

Environmental Monitoring Report

Final Report (July 2018–July 2020)
G0400
August 2020

BHU: South Asia Subregional Economic Cooperation Road Connectivity Project Pasakha Access Road

Prepared by Egis International in association with Gyaltshen Consultancy for Department of Roads, Ministry of Works and Human Settlement, Royal Government of Bhutan and the Asian Development Bank.

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**Asian Development Bank Grant No. 0400-BHU(SF)
South Asian Sub-regional Economic Cooperation (SASEC)
Road Connectivity Project**

Final Environmental Monitoring Report Consolidated (July 2018 – July 2020)

Pasakha Access Road August 2020

Prepared by Egis International in association with Gyaltshen Consultancy for Department of Roads, MoWHS, Royal Government of Bhutan and the Asian Development Bank.
Updated as of August 2020 by PMU, SASEC Project, Department of Roads.

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CURRENCY EQUIVALENTS

(as of 31 July 2020)

Currency unit	–	Bhutanese Ngultrum
Nu. 1.00	=	\$ 0.0133
\$ 1.00	=	Nu. 74.73

ACRONYMS

ADB	Asian Development Bank
CSC	Construction Supervision Consultant
DEC	District Environment Committee
DOF	Department of Forest
EC	Environment Clearance
EFRC	Environment Friendly Road Construction
EMP	Environmental Management Plan
ES	Environmental Specialist
IEE	Initial Environmental Examination
NECS	National Environment Commission Secretariat
NRDCL	Natural Resource Development Corporation Limited
NWF	National Work Force
OHS	Occupational Health and Safety
PC	Project Coordinator
PM	Project Manager
PMO	Project Management Office
ROGB	Royal Government of Bhutan
ROW	Right of way
BHU	Basic Health Unit
DGM	Department of Geology and Mines

WEIGHTS AND MEASURES

ha	-	Hectare
km	-	Kilometer
m	-	Meter
cum	-	Cubic meter

NOTES

In this report, "\$" refers to US dollars

EXECUTIVE SUMMARY

1. The Royal Government of Bhutan (RGOB) has received a grant from the Asian Development Bank (ADB) to finance part of the cost of South Asian Sub-regional Economic Cooperation (SASEC) Road Connectivity project and in particular for the improvement of Pasakha Access Road (PAR). The Department of Roads (DOR) under the Ministry of Works and Human Settlement (MoWHS) is the implementing agency for improvement and rehabilitation of PAR.
2. The Pasakha Access Road (PAR) consist of improving a 1.2 km (Original length) section between km 7 – 8 on the existing Rinchending - Pasakha Highway and other international border crossing facilities at Alay. The Land Customs Station will connect the Indian SASEC Road from Hashimara under West Bengal, India to Alay in Bhutan.
3. PAR construction activities include i) improvement and rehabilitation of 1.385km of road section between km 7 – 8 on the existing Rinchending - Pasakha Highway; ii) Construction of 50 m multi-cellular culvert over Bhawanijhora slide zone; iii) 122.85m span pre-stressed concrete bridge over Bhalujhora river; iii) Construction of river training and check dams for minimizing the flow velocity; iv) construction of roadside drains and culverts; v) Road pavement strengthening works; and vi) upstream catchment improvement through bioengineering applications.
4. The Pasakha access road provides the principal access to the Pasakha industrial estate from Thimphu, Phuentsholing and India. The PAR is classified as a Primary National Highway and is managed by the Department of Roads (DoR). The existing road infrastructure from Pasakha to the west needs to be improved because the standards and conditions are inadequate to meet the rapidly growing demand for efficient movement of traffic.
5. The overall progress of physical works for Package I – Construction of Bhalujhora Bridge is 100% as of June 2019. The overall progress for Package II – Construction of Multi-Cellular box culvert, road works, and Gabion structures and Package III – Construction of Gabion Structure is 100% as of May 2019. EMP has been monitored and implemented on a day to day basis by the Environmental Focal Persons from both Contractor's side and from CSC (SI/ES). Contractor submits monthly EMP to CSC and Environment Specialist from CSC checks the EMP and further submits to DTL. DTL incorporates in the monthly reports. Environmental Clearance has been obtained from the National Environment Commission, Thimphu as per project's requirements.
6. In 2018, we had a minor concern regarding one of the resident's (Mr. Nala) property which was along the Package II road construction site. No damage was caused to the property, but to avoid any damages during the road construction, the problem was immediately addressed and resolved by providing RRM retaining wall as part of road structure to avoid embankment materials flowing to his area. Apart from this matter, the project did not receive or cause any social issue or impact.
7. This is the Final Environmental Monitoring Report for Pasakha Access Road under SASEC Project. This is a consolidated report covering the period from January 2018 to July 2020. The project initially started on 1 September 2015 – 31 August 2017, but due to inordinate delays, the contract for Package I and III was re-awarded on 22 December 2017 with start date on 1 January 2018 and the contract

package II was awarded on 20 February 2018 with start date on 1 March 2018. The overall level of compliance with environmental safeguards is satisfactory. Contractors for package I, II and III, M/s CDCL, M/s Bhutan Builders Pvt. Ltd, and M/s Druk Chapcha Construction Pvt. Ltd. & Gyalcon Infrastructure Pvt. Ltd. JV respectively have cleared their camps and office sites and restored back to its original.

8. The structures along Bhawanijhora stream was covered by debris during the flood event on 24 and 25 June 2019. To restore the access road and minimize further damage to the existing structures, the dredging work was carried out from May 6, 2020. As an emergency work, it is being carried out departmentally through the force account.

I. PROJECT DESCRIPTION

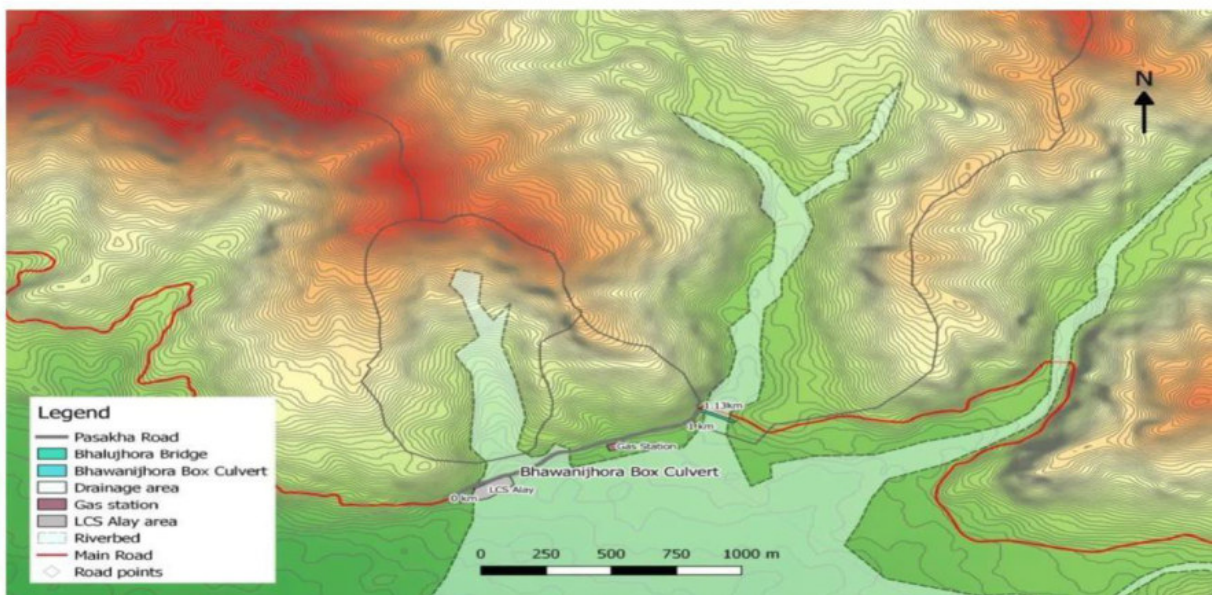
A. Project Scope

9. The proposed works required improvement and reconstruction of a 1.385 km section of the existing access road to Pasakha coming from Phuentsholing; construction of pre-stressed concrete bridge over the Bhalujhora River (122.85m) and construction of 50 m long RCC multi-cellular box culverts over Bhawanihora landslide debris flow.

