

CHAPTER – 6**6 ENVIRONMENTAL MANAGEMENT PLAN****6.1 INTRODUCTION**

Environmental Management Plan (EMP) is prepared for effective implementation of proposed augmentation and mitigation measures, with monitoring on the compliance of implementation of the proposed mitigation measures, auditing for assessing the effectiveness of mitigation measures and the institutional arrangement for the implementation of the EMP.

EMP focuses on the inclusion of planning, organization, staffing, directives, co-ordination, reporting and budgeting. Within this broad framework, the following sections describe to address 5W's (what, why or how, where, when and who) for the implementation of benefit augmentation and mitigation measures, environmental monitoring and auditing works. The EMSF of DOR has been duly considered during the preparation of this EMP. The EMP guides the project management in such a way that the environmental protection measures are adequately implemented, effectiveness of such measures are monitored and environmental auditing is carried out to know the project performance on the environmental ground.

6.2 PLANNING

The environmental protection measures (EPMs) will be implemented during the pre-construction, construction and operational and maintenance stages of the project. The implementation of EPMs will be the responsibility of the proponent. All preparatory activities related to site clearance including the necessary permission from the relevant government organization(s) as well as land and property acquisition will be completed during the pre-construction stage. In this stage, the project will delineate the actual area to be acquired for the project activities, negotiate with the land and property owner(s), and compensate for the lost resources. In case of government land, the project will request the government for leasing out required land. As these are basically related to the pre-construction stage, the project will not be implemented without completing these pre-requisites. Similarly, the design has been undertaken by adopting the basic civil engineering design principle for the environmental and social protection. To be specific the detailed design has considered all the proposed mitigation measures in this updated EIA report.

6.2.1 IMPLEMENTATION PLAN FOR ENVIRONMENT PROTECTION MEASURES**6.2.1.1 Benefit Augmentation Measures**

The proposed benefit augmentations measures have been presented in Chapter 5 of this report. The implementation mechanism is presented in Table 6.1.

6.2.1.2 Adverse Impacts Mitigation Measures

Numbers of mitigation measures have been proposed for the impacts identified in Chapter 5 of this report. Most of the proposed mitigation measures are the part of civil engineering, their cost have been already included in the construction cost of the project. The compensation cost and support to the schools, training to construction workers, counseling etc have been presented in implementation plan of mitigation measures in Table 6.2.

Table 6-1: Implementation Plan, Beneficial Impact and Enhancement Measures

SI	Project Benefit	Benefit Enhancement Measures	Cost implication	Implementation Responsibility	Inclusion in the project document
B 1	Generation of employment	- Provide employment to the local people to the extent possible. - minimum wages for the construction labours shall not be less than the approved district rate.	No cost	Contractor/sub-contractor	Covered in special condition of contract no 111
		Provide technical skill training and income generating training to the interested project affected people (170 people)	Rs 15,300,000 .00	Project	Covered in special condition of contract no 111
	Increase in income	Encouraged to use the local products and material	No cost	Contractor/sub-contractor/Consultant	
	Shortening of Travel Time	The proposed tunnel road including access road has been made access control road.	No cost		
	Reduction on Air Pollution	Only emission passed vehicles will be allowed in the tunnel road	No cost	Project	
	Operation of the Michi-no-kei	The shops in the Michi-no-kei will be place the promotion of the local products	No cost	Project/Operator of the Michi-no-kei	
	Motivation to Highway Tunnel Construction and Operation	Successful implementation of the project would be example for other tunnel roads in Nepal		Project/Contractor/Consultant	

