Initial Environmental Examination

Stage of the document: Final
Project number: 49026-003
June 2017

VIE: Basic Infrastructure for Inclusive Growth in Nghe An, Ha Tinh, Quang Binh and Quang Tri Provinces Sector Project-Constructing and Upgrading Gio Linh – Cam Lo Interdistrict Road of Quang Tri Province

Prepared by Planning and Investment Department of Quang Tri province for the Asian Development Bank.

CURRENCY EQUIVALENTS

(as of 12 June 2017)

Currency unit	–	Viet Nam Dong (D)
D1.00	=	$0.000044
$1.00	=	Đ 22,680

ACRONYMS AND ABBREVIATIONS

ADB	Asian Development Bank
CPC	Commune People's Committee
CSC	Construction Supervision Consultant
DARD	Department of Agriculture and Rural Development
DONRE	Department of Natural Resources and Environment
DOT	Department of Transportation
DPC	District People's Committee
DPI	Department of Planning and Investment
ECT	Emergency Control Team
EIAR	Environmental Impact Assessment Report
EMP	Environmental Management Plan
EPP	Environmental Protection Plan
ESO	Environmental Safeguards Staff
ESS	Environmental Safeguard Specialist
GMS	Greater Mekong Sub-region
IEE	Initial Environmental Examination
IPM	Integrated Pest Management
LEP	Law on Environmental Protection
MPI	Ministry of Planning and Investment
MPN	Most Probable Number of viable cells of a pathogen - a measure of water quality
PPC	Provincial People's Committee
PPE	Personal Protective Equipment
PPMU	Provincial Project Management Unit
PPTA	Project Preparatory Technical Assistant
ROW	Right of Way
SPS	Safeguard Policy Statement
SST	Subproject Support Teams
The PPTA	The Project Preparatory Technical Assistant Consultants

The Project	Basic Infrastructure for Inclusive Growth in Nghe An, Ha Tinh, Quang Binh and Quang Tri Provinces Sector Project
The Subproject	Constructing and Upgrading Gio Linh - Cam Lo Inter-district Road of Quang Tri Province
UXO	Unexploded ordnance

WEIGHTS AND MEASURES

Km^2 (square kilometer)	–	unit of length
m^3 (cubic meter)	–	A measure of volume

Note:

(i) In this report, "$" refers to US dollars.

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I. EXECUTIVE SUMMARY

1. The proposed Basic Infrastructure for Inclusive Growth in Nghe An, Ha Tinh, Quang Binh and Quang Tri Provinces Sector Project will invest in implementation of the north central coastal provinces sub-region socio-economic development plans. The Project responds to the Government of Vietnam's strategy of targeting the use of concessional ODA investment into poorer provinces using economic sub-regions as a means of identifying interconnectivity and synergies between provinces to accelerate economic growth in provinces that have previously lagged in terms of economic growth.

2. The project has three outputs being (i) Improved connectivity within value chains and their supporting infrastructure; (ii) Improved business development infrastructure; and (iii) Strengthened Sub-regional infrastructure planning and management.

A. Subproject Summary

3. The subproject is entitled "Constructing and Upgrading Gio Linh - Cam Lo Inter-district Road of Quang Tri Province" and is a representative subproject for Output 1 of the Project: Improved connectivity within value chains and their supporting infrastructure. The start point (Km0+000) connects to provincial road 575B and crosses the Ho Chi Minh trail in the area of Xuan Hoa village, Hai Thai commune, Gio Linh district. The end point (Km23+300) is the T-junction with National Road No.9 at Km17+380 in the area of Quat Xa village, Cam Thanh commune, Cam Lo district.

4. The road is proposed to be upgraded to category V mountainous road in compliance with Vietnamese Standard TCVN 4054-2005, with a roadway width of 6.5 m comprising a 3.5m wide carriageway and shoulders of 2x1.5 = 3m. The total right-of-way (ROW) including side drainage will generally be 14.5m.

- Design velocity: 30km/h
- Width of subgrade: 6.5m
- Width of pavement (carriage-way): 3.5m
- Width of shoulder: 2 x 1.5m
- Normal crossfall (%): 2%
- Max. Superelevation (%): 6%
- Pavement structure: Bitumen Surface Treatment

5. On the route, 4 new bridges will be designed for construction including (i) a slab beam bridge at Km11+882.07; (ii) a slab beam bridge at Km17+153.19; (iii) a slab beam bridge at Km18+347.64; (iv) a bridge at Hieu river at Km21+208.88.

Table 1 – Number of bridges along the subproject road

No	Name + Chainage	Beam / L bridge (m)	Width (m)	Note
1	Slab beam bridge at Km11+882.07	2I21 / 52.91	7.5 (6.5 + 2x0.5)	Design new bridge over ravines

No	Name + Chainage	Beam / L bridge (m)	Width (m)	Note
2	Slab beam bridge at Km17+153.19	21 / 31.86	7.5 (6.5 + 2x0.5)	Design new bridge replacing the old one, same position.
3	Slab beam bridge at Km18+347.64	21 / 35.37	7.5 (6.5 + 2x0.5)	Design new bridge replacing the old one, same position.
4	Bridge at Hieu river at Km21+208.88	4I33 / 145.09	7.5 (6.5 + 2x0.5)	Design new bridge over Hiế river

B. Environment impacts and mitigation

6. The Project has been categorized as B on environmental issues during the Project Concept note as it has few potential significantly adverse impacts and none of them are irreversible. The initial environmental concerns are alteration of the landscape by road formation including alteration of surface water hydrology of waterways crossed by the road.

7. This IEE has been prepared to screen and assess impacts and formulate mitigation measures in an Environmental Management Plan (EMP) covering the three phases of subproject implementation including design and pre-construction; construction and operation phases and to set out the institutional arrangements needed to ensure that the subproject EMP will be implemented.

8. In the design and preconstruction phases, the potential issues that have been identified are (i) disturbance of UXO; and (ii) land acquisition and resettlement. To minimize the first impact, the PMU will coordinate with appropriate agencies to identify any UXO left and engage an authorized UXO clearing contractor. To minimize the impact on income and disturbance of local people's lives, the PMU will check and review the Land acquisition and resettlement process before construction starts to ensure that all affected households have received compensation adequately in accordance with GOV and ADB safeguard policies.

9. The potential negative impacts of the construction phase have been identified as (i) encroachment the forest and alteration of landscape by road formation and quarrying, although the road will mainly be constructed on the existing road foundation. The contractor should not store construction material in the forest area and may not source any materials from the forest. The workers should be informed and prohibited from cutting trees for firewood or extraction of any other forest products.

10. (ii) Alteration of surface water hydrology of waterways crossed by the subproject road. There are 3 crossing points with a stream and one crossing point with the Hieu River along the proposed road. Excavation for foundations and pipe installation on the streams and in Hieu River for bridge construction will result in increased sediment release during the construction period. The proposed mitigation measures are design of bridges/ culverts of sufficient capacity to handle flood events; ensuring that no excavated material is deposited in the streams or river; use of coffer dams, silt fences, sediment barriers or other devices as appropriate during

construction; and re-vegetation of bare surfaces with grasses and creepers to reduce runoff and prevent filling.

11. (iii) Deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps. About 3.2 km of the subproject road runs along a stream, and any release of raw sewage or other waste from workers' camps will impair the quality of stream water. To minimize the impact, the contractor will provide adequate drainage facilities at construction sites and worker camps; store lubricants, fuels and wastes in dedicated enclosures at least 50m from water bodies and use silt fences and coverings over stockpiles as necessary to prevent release of fine materials into the air or waterways.

12. (iv) Release of dust from rock crushing, cutting and filling works, and chemicals from asphalt processing and use of vehicles and plant. This is to be mitigated by siting materials processing facilities away from residential areas, and fitting asphalt plant with scrubbers or a bag house to remove micro-particles from the plant's emissions. Where vehicles pass residential areas in dry conditions, the road surfaces shall be sprayed with water to control dust.