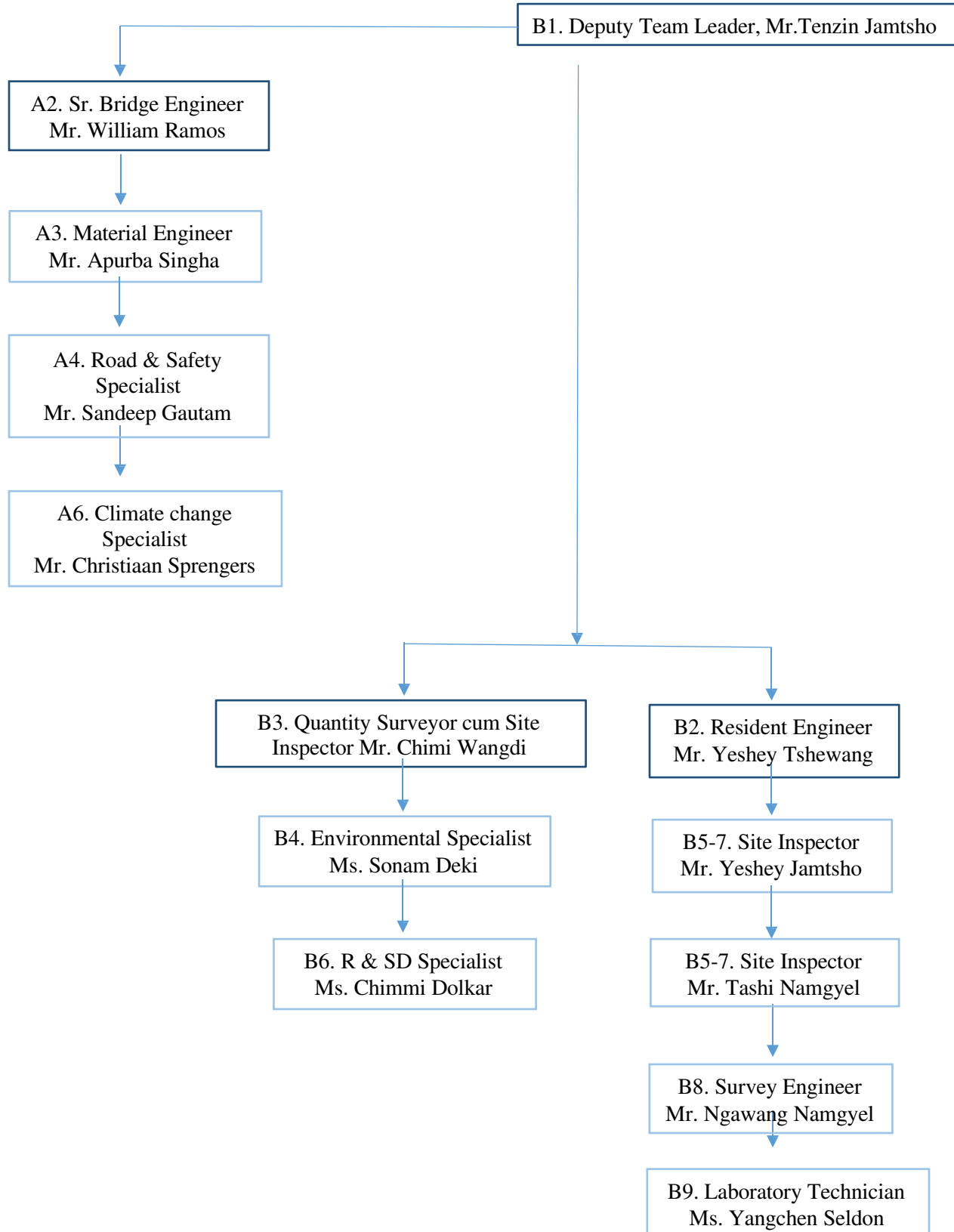
Table 1. Work item, contractor's schedule, date of award and completion date

SI. No	Work Item	Name of Contractor	Contract award date/start date	Contract completion date (actual)
1.	Construction of Bhalujhora Bridge (Pkg-I)	M/s Construction Development Corporation Limited (CDCL)	January 01, 2018	June 29, 2019
2.	Construction of multi-cellular box culverts, road works, LCS and gabion structures (Pkg-II)	M/s Bhutan Builders Pvt. Limited	March 1, 2018	May 20, 2019
3.	Construction of Gabion Structures (Pkg-III)	M/s Druck Chapcha Construction Pvt. Ltd. & M/s Gyalcon Infrastructure Pvt. Ltd	January 1, 2018	March 25, 2019
4.	Dredging work at Bhawanihora stream	Departmental work	6 May 2020	Ongoing

B. Location of Pasakha Access Road



C. Organizational Chart of Supervision Team



D. Implementation Arrangement.

10. The Department of Roads (DoR) under the Ministry of Works and Human Settlement (MoWHS) is the implementing agency and Pasakha Access Road (PAR) is implemented through the Project Implementation Unit (PIU).

11. Project Manager (PM) from the PIU is the environmental focal person for the DoR at the PIU level, who is responsible for ensuring the compliance of environmental conditions of the project. Construction Supervision Consultant (CSC) hired is part of the PIU.

12. CSC includes Team Leader (the Engineer) supported by Resident Engineer (RE), Bridge Engineer, Material Engineer, Quantity Surveyor, Environmental Specialist (ES), Resettlement & Social Specialist (RS), Survey Engineer, and Site Inspectors (SI).

13. RE and SI are the focal person to carry out the daily monitoring of construction works; and ensure the implementation of environmental mitigation measures as proposed in the Environment Management Plan (EMP), by the construction contractor (CC).

14. The contractor through its Project Manager/engineer is responsible for the submission of the monthly EMP compliance report. Similarly, RE reviews the monthly project progress report which includes the section on the compliance of environmental terms and conditions.

15. Environment Specialist (ES) carries out intermittent environmental compliance monitoring of the project to ensure the environmental mitigation measures or conditions are adequately addressed. ES is responsible for compiling and submitting the annual environmental monitoring report to the DOR through PIU, and to the ADB.

16. A District Environmental Committee (DEC) consists of Dzongkhag planning officer, Dzongkhag forest officer, Dzongkhag land record officer, Dzongkhag agriculture officer, Dzongkhag environmental officer, and Dzongkhag engineer. The District Environmental Officer (DEO) is district official of NECS.

17. DEC is responsible for issuing Environmental Clearance to some project activities mandated to the committee and for checking compliance of the projects to which it issues EC periodically. As part of its regular activities, NECS gives general training and orientation to DEOs before sending them to districts. These orientations focus mainly on Bhutan's environmental requirements.

E. Project Implementation Progress

17. The progress of work as of June 2020 is shown in **Table 2**.

Table 2. Work Progress as of July 2020

SI. No.	Activities	% Completed	Remarks
1.	Camp and site office establishment	100	
2.	Setting up of batching plant at Bhawanijhora	100	
3.	Pasakha Access Road widening/improvement work and pavement	100	
4.	Construction of Bhalujhora bridge	100	
5.	Construction of multicellular culverts over Bhawanijhora	100	
6.	Construction of gabion check dams	100	
7.	Dredging work at Bhawanijhora stream	90	

F. Construction Approach and Methodology

18. PAR widening and reconstruction is based on Environment-Friendly Road Construction (EFRC) Technology with the principle of balanced cut and fill. Excess excavated materials are disposed off in pre-identified approved disposal sites.

19. Civil and bioengineering techniques were applied to rehabilitate degraded or unstable area along the road corridor.

20. The dredging work has begun from May 2020 with maximum resources in the beginning so that the impact during peak of monsoon can be reduced. From May to June, about 180,000 cum of debris were disposed of. These spoils were used to build an embankment on various location. It was used as toe protection on the both side of hill at Upstream where settlement of more than 50 households are located. On the Downstream, land filled was developed on which warehouse/godown will be built by Food Cooperation of Bhutan (FCB) in the nearby future. Also, the materials were used to fill pot holes on the highway from Phuentsholing to Pasakha.

21. The fast-growing tree were planted along the road corridors and Upstream to prevent the soil erosion. More than 100 number of tress have been planted which were collected from local area.

22. In carrying out the dredging work, every safety measure in regard to COVID19 were undertaken based on the guideline issued by the Ministry of Health (MoH). All work forces were made to wear mask and wash hand. The local people were involved as labors so that the transmission could be minimized.

G. Climate Change Adaption Measures

23. In the detailed design study, surface geological investigation and subsoil investigation by seismic refraction technique was carried out at Pasakha Access road, across Bhawanihora debris bed, and at entire Bhawanihora Slide. The slides have been apparently triggered due to the stream cutting at the toe of the slide which is composed of talcosephyllite. Until such time the phyllite layer is completely moved down by the slide, the slope will remain active.

24. Most of the areas at the western slopes towards Phuentsholing show signs of distress mainly due to the stream cutting, steep angle of repose and saturated clay. On the contrary, the eastern side of the slide towards Pasakha is observed to be stable with the bedrock of phyllite and quartzitic-phyllite at the base of the slope.

25. The geology between Bhawanihora slide and the stretch of Pasakha road that passes through this slide debris is characterized by sandy gravels, boulders of dark grey and pink quartzite and phyllite. The distance between the road and the base of the slide is almost 1000m. The Bhawanihora slide covers about 1000m length by 500m width through the active zone. Based on the surface geology and seismic refraction results, presence of loose top soils with the debris of alluviums/colluviums at the widespread stream bed for a depth of about 5m is inferred. Below this layer, there is the possibility of weathered rock (possibly phyllite) and compact colluviums and alluviums of quartzite and phyllite with silt, sand and gravels.

26. The mitigation measures carried out are as follows:

- I. Construction of check dams of 8m high and 100m to 200m length at a spacing of 150m to 200m at the required location on the flood plain. This will help to control the debris flow.
- II. Construction of about 300m of protection wall (9m high Gabion retaining wall) at the base of slope starting from the confluence of main Bhawanihora stream with its tributary from Alay side to the start of the active slide.
- III. Bio-engineering measures applied at the unstable area with local species of plants and grasses where ever possible especially in the stabilizing zones to prevent reactivation of the slide.

27. Besides mitigation measures, the following Climate Change Adaption measures have been designed:

- I. Design of drainage structures has been based on future predicted design discharge using the rational method and Peak flow SCS method.
- II. Culverts of higher discharge capacity, for example, 1200 mm diameter hume pipes have been proposed as compared to 600 mm and 900 mm diameter hume pipe culverts.
- III. Adequate wing walls and aprons both upstream and downstream, and scour protection works have been included in the design.
- IV. Trapezoidal drains with increased discharge capacity have been proposed in place of L- shaped drains.

- V. Sufficient river training structures, wing walls, aprons and scour protection structures have been considered for bridges and culverts.
- VI. The application of bio-engineering techniques for slope stabilization has been proposed to the maximum extent.
- VII. The drainage capacity of bridges & culverts (increased span and height) and side drains have been increased and a number of relief culverts have been proposed according to the site requirement.

H. Project Cost

28. The total implemented project cost stands at Nu. 387.612 million of three Construction packages including partial work carried out by Gaseb and SPML Maccaferri JV and Rigsar Construction Co. Pvt. Ltd. The total figure reflected is based on the implemented values of (I) CDCL (Nu. 80,329,259.33); (II) BBPL (Nu. 109,161,869.16); (III) DCCPL (Nu. 135,276,152.53); (IV) Gaseb and SPML Maccaferri JV (Nu. 48,384,534.44) and (V) Rigsar Construction Co. Pvt. Ltd. (Nu. 14,460,515.35). The amount allocated for force account is Nu23.00 million.

I. Project Categorization

29. The project is classified as Category B in accordance with ADB's Safeguard Policy Statement (2009), as no significant impacts were envisioned.