Table 6-2: Implementation Plan for Adverse Impact and Mitigation Measures

Sl	Adverse impact	Mitigation/ Compensatory Measures	Cost implication	Implementation Responsibility	Inclusion in the project document
P	Physical Environment				
P 1	Permanent/ temporary change in land use The project infrastructures will occupy areas of both private and public sector, The construction of infrastructures for the project will change the land use pattern of the area. A total of 14.2344 ha of land will be permanently acquired for building infrastructures.	Change in land use due to the permanent acquisition cannot be avoided but the temporary land acquisition will be brought back original condition or even better. The land use clearance will be limited within the right of way or the acquired land only. Land clearance may affect adjacent land.	Cost is presented in social section	Project	
P 2	Air quality degradation Following activities during the construction will degraded the air quality: • Vehicles plying in the project area • Batching plant • Earthwork in excavation • Tunnel excavation	Prepare pollution abatement plan All the construction workers and staffs who would be working in these sites will be provided with the helmets, earplugs and face mask. The equipments and vehicles should be regularly maintained as per the specification of the manufacturer. Spraying of water at the work areas three time of day and washing the vehicles before they leave the construction sites, will be taken. Prohibit open storage and spillage of loose soil in and around construction site. Appropriately cover or wet the stock piled and spoil materials if it gives rise to dust pollution. All vehicles belonging to the project i.e. consultants, owner, contractors, vendors will comply with the national emission standards and regular (monthly) check-up for maintenance of all vehicles will be carried out every 3000 km;	No cost Part of the construction cost Part of the construction cost Part of the construction cost Part of the construction cost Part of the construction cost Part of the construction cost Part of the construction cost	Contractor Contractor Contractor Contractor Contractor Contractor Contractor/sub-contractors/ vendors/ projects/consultants	Maintenance of the air quality standard and its mitigation measures is covered in special condition of contract no 111

Sl	Adverse impact	Mitigation/ Compensatory Measures	Cost implication	Implementation Responsibility	Inclusion in the project document
P 3	Surface water quality degradation The construction work including batching plant and the tunnel excavation is likely to generate waste water comprising of sediment. If they directly discharged into the natural stream, they will be polluted. The operation of the labour camp will generate sewage.	Use of breathing mask by the construction workers in the dust-prone areas such as crushing plant, batching plant, rock drilling areas etc will be made compulsory. • Turbid water discharged during Tunnel construction will be first treated at the Water Treatment Plant before discharging. • Wastes generated from the batching plant and other sources will be treated before discharging into the stream or other water source. • Sewerage generated in the labour camp, contractor camp, work camp will be disposed safely in the soak pits. • Maximum turbidity avoidance measures will be designed in the Construction Plan of the bridges and culverts. • Raise awareness and establish communication during the Construction Phase between the Contractor, water users and community leaders; project will be undertaken for information dissemination and grievance redress. • Avoid disposal of solid waste, sludge, and other wastes directly into water bodies and properly manage campsites. • Prohibit disposal of waste fuel, oil, grease into water and cleaning of vehicles in rivers. • Prohibition of urination and defecation in open areas and near water bodies by construction workers with the installation of sanitation facilities.	Part of the construction cost Part of the construction cost	Contractor Contractor	Maintenance of the water quality standard and its mitigation measures is covered in special condition of contract no 111

SI	Adverse impact	Mitigation/ Compensatory Measures	Cost implication	Implementation Responsibility	Inclusion in the project document
P 4	Impact due to noise pollution The necessity of using blasting material for excavating the hard rock, operation of machineries such as the compressor and diesel generator for 24 hours and the movement of increased number of vehicles along with the use of pressure horn would increase the noise level in the project area.	Use of explosives will be limited to the extent possible; The construction area will be fenced by thick plywood; Ear gears will be provided to the construction workers in the noise-prone areas such as blasting for hard rock excavation; Noise producing engines such as air compressors will be fitted with noise reducing equipment; and All vehicles plying in the construction area will be maintained regularly as per the manufacturer's recommendations. Select low-noise type equipment.	Part of the construction cost	Contractor	Noise pollution control requirement its mitigation measures is covered in special condition of contract no 111
		Provide noise barriers at sensitive area like schools, temples, health centers and big settlement area.	Part of the construction cost	Contractor	
		Control of work hours and days, i.e. stopping at night and weekends, near the vulnerable facilities and settlements.	Part of the construction cost	Contractor	
		Establish batching plant etc. away from settlement and wildlife habitat areas to extent possible.	Part of the construction cost	Contractor	
		Prohibition of using pressure horns by vehicles near the settlements and wildlife habitat areas, if any.	Part of the construction cost	Contractor	
		Large noise producing machineries such as air compressors, road header to be fitted with noise reduction mechanism.	Part of the construction cost	Contractor	
		Ear gears will be provided to the construction workers in the noise-prone areas such as blasting for hard rock excavation;	Part of the construction cost	Contractor	
		All vehicles plying in the construction area will be maintained regularly as per the manufacturer's recommendations.	Part of the construction cost	Contractor	