13. (v) Impact of the operation of construction machines and vehicles on local traffic; impeding traffic flows and increasing risks of work accidents and traffic accidents. These risks will be reduced by careful planning of transport of materials and equipment around the site, restricting movements during peak traffic hours, parking vehicles and plant in designated areas that do not cause obstruction and ensuring that only trained and certified operators may drive vehicles or operate plant.

14. (vi) Noise and vibration from construction machines such as excavators, concrete mixing plants or trucks could disturb local people or damage their houses. Risks will be mitigated by ensuring that plant and vehicles are in sound operable condition, free of leaks and fitted with exhaust baffles to reduce noise. Construction methods that involve heavy vibration should be excluded from areas that are in close proximity to houses and structures. The Contractor will be responsible to rectify damage to private property caused by vibration or accidents involving construction vehicles ore plant.

15. (vi) The construction activities will pose potential safety risks to workers and also to the local public, to be mitigated by briefing and training workers on safety procedures, marking hazardous work sites, providing warning signs and assigning responsibility for site safety to on-site supervisors; (vii) Large numbers of construction workers brought to the construction area could cause social impacts on the local communities, particularly associated with activities such as gambling, use of drugs and alcohol and antisocial behavior. The Contractor will be required to implement strict codes of conduct relating to social and commercial interaction with local communities and facilitate constructive recreation such as sport activities;

16. In the operation phase, the main potential negative impacts that have been identified are related to driving conditions and traffic safety. To minimize negative impacts, the Quang Tri Department of Transportation (DOT), the responsible agency for subproject management in the operation phase, will cooperate with Quang Tri DONRE, Cam Lo and Gio Linh DPCs, and the 3 CPCs to maintain the road periodically and collaborate with traffic police to control speeds and vehicle loads on the road, especially near the residential areas of Hai Thai commune; Tan Hiep, Tan Hoa villages of Cam Tuyen commune and Quat Xa village of Cam Lo commune.

17. The PPTA Consultant has also identified key stakeholders and conducted public consultations from provincial to commune level with a focus on the affected people’s views. In general all the stakeholders are showed their support to the subproject. There is only one

concern from local people related to the impact from the implementation of the subproject on cultivation areas of the local people. The concern is addressed in the EMP (See Table 11 – 12 for more details).

18. An EMP has been prepared under this IEE to detail responsibilities of relevant stakeholders on mitigation measures to be implemented during construction and operation phases of the subproject.

C. Institutional arrangements

19. Quang Tri DPI will establish an Official Development Assistance (ODA) Project Management Unit (PMU) to implement the subproject in all phases. One PMU staff will be assigned as the Environmental Safeguards Officer (ESO). An Environmental Safeguards Specialist (ESP), within the Loan Implementation Consultant (LIC) team will organize a formal training course in roles and responsibilities for EMP implementation and on-the-job training for relevant PMU staff, CSC, communities, contractors; and support for establishment and operation of the subproject environment management system in construction phase. The ESS will also support PMU's capacity building by reviewing and evaluating the capacity for environmental protection of the PMU and Quang Tri Department of Transportation (DOT) – subproject management organization in the operation phase.

20. To ensure that environmental protection and mitigation measures are included in the civil works contracts, the EMP will be included in the bidding documents and civil works contracts. Any omission of environmental management costs will create high risks for implementing mitigation measures during the construction phase due to lack of resources and capacity, thus the environmental protection cost and responsibilities need to be involved from the beginning. Bid documents will also specify that contractors shall engage capable and trained staff to take responsibility for the environmental management and safety issues at the working level and to monitor the effectiveness and review mitigation measures as the subproject proceeds.

D. Conclusion

21. The IEE concludes that the feasibility study of the subproject combined with available information is sufficient to identify the scope of potential environmental impacts and formulate mitigation measures for the subproject. Providing that significant changes to the subproject description do not occur at the detailed design phase, and that new sensitive environmental, or cultural resources are not encountered, further detailed environmental impact assessment (EIA) is not required. The ESS will update EMP on finalization of detailed design.

Figure 1 – General Map of Cam Lo, Gio Linh Districts and Subproject Area

II. BACKGROUND

A. Objectives of the Project

1. Basic Infrastructure for Inclusive Growth in Nghe An, Ha Tinh, Quang Binh and Quang Tri Provinces Sector Project

22. The Project Preparation Technical Assistance (PPTA) for the proposed Basic Infrastructure for Inclusive Growth Project in Nghe An, Ha Tinh, Quang Binh and Quang Tri Provinces (Project) was included in the Asian Development Bank's (ADB) Viet Nam Country Operations and Business Plan (2015–2017).[1]

23. The proposed Project will invest in implementation of the north central coastal provinces (NCCP) subregion socio-economic development plans. The Project responds to the Government of Vietnam's strategy of targeting the use of concessional ODA investment into poorer provinces using economic subregions as a means of identifying interconnectivity and synergies between provinces to accelerate economic growth in provinces that have previously lagged in terms of economic growth.

24. The project has three outputs being: (i) Improved connectivity within value chains and their supporting infrastructure; (ii) Improved business development infrastructure; and (iii) Strengthened Subregional infrastructure planning and management.

2. The Subproject

25. The Gio Linh – Cam Lo interdistrict road was constructed under two road projects between 2001 and 2006 for access to Ban Chua village, Cam Lo district and Xuan Hoa – Trang Rong road of Gio Linh district. The lack of consolidation of the gravel road surface results in a very muddy slippery road in the rainy season and dust in the dry season, reducing speed of travel and in some cases being impassable. Currently, 3.5km remains unformed from Trang Rong village to Ban Chua village, increasing transport costs significantly.

26. The subproject is initially categorized as 'B' for environmental safeguards, and this IEE is required according to the ADB Safeguards Policy Statement (SPS) of 2009. The objectives and scope of this IEE are to (i) assess the existing environmental conditions in the vicinity of the subproject road; (ii) identify potential environmental impacts from the proposed road improvement works; (iii) evaluate and determine the significance of the impacts; (iv) develop an environmental management plan (EMP) detailing mitigation measures, monitoring activities, reporting requirements, institutional responsibilities and cost estimates to address adverse environmental impacts; and (v) carry out public consultations to document any issues/ concerns that stakeholders may have on the subproject and to ensure that such concerns are addressed in the subproject design and mitigation measures.

[1] The Project is consistent with ADB's Country Partnership Strategy (CPS) 2012-2015.

III. POLICY AND LEGAL FRAMEWORK

27. The subproject shall comply with requirements of ADB SPS 2009 and the GOV's Guidelines on Implementation of Law on Environmental Protection 2014. Decree No. 18/2015/ND-CP has detailed information on strategic environmental assessment, environmental impact assessment and environmental protection plans. However certain activities commonly associated with infrastructure subproject such as quarry operations, extraction of gravel, etc., will also require permission from the relevant provincial level authorities. Depend on the scale; some constructions on the proposed road such as bridge or spillway shall require separated environmental impact assessment.

A. Asian Development Bank requirements

28. ADB safeguard policy statement (SPS) 2009 imposes safeguard requirements for all its funded projects. The SPS 2009 clarifies the rationale, scope and contents of the environmental assessment. It emphasizes environmental and social sustainability in progress of economic growth and poverty reduction in Asia and the Pacific, with the following aims:

- Avoid adverse impacts of projects on the environment and affected people, where possible;
- Minimize/mitigate and/or compensate for adverse impacts on environment and affected people when avoidance is not possible; and
- Help borrowers/clients to strengthen their safeguard systems and develop the capacity to manage environmental and social risks

29. For environmental safeguards, the Subproject is initially categorized as 'B'. A subproject that is classified as category A on environmental safeguards would be ineligible as a BIIG 2 subproject.

B. Legal and Administrative Framework for Environmental Protection in Vietnam

30. The subproject has to comply with the environmental legal framework of Vietnam, which is outlined in this section. The main components of the framework, if not, the more applicable ones are shown here.