II. COMPLIANCE TO SAFEGUARDS PROVISIONS IN AGREEMENTS UNDER THE PROJECT

A. Compliance to Financing Agreement (Special Operations)

30. The environmental safeguard requirements are indicated in the Financing Agreement (Loan Number 3149-BHU and Grant Number 0400-BHU) between ADB and Kingdom of Bhutan dated 5 September 2014. These financing agreement provisions and compliance status are provided in **Table 3**.

Table 3: Status of Compliance to Environmental Provisions of the Financing Agreement

S.N	Environmental Provision	Compliance Status
1	<p>Schedule 4. Item 6 (a):</p> <p><u>Conditions for awards of contracts</u></p> <p>6. The Beneficiary shall ensure that no Works contract which involves environmental impacts is awarded until:</p> <ul style="list-style-type: none"> (a) the relevant environmental authority of the Beneficiary has granted the final approval of the EIA and/or IEE, and (b) the beneficiary has incorporated the relevant provisions from the EMP into the works contract. 	<p>Complied. The EC was accorded as per IEE on February 12, 2018, while the civil works contract commenced on January 01, 2018.</p> <p>Complied. The EMP prepared and submitted by the contractor has been approved for implementation which is being monitored from time to time.</p>
	<p>Schedule 5. Item 2:</p> <p><u>Counterpart Funds</u></p> <p>The Beneficiary shall make available the Loan and Grant proceeds to the Project Executing Agencies under appropriate arrangements acceptable to ADB, and shall provide or cause each Project Executing Agency to provide, as necessary, respective counterpart staff, land, facilities, and funding requires for timely and effective implementation of the Project, including, without limitation, any funds required</p> <ul style="list-style-type: none"> (a) to meet any shortfall between cost and revenues for the O & M of the Project facilities; (b) to mitigate unforeseen environmental or social impacts; and (c) to meet any additional costs arising from design changes, price escalation in construction costs and /or unforeseen circumstances. 	<p>Complied. The counterpart funding from the RGoB is being disbursed timely for the project and compensation to the affected parties. The Project Coordinator and Project Manager have been appointed as counterpart staff to the Project.</p>

	The Beneficiary shall cause the relevant Project Executing Agency to make the resources thus required available on an annual basis for each fiscal year.	
3	<p>Schedule 5. Item 5:</p> <p><u>Environment</u></p> <p>5. The Beneficiary shall ensure, or cause the relevant Project Executing Agency to ensure, that the preparation, design, construction, implementation, operation and decommissioning of the Project and all Project facilities comply with</p> <p>(a) all applicable laws and regulations of the Beneficiary relating to the environment, health and safety;</p> <p>(b) the Environmental Safeguards; and</p> <p>(c) all measures and requirements set forth in the EIA, the IEE, the EMP, and any corrective or preventative actions set forth in a Safeguards Monitoring Report</p>	Complied. The compliance requirements with regards to social and environmental safeguards, health and safety and EMP are being satisfactorily complied.
4	<p>Schedule 5. Item 9:</p> <p><u>Human and Financial Resources to Implement Safeguards Requirements</u></p> <p>9. The Beneficiary shall make available, or cause the Project Executing Agencies to make available, necessary budgetary and human resources to fully implement the EMP and the RP.</p>	Complied. DoR has designated (PM) as Environment Focal Person who monitors the site from time to time.
5	<p>Schedule 5. Item 10:</p> <p><u>Safeguards – Related Provisions in Bidding Documents and Works Contracts</u></p> <p>10. The Beneficiary shall ensure, or cause the Project Executing Agencies to ensure, that all bidding documents and contracts for works contain provisions that require contractors to:</p> <p>(a) comply with the measures relevant to the contract set forth in the EIA, the IEE, the EMP, the RP and any indigenous peoples</p>	No indigenous people located on the project premises.

	<p>plan (to the extent they concern impacts on affected people during design and/or construction), and any corrective or preventative actions set forth in a Safeguards Monitoring Report;</p> <p>(b) make available a budget for all such environmental and social measures;</p> <p>(c) provide the Project Executing Agency with a written notice of any unanticipated environmental, resettlement or indigenous peoples risks or impacts that arise during design, construction, implementation, or operation of the Project that was not considered in the EIA, the IEE, the EMP, and the RP</p> <p>(d) adequately record the condition of roads, agricultural land, and other infrastructure prior to starting to transport materials and construction; and</p> <p>(e) Reinstall pathways, other local infrastructure, and agricultural land to at least their pre-project condition upon the completion of construction.</p>	<p>Complied. The required funds for the environmental and social measure are being disbursed on a need basis. Impacts on environmental, resettlement or indigenous people are not anticipated.</p> <p>No effect on road and agricultural land.</p>
6	<p>Schedule 5. Item 11:</p> <p><u>Safeguards Monitoring and Reporting</u></p> <p>11. The Beneficiary shall do the following or cause the Project Executing Agencies to do the following:</p> <p>(a) Submit annual Safeguards Monitoring Reports to ADB for disclosure on ADB's website and disclose relevant information from such reports to affected persons promptly when requested;</p> <p>(b) If any unanticipated environmental and/or social risks and impacts arise during construction, implementation or operation of the project that were not considered in the EIA, the IEE, the EMP, and the RP, promptly inform ADB of the occurrence of such risks or impacts, with detailed</p>	<p>Complied</p> <p>N/A (No unanticipated risks have been experienced)</p>

	<p>description of the event and proposed corrective action plan;</p> <p>(c) No later than three months from award if the first works contract, engage or cause to the engaged qualified and experienced external experts or qualified non-governmental organizations under selection process and terms of reference acceptable to ADB, to verify information produced through the Project monitoring process for environment, resettlement and indigenous peoples (if any), and facilitate the carrying out of any verification activities by such external experts; and</p> <p>(d) Report any actual or potential breach of compliance with the measures and requirements set forth in the EMP and the RP promptly after becoming aware of the breach.</p>	<p>N/A (No major environment or social issues are anticipated in the project that warrants engagement of external expert)</p> <p>N/A (the compliance requirements of the EMP are being satisfactorily compiled)</p>
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B. Compliance to Project Administration Manual

31. The Project Administration Manual¹ (PAM), describes how the Department of Roads and Ministry of Works and Human Settlements will implement the project and deliver the results on time, with quality, within budget, and in accordance with government and Asian Development Bank (ADB) policies and procedures. The PAM is mandatory and serves as the main document describing implementation details. The status of implementing the environmental safeguards requirements set out in PAM is provided in **Table 4**.

Table 4. Status of Compliance to Environmental Provisions of the Project Administration Manual

S.N	Environmental Provision	Compliance Status
1	<p>Schedule VIII. Item 31:</p> <p><u>Categorization</u></p> <p>31. The Project is classified as category B in accordance with ADB's Safeguard Policy Statement (2009) (SPS). An Initial Environment Examination (IEE) report has been prepared for PAR</p>	Complied
2	Schedule VIII. Item 32:	

	<p><u>Implementation of Environmental Management Plan (EMP)</u></p> <p>32. DoR will ensure that all environment safeguard requirements under the project will be implemented as required by the IEE for PAR. The EMP with detailed budget estimates are given in IEE for the PAR. For the new section of PAR, necessary clauses on environmental safeguards will be included in the main text of the contract documents and the EMP matrix from the final IEE report will be attached to the bidding documents. The contractors will be required to include the costs for implementing the environmental clauses and EMP in their bids.</p>	Complied
3	<p>Schedule VIII. Item 33:</p> <p>33. The EMP is a plan for implementation and monitoring of environmental mitigation and enhancement measures during project construction and operation. Specific measure with details on location, time and responsible agency for implementation and monitoring is given in the EMP. Mitigation measure for implementation during the construction stage is implemented by the contractor and during the operation stage by DoR and PT through PIU. The Environmental Specialist in the consulting services for both the DoR and PT sub-project will support DoR and PT to guide and monitor implementation of EMPs by contractors including climate adaptation activities. An Environmental Focal Person (EFP) will be appointed in each of the three Project offices under DoR. Similarly, an EFP will be appointed at the site level under the consulting services for conducting day to day monitoring of EMP implementation. An EFP will also be appointed by the contractor for each contract package to ensure proper implementation of the EMP.</p>	Complied
4	<p>Schedule VIII. Item 34:</p> <p>34. The EMP includes the collection of baseline data on air and noise quality during the pre-construction stage. The Environmental Specialist</p>	Complied

	<p>in the consulting services will be responsible for procuring the monitoring equipment and organizing training on the operation of the equipment by the supplier for the EFP under the PIUs, consulting services and contractors before the start of construction works. The Environmental Specialist in the consulting services will be responsible for baseline data collection on air, noise, and water quality before construction works begin, during construction and curing early stages of operation as given in the EMP. After the construction works are over, the monitoring equipment will be handed over to DoR for use by the EFP for other projects. An initial coordination cum training workshop will be organized by DoR with technical support from consulting services and ADB as necessary.</p>	
5	<p>Schedule VIII. Item 35:</p> <p>35. All required clearances such as the environmental clearance and forestry clearance must be obtained by the PIUs before the start of construction works for all project components.</p>	Complied
6	<p>Schedule VIII. Item 43:</p> <p><u>Grievance Redress Mechanism</u></p> <p>43. A grievance redress mechanism will be established to receive and facilitate the resolution of concerns, complaints and grievances of affected people and relevant agencies on the social and environmental performance of the project in a time-bound and transparent manner. The project specific GRM is not intended to bypass the government's own redress process rather is it intended to address project affected people's concerns and complaints promptly, making it readily accessible to all segments of affected persons and is scaled to the risks and impacts of the project.</p>	Complied
7	<p>Schedule VIII. Item 44:</p> <p><u>Monitoring and Reporting</u></p>	

	44. Implementation of the EMP will be monitored by PIUs with the support consulting services. The purpose of monitoring implementation of the RP will be to evaluate and report whether resettlement goals have been achieved. For environment safeguards, records on the implementation of the mitigation measures on site will be maintained by the contractor. Based on these records and spot checks of at least once a month by PIUs and consultants, <i>monitoring reports will be compiled by the Environmental Specialists.</i>	Complied
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C. Compliance to the Civil Works Contract Agreement

Table 5. Status of Compliance to Environmental Provisions of the Civil Works Contract Agreement

S.N.	Description	Compliance Status
1.	Orientation for Contractors, Workers on environmental and Social management	Complied
2.	Loss of Vegetation	N/A
3.	Drainage and Hydrological Impacts	Complied
4.	Procurement and storage materials	Complied
5.	Solid Waste management	Complied
6.	Noise and Dust pollution	Complied
7.	Excavation and disposal	Complied

III. COMPLIANCE TO ENVIRONMENTAL MANAGEMENT PLAN

32. The environmental management plan (EMP) for the project is provided in Table 6. As per EMP, five environmental management activities were required to be implemented during the pre-construction stage; fourteen (14) activities are required to be implemented during the construction stage, and three (03) activities are required to be implemented during the operation stage. The following **Table 6** lists out the status of activities during the pre-construction and construction stage. **Table 7, 8 & 9** lists out the status of site-specific activities.

