materials including soils will be removed from the site for suitable treatment and disposal.
PHY-MM63	Soil and Land Use	Operation	Minimisation (incidents)	Entire AoI	All staff and subcontractors will be required to report any incidents. Investigate incidents and implement remedial and preventive actions.
	Hydrology and Surface Water	Operation	Minimisation (incidents)	Toll, counting and weighing stations	
	Hydrogeology and Groundwater	Operation	Avoidance (incidents)	Right of Way Toll, counting and weighing stations	
PHY-MM64	Soil and Land Use	Operation	Minimisation (incidents)	Entire AoI	Operate all Petrol Stations along the Road in accordance with the IFC EHS Guidelines for Retail Petroleum Networks as best practice measures.
	Hydrology and Surface Water	Operation	Avoidance (incidents)	Right of Way	
	Hydrogeology and Groundwater	Operation	Minimisation (incidents)	Right of Way	
PHY-MM65	Soil and Land Use	Operation	Minimisation (contamination from waste)	Right of Way	In order to prevent soil contamination wastes along the road have to be removed and correctly managed.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM67	Soil and Land Use	Operation	Minimisation (water flows control)	Bridges Culverts Drainage infrastructures	In order to collect rainy water and to prevent soil contamination, periodically maintain and clean the hydraulic structures to ensure that the flow of water is not obstructed by objects, waste, sediments or vegetation.
PHY-MM68	Soil and Land Use	Operation	Restore	Borrow Pits Access roads Bridge construction areas Laydown areas	Perform periodic visual inspection of vegetation regrowth and health in the areas reclaimed at the end of the construction phase.
	Landscape and Visual quality	Operation	Restore	Entire AoI	
PHY-MM68a	Soil and Land Use	Operation	Minimisation	Right of Way	During maintenance, invasive species will be removed from the site separately and managed as waste in appropriate facilities. Other vegetation cleared during maintenance may be managed onsite as organic matter, pilled or mulched onsite
PHY-MM68b	Soil and Land Use	Operation	Restore	Bridges Drainage structures Swamp reclamation areas	Perform visual inspection of banks on the rivers, streams and swamps affected by construction. Evaluate of erosion signs are present and act accordingly to prevent and maintain soil cohesion, preferably through improving revegetation or adding natural materials.
PHY-MM68c	Landscape and Visual quality	Operation	Minimisation	Entire AoI	Use fencing and screening to obscure the view of certain facilities such as maintenance areas or parking lots from the public view. This can be done with natural barriers or decorative walls.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM69	Hydrology and Surface Water	Construction	Minimisation (contaminated runoff water)	Right of Way Parking areas Bridges	Conduct paving activities during dry weather to prevent runoff of asphalt or cement materials. Paving activities should be conducted during dry weather to prevent runoff of asphalt or cement materials.
PHY-MM70	Hydrology and Surface Water	Construction	Avoidance (hazardous material)	Entire AoI	In order to avoid surface water contamination, release of hazardous materials, wastes and/or oil will be controlled. Topsoil stockpiles and hazardous materials including fuel must be handled and stored away from waterways.
PHY-MM71	Hydrology and Surface Water	Construction	Avoidance (hazardous materials)	Culverts Bridges construction areas	Avoid the use of pesticides or herbicides in any seasons and anywhere near watercourses.
	Hydrology and Surface Water	Operation	Avoidance (hazardous materials)	Right of Way	
	Waste and Wastewater	Operation	Avoidance (hazardous materials)	Right of Way	
PHY-MM71a	Waste and wastewater	Operation	Minimisation	Entire AoI	When the use of herbicides cannot be avoided, select biological and biodegradable products.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM72	Soil and Land Use	Construction	Avoidance (hazardous materials)	Camp Right of Way	Use storage tanks and tankers only for their intended purposes.
	Hydrology and Surface Water	Construction	Avoidance (hazardous materials)	Right of Way	
	Hydrogeology and Groundwater	Construction	Avoidance (hazardous materials)	Camp Right of Way	
PHY-MM73	Soil and Land Use	Construction	Avoidance (hazardous materials)	Entire AoI	Train personnel on installing and using the necessary equipment to control propagation of contaminants.
	Hydrology and Surface Water	Construction	Avoidance (hazardous materials)	Entire AoI	
	Hydrology and Surface Water	Operation	Avoidance (hazardous materials)	Toll, counting and weighing stations Right of Way	
	Hydrogeology and Groundwater	Construction	Avoidance (hazardous materials)	Entire AoI	

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM74	Soil and Land Use	Construction	Avoidance (hazardous materials)	Entire AoI	Use absorbent materials to control leaks.
	Hydrology and Surface Water	Construction	Avoidance (hazardous materials)	Vehicles and equipment	
	Hydrogeology and Groundwater	Construction	Avoidance (hazardous materials)	Camp Right of Way Borrow pits Laydown areas Bridge construction areas	
PHY-MM75	Soil and Land Use	Construction	Avoidance (hazardous materials)	Entire AoI	Ensure integrity of tanks and containers. Always place them always in areas with flood control and perimetral drainage.
	Hydrology and Surface Water	Construction	Avoidance (hazardous materials)	Camp Laydown areas	
	Hydrogeology and Groundwater	Construction	Avoidance (hazardous materials)	Entire AoI	

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM76	Soil and Land Use	Construction	Avoidance (hazardous materials)	Entire AoI	Place storage tanks inside overflow pools (having at least a volume 10% higher of storage tank itself).
	Hydrology and Surface Water	Construction	Avoidance (hazardous materials)	Camp Laydown areas	
	Hydrogeology and Groundwater	Construction	Avoidance (hazardous materials)	Camp Borrow pits Laydown areas Bridge construction areas	
PHY-MM77	Soil and Land Use	Construction	Avoidance (hazardous materials)	Entire AoI	Identify specific areas for loading and unloading hazardous substances and ensure they have adequate characteristics such as impermeable ground.
	Hydrology and Surface Water	Construction	Avoidance (hazardous materials)	Camp Laydown areas All construction areas	
	Hydrogeology and Groundwater	Construction	Avoidance (hazardous materials)	Camp Right of Way Borrow pits Laydown areas Bridge construction areas	

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM78	Soil and Land Use	Construction	Avoidance (hazardous materials)	Entire AoI	Ensure proper positioning of all hoses and washers before fuels and other liquids are received and distributed.
	Hydrology and Surface Water	Construction	Avoidance (hazardous materials)	Camp Laydown areas	
	Hydrogeology and Groundwater	Construction	Avoidance (hazardous materials)	Camp Laydown areas	
PHY-MM79	Soil and Land Use	Construction	Avoidance (hazardous materials)	Entire AoI	Ensure drip trays are placed over points that are more statistically inclined to leak and contact points of vehicles.
	Hydrology and Surface Water	Construction	Avoidance (hazardous materials)	Camp All construction areas Laydown areas	
	Hydrogeology and Groundwater	Construction	Avoidance (hazardous materials)	Camp Right of Way Borrow pits Laydown areas Bridge construction areas	

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM79a	Waste and wastewater	Operation	Avoidance (hazardous materials)	Toll, counting and weighing stations	Extra precautionary measures will be carried out when handling any kind of waste (oils, fuel, paintings). Thak will be developed in maintenance areas within buildings prepared to do so, never in the environment.
PHY-MM80	Hydrology and Surface Water	Construction	Avoidance (hazardous materials)	Camp All construction areas Laydown areas	Place mobile or portable fuel oil storage tanks in a way to mitigate any leaks before they reach natural streams, lakes or other water bodies/courses.
	Hydrogeology and Groundwater	Construction	Avoidance (hazardous materials)	Camp Right of Way Borrow pits Laydown areas Bridge construction areas	
PHY-MM83	Hydrology and Surface Water	Construction	Minimisation (wastewater)	Entire AoI	Reduce water consumption.
PHY-MM83a	Hydrology and Surface Water	Construction	Minimisation (water demand)	Entire AoI	Carry out a preconstruction survey before deploying pumps for water abstraction in the rivers. The abstractions can occur only when: - Rivers have high flow rate; - there is no downstream water abstraction point used by the population (either for formal water supply systems or informal water use). Locations for abstractions points must be agreed with the communities.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM83b	Geomorphology and Topography	Construction	Minimisation (Erosion control)	Right of Way	Cover the embankments immediately after construction to prevent erosion using stone riprap, gabion structures, geotextile membranes or replanting with native vegetation.
PHY-MM83c	Hydrology and Surface Water	Construction	Minimisation (Erosion control)	Drainage structures	Ensure the stability of the soil at the drainage discharge points along construction sites and along the longitudinal drainage of the road. Include appropriate structures (flow breakers, stone riprap and the like) to prevent any adverse impacts from surface water runoff on soil.
PHY-MM83d	Geomorphology and Topography	Construction	Minimisation (Erosion control)	Right of Way (cut sections)	Assess the need of installing crest drains to manage water in cut sections and minimise erosion risks.
PHY-MM84	Hydrology and Surface Water	Construction	Avoidance (surface water contamination)	Access roads	Avoid uncontrolled discharge of stormwater from drainage network in correspondence to access roads and to natural wetlands.
PHY-MM85	Hydrology and Surface Water	Construction	Minimisation (surface water contamination)	Right of Way	Minimise the extension of artificial embankments.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM85a	Hydrology and Surface Water	Construction	Minimisation (surface water contamination)	Swamp reclamation areas	Minimise swamp reclamation using materials and equipment which reduce the dispersion of deposited materials in the waterbody: - Deposit the embankment materials slow and in small quantities at the time; - use removable barriers (sandbags or floating barriers) to prevent soil dispersion in the waterbody; - cover the slopes immediately after construction to prevent erosion using local materials (stone riprap), geotextile membranes or replanting immediately with native vegetation.
PHY-MM85b	Hydrology and Surface Water	Construction	Avoidance	Culverts Bridges construction areas Swamp reclamation areas	Avoid the work of heavy machinery in water course. Earthworks will be carried slow and in small quantities to avoid dust dispersion and deposition in waterbodies.
PHY-MM86	Hydrology and Surface Water	Construction	Minimisation (employees' awareness)	Entire AoI	Inform and train workers about practices for prevention of surface water contamination.
PHY-MM87	Hydrology and Surface Water	Construction	Minimisation (employees' awareness)	Entire AoI	Hold training to all employees to ensure awareness of the importance of surface water quality in the area and how uncontrolled refuelling and maintenance can affect it.
PHY-MM88	Hydrology and Surface Water	Construction	Minimisation (employees' awareness)	Entire AoI	Keep records of employees training involved in surface water contamination prevention, management and reinstatement and make records available for review.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM91	Hydrology and Surface Water	Construction	Avoidance (hazardous material)	Entire AoI	Any soil contaminated by spills will be promptly removed from the site for treatment and/or disposal.
PHY-MM92	Hydrology and Surface Water	Construction	Restore (surface water contamination)	Right of Way	Reinstate deposit areas by means of a final soil cover to be revegetated with local grasses and shrubs.
PHY-MM94	Hydrology and Surface Water	Operation	Avoidance (surface water contamination)	Borrow Pits Access roads Bridge construction areas Laydown areas	Avoid uncontrolled stockpiling of material excavated during the restoration activities
PHY-MM94a	Waste and wastewater	Operation	Minimisation (surface water contamination)	Drainage infrastructures	Use manual maintenance methods whenever possible for the cleaning/clearing of drainage infrastructures.
PHY-MM94b	Waste and wastewater	Operation	Minimisation	Right of Way Drainage infrastructures Bridges	The organic matter wastes from maintenance (rests of clearance along the ROW or removal of organic material from the drainage system) can be stockpiled in the surrounding environment and left on the soil for organic decomposition if considered secure for human and environment. Vegetation stockpiles will be placed within a safe distance from the watercourse and riverbanks in an area not affected by flooding or runoff
PHY-MM95	Hydrology and Surface Water	Operation	Avoidance (hazardous materials)	Right of Way Toll, counting and weighing stations	Use absorbent materials to control leaks.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM96	Hydrology and Surface Water	Operation	Avoidance (hazardous materials)	Toll, counting and weighing stations	Ensure integrity of tanks and containers, and always install them in areas with flood control.
PHY-MM97	Hydrology and Surface Water	Operation	Avoidance (hazardous materials)	Toll, counting and weighting stations	Place storage tanks inside overflow pools (which have 10% more volume with respect to the storage tank itself).
PHY-MM98	Hydrology and Surface Water	Operation	Avoidance (hazardous materials)	Toll, counting and weighing stations	Position all hoses and washers before fuels and other liquids are received and distributed.
PHY-MM99	Hydrology and Surface Water	Operation	Avoidance (hazardous materials)	Right of Way Toll, counting and weighting stations	Place drip trays over points that are more statistically inclined to leak and contact points of vehicles.
PHY-MM100	Hydrology and Surface Water	Construction	Avoidance (hazardous materials)	Entire AoI	Collect and clean residues of pollution completely rather than just washing out contaminated area with a hose.
	Hydrology and Surface Water	Operation	Avoidance (hazardous materials)	Right of Way Toll, counting and weighting stations	
	Hydrogeology and Groundwater	Construction	Avoidance (hazardous materials)	Right of Way Toll, counting and weighting stations	

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM101	Hydrology and Surface Water	Operation	Avoidance (herbicide use)	Right of Way Toll, counting and weighting stations	Ensure that personnel responsible for the application of herbicides in the maintenance of the green rows along the road receive applicable certifications or equivalent training where such certifications are not required.
PHY-MM102	Hydrology and Surface Water	Operation	Avoidance (spills)	Right of Way Toll, counting and weighting stations	Plan measures for the case of lorry spills, fire, etc. involving hazardous/polluting substances along the Road so to prevent and clean up any significant impacts from drainage of contaminated liquids and fire-fighting water.
PHY-MM103	Hydrology and Surface Water	Operation	Avoidance (spills)	Right of Way Toll, counting and weighting stations	Immediately contain any spillages on site and remove all contaminated materials including Surface Waters for suitable treatment and disposal.
PHY-MM104	Hydrology and Surface Water	Operation	Avoidance (contamination from waste)	Toll, counting and weighting stations	Avoid littering and remove waste along the road and correctly manage it.
PHY-MM105	Hydrology and Surface Water	Operation	Minimisation (water flows control)	Drainage structures Bridges	Periodically maintain and clean the hydraulic structures to ensure the flow of water is not obstructed by objects, waste, sediments or vegetation.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM106	Hydrology and Surface Water	Construction	Minimisation (wastewater)	Camp All construction areas	Treat any wastewater on site or transport it to offsite treatment facilities before disposal.
	Hydrology and Surface Water	Operation	Minimisation (wastewater)	Camp All construction areas	
	Waste and Wastewater	Construction	Minimisation (wastewater)	Camp All construction areas	
	Hydrology and Surface Water	Operation	Minimisation (wastewater)	Camp All construction areas	
PHY-MM107	Hydrology and Surface Water	Construction	Minimisation (wastewater)	Entire AoI	In all construction sites, use chemical toilets and ensure that sewage is managed and disposed of through authorised contractors.
	Hydrogeology and Groundwater	Construction	Minimisation (wastewater)	Entire AoI	

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM108	Soil and Land Use	Construction	Minimisation (hazardous materials)	Entire AoI	Ensure transporters of hazardous goods are authorized according to ADR standards.
	Soil and Land Use	Operation	Minimisation (hazardous materials)	Toll, counting and weighting stations	
	Hydrology and Surface Water	Construction	Minimisation (hazardous materials)	Entire AoI	
	Hydrology and Surface Water	Operation	Minimisation (hazardous materials)	Toll, counting and weighting stations	
	Hydrogeology and Groundwater	Construction	Minimisation (hazardous materials)	Entire AoI	
	Hydrogeology and Groundwater	Operation	Minimisation (hazardous materials)	Toll, counting and weighting stations	
PHY-MM109	Soil and Land Use	Operation	Minimisation (hazardous materials)	Entire AoI	Ensure transporters are certified and have the human resources and appropriate technology for handling, transporting and managing the hazardous materials in question.
	Hydrology and Surface Water	Operation	Minimisation (hazardous materials)	Entire AoI	
	Hydrogeology and Groundwater	Operation	Minimisation (hazardous materials)	Entire AoI	

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM110	Hydrology and Surface Water	Operation	Minimisation (hazardous materials)	Toll, counting and weighing stations	Ensure transporters have procedures for hazardous material management and emergency response procedures in case of an accident.
	Hydrogeology and Groundwater	Operation	Minimisation (hazardous materials)	Toll, counting and weighing stations Right of Way	
PHY-MM111	Hydrology and Surface Water	Operation	Minimisation (hazardous materials)	Toll, counting and weighing stations	Ensure hazardous materials will be only transported by qualified, trained vehicle operators, using appropriate industrial forklifts or other vehicles.
	Hydrogeology and Groundwater	Operation	Minimisation (hazardous materials)	Toll, counting and weighing stations Right of Way	
PHY-MM112	Hydrology and Surface Water	Operation	Avoidance (surface water contamination)	Right of Way	Avoid uncontrolled discharge of stormwater from drainage network in correspondence to access roads and to natural wetlands.
PHY-MM114	Hydrogeology and Groundwater	Construction	Minimisation (contaminated runoff water):	Right of Way Borrow pits	Minimise erosion of temporary stockpiles of potentially contaminated excavated material, using erosion control methods, such as covers for open materials storage piles.
PHY-MM115	Hydrogeology and Groundwater	Construction	Avoidance (hazardous materials):	Camp Right of Way Borrow pits Laydown areas Bridge construction areas	Avoid release of hazardous materials, wastes and/or oil in order to avoid groundwater contamination.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM116	Hydrogeology and Groundwater	Construction	Avoidance	Camp Toll, counting and weighing stations	Prior to withdraw water from a borehole or well: - identify all boreholes and wells within 100 m of the source; - measure the quality of water in these wells; - measure quality of water on a monthly basis, continuing until two months after abstraction ceases; - If monitoring indicates a material reduction in water quality, then abstraction should cease; - If the reduction is substantial enough to affect the usability of supply to the users, then it is necessary to provide and fund an alternate supply. Likewise, if a Project related leak or spillage has the potential to impact on groundwater usability/acceptability to a local user then it is necessary to investigate and provide an alternate, equivalent water supply for the duration of the period that an effect occurs
PHY-MM116a	Hydrogeology and Groundwater	Construction	Minimization	Camp Toll, counting and weighing stations	Before proceeding with drilling a borehole a complete site assessment is needed to understand the geological composition of the site, the water table depth and potential contamination pathways. A specific hydrogeological study must be developed to select the best location, considering the avoidance of any interaction with other existent wells and the environment. Then is to: - Choose the right drilling method; - collect accurate drilling logs and reports while drilling noting any changes in geology formations, aquifers and water presence; - testing water quality and quantity; - testing aquifer permeability, well sustainability, aquifer recover time and impact on local water resources (wells, boreholes, rivers).