1. Laws

- Law No. 55/2014/QH13 of 23 June 2014 by the National Assembly on environment protection
- Law No. 17/2012/QH13 of 21 June 2012 by the National Assembly on water resources
- Law No. 20/2008/QH12 of 13 November 2008 by the National Assembly on Biodiversity Conservation
- Law No. 68/2006/QH11 of 29 June 2006 by the National Assembly on standards and technical regulations
- Law No. 29/2004/QH11 of 03 December 2004 by the National Assembly on forest protection and development

2. Decrees and Regulations

- Decree No. 18/2015/ND-CP dated February 14, 2015 on environmental protection planning, strategic environmental assessment, environmental impact assessment and environmental protection plans.
- Circular No. 27/2015/TT-BTNMT dated May 29, 2015 on strategic environmental assessment, environmental impact assessment and environmental protection plans.
- Circular No. 36/2015/TT-BTNMT of 30 June 2015 by the Ministry of Natural Resources and Environment stipulating hazardous waste management
- Decision 07/2012/QD-TTg dated February 08, 2012 of the Prime Minister promulgating some regulations on intensified enforcement of forest protection
- Decision 186/2006/QD-TTg dated August 14, 2006 of the Prime Minister promulgating the Regulation on forest management
- Decree 09/2006/ND-CP dated 16th January, 2006 of the Government on forest fire prevention and control
- National Technical Regulations on air and noise quality
    - QCVN 05: 2013/BTNMT on ambient air quality
    - QCVN 26: 2010/BTNMT on noise
    - QCVN 27: 2010/BTNMT on vibration
- National Technical Regulations on water quality
    - QCVN 01: 2009/BYT on drinking water quality
    - QCVN 02: 2009/BYT on domestic water quality
    - QCVN 08-MT:2015/BTNMT on surface water quality
    - QCVN 09-MT:2015/BTNMT on underground water quality
    - QCVN 14: 2008/BTNMT on domestic wastewater

3. Other legislation applicable to the subproject are the following:

- Law No. 27/2001/QH10 of 29 June 2001 by the National Assembly on fire prevention and fighting
- Law No. 40/2013/QH13 of 22 November 2013 by the National Assembly on amending and adding a number of articles of the Law No. 27/2001/QH10 of 29 June 2001 on fire prevention and fighting
- Decision No. 3733/2002/QD-BYT of 10 October 2002 by the Ministry of Health promulgating 21 labor hygiene standards, 5 principles and 7 labor hygiene measurements
- Law No. 50/2014/QH13 of 18 June 2014 by the National Assembly on construction
- Circular No. 22/2010/TT-BXD of 03 December 2010 by the Ministry of Construction on labor safety in work construction
- Law No. 10/2012/QH13 of 18 June 2012 by the National Assembly on labor code.

C. Requirements for Subproject Categorization and Approval

31. Subproject selection and screening ensures that only subprojects ranked as Category B or C to follow ADB SPS 2009 will be included in the list of eligible subprojects for possible funding under the proposed Project. It is anticipated that all eligible subprojects will fall into Category B, whereby some adverse environmental impacts are expected additional subprojects will be screened by carrying out initial site visits to view local conditions, identify potential negative impacts, and complete Rapid Environmental Assessment (REA) Checklists. With regard to the requirements of Decree No. 18/2015/ND-CP, an Environmental Assessment Report is required for all development projects, either an Environmental Impact Assessment Report (EIAR) or an Environmental Protection Plan (EPP). In common with projects classified as Category B under the ADB SPS, smaller projects with some but limited adverse impacts will be subject to a lesser level of assessment in the form of an EPP. EPPs are required to be submitted for appraisal at the time of Subproject Investment Report preparation.

32. An IEE/EPP needs to be prepared if a subproject is classified as environmental category B following ADB SPS 2009. The IEE needs to include an environmental management plan (EMP). The PMU will select an appropriate national consulting firm to prepare the IEE/EPP with support from PMU/LIC environment specialist and update the representative IEE/EMP prepared by the PPTA Consultants if needed to reflect any change in the subproject detail design. The IEE/EPP should include the subproject scope, baseline information, materials to be used construction techniques, impact assessment, mitigation and environmental monitoring, and a minute of public consultation. The content and format of the IEE report should satisfy the requirements of both ADB and the Government of Viet Nam (EPP). Adequate public consultation needs to be carried out to share and get feedback on the initial findings of the IEE.

33. Review of IEE/EPPs: On completion, IEE/EPP reports will be reviewed initially by the PMU and if satisfactory, IEE/EPP reports will be forwarded to relevant PPC for approval. The environmental assessment and review procedures for IEE/EPP are as follows:

(i) PMU reviews IEE/EPP reports;
(ii) If found satisfactory, the PMU will forward to relevant PPC for approval and submit the IEE/EPP for each subproject to ADB for review, endorsement and uploading on the ADB website.

IV. DESCRIPTION OF THE SUBPROJECT

A. The need for subproject

34. The road will be a spur road on the East-West economic corridor. The road passes 2 districts, Gio Linh and Cam Lo, and connects to provincial road 575B, and on to the Ho Chi Minh highway and to the East-West economic corridor, national road 9. This provides road access to the special economic zones and commercial area at Lao Bao, to seaports such as Cua Viet and My Thuy. The connectivity will link raw material production areas with processing factories.

35. The road plays an important role in socio-economic development. Currently, vehicles transporting raw materials from Hai Thai commune, Gio Linh district to the factories in Cam Lo commune, have to divert onto the Ho Chi Minh road and then to National Road 9. The proposed subproject will reduce the transport distances and costs of transport to local producers and improve economic efficiency for the production area.

36. The road will benefit traffic as well as 9,000 people of Hai Thai commune, Gio Linh district (about 4,000 people) and Cam Tuyen commune, Cam Lo district (about 5,000 people) through connecting these people to the district centers. Direct beneficiaries are estimated to be over 3,400 who will be directly involved in commerce, services, industry and agriculture in Hai Thai commune, Gio Linh district (over 2,160 people) and Cam Tuyen commune of Cam Lo district (over 1,480 people). The road will also serve a total of 8,839ha of industrial and plantation forestry (including rubber, coffee etc.) spread between Hai Thai commune (839ha) and Cam Tuyen commune (8,000ha).