A. Table 6. Overall status of Compliance to Environmental Provisions of the Environmental Management Report

S.N	Activity	Mitigation Measures	Compliance attained (Yes, No, Partial)	Comment/Reasons for Partial or Non Compliance	Issues for further action and target dates
PRE-CONSTRUCTION					
1	Design Measures	<ul style="list-style-type: none"> • IEE for PAR submitted to NEC and environmental clearance was approved. • Public clearance from Phuentsholing Thromde was obtained. • IEE recommendations have been incorporated into the design. • Unnecessary stockpiling of rock and bitumen-based materials near the road is avoided. • Water and power supply is provided from a different source from community 	<p>Yes. Environmental clearance for PAR has been received.</p> <p>See Appendix III (Environmental Clearance of Pasakha Access Road)</p>		
2	Environmentally responsible procurement	<ul style="list-style-type: none"> • Procured air and noise monitoring equipment's. • Contractor engineer is trained at the site on day to day basis on environmental dos. 	<p>Yes. The equipment's for monitoring air and noise were procured in July 2016. Training was held on September 08, 2016.</p>		
3	Environmental capacity development	<ul style="list-style-type: none"> • Environment baseline (air and noise) monitoring equipment and required training on data collection and assessment is conducted recently. 	<p>Training on baseline data collection was not conducted by the equipment supplier.</p>		

		<ul style="list-style-type: none"> Health awareness campaign on STD/HIV/AIDS has been conducted at the contractor's camp area 	<p>Yes.</p> <p>STD/HIV/AIDS awareness campaign was conducted at all three sites on</p> <p>Package I (CDCL) – 27th July 2018, 32 participants, including laborers, drivers and site engineers were present during the campaign.</p> <p>Package II (BBPL): 25th July 2018, 49 participants including laborers, drivers and site engineers were present during the campaign.</p> <p>Campaign at Package III (DCCPL) was conducted. The campaign was stalled due to weather conditions.</p>		
4	Protect and re-provision irrigation and utilities	<ul style="list-style-type: none"> Power, water supply, telecommunications, and irrigation systems are not interrupted by project work till now. 	Three telecommunications posts relocated.		

5	Tree Cutting	<ul style="list-style-type: none"> 14 number of trees felled only in required areas with approval from the Department of Forestry. 	Yes		
CONSTRUCTION					
1	Orientation for Contractors, Workers on environmental and social management	<ul style="list-style-type: none"> We oriented our contractor during the monthly meeting and workers at the construction site. The awareness campaign has been conducted at the camp area on health issues. 	Yes		
2	Loss of vegetation and impacts to fauna	<ul style="list-style-type: none"> Impact on vegetation and fauna is very minimal. 	Yes		
3	Drainage and Hydrological Impacts	<ul style="list-style-type: none"> Provided adequate drainage at construction sites and camps to avoid pounding and flooding Implemented agreed designs for bridges and culverts sufficient to control flooding as designed and to dissipate the energy of flow to reduce erosion. 	Yes		
4	Materials exploitation and management of quarry and borrow areas	<ul style="list-style-type: none"> Not required as construction materials are being transported from approved private mines 	No	Not required as the mines/quarry is managed by a private individual	
5	Spoil Disposal	<ul style="list-style-type: none"> The concept of Environmental Friendly Road Construction method (cut and fill) was followed. The excess spoils were dumped in a pre-identified disposal yard. 	Yes		
6	General Construction Waste Disposal	<ul style="list-style-type: none"> The contractor has made two pits for organic waste & nonorganic waste, 	Yes		

		with sufficient refuse bins within site camps and offices.			
7	Use of hazardous substances and hazardous waste disposal	<ul style="list-style-type: none"> No hazardous substances and waste are generated at the construction site The contractor maintains their machines and vehicles in Phuentsholing workshops (7 km away from a construction site) Project vehicles are fuelled from Pasakha fuelling station. 	Yes		
8	Asphalt plant rock crushers, bitumen usage, and soil contamination	<ul style="list-style-type: none"> As per the Contractor's work plan, they will not establish asphalt plant and rock crushers. They will source from a private firm. Therefore, there would be no soil contamination 	Yes		
9	Noise and dust nuisances	<ul style="list-style-type: none"> Noise is very minimal as the construction site is away from human settlements. Project vehicles are maintained on time. Water tanker is being deployed by the contractor to subside the dust along the road within the project area. Air and noise have been monitored by CSC. 	Yes		
10	Blasting (if required)	<ul style="list-style-type: none"> N/A 	No	Project did not encounter rock excavation	
11	Erosion control / run-off	<ul style="list-style-type: none"> Project has constructed gabion wall at a different location within the project. 	Yes	Gabion walls constructed	Bio-engineering work implemented

		<ul style="list-style-type: none"> • Temporary drainage has been constructed. • Implementation of bio-engineering work is not applicable as of now. 			
12	River protection and bridge repair	<ul style="list-style-type: none"> • Bridge work is carried out only in the dry season • Rocks and stones will not be disposed to block rivers and streams. • No cofferdams will be constructed 	Yes		
13	Water quality	<ul style="list-style-type: none"> • Camps and site office are located away from Bhalujhora river. • No solid waste from construction is thrown in the river. • Washing of machinery and vehicles in the river is strictly prohibited within project premises 	Yes		
14	Water Resources	<ul style="list-style-type: none"> • Water has been sourced from a different source within the community • Camps are located away from the water source • Contractor transports water by water tanker 	Yes		

B. Table 7. Status of Compliance to Environmental Provisions of the Environmental Management Plan – Package I - Bhalujhora bridge Site Specific

SN	Environmental Concern	Mitigation Measures Proposed	Mitigation Measures Implemented	Deficiencies/Remarks/ Observations (To be completed by CSC)
1.	Safety precautions for the workers	<ul style="list-style-type: none"> Worker's occupational health and safety shall be generally governed by Labor and Employment Act of Bhutan 2007 The contractor shall instruct workers in health and safety matters as required by law and by good engineering practice and provide first aid facilities Fencing shall be carried out for all areas of excavation greater than 1m deep and side of temporary works Workers shall be provided with appropriate personal safety equipment such as safety boots, helmets, gloves, protective clothes, dust mask, goggles, and ear protection at no cost to the workers Contractor shall at all time keep the first aid kit at the construction sites Contractor shall be responsible for the evacuation of the injured person to the nearest medical 	<ul style="list-style-type: none"> Labour and Employment Act 2007 has been followed by the contractor The contractor has instructed workers in health and safety matters as required by law and by good engineering practice and provided first aid facilities CGI sheet fencing has been carried out in all areas of excavation and work sites Workers have been provided with appropriate personal protective gears Contractor at all time kept the first aid kit at the construction site No injuries in the entire duration of the reporting period 	<ul style="list-style-type: none"> Complied

		center and bear all the medical expenses		
2.	Public Safety	<ul style="list-style-type: none"> • Install barriers or temporary fence at construction areas to deter pedestrian access to the construction site except at designated crossing points. • The general public or local residents shall not be allowed in high-risk areas, e.g. excavation sites and areas where heavy equipment is in operation and such sites shall have a watchman to keep public out • Speed restrictions shall be imposed on the project vehicles when traveling within 50m of sensitive receptors (e.g. residential, schools, temples) 	<ul style="list-style-type: none"> • CGI sheet fencing has been installed • General public not allowed in the project vicinity • Speed restrictions imposed on project vehicles and equipment's 	<ul style="list-style-type: none"> • Complied
3.	General construction waste disposal	<ul style="list-style-type: none"> • The waste generated shall be minimized at source • Waste products shall be segregated, recycled and reused whenever possible • Recyclable waste shall be sold to the scrap dealer • Organic waste shall be composted • Non-hazardous waste shall be disposed-off in the waste disposal pit 	<ul style="list-style-type: none"> • Contractor has provided dust bins and dug pits near the camp area and site office. • Waste products are segregated • Scrap are sold to scrap dealers • Organic waste is disposed off in the pits • Residual non-hazardous waste is disposed-off in the disposal pit • Provided dust bins and dug pits near camp area and site office 	<ul style="list-style-type: none"> • Complied

		<ul style="list-style-type: none"> • Construction/workers camps shall be provided with sufficient dust bins • Burning of construction and domestic wastes will be prohibited • Disposal of solid wastes into floodways, wetlands, rivers, other water courses, farmland, forest and associated places of worship or other culturally sensitive areas or areas where livelihood is derived, canals, agricultural fields, and public areas will be prohibited 	<ul style="list-style-type: none"> • Solid wastes are not disposed into floodways, wetlands, rivers, other water courses, farmland, forest and associated places of worship or other culturally sensitive areas 	
4.	Traffic Conditions	<ul style="list-style-type: none"> • In coordination with local traffic authorities, appropriate traffic diversion schemes shall be implemented to avoid inconvenience due to project operations to road users, ensure smooth traffic flow and avoid or minimize accidents, traffic hold up and congestion • In coordination with local traffic officials, transport of materials shall be scheduled to avoid congestion, setup clear traffic signal boards and traffic advisory signs at the roads going in and out of the road and bridge construction sites to minimize traffic build-up. 	<ul style="list-style-type: none"> • Minimized traffic disturbance • Erected traffic sign boards at bridge construction sites • Contractor ensure safe vehicle and pedestrian access • Diversion signs and safety signboards erected at Bhalujhora bridge construction site 	<ul style="list-style-type: none"> • Complied