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM116b	Hydrogeology and Groundwater	Construction	Minimization	Camp Toll, counting and weighing stations	Ensure the sustainability and compliance of boreholes following best practice during construction: - Proper casing and screening: high – quality PVC or steel casing and proper well screens located according to the geotechnical study to protect the aquifer from any source of pollutants and for well efficiency; - use gravel pack to prevent fine materials entering in the well; - Euse effective sealing methods (e.g. bentonite clay or cement grout for sealing aquifer or aquifers); - Place a top sanitary bentonite and concrete sealing: for enhancing stability and preventing contamination from the topsoil.
PHY-MM117	Hydrogeology and Groundwater	Construction	Avoidance	All construction areas	Collect precipitation and surface run-off during construction with appropriate drainage systems and apply oil water separators and grease traps prior to discharge.
PHY-MM118	Hydrogeology and Groundwater	Construction	Minimisation (employees' awareness)	Entire AoI	Inform and train workers about practices for groundwater contamination prevention.
PHY-MM119	Hydrogeology and Groundwater	Construction	Minimisation (employees' awareness)	Entire AoI	Train employees to ensure awareness on the importance of Groundwater quality in the area and how uncontrolled refuelling and maintenance can affect it .
PHY-MM120	Hydrogeology and Groundwater	Construction	Minimisation (employees training)	Entire AoI	Keep records of employees training involved in Groundwater contamination prevention, management and reinstatement and made records available for review. Adhere to procedures on mitigation measures for fuel and oil storage and handling and spill prevention control measures.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM121	Hydrogeology and Groundwater	Construction	Minimisation (hazardous material)	Camp Right of Way Borrow pits Laydown areas Bridge construction areas	Remove any soil contaminated by spillages or other operations for suitable treatment and/or disposal.
PHY-MM121a	Hydrogeology and Groundwater	Construction	Minimization (hazardous material)	Entire AoI	Delimit well protection areas and strictly prohibit parking of vehicles, trucks or any equipment in those areas. Parking of construction vehicles, trucks and equipment will be only allowed in designated sign posted areas.
	Hydrogeology and Groundwater	Operation	Minimization (hazardous material)	Entire AoI	
PHY-MM122	Hydrogeology and Groundwater	Construction	Minimisation (water consumption)	Toll, counting and weighing stations	Ensure that use of water resources by the Project respect efficiency and management procedures.
	Hydrogeology and Groundwater	Operation	Minimisation (water consumption)	Entire AoI	
PHY-MM123	Hydrogeology and Groundwater	Operation	Avoidance (spills)	Entire AoI	Immediately contain any spillages on site and remove all contaminated materials including groundwater from the site for suitable treatment and disposal.
PHY-MM124	Hydrogeology and Groundwater	Operation	Minimisation (contamination from waste)	Right of Way Toll, counting and weighing stations	Remove waste along the road in order to prevent groundwater contamination and manage it correctly.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM125	Hydrogeology and Groundwater	Operation	Minimisation (water flows control)	Drainage structures	Maintain and clean hydraulic structures to ensure that the flow of water is not obstructed by objects, waste, sediments or vegetation.
PHY-MM126	Hydrogeology and Groundwater	Operation	Minimisation (water consumption)	Toll, counting and weighing stations	Water resources must be used in respect for efficiency and management procedures. These procedures will need to be prepared to ensure their efficient use by the Project.
PHY-MM127	Hydrogeology and Groundwater	Operation	Avoidance (Groundwater contamination)	Drainage structures	Avoid uncontrolled discharge of stormwater from drainage network
PHY-MM128	Hydrogeology and Groundwater	Operation	Avoidance (Groundwater contamination)	Entire AoI	If a Project related leak or spillage has the potential to impact on groundwater usability/acceptability to a local user, investigate it and provide an alternative, equivalent water supply option.
PHY-MM130	Waste and wastewater	Construction	Minimisation (Waste)	Entire AoI	Ascertain and document final waste destination and standards at which disposal sites are operated.
PHY-MM130a	Waste and wastewater	Construction	Minimisation (Waste)	Landfill	Keep a register of the waste quantities and typology entering daily to the landfill

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM131	Waste and wastewater	Construction	Minimisation (Waste)	Entire AoI	Personnel at an appropriate level of seniority will be nominated to be responsible for good site practices and arrangements for collection and effective disposal of all wastes generated by the Project. All personnel will be trained in proper waste management procedures as appropriate to their level of responsibility and duties. This will include training in concepts of site cleanliness and on appropriate waste management procedures, including waste reduction, reuse and recycling.
PHY-MM131a	Waste and wastewater	Construction	Minimisation (Waste)	Entire AoI	Any waste resulting from work activities or workers presence along the ROW (litter, leftovers) must be disposed and managed properly. Leaving any waste in the environment will be prohibited. All the working areas will be revised daily to collect and clean the surroundings of the working areas.
	Waste and wastewater	Operation	Minimisation (Waste)	Right of Way Toll, counting and weighing stations	
PHY-MM132	Waste and wastewater	Construction	Avoidance (Waste and Wastewater)	Entire AoI	Wastes which cannot be recycled, will be transported to the closest suitable treatment or disposal site. This will depend on the individual type of waste. The Waste MP will detail the preferred treatment options for all of the expected types of waste and will also include a procedure for determining how any other wastes, not expected at this stage but which arise during the Project, will be treated.
PHY-MM132a	Waste and wastewater	Construction Operation	Avoidance (Waste)	Entire AoI	No wild dumping of waste will be permitted.
PHY-MM133	Waste and wastewater	Construction	Minimisation (Waste)	Right of Way Access roads Landfill	Maximise the re-use of soils and aggregates arising from cuttings as far as possible. Properties of spoil inert soils and aggregates will be investigated for re-use up to the maximum volume receivable. The balance of soils and aggregates will be disposed to appropriate landfill sites for its management as waste.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM134	Waste and wastewater	Construction	Minimisation (Wastewater)	Camp Entire AoI	Provide sanitary facilities with capacity to meet sanitation requirements of personnel at all construction locations. All personnel must have access to toilet facilities within 500 m of their place of work. Personnel must use the provided facilities, which will be serviced daily to ensure hygienic conditions. Raw sewage must be contained and subject to treatment and disposal by a registered service provider at an appropriately permitted facility. Records of safe treatment and disposal of sewage must be maintained.
PHY-MM135	Waste and wastewater	Construction	Avoidance (hazardous/non-hazardous materials)	Entire AoI	Avoid the generation of hazardous and non-hazardous waste materials. Where waste generation cannot be avoided, reduce the generation of waste, and recover and reuse waste in a manner that is safe for human health and the environment.
PHY-MM135a	Waste and wastewater	Construction	Avoidance (hazardous/non-hazardous materials)	Drainage infrastructures Culverts Bridges Right of Way Borrow Pits	When works are developed in sensitive areas (CH, waterbodies or watercourses) special attention must be placed to avoid the generation of waste and pollution which could affect the soil, the water resource and surrounding environment during or after the works
PHY-MM135b	Waste and wastewater	Construction	Avoidance (hazardous/non-hazardous materials)	Drainage infrastructures Culverts Bridges Right of Way Borrow Pits	Use protective plastic sheets or other elements to avoid pollution of soil and water bodies when hazardous materials such as concrete, asphalt, oils and paintings are used. Onsite concrete will be handled in a safety area protecting the soil and far from the waterbody (200 m)

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM135c	Waste and wastewater	Construction	Avoidance (hazardous/non-hazardous materials)	Drainage infrastructures Culverts Bridges Right of Way Borrow Pits	Collect and remove any soil polluted with hazardous materials as soon as possible to avoid its interaction with the environment. Polluted soil will be sent to an appropriate waste facility for hazardous waste.
PHY-MM137	Waste and wastewater	Construction	Minimisation (Waste)	Camp Offices	Collect and store the waste separately on the site.
	Waste and wastewater	Operation	Minimisation (Waste)	Toll, counting and weighing stations	
PHY-MM138	Waste and wastewater	Construction	Minimisation (wastewater)	Entire AoI	Wastewater will be minimised by reducing water consumption
PHY-MM139	Waste and wastewater	Construction	Minimisation (wastewater)	Entire AoI	Wastewater will be minimised by managing wastewater through collection and treatment; if not possible dispose of wastewater streams through authorised contractors
PHY-MM140	Waste and wastewater	Construction	Minimisation (wastewater)	Entire AoI	Wastewater will be minimised by using chemical toilets to be managed through authorised contractors (domestic wastewater disposal).
PHY-MM141	Waste and wastewater	Construction	Avoidance (Waste)	Camp	Collect the domestic solid waste from the personnel in closed containers located at various points of the camp.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM141a	Waste and wastewater	Construction	Avoidance (Waste)	Camp Offices	Place garbage bins in the production sites as well as near the facilities (office and accommodation base).
	Waste and wastewater	Operation	Avoidance (Waste)	Toll, counting and weighting stations Offices	
PHY-MM142	Waste and wastewater	Construction	Avoidance (Waste)	Camp Offices	Collect the packaging paper, plastic and glass bottles i.e. packaging wastes separate from other wastes without considering material used and the source of the material and send to licensed recycling facilities.
	Waste and wastewater	Operation	Avoidance (Waste)	Toll, counting and weighting stations Offices	
PHY-MM143a	Waste and wastewater	Operation	Minimisation (hazardous/non-hazardous wastes)	Entire AoI	Ensure the vehicles for road maintenance are maintained in good conditions and develop periodical revisions.
PHY-MM144	Waste and wastewater	Construction	Avoidance (Waste)	Right of Way Borrow pits	Excavation and demolition wastes will be disposed in accordance with the applicable regulations.
PHY-MM146	Waste and wastewater	Construction	Avoidance (Waste)	Bridge assembling areas Laydown areas	Iron and steel wastes will not be left on the construction areas. These will be temporarily stored at site and be disposed by licensed recycling companies in line with the applicable local legislation.
PHY-MM147	Waste and wastewater	Operation	Minimisation (Waste)	Entire AoI	Wastes which cannot be recycled, will be transported to the closest suitable treatment or disposal site. This will depend on the individual type of waste.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM149	Waste and wastewater	Operation	Minimisation (Waste)	Entire AoI	The project will implement a community grievance mechanism (or equivalent) to manage any complaints from surrounding community members, including those related to waste management.
PHY-MM150	Waste and wastewater	Operation	Minimisation (wastewater)	Toll, counting and weighing stations Entire AoI	Wastewater will be minimised by reducing water consumption.
PHY-MM151	Waste and wastewater	Operation	Minimisation (wastewater)	Entire AoI	Wastewater will be minimised by managing wastewater through collection and treatment; if not possible dispose of wastewater streams through authorised contractors
PHY-MM152	Waste and wastewater	Operation	Minimisation (wastewater)	Toll, counting and weighing stations Entire AoI	Wastewater will be minimised by using chemical toilets to be managed through authorised contractors (domestic wastewater disposal).
PHY-MM153	Air Quality	Construction	Minimisation	Right of Way (Blasting locations)	If blasting is required during earthworks, this will be limited to dedicated blasting times which will be negotiated with the potential affected communities in order to protect the people and minimise nuisance.
PHY-MM154	Noise	Construction	Avoidance	Entire AoI	Avoid construction activities during nighttime.
PHY-MM155	Noise	Construction	Minimisation	Entire AoI	Plan activities in consultation with local communities so that activities with the greatest potential to generate noise occur during a time of the day that will result in the least disturbance.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM156	Noise	Construction	Minimisation	Entire AoI	Announce to the public on a board to be installed at each construction location i) construction start and completion dates ii) working hours, and iii) information about permits obtained from local municipalities.
PHY-MM157	Noise	Construction	Minimisation	Entire AoI	Re-locate any equipment or machine (such as generators) that represent a noise source to less sensitive areas to take advantage of distance and shielding.
PHY-MM158	Noise	Construction	Minimisation	Right of Way (Blasting locations)	Where blasting is required during earthworks, introduce blasting times which will be negotiated with the potential affected communities in order to protect the people and minimise nuisance.
PHY-MM160	Noise	Construction	Minimisation	Entire AoI	Minimize hours of operation for specific pieces of equipment or operations, especially mobile sources operating through community areas.
PHY-MM160a	Noise	Operations	Minimisation	Key sensitive receptors indicated in the noise model.	In the initial months of road operations, carry out noise monitoring at receptors chosen among those that the model indicates as subject to high noise levels. If exceedance of Project Standards is confirmed, adopt mitigation measures as indicated in PHY-MM161 or other suitable measures.
PHY-MM161	Noise	Operations	Minimisation	Key sensitive receptors indicated in the noise model.	Depending on the results of the acoustic monitoring Install acoustic barriers (to be designed in detail on a case-by-case basis according to the specific context of the receptor) or other suitable acoustic mitigations.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-MM161a	Noise	Construction	Minimisation	Sensitive receptors location (especially near schools and health centres and schools) and inhabited areas crossed by the road	At specific construction locations where the noisy equipment is in use, install around it suitable acoustic barriers without gaps and with a continuous minimum surface density of 10 kg/m² to minimize the transmission of sound through the barrier. Barriers should be located as close to the source or to the component location to be effective.
PHY-MM162	Noise	Construction	Minimisation	Entire AoI	Selecting equipment with lower sound power levels that will comply with noise limits according to the power (kW) of equipment.
PHY-MM163	Noise	Construction	Minimisation	Entire AoI	Regularly maintain construction equipment to ensure noise levels remain within the limits set by Project standards requirements.
PHY-MM165	Noise	Operation	Minimisation	Entire AoI	For road maintenance activities, select equipment with lower sound power levels that comply with noise limits.
PHY-MM166	Noise	Operation	Minimisation	Entire AoI	Regularly maintain maintenance vehicles and equipment to ensure noise levels are maintained within requirements.
PHY-MM167	Noise	Operation	Minimisation	Villages Urban Areas Sensitive receptors (e.g. Schools Health Centres Churches)	Apply speed limits or 50 km/h or less along road sections crossing communities. Lower speed limits may be considered under specific circumstances in proximity of sensitive receptors.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
SOC-MM10	Landscape & Visual	Construction	Minimisation	Entire AoI	As part of the SEP implementation, periodically consult local authorities of villages in the rural areas of the Project and discuss potential mitigation measures to be implemented.
	Landscape & Visual	Operation	Minimisation	Entire AoI	
SOC-MM64	Landscape & Visual	Operation	Minimisation	Entire AoI	Ensure regular maintenance activities of the road.
SOC-MM76	Landscape & Visual	Construction	Minimisation	Entire AoI	Include in public consultations topics relevant to landscape features elements that are important for the community.
SOC-MM76b	Landscape & Visual	Construction	Minimisation	Entire AoI	Where feasible and adequate, carry out public consultations about final layout for permanent facilities landscaping

Table 2 : SPECIFIC MITIGATION MEASURES FOR PHYSICAL COMPONENTS – QUARRY & SITE INSTALLATIONS-

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-Q-MM01	Geomorphology and Topography	Construction	Minimization	Quarry (Site 1)	A detailed topographic model of the quarry will be prepared to guide quarry operations and ensure that the risk of landslides is minimised
PHY-Q-MM02	Geomorphology and Topography	Construction	Restore	Quarry (Site 1) Site installations (Site 2)	At the end of the quarry life, restore the aggregate areas and any other surface that will have been modified on both Site 1 and 2 by means of a soil cover that shall be revegetated with autochthonous grasses and shrubs.
PHY-Q-MM03	Geomorphology and Topography	Construction	Restore	Quarry (Site 1)	Provide for the quarry site manager or for a qualified person to inspect the quarry site every morning at the beginning of the working day to detect any incipient erosion. If any is detected, immediate actions will be taken to ensure this is stopped and restored.
PHY-Q-MM04	Soil and Land Use	Construction	Minimization	Quarry (Site 1) Site installations (Site 2)	Implement around Site 1 and Site 2 and along the access road a drainage network that is suitable to collect any water runoff and take it to a sedimentation pond or to another suitable location before it is discharged into the environment.
PHY-Q-MM05	Soil and Land Use	Construction	Minimization (topsoil excavating and stockpiling)	Quarry (Site 1) Site installations (Site 2)	Topsoil stockpiles shall be: - Designed and managed in a manner that will minimize surface damage and not obstruct natural drainage. -Protected from erosion due to water runoff and infestation by weeds; - Not exceed 1.3 m in height. - Stockpiles shall be covered with appropriate material to prevent soil loss and the slope shall not exceed 5%. Storage time within the stockpile shall be as short as possible less than 1 year and preferably less than 6 months.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-Q-MM06	Soil and Land Use	Construction	Avoidance (hazardous materials)	Quarry (Site 1) Site installations (Site 2)	Ensure that hazardous materials are stored at the warehouse as the only centralized storage location for both Site 1 and 2. Provide the warehouse with the required tools and equipment to respond to spills and to incidents that may have consequences affecting the environment.
PHY-Q-MM07	Soil and Land Use	Construction	Avoidance (hazardous materials)	Quarry (Site 1) Site installations (Site 2)	Contain any soil contamination caused on Site 1 and Site 2 or along the access road to avoid further contamination.
PHY-Q-MM08	Soil and Land Use	Construction	Avoidance (hazardous materials)	Quarry (Site 1) Site installations (Site 2)	Remove any contaminated soil on Site 1 and 2 and along the access road dispose it of as hazardous waste material. The same procedure identified for managing contaminated soils from road construction activities will apply to the quarry and site installations
PHY-Q-MM09	Soil and Land Use	Construction	Minimization (employees' awareness)	Quarry (Site 1) Site installations (Site 2)	Hold specific training to all employees working at the quarry and site installations to ensure awareness of the importance of soil quality.
PHY-Q-MM10	Soil and Land Use	Construction	Minimization (hazardous material)	Quarry (Site 1) Site installations (Site 2)	Within one month prior to the start of mobilization, prepare a spill response plan specific to Site 1 and 2 and to the access road. The plan should include measures to respond to spills that may affect the Kienké River and any minor permanent or temporary stream that may be present.
PHY-Q-MM11	Hydrology and Surface water	Construction	Avoidance	Quarry (Site 1) Site installations (Site 2)	Identify specific spots within Site 1 and Site 2 and along the access road where any excavated material will be temporarily stored for later use as back fill material or, in the case of topsoil, for final reinstatement. Their footprint should be minimized and remain within the boundaries of the two sites.
PHY-Q-MM12	Hydrology and Surface water	Construction	Minimization (emission to atmosphere)	Quarry (Site 1) Site installations (Site 2)	At the gates of Sites 1 and 2, establish a wheel washing station where for trucks.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-Q-MM13	Hydrology and Surface water	Construction	Avoidance (hazardous materials)	Quarry (Site 1) Site installations (Site 2)	Identify within both Site 1 and 2 a location where any contaminated soil will be temporarily stored. This location will be segregated from other storage areas and will be equipped with leak-proof floor and covered with a shelter. Soil will be transported offsite according to the same requirements indicated for the main road.
PHY-Q-MM14	Hydrology and Surface water	Construction	Minimization (hazardous material)	Quarry (Site 1) Site installations (Site 2)	Prepare a spill response plan specific for Site 1 and 2 and for spills that may occur along the access road and affect the Kienké river. The will must be communicated to concerned personnel and training to respond emergency must be conducted.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-Q-MM15	Hydrology and Surface water	Construction	Avoidance (hazardous materials)	Site installations (Site 2)	Ensure that the fuel station located in front of Site 2 is designed and equipped according to the following requirements: - Do not construct any underground tanks. - Periodically check (Weekly) the integrity of tanks and containers. - Place storage tanks inside overflow pools (which have 10% more volume with respect to the storage tank itself). - Place drip trays over points that are more statistically inclined to leak and contact points of vehicles. - Position all hoses and washers before fuels and other liquids are received and distributed. - Place absorbent materials and spill intervention kits in the vicinity of thanks and at any fulling point. - Provide areas where fuelling or tank refilling operations will take place with impervious surfaces with a surface drainage system connected to an oil separator. - Train personnel on the use of spill response kits and on the procedures to be adopted for preventing them. - Maintain an inventory at the site managers office for all fuel received and quantity stored at the fuel station. - Any soil contaminated due to spillages during handling fuel and other hazardous liquids will be removed from the site for suitable treatment and/or disposal according to the Environmental Soil Management Plan.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-Q-MM16	Hydrology and Surface water	Construction	Minimization	Site installations (Site 2)	At the bridge construction site on the Kienké River ensure that all construction material is stored at a safe distance from the water course to prevent any contamination to enter the water. Avoid wet days or wet conditions when constructing the bridge to reduce and possibly avoid any remaining risk of cementitious material or contaminants to be washed out into the river. Use precast materials as much as possible. At all locations where concrete or other wet materials are to be used, make use of bunded steel decks to capture any spill.
PHY-Q-MM17	Hydrology and Surface water	Construction	Avoidance	Site installations (Site 2)	Before commencing water abstraction from the borehole in Site 2, do the following: - Identify other boreholes, wells or water sources used by the local population within 500 from Site 2. - Measure water quality and water flow from these wells on a monthly basis, continuing until two months after abstraction ceases. - If monitoring indicates a material reduction in water quality or water flow, stop abstraction. - If the reduction is substantial so to affect other users, identify and fund an alternative supply.
PHY-Q-MM18	Air quality	Construction	Avoidance	Quarry (Site 1) Site installations (Site 2)	Install an anemometer and a windsock as Site 1 in proximity of the quarry. Perform blasting only in conditions where the wind blows to the north or east so to avoid emissions to reach the communities located west and south. In case there are unfavourable conditions in terms of wind direction and communities and other receptors remain downwind for a long time, perform blasting only when wind speed is low.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-Q-MM19	Air quality	Construction	Minimization	Quarry (Site 1) Site installations (Site 2)	Where blasting is required, this will be limited to dedicated blasting times which will be negotiated with the potential affected communities in order to protect the people and minimize nuisance.
PHY-Q-MM20	Air quality	Construction	Minimization	Quarry (Site 1) Site installations (Site 2)	Use of water suppression along the access road and on both Site 1 and 2, to reduce dust emissions from vehicles.
PHY-Q-MM20a	Air quality	Construction	Minimization	Quarry (Site 1) Site installations (Site 2)	Use of water suppression to reduce dust emissions from rock stockpiles during placement and material removal in Site 1 and Site 2
PHY-Q-MM20b	Air quality	Construction	Minimization	Site installations (Site 2)	Use dust suppression mist sprays on the rock crushing plant (Site 2) in hot dry climatic conditions
PHY-Q-MM21	Noise and vibration	Construction	Minimization	Quarry (Site 1) Site installations (Site 2)	Plan blasting activities in consultation with local communities so that activities with the greatest potential to generate noise occur during a time of the day that will result in the least disturbance.
PHY-Q-MM22	Noise and vibration	Construction	Minimization	Quarry (Site 1) Site installations (Site 2)	Announce to the public on a board to be installed at the junction with the: -Quarry and site installations operations start and completion date - Working hours. - Information about permits obtained from local municipalities. - Existence of the grievance mechanism and whom people can turn to submit grievances or complaints.
PHY-Q-MM23	Noise and vibration	Construction	Minimization	Quarry (Site 1) Site installations (Site 2)	Inform local communities and negotiate with them blasting times in order to protect the people and minimize nuisance.
PHY-Q-MM24	Waste and wastewater	Construction	Minimization	Quarry (Site 1) Site installations (Site 2)	Keep a register of waste quantities and typology produced on both Site 1 and 2 and their final destinations (recycle / selling / treatment / disposal of and where).
PHY-Q-MM25	Waste and wastewater	Construction	Minimization	Quarry (Site 1) Site installations (Site 2)	Ascertain and document final waste destination and standards at which disposal sites are operated.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-Q-MM26	Waste and wastewater	Construction	Minimization	Quarry (Site 1) Site installations (Site 2)	All personnel working on Site 1 and 2 and drivers will be trained in proper waste management procedures as appropriate to their level of responsibility and duties. This will include training in concepts of site cleanliness and on appropriate waste management procedures, including waste reduction, reuse and recycling.
PHY-Q-MM27	Waste and wastewater	Construction	Minimization	Quarry (Site 1) Site installations (Site 2)	No wild dumping of waste will be permitted on Site 1 and 2 or beyond their fences or along the access road. Periodic visual inspections of the access road and beyond the site fences will be carried out and in case any waste is detected this will be cleaned up promptly.
PHY-Q-MM28	Waste and wastewater	Construction	Minimization	Quarry (Site 1) Site installations (Site 2)	Provide sanitary facilities with capacity to meet sanitation requirements of personnel at all construction locations. There must be toilet facilities on both Site 1 and 2 available for workers, in both buildings and openair work area. Personnel must use the provided facilities, which will be serviced daily to ensure hygienic conditions. Raw sewage must be contained and subject to treatment and disposal by a registered service provider at an appropriately permitted facility. Records of safe treatment and disposal of sewage must be maintained. Ensure that no other informal facilities are used than those provided by ICMC.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-Q-MM29	Waste and wastewater	Construction	Minimization	Quarry (Site 1) Site installations (Site 2)	Wastewater will be minimised. Any wastewater and run off water produced at both Site 1 and 2 that is not sewage, must be collected and diverted to an oil separator before it is discharged. Wastewater streams must be segregated to ensure that water from clean surfaces goes to a sedimentation pond before it is discharged. Quality of this water must be monitored periodically to ensure there is no contamination released into the environment.
PHY-Q-MM30	Waste and wastewater	Construction	Minimization	Quarry (Site 1) Site installations (Site 2)	Wastewater will be minimized by using chemical toilets to be placed on both Site 1 and 2 in sufficient number, to be managed through authorised contractors (domestic wastewater disposal).
PHY-Q-MM31	Waste and wastewater	Construction	Minimization	Quarry (Site 1) Site installations (Site 2)	Place garbage bins across Site 1 and 2 at production sites and in all buildings (such as offices and warehouse) as well as near the facilities.
PHY-Q-MM32	Waste and wastewater	Construction	Minimization	Quarry (Site 1) Site installations (Site 2)	Collect the domestic solid waste produced by the personnel in closed containers located at various points of the quarry and site installations.
PHY-Q-MM33	Waste and wastewater	Construction	Minimization	Quarry (Site 1) Site installations (Site 2)	Segregate packaging waste, paper, plastic and glass bottles resulting from the offices, refectory and other places used by workers and staff before they are sent to a licensed recycling facility.
PHY-Q-MM34	Waste and wastewater	Construction	Avoidance	Quarry (Site 1) Site installations (Site 2)	Collect spent lubricants and oil resulting from maintenance at the workshop, in a closed temporary waste storage shelter with impervious surface, secondary containment, and drainage system connected to an oil separator. The waste oils will be collected in cans or other suitable avoiding mixing different kinds of oils.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-Q-MM35	Waste and wastewater	Construction	Avoidance	Quarry (Site 1) Site installations (Site 2)	Identify a specific spot at the workshop where spent tires will be stored. This should preferably be a closed container to avoid that tyre pile up in an uncontrolled manner and collapse. Spent tyres will be disposed of in line with the applicable regulation on the waste tires.
PHY-Q-MM36	Waste and wastewater	Construction	Avoidance	Quarry (Site 1) Site installations (Site 2)	Ensure that iron and steel wastes from the steel yard are temporarily stored at a specific segregated spot at the yard before they are transported off site by a licensed recycling company in line with the applicable local legislation.
PHY-Q-MM37	Landscape	Construction	Minimization	Quarry (Site 1) Site installations (Site 2)	If spreading of invasive species is observed at the quarry or at Site 2, a focused eradication program will be developed and implemented.
PHY-Q-MM38	Landscape	Construction	Minimization	Quarry (Site 1) Site installations (Site 2)	Include in the additional public consultations to be carried out as part of the SEP implementation within the QAoI, topics relevant to landscape features elements that are important for the community.
PHY-Q-MM39	Landscape	Construction	Restore	Quarry (Site 1) Site installations (Site 2)	Upon closure of the quarry and site installations, reinstate all the temporary construction areas by means of a final soil cover that will be revegetated with local grasses, shrubs and trees.
PHY-Q-MM40	Landscape	Construction	Restore	Quarry (Site 1) Site installations (Site 2)	Revegetate Site 1 and 2 with native vegetation to make up for the lost habitats.
PHY-Q-MM41	Landscape	Construction	Restore	Quarry (Site 1) Site installations (Site 2)	Carry out periodic visual inspection of vegetation regrowth and health on Site 1 and 2 at the end of the construction phase.
PHY-Q-MM42	Landscape	Construction	Restore	Quarry (Site 1)	Reinstatement of quarry area will be carried out by phases and efficiency of revegetation monitored and controlled. Quarry terraces will be filled with soil stocked from the initial site clearance. Native shrubs will be used for first to quick cover the soil and avoid erosion