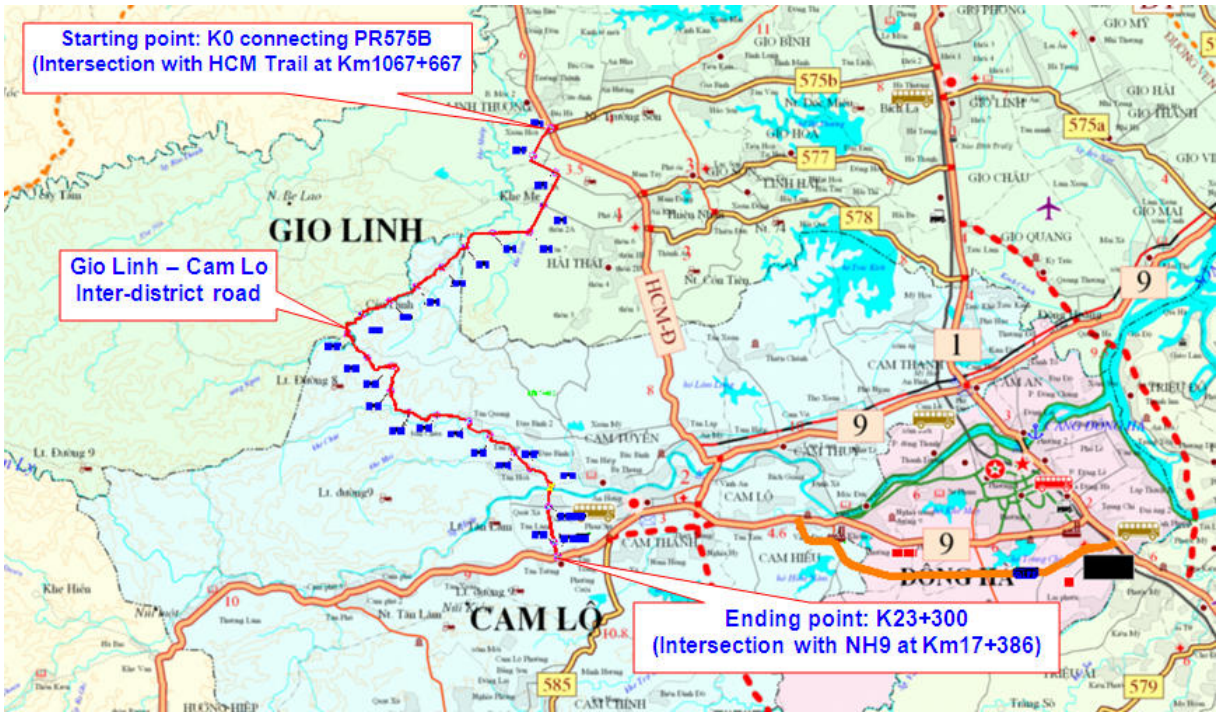


Figure 2: Map of the subproject road

B. Location and scope

37. The Quang Tri representative subproject will upgrade the Gio Linh – Cam Lo inter-district road. The road is 23.3 km long. The start point (Km0+000) connects to provincial road 575B and cross Ho Chi Minh trail in the area of Xuan Hoa commune, Hai Thai commune, Gio Linh district. The end point (Km23+300) is T-junction with national road 9 at Km17+380 in the area of Quat Xa village, Cam Thanh commune, Cam Lo district.

38. The subproject is basically located on the existing alignment, except for a 3.5 km section from Trang Rong village, Gio Linh district to Ban Chua village, Cam Lo district. This section is currently not open to traffic and the proposed subproject will upgrade an existing pathway used by local people and the alignment has been approved by the PPC.

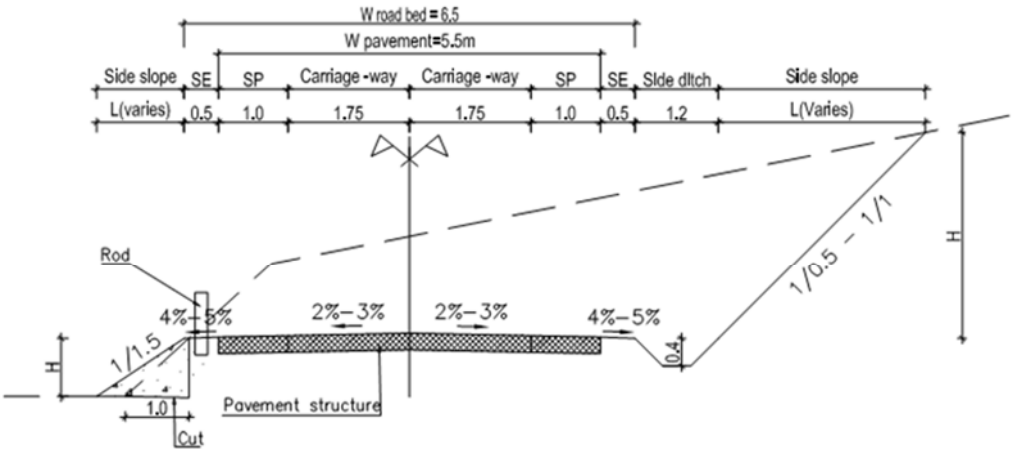
39. The Gio Linh – Cam Lo interdistrict road was formed on the basis of two road projects constructed between 2001 and 2006 for access to Ban Chua village, Cam Lo district and Xuan Hoa – Trang Rong road of Gio Linh district. The lack of consolidation of the gravel road surface results in a very muddy slippery road in the rainy season and dust in the dry season, reducing speed of travel and in some cases being impassable. Currently, 3.5km remains unformed from Trang Rong village to Ban Chua village, increasing transport costs significantly.

40. The road passes Hai Thai commune, Gio Linh and Cam Tuyen and Cam Thanh communes, Cam Lo district, Quang Tri province. The subproject improves an inter-district road from Gio Linh – Cam Lo. The road is proposed to be upgraded to category V mountainous road in compliance with Vietnamese Standard TCVN 4054-2005, with an embankment width of 6.5 m pavement of 3.5m and shoulders of 2x1.5=3m. The total right-of-way (ROW) including side drainage will generally be 14.5m.

- Design velocity: 30km/h
- Width of subgrade: 6.5m
- Width of pavement (carriage-way): 3.5m
- Width of shoulder: 2 x 1.5m
- Normal cross fall (%): 2%
- Max. Super elevation (%): 6%
- Pavement structure: BST

Figure 3 – Typical Straight Line Section

FOR STRAIGHT LINE SECTION



LEGEND:
- SE: SHOULDER EARTHEN
- SP: SHOULDER PAVEN WITH STRUCTURE AS CARRIAGE -WAY
- I sc%: SUPER ELEVATION GRADIENT
- W: WIDENING

1. Hydrological investigations

41. The hydrological survey study was conducted through the observation of emergence and interviews with the local people living in the subproject areas. Parameters of hydrological survey of bridges, river, stream and survey of water along the road are assessed and classified based on observation and description of the site and summarized in Table 2 below.

Table 2 – Hydrological Survey Results of Bridges and Spillways on the Road

No.	Name of bridge/ Chainage	Elevation of maximum flood level	Year of happening	Elevation of average flood level	Remarks
1	Slab bridge Km4+519	+68,19	2007	+67,69	
2	Slab bridge - Trang Rong - Hai Thai commune Km6+500	+71,71	1997	+70,71	
3	Ravine area where expected to build composite causeway bridge Km11+871.54	+87,00	2009	+85,72	
4	Slab bridge Km17+153.19	+27,64	2009	+26,66	
5	Slab bridge Km18+356.64	+20,84	2009	+19,15	
6	Riverbed and river bank of Hieu river where expected to build newly bridge (Km21+088.66-	+13,50	2009	+10,80	

	Km21+390.85)				

2. Construction Material Sources

42. Quarries: After conducting and consulting with the local authorities, the PPTA engineering consultants came up with some suitable quarries including 1 rock/stone quarry, 6 sand / soil sources which meet the required capacity for the construction project and acceptable transport distance.

1. Quarry source

(i) The estimated volume of rock to be used for the subproject construction is 41,497 m^3. Tan Lam quarry: situated on the side of 9 Road at Km28+000 along road to Lao Bao, Cam Thanh Commune, Cam Lo district with an area 8.3ha and a capacity of 3,000,000m^3. It is about 10.6km from the quarry to the start point of the construction site and is served by an asphalt road.

2. Soil borrow pit and gravel source: The estimated soil volume to be used for the subproject construction is 109,752 m^3. The volume of excavated soil that can be reused as fill soil is 46,933 m^3. The rest will be purchased from the following borrow pits:

(i) Trang Rong borrow pit: situated far from the subproject road of about 500m on the right side of the route at Km8+200, on hilly land that is privately owned in Trang Rong village, Hai Thai commune, Gio Linh. Visual inspection shows that material at the site is clay and gravel, sections of weathered siltstone clay, golden brown stone and pale yellow, semi-hard state. Soil quality at the mine is satisfactory for use in roadbed embankment works. Land reserves of the borrow pit are estimated at 3ha x 6m = 180,000 m^3.

(ii) Tan Hiep borrow pit: situated about 2,100 m from the subproject road, on the right hand side, on hilly land belonging to Tan Hiep village, Cam Tuyen commune, Cam Lo district. Visual inspection shows that material at site is clay and gravel, sections of weathered siltstone clay, golden brown stone and pale yellow, semi-hard state. Soil quality at the mine is satisfactory for use in roadbed embankment works. Land reserves of the borrow pit are estimated 200m x 100m x 6m = 120,000 m^3.