SI	Adverse impact	Mitigation/ Compensatory Measures	Cost implication	Implementation Responsibility	Inclusion in the project document
P 5	Impact due to wastes generation Muck: A large volume of the muck will be generated from the excavation of the tunnel. It is estimated that 260,000 m³ of muck is expected from the tunnel excavation. Improper handling and disposal of spoil will have adverse impact on crop land, water quality and air quality.	Spoil disposal plan will be prepared. Following points will be considered. - more than 50 % tunnel muck will be used for the construction materials - Generated spoil will be used as back fill material as far as possible. - The spoil will be disposed at the designated area only - The disposal area will be properly leveled and reclaimed for reuse and restored to original shape as far as possible - The Disposal Area must be planned avoiding the following conditions. - Natural water course posing a threat of or causing chowking in its flow and course change. - Over the edge of the excavations and fresh embankments. - Immediately above potential arable land and forest areas. - Above public utilities and existing services – water supply lines, irrigation canal systems, valley side trails etc. Under take necessary institutional coordination and allocate budget plan for hiring labor for collection and disposal service. Workers and managers should be trained for source segregation and management of generated waste at site. Establishment of labour camps with appropriate arrangements for solid waste collection and its management through incineration or proper landfill for degradable wastes.	Management of the muck is the part of the construction cost	Contractor	Requirement of different type of wastes management and their mitigation measures are covered in special condition of contract no 111
	Solid wastes: Labour camps, site office, work camps and the project office will be generating solid wastes. Though these sites will be located at the different locations, haphazard dumping of the solid wastes will spoil the environment of the vicinity. It could be even hazardous if the biodegradable wastes are allowed to decay at the open space.		Management of the solid wastes is the part of the construction cost	Contractor	

SI	Adverse Impact	Mitigation/ Compensatory Measures	Cost implication	Implementation Responsibility	Inclusion in the project document
		Develop and implement "Code of Conduct" and enforce strict penalty to violator of "Code of Conduct". Educate about non-use of bio non-degradable materials such as plastic, metal, glass etc. and separation of such waste material and incineration safely			
	Liquid wastes: The liquid wastes will be generated from the labour camps, work camp, tunnel excavation, batching plant. They could be leaked to the nature if not proper taken care	Septic tank will be provided in the labour camp and work camp. The waste water from the batching plant and tunnel excavation will comprises of sediment. The wastes will pass through the settling basin	Management of the liquid wastes is the part of the construction cost	Contractor	
	Hazardous wastes: Number of light and heavy vehicles will be required for the construction of the project. These vehicles will use diesel and petrol, engine oil, gear oil, brake oil etc. Operation of the workshops for the maintenance also will be the source of hazardous waste. The labor housing would require large volume of kerosene for cooking purpose.	Storing and handling of fuel, lubricants bitumen etc. should be done in a safe manner. Storing compounds shall have fire extinguisher facilities. Used lubricants shall not be discarded in a haphazard manner or disposed in streams and water sources. Direct cleaning of vehicles or equipments should prohibit in streams, rivers or canals. Avoid contamination if Liquid waste with water sources in case of spillage. Protective clothing, gloves, boots etc. should be provided to the laborers dealing with liquid waste. Bitumen heating and mixing plants should be away from settlement areas and Excess bitumen should be managed properly.	Management of the hazardous wastes is the part of the construction cost	Contractor	
P 7	Addressing Impact on Water Regime, Water Right and Water Use:	Water is the basic need of the people which cannot be disrupted for a day also.	An amount of RS 139 million	Contractor	Restoration of the water supply