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
PHY-Q-MM43	Visual Quality	Construction	Minimization	Site installations (Site 2)	Use fencing and screening to obscure the view of site facilities if visible from the surrounding (from the public view). This can be done with natural barriers or decorative walls.
PHY-Q-MM44	Visual Quality	Construction	Minimization	Quarry (Site 1)	Use dark green or brown colours for partial wall painting when large cuttings are visible from far distance to attenuate the cutting visual effect.

Table 3: SPECIFIC MITIGATION MEASURES FOR BIOLOGICAL COMPONENTS – ROAD AND BYPASSES-

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM01	Biological component	Construction	Minimization - Removal/degradation of vegetation and topsoil - Change in land use	Entire AoI	Have a wildlife ecologist implementing biological pre-construction surveys before vegetation clearance to identify and relocate fauna species (not earlier than 7 days before clearance). Focus on fauna species with limited mobility (e.g. mammals, reptiles and amphibians) that cannot move ahead of construction. If any of these species are observed, collect and move them to undisturbed but similar sites outside the Project footprint.
BIO-MM01a	Biological component	Construction	Avoidance - Removal/degradation of vegetation and topsoil - Change in land use	Entire AoI	Plan soil and vegetation removal activities in advance to ensure that: - The Project's footprint be minimized and only the strictly necessary footprint is generated. - The amounts of excavated soils and vegetation clearance reflect the Project’s specifications.
BIO-MM01b	Biological component	Construction	Avoidance - Removal/degradation of vegetation and topsoil - Change in land use	Right of Way Camp Borrow pits Bridge construction areas Access roads Laydown areas	Avoid the use of herbicides or similar substances in any seasons and anywhere. Use mechanical removal of vegetation instead of fire, which is to be avoided in all cases.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM01c	Biological component	Construction	Minimization - Removal/degradation of vegetation and topsoil - Change in land use	Entire AoI	In case the vegetation removal activities cannot be avoided during the birds breeding season, have a qualified ecologist conducting pre-construction surveys of breeding nests within 48 hours before vegetation is cleared in the Project footprint and surroundings. If any are discovered, immediate action must be taken and evaluate if it is feasible to postpone working in that area until the breeding cycle is complete (this may take up to three weeks). If that is not possible, the nests and roosts will be transported to a secure similar undisturbed location. Specific pre-construction surveys will also be performed 48 hours before vegetation clearance to identify any bat roost potentially present within the Project footprint. If any permanent or temporary roosts are observed, take actions to allow bats to leave on their own at sundown and keep them from returning at sun set; actions may include removal or obstruction of the roost or closing the roost entrance, however this will be done only if no dependent young are present (e.g., maternity roosts are typically present between May through August).
BIO-MM01d	Biological component - Birds and bats	Construction	Avoidance – Removal/degradation of soil and vegetation - Change in land use	Entire AoI	Avoid any tree cutting during the nesting/maternity period for birds (from April until July) and bats (two pick seasons one in May-July and a second one in November-December). In case this activity cannot be avoided, please refer to the Mitigation measure BIO-MM01c.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM01e	Biological component - Arboreal mammals, small-medium size mammals, reptiles	Construction	Avoidance – Removal/degradation of soil and vegetation - Change in land use	Entire AoI	Before any vegetation clearance and tree cutting, ECow will perform a pre-construction survey for ground-nesting species, and species with limited mobility, such as reptiles, amphibians and pangolins, (please refer to BIO-MM01).
BIO-MM01f	Biological component - Great Apes and big mammals	Construction	Avoidance – Removal/degradation of soil and vegetation - Change in land use	Entire AoI	Avoid Great Apes disturbance. In case Great Apes nests are found during the pre-construction surveys (please refer to BIO-MM01), immediately stop the construction activities, inform the ECow, the authorities.
BIO-MM01g	Biological component - Great Apes and big mammals	Construction	Minimization – Removal/degradation of soil and vegetation - Change in land use	Entire AoI	The ECow will include a primatologist expert in the team.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM01h	Biological component - Terrestrial CH habitats	Construction	Minimization – Removal/degradation of soil and vegetation - Change in land use	Entire AoI	The ECow will include a qualified ecologist specialized terrestrial flora
BIO-MM01i	Biological component - Freshwater CH habitat; Aquatic and riparian fauna	Construction	Minimization – Change in hydrological regime - Water demand	Bridge construction areas Swamp reclamation areas Transversal drainage infrastructures (box and pipe culverts)	Whenever works are within riparian habitat or waterbodies, the pre-construction surveys will be developed by the Ecology Clerk of works (ECow) and will include a qualified ecologist specialized in freshwater species, fish and amphibians.
BIO-MM01j	Biological component - Freshwater CH habitat; Aquatic and riparian fauna	Construction	Minimization – Change in hydrological regime - Water demand	Bridge construction areas Swamp reclamation areas Transversal drainage infrastructures (box and pipe culverts)	Specific biological surveys (pre-construction surveys) will be implemented before any kind of intervention in the waterbodies, water channels and banks of the areas where interventions are previewed (demolition or removal of existent hydraulic structures, vegetation clearance, earthworks, culvert installation, maintenance). A team of biologists will perform the surveys not earlier than 7 days before the works will start. An expert freshwater ecologist will be present. The survey will focus on fauna species with limited mobility (e.g. small mammals, reptiles and amphibians) that cannot move ahead of construction. If any of these species are observed, they will be collected by the ECow and translocated to undisturbed but similar sites within the AoI. The same specimens will be reinstalled in the same area where they were collected after construction is finished, whenever the ECow consider the site is appropriate for them afterwards.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM01l	Biological component - Freshwater CH habitat	Construction	Minimization – Change in hydrological regime - Water demand	Bridge construction areas Swamp reclamation areas Drainage infrastructures	The pre-construction surveys will be developed by the ECow and will include a qualified ecologist specialized freshwater flora
BIO-MM01k	Biological component - Freshwater CH habitat	Operation	Minimization – Introduction and spreading of alien species	Bridge construction areas Swamp reclamation areas Drainage infrastructures	Before maintenance in drainage structures and green rows nearby watercourses (bridges, swamp reclamation) a visual flora survey will be developed by a qualified ecologist specialized freshwater flora to detect alien species presence.
BIO-MM02	Biological component	Construction	Minimization - Removal/degradation of vegetation and topsoil	Right of Way Borrow pits Drainage infrastructure Access Road Laydown areas	Store removed topsoil in a proper area, for later reinstatement and landscaping. This may include areas segregated from the construction activities on appropriate sheeting and under a cover to protect topsoil from weathering. The topsoil should not be positioned adjacent to ditches, water courses, future excavations and other construction activities. Do not mix topsoil with subsoil or rock-like topsoil materials

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM03	Biological component	Construction	Minimization - Removal/degradation of vegetation and topsoil - Change in land use	Entire AoI	Protect on-site natural habitats adjacent to the Project footprint from unintentional disturbance during construction. Demarcate Project working areas through highly visible wooden sticks or flags (50 cm high) put into the ground. Provide training to raise awareness among employees and contractors working on site about the protected species/habitats potentially present in the area; inform workers and employees on actions to be taken if wildlife is encountered.
BIO-MM03a	Biological component	Construction	Minimization - Removal/degradation of vegetation and topsoil - Change in land use	Entire AoI	Cover and fence all deep excavations to prevent the access of wildlife (including at night). Check daily (at beginning of the day and before dust) open trenches and other excavations to identify any entrapped animals. Undertake rescue of any entrapped animals minimizing animal stress and the risk of injury. For trenches that will need to be left open for a considerable time, install slopes or other escape measures for small animals at places that are not fenced off. Consult BMP for more specifics on the kind and sizes of fences to be used. The ECow will define the most apropriate fence to be used in each location.
BIO-MM04a	Biological component	Construction	Avoidance - Increase of road traffic	Entire AoI	Ensure that all the vehicles comply with the site safety signs and enter and exit the Project site along predefined routes and directions. Enforce safe driving rules, which among others include prohibiting vehicles' manoeuvrings and U-turns on public roads.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM04	Biological component	Construction	Avoidance - Increase of road traffic	Entire AoI	Restrict vehicles traffic to roads existing on the construction sites and to approved roads. Prohibit off road driving.
BIO-MM05	Biological component	Construction	Minimization - Increase of road traffic	Entire AoI	Brief all drivers accessing the site on speed restrictions. Install speed limits and animal crossing signs on the access road and enforce speed limits. Methods to make fauna signs effective include adding a speed limit, adding flashing lights, making signs physically larger, adding diamond reflecting materials, using portable rather than permanent sign. These methods must be reinforced in wildlife crossing areas and in core areas (such as swamps, forested areas). Identify, correct and report to HSE department any unsafe or irresponsible actions.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM08	Biological component	Construction	Minimization - Increase of road traffic	Entire AoI	If any fauna are encountered at a work location, ensure that employees and contractors wait until they leave or ask the assistance of a Wildlife Ecologist for safe removal and relocation in a suitable environment. If any fauna are injured during construction, the animal must be taken by the Wildlife Ecologist to the nearest vet or wildlife rescue centre for treatment. To reduce the likelihood that scavenging species will be struck by vehicles, roadkill will be removed or relocated by the Wildlife Ecologist and shall be reported as an environmental event. Moreover, all fauna deaths and real animal sightings in the project site and dumping areas will be reported. Project traffic routing will be reduced through areas of particular interest for autochthonous fauna species (birds, amphibians, mammals) wherever possible and during sensitive periods (nesting, reproduction).
BIO-MM08b	Biological component	Construction	Restoration - Increase of road traffic	Entire AoI	Restore all the temporary roads. Restore or reduce in width side roads of the existing N17 that will not be paved.
BIO-MM06	Biological component	Construction	Avoidance - Removal/degradation of vegetation and topsoil - Change in land use	Entire AoI	Avoid the accumulation of stagnant water and organic waste within the construction site that could attract wildlife, especially amphibians and birds. Cover all conduits, excavations, pits and similar facilities to avoid fauna being trapped or injured.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM60	Biological component	Construction	Avoidance - Influx of workers	Entire AoI	Prohibit the workers from fishing, hunting and arrangement of traps for animals and birds. Ensure that during the construction phase, any fauna species encountered will not be interfered with or disturbed until it moves on by itself. This includes the temporary stop of operations if required.
BIO-MM07	Biological component	Construction	Minimization - Influx of workers	Entire AoI	Train and inform all employees and subcontractors on the presence of conservation areas on site, on the biodiversity values, and how to behave in case of wildlife encounters. Partner with agencies responsible for law control, to enforce law illicit wildlife trade and bushmeat hunting.
BIO-MM08a	Biological component - Great Apes and big mammals	Construction	Avoidance - Increase of road traffic	Entire AoI	Prevent and reduce poaching and trade of protected species by, placing several check point controls in agreement with the Government. All trucks and moving vehicles will be labelled with serial numbers for properly and readily identifying the potential transgressors. Control will be carried out for all the vehicles in transit along the road.
BIO-MM08e	Biological component - Aquatic and riparian fauna; Arboreal mammals, small-medium size	Construction	Minimization - Increase of road traffic	Right of Way	Ensure an adequate frequency and variety of wildlife crossing structures in the road sections determined with the highest sensibility. Crossing structures will include under-passing taking advantage of drainage infrastructures (please refer to BIO-MM11d and BIO-MM11e) and tree-top overpassing that will consider specific needs for different fauna groups. More specifications for wildlife crossings may be provided in the Biodiversity Management Plan, together with adequate monitoring and maintenance.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
	mammals, reptiles				
BIO-MM08c	Biological component - Terrestrial and Freshwater CH habitat; all fauna groups	Construction	Restoration - Improvement of infrastructure	Entire AoI	Restore all temporary roads. All the access road used for construction and those detours (of the existing N17) that will not be upgraded will be restored or reduced in width, where feasible. All recovered areas must be maintained. A specific Biodiversity Management Plan will be developed to address monitoring plan, keeping track of the restoration activities, evaluating their effectiveness and should implement a maintenance plan.
BIO-MM08d	Biological component - Bats and birds	Construction	Restoration - Improvement of infrastructure	Bridges	Old structures that will not be demolished (such as bridges or buildings), may hold roosting spaces for birds and bats that should be conserved. Conflict may arise when old buildings are also used by humans, and solutions may be sought to both conserve bat roosts and bird nests and reduce any negative impacts on human inhabitants or visitors.
BIO-MM08g	Biological component - Bats and birds	Operation	Minimization - Soil occupancy- Increase of vehicular traffic	Bridges	Old structures not demolished (such as bridges or buildings), maintained for potential holding roosting spaces for birds and bats will be periodically visited. Awareness to promote non-disturb to bats and birds is recommended.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM08f	Biological component - Great Apes and big mammals	Operation	Avoidance - Soil occupancy- Increase of vehicular traffic	Entire AoI	Checkpoints Control. Register books will be used in the Check point controls to inform about any irregularity. Registers will be periodically sent to the appropriate Government authorities. In case of poaching detection, the checkpoint responsible will inform immediately according to a pre-stablished protocol. The Govern may use the checkpoint data to detect the need of improving support actions against poaching and to cushion a possible escalation on bushmeat hunting. Controls will be carried out for all the vehicles in transit along the road.
BIO-MM08h	Biological component - Great Apes and big mammals	Operation	Minimization - Soil occupancy- Increase of vehicular traffic	Entire AoI	Informative panels will be placed in visible areas informing the road crosses areas of high biodiversity sensibility and value and remembering the legal consequences of poaching.
BIO-MM09b	Biological component	Construction	Avoidance - Emission of noise and vibrations	Construction camp	Install visual, physical or audio deterrents to keep fauna away from construction areas (for example nets, fencing, or other barriers as well as streamers, reflectors and flagging).