(iii) Hill gravel quarry in Gio An 2: situated to the left of the provincial road 575B at Km6 + 000, 6km from the start point in Gio An Commune, Gio Linh district. The quarry is within the Quang Tri planning area and approved as a quarry by Decision No. 2242/QD-Committee dated 10.15.2015. The licensed area for quarrying is 19ha in extent and the estimated reserves are 2,500,000m^3. The site has a mixture of soil and gravel which is of suitable quality for road surfacing. The distance from the quarry to the start point is about 6 km along provincial road 575B which has an asphalt concrete pavement.

(iv) Hill gravel quarry Tan Lap: situated on the right hand side of Ho Chi Minh East Road at Km1079+320, Tan Lap village, Cam Tuyen commune, Cam Lo district. The quarry is within the plan of Quang Tri in accordance to Decision No. 2242/QD-Committee dated 10.15.2015. The licensed area for quarrying is 2.4ha in extend and the estimated reserves are 150,000m^3. The soil composition includes clay and red-brown gravel of good quality and can be used for leveling and surfacing to the required level of compaction. The site is 11.7km from the work site.

3. Sand Source

On the route, there are 02 sand suppliers: a sand yard at Hieu River at Dong Ha city and another at Thach Han River in Quang Tri commune. Details are as follows:

(i) The yard at the Hieu River is on the left bank, on the side of Dong Ha Bridge at Km756+800 on route 1A. The material includes small grain sand, gravel, medium grain sand of high quality and has substantial reserves, sufficient to meet the technical requirements and volume of construction works for bridge and drain construction for the project. The distance from Hieu River yard to the work site is approximately 18km, involving travel for 10km along the Dong Ha city bypass, 1km on the Ho Chi Minh Road to the East and 7km on the Cau Duoi road to Tan Hoa. All these routes have good quality asphalt surfaces.

(ii) The yard at Thach Han River is on the right bank, near the Thach Han Bridge in Quang Tri commune at Km770 + 100 on road 1A. The material includes small grain sand, gravel, medium grain sand of high quality and sufficient reserves to meet the technical requirements and volume for bridge and drain construction for the subproject. The distance from the yard to the end point of construction is approximately 28.8km along good quality asphalt surfaced roads.

43. Mine investigation: Working with the local authorities and people (district, commune) the survey team collected information on potential sites and then conducted investigations of these sites near the project road and nearby areas. These were found to meet requirements in terms of transport distance, dumping site capacity for construction project.

C. Socioeconomic Context

44. In 2015, the population of Quang Tri province was 641,222, accounting for 0.68% of the total population of the country. Population density is 129 persons/km^2 (the urban population accounts for 29%, and rural 71%). The number of people of working age is 336,327 including 159,736 females with agricultural labor accounting for 80%l Most workers (70%) have no formal training.

45. The provincial urban system includes of 1 city, 1 town, and 11 townships with a total area of 17,557ha. The urban infrastructure has upgraded Dong Ha Town to city status; the administrative area of Quang Tri Town has been enlarged; Cua Viet and Cua Tung Towns have been established and further construction is taking place in the urban areas of Khe Sanh-Lao Bao and Cua Viet-Cua.

46. The Average income of province in 2015 reached VND 34 million/capita/annum (the national average is VND 44.8 million/capita/annum and the average for the north central region is VND 33.7 million/capita/annum).

47. The rate of poor households in Quang Tri in 2015 (using the 2016 criteria) is 6.8% compared with the average for the North Central region of 7% and national level of 6%. The rate of poverty reduction (2015) reached 2.5%/yr, exceeding the rate of reduction for Viet Nam that averaged 2%/yr.

D. Land use status in subproject area

48. Agricultural land accounts for 83% of total land area, of which the agricultural land area available for plantation of annual crops and perennial plants is about 36 % and 17% respectively. Forestland occupies 46 % and 51% of total district land area in Gio Linh and Cam Lo respectively.

Table 3 – Land use in subproject districts, 2015

Type of land		Gio Linh	Cam Lo
Total land area	ha	47,067.7	34,420.72
Agricultural Land	ha	39,415.4	28635.4
Agricultural production land	ha	17,150.2	10714
Land for annual crops	ha	8,701.3	4957.4
Paddy land	ha	5,551.2	1967.6
Land for other crops	ha	3,150.1	2989.8
Land for perennial plant	ha	8,448.9	5757
Forestry land	ha	21,695.3	17791.4
Aquaculture land	ha	568.3	105.8
Non- agricultural land	ha	5,428.8	4822.3

Source: Gio Linh and Cam Lo District Statistic Yearbook, 2015

E. Land acquisition

49. Impacts on land: According to the IOL results, the subproject will permanently acquire totally 72,618 m^2 of various kinds of land, including 5,558m^2 of residential land, 7,277m^2 of annual crop land, 4,285 m^2 of perennial crop land, 54,840m^2 of production forest land, 127m^2 of aquaculture land and 531m^2 of other public land. The IOL result is presented in Table 4.

Table 4 – Impacts on land of households and organization

No.	District/commune	Total affected area (m^2)	Rsidential land (m^2)	Annual crop land (m^2)	Perennial crop land (m^2)	Production forest land (m^2)	Aquaculture land (m^2)	Other pb land (m^2)
I	**Gio Linh**	**4,445**	**85**	**536**	**2,906**	**928**	**-**	**-**
1	Gio An	413	85	88	-	240	-	-
2	Hai Thai	4,042	-	448	2,906	688	-	-
II	**Cam Lo**	**68,163**	**5,473**	**6,741**	**1,379**	**53,912**	**127**	**531**
1	Cam Tuyen	66,438	5,068	6,233	799	53.912	127	299
2	Cam Thanh	1,725	405	508	580	-	-	232
Total		**72.618**	**5,558**	**7,277**	**4,285**	**54,840**	**127**	**531**

Source: IOL result in December 2016

50. Impacts on houses and structures: The subproject does not affect house of households and only affects structure of 38 households in Cam Tuyen and Cam Thanh communes, Cam Lo district. The subproject is expected to affect 1,073m^2 of structures of various kinds, 21 end posts, eight concrete slabs and six culverts

F. Cost estimate

51. In the plan, the subproject will be constructed within 24 months with the estimated budget in Table 5 below:

Table 5 – Estimated budget of the subproject

No	Cost Items	Unit	After tax costs (VND)	After tax costs (USD)[1]
I	Civil Works Cost		165,392,015,000	7,400,090
2	Project Management Cost	1.33%	2,199,217,624	98,399
3	Construction Investment Consultancy Cost		9,905,435,152	443,196
-	Project Investment Survey Cost	Temporarily estimated	3,000,000,000	134,228
-	Design Survey Cost	Temporarily estimated	2,400,000,000	107,383
-	Project Investment Cost	0.24%	392,309,860	17,553
-	Environmental Impact Assessment Cost	Temporarily estimated	200,000,000	8,949
-	Shop Drawings Design Cost	0.85%	1,405,005,168	62,864
-	Shop Drawings Design Verification Cost	0.06%	101,550,698	4,544
-	Construction Works Cost Estimates Verification Cost	0.06%	98,242,857	4,396
-	Bidding Documents Preparation Cost		55,000,000	2,461
-	Bidding Documents Evaluation Cost		55,000,000	2,461
-	Expression of Interest & Prequalification Bidding Documents Evaluation Costs		33,000,000	1,477
-	Bidding Document & Request for Proposal Evaluation Costs		55,000,000	2,461
-	Contractor Selection Results Evaluation Cost		55,000,000	2,461
-	Cost of the consultant Committee to resolve Contractors' Requests		33,078,403	1,480
-	Construction Supervision Cost	1.22%	2,022,248,168	90,481
4	Other Costs		10,566,423,530	472,771
-	General Costs		6,615,680,600	296,004
-	Design Verification Cost	0.05%	80,971,358	3,623
-	Construction Investment project appraisal cost	0.05%	123,920,732	5,545
-	Construction Works Evaluation & Approval Cost	0.33%	369,986,033	16,554
-	Independent audit cost	0.50%	1,232,483,529	55,145
-	Construction insurance cost	1.03%	1,703,537,755	76,221
-	Project Investment supervision and evaluation Cost	20.00%	439,843,525	19,680
5	Land Acquisition and Resettlement Costs	Temporarily estimated	7,362,470	329,417
6	Contingency	16.00%	31,136,014,385	1,393,110
	Total		226,562,105,691	10,136,983

[a] Comprises $4.75 million for road construction and $2.66 million for construction of bridges and structures

V. DESCRIPTION OF THE ENVIRONMENT

A. Physical Environment

1. Topography, Geology, and Soils

52. The subproject road is located in the administrative area of Hai Thai commune, Gio Linh district and Cam Tuyen; Cam Thanh communes, Cam Lo district, Quang Tri province, 20 km from the East Sea to the East and t 30 km from the Lao border to the West.