SI	Adverse impact	Mitigation/ Compensatory Measures	Cost implication	Implementation Responsibility	Inclusion in the project document
	The construction of the tunnel is likely to affect the spring sources and ground water wells of the project area vicinity. As per the EIA study, 11 number of springs and 31 number of ground water wells are likely to be affected.	<i>The source of the water supply systems that are likely to be disturb will be identified. A water supply system will be constructed to supply the drinking water in the project affected area.</i>	<i>has been allocated for the construction of water supply</i>		system during the construction phase is covered by the provisional sum.
P-8	Impact on Slope and Embankment Stability and Local Geology: The access road at the eastern part of the tunnel has been design with cutting as much as 40 m high and embankment as high as 60 m. Similarly the disposal site at the western portal also has high earthwork filling.	The slope and of the embankment and side slope cutting of the proposed road has been in accordance with Nepal Road Standard 2070, Government of Nepal	Part of the construction cost	Contractor	Included in the detailed design
P 9	Impact due to physical Splits of the Community Facilities: The proposed access road to the tunnel crosses the local road network at _____ locations. The proposed access road has been made access control road. There will be no direct access from the local roads to the tunnel access road.	<i>In order to make the smooth traffic flow in the local roads, under pass, over pass and service roads have been proposed</i>	Restoration of the public utilities due to the construction is the part of the construction cost	Contractor	Included in the detailed design
S	Socio-economic Environment				
S 1	Loss of land property Farmland/ other Categories of Lands, Structures and Agricultural Products as a Part of Site Clearance				
	____ ha of land will be acquired	Land will be compensated at the market rate. Total amount budgeted for the land compensation is RS _____	Part of RAP	Project	Covered by RAP
	____ number of houses will be acquired,	Cost of the building will be compensated at the replacement value Owners will be allowed to take away the reusable materials Transportation allowance will be provided to the owner for moving house	Part of RAP	Project	Covered by RAP

SI	Adverse impact	Mitigation/ Compensatory Measures	Cost implication	Implementation Responsibility	Inclusion in the project document
	Loss of agricultural product: The land acquisition will be affecting _____ tonnes of wheat, — tonnes of tomato	The standing crops on the acquired land will be compensated at the market value. Estimated to loss ----- tones of wheat _____ tons of tomato	Part of RAP	Project	Covered by RAP
	Business loss: The project will be affecting a concrete block factory and a brick kiln located at the eastern approach road	Both affected business are operated on the leased land.	Part of RAP	Project	Covered by RAP
S 2	Impact due to displacement of vulnerable/ poor community All the project affected families are economically sound people. They are neither vulnerable nor poor. Yes some them do loss their house some loss large parcel of land. They will be considered as the severely project affected families. 54 no of families will losing their house and 116 number of people will be loss entire parcels of land.	<i>Income generating training will be provided to a member each of the SPAF if people are interested.</i> <i>Type of training will be decided in consultation with affected people.</i>	<i>An amount of Rs _____ has been allocated for the income generating training.</i>	Project Project	Covered by RAP
S 3	Impact on local economy and livelihood The project area will be affecting 6.3_ ha of the farm land, out of which 2.38 ha of vegetable farming operated.	<i>Business loss will be compensated as decided by the CDC. Estimated budget for the economic loss is presented in</i>		Project	Covered by RAP
S 5	Impact on traffic, public facilities, infrastructures and social services (a) Traffic The project will be constructing 3 numbers of traffic intersections at TRP namely (i) at Balambu, entrance of the access road (ii) at Jhyaple Khola, western portal of the tunnel and (iii) at Michi-no-kei. The existing heavy traffic of the TRP could be significantly affected during the construction phase.	<i>The construction works at these locations will start only after making the traffic diversion arrangement during construction.</i> Underpass, over pass and service road will be constructed for the smooth operation of the existing local roads. However there could some disturbance during the construction phase.	<i>Provision of the traffic diversion measures during the construction is the part of the construction activities.</i>	Contractor	Covered by special condition of contract no 111 Covered by detailed design