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM09a	Biological component - Arboreal mammals, small-medium size mammals, reptiles; Great Apes and big mammals; Birds and bats	Construction	Avoidance - Emission of noise and vibrations	Entire AoI Right of Way	Plan activities involving high noise levels to commence each year outside the breeding and rearing periods (depending on the species). More detailed information is given in the mitigation measure for medium-low sensitivity biological component (BIO-MM01d; BIO-MM25)
BIO-MM09c	Biological component - Arboreal mammals, small-medium size mammals, reptiles; Great Apes and big mammals; Birds and bats; Aquatic and riparian fauna	Construction	Minimization - Emission of noise and vibrations	Entire AoI	The ECow wildlife ecologist will survey and monitor for presence of wildlife in the working areas after each prolonged work interruption (due to the seasonal constraint) .The wildlife biologist will conduct a survey within 48 hours to identify any wildlife species that could potentially repopulate the disturbed areas.
BIO-MM10a	Biological component	Construction	Minimization - Emission of noise and vibrations	Entire AoI	Adjacent natural and sensitive areas, consider the installation of the following sound barriers or a combination of them: artificial acoustic barriers; vegetative barriers, selecting plants tolerant for conditions (e.g., native species, and air/road contaminants); earth berms structures constructed from soil designed to block sound; low-height barriers.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM10b	Biological component	Construction	Minimization - Emission of noise and vibrations	Entire AoI	Purchase and use equipment with low sound power levels. The noise emission of equipment used at the site, expressed in terms of sound power level (LwA), must comply with the noise limits according to the power (kW) of the equipment. Install silencers for fans, suitable mufflers on engine exhausts and compressor components, acoustic enclosures for equipment casing radiation noise, vibration isolation for mechanical equipment. Maintain regularly the equipment to ensure noise levels are within the Project standards. Reduce noise impact from vehicle transport by switching off machinery or equipment engines during idle hours.
BIO-MM11a	Biological component - Freshwater CH habitat; Aquatic and riparian fauna	Construction	Avoidance - Changes in hydrological regime - Water demand	Abstraction in watercourses	Avoid extraction of water from low flowing rivers and/or in rivers already providing water to other users in the nearby area (e.g. for agribusiness/local use etc.). -Maintain river flow regimes natural in magnitude, frequency, duration and time. -Collect stormwater through a collection system, applying best management practices.
BIO-MM11b	Biological component	Construction	Avoidance - Changes in hydrological regime - Water demand	Entire AoI	Prevent the generation of pits and ponds, avoiding soil over consolidation and uncontrolled wastewater discharges, and implementing proper runoffs and stream channelling design. In case heavy rains lead to the generation of pits and ponds, promptly remove water and fill the pond.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM11	Biological component	Construction	Minimization - Changes in hydrological regime - Water demand	Right of Way Access Road Drainage infrastructure	Design box culverts/pipe culvert wildlife friendly to ensure road permeability and for the passage of both small- and medium-sized animals (amphibians, small mammals and reptiles). The minimum dimensions should be of 2m width x 2m height. Use natural earthen substrates that are more supportive to wildlife passage than concrete floors. Integrate inside the box and pipe culverts terracing structures. A wildlife ecologist will manage the functionality and maintenance of the culvert.
BIO-MM11c	Biological component - Aquatic and riparian fauna	Construction	Minimization - Changes in hydrological regime - Water demand	Transversal drainage infrastructures (box and pipe culverts)	Install box and pipe culverts to ensure road permeability and to ensure the continuity of waterways, the natural flow, the avoidance of stagnant water, and so to not constitute a barrier to fish movement.
BIO-MM11d	Biological component - Aquatic and riparian fauna	Construction	Minimization - Changes in hydrological regime - Water demand	Transversal drainage infrastructures (box and pipe culverts)	For transversal drainage structures: -Installation of either box or pipe culverts must ensure the watercourse flow as natural regime, even when waters are low. -Must be positioned similar to the initial precise longitudinal profile of the watercourse which must be determined by a precise topographic survey. -Once slope angles are determined, the leading edge of the foundation should be installed at least 30 cm below the natural bed of the stream. Burying the foundation also makes it possible to correct small errors in the positioning of the structure during installation and recreate a favourable rough bottom surface.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM11e	Biological component - Aquatic and riparian fauna	Construction	Minimization - Changes in hydrological regime - Water demand	Transversal drainage infrastructures (box and pipe culverts)	For transversal drainage structures: -Design box culverts/pipe culvert wildlife friendly to ensure road permeability and for the passage of both small- and medium-sized animals (amphibians, small mammals and reptiles). -The minimum dimensions should be of 2m width x 2m height. -Integrate inside the box and pipe culverts terracing structures. -Use rectangular shape as preferred. Vertical walls provide a better guidance and larger floor space. -When pipes will be used the base should be filled to provide a flat surface for walk on. -Use natural earthen substrates that are more supportive to wildlife passage than concrete floors. -Keep the bottom of the structure at all times above the level of the groundwater. -Entrances should be located in recesses along the fence line so that animals are guided to them. -No roads or tracks that interrupt the habitat connectivity adjacent to the underpass should be built parallel to the infrastructure being crossed. -A wildlife ecologist will monitor and manage the functionality and maintenance of the culvert (as wildlife crossing).
BIO-MM12	Biological component - Aquatic and riparian fauna	Construction	Minimization - Changes in hydrological regime - Water demand	Bridge construction areas Swamp reclamation areas Transversal drainage infrastructures (box and pipe culverts)	The ECow will regularly inspect cofferdams to prevent the death of fishes. Collect any individuals present and bring them to undisturbed but similar sites.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM12a	Biological component - Aquatic and riparian fauna	Construction	Minimization - Changes in hydrological regime - Water demand	Abstraction in watercourses Swamp reclamation areas	Cofferdams or similar protections will be used to prevent injury or death to fish and freshwater fauna from pumping systems allocated in rivers. The same systems may be used during swamp reclamation to avoid fauna injury.
BIO-MM13	Biological component - Freshwater CH habitat; Aquatic and riparian fauna	Construction	Minimization - Changes in hydrological regime - Water demand	Bridge construction areas Swamp reclamation areas Transversal drainage infrastructures (box and pipe culverts)	If erosion is observed at river crossings, implement environmental engineering techniques to stop it and ensure soil protection and the development of natural vegetation. Environmental engineering techniques will include as appropriate: erosion control mat, live crib wall, rock mattresses, hydro seeding and afforestation with appropriate species etc.
BIO-MM13a	Landscape and visual quality	Operation	Minimisation	Entire AoI	If erosion is observed environmental engineering techniques will be put in place to stop it and ensure soil protection and the development of natural vegetation. Environmental engineering techniques will include as appropriate: erosion control mat, live crib wall, rock mattresses, hydro seeding and afforestation with appropriate species and the like.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM14	Biological component	Construction	Minimization - Changes in hydrological regime - Water demand	Entire AoI	In order to attenuate flows and minimise sediment input into the local hydrography, direct all surface water run-off from the construction site to a temporary facility, where the flow will be reduced and sediments allowed to settle.
BIO-MM15	Biological component	Construction	Minimization - Changes in hydrological regime - Water demand	Bridge construction Drainage infrastructures	Minimise the risk of any water run-off of cementitious material into streams from the landside elements of the construction. All construction material must be kept securely installed and inspected for leaks. All the cement pouring operations must be supervised and monitored for spills and leaks. To eliminate any remaining risks, all pouring of concrete, sealing of joints, application of water-proofing paint or protective systems, curing agents etc. for outfalls will be completed in dry weather. At last, at all locations where concrete or other wet materials are used, bunded steel decks will be used to capture any spilled concrete, alkaline water displaced from inside tubular steel piles or spilled sealants or other materials.
BIO-MM17a	Biological component - Terrestrial and Freshwater CH habitat	Construction	Minimization - Introduction and spreading of alien species	Entire AoI	Restore all areas cleared during construction for temporary use, such as storage areas and laydown areas, immediately after construction completion. Restoration will follow best practices with the goal of producing a stable vegetative cover to minimize erosion, dust and spreading of invasive alien species.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM17b	Biological component - Terrestrial and Freshwater CH habitat	operation	Restoration - Removal/degradation of soil and vegetation - Change in land use	Entire AoI	Restored temporary used areas and in general all the areas where maintenance of vegetation is close to high sensitivity areas (e.g. swamp forest, riparian habitat) must be surveyed from a flora biodiversity specialist to detect incipient presence of alien species. The surveys will also evaluate the restoration efficiency and the need for further complementing the restoration activities.
BIO-MM19	Visual resources	Construction	Restore	Entire AoI	Only plants that are native to the region will be used for restoration, soil improvement, erosion control, stream banks and habitat rehabilitation. Seeding and planting of grass shrubs and tree species typical of the local vegetation species, such as mosaics of steppe and mixed forest vegetation succession, will be used to ensure optimal ground cover.
BIO-MM20	Biological component - Terrestrial and Freshwater CH habitat	Construction	Avoidance – Removal/degradation of soil and vegetation - Change in land use	Entire AoI	Avoid direct clearance and disturbance of areas where flora and fauna species triggering CH are identified. If not feasible, other mitigation measures will be applied (BIO-MM01a).

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM21	Biological component - Terrestrial and Freshwater CH habitat	Construction	Avoidance – Removal/degradation of soil and vegetation - Change in land use	Entire AoI	Have an expert botanist within the Ecology Clerk of works (ECow) performing a survey in the areas to be cleared of vegetation and its immediate surroundings. The expert must carry out the surveys during the flowering period of the species identified as triggering CH (and the 18 flora species identified as Potentially CH). The data regarding date, location, population extension and number of individuals will be recorded to allow for the correct planning and execution of other mitigation measures.
BIO-MM22	Biological component - Terrestrial and Freshwater CH habitat	Construction	Minimization – Removal/degradation of soil and vegetation - Change in land use	Entire AoI	Salvaging and Direct Translocation: If any flora individuals triggering CH (and potentially CH) are going to be impacted by the Project footprint, the expert botanist have to salvage them before the construction activities and translocate them to an appropriate site. The translocation of individuals must be performed during the dormant stage to minimize stress to the plant. The data regarding date, location, source species and number of individuals collected and translocated will be recorded
BIO-MM23	Biological component - Terrestrial and Freshwater CH habitat	Construction	Minimization – Removal/degradation of soil and vegetation - Change in land use	Entire AoI	Protect on-site natural habitats and CH triggering flora species adjacent to the Project footprint from unintentional disturbance during construction. Demarcate habitats and CH triggering species through highly visible wooden sticks or flags (50 cm high) put into the ground. Provide training to raise awareness among employees and contractors working on site about the protected species/habitats present in these demarked areas. These demarked areas will be by clearly identified both on the maps and in the field as exclusion zone where soil and vegetation will be preserved, and access will not be permitted. Please, refer to the BIO-MM07 for the awareness among employees and contractors working on site.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM24	Biological component - Terrestrial and Freshwater CH habitat	Construction	Minimization – Removal/degradation of soil and vegetation - Change in land use	Entire AoI	Seed collection: Perform seed collection for endemic and CH-triggering flora species, identified within the Project Activities footprint.The expert botanist will collect and conserve seeds following the best practice indicated by the Millenium Seed Bank. Seeds collected will be separately stored for each species and sub population using clearly identifiable codes and will be donated to the most relevant African Seed Bank association for storage and scientific research.
BIO-MM25a	Biological component - Freshwater CH habitat; Aquatic and riparian fauna	Construction	Avoidance - Changes in hydrological regime - Water demand	Bridge construction areas Swamp reclamation areas Transversal drainage infrastructures (box and pipe culverts)	Avoid any changes or modification in the hydrological regime. Decision at the design level on the Project footprint will avoid disruption of water bodies using box and pipe culverts. Bridges's foundation must be laid as far back as possible from the minor bed, the banks and the riparian forest in order to guarantee the stability of these environments and to restore ecological continuity.
BIO-MM25b	Biological component - Freshwater CH habitat; Aquatic and riparian fauna	Construction	Avoidance - Changes in hydrological regime - Water demand	Bridge construction areas Swamp reclamation areas Transversal drainage infrastructures (box and pipe culverts)	Any works developed within waterbodies temporary or permanent (swamps, rivers, streams) will be performed considering the driest period of the year.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM25	Biological component - Aquatic and riparian fauna	Construction	Avoidance - Changes in hydrological regime - Water demand	Right of Way Bridge construction areas Swamp reclamation areas Transversal drainage infrastructures (box and pipe culverts)	The Contractor will avoid activities involving modification of river or stream beds and shoulders during breeding and spawning periods of the fish, amphibians and reptile’s species, which typically breed in aquatic environments such as ponds, wetlands, and streams during the rainy season. Generally, this happens twice a year, one during September-October, and the second during from April to June. Normally, the reproductive migrations of fish species take place as water rise in May and October.
BIO-MM26	Biological component - Aquatic and riparian fauna	Construction	Minimization - Changes in hydrological regime - Water demand	Right of Way Bridge construction areas Swamp reclamation areas Transversal drainage infrastructures (box and pipe culverts)	The ECow wildlife ecologist will regularly inspect the diverted rivers or streams areas, before any modification takes place the activities involving modification of river or stream beds and shoulders. If any fauna species are observed, they the wildlife ecologist will be collect them by the wildlife ecologist and translocated to undisturbed but similar sites outside the affected area.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM26a	Biological component - Aquatic and riparian fauna	Construction	Minimization - Changes in hydrological regime - Water demand	Right of Way Bridge construction areas Swamp reclamation areas Transversal drainage infrastructures (box and pipe culverts)	Amphibian CH species translocation. *Conraua goliath* breed exclusively in the dry season (November to April). If any eggs/individuals of this species are found, the wildlife ecologist must collect and translocate them to undisturbed but similar sites outside the affected area
BIO-MM26b	Biological component - Aquatic and riparian fauna	Construction	Minimization - Changes in hydrological regime - Water demand	Right of Way Bridge construction areas Swamp reclamation areas Transversal drainage infrastructures (box and pipe culverts)	The ECow wildlife ecologist will inspect the areas, before the start of activities involving modification of river or stream beds and shoulders, including inspection of the areas nearby. If any mound nest of *Osteolaemus tetraspis* (African dwarf crocodile) species are observed, they will not be disturbed until the end of eggs incubation. Activities will be stopped and postponed.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM26c	Biological component - Bats and birds	Construction	Minimization - Changes in hydrological regime - Water demand	Right of Way Bridge construction areas Swamp reclamation areas Transversal drainage infrastructures (box and pipe culverts)	Bridges and culverts can provide roosting and nesting opportunities for birds and bats. Incorporate into the design of new bridges and culverts, suitable roosting and nesting spaces, such as crevices or chambers, can be incorporated into the design of new bridges and culverts, or can be retrofitted to existing structures
BIO-MM28	Biological component	Operation	Minimization - Soil occupancy - Increase of road traffic	Entire AoI	Based on the results of the monitoring conducted during the Construction phase, consider planning additional measures in specific sections of the roads/bridge where observation of wildlife crossings are reported: fencing of particular section of the roads to avoid wildlife crossing and conduct wildlife toward safe crossing locations; creation of extra underpasses or overpasses designed in a way to be useful for wildlife.
BIO-MM29	Biological component	Operation	Minimization - Soil occupancy - Increase of road traffic	Entire AoI	Based on the results of the monitoring conducted during the Construction phase, consider using barrier-like structures to reduce the proportion of birds flying in locations of high collision risk, such as in areas close to the Campo Ma'an complex KBA and IBA and in the major freshwater crossings.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM30	Biological component - Freshwater CH habitat; Aquatic and riparian fauna	Operation	Minimization - Soil occupancy - Increase of road traffic	Drainage structures Bridges	Conduct regular inspections of the drainage system (box, pipe culvert and bridges) to remove trapped wildlife individuals and clean structures in order maintain their functionality as wildlife crossings
BIO-MM30a	Biological component - Freshwater CH habitat; Aquatic and riparian fauna	Operation	Minimization - Discharge or introduction of pollutants in freshwater and groundwater	Drainage structures Bridges	Maintenance interventions in drainage structures will be developed during dry period Whenever possible interventions in drainage structures will be developed manually and, in any case, avoiding any machinery entering in the channel. Visual inspections of the area 48 h before the drainage cleanings will be carried out. An expert freshwater ecologist will perform the survey. Will focus on fauna species with limited mobility (e.g. small mammals, reptiles and amphibians) The following measures will be also adopted if needed: BIO-MM25; BIO-MM26a; BIO-MM26b
BIO-MM31	Biological component	Operation	Minimization - Soil occupancy - Increase of road traffic	Entire AoI	Avoid the accumulation of stagnant water and organic waste in the vicinity of the Project (100 m), that could attract wildlife.
BIO-MM71	Biological component	Operation	Minimization - Soil occupancy - Increase of road traffic	Entire AoI	To avoid attractiveness of wild animals, modify vegetation along the road to reduce collisions. Vegetation alongside the road may become a feeding ground that attracts animals while, at the same time, blocking the view of oncoming vehicles.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM32	Biological component	Operation	Minimization - Soil occupancy - Increase of road traffic	Entire AoI	Whenever there is the periodic maintenance of the road/bridges and of associated infrastructures, apply all mitigation measure proposed for the Construction phase. Apply always the mitigation measures BIO-MM04a, BIO-MM04, BIO-MM05, BIO-MM08, BIO-MM60 and BIO-MM07.
BIO-MM33	Biological component	Operation	Minimization - Emission of light	Entire AoI Toll, counting and weighting stations	Whenever there is the periodic maintenance of the road/bridges and of associated infrastructures, apply all mitigation measure proposed for the Construction phase. Apply always the mitigation measures BIO-MM53 and BIO-MM53a.
BIO-MM33a	Biological component	Operation	Minimization - Emission of light	Entire AoI Toll, counting and weighting stations	Allow, parking and stopping only in designated clearly signalled areas. Switch off lights whenever not necessary.
BIO-MM34	Biological component	Operation	Minimization - Discharge or introduction of pollutant in freshwater and groundwater	Entire AoI	Whenever there is the periodic maintenance of the road/bridges and of associated infrastructures, apply all mitigation measure proposed for the Construction phase. Apply regularly the mitigation measure BIO-MM13.
BIO-MM34a	Biological component	Operation	Minimization - Emission of greenhouse gases- Emission of gaseous pollutants Emission of dust and particulate matter – Noise and vibration	Entire AoI	When not in use, park maintenance vehicles and all vehicles used by the operators in designated areas with the engine off. Place parking areas at least 100 m far from any watercourses and waterbodies.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM34b	Biological component	Operation	Minimization - Emission of greenhouse gases- Emission of gaseous pollutants Emission of dust and particulate matter – Noise and vibration	Toll, counting and weighting stations	Equip traffic control in the toll, counting and weighting stations so that a general check can be carried out for the vehicles regarding emission of air pollutants, noise and vibrations.
BIO-MM35	Visual resources	Operation	Restore	Entire AoI	Areas cleared during construction for temporary use, such storage areas, will be restored, as soon as possible, with the goal of producing a stable vegetative cover to minimise erosion, dust and spreading of invasive alien species, and the aim of re-establish the original habitat with a positive impact on biodiversity.
BIO-MM36a	Visual resources	Operation	Minimisation	Entire AoI	Plant trees and other vegetation for landscaping around the new infrastructures (e.g. toll, counting and weighting stations) Use plants that are native to the region. Control periodically the spread of alien species.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM38	Biological component - Arboreal mammals, small-medium size mammals, reptiles; Great Apes and big mammals; Birds and bats	Operation	Minimization - Soil occupancy - Increase of road traffic	Drainage structures Bridges Right of Way	Monitor the effectiveness and the maintenance of the wildlife crossing. Please refer to: BIO-MM61, BIO-MM61a
BIO-MM38a	Biological component - Great Apes and big mammals	Operation	Minimization - Soil occupancy - Increase of road traffic	Right of Way	Based on data from biodiversity monitoring and advise from the construction ECow and biodiversity experts, fauna signals should be included in strategic points of the roadway, where collision with high sensitivity fauna is likely. Fauna signals should go placed along with measures for traffic speed reduction (speed signals and bumps if needed)
BIO-MM41	Biological component	Construction	Avoidance - Change in the local morphology and topography	Entire AoI	Avoid unnecessary levelling and excavations and ensure the excavation rates strictly follow the Project design specifications. Base design on the site-specific characteristics and the natural state of the landscape. Similarly, avoid the creation of unnecessary high reliefs. Unauthorized and uncontrolled soil and rocks piles will be avoided. No digging of materials will be allowed.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM42	Biological component	Construction	Minimization - Change in the local morphology and topography	Entire AoI	Ensure no excessive changes in the local morphology and topography and that the general slope of the site be preserved. Strictly follow the Project design drafted accordingly to specific technical studies. Ensure excavation and the foundation leave no voids (i.e., sinking prevention). Avoid unnecessary over consolidation of the soil.
BIO-MM43	Biological component	Construction	Restoration - Change in the local morphology and topography	Entire AoI	Restore excavated areas immediately after construction completion using the most effective bio-engineering techniques (e.g. slope plantings, plant-root reinforced and anchored slopes).
BIO-MM43a	Biological component	Construction	Avoidance - Emission of greenhouse gases - Emission of gaseous pollutants	Entire AoI	Ensure that engines, vehicles, equipment and machinery are properly switched off/turned off while not in use.
BIO-MM44	Biological component	Construction	Avoidance - Emission of greenhouse gases - Emission of gaseous pollutants	Entire AoI	Carry out i) regular periodical maintenance on equipment and machinery; ii) periodical maintenance and control on the emission control systems (e.g., aspiration and filtration systems) serving the machinery, equipment and vehicles; iii) periodical verifications on the fuel and oil types used and on their consumption; iv) periodical control on the speed of moving trucks; v) periodical verification of the weight of the truckloads. Retain a specialized subcontractor to carry out the periodical maintenance and controls and track them on a dedicated log to be kept on site.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM45	Biological component	Construction	Minimization - Emission of greenhouse gases - Emission of gaseous pollutants	Entire AoI	Reduce the Project GHG footprint and gaseous emissions adopting specific measures such as: - minimize the materials and goods transportation impacts by defining preferential roads to be followed. - Minimise the use of air transport and planes. - Purchase low Sulphur fuels. - Source engines, machinery, vehicles, and equipment operating on carbon-neutral biofuels or renewable energies. - Ensure that the cooling systems to be installed in the administration/offices area exclusively contain refrigerant gases with low global warning potential (GWP); the cooling system will be periodically inspected for detecting potential pollutive gas leakages. - Define strategies for reducing, reusing, and recycling waste and, consequently, minimise waste disposing off to landfills. - Prefer eco-friendly building materials and consider renewable energy generation options on-site.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM46	Biological component	Construction	Avoidance - Emission of dust and particulate matter	Entire AoI	Adopt specific mitigations for avoiding dust and particulate matter generation and dispersion: - segregate, spray down with water and protect from weathering any loose material temporarily stored on the Project construction area. - Store granular material in stalls, or in controlled and treated heaps protected with tarpaulins. - Install covered and uncovered warehouses for storing small/medium construction materials and equipment. - Ensure the height of the mounds/piles of loose material should are no more than 2 m and the slope angle no more than 30° for preventing flows and sliding. - Use wind barriers (protective fences) in sensitive areas and/or if fauna damages is observed. - Avoid long-term stockpiling of material; when long stockpiling is necessary, piles should be capped or grassed over. Supervise the construction site for ensuring the adoption of the mitigation measures by carrying out periodical visual inspections.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM47	Biological component	Construction	Avoidance - Emission of dust and particulate matter	Entire AoI	Implement the following actions: - spray roads down with water (please refer to BIO-MM11a) one or two times per day (during the dry season and/or periods of transition to the wet season); - ensure that all moving vehicles follow pre-defined routes; - restrict to 20 km/h the speed limit for heavy vehicles within the construction site; - cover up the trucks and the other moving vehicles transporting loose materials during transportation; - periodically wash/clean trucks and other moving vehicles prior to leaving the construction site. Supervise the construction site to ensure the proper adoption of mitigation measures by carrying out periodical visual inspections.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM48	Biological component	Construction	Minimization - Emission of dust and particulate matter	Entire AoI	Ensure that: - sufficient water is available on site for dust suppression (please refer to BIO-MM11a); - the construction activities do not result in exceedances of the air quality objectives/limit values for gaseous pollutants and for dust deposition; - the excavation surfaces be stabilized, covered up and/or re-vegetated as soon as possible; - abetment measures and control systems (e.g., welding tents and barriers or mobile aspirators equipped with filters) be adopted when operations such as welding, cutting, grinding and sandblasting (representing major sources of airborne particles) are carried out.. Carry out periodical on-site visual inspections for assessing the proper management of dust control measures.
BIO-MM49	Biological component	Construction	Minimization - Emission of dust and particulate matter	Entire AoI	Ensure that truck loading and unloading operations be carried out properly and that dust is minimised. Appoint workers to spray down (please refer to BIO-MM11a) with water the materials over dump trucks before unloading.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM50	Biological component	Construction	Avoidance - Discharge or introduction of pollutants in freshwater and groundwater	Entire AoI	Ensure vehicles (e.g., trucks meant for goods and materials transportation, dumper trucks, concrete mixers, bulldozers) follow predefined paths and roads, avoiding crossing water bodies. Ensure they are regularly cleaned and repaired/maintained. Ensure that: - no dirty or damaged vehicles leave the construction site; - the goods and materials to be transported by road are properly secured for avoiding goods tripping, flipping and overflows; - the moving vehicles transporting sludge, semi-solid and liquids have perfect tightness and are equipped with spills prevention kits. - Drivers are authorized and trained to respond in case of accidental spills and leaks.
BIO-MM51	Biological component	Construction	Avoidance - Discharge or introduction of pollutants in freshwater and groundwater	Entire AoI	Ensure that no intentional or accidental discharge of liquid, semi-solid or muddy materials into surface waters occur. The proper supervision of materials quantities, paths and destination will help preventing such potential issue.
BIO-MM52	Biological component	Construction	Avoidance - Discharge or introduction of pollutants in freshwater and groundwater	Entire AoI	Prevent pollutant runoffs: - Store properly solid and liquid products and waste on the construction site; - Stockpile and cover fine-grained material. This must be placed 30 m from the drains or from the areas where seasonal water channels generated; - Design and install a station for properly collecting and managing the wastewater deriving from the construction site activities.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM53a	Biological component	Construction	Avoidance - Emission of light	Entire AoI	Adopt specific measures to avoid effects of lighting: - avoid direct light to the adjacent natural and sensitive areas. Direct lights solely onto work areas (i.e. use of spotlights instead of floodlights). For road and amenity lighting installations, light near to and above the horizontal should normally be minimized to reduce glare and sky glow; - avoid long wavelength light sources, higher than 700 nm, thus red lights. Avoid light blue/violet (400 – 500nm) and ultra-violet wavelengths (< 400nm). Use "warm-white" rather than "cool" LEDs; - use amber spectrum bulbs (wavelength of 500 – 700nm), with minimal blue; - consider lumens (amount of light produced) rather than watts (amount of energy used) when selecting lighting and prefer low glare lighting fixtures to reduce excessive brightness and diffuse light. - consider flashing lights instead of steady lights. - consider use of vegetative screens (e.g., trees and shrubs) and wildlife tunnels to shield habitat for light-sensitive wildlife.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM53	Biological component	Construction	Minimization - Emission of light	Entire AoI	Design lighting to ensure construction safety while minimizing light intensity. Minimize activities at night, particularly where the Project is in proximity to sensitive areas. When selecting luminaires, ensure that suitable products are chosen and that their placement minimizes stray light and glare. Prefer dark-sky compliant full-shielded (i.e., full cut-off) light fixtures that direct light downwards below the horizontal plane and result in no up-light. Keep glare to a minimum by ensuring that the main beam angle of all lights directed towards any potential observer is not more than 70°. Higher mounting heights allow lower main beam angles, which can assist in reducing glare. When lighting vertical structures, direct light downwards wherever possible. If there is no alternative to up-lighting, then use shields, baffles and louvres to reduce spill light around and over the structure to a minimum. In rural areas use full horizontal cut off luminaires installed at 0° uplift to help minimize visual intrusion within the open landscape.
BIO-MM54	Biological component	Construction	Avoidance - Waste and wastewater generation	Entire AoI	Develop systems and strategies for improving waste recycling and for reusing materials as by-products, where possible. Whenever possible choose waste recycling or recovery plants for landfills. Transport waste that cannot be recycled to the closest suitable treatment or disposal site. Ensure that waste management be compliant with the Project specifications and the Management Plan.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM55	Biological component	Construction	Avoidance - Waste and wastewater generation	Entire AoI	Ensure that: - Project construction sites are equipped with proper temporary waste storage/accumulation areas; - the temporary waste storage/accumulation areas are roofed, concrete-paved or waterproofed or equipped with containment trays to prevent spills and leakages; - the waste is segregated and stored per categories and labelled for identification and classification; - the drains of the waste storage/accumulation areas collect the water runoffs and convey them into the wastewater treatment plant; - no waste mixing, no storing on the bare land and no burning is carried out; - materials that can be recycled such as packaging paper, plastic and glass bottles will be sent to licensed recycling facilities, as far as practicable; - the waste deriving from the equipment maintenance (e.g., filters, oily rugs and metal parts containing hydrocarbons, oils and lubricants) is properly stored on a leak-proof floor covered with a shelter and then sent to recovery/disposal; - the waste oils is collected in specific containers; - oils is not mixed for storage; - a specialist carry out regular site inspections for verifying the spills and leaks containment systems conditions and integrity; - site workers are trained on good practices and arrangements for collection, safe handling and effective and correct disposal of both hazardous and non-hazardous waste. The training includes indications and best-practices for enhancing waste reduction, reuse and recycling; - the medical waste generated from the site infirmary is not mixed to the general waste but it will be properly segregated, and it will be managed by a company licensed for managing medical waste.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM56	Biological component	Construction	Avoidance - Waste and wastewater generation	Entire AoI	Ensure that the materials and chemicals used onsite (i.e., paints, glues, oils, thinners, and plastics) be sourced and purchased according to the Project standards. The usage of non-compliant or unlabelled chemicals must be avoided. Ensure that chemicals bins and trays are properly labelled. The materials and chemicals' labels need to show the product name and the hazard pictograms (e.g., Hazardous to the environment or acute toxicity symbols). Each product will be equipped with its updated MSDS showing the productor name, the chemical formula/the components, the hazard pictograms, the warnings and the danger indications and the safety advice on the proper personal or collective protection equipment to be used for the handling. Avoid unproper management of chemicals. The Contractor will ensure that the materials and chemicals used onsite will be properly stored in dedicated locations which will be locked-up and well-ventilated.
BIO-MM57	Biological component	Construction	Avoidance - Waste and wastewater generation	Entire AoI	Whether hazardous or non-hazardous, forbid the open burning of solid wastes. Ensure that no intentional or accidental waste burning occur on site. The Contractor will take immediate actions – according to the legal framework - in case a waste arson starts