53. The subproject is located in the mountainous areas of Cam Lo and Gio Linh district, on the Eastern side of the Truong Son range. The terrain has a dense network of rivers, streams and lakes. The elevation declines gradually from West to East.[2]

54. The main soil type of the subproject area is yellow red soil (acrisol); making up 84% of the total land area of Cam Lo district[3]. In Hai Thai commune, Gio Linh district, the main soil type are light yellow soils on slate ground (ferralic acrisols) and light yellow soils on sandy ground (hapli acrisols).

2. Weather, natural disaster and climate change

55. The subproject area has a typical tropical monsoon climate, affected by the East Truong Son Climate regime which features two separate seasons: a dry summer with predminantly hot and dry West winds from February to September and a wet, winter season with predominantly northeast winds from October to January. The annual average temperature varies from 24^0C to 25^0C. The highest temperatures occur in June and July (reaching 30.3^0C) while the lowest coolest months are January and February (with average daily temperatures going down to 18.9^0C).

56. The annual average rainfall is 2,400mm. 80% of the rainfall in each year falls between September and December. The average humidity is 80-90%, reaching 90% between September and April but as low as 30% between May and August.

57. The main weather related risk in the project is storms, which usually happen between September and November with a frequency of of 4-5 storms per year and wind speeds reaching 8 to 11 on the Beaufort scale.[4]

3. Hydrology

58. Quang Tri has a dense river and stream network with an average density of 0.8 - 1 km/ km^2. Terrain in the provinces drops rapidly from the high Truong Son range on the West side over a short distance (about 60km)to the sea so its rivers are usually short and fast flowing. The four main river systems in Quang Tri are Ben Hai, Thach Han, O Lau and Se Pon - Se Pang Hieng.

59. The Hieu River (which is also known as the Cam Lo River), which is crossed by the subproject road at Km 21+200, is a branch of Thach Han River, which originatess in the East Truong Son Range at the elevation of 1,425m. Hieu River has a total length of 78 km, water

[2] Status of Environment report (SOE) of Quang Tri province 2015
[3] http://camlo.quangtri.gov.vn
[4] http://giolinh.quangtri.gov.vn

catchment of 535 km^2. It flows to Dong Ha city before joining Thach Han River at Gia Do confluence[5]

4. Surface and ground water

Surface water resources

60. The main water bodies in the subproject area are the Hieu River, and the Da Mai and Tan Kim Reservoirs in Cam Lo district. As stated in the State of the Environment (SOE) report for Quang Tri, 2015, the surface water quality in the Hieu River is still in good quality and all the testing parameters are within the allowed limits of standard QCVN 08-MT:2015/BTNMT.

Groundwater resources

61. The total groundwater capacity of Quang Tri is about 1,656,800,000 m^3 with a potential yield capacity of 1,112,750 m^3/ day. The monitoring result of Quang Tri DONRE for 2011-2014 period shows that all the water quality parameters are within permissible levels of QCVN[6].

5. Air quality and noise

62. Compared to the standard QCVN[7] for ambient air quality, the levels of some quality parameters like Carbon monoxide (CO), Nitrogen dioxide (NO_2), Sulfur dioxide (SO_2) and Total Suspended Particles (TSP) in Cam Lo and Gio Linh districts are all within permissible limits, showing some minor variation between 2011 and 2014.

63. In general, noise levels within the province and the two subprojects districts are within the allowed levels of the QCVN[8] standard, with noise level of production, construction, trade and service activities not higher than 70 dBA during the daytime (from 6 am to 9 pm) and 55 dBA at night (from 9 pm to 6 am). Only in some monitoring locations along the National Road No.1A and No.9, is the noise level sometimes higher than the allowed level.[9]

B. Biological Environment

1. Forestry

64. Gio Linh and Cam Lo districts have suitable conditions for tree growing. However, due to over exploitation, there is no natural forest area left in the two districts. The nearest protected area, in neighboring districts, is the Bac Huong Hoa Nature Reserve, about 16km away to the West of the subproject road in Huong Hoa district, Quang Tri province. Planting has taken place to establish plantation forest in the two subproject districts under Program No. 327 and 135 and the Vietnam - Germany Forest Plantation Project[10].

65. The main tree species observed by the PPTA team is *Acacia spp*. Along the streams in the subproject area, colonization by the highly invasive woody shrub *Mimosa pigra* is profuse.

[5] Quang Tri SOE, 2015
[6] QCVN 09: 2015-MT/BTNMT National Technical Regulation on Ground Water Quality
[7] QCVN 05: 2013/BTNMT National Technical Regulation on Ambient Air Quality
[8] QCVN 26:2010/BTNMT National Technical Regulation on Noise
[9] Quang Tri SOE 2015
[10] http://giolinh.quangtri.gov.vn

2. Agriculture

66. Main agricultural crops in these districts include rice, maize, cassava, sweet potatoes, groundnut and cash crops such as pepper and rubber. Livestock also significantly contribute in gross output of these districts. Table 7 illustrates the gross output of agricultural sector.

Table 6 - Main agricultural products in subproject area, 2015

Main agricultural products		Gio Linh	Cam Lo
Paddy			
+ Planted Areas	hectare	6,673.00	2,661.20
+ Production	Ton	30,893.00	13,032.50
Maize			
+ Planted Areas	hectare	111.60	283.80
+ Production	Ton	284.42	584.00
Groundnut			
+ Planted Areas	hectare	460.75	609.00
+ Production	Ton	936.30	1,285.80
Cassava			
+ Planted Areas	hectare	1,028.00	1,507.70
+ Production	Ton	11,813.00	33,154.00
Sweet potato			
+ Planted Areas	hectare	310.00	16,7
+ Production	Ton	1,484.00	36.70
Rubber			
+ Planted Areas	hectare	3,856.10	4,245.60
+ Production	Ton	2,099.30	2,023.00
Pepper			
+ Planted Areas	hectare	480.90	358.70
+ Production	Ton	406.64	182.00
Livestock			
Buffaloes	head	4,438	1,681
Cow	head	9,726	6,788
Pig	head	41,354	23,368
Poultry	head	435,800	124,600

Source: Gio Linh and Cam Lo District Statistic Yearbook, 2015

C. Socio- Economic Condition and Infrastructure

1. Population and Ethnic

67. Gio Linh is a rural district of Quang Tri province. As end of 2015 the district had a population of 74,351 people in 19,524 households. The district capital lies at Gio Linh township. It has 19 communes and two townships. The district has total of 1,859 ethnic minority households of Van Kieu and Pa Co. It accounts for 3.1% of total district population.

68. Cam Lo district has the natural area of 34,420.72 hectares as of 2015. It consists of 8 communes and 1 township- Cam Lo township as capital of the district- with total population of 45,532 people in 12,196 households as end of 2015. There are 73 Van Kieu ethnic minority households in the district.