		<ul style="list-style-type: none"> • Provide safe vehicle and pedestrian access around construction areas • Install bold diversion signs that would be clearly visible even at night and provide flag person to warn of dangerous conditions (24 hours, if necessary) • Provide sufficient lighting at night within and in the vicinity of construction sites. 		
5.	Noise and dust (Construction activities will generate noise and dust pollution)	<ul style="list-style-type: none"> • Water sprinkling or spraying using tanker will be done twice a day to reduce dust generation • Water can be sourced from Bhalujhora river • Fuel efficient and well-maintained haulage trucks will be employed to minimize exhaust emissions. Regular maintenance will be carried out. • Vehicles transporting soil, sand and other construction materials will be covered with tarpaulin sheets to reduce the release of dust and avoid impacts from dust • Speed limits of such vehicles within the works site and on unpaved edge areas of the Project road shall be monitored 	<ul style="list-style-type: none"> • Water tanker at the construction site deployed • Regular maintenance of trucks and project machinery carried out • Ensured that vehicles carrying construction materials are covered with tarpaulin sheets to reduce the release of dust and avoid impacts from dust • Contractor ensure speed limits of vehicles within the project site • Noise and dust pollution monitored by CSC • Contractor adhered to the working hours 	<ul style="list-style-type: none"> • Complied

		<ul style="list-style-type: none"> Noise and dust monitoring shall be carried out Working hours should be restricted from 8 am to 5 pm to avoid disturbances to nearby residents during the night 		
6.	Identification of disposal sites for construction debris	<ul style="list-style-type: none"> Identify suitably located disposal sites for construction debris 	<ul style="list-style-type: none"> Construction waste is disposed at the pre-identified disposal area 	<ul style="list-style-type: none"> Complied
7.	Set up of construction camps	<ul style="list-style-type: none"> Camp facilities shall be located at a distance away from nearby communities Sanitary facilities shall be provided (dry pit or pour-flush latrines and bathrooms) for workers and arrange for disposal of solid waste 	<ul style="list-style-type: none"> Construction of site office and camps are away from the nearby communities Ensured sanitary facilities are provided with adequate water supply After completion of the project, camp areas restored near to its original 	<ul style="list-style-type: none"> Complied

C. Table 8. Status of Compliance to Environmental Provisions of the Environmental Management Plan – Contract Package II - Bhawanijhora Site Specific

SN	Environmental Concern	Mitigation Measures Proposed	Mitigation Measures Implemented	Deficiencies/Remarks/ Observations (To be completed by CSC)
1.	Loss of Vegetation	<ul style="list-style-type: none"> Only marked trees shall be felled in the required area Cut trees shall be compensated by re-plantation Felled trees shall be handed to NRDCL Cutting of trees for firewood shall be prohibited Construction camps, plants, material storage site shall be located away from Forest area Hunting of wild animals shall be prohibited 	<ul style="list-style-type: none"> All the trees located nearby road edge, which required felling was done only after seeking the necessary approval from the Forest Department of Bhutan Camps were constructed in the areas allocated by the CSC Workers were all briefed regarding hunting. 	<ul style="list-style-type: none"> Complied
2.	Awareness to Contractor's workers on Health	<ul style="list-style-type: none"> Health check-up shall be done before entry 	<ul style="list-style-type: none"> Health check-up did before entering the country/workplace 	<ul style="list-style-type: none"> Complied
3.	Camp area location & operation (drinking water/latrines/waste disposal/energy supply)	<ul style="list-style-type: none"> Camp area shall be located at least 500m away from communities Sourcing of water for site office and camp area shall be separate from community water sources. First aid kit and medical supply be provided at the site Fire extinguishers shall be at site office and camp area 	<ul style="list-style-type: none"> All the labor camps and stores constructed within the 50m range due to lack of spaces allocated by CSC officials Drinking water sourced separately from the nearby area First aid kit and medicine made available at the site 	<ul style="list-style-type: none"> All mitigation measure Complied

		<ul style="list-style-type: none"> • Provision of waste disposal bins and construction of waste disposal pits at appropriate locations • Provision of proper toilets/bathing facilities away from streams and rivers • Provision of cooking gas or kerosene to workers • Proper restoration of construction camp area by clearing up the site, planting appropriate plant species and cover the disposal pits with topsoil. • Proper drainage system shall be constructed around the site office and worker's camp area 	<ul style="list-style-type: none"> • Fire extinguishers shall be at site office and camp area • Waste disposal bins placed at the site • Sufficient toilets and bathrooms are constructed • Rice and curry cooker provided to workers • After completion of the project, the camp area restored near to its original • Drains constructed around the camp area 	
4.	Drainage and hydrological impacts	<ul style="list-style-type: none"> • Adequate drainage facilities shall be provided at construction and campsite to avoid ponding and flooding 	<ul style="list-style-type: none"> • Proper drainage system provided to avoid water ponding and flooding 	<ul style="list-style-type: none"> • Complied and Monitored by CSC.
5.	Management of quarry, borrow area and material storing	<ul style="list-style-type: none"> • Boulders shall be brought from already established government approved quarry 	<ul style="list-style-type: none"> • Stones and boulders are brought from approved quarry site or source 	<ul style="list-style-type: none"> • Monitored by CSC
6.	Spoil Disposal	<ul style="list-style-type: none"> • The spoils shall be disposed of in designated locations 	<ul style="list-style-type: none"> • All excavated materials disposed to designated areas allocated by CSC • The excavated debris were used in: <ol style="list-style-type: none"> 1. raising embankment for godown under Food 	<ul style="list-style-type: none"> • Complied

			<p>Cooperation of Bhutan (FCB);</p> <ol style="list-style-type: none"> 2. Filling of pot holes between the road section from Rinchening to Pasakha 3. Access road near the bhalujhora bridge 4. Filling area for temporary dry port 5. Bank protection on US settlement 	<ul style="list-style-type: none"> •
7.	General construction waste disposal	<ul style="list-style-type: none"> • The waste generated shall be minimized at source • Recyclable waste shall be sold to the scrap dealer • Organic waste shall be composted • Non-hazardous waste shall be disposed-off in a waste disposal pit 	<ul style="list-style-type: none"> • Waste generated is disposed of in designated areas • Recyclable wastes sold to scrap dealer • Organic waste composted 	<ul style="list-style-type: none"> • Complied
8.	Use of hazardous substances and waste disposal	<ul style="list-style-type: none"> • Oil and lubricants shall be safely stored. Secondary containment around fuel store shall be ensured • Fuel and other hazardous substances shall be stored in areas provided with roof, flooring, and containment to protect from elements like rain, wind etc and to contain spilled fuel/lubricants 	<ul style="list-style-type: none"> • Usable oils and lubricants stored in safe places and unused ones disposed at designated areas 	<ul style="list-style-type: none"> • Complied and Monitored by CSC
9.	Asphalt plant, rock crushers, and soil contamination	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • N/A

10.	Noise and dust (Construction activities will generate noise and dust pollution)	<ul style="list-style-type: none"> • Water tanker shall be used to subside the dust along the stretch (water will be sprayed along the stretch at least twice a day during the dry season or more if required) • Construction activities shall be carried out only during the day time • Vehicle carrying construction materials shall be covered with tarpaulin sheets to reduce the release of dust 	<ul style="list-style-type: none"> • Sprayed water in the dusty area with a company water tanker • Works carried out in the day time, however, proper lightings are provided if works (concreting) needs to be carried out during night time. • Vehicle carrying materials are covered with tarpaulin sheets to reduce the release of dust. 	<ul style="list-style-type: none"> • Air pollution and the noise level are monitored by CSC quarterly. • Complied
11.	Blasting activities	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • N/A
12.	Water quality	<ul style="list-style-type: none"> • Lubricants & fuel shall be stored at least 50m away from water bodies • Waste generated from construction camps shall be dumped in a designated location (not to throw into river and streams) • Stockpiling of construction materials affecting the water bodies shall be located at least 100m away from the water body • Washing of machines and vehicles in surface waters shall be prohibited 	<ul style="list-style-type: none"> • All types of oil and lubricants are kept in stores which are situated away from the water bodies • Waste generated from camp areas disposing of in designated locations • All construction materials are located (stockpiled) away from water bodies • No machines and vehicles will be washed in surface water 	<ul style="list-style-type: none"> • Complied and Monitored by CSC

13.	Erosion control/runoff (Excavation will generate soil erosion and landslide)	<ul style="list-style-type: none"> • Proper drainage for surface runoff shall be provided to prevent soil erosion and landslide • Bio-engineering shall be implemented to control erosion if required 	<ul style="list-style-type: none"> • After excavation wherever applicable proper drainages provided and bioengineering works carried out to control the soil erosion and landslide 	<ul style="list-style-type: none"> • Monitored by CSC
14.	Sliding of area and blockage of drains during summer seasons at CH:0+590 km - CH:0+630 km (Valley slides) and CH:0+10 km – CH:0+30 km (Valley slides)	<ul style="list-style-type: none"> • Gabion breast walls will be constructed to protect the slopes 	<ul style="list-style-type: none"> • Gabion breast wall constructed 	<ul style="list-style-type: none"> • Complied
15.	Occupational Health and safety measures	<ul style="list-style-type: none"> • Awareness shall be provided to workers on health and safety matters as required by safety law and good engineering practice and provide first aid facilities • All areas of excavation greater than 1m deep shall be fenced/barricaded • All workers shall be provided with appropriate personal protection equipment (PPE) such as safety boots, helmets, gloves, protective clothes and ear protection • First aid kit box shall be made available at the construction sites for all • Any injured person shall be immediately evacuated to the nearest medical center 	<ul style="list-style-type: none"> • Awareness conducted at work site on health and safety • Safety kits provided to laborers working at the site • Deep excavation areas barricaded • PPE provided • No injuries in the entire duration of the reporting period 	<ul style="list-style-type: none"> • Complied