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM58	Biological component	Construction	Avoidance - Waste and wastewater generation	Entire AoI	Ensure that fencing be installed to keep off animals from accidentally entering the Project areas and waste storages. Ensure that fencing used for delimiting areas is designed so that is not harmful to wildlife. Fence design will consider materials used (non-bared wire), height of strands and permeability to ensure they are wildlife friendly. In addition, install visual, physical and/or audio deterrents to keep fauna and avifauna away from waste storages, for example, using streamers, reflectors and flagging.
BIO-MM59	Biological component	Construction	Avoidance - Waste and wastewater generation	Entire AoI	Install trash bins all over construction sites for avoiding waste spreading, burning and burial. Collect, segregate and manage the domestic solid waste from the accommodation camp and the rest areas as per the Project standards. Ensure the HSE team raise workers’ awareness on the proper general waste disposal.
BIO-MM70	Biological component	Construction	Restoration - Waste and wastewater generation	Entire AoI	As soon temporary waste storage/accumulation areas are dismantled/decommissioned, restore them before they are used for other purposes or revegetated. If revegetated, specific measures are going to be developed in the Biodiversity Management Plan. The plan will include the control of the quality of the plant soil, the quality of mixtures for hydroseeding, the engraftment of planted tree and shrub individuals, the management of reforested areas over time, the use of rescue irrigation if necessary.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM60a	Biological component - Arboreal mammals, small-medium size mammals, reptiles; Great Apes and big mammals; Birds and bats	Construction	Avoidance - Influx of workers	Entire AoI	Zero tolerance for poaching. All personnel have zero tolerance for hunting, purchasing, and consuming prohibited species of wildmeat. Worker's eating turns are only allowed in adequate areas followed by full remains collection and disposal.
BIO-MM60b	Biological component - Great Apes and big mammals	Construction	Avoidance - Influx of workers	Entire AoI	Workers will not be allowed to introduce pets and domestic animals in the Project AoI
BIO-MM60c	Biological component - Great Apes and big mammals	Construction	Minimization - Influx of workers	Entire AoI	Strict hygiene and behavioural conduct protocol for all workers including those in the supply chain. Waste disposal units and latrines along the working areas and AoI with frequent and adequate cleaning and management. No spitting, defecating or leaving cigarette butts is allowed in the environment. Human hygiene must be encouraged with periodical training and constant awareness. Conduct periodic health screenings among workforce and monitoring of health conditions. Encourage healthy practices, self-declaration of illness, hand-washing facilities, and immunization programme.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM61	Biological component	Construction	Minimization - Improvement of infrastructure	Right of Way Access Road Drainage infrastructures Bridge construction	Implement barrier fences for reptiles, small mammals and other small species. Install them in association with underpasses to form a funnel leading towards box and pipe culvert entrances. For arboreal mammals (i.e small arboreal primates, squirrels, martens) install canopy bridges, such as rope bridges.
BIO-MM61a	Biological component - Great Apes and big mammals; arboreal mammals, small-medium size mammals, reptiles	Construction	Minimization - Improvement of infrastructure	Entire AoI	Camera traps will be installed in the more sensitive wildlife crossing hotspot areas and structures to verify the effectiveness of the implemented mitigation measure. Please refer to BIO-MM61.
BIO-MM62	Biological component	Construction	Minimization - Improvement of infrastructure	Entire AoI	Organize the construction site areas and the storage areas of material and work vehicles in such a way as to optimize its footprint.
BIO-MM63	Biological component	Construction	Minimization - Improvement of infrastructure	Right of Way Camp	In all temporary and permanent infrastructure (such as Camp Site, toll station etc.), install window decals or non-reflective window covering to reduce the potential for bird window strikes. Use bird-friendly glasses or bird bollards to be installed on glass to avoid reflective glass. In case power lines are going to be relocated, appropriately plan to avoid direct collision, mortality and electrocution, such as bury or isolate power lines.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM64	Biological component	Construction	Avoidance	Entire AoI	Apply rigorous and appropriate process of controls at all site gates (excluding emergency gates), to prevent accidental introduction of invasive alien species. Clean the wheels of trucks before the trucks leave the dumping area sites.
BIO-MM65	Biological component	Construction	Minimization - Introduction and spreading of invasive alien species	Entire AoI	In case alien (invasive) species are detected, reduce their impacts through eradication, containment, exclusion, or population reduction by physical or biological control. Design and implement effective management programmes appropriate for each species and habitats, incorporating best-practise standards.
BIO-MM66	Biological component	Construction	Minimization - Introduction and spreading of invasive alien species	Entire AoI	Adopt a monitoring plan, to annually verify the presence of invasive species through field surveys.
BIO-MM67	Biological component - Freshwater CH habitat	Construction	Minimization - Changes in hydrological regime - Water demand	Swamp reclamation areas	Avoid whenever feasible, activities involving modification or reduction of swampy areas and habitat loss in swamp areas. Alternatively, other mitigation measures will be applied (please refer to BIO-MM11).
BIO-MM67a	Biological component - Freshwater CH habitat	Construction	Minimization - Changes in hydrological regime - Water demand	Swamp reclamation areas	Plan the construction site activities in such a way as to optimize the spatial footprint and reduce as much as possible the impact on swamp area and habitat loss in swamp areas.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM68	Biological component - Freshwater CH habitat; Aquatic and riparian fauna	Construction	Restoration - Changes in hydrological regime - Water demand	Right of Way Bridge construction areas Swamp reclamation areas Transversal drainage infrastructures (box and pipe culverts)	If any freshwater habitats are degraded by the construction activities, recovery actions for restore those habitats will be implemented to maintain the form and function of these ecosystems. The various restoration techniques include physical methods such as sewage interception, dredging, non-native plant species and algae removal, and biological processes which include restoration of aquatic plants and/or bio membrane techniques. All recovered areas must be maintained. A specific Biodiversity Management Plan will be developed to address monitoring plan, keeping track of the restoration activities, evaluating their effectiveness and should implement a maintenance plan. The plan must include the control of water quality, freshwater biodiversity, and the maintenance of the ecological balance.
BIO-MM72	Biological component	Operation	Minimization - Introduction and spreading of invasive alien species	Entire AoI	During road operations, apply all mitigation measure proposed for the Construction phase must be applied, in particular: BIO-MM064, BIO-MM65, BIO-MM66.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-MM73	Biological component - Arboreal mammals, small-medium size mammals, reptiles; Great Apes and big mammals; Birds and bats	Operation	Minimization - Soil occupancy - Increase of road traffic	Entire AoI	Apply all mitigation measures proposed for the Construction phase. In particular: BIO-MM08a, BIO-MM08d, BIO-MM60a, BIO-MM60b, BIO-MM60c
BIO-MM74	Biological component - Great Apes and big mammals	Operation	Minimization - Soil occupancy - Increase of road traffic	Entire AoI	Based on the results of the monitoring on bushmeat and GAs studies conducted during the Construction phase, identify additional mitigation measures in consultation with the IUCN PSG SGA, and will be discussed and proposed as appropriate
BIO-MM74a	Biological component - Great Apes and big mammals	Operation	Minimization - Soil occupancy - Increase of road traffic	Entire AoI	The Govern must approve a package of actions to: - Prevent an uncontrolled increase of bushmeat hunting and marketing along with traffic increase - Better understand the status and evolution of the GA population in the AoI - Prevent actions that may affect the GA population

Table 4: SPECIFIC MITIGATION MEASURES FOR BIOLOGICAL COMPONENTS – QUARRY & SITE INSTALLATIONS-

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-Q-MM01	Biological component	Construction	Avoidance - Removal/degradation of vegetation and topsoil - Change in land use	Quarry (Site 1) Site installations (Site 2)	Plan soil and vegetation removal activities in advance to ensure that the Project's footprint within Site 1 and 2 and along the access road be minimized and only the strictly necessary footprint is generated. Avoid the unnecessary removal of vegetation or soil even if this is within the boundary of the sites.
BIO-Q-MM02	Biological component	Construction	Minimization - Removal/degradation of vegetation and topsoil - Change in land use	Quarry (Site 1) Site installations (Site 2)	In case the vegetation removal activities cannot be avoided during the birds breeding season, have a qualified ecologist conducting pre-construction surveys of breeding nests within 48 hours before vegetation clearance in the Site 1 and 2 and surrounding areas (at least 100 meters buffers). If any breeding nests are discovered, immediate action must be taken and evaluate if it is feasible to postpone working in that area until the breeding cycle is complete (this may take up to three weeks). If that is not possible, the nests and roosts will be transported to a secure similar undisturbed location. Specific pre-construction surveys will also be performed 48 hours before vegetation clearance to identify any bat roost potentially present within the Site 1 and Site 2 area. If any permanent or temporary roosts are observed, take actions to allow bats to leave on their own at sundown and keep them from returning at sun set; actions may include removal or obstruction of the roost or closing the roost entrance, however this will be done only if no dependent young are present (e.g., maternity roosts are typically present between May through August).