SI	Adverse impact	Mitigation/ Compensatory Measures	Cost implication	Implementation Responsibility	Inclusion in the project document
	(b) Infrastructures Apart from the impact on the traffic, the project is likely to affect the drinking water supply system of the project area vicinity, 312 m of 11 kV transmission line and 132 m of irrigation channel at the western portal. (c) Social Services The construction of the tunnel is likely to affect existing ground water and surface water sources of the tunnel area vicinity.	They will be relocated	Relocation of the affected infrastructures is part of the detailed design	Contractor	Covered by detailed design
S 6	Impact due to uneven distribution benefits and damages, local conflict of interests All the possible affect/damage to the local infrastructures has been identified to the extent possible and their remedial measures/compensation have been made in the detailed design and the contract document.	The project will construct groundwater tubewell and 3 numbers of reservoirs to supply the drinking water to the affected areas. Restoration and compensation of the project impact is the part of the construction cost. Additional measures which are not included in the bill of quantities will be covered from the contingencies.	Construction of the reservoir pumping facilities is covered in DD Restoration of the project impact is the part of construction cost	Contractor	In design, provisional sum
S 8	Impact to Domestic Workers and Housewives The construction of access road would obstruct the movement of the people during the construction of the access road	The project will make traffic diversion for each local road before the construction of the access roads. The traffic diversion cost is included in the project construction cost.	Restoration of the traffic and to keep the movement of the people is part of construction cost	Contractor	Covered by special condition of contract 111
S 9	Impact on sanitation, public health condition and possible transmission of infectious diseases. The contractor will be operating labour camp during the construction. Most of the workers are expected to be from the outside the project area. Concentration of a large number of people in the project site might create problems due to	The contractor will establish campsites for housing all outside workers. The project will manage services and facilities in the campsites such as drinking water supply, pit latrines and health clinics along with free distribution of necessary medicines to the workers and their dependents. These will be part of the construction cost.	Health and sanitation of the workers is the part of construction cost	Contractor	Covered by special condition of contract 111

SI	Adverse impact	Mitigation/ Compensatory Measures	Cost implication	Implementation Responsibility	Inclusion in the project document
	contamination of water through the disposal of solid and liquid wastes. The contamination of water may spread communicable diseases such as cholera, dysentery, diarrhea and other parasitic diseases etc. The mobilization of large numbers of outside workers might also raise danger of spreading of communicable diseases to the local people.	The workforce will be made aware of the health problems caused by unhealthy sanitation and contamination of drinking water. Implementation of proper measures for managing disposal of sewerage and control of water contamination will be made mandatory part of construction works. Before employing the worker, a certificate of medical checkup that he/she is free from any contagious disease like HIV, TB. The contractor will prepare leaflet on the awareness of the health and sanitation and provide orientation to all the workers who will be working in the Project.			
S 10	Impact on occupational health and safety of the worker for the safe working environment In the construction sites there will be movements of local people. In spite of precautions while drilling, blasting and other construction activities occurrence of accidents may not be ruled out. Hence construction activities pose safety concerns to the local people and workers as well. Construction activities and plying of vehicles in the earthen road during the construction will increase dust and gaseous emissions which may threat to the health condition of the local people and workers.	• Prepare operational health and safety plan for the project • All construction workers and staffs will be covered with accident insurance. • In order to minimize the unwanted accidents and possible effects of dust and gaseous emission to construction workers, the project will ensure adequate safety measures such as provision of helmets, masks, air plugs, road signs, warning signals etc. • Entry in the construction sites will not be permitted without proper safety gears	Occupational health and safety is part of the construction practice. It is the part of the construction cost.	Contractor	Covered by special condition of contract 111

SI	Adverse impact	Mitigation/ Compensatory Measures	Cost implication	Implementation Responsibility	Inclusion in the project document
		- To minimize effects of dust to local people provision of water spraying will be made during the dry season. - Erect notice sign and signal at the construction sites - Provide occupational health and safety training to all the construction sites - Provide orientation of the health and safety to all the workers at least once in the week.			
S 11	Impact due to possible crime and social behavior change (Law and order) The concentration of large number of people with varied social and cultural backgrounds and cash in their hands may lead to anti-social activities such as use of more alcohol, gambling and prostitution. The influx of outside workers with varied socio-cultural backgrounds may also disturb existing local socio-cultural practices. This may bring uneasiness to the local people resulting conflicts. The conflicts may deteriorate the law and order situation. Such conflicts may eventually lead to work stoppage.	In case of malpractices and disturbances by the construction workers and staffs, local authority will be informed and requested to impose restrictions on late night operation of Bhattis, restaurant and bars. Regular surveillance will be made. In order to encourage discipline among the workers, a cash prize of Rs 20,000.00 per person will be awarded to five diligent and disciplined workers every year. With the construction period of 3.5 years, Rs 400,000.00 has been allocated for this purpose.	Maintenance of the law and order within the project area Included in environmental cost.	Contractor/Local police/project Contractor	Included under environmental management cost