16.	Archaeological and cultural artifacts	<ul style="list-style-type: none"> There are no known archaeological or cultural sites 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> N/A
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D. Table 9. Status of Compliance to Environmental Provisions of the Environmental Management Plan Package III – Gabion wall Site Specific

SN	Environmental Concern	Mitigation Measures Proposed	Mitigation Measures Implemented	Deficiencies/Remarks/ Observations (To be completed by CSC)
1.	Loss of Vegetation	<ul style="list-style-type: none"> Only marked trees shall be felled in the required area Cut trees shall be compensated by re-plantation Felled trees shall be handed to NRDCL Cutting of trees for firewood shall be prohibited Construction camps, plants, material storage site shall be located away from Forest area Hunting of wild animals shall be prohibited 	<ul style="list-style-type: none"> Shall be taken care and informed to concerned authority accordingly, if any issues arise. It has been taken care Construction activities are away from the forest Workers were all briefed regarding hunting. 	<ul style="list-style-type: none"> Complied
2.	Awareness to Contractor's workers on Health	<ul style="list-style-type: none"> Client to conduct a health awareness campaign on HIV/AIDS and other diseases Health check-up shall be done before entry 	<ul style="list-style-type: none"> Health check-up done before entering the country/workplace Health awareness conducted at work site 	<ul style="list-style-type: none"> Complied

3.	Camp area location & operation (drinking water/latrines/waste disposal/energy supply)	<ul style="list-style-type: none"> • Camp area shall be located at least 500m away from communities • Sourcing of water for site office and camp area shall be separate from community water sources. • First aid kit and medical supply be provided at the site • Fire extinguishers shall be at site office and camp area • Provision of waste disposal bins and construction of waste disposal pits at appropriate locations • Provision of proper toilets/bathing facilities away from streams and rivers Provision of cooking gas or kerosene to workers. If firewood is required for cooking, forestry permits from relevant forest office must be obtained • Proper restoration of construction camp area by clearing up the site, planting appropriate plant species and cover the disposal pits with topsoil. • Proper drainage system shall be constructed around the site office and worker's camp area 	<ul style="list-style-type: none"> • All the labor camps and stores constructed away from communities • Water source is separated from community water sources • First aid kit and medicine made available at the site • Fire extinguishers available at the site • Waste disposal bins placed at appropriate places • Four numbers of the toilet, two numbers of bathrooms, and 1 number of washing platform provided • Provided • Camp areas have been restored near to its original state and bioengineering works have been carried out. • Proper drainage system has been constructed around the site office and workers camp area 	<ul style="list-style-type: none"> • Complied
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4.	Drainage and hydrological impacts	<ul style="list-style-type: none"> Adequate drainage facilities shall be provided at construction and campsite to avoid ponding and flooding 	<ul style="list-style-type: none"> Proper drainage system provided to avoid water ponding and flooding 	<ul style="list-style-type: none"> Complied
5.	Management of quarry, borrow area and material storing	<ul style="list-style-type: none"> Boulders shall be brought from already established government approved quarry 	<ul style="list-style-type: none"> Stones and boulders are brought from approved quarry site or source after prior purchase No sand is required at the site 	<ul style="list-style-type: none"> Complied
6.	Spoil Disposal	<ul style="list-style-type: none"> The excavated materials will be disposed to the designated tipping site provided 	<ul style="list-style-type: none"> All excavated materials disposed to designated areas allocated by CSC 	<ul style="list-style-type: none"> Complied
7.	General construction waste disposal	<ul style="list-style-type: none"> The waste generated shall be minimized at source Recyclable waste shall be sold to the scrap dealer Organic waste shall be composted Non-hazardous waste shall be disposed-off in the waste disposal pit 	<ul style="list-style-type: none"> Waste generated are disposed of in designated areas as per the environmental practices Bins have been provided to workers 	<ul style="list-style-type: none"> Complied

8.	Use of hazardous substances and waste disposal	<ul style="list-style-type: none"> • Use of hazardous substances such as oil and lubricants can cause significant environmental impact if the waste is not disposed of correctly • Oil and lubricants shall be safely stored. Secondary containment around fuel store shall be ensured • Fuel and other hazardous substances shall be stored in areas provided with roof, flooring, and containment to protect from elements like rain, wind etc and to contain spilled fuel/lubricants 	<ul style="list-style-type: none"> • Usable oils and lubricants stored in safe places and unused ones disposed at designated areas 	<ul style="list-style-type: none"> • Complied
9.	Noise and dust (Construction activities will generate noise and dust pollution)	<ul style="list-style-type: none"> • Construction activities will generate noise and pollution affecting travelers and local communities • Only day work permitted • Vehicle carrying construction materials shall be covered with tarpaulin sheets to reduce the release of dust 	<ul style="list-style-type: none"> • Works carried during the day time, and vehicle carrying materials are covered with tarpaulin sheets to reduce the release of dust. • Tanker is deployed to spray water as and when required 	<ul style="list-style-type: none"> • Air pollution and the noise level monitored by CSC quarterly. • Complied
10.	Erosion control/runoff	<ul style="list-style-type: none"> • Excavation and earth work during the construction will generate soil erosion and landslide • Stockpile topsoil for plantation during bio-engineering work • Drainage must be provided to prevent soil erosion and landslide 	<ul style="list-style-type: none"> • After excavation wherever applicable bioengineering works will be carried out to control the soil erosion and landslide • Drainage system has been provided to prevent soil erosion and landslide 	<ul style="list-style-type: none"> • Complied

		<ul style="list-style-type: none"> Erosion can be prevented by seeding and planting grasses that grow under local conditions (Bio-engineering works) 		
11.	Water quality	<ul style="list-style-type: none"> Lubricants & fuel shall be stored at least 50m away from water bodies Waste generated from construction camps shall be dumped in a designated location (not to throw into river and streams) Stockpiling of construction materials affecting the water bodies shall be located at least 100m away from the water body Washing of machines and vehicles in surface waters shall be prohibited 	<ul style="list-style-type: none"> All types of oil and lubricants are kept in stores which is situated away from the water bodies Waste generated from camp areas disposing of in designated locations All construction materials are located (stockpiled) away from water bodies No machines and vehicles allowed to wash in the running stream 	<ul style="list-style-type: none"> Complied
12.	Occupational Health and safety measures	<ul style="list-style-type: none"> Contractor is required to instruct all workers on health and safety matters as required by safety law and good engineering practice and provide first aid facilities All areas of excavation greater than 1m deep shall be fenced/barricaded All workers shall be provided with appropriate personal protection equipment (PPE) such as safety boots, helmets, gloves, protective clothes, and ear protection 	<ul style="list-style-type: none"> Safety kits provided to laborers working at the site and at the office site. Any injuries at the site will be referred to a nearest medical center Safety fences are provided on all areas of excavation with a height greater than 1m depth All workers are provided with appropriate personal safety equipment's No injuries in the entire duration of the reporting period 	<ul style="list-style-type: none"> Complied

		<ul style="list-style-type: none"> Contractor at all time keep the first aid kit box at the construction sites for all Contractor will be responsible for the evacuation of an injured person to the nearest medical center 		
13.	Public Safety	<ul style="list-style-type: none"> Install barriers or temporary fence at construction areas Speed restrictions shall be imposed on the project vehicles and equipment Install bold diversion signs that would be clearly visible even at night and provide flag persons to warn of dangerous condition. Provide sufficient lighting at night within and in the vicinity of construction sites 	<ul style="list-style-type: none"> Construction areas are fenced and speed restrictions imposed on project vehicle and equipment Bold diversion signs installed wherever required 	<ul style="list-style-type: none"> Complied
14.	Compensatory Plantation	<ul style="list-style-type: none"> Project in consultation with local government; Divisional Forest Office must implement compensatory plantation using local or native tree species Ration for compensation plantation will be 1:1 if the area is small. However, the project can go up 1:4 if the area is large 	<ul style="list-style-type: none"> Project in consultation with local government; Divisional Forest Office implemented compensatory plantation using local or native tree species 	<ul style="list-style-type: none"> Complied

IV. COMPLIANCE TO ENVIRONMENTAL CLEARANCE

33. The Environmental Compliance of Pasakha Access Road (PAR) project is prepared as per terms and conditions of EC and implementation of Environmental Management Plan (EMP) of the project. **Table 10** contains the compliance requirements and the status compliance of PAR.

Table 10. PAR Compliance with the Terms and Conditions of the Environmental Clearance

No.	Compliance Requirement	Status
1	Any modification of the proposal shall take place only with the prior approval of the NEC	There has been no major modification in the proposal.
2	Construction complies with the National Environmental Protection Act 2007, the Environmental Assessment Act 2000 and its regulation 2002, Waste Prevention and Management Act of Bhutan 2009 and its Regulation 2012, and the Water Act 2011	Construction carried out as per the mentioned laws. The site is monitored by the Dzongkhag Environmental Officer, DoR as well as the site supervisor from the consultant firm.
3	Constructions carried out as per the project's documents submitted for environmental clearance.	Construction done as per the IEE submitted and as per the Environmental Clearance issued
4	Environmental Clearance is valid only for the construction of the road widening and improvement of 1.2 Km of Rinchending-Pasakha Highway, construction of 122.85m Bhalujhora bridge, 50 m multi-cellular box culvert and flood retention walls at Pasakha under Chhukha Dzongkhag	No works other than the road widening and improvement of 1.2 Km of Rinchending-Pasakha Highway, construction of 122.85m Bhalujhora bridge, 50 m multi-cellular box culvert and flood retention walls construction were carried out and completed
5	The construction confined within the allotted area	Construction confined within the premises of the Pasakha Access Road (PAR) project.
6	Ensure compliance with all conditions of stakeholder clearances	All the three packages were completed within the contract duration
7	Local residents, households, communities, public, private parties, and any religious historic and ecologically important sites are not adversely affected by the construction.	The construction did not affect any sites of this nature.
8	NEC is informed of any chance finds of precious metals or minerals or articles that have economic, religious or ecological significance	There have been no such chance findings
9	The holder shall be solely responsible for any disputes	As all disputes and settlements have been made during the IEE stage, the construction phase did not encounter any disputes.
10	The holder shall ensure that the import and use of second-hand equipment and machinery are strictly prohibited	Equipments used at the site were all in good condition.