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-Q-MM03	Biological component	Construction	Minimization - Removal/degradation of vegetation and topsoil - Change in land use	Quarry (Site 1) Site installations (Site 2)	Ensure that the fence that will be put around Site 1 and 2 will not be trespassed and that nearby habitats will not be affected or accessed by any vehicles or workers. In case there will be areas on Site 1 and 2 where vegetation removal could be avoided or minimised and there are habitats left, ensure that these are demarcated and remain inaccessible through highly visible wooden sticks or flags (250 cm high) put into the ground with the top part painted in bright colour. Provide training to raise awareness among employees and contractors working on site about the protected species/habitats potentially present in the area; inform workers and employees on actions to be taken if wildlife is encountered.
BIO-Q-MM04	Biological component	Construction	Minimization - Removal/degradation of vegetation and topsoil - Change in land use	Quarry (Site 1)	Fence permanently the quarry site to prevent the access of wildlife. At the beginning of the working hours, check any open trenches and excavated areas to identify any entrapped animals. Replicate the same operation at the end of the working day and always consider the quarry pit to confirm the fence has been effective. Undertake rescue of any entrapped animals minimizing animal stress and the risk of injury. Consult BMP for more specifics on the kind and sizes of fences to be used.
BIO-Q-MM05	Biological component	Construction	Minimization - Removal/degradation of vegetation and topsoil - Change in land use	Site installations (Site 2)	In all temporary infrastructure in the site installation, install window decals or non-reflective window covering to reduce the potential for bird window strikes. Use bird-friendly glasses or bird bollards to be installed on glass to avoid reflective glass. In case power lines or other tall structures are going to be installed that may represent a collision hazard, appropriately plan to avoid direct collision, mortality and electrocution, such as bury or isolate power lines.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-Q-MM06	Biological component	Construction	Avoidance - Change in the local morphology and topography	Quarry (Site 1)	At the quarry, avoid unnecessary levelling and excavations and ensure the excavation rates strictly follow the quarry design specification and technical studies. Base design on the site-specific characteristics and the natural state of the landscape. Similarly, avoid the creation of unnecessary high reliefs. Unauthorized and uncontrolled rocks piles will be avoided.
BIO-Q-MM07	Biological component	Construction	Avoidance - Changes in hydrological regime - Water demand	Quarry (Site 1)	Implement periodic dedicated verifications at the quarry to ensure that there are no pits and ponds and prevent them by avoiding soil over consolidation and uncontrolled water runoff. In case heavy rains lead to the generation of pits and ponds, promptly remove water and fill the pond.
BIO-Q-MM08	Biological component	Construction	Minimization - Changes in hydrological regime - Water demand	Quarry (Site 1) Site installations (Site 2)	In order to attenuate water runoff from Site 1 and 2 and minimise sediment input into the local hydrography, direct all surface water run-off from the sites to temporary sedimentation ponds to be constructed there before water is discharged. Provide for fencing and ensure ponds are periodically cleaned up.
BIO-Q-MM09	Biological component	Construction	Avoidance - Emission of dust and particulate matter	Quarry (Site 1) Site installations (Site 2)	Adopt specific mitigations on Site 1 and Site 2 for avoiding dust and particulate matter generation and dispersion: - Spray down with water and protect from weathering the aggregates stored on Site 1 and any other loose material temporarily stored on Site 2. Granular material should be stored in stalls, or in controlled and treated heaps protected with tarpaulins. - Ensure the height of the aggregate storage is no more than 2 m and the slope angle no more than 30° for preventing flows and sliding. - As an alternative to spraying, wind barriers and protective fences may be used.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-Q-MM10	Biological component	Construction	Avoidance - Emission of dust and particulate matter	Quarry (Site 1) Site installations (Site 2)	Implement the following actions: - Ensure that the surface of Site 1 and 2 that is not occupied by the quarry or by facilities and materials is regularly sprayed to avoid dust generation. - Regularly spray the access road.
BIO-Q-MM11	Biological component	Construction	Minimization - Emission of dust and particulate matter	Quarry (Site 1) Site installations (Site 2)	- Implement dust suppression measures at the quarry on surfaces that are being exploited, such as through the use of water sprayers - Ensure that the crusher is equipped with dust suppression systems so that fugitive dust is minimised and ideally avoided.
BIO-Q-MM12	Biological component	Construction	Minimization - Emission of dust and particulate matter	Quarry (Site 1) Site installations (Site 2)	Ensure that truck loading and unloading operations within the Site 1 and Site 2 is carried out properly and that dust is minimised. Where possible, appoint workers to spray down (please refer to BIO-Q-MM11a) with water the materials over dump trucks before unloading.
BIO-Q-MM13	Biological component	Construction	Avoidance - Discharge or introduction of pollutants in freshwater and groundwater	Quarry (Site 1) and Site installations (Site 2)	Ensure that vehicles during the operation in Site 1 and Site 2 follow predefined paths and roads, avoiding crossing water bodies and swamps areas. Ensure they are regularly cleaned and repaired/maintained. Ensure that: - no dirty or damaged vehicles leave the Site 1 and Site 2; - the goods and materials to be transported along the road access are properly secured for avoiding goods tripping, flipping and overflows; - the moving vehicles transporting sludge, semi-solid and liquids have perfect tightness and are equipped with spills prevention kits. - Drivers are authorized and trained to respond in case of accidental spills and leaks.
BIO-Q-MM14	Biological component	Construction	Avoidance - Discharge or introduction of pollutants in freshwater and groundwater	Site installations (Site 2)	Ensure that no intentional or accidental discharge of liquid, semi-solid or muddy materials into the Kienké River occurs, by having a permanent surveyor at the bridge. In case any accidental discharge or drop of material will happen the ensure the surveyor notifies his manager and adequate measures are adopted.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-Q-MM15	Biological component	Construction	Avoidance - Emission of noise and vibrations	Quarry (Site 1) and Site installations (Site 2)	Avoid rock blasting and other noisy activities overnight and during critical hours (dusk and dawn). Avoid night works (from 6 pm to 6 am) in Site 1 and Site 2. Perform blasting during daytime and at regular times to enhance local fauna noise adaptation.
BIO-Q-MM16	Biological component	Construction	Avoidance - Emission of noise and vibrations	Quarry (Site 1) Site installations (Site 2)	Install around Site 1 and Site 2 and along the access road visual, physical or audio deterrents to keep fauna away from construction areas (for example nets, fencing, or other barriers as well as streamers, reflectors and flagging).
BIO-Q-MM17	Biological component	Construction	Minimization - Emission of noise and vibrations	Quarry (Site 1) Site installations (Site 2)	The areas within Site 1 and Site 2 where noise emission exceed the sensory threshold for the biodiversity component, install sound barriers or a combination of them such as artificial acoustic barriers; vegetative barriers, selecting plants tolerant for conditions (e.g., native species, and air/road contaminants); earth berms structures constructed from soil designed to block sound; low-height barriers. Sensitive areas will be outlined in the Biodiversity Management Plan.
BIO-Q-MM18	Biological component	Construction	Avoidance - Emission of light	Quarry (Site 1) Site installations (Site 2)	In addition to the mitigation measures adopted for lighting along the main road, consider the following: - Ensure that there are no lights working at night along the access road as night work will be not allowed so night lighting is not necessary. - Ensure that any lighting at Site 1 and 2 installed for safety or security reasons and working at night is directed onto work areas (i.e. use of spotlights instead of floodlights) inside the site and not to the fence or beyond. - Avoid if technically possible to put any lights at high on top of tall structures at the two sites.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-Q-MM19	Biological component	Construction	Avoidance - Waste and wastewater generation	Quarry (Site 1) Site installations (Site 2)	Install fence to keep off animals from accidentally entering the areas of waste storages. Ensure that fencing used for delimiting areas is designed so that is not harmful to wildlife. Fence design will consider materials used (non-bared wire), height of strands and permeability to ensure they are wildlife friendly. In addition, install visual, physical and/or audio deterrents to keep fauna and avifauna away from waste storages, for example, using streamers, reflectors and flagging.
BIO-Q-MM20	Biological component	Construction	Avoidance - Waste and wastewater generation	Quarry (Site 1) and Site installations (Site 2)	Ensure that the access road remains the only passable one and avoid any offroad traffic that may generate additional footprint.
BIO-Q-MM21	Biological component	Construction	Minimization - Waste and wastewater generation	Quarry (Site 1) Site installations (Site 2)	Introduce a 30km/h speed limit along the access road and at the sites. Brief all drivers accessing the quarry and site installation areas on speed restrictions. Speed limits and animal crossing signs must be reinforced in wildlife crossing areas and in core areas (such as swamps, forested areas). Identify, correct and report to HSE department any unsafe or irresponsible actions.
BIO-Q-MM22	Biological component	Construction	Restoration - Waste and wastewater generation	Quarry (Site 1) Site installations (Site 2)	Restore the access roads. Restoration will follow best practices with the goal of producing a stable vegetative cover to minimize erosion, dust and spreading of invasive alien species.
BIO-Q-MM23	Biological component	Construction	Avoidance - Introduction and spreading of invasive alien species	Quarry (Site 1) Site installations (Site 2)	Apply rigorous and appropriate process of controls, to prevent accidental introduction of invasive alien species in the quarry and site installation areas. Implement a check point at the traffic junction with the N17 road where truck wheels are cleaned before they get onto the access road.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-Q-MM24	Biological component	Construction	Minimization - Introduction and spreading of invasive alien species	Quarry (Site 1) Site installations (Site 2)	Adopt a monitoring plan tailored on Site 1, Site 2 and the access road, to annually verify the presence of invasive species through field surveys. Include in the plan a final detailed survey of the sites and access road at the end of Project construction.
BIO-Q-MM25	Biological component - Terrestrial and freshwater CH habitat	Construction	Avoidance - Removal/degradation of vegetation and topsoil - Change in land use	Quarry (Site 1) Site installations (Site 2)	Have an expert botanist within the Ecology Clerk of works (ECow) performing a survey in Site 1, Site 2 and along the access roads before the vegetation clearance. The area to be monitored will cover the footprints and will be carried out in a buffer zone of 300 m. The expert must carry out the surveys during the flowering period of the species identified as triggering CH (and the 18 flora species identified as Potentially CH). The data regarding date, location, population extension and number of individuals will be recorded to allow for the correct planning and execution of other mitigation measures. The number and location of the Surveys Points will be detailed in the Biodiversity Management Plan.
BIO-Q-MM26	Biological component - All fauna groups	Construction	Avoidance - Removal/degradation of vegetation and topsoil - Change in land use	Quarry (Site 1) Site installations (Site 2)	Have an expert ecologist within the Ecology Clerk of works (ECow) performing a survey in Site 1, Site 2 and along the access roads before the vegetation clearance. The area to be monitored will cover the footprints and will be carried out in a buffer zone of 300 m. The number and location of the Surveys Points will be detailed in the Biodiversity Management Plan.
BIO-Q-MM27	Biological component - Birds and bats	Construction	Avoidance - Removal/degradation of vegetation and topsoil - Change in land use	Quarry (Site 1) Site installations (Site 2)	Plan the activities to avoid vegetation clearance and tree cutting during the nesting/maternity period for birds (from April until July) and bats (two pick seasons one in May-July and a second one in November-December).

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-Q-MM28	Biological component - Arboreal mammals, small-medium size mammals, reptiles	Construction	Avoidance - Removal/degradation of vegetation and topsoil - Change in land use	Quarry (Site 1) Site installations (Site 2)	Before any vegetation clearance and tree cutting, ECow will perform a walkaround surveillance for ground-nesting species, and species with limited mobility, such as reptiles, amphibians and pangolins. If any of these species are observed, they will be collected by the ECow and translocated to undisturbed but similar sites within the AoI.
BIO-Q-MM29	Biological component - Great Apes and big mammals	Construction	Avoidance - Removal/degradation of vegetation and topsoil - Change in land use	Quarry (Site 1) Site installations (Site 2)	In case Great Apes nests are found during the pre-construction surveys immediately stop any activities, inform the ECow, the authorities.
BIO-Q-MM30	Biological component - Terrestrial and freshwater CH habitat	Construction	Minimization - Removal/degradation of vegetation and topsoil - Change in land use	Quarry (Site 1) Site installations (Site 2)	After the pre-construction surveys, if any flora individuals triggering CH (and potentially CH) are going to be impacted by the Site 1 and Site 2 footprint, the expert botanist have to salvage them before the construction activities and translocate them to an appropriate site. The translocation of individuals must be performed during the dormant stage to minimize stress to the plant. The data regarding date, location, source species and number of individuals collected and translocated will be recorded
BIO-Q-MM31	Biological component - Terrestrial and freshwater CH habitat	Construction	Minimization - Removal/degradation of vegetation and topsoil - Change in land use	Quarry (Site 1) Site installations (Site 2)	Protect on-site natural habitats and CH triggering flora species adjacent to the Site 1 and Site 2 footprint from unintentional disturbance during the activities. Demarcate habitats and CH triggering species through highly visible wooden sticks or flags (50 cm high) put into the ground. These areas will be detailed in the Biodiversity Management Plan, and further defined at the end of the pre-construction surveys by the ECOw. Provide training to raise awareness among employees and contractors working on site about the protected species/habitats present in these demarked areas. These demarked areas will be by clearly identified both on the maps and in the field as exclusion zone where soil and vegetation will be preserved, and access will not be permitted.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-Q-MM32	Biological component - Terrestrial and freshwater CH habitat	Construction	Restoration - Removal/degradation of vegetation and topsoil - Change in land use	Quarry (Site 1)	Have an expert botanist within the Ecology Clerk of works (ECow) to draw up a specific quarry Restoration Plan.
BIO-Q-MM33	Biological component - Terrestrial and freshwater CH habitat	Construction	Restoration - Removal/degradation of vegetation and topsoil - Change in land use	Quarry (Site 1) Site installations (Site 2)	Restore the access roads. Restoration will follow best practices with the goal of producing a stable vegetative cover to minimize erosion, dust and spreading of invasive alien species.
BIO-Q-MM34	Biological component - Terrestrial and freshwater CH habitat	Construction	Restoration - Removal/degradation of vegetation and topsoil - Change in land use	Quarry (Site 1) Site installations (Site 2)	Restore all areas cleared during construction for temporary use immediately after construction completion. Restoration will follow best practices with the goal of producing a stable vegetative cover to minimize erosion, dust and spreading of invasive alien species
BIO-Q-MM35	Biological component - Freshwater CH habitat; Aquatic and riparian fauna	Construction	Minimization - Changes in hydrological regime - Water demand	Quarry (Site 1) Site installations (Site 2)	Specific biological surveys (pre-construction surveys) will be developed before any kind of intervention within riparian habitat and/or waterbodies, by the Ecology Clerk of works (ECow) and will include a qualified ecologist specialized in freshwater species, fish and amphibians. A team of biologists will perform the surveys not earlier than 7 days before the works will start. The survey will focus on fauna species with limited mobility (e.g. small mammals, reptiles and amphibians) that cannot move ahead of construction. If any of these species are observed, they will be collected by the ECow and translocated to undisturbed but similar sites within the AoI.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-Q-MM36	Biological component - Freshwater CH habitat; Aquatic and riparian fauna	Construction	Avoidance - Changes in hydrological regime - Water demand	Quarry (Site 1) Site installations (Site 2)	Avoid extraction of water from low flowing rivers and/or in rivers already providing water to other users in the nearby area (e.g. for agribusiness/local use etc.). - Maintain river flow regimes natural in magnitude, frequency, duration and time. - Collect stormwater through a collection system, applying best management practices.
BIO-Q-MM37	Biological component - Freshwater CH habitat; Aquatic and riparian fauna	Construction	Minimization - Changes in hydrological regime - Water demand	Site installations (Site 2)	The single-span bridge foundation that will be built on the Kienké River must laid as far back as possible from the minor bed, the banks and the riparian forest in order to guarantee the stability of these environments and to restore ecological continuity.
BIO-Q-MM38	Biological component - Freshwater CH habitat	Construction	Minimization - Changes in hydrological regime - Water demand	Site installations (Site 2)	Check that all the trucks crossing the rivers follow these instructions: - All the trucks and the other moving vehicles transporting loose materials during transportation are covered up. - The trucks are periodically wash/clean. - No dirty or damaged vehicles are crossing the bridge. - The goods and materials to be transported are properly secured for avoiding goods tripping, flipping and overflows. - The vehicles transporting sludge, semi-solid and liquids have perfect tightness and are equipped with spills prevention kit.
BIO-Q-MM39	Biological component - Aquatic and riparian fauna	Construction	Minimization - Changes in hydrological regime - Water demand	Quarry (Site 1) Site installations (Site 2)	Cofferdams or similar protections will be used to prevent injury or death to fish and freshwater fauna from pumping systems allocated in rivers. *Conraua goliath* breed exclusively in the dry season (November to April). If any eggs/individuals of this species are found, the wildlife ecologist must collect and translocate them to undisturbed but similar sites outside the affected area Entire AoI (abstraction in watercourses)

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
BIO-Q-MM40	Biological component - Freshwater CH habitat; Aquatic and riparian fauna	Construction	Minimization - Changes in hydrological regime - Water demand	Site installations (Site 2)	If erosion or quarry materials are observed at river crossing, implement environmental engineering techniques to stop it. Environmental engineering techniques will include as appropriate: erosion control mat, live crib wall, rock mattresses, hydro seeding and afforestation with appropriate species etc.
BIO-Q-MM41	Biological component - Freshwater CH habitat	Construction	Avoidance - Changes in hydrological regime - Water demand	Site installations (Site 2)	Avoid any interaction with the swamp area in proximity of Site 2. This area will remain untouched by activities at the site installations.
BIO-Q-MM42	Biological component - Freshwater CH habitat; Aquatic and riparian fauna	Construction	Restoration - Changes in hydrological regime - Water demand	Quarry (Site 1) Site installations (Site 2)	During the quarry and site installation activities if any freshwater habitats or the main river (Kienké) are degraded, implement recovery actions for restore those habitats to maintain the form and function of these ecosystems. The various restoration techniques include physical methods such as sewage interception, dredging, non-native plant species and algae removal, and biological processes which include restoration of aquatic plants and/or bio membrane techniques. All recovered areas must be maintained and monitored following the instruction in the Biodiversity Management Plan.
BIO-Q-MM43	Biological component - Arboreal mammals, small-medium size mammals, reptiles; Great Apes and big mammals; Birds and bats	Construction	Avoidance - Emission of noise and vibrations	Quarry (Site 1) Site installations (Site 2)	Plan blasting and other activities generating high noise levels to commence each year outside the breeding and rearing periods (depending on the species). More detailed information is given in the mitigation measure for medium-low sensitivity biological component (please refer to BIO-Q-MM01d).

Table 5: SPECIFIC MITIGATION MEASURES FOR SOCIAL COMPONENTS – ROAD AND BYPASSES-

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
SOC-MM01	Demography	Construction	Minimisation	Entire AoI	Periodically monitor workers accommodation needs and verify if the accommodation facilities identified and used by workers are adequate, so to avoid increase Project pressure on the housing system in the AoI.
SOC-MM02	Demography	Construction	Minimisation	Entire AoI	As part of the SEP implementation, periodically consult local authorities to discuss potential problems linked to the presence of workers, the impacts on vulnerable groups and possible mitigation measures to be implemented.
SOC-MM03	Demography	Construction	Minimisation	Entire AoI	Set up a centralized recruitment process and avoid recruitment at construction sites, to discourage persons moving to the construction site areas in search of employment positions.
SOC-MM04	Demography	Construction	Minimisation	Entire AoI	Develop and implement a local content strategy. The strategy will aim at maximizing the use of local workforce and maximizing the use of goods and products from the AoI and from Cameroon. The strategy will identify actions such as training for local workers, engagement activities targeted at local workers and mapping of local companies providing goods and services necessary to the Project. The implementation of actions will then be agreed with contractors and subcontractors.
SOC-MM04	Economy and employment	Construction	Enhancement	Entire AoI	Develop and implement a local content strategy. The strategy will aim at maximizing the use of local workforce and maximizing the use of goods and products from the AoI and from Cameroon. The strategy will identify actions such as training for local workers, engagement activities targeted at local workers and mapping of local companies providing goods and services necessary to the Project. The implementation of actions will then be agreed with contractors and subcontractors.
SOC-MM04	Economy and employment	Operation	Enhancement	Entire AoI	Develop and implement a local content strategy. The strategy will aim at maximizing the use of local workforce and maximizing the use of goods and products from the AoI and from Cameroon. The strategy will identify actions such as training for local workers, engagement activities targeted at local workers and mapping of local companies providing goods and services necessary to the Project. The implementation of actions will then be agreed with contractors and subcontractors.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
SOC-MM05	Demography	Construction	Minimisation	Entire AoI	Develop and implement an Influx Management Plan to identify risks connected to the movement of persons in the Project's AoI. The Plan will include the measures indicated above and additional measures that may emerge from engagement with stakeholders. The Plan will also include measures to reduce the health risks connected to the movement of persons in the AoI , particularly related to the spread of communicable diseases and STIs.
SOC-MM05	Community health, safety and security	Construction	Minimisation	Entire AoI	Develop and implement an Influx Management Plan to identify risks connected to the movement of persons in the Project's AoI. The Plan will include the measures indicated above and additional measures that may emerge from engagement with stakeholders. The Plan will also include measures to reduce the health risks connected to the movement of persons in the AoI , particularly related to the spread of communicable diseases and STIs.
SOC-MM06	All social components	Construction	Minimisation	Entire AoI	Implement the Stakeholder Engagement Plan and ensure that appropriate resources and budget are dedicated to engagement. Periodically revise the stakeholder mapping and the plan based on progress of activities.
SOC-MM06	All social components	Operation	Minimisation	Entire AoI	Implement the Stakeholder Engagement Plan and ensure that appropriate resources and budget are dedicated to engagement. Periodically revise the stakeholder mapping and the plan based on progress of activities.
SOC-MM07	Demography	Construction	Minimisation	Villages and rural communities in the entire AoI	Periodically verify if uncontrolled immigration linked to Project activities is occurring in villages identified with medium sensitivity and discuss with local authorities if additional mitigation measures are necessary.
SOC-MM08	Demography	Operation	Minimisation	Entire AoI	Verify population changes in the villages within the AoI.
SOC-MM09	Demography	Operation	Minimisation	Villages and rural communities in the entire AoI	As part of the SEP implementation, periodically consult local authorities of villages where significant population changes are occurring and discuss potential mitigation measures to be implemented.
SOC-MM10	Demography	Operation	Minimisation	Entire AoI	As part of the SEP implementation, periodically consult local authorities of villages in the rural areas of the Project and discuss potential mitigation measures to be implemented.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
SOC-MM11	Land tenure and livelihood	Construction	Avoidance	Road Right of Way	The Project has established a RoW of 40 m, however whenever possible this will be reduced to maximise avoidance of displacement.
SOC-MM12	Land tenure and livelihood	Construction	Minimisation	Entire AoI	Develop and implement a grievance mechanism specific for the resettlement process. Ensure that all Project Affected People are informed about this channel to submit grievances. Ensure that appropriate budget and resources are assigned. The Grievance Mechanism will include specific channels for women workers to submit grievances and personnel specialised and trained in addressing cases of GBVH within work environments.
SOC-MM13	Land tenure and livelihood	Construction	Minimisation	Entire AoI	Develop and implement a Stakeholder Engagement Plan specific to the resettlement process and targeted to PAPs. Ensure resources and budget are dedicated to engagement. Periodically revise the stakeholder mapping and the plan based on progress of activities.
SOC-MM14	Land tenure and livelihood	Construction	Compensation	Entire AoI	Develop and implement a Resettlement Action Plan (RAP) compliant with Cameroon Legislation and IFC Performance Standard 5, in particular on identification of Project Affected Peoples, eligibility of PAPs, support to vulnerable groups, engagement and grievance mechanism.
SOC-MM14A	Land tenure and livelihood	Construction	Minimisation	Entire AoI	Ensure that the RAP includes specific mitigation measures for vulnerable groups that have been identified in the process.
SOC-MM15	Land tenure and livelihood	Construction	Minimisation	Entire AoI	As part of the RAP implementation, identify and agree with local authorities and local community’s livelihood restoration actions targeted at rural villages along the road.
SOC-MM16	Economy and employment	Construction	Enhancement	Entire AoI	Identify in the recruitment process measures to encourage the hiring of vulnerable groups, such as women, minorities (including Bagyeli) and people with disabilities. Positions suitable for these groups should be identified and priority should be given to these groups when hiring.
	Economy and employment	Operation	Enhancement	Entire AoI	