2. Incidence of poverty

69. For the new period of Socio-Economic Development Plan (SEDP) 2016- 2020, GoV established a new poverty line based on multi-dimension poverty criteria. This has resulted in a stepwise increase in poverty as at December 30th 2015. Accordingly, the 2016 poverty rate is 11.72% and 6.11% in Gio Linh and Cam Lo districts respectively. Table 4 presents poverty rate of sub- project Districts in 2016. The data indicates that although the overall poverty rate in sub-project districts is lower than one in whole province, poverty is more concentrated in ethnic minority groups with the rate of 64.76% in Gio Linh district compared to 45.32% of the province.

Table 7 – Poverty incidence in subproject districts, 2016

	Poverty rate (%)	
Administrative Unit	As Overall	Ethnic minority
Whole province	15.43	45.32
Gio Linh district	11.72	64.76
Cam Lo district	6.11	43.84

Source: PPTA consultants- Data collection from Quang Tri province and two sub- project districts, 2016

3. Employment and income

70. Agriculture is still dominant in sub- project districts. Labor force is still concentrated in agricultural sector with proportion of 68% and 53% in Gio Linh and Cam Lo district respectively. Gross output of agricultural sector is the largest in total gross output.

Table 8 – Labor force and gross output in subproject area, 2015

Indicator		Gio Linh district	Cam Lo district
Labor force (from aged 15 to 60)	person	33,256	27,249
+ Agricultural sector	person	22,648	14,382
+ Industrial and Construction sector	person	3,713	4,556
+ Services	person	6,895	8,311
Gross output of agricultural sector at current price	VND million	836,662	545,881
Gross output of industrial sector at current price	VND million	544,278	158,419

Source: Statistic Yearbook of Gio Linh and Cam Lo district, 2015

4. Education levels

71. A survey of 120 respondents was conducted in three communes of Hai Thai, Cam Thanh and Cam Tuyen with 40 in each commune. Table 15 shows that 20% and 13.79% of the respondents[11] in poor and female-headed households respectively had never been to school. The percentage of respondents who never attend school is 7.7% of women compared to 2.94% of men. Among 120 interviewed people, only one man graduated from the university. Most of respondents had attained secondary school level. The higher the level attained, the more likely the household is to be non-poor. Only 6.7% of the poor had attained high school level of education compared to 36.4% and 28.7% of near- poor and non- poor households.

Table 9 – Education by economic status and sex disaggregation
(% survey respondents)

	% survey respondents					
	By poverty classes			By Sex		Female
Education level	poor	near poor	non-poor	Women	Men	headed HH
Never been to school	20.00%	0.00%	0.00%	7.69%	2.94%	13.79%
Primary school	13.33%	27.27%	10.53%	19.23%	13.24%	20.69%
Secondary school	60.00%	36.36%	52.63%	57.69%	44.12%	55.17%
High school	6.67%	36.36%	28.07%	11.54%	35.29%	6.90%
Vocational training	0.00%	0.00%	7.02%	3.85%	2.94%	3.45%
University	0.00%	0.00%	1.75%	0.00%	1.47%	0.00%

Source: PPTA Consultants- BIIG socio- economic baseline household survey 2016

5. HIV and human trafficking

72. Human trafficking has not been recorded in the subproject area. Related to knowledge of HIV/AIDS, only 77.5% of respondents had heard about HIV/AIDS with more men (82%), as compared to 71% of women. For those that had some knowledge of HIV/AIDS, the main sources of information were television (73.3%). The medical staff/ healthcare workers at commune/ village level play a crucial role in dissemination of HIV/AIDS knowledge; about 47.5% of respondents had knowledge of HIV/AIDS through health worker.

73. Overall the survey results revealed that many people are uncertain of what causes and prevents HIV/AIDS. Although 76% of the men and 67% women respectively agreed that having sex with only one faithful partner reduces the risk of HIV transmission. A high proportion of both men (81%) and women (75%) agreed with the statement that using a condom prevents HIV transmission. However, 16% men and 6% women still believed that mosquitoes and other insect bites would transmit HIV. Overall, 2% of respondents and 7% female-headed households agreed that it could be tell someone is infected with HIV just by looking at him/her.

Table 10 – Sources of information on HIV/AIDS

	HIV Sources				
	TV	Radio	Images/ posters	Friends/ Family	Medical staffs

[11] 6 out of 30 respondents who are poor and had never been to school, the average age of 6 respondent are 70 years old

Percentage of respondents know about HIV	77.5%				
Percentage of respondents	73.3%	37.5%	20.8%	25.8%	47.5%
Men	82.4%	36.8%	33.8%	36.8%	50.0%
Women	61.5%	38.5%	3.8%	11.5%	44.2%
No. of respondents with female-headed family know about HIV	58.6%	34.5%	6.9%	13.8%	51.7%

Source: PPTA Consultants- BIIG socio- economic baseline household survey 2016

Table 11 – Knowledge of HIV/AIDS (% of survey respondents)

Survey responses	Men	Women	Total	Female headed HH
Having sex with only one faithful partner reduces the risk of HIV transmission	76%	67%	73%	55%
Using condom every time during sex prevents HIV transmission	81%	67%	75%	55%
In your opinion, can you tell someone is infected with HIV just by looking at him/her	0%	4%	2%	7%
Mosquitoes and other insect bites will transmit HIV	16%	6%	12%	7%
One can get HIV if one uses public toilets	3%	6%	4%	10%

Source: PPTA Consultants- BIIG socio- economic baseline household survey 2016

6. Infrastructure

74. ***Transportation***:

75. The Gio Linh – Cam Lo interdistrict road was formed on the basis of two road projects constructed between 2001 and 2006 for access to Ban Chua village, Cam Lo district and Xuan Hoa – Trang Rong road of Gio Linh district. The lack of consolidation of the gravel road surface results in a very muddy slippery road in the rainy season and dust in the dry season, reducing speed of travel and in some cases being impassable. Currently, 3.5km remains unformed from Trang Rong village to Ban Chua village, increasing transport costs significantly.

76. During focus group discussions with local authorities and villagers, it was reported that currently, vehicles transporting raw materials from Hai Thai commune, Gio Linh district to the factories in Cam Lo commune with the distance of 15 km, the proposed subproject will reduce the transport distances by half and reduce costs of transport to local producers and improve economic efficiency for the production area. Individual interviews with transporters in Cam Thanh commune, it is reported that cost of petro for transportation of construction materials from Cam Thanh commune to Cam Tuyen commune in the current road is about VND 130,000. It is estimated the cost will be reduced 50% with upgraded road.

77. Because of the current bad condition of the road, villagers in communes also face some difficulties, especially in rainy season such as (i) difficult access to market, therefore low prices attainable by traders for farmers' products; (ii) difficult access to social services such as education and health care. Participants in focus group discussions in communes indicated that market price of a kg of cassava can be at VND 1,000 but trader only offers at price of VND 300/kg in these communes; rubber latex price is offered at half price compared to market price.

78. ***Means of transport use***:

79. Table 12 examines the means of transport employed for different purposes. The motorcycle is the most important means of transport for all reasons. Going to school, for which bicycles are used, and going to work, for which go by foot.