11	Construction conforms to Safety rules and norms	The contractor has appointed Safety Officer. From PIU, PM took care of safety issues and from CSC side Environmental Focal person monitored this.
12	Felling of trees is done upon obtaining approval from the Divisional Forest Office	Forest permit obtained for felling of trees.
13	Excavated material is dumped at pre-identified sites	Excavated materials have been dumped in designated dumping site and moreover cut and fill method was adopted at the site for minimizing disposal of excavated materials.
14	Spillage and rollover of excavated materials is avoided	Due to the flat terrain spillage did not occur
15	The holder shall ensure that the adverse visual impact of construction is minimized	There were no adverse visual effects that needed to be covered.
16	Safety signs are posted at strategic locations	Safety signs have been placed in strategic locations.
17	Ensure that adequate safety gadgets are provided to the workers	Gumboots, helmets, safety vest and face masks have been issued to the workers.
18	Adequate sanitation facility is provided to the workers	There were more than four toilets each at contractor's camps. The camp had adequate water for both cooking and washing.
19	Ensure that First Aid kit is available at the site	First Aid kit made available at the site. Other than treating simple cuts and wounds at the site, workers are taken to the hospital in case of emergency
20	Copy of the Environmental Clearance is available at the site office	Copy of the EC is made available with the contractor's office.

V. MONITORING ACTIVITIES UNDERTAKEN

A. Air and Noise Quality Monitoring

34. A total of two Environmental Monitoring reports were submitted for the duration of this project (after retendering and award). This is the third and final Environmental Monitoring report for this project. **Tables 11 & 12** reflect the NEC's air and noise quality standards. **Tables 13 & 14** reflects the air quality monitored at the project site for February 2018 and February 2019 respectively. **Tables 15 & 16** reflects the noise quality monitored at the project site for February 2018 and February 2019 respectively:

Table 11: NEC'S Ambient Air Quality Standards (Maximum permissible Limits in $\mu\text{g}/\text{m}^3$)

Parameter	Industrial Area	Mixed Area	Sensitive Area
Total Suspended Particulate matter			
24 Hour Average	500	200	100
	360	140	70
Respirable Particulate Matter (PM10)			
24 Hour Average	200	100	75
	120	60	50

Table 12: Noise Level Limits, Environmental Standard 2010 NEC

LOCATION	DAY	NIGHT
Industrial Area	75 dBA	65 dBA
Mixed Area	65 dBA	55 dBA
Sensitive Area	55 dBA	45dBA

Ambient Air Quality Monitoring of PAR Project Area

Table 13: Air Quality Monitoring for PAR February 2018

S.N	Location	Date	In Microgram per cubic meter		Environmental Standards, 2010	
			TSPM	PM10	TSPM	PM10
1	CDCL camp site	28/02/2018	458	150	360-500 $\mu\text{g}/\text{m}^3$	200-120 $\mu\text{g}/\text{m}^3$

Table 14: Air Quality Monitoring for PAR February 2019

S.N	Location	Date	In Microgram per cubic meter		Environmental Standards, 2010	
			TSPM	PM10	TSPM	PM10

1	DCCPL camp site	15/02/2019	212.8	138.3	360-500 µg/m ³	200-120 µg/m ³
2	CDCL camp site	16/02/2019	277.7	55.5	360-500 µg/m ³	200-120 µg/m ³
3	BBPL camp site	18/02/2019	208	156	360-500 µg/m ³	200-120 µg/m ³

Result and Interpretation of Air Quality Monitoring

After the PAR project resumed, the first test was conducted in February 2018 and the second was conducted in February 2019. The air equipment were all placed in the campsites instead of the construction sites because i) Although there were power outlets in the construction sites, because the machine was running for 24 hours, the equipment needed to be placed in a safe area where there was constant supply of electricity and had to ensure that if it rained the equipment was kept in a shaded area. Due to weather conditions during the testing in the past and the air equipment being placed away from all the construction activities, the air test in all three locations i) DCCPL camp site, ii) CDCL camp site and iii) BBPL camp site were all within the permissible limits of the industrial emission standards (Refer to **table 11**)

Usually, the PAR project site is very dusty, due to several construction activities happening within the project area. If the result of air pollution test from the PAR project area was above the permissible limits some of the primary sources that would have contributed towards the air pollution in the area, would have been from i) Movement of heavy vehicles to and from the project site ii) Movement of heavy vehicles to and from the industries in the vicinity iii) Smoke released from the industries iv) Natural factors such as wind and v) Vehicles carrying construction or industrial materials which are not covered with tarpaulin sheets. However, the results from the air test were all within the permissible limit.

Mitigation Measure

The two air pollution tests conducted at the PAR project site were all within the permissible limits. Even though the air pollution level was within the permissible limits, contractors were still encouraged to deploy water tankers to ensure that settled dusts were not spiralled into the air. Compliance letters were also emailed to the contractors to continue watering their respective sites, and encouraged to increase the frequency of water sprinkler truck along the construction area and beyond as the people living in the communities use the road along the project site frequently for their daily commute. Vehicles carrying construction or industrial materials were all encouraged to cover their vehicles with tarpaulin when carrying construction materials, and speed limits signage were erected within the project sites. It was also ensured that contractors, consultant engineers and all workers at site wore suitable gears and were provided with N95 or equivalent mask (refer to Appendices I & II).

Ambient Noise Quality Monitoring of PAR Project Area

Table 15. Noise Level Monitoring (Dba) for February 2018

S.N	Location	Date	Day (Leq)	Night (Leq)
1	CDCL camp site	28/02/2018	53	47

Table 16. Noise Level Monitoring (Dba) for February 2019

S.N	Location	Date	Day (Leq)	Night (Leq)
1	DCCPL camp site	15/02/2019	75	55
2	CDCL camp site	16/02/2019	77.2	60
3	BBPL camp site	18/02/2019	76.1	61

Result and Interpretation of Ambient Noise Level Monitoring

During both the noise test monitoring there were a lot of activities occurring at the PAR project area, along with poor weather conditions such as rainfall and wind. During both the tests some of the main source of noise emission during the morning hours was due to movement of heavy project vehicles/machinery, vehicles commuting to and from industries, from natural factors such as the wind, rain and from animals such as dogs barking and birds chirping. During the evening hours, when the tests were being conducted the primary cause of noise pollution was mainly from natural sources such as wind, and animals, and external sources such as movement of vehicles within the site, and industries. The noise generated during the testing was not permanent, and does not impact the community after the completion of the project.

Ambient noise measurements were carried out at three locations: i) DCCPL Campsite, ii) CDCL campsite and iii) BBPL campsite. The analysis showed that noise level for DCCPL campsite is within the national limits of an industrial area, whereas the noise level for CDCL campsite and BBPL campsite are a little above the permissible limit as presented in Table 16 above.

Mitigation Measure

To ensure that the communities were not impacted due to noise especially during evening hour's contractors were advised to ensure that all machines were switched off after working hours. Working hours were restricted from 8 am to 5 pm to avoid disturbances to nearby residents during the night, and if incase any work needed to be prolonged, contractors needed to ensure that they got an approval from the designated authorities and informed the communities in advance. Contractors were also advised to ensure that no form of drilling, excavation or blasting work continued after workhours. Vehicles transporting construction materials to and from the site were to follow a certain speed limit and restricted from honking unnecessarily. Contractors were requested to inform all workers to minimize the noise from the camp area. Overall as mentioned above the noise generated during the testing are not permanent, and since the completion of the project does not have any impact in the vicinity.

VI. CONCLUSION

35. This PAR, SASEC Connectivity Project final environmental monitoring report is required to be prepared and disclosed in DoR and ADB website as required by SPS 2009 for the environment category-B project.
36. The contract packages have been awarded by Department of Roads under Ministry of Works and Human Settlement to three main Contractors namely, M/s Construction Development Corporation Limited, M/s Bhutan Builders Private Limited and M/s Druk Chapcha Construction Private Limited &Gyalcon Infrastructure Private Limited JV.
37. The project is compliant with ADB's requirements as well as RGoB guidelines concerning environment safeguards as provided in IEE and EMP. The baseline data collection for air quality and noise level monitoring was conducted by the M/s Gyaltshen Consultancy on 28 February 2018 at the CDCL campsite and from 14 – 19 February 2019 (24 hours) and at three locations i.) CDCL Campsite, ii.) BBPL campsite and iii.) DCCPL campsite.
38. All camp sites have been cleared and restored back to its original state by the contractors.
39. The Environmental Clearance was obtained by the Department of Road from National Environmental Commission, Thimphu for the execution of the SASEC/PAR project. The EC is valid till 30 June 2019. The public clearance was obtained from Phuentsholing Thomde for the construction activities and the establishment of labor camps.
40. Occupational Health and Safety Measures are compiled by issuing the necessary safety outfits like safety hamlet, safety gumboots, safety boots, safety jackets and dust mask. Excavation more than 1m depth is fenced for safety purposes. A water tanker is deployed to sprinkle water along the project road as and when needed to suppress dust. All the necessary facilities are provided to the labors and staff living within the Construction area.
41. In Pasakha Access Road Connectivity project under SASEC, no grievance was received during the reporting period.
42. During the monitoring for the month of June, 2019 Phuentsholing town was faced with heavy rainfall causing a flash flood in communities. Pasakha roads were blocked due to landslide, except for some damages to the gabion check dams and retaining walls, there was no major damages seen on the multi cellular box-culvert despite being completely covered by piles of debris, which was eventually cleared and made accessible to the communities. Apart from the road blockage, no immediate impairment was caused to the people or the community.
43. During the month of June and July 2020, a series of flash flood has occurred at the site. In every such events, the debris deposition reach to the level of top slab of the culvert. However, with continuous dredging work, there was no disruption to the traffic.