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
SOC-MM20	Economy and employment	Construction	Minimisation	Entire AoI	Set up a centralized recruitment process and avoid recruitment at construction sites, to discourage persons moving to the construction site areas in search of employment positions.
SOC-MM21	Economy and employment	Construction	Minimisation	Entire AoI	During recruitment, provide to all potential workers a clear and transparent information on wages, benefits and working conditions, in their language of preference.
		Operation	Minimisation	Entire AoI	
SOC-MM22	Economy and employment	Construction	Minimisation	Entire AoI	Prior to the beginning of work, provide to all workers a clear and transparent contract of employment, in their language of preference. The contract will include clear indications on working conditions and employment terms. The contract will also be explained verbally to all workers before it is signed.
		Operation	Minimisation	Entire AoI	
SOC-MM23	Economy and employment	Construction	Minimisation	Entire AoI	Develop and enforce a workers Code of Conduct. The Code of Conduct will provide rules aimed at creating a positive work environment and avoiding tensions and conflicts with the local population. The code of conduct will also address the issue of GBVH within the workplace and in interactions with local communities. The Code of Conduct will be provided to workers during the recruitment process and will be covered during induction training.
		Operation	Minimisation	Entire AoI	
SOC-MM23	Education	Construction	Minimisation	Entire AoI	Develop and enforce a workers Code of Conduct. The Code of Conduct will provide rules aimed at creating a positive work environment and avoiding tensions and conflicts with the local population. The code of conduct will also address the issue of GBVH within the workplace and in interactions with local communities. The Code of Conduct will be provided to workers during the recruitment process and will be covered during induction training.
SOC-MM24	Economy and employment	Construction	Minimisation	Entire AoI	Develop and implement a grievance mechanism open to workers. Ensure that all workers directly and indirectly employed are informed about this channel to submit grievances. Ensure that appropriate budget and resources are assigned. The Grievance Mechanism will include specific channels for women workers to submit grievances and personnel specialised and trained in addressing cases of GBVH within work environments. If useful NGOs working with women and on GBVH will be involved in the grievance mechanism implementation.
		Operation	Minimisation	Entire AoI	

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
SOC-MM26	Economy and employment	Construction	Minimisation	Entire AoI	Develop and implement a Workforce Demobilisation Plan, using the principles in the IFC Good Practice Note No. 4: Managing Retrenchment, 2005, with the aim of reducing the impacts of cessation of employment contracts.
SOC-MM27	Economy and employment	Construction	Minimisation	Entire AoI	Develop and implement a Human Resources and Labour Procedure and Plan compliant with the requirements of IFC PS 2 and national law. This Plan will be understandable and accessible to workers, and in the main language(s) spoken by the workforce. The Plan will include all measures listed above and additional measures that may emerge from engagement with stakeholders.
		Operation	Minimisation	Entire AoI	
SOC-MM28	Economy and employment	Construction	Minimisation	Entire AoI	Develop and implement a Contractor, Supply Chain Management and Procurement Plan. The Plan will ensure that contractors and subcontractors along the supply chain will be compliant with IFC PS2 and national legislation.
		Operation	Minimisation	Entire AoI	
SOC-MM28A	Economy and employment	Operation	Minimisation	Entire AoI	Undertake pre-handover engagements between ICMC and the relevant governmental authorities responsible for the Project during Operations, focusing on the duty of these stakeholders to respect the labour rights of employees in accordance with national legislation and the requirements of IFC PS2.
SOC-MM29	Economy and employment	Construction	Minimisation	Entire AoI	As part of the SEP implementation, engage local authorities and local communities on the issue of employment opportunities, ensuring a transparent and clear communication on the actual Project needs, to avoid unrealistic expectations on employment positions.
		Operation	Minimisation	Entire AoI	
SOC-MM29A	Economy and employment	Construction Operation	Enhancement	Entire AoI	Undertake the recruitment of workers in collaboration with the National Unemployment Fund and the Ministry of Social Affairs particularly to encourage the recruitment of vulnerable groups and women.
SOC-MM29B	Economy and employment	Construction Operation	Minimisation	Entire AoI	Develop and implement a Gender Inclusion Strategy that assesses the potential risks that may be associated with women's participation in the Project and identifies measures to address such risks.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
SOC-MM30	Economy and employment	Construction	Enhancement	Villages in rural areas in the entire AoI	Within the context of the local content strategy, implement a training programme for the local workforce of villages in rural areas to enable them to take advantage of the employment opportunities generated by the project.
		Operation	Enhancement	Entire AoI	
SOC-MM31	Education	Construction	Minimisation	Schools within the AoI	As part of the SEP implementation, inform local authorities, local communities and schools on the progress of activities and in particular on the schedule of activities that will entail closures/limitations of roads and interruption of infrastructure networks; possible changes to limit impacts on local communities will be agreed and implemented.
SOC-MM32	Education	Construction	Minimisation	Schools within the AoI	Perform training activities with the support of schools to inform students on Project related risks to health and safety and measures to be implemented, particularly on the issue of road safety.
		Operation	Minimisation	Schools within the AoI	
SOC-MM33	Education	Construction	Minimisation	Entire AoI	As part of the SEP implementation, inform local authorities, local communities and schools on the progress of activities and in particular on the schedule of activities that will entail closures/limitations of roads and interruption of infrastructure networks; possible changes to limit impacts on local communities will be agreed and implemented.
SOC-MM34	Education	Construction	Minimisation	Entire AoI	Perform training activities with the support of schools to inform students on Project related risks to health and safety and measures to be implemented, particularly on the issue of road safety.
		Operation	Minimisation	Schools within the AoI	
SOC-MM35	Education	Construction	Minimisation	Schools within the AoI	Discuss with school facilities strategies to ensure attendance of students to schools during construction activities that may entail road closures or significant diversions.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
SOC-MM36	Education	Construction	Minimisation	Schools within the AoI	Periodically verify with schools if attendance of students has changed during the construction activities and discuss additional measures to ensure full attendance of all students.
SOC-MM37	Education	Operation	Minimisation	Schools within the AoI	Periodically verify with schools if attendance of students has changed during the operation and discuss additional measures to ensure full attendance of all students.
SOC-MM38	Community health, safety and security	Construction	Avoidance	Entire AoI	Provide induction training on traffic safety to all drivers.
SOC-MM39	Community health, safety and security	Construction	Avoidance	Entire AoI	Identify speed limits in construction areas and in public roads and ensure that they are respected by drivers.
SOC-MM40	Community health, safety and security	Construction Operation	Minimisation Minimisation	Schools within the AoI Healthcare centres along the AoI Community facilities along the AoI Other sensitive receptors along the AoI	Identify sensitive receptors (e.g. schools) within the AoI and identify additional road safety measures in proximity to these receptors.
SOC-MM40A	Community health, safety and security	Construction	Minimisation	School within the AoI Healthcare centres along the AoI Community facilities along the AoI Other sensitive receptors along the AoI	Position fixed barriers in proximity to schools and other community buildings during the construction activities to avoid trespassing

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
SOC-MM40B	Community health, safety and security	Construction	Avoidance	Entire AoI	Ensure that the construction site is fenced or controlled by personnel to avoid trespassing
SOC-MM40C	Community health, safety and security	Construction	Avoidance	Bridges	In the presence of cranes at the construction area, a site planning will be developed evaluating the worksite, potential hazards, and risks for communities. The area will be secured and fenced accordingly.
SOC-MM40D	Community health, safety and security	Construction	Minimisation	Bridges	Clear communication protocols will be developed between the operator and the ground personnel to avoid any risk associated to the crane's operation for traffic and community
SOC-MM40E	Community health, safety and security	Construction	Avoidance	Right of Way (blasting locations)	Whenever a blasting plan is confirmed, clearly define the blasting danger zone and notify all the stakeholders near that area, as well as all workers.
SOC-MM40F	Community health, safety and security	Construction	Minimisation	Right of Way (blasting locations)	Place warning signs, to segregate the blasting zone, and develop public notification system prior to blasting events.
SOC-MM40G	Community health, safety and security	Construction	Minimisation	Right of Way (blasting locations)	Whenever a blasting is to be developed in the ROW, the road will be closed to any transit and the area secured with enough anticipation. The road will be reopened only once full security post- blast inspection is completed and the area is confirmed safe.
SOC-MM40H	Community health, safety and security	Construction	Minimisation	Right of Way (blasting locations)	Implementing robust security processes that restrict access to areas were blasting is scheduled to take place allowing only authorized personnel
SOC-MM40I	Community health, safety and security	Construction	Minimisation	Right of Way (blasting locations)	Restrict blasting activities at daytime with an approved schedule (i.e. 07:00 – 18:00) any change in Schedule must be informed and approved
SOC-MM40J	Community health, safety and security	Construction	Minimisation	Right of Way (blasting locations)	Maintain active community consultation and positive relations with local residents to respond to concerns and resolve any potential complaints for noise, and ensure relevant stakeholders and communities are appropriately notified prior to blasting activities being undertaken.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
SOC-MM41	Community health, safety and security	Construction	Minimisation	Entire AoI	Perform traffic safety awareness campaigns targeted at local communities and vulnerable groups, such as children and elderly, that may be increasingly involved in road accidents.
SOC-MM42	Community health, safety and security	Construction	Minimisation	Entire AoI	Ensure that vehicles are equipped with all safety devices such as seat belts, mirrors, safety signals etc.
SOC-MM43	Community health, safety and security	Construction	Minimisation	Entire AoI	Periodically check all vehicles to ensure that they are properly maintained and that all the safety devices are working properly.
SOC-MM44	Community health, safety and security	Construction	Minimisation	Schools within the AoI	Perform training activities with the support of schools to inform students on Project related risks to health and safety and measures to be implemented, particularly on the issue of road safety.
SOC-MM45	Community health, safety and security	Construction	Minimisation	Entire AoI	Verify and register of all traffic related incidents and periodically revise road safety measures based on lessons learned.
SOC-MM46	Community health, safety and security Mobility and infrastructures	Construction	Minimisation	Entire AoI	Develop and implement a Traffic Management Plan, with indication of the measures that will be enforced to reduce impacts generated by traffic and to increase safety for workers and local communities.
SOC-MM47	Community health, safety and security	Construction	Minimisation	Entire AoI	Perform a health screening of all workers prior to beginning of work and on a periodic basis.
SOC-MM48	Community health, safety and security	Construction Operation	Minimisation	Entire AoI	Provide all necessary PPEs to workers, based on their position.
SOC-MM49	Community health, safety and security	Construction Operation	Minimisation	Entire AoI	Provide induction training and periodic training to all workers on Health&Satey aspects and on communicable diseases, particularly sexually transmittable diseases, to all workers.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
SOC-MM51	Community health, safety and security	Construction Operation	Minimisation	Entire AoI	Develop and implement an Occupational Health and Safety (OHS) Management Plan compliant with national regulations, IFC standards and OHSAS18001 standard. The Plan will include the measures indicated above and additional measures that may emerge from engagement with stakeholders.
SOC-MM52	Community health, safety and security	Construction Operation	Minimisation	Entire AoI	If necessary, develop and implement an infectious diseases Management Plan that will identify additional measures necessary to manage epidemies among workers and local communities.
SOC-MM53	Community health, safety and security	Construction Operation	Minimisation	Entire AoI	Perform training and awareness raising campaigns among local communities on health and safety risks that may be caused by the Project.
SOC-MM53A	Community health, safety and security	Operation	Minimisation	Schools within the AoI	Perform training and awareness raising campaigns in schools on health and safety risks that may be caused by the Project.
SOC-MM54	Community health, safety and security	Construction	Minimisation	Entire AoI	Implement targeted measures to reduce traffic related incidents that may be caused by the Project.
SOC-MM55	Community health, safety and security	Construction	Minimisation	Entire AoI	Implement targeted measures to ensure the protection of vulnerable groups like elders, people with disabilities and children from risks that may be caused by the Project.
SOC-MM56	Community health, safety and security	Construction	Minimisation	Entire AoI	Develop and implement a Community Health and Safety Management Plan. The Plan will include the measures indicated above and additional measures that may emerge from engagement with stakeholders.
SOC-MM57	Community health, safety and security	Construction	Minimisation	Entire AoI	Develop and implement an Emergency Preparedness and Response Management Plan.
SOC-MM58	Community health, safety and security	Construction	Minimisation	Entire AoI	Develop and implement a Security Management Plan. Potential risks and impacts of security personnel with regards to GBVH will be considered with measures to manage such risks and impacts accordingly.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
SOC-MM59	Community health, safety and security	Construction	Minimisation	Entire AoI	As part of the SE implementation, local communities and health facilities on the progress of activities and in particular on the schedule of activities that will entail closures/limitations of roads and interruption of infrastructure networks; possible changes to limit impacts on local communities will be agreed and implemented.
SOC-MM60	Community health, safety and security	Construction	Minimisation	Healthcare centres within the AoI	Cooperate and coordinate with local health and safety facilities to minimise impacts on health centres and access for the local population, particularly from villages that do not have health centres.
SOC-MM61	Community health, safety and security	Construction	Minimisation	Entire AoI	Verify if vulnerable groups such as elders and people with disabilities in villages without health centres may require support in reaching health centres during the construction activities. If so, set up specific transport systems.
SOC-MM62	Community health, safety and security	Operation	Minimisation	Entire road including access roads	Define speed limits in the roads in compliance with Cameroon legislation and ensure that they are enforced.
SOC-MM63	Community health, safety and security	Operation	Minimisation	Entire road including access roads	Verify the number of traffic related incidents, with particular focus on level of severity, location and vehicles/persons involved. This data should be used to identify if specific improvements and measures are possible to reduce incidents wherever possible.
SOC-MM64	Community health, safety and security	Operation	Minimisation	Entire AoI	Ensure regular maintenance activities of the road.
SOC-MM65	Community health, safety and security	Operation	Minimisation	Entire AoI	Perform extensive awareness raising activities in the first year of Project Operations to sensitise the villages affected by the Project about the health and safety risks associated with increased traffic levels and higher vehicle speeds, focusing on children and other groups at heightened risk of road traffic accidents, alongside high risk locations (e.g. schools).
SOC-MM66	Community health, safety and security	Operation	Minimisation	Entire AoI	Identify sensitive receptors along the road and agree with local authorities and local communities on additional measures to be implemented to reduce the risk of traffic incidents.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
SOC-MM67	Mobility and infrastructures	Construction	Minimisation	Entire AoI	Define the transport needs of the project and identify the routes that will be used, keeping in mind social and environmental constraints, so to use the less impacting routes available. Organize vehicle journeys so to optimize the transport of materials and reduce unnecessary trips.
SOC-MM68	Mobility and infrastructures	Construction	Minimisation	Entire AoI	Define alternative routes, construction area crossings and road closures for each construction spread in collaboration with local authorities and local communities, to identify solutions that are as little impacting as possible on local communities.
SOC-MM68A	Mobility and infrastructures	Construction	Enhancement	Entire AoI	Before any relocation commences, agree with local communities to find suitable mitigation measures and ensure that the replacement infrastructures respond to communities' needs.
SOC-MM68B	Mobility and infrastructures	Construction	Minimisation	Entire AoI	Agree on the relocation of services with local communities to find suitable mitigation measures during their relocation and ensure that the replacement infrastructures respond to communities' needs. If the relocation of water networks requires a temporary disruption of the water distribution agree with communities on mitigation measures, such as for example the provision of water through tanks.
SOC-MM68C	Mobility and infrastructures	Construction	Minimisation	Entire AoI	If the relocation of power networks requires a temporary disruption of the power distribution agree with communities on mitigation measures, such as for example the installation of fuel generators.
SOC-MM68D	Mobility and infrastructures	Construction	Minimisation	Entire AoI	Agree with local communities on the water sources to be used for meeting the Project water demand, so to avoid any interferences with communities' water sources.
SOC-MM68E	Mobility and infrastructures	Construction	Minimisation	Entire AoI	Set up a waste collection system for non-resident workers that are accommodated in the villages.
SOC-MM68F	Mobility and infrastructures	Construction	Minimisation	Entire AoI	Develop and implement a Waste Management Plan.
SOC-MM69	Mobility and infrastructures	Construction	Minimisation	Entire AoI	As part of the SEP implementation, inform local authorities and local communities on the progress of activities and in particular on the schedule of activities that will entail closures/limitations of roads and disruption of infrastructure networks; possible changes to schedules for limiting impacts on local communities will be agreed and implemented.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
SOC-MM70	Mobility and infrastructures	Construction	Minimisation	Entire AoI	Before any work starts on a 10-km work front, discuss with local authorities and communities along that front specific measures to ensure that disruption to mobility and transport is reduced to the extent possible.
		Operation	Minimisation	Entire AoI	
SOC-MM70A	Mobility and infrastructures	Operation	Minimisation	Entire AoI	Discuss the position of the tolling stations with local communities to identify the most suitable locations. Monitor during the operation phase if the tolling system is generating negative effects on the mobility of local communities.
SOC-MM70B	Mobility and infrastructures	Construction	Minimisation	Entire AoI	Before road construction starts, discuss with communities if the Project is leading to any impacts in terms of availability of food and products in the villages, particularly those further away from Ebolowa and Kribi.
SOC-MM70C	Mobility and infrastructures	Operation	Minimisation	Entire AoI	Monitor during the operation phase if the tolling system is generating negative effects on the mobility of local communities.
SOC-MM70D	Mobility and infrastructures	Operation	Minimisation	Entire AoI	Define specific measures for vulnerable groups in rural areas to ensure their mobility and transport options are not affected by the tolling system introduced in operations.
SOC-MM71	Ecosystem services	Construction	Minimisation	Entire AoI	Make available to local communities plants and trees deriving from clearance activities.
SOC-MM72	Ecosystem services	Construction	Minimisation	Entire AoI	Forbid workers from hunting, fishing and collecting plants or plant products.
SOC-MM73	Ecosystem services	Construction	Minimisation	Rural communities	As part of the SEP implementation, periodically consult local authorities and local communities on access to and availability of ecosystem services, and discuss potential additional mitigation measures to be implemented.
SOC-MM74	Ecosystem services	Operation	Minimisation	Entire AoI	As part of the SEP implementation, periodically consult local authorities and local communities on access to and availability of ecosystem services, and discuss potential additional mitigation measures to be implemented.
SOC-MM75	Cultural heritage	Construction	Minimisation	Entire AoI	Develop and implement a Chance Find Procedure, compliant with National law and IFC Performance Standard 8. The Chance Find Procedure will have to indicate all steps that will have to be taken by workers in the case that a chance find is identified during construction activities. Training on the Chance Find Procedure will have to be provided to all workers during induction.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
SOC-MM77	Cultural heritage	Construction	Minimisation	Entire AoI	For tangible elements outside the RoW, prior to any construction activities verify if specific protection measures are necessary to minimise project related impacts such as dust or unplanned collisions with vehicles.
SOC-MM78	Cultural heritage	Construction	Minimisation	Entire AoI	For tangible elements outside the RoW, prior to any construction activities and whenever possible guarantee access for local communities to the cultural heritage elements during the construction activities.
SOC-MM79	Cultural heritage	Construction	Avoidance	Entire AoI	For tangible elements within the RoW, prior to any construction activities verify if relocation or replacement can be avoided, if project construction and operation activities do not require the use of the entire RoW where the cultural heritage element is located.
SOC-MM80	Cultural heritage	Construction	Minimisation	Entire AoI	For tangible elements within the RoW, prior to any construction activities if relocation or replacement of the cultural heritage element is necessary, discuss and agree solutions with local authorities and local communities.
SOC-MM81	Cultural heritage	Construction	Minimisation	Entire AoI	For intangible elements within the AoI, prior to any construction activities discuss with local authorities and local communities the most suitable measures to avoid disruptions.
SOC-MM82	Cultural heritage	Construction	Minimisation	Entire AoI	Develop and implement a Cultural Heritage Management Plan , which includes measures to manage impacts to cultural heritage in compliance with National law and IFC Performance Standard 8. The Plan will include all measures listed above and additional measures that may emerge from engagement with stakeholders. The Plan will also include an Accidental Damage Procedure to address potential damages to cultural heritage and other assets which have the potential to occur during the Project’s Construction phase.
IPP01	Indigenous people	Construction	Minimisation	Bagyeli communities	Implement dedicated engagement activities with Bagyeli communities prior to construction to share information on the Project, expected impacts and planned mitigation measures. Throughout construction conduct periodic meetings with Bagyeli community leaders to discuss impacts generated by the Project, effectiveness of mitigation measures and any necessary changes to be performed.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
IPP02	Indigenous people	Construction	Minimisation	Bagyeli communities	Inform Bagyeli communities about the Project’s Grievance Mechanism. The most suitable channels for Bagyelis to submit their grievances will be identified together with the community members and leaders.
IPP03	Indigenous people	Construction	Minimisation	Bagyeli communities	Develop and implement and Influx Management Plan to identify risks connected to the movement of persons in the Project's AoI. The Plan will specify measures that mitigate impacts to Bagyeli.
IPP04	Indigenous people	Construction	Minimisation	Bagyeli communities	Develop and enforce a workers Code of Conduct. The Code of Conduct will provide rules aimed at creating a positive work environment and avoiding tensions and conflicts with the Bagyeli communities. The Code of Conduct will be provided to workers during the recruitment process and will be covered during induction training.
IPP05	Indigenous people	Construction	Minimisation	Bagyeli communities	Perform training activities with Bagyeli communities, to inform community members on Project related risks to health and safety and measures to be implemented, particularly on the issue of road safety.
IPP06	Indigenous people	Construction	Minimisation	Bagyeli communities	Develop and implement a Traffic Management Plan, with indication of the measures that will be enforced to reduce impacts generated by traffic and to increase safety for workers and local communities. The Plan will include the measures that may emerge from engagement with Bagyeli communities.
IPP07	Indigenous people	Construction	Minimisation	Bagyeli communities	Develop and implement a Community Health and Safety Management Plan. The Plan will include the measures that may emerge from engagement with Bagyeli communities.
IPP08	Indigenous people	Construction	Minimisation	Bagyeli communities	Develop and implement a Cultural Heritage Management Plan, which includes measures to manage impacts to cultural heritage in compliance with National law and IFC Performance Standard 8. The Plan will include measures to mitigate impacts to Bagyeli tangible and intangible cultural heritage.
IPP09	Indigenous people	Construction	Minimisation	Bagyeli communities	A Free, Prior and Informed Consent (FPIC) of the Bagyeli communities has been developed in line with the indications of IFC PS7. The requirements included in the FPIC agreements have to be implemented.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
IPP10	Indigenous people	Construction	Enhancement	Bagyeli communities	Employment positions that could be filled by members of the Bagyeli communities will be identified, based on type of skills required. Bagyeli members will invited and accompanied in applying for these positions. Contractors and subcontractors will be required to implement similar processes. The recruitment process will ensure non-discrimination and equal opportunities to all workers, including Bagyeli community members. Periodic audits of contractors and subcontractors to ensure that Bagyeli community members are treated equally and fairly and that they are not subject to different working conditions compared to other workers.
IPP11	Indigenous people	Construction	Enhancement	Bagyeli communities	Develop and implement a local content strategy. The strategy will aim at maximizing the use of local workforce and maximizing the use of goods and products from the AoI and from Cameroon. The strategy will identify actions such as training for local workers, engagement activities targeted at local workers including Bagyeli and mapping of local companies providing goods and services necessary to the Project. The implementation of actions will then be agreed with contractors and subcontractors
IPP12	Indigenous people	Construction	Enhancement	Bagyeli communities	ICMC will support Bagyeli community members in obtaining all the necessary documents and certifications necessary to be compensated for economic or physical displacement and legally employed. ICMC will liaise with local authorities if necessary to facilitate this process.
IPP13	Indigenous people	Construction	Minimisation	Bagyeli communities	The Government led resettlement process will pay attention that specific information on the losses to be faced by Bagyeli is collected and appropriate compensation is calculated and provided directly to the impacted Bagyeli communities prior to any land clearing. As per the requirements of PS5 and the requests of the Bagyeli, compensation will be provided in the form of replacement land and housing rather than cash. Livelihood restoration measures tailored to the needs of Bagyeli communities will be identified and implemented in the context of the resettlement process.
IPP14	Indigenous people	Construction	Minimisation	Bagyeli communities	If replacement buildings of public facilities such as schools, churches or health centres are to be built due to the Project, Bagyeli leaders and community members will be consulted to ensure that these facilities are as accessible as possible to Bagyeli community members.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
IPP15	Indigenous people	Construction	Minimisation	Bagyeli communities	BACUDA to be contracted to assist and support Bagyeli in ensuring that all mitigation measures and Project benefits are realised, information is shared, and engagement is conducted in a culturally appropriate manner.
IPP16	Indigenous people	Operation	Minimisation	Bagyeli communities	Implement dedicated engagement activities with Bagyeli communities prior to the start of operation to share information on the Project, expected impacts and planned mitigation measures. At the beginning of operation periodic meetings with Bagyeli community leaders will be held to discuss impacts generated by the Project, effectiveness of mitigation measures and any necessary changes to be performed.
IPP17	Indigenous people	Operation	Minimisation	Bagyeli communities	The most suitable channels for Bagyelis to submit their grievances during operation will be identified together with the community members and leaders.
IPP18	Indigenous people	Operation	Minimisation	Bagyeli communities	Perform training activities with Bagyeli communities, to inform community members on Project related risks to health and safety and measures to be implemented, particularly on the issue of road safety during operation.
IPP19	Indigenous people	Operation	Enhancement	Bagyeli communities	Employment positions that could be filled by members of the Bagyeli communities will be identified, based on type of skills required. Bagyeli members will invited and accompanied in applying for these positions. The recruitment process will ensure non-discrimination and equal opportunities to all workers, including Bagyeli community members.
IPP20	Indigenous people	Operation	Enhancement	Bagyeli communities	Develop and implement a local content strategy. The strategy will aim at maximizing the use of local workforce and maximizing the use of goods and products from the AoI and from Cameroon. The strategy will identify actions such as training for local workers, engagement activities targeted at local workers including Bagyeli and mapping of local companies providing goods and services necessary to the Project. The implementation of actions will then be agreed with contractors and subcontractors.
IPP21	Indigenous people	Operation	Minimisation	Bagyeli communities	BACUDA to be contracted to assist and support Bagyeli in ensuring that all mitigation measures and Project benefits are realised, information is shared, and engagement is conducted in a culturally appropriate manner.