VII. RECOMMENDATION

44. The choice of gabion structures as check dams and retaining walls where debris flows are aplenty in monsoon is not the best of solutions. The use of gabion structures for similar locations and conditions as that of Bhawanijhora must be avoided at all cost and substituted by structures that are more resilient and weather proof.
45. Although the clearing work is required only in monsoon season, the volume of debris required to be dredged is huge and costly. And in long run, it will be uneconomical taking up such clearing work to keep the traffic open.
46. The study of such landslide area shall be carried out as a separate package/project. This is to ensure that the firm are specialized to carry out the service.

VIII. PHOTO LOG



Air monitoring Equipment



Noise monitoring Equipment



Water Tanker deploying water at site



Workers in their protective gear

PROGRESS OF PACKAGE I – BHALUJHORA BRIDGE





**PROGRESS OF PACKAGE II – CONSTRUCTION OF MULTI-CELLULAR BOX CULVERT,
ROADWORKS, LCS AND GABION STRUCTURES**







PHOTO'S OF PROGRESS OF PACKAGE III – CONSTRUCTION OF GABION STRUCTURES



PHOTO OF PROGRESS - DREDGING WORK AT BHAWANIJHORA STREAM









Toe protection. The toe of hill was filled by dredged debris to minimize the risk of flood. The settlement is as marked in red circle.



Prevention of soil erosion. Trees were planted along the road to control the debris flow into road side drains.

APPENDIX I: PAR COMPLIANCE LETTER TO BHUTAN BUILDERS



Our Reference : SASEC/ENG/DOR/PAR/DTL/ 2019-20/01/ February 20, 2019

To : **PROJECT MANAGER**
M/S Bhutan Builders Private Limited
Pasakha, Phuentsholing

For Attention : **Bhutan Builders Representative: Mr. Tharpo Kinley**

Project : **BTN_140144USASEC Road Connectivity Project**

Subject : Observation and recommendation on air and noise pollution

Sir/Madam,

As per the Monitoring and Evaluation Plan prescribed under the Project framework, the Environmental Consultant has commenced the monitoring of Air and Noise quality test within the Project corridor sites from 14th-18th of February, 2019.

Subsequent to the compilation and review of the test results, the Noise level is found to be a little above the permissible range. This is due to the use of heavy machinery, movement of heavy vehicles, from the surrounding factories and natural factors such as the wind and animals. We request you to ensure that all machines are switched off and no work which generates loud noise (e.g. Drilling) is conducted after work hours.

Whereas, the result from Air Quality survey indicates that the sites are within the permissible range. This is due to the heavy rainfall over the period of time when the air pollution test was being conducted at all three sites. Although the air pollution is within the limit, please ensure that water sprinkling is continued for the health and safety of your workers. We would suggest increasing the number of times water is sprinkled especially during the evening hours as schools in the Pasakha area has commenced, and the construction route is frequently used by people living in the communities and students for their daily commute. Our priorities are to mitigate and create favourable and conducive environment by minimizing and maintaining the pollution to permissible level.

Looking forward for your continuous support and compliance in maintaining our Project Corridor free from any sort of pollution at any moment of time.

Sincerely,



Sonam Deki
Environmental Specialist
Gyaltshen Consultancy
Phuentsholing, Bhutan



Our Reference : SASEC/ENG/DOR/PAR/DTL/ 2019-20/02/ February 20, 2019

To : **PROJECT MANAGER**
M/S Bhutan Builders Private Limited
Pasakha, Phuentsholing

For Attention : **Bhutan Builders Representative: Mr. Tharpo Kinley**

Project : **BTN_140144USASEC Road Connectivity Project**

Subject : Observation and recommendation on cleanliness of camp and safety at work site

Sir/Madam,

As per the Monitoring and Evaluation Plan prescribed under the Project framework, the Environmental Consultant has commenced the monitoring of Air and Noise quality test within the Project corridor sites from 14th-18th of February, 2019.

During the air and noise pollution monitoring, camp and work sites were also visited. The Bhutan Builder camp site was poorly upheld. There was disposal of garbage around and behind the camp site. It is very important that the person in charge ensures that the camp sites are installed with separate garbage disposal bins to segregate the recyclable and non-recyclable waste. Also, ensure that while the wastes are being disposed, they are tightly tied, and disposed in a designated area which is well fenced so that dogs or any other animals do not rummage through the waste and litter the surrounding areas. There was foul odour from the toilets and puddles of mucky water in multiple areas of the camp site. With the change in weather and with monsoon just around the corner, the mucky puddles will soon start breeding mosquitoes, and if these puddles are not cleaned and filled out, it will soon start to overflow and seep into the workers shelters. This is an environmental as well as health and safety issue. Before this minor issues turns into something serious, we request that the person in charge look into this matter immediately and monitor that the workers maintain a clean surrounding. While visiting the work sites, majority of the workers were not wearing their protective gears. For the safety of your workers please ensure that they are provided with suitable "Personal Protective Equipment" PPE and are strictly instructed to wear them during the duration of work hours, including N95 or equivalent mask.

Looking forward for your continuous support and compliance in maintaining our Project Corridor free from any sort of pollution at any moment of time.

Sincerely,



Sonam Deki
Environmental Specialist
Gyaltshen Consultancy
Phuentsholing, Bhutan

APPENDIX II: PAR COMPLIANCE LETTER TO DRUK CHAPCHA CONSTRUCTION PRIVATE LIMITED



Our Reference : SASEC/ENG/DOR/PAR/DTL/ 2019-20/04/ February 20, 2019

To : **PROJECT MANAGER**
M/S Druk Chapcha Construction Private Limited
Pasakha, Phuentsholing

For Attention : **Bhutan Builders Representative: Ms. Jangchuk Dem**

Project : **BTN_140144USASEC Road Connectivity Project**

Subject : Observation and recommendation on Air and Noise Pollution

Sir/Madam,

As per the Monitoring and Evaluation Plan prescribed under the Project framework, the Environmental Consultant has commenced the monitoring of Air and Noise quality test within the Project corridor sites from 14th-18th of February, 2019.

Subsequent to the compilation and review of the test results, the Noise level is found to be a little above the permissible range. This is due to the use of heavy machinery, movement of heavy vehicles, from the surrounding factories and natural factors such as the wind and animals. We request you to ensure that all machines are switched off and any work which generates loud noise (e.g. Drilling) is discontinued after work hours.

Whereas, the result from the Air Quality survey indicates that the sites are within the permissible range. This is due to the heavy rainfall over the period of time when the air pollution test was being conducted at all three sites. Although the air pollution is within the limit, please ensure that water sprinkling is continued for the health and safety of your workers. We would also suggest increasing the number of times water is sprinkled especially during the evening hours as schools in the Pasakha area has commenced. Although the DCPL construction site is away from the route, due to natural factors such as wind, dust generated from the site will be wafted into areas which are frequently used by people living in the communities and students for their daily commute. Our priorities are to mitigate and create favourable and conducive environment by minimizing and maintaining the pollution to permissible level.

Looking forward for your continuous support and compliance in maintaining our Project Corridor free from any sort of pollution at any moment of time.

Sincerely,



Sonam Deki
Environmental Specialist
Gyaltshen Consultancy
Phuentsholing, Bhutan



Our Reference : SASEC/ENG/DOR/PAR/DTL/ 2019-20/03/ February 20, 2019

To : **PROJECT MANAGER**
M/S Druk Chapcha Construction Private Limited
Pasakha, Phuentsholing

For Attention : **Bhutan Builders Representative: Ms. Jangchuk Dem**

Project : **BTN_140144USASEC Road Connectivity Project**

Subject : Observation and recommendation on cleanliness of camp and safety at work site

Sir/Madam,

As per the Monitoring and Evaluation Plan prescribed under the Project framework, the Environmental Consultant has commenced the monitoring of Air and Noise quality test within the Project corridor sites from 14th-18th of February, 2019.

During the air and noise pollution monitoring, camp and work sites were also visited. The Druk Chapcha camp site was not well maintained. Garbage was poorly tied and disposed around and behind the camp site. We request that the person in charge ensure that camp sites are installed with separate garbage disposal bins to segregate the recyclable and non-recyclable waste. Also, ensure that while the wastes are being disposed, they are tightly tied, and disposed in a designated area which is well fenced so that dogs or other animals do not rummage through the waste and litter the surrounding areas. While visiting the work sites, majority of the workers were not wearing their protective gears. For the safety of your workers please ensure that they are provided with suitable "Personal Protective Equipment" PPE and are strictly instructed to wear them during the duration of work hours, including N95 or equivalent mask.

Looking forward for your continuous support and compliance in maintaining our Project Corridor free from any sort of pollution at any moment of time.

Sincerely,



Sonam Deki
Environmental Specialist
Gyaltshen Consultancy
Phuentsholing, Bhutan

庚子年 庚子月 庚子日
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Ngoedrup-Tse Dzong: Chhukha



12th February, 2018

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- The DEC may stop the activity or impose additional terms and conditions, as may be deemed necessary; and
- The EC shall be subject to periodic review and modifications as per Article 25 of the EA Act 2000, without any liability on the part of the Royal Government.

The holder may adopt best practices in executing these terms and conditions to avoid adverse environmental impacts.

Failure to comply with any of the above terms and conditions shall constitute an offence and the proponent shall be liable in accordance to the Environmental Assessment Act 2000 and/or existing environmental laws.

Validity

This EC is issued with its validity from 12/02/2018 until 30/06/2019 only for the 1.2km road widening and improvement of Rinchening-Pasakha Highway, 170m bridge construction, flood retention walls and other ancillary facilities establishment under Sampheling Gewog, Chhukha Dzongkhag.



(DEC Chairman)

CC:

1. Chief Environment Officer, ESD, NECS, Thimphu for kind information.
2. Gup, Sampheling Gewog Administration for kind information.
3. Office Copy.