Table 6: SPECIFIC MITIGATION MEASURES FOR SOCIAL COMPONENTS – QUARRY & SITE INSTALLATIONS-

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
SOC-Q-MM01	Demography	Construction	Minimisation	Quarry (Site 1) Site installations (Site 2)	Periodically monitor the accommodation needs used by quarry and site installation workers. Verify if the accommodation facilities they use, either formal (Provided by ICMC) or informal (within communities), respond to their needs.
SOC-Q-MM02	Demography	Construction	Minimisation	Quarry (Site 1) Site installations (Site 2)	As part of the SEP implementation, consider additional specific consultation meetings with local authorities and communities from the QAoI to discuss any issues linked to the presence of quarry and site installation workers, their impacts on communities and vulnerable groups in AKOM II and the three communities in the QAoI, and the effectiveness of mitigation measures that are being implemented.
SOC-Q-MM03	Demography	Construction	Minimisation	Quarry (Site 1) Site installations (Site 2)	Set up a centralized recruitment process and avoid recruitment at the quarry and site installations offices. Set up and information board at the junction between the access road and the main road with information for candidates.
SOC-Q-MM04	Demography	Construction	Minimisation	Quarry (Site 1) Site installations (Site 2)	Include in the local content strategy specific measures to maximise recruitment of quarry and site installations workers from Akom II and the nearby communities.
SOC-Q-MM05	Demography	Construction	Minimisation	Quarry (Site 1) Site installations (Site 2)	Periodically verify if uncontrolled immigration linked to quarry and site installations activities is occurring in Akom II and in the nearby communities. As part of the enhanced stakeholder engagement for communities within the QAoI discuss and identify shared mitigations to prevent and manage uncontrolled immigration.
SOC-Q-MM06	Land tenure and livelihood	Construction	Avoidance	Quarry (Site 1) Site installations (Site 2)	During mobilisation and before establishing the permanent footprint for Site 1, Site 2 and the access road, explore opportunities to reduce it and maximise avoidance of land acquisition and economic displacement.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
SOC-Q-MM07	Land tenure and livelihood	Construction	Minimisation	Quarry (Site 1) Site installations (Site 2)	Develop and implement a grievance mechanism specific for the land acquisition process to be undertaken for quarry and site installations. Ensure that all Project Affected People identified in the RAP specific to this process are informed about this channel to submit grievances. Ensure that appropriate budget and resources are assigned. The Grievance Mechanism will include specific channels for women workers to submit grievances and personnel specialised and trained in addressing cases of GBVH.
SOC-Q-MM08	Land tenure and livelihood	Construction	Minimisation	Quarry (Site 1) Site installations (Site 2)	Develop and implement a Stakeholder Engagement Plan specific to the quarry an site installations land acquisition process and targeted to the PAPs in the QAoI. Ensure resources and budget are dedicated to engagement. Periodically revise the stakeholder mapping and the plan based on progress of activities.
SOC-Q-MM09	Land tenure and livelihood	Construction	Compensation	Quarry (Site 1) Site installations (Site 2)	Develop and implement a Resettlement Action Plan (RAP) specific to the land acquisition process for the quarry and site installations and compliant with Cameroon Legislation and IFC PS5.
SOC-Q-MM10	Land tenure and livelihood	Construction	Compensation	Quarry (Site 1) Site installations (Site 2)	Within the context of the RAP, identify and agree with local authorities and local communities' livelihood restoration actions targeted at the three communities existing in the QAoI and the town of Akom II.
SOC-Q-MM11	Economy and employment	Construction	Minimisation	Quarry (Site 1) Site installations (Site 2)	Include in the local content strategy specific measures to maximise recruitment of quarry and site installations workers from Akom II and the nearby communities.
SOC-Q-MM12	Economy and employment	Construction	Minimisation	Quarry (Site 1) Site installations (Site 2)	Set up a centralized recruitment process and avoid recruitment at the quarry and site installations offices. Set up and information board at the junction between the access road and the main road with information for candidates.
SOC-Q-MM13	Economy and employment	Construction	Minimisation	Quarry (Site 1) Site installations (Site 2)	Develop and implement a Workforce Demobilisation Plan specific to quarry and site installation workers, using the principles in the IFC Good Practice Note No. 4: Managing Retrenchment, 2005, with the aim of reducing the impacts of cessation of employment contracts.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
SOC-Q-MM14	Economy and employment	Construction	Minimisation	Quarry (Site 1) Site installations (Site 2)	Include in the Contractor, Supply Chain Management and Procurement Plan specific measures for quarry and site installation contractors. The Plan will ensure that contractors and subcontractors along the quarry supply chain will be compliant with IFC PS2 and national legislation.
SOC-Q-MM15	Economy and employment	Construction	Minimisation	Quarry (Site 1) Site installations (Site 2)	As part of the SEP implementation and of the additional specific consultation meetings with local authorities and communities from the QAoI to be held to discuss issues linked to the presence of external quarry and site installation workers, engage them also on the issue of employment opportunities for local, ensuring a transparent and clear communication on the actual Project needs, to avoid unrealistic expectations on employment positions.
SOC-Q-MM16	Education	Construction	Avoidance	Quarry (Site 1) Site installations (Site 2)	As part of the dedicated additional stakeholder engagement activities to be held with communities in the QAoI, include information on the blasting schedule. The schedule should be shared with communities and agreed with them. The schedule should be made public and exposed in public places and board in Akom and at the nearby communities.
SOC-Q-MM17	Education	Construction	Avoidance	Quarry (Site 1) Site installations (Site 2)	Provide induction training on traffic safety to all drivers. The training will include a specific session on safety at the junction between the access road and the RN17, and on speed limits along the access road.
SOC-Q-MM18	Education	Construction	Avoidance	Quarry (Site 1) Site installations (Site 2)	Adopt and enforce a 30 km/h speed limit on the access road.
SOC-Q-MM19	Education	Construction	Minimization	Quarry (Site 1) Site installations (Site 2)	Identify sensitive receptors (e.g. schools) within the QAoI and identify additional road safety measures in their proximity. Give specific care to the households at the junction between the access road and the RN17 and identify specific measures for that critical point.
SOC-Q-MM20	Education	Construction	Minimization	Quarry (Site 1) Site installations (Site 2)	Ensure that the construction site is fenced or controlled by personnel to avoid trespassing
SOC-Q-MM21	Education	Construction	Minimization	Quarry (Site 1) Site installations (Site 2)	Perform targeted traffic safety awareness campaigns for local communities in the QAoI. These will include sessions specific to the risks posed by the traffic hot spot of the quarry and site installations and of the junction with the NR17.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
SOC-Q-MM22	Education	Construction	Minimization	Quarry (Site 1) Site installations (Site 2)	Include in the Quarry Management Plan measures that are specific to traffic in the QAoI and in particular for safety at the junction with the RN17. The Plan will include the measures indicated above and additional measures that may emerge from engagement with stakeholders.
SOC-Q-MM23	Education	Construction	Minimization	Quarry (Site 1) Site installations (Site 2)	Assign a flagmen/flagwoman to all critical points across the quarry and site installation sites and access road, as a minimum at the bridge and at the entrance to both sites. Vehicles moving on the two sites, will be preceded by a flagman/flagwomen. The site manager will be responsible for adopting a safety procedure for traffic on Site 1 and 2 that will prevent and manage risks due to the presence of heavy vehicles and primarily any human-vehicle interaction risks
SOC-Q-MM24	Education	Construction	Minimization	Quarry (Site 1) Site installations (Site 2)	The site manager will be responsible for adopting and enforcing a safety procedure for traffic at Site 1 and 2 that will identify and manage risks due to the presence of heavy vehicles and workers. Personnel will be trained Vehicles moving on the two sites, will be always preceded by a flagman/flagwomen. Flagmen/Flagwomen will be also deployed at critical junctions and points in Akom II and along the RN17 in proximity of the Junction.
SOC-Q-MM25	Education	Construction	Minimization	Quarry (Site 1) Site installations (Site 2)	Ensure that a flagmen/flagwoman is always present at the traffic junction between the access road and the RN17, during working hours and whenever there is Project traffic there. The flagman/flagwomen will be trained to supervise traffic at that point and ensure operations occur in safe conditions. He/she will be given the authority to stop traffic and to prevent access to the access road or to the RN17 to drivers that are not behaving according to the rules. He/she will be also given the authority to report any misconduct to the site manager. Drivers will be trained on the role of the flagman and any misconduct will be reported to the human resources department.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
SOC-Q-MM26	Mobility and infrastructures	Construction	Minimization	Quarry (Site 1) Site installations (Site 2)	Discuss with local authorities and local communities in the QAoI specific measures to ensure that disruption to mobility and transport is reduced to the extent possible. Discuss if the Project is leading to any impacts in terms of availability of food and products in the QAoI as a consequence of the traffic induced by the Project.
SOC-Q-MM27	Ecosystem services	Construction	Minimization	Quarry (Site 1) Site installations (Site 2)	As part of the additional consultation to be carried out in the QAoI, periodically consult local authorities and local communities on access to and availability of ecosystem services within and around Site 1 and 2 and discuss potential additional mitigation measures to be implemented.

Table 7: SPECIFIC MITIGATIONS FOR CLIMATE CHANGE RISKS

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
CCR1	Climate Change Risk	Operation	Minimisation	Overall road	In 10 to 20 years assess the need to improve the protection of the drainage system, dirt escarpments and road embankments; give priority to Ebolowa and its vicinity (highest risk). Additional adaptive measures to be placed all along the road.
CCR2	Climate Change Risk	Operation	Minimisation	Overall road	Make sure maintenance is given particular attention, and a regular cleaning of the draining systems, channels and other protections works is planned and put in place by local authorities so to maintain their efficiency during the entire life of the road (15 years). Maintenance will include the periodical cleaning of the right of way by eliminating vegetation in excess that could represent a threat in case of extreme weather conditions.
CCR3	Climate Change Risk	Operation	Minimisation	Overall road	Maintenance measures will include planned regular treatments to preserve the road thermal properties and performances.
CCR4	Climate Change Risk	Operation	Minimisation	Overall road	Particularly after 2050, a more in-depth analysis must be run, to verify that the materials mix for both the road and the lining of the carriageway are able to guarantee their longevity in case of higher temperature conditions, which are expected to occur in the medium-long future.
CCR5	Climate Change Risk	Operation	Minimisation	Overall road	Strength the collaboration with local authorities to deploy fixed fire-fighting equipment (such as hydrants connected to a fire-fighting network) along the road, with priority around PK 60 (higher probability of wildfires identified).
CCR6	Climate Change Risk	Operation	Minimisation	Overall road	Competent local authorities to clean periodically the right of way by eliminating the vegetation in excess alongside the road that could facilitate wildfire. The maintenance program and plan will be adapted periodically to local changes and circumstances.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
CCR7	Climate Change Risk	Operation	Minimisation	Overall road	A more in-depth hydrological analysis will be developed against the evidence of increased flooding events (intensity or frequence), in particular around location #8 at PK 120 where the risk has been assessed slightly higher than elsewhere along the road. The analysis will serve to better understand the morphology changes in the nearby river and the water surface that could overflow in case of intense and prolonged rains, potentially representing a threat for the road.
CCR8	Climate Change Risk	Operation	Minimisation	Overall road	Taking into considerations the outcomes of a more in-depth hydrological analysis, speed regulation will be updated based on forecast for the most exposed area (From Km 110 to Km 130) and extra road signals advising of potential flooding within the most exposed area (Km 110 to Km 130) will be considered.
CCR9	Climate Change Risk	Operation	Minimisation	Bridges	Exceptional traffic and speed regulation will be adopted temporarily based on warnings from weather forecast and local water level monitoring
CCR10	Climate Change Risk	Operation	Minimisation	Bridges	A program for evaluating the efficacy of existing maintenance in line with the expected increase of temperatures will be implemented.
CCR11	Climate Change Risk	Operation	Minimisation	Bridges	Install water level monitoring systems in some of the bridges (16m and 25 m span bridges designed with Q50) around the most exposed area for flooding (from Km 110 to Km 130). Implement traffic and speed limits as precautionary measure for passing the bridges based on the status of water level.
CCR12	Climate Change Risk	Operation	Minimisation	Bridges Culverts	A program for evaluating the status of riverbanks where foundation or infrastructures are located must be implemented. Monitoring to be developed both periodically and flooding event based.
CCR13	Climate Change Risk	Operation	Minimisation	Bridges Culverts	Make sure full review of the structures and maintenance is done after flood and extreme precipitation events.
CCR14	Climate Change Risk	Operation	Minimisation	Culverts	A program for monitoring and evaluating the road drainage systems during flooding events to assess the efficacy of the existing design elements and the mitigations/maintenance will be implemented.
CCR15	Climate Change Risk	Operation	Minimisation	Culverts	Carry out regular maintenance of the culverts, including cleaning before and after the rain period. Culverts must be cleared from inert materials transported to the place which could hamper water drainage.

ID	Components	Project Phase	Mitigation Hierarchy	Applied in	Mitigation Measures/Actions
CCR16	Climate Change Risk	Operation	Minimisation	Toll, weighting and counting stations	Ensure the implementation of a Risk Management Plan which foresees that work is stopped in tolls, counting and weighing stations during hard weather conditions. All personal working in tolls, counting and weighing stations must be trained accordingly about procedures following the Risk Management Plan indications.
CCR17	Climate Change Risk	Operation	Minimisation	Toll, weighting and counting stations	Make sure the building elements and infrastructure are well equipped with specific elements against strong winds, lightings and damages due to extreme precipitation. Make sure the stations have elements to also secure vehicles, and their loads retained in the installations during severe storms.

Signature Page

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