Table 12 – Mean of transportation in the subproject area

Purpose	Mode of Transport			
	Foot	Bicycle	Motorbike	Car
Trips to work	12.50%	5.00%	60.83%	1.67%
Trips to school	0.00%	14.17%	45.83%	0.00%
Trips to local market	2.50%	6.67%	80.83%	0.00%
Trips for health and social services	1.67%	8.33%	89.17%	0.00%
Trips to district centre	0.00%	8.33%	85.00%	0.00%

Source: PPTA Consultants- BIIG socio- economic baseline household survey 2016

7. Unexploded Ordnance

80. Quang Tri is among the localities that suffered the most in the aftermath of the war, with more than 390,000 ha of land, or 82% of the province's area, getting contaminated with Unexploded Ordnance (UXO)[12] used by combatants during conflict that took place in the region between 1962 and 1975. UXO includes bombs dropped from aircraft, booby traps and land mines, all of which are indiscriminate and all of which result in concealment of the ordinance, defying the assessment of risks to a reliable level. Information on the extent and location of UXO is sparse at any level. The Viet Nam military authorities estimate that the volume of UXO left in the country following the cessation of hostilities with the United States was between 350,000 to 700,000 tons. In some locations, such as the sites of former combat bases or military supply routes, the scale of the risk is high. For most of the rest of the country, the level of risk for any one site is largely unknown. According to the province's Department of Labor, Invalids and Social Affairs, since the end of the war in 1975, bomb and mine accidents have killed and injured some 8,500 people, 31% of whom are children.

81. UXO devices are encountered when ploughing fields, searching for scrap metal and even by children playing. Information on the level of risk in any subproject area includes that available from local officials and residents, and records of incidents in the area, which are maintained by the Government agency Bomcien, under the Ministry of Defense. Risk assessment may also be based on the existing use of land to be used under the subproject, and the level of disturbance necessary in implementing the subproject: if land is already subject to foot and vehicle traffic, and disturbance such as plowing and excavations, is likely to be relatively safe. However UXO risks are always present to some degree when excavation is to take place.

[12] http://vietnamnews.vn/society/344821/unexploded-bomb-found-in-quang-tri.html#sviliJiMDkFGhgVS.97

D. Items of Archaeological, Historical and Cultural Significance

82. There are several historical sites located in the subproject area, mainly from the war between 1954 and 1976, such as cemeteries and sites that commemorate specific battle events. There is no known archaeological site in the subproject area of Gio Linh and Cam Lo districts.

E. Key Environmental Features

83. ***Physical environmental features:*** The subproject route runs mainly in flat terrain where much of the land use is the cultivation area of pepper, turmeric and rubber. The road was constructed under two road projects between 2001 and 2006 to provide access to Ban Chua village, Cam Lo district and Xuan Hoa – Trang Rong road of Gio Linh district. 3.5km remains unformed between Trang Rong village and Ban Chua village, in hilly terrain where adjoining land is mainly *Acacia* plantation. The road crosses the Hieu River at about Km21+200.

84. ***Social environmental features:*** The road runs through a low-density populated area, from Hai Thai commune, Gio Linh district to Cam Tuyen and Cam Thanh communes, Cam Lo district. Cam Lo town is about 4 km away from the end point of the subproject road.

VI. ANTICIPATED ENVIRONMENTAL IMPACT AND MITIGATION MEASURES

85. This section discusses the potential environmental impacts of the subproject and identifies mitigation measures to minimize the impacts in all design, construction and operation phases of the subproject.

86. Activities during the construction phase will be mainly confined to the existing road footprint. The main physical issues relate to impacts such as vegetation clearance, earthworks, erosion control, obtaining rock based construction materials, spoil disposal, and disposal of other waste. The effects of these activities are examined.

87. Subproject implementation will impact on the lives of local people, especially those who live along the subproject road. Cam Lo town is about 4 km away from the end point of the road.

88. The potential environmental impacts as well as the mitigation measures associated with the pre-construction, construction and operational phases are assessed below. The criteria for assessment are in line with ADB's Safeguard Policy Statement 2009 and the Government of Viet Nam standards based on the Environmental Protection Law (2014). Where government standards or guidelines have some kind of conflict with the ADB SPS, the ADB SPS will be applied as the policy for the subproject implementation. The EMP is presented below including mitigation measures and monitoring plan for the implementation of the subproject road.

A. Potential Impact and Mitigation Measures in the Pre-Construction Phase

1. Land acquisition and resettlement

89. **Impacts:** The impact is mainly on the residential area along the road including Hai Thai commune center in Gio Linh district; Tan Hiep and Tan Hoa villages, Cam Tuyen commune and Quat Xa village in Cam Thanh commune, Cam Lo district. The subproject will affect 160 households in four communes of two districts of Gio Linh and Cam Lo, Quang Tri province. Out of the 160 affected households, there are four households having production land adversely affected (losing 10% or more than 10% of their production land area), 36 ethnic minority households, 40 poor households and eight vulnerable households. The subproject also affects land, tree, crop and structures of seven organizations and enterprises. No households have to relocate.

90. The subproject is expected to affect 2,030 m^2 of perennial crop land, 130 rubber trees under management of Quang Tri Rubber One member Limited Company; 74 m^2 of production forest land under management of Hai Thai CPC; 105 m^2 of annual crop land; 232 m^2 of public land under management of Cam Thanh CPC; 4,046 m^2 of residential land; 2,200 m^2 of annual crop land; 2678 m^2 of production forest land; 299 m^2 of public land under management of Cam Tuyen CPC; 10,878 m^2 of production forest land; 1,200 rubber trees under management of NH 9 Forestry One member Limited Company and 19 electric towers, 900m of electric wire, one 0.4kV station under management of Gio Linh and Cam Lo power companies.

91. **Mitigation measures:** During the feasibility study phase, resettlement and land acquisition impacts have been identified and a Resettlement and Ethnic Minority Development Plan has been prepared. As there is no household adversely affected by construction of the subproject, the REMDP will be updated and validated, and will provide for compensation and support of affected households as appropriate before construction starts. PMU will also inform Cam Tuyen, Cam Thanh, Gio An, Hai Thai CPCs, local people and Quang Tri Rubber Company,

NH9 Forestry Company and Gio Linh, Cam Lo power companies all information related to the road construction in advance. Arrangements will be made for regular monitoring and to record and redress grievances.

2. Disturbance of Unexploded Ordnance (UXO)

92. **Impacts:** Along the subproject road, there is some possibility that UXO remains from wartime, especially for Quang Tri, the province that suffered the most in the aftermath of the war. The risk of UXO exploded should be verified by consultations with authorized organizations and local residents to find out if there is knowledge of fighting in the area in recent decades.

93. **Mitigation measures**: The PMU will conduct consultations with roadside residents to determine any history of conflict in the area that may have resulted in items UXO being left in the area. The PMU will also verify with the Quang Tri Province Legacy of War Coordination Center, Renew Project to check whether the area along the subproject route has been checked for in the past. If it is not, and if a risk is identified following consultation, an authorized UXO clearing contractor will be engaged to undertake UXO detection and clearing along the subproject road. The PMU must ensure that the construction contractors shall only commence site works after the UXO clearing contractor has certified that the subproject areas as safe.

B. Potential Impact and Mitigation Measures in the Construction Phase

1. Encroachment the forest and disfiguration of landscape

94. **Impacts:** Construction work will involve some removal of trees along the route, mainly along the 3.5 km section of new road and other trees cultivated by people who live along the road. The subproject will affect 3,476m^2 of crop (rice, cassava, peanut, sweet potato) and 6,114 trees of various kinds, which include industrial plants, fruit trees, and timber trees in the territory of subproject-affected communes (See Table 13 for more detail). Land clearance at the 3.5 km section will involve minor alteration of the landscape. Workers could cut down trees in the forest for fuel wood. These risks occur particularly in the 3.5 km section of new road. The impacts will take place over 24 months of construction time.

Table 13 - Summary of affected tree by subproject implementation

Total		**Tree**	**6,114**
Fruit tree	Avocado	tree	12
	Areca catechu	tree	6
	Banana	tree	143
	Jack fruit	tree	16
	Longan	tree	4
	Ficus racemosa	tree	2
	Chrysophyllum cainino	tree	3
	Mango	tree	28
	Clausena lansium	tree	2
	Spondias dulcis	tree	1
Timber tree	Melaleuca	tree	2,919
	Acacia	tree	419
	Meliaceae	tree	89
	Bamboo	tree	108
	Dalbergia tonkinensis Prain	tree	15
	Khaya senegalensis	tree	20

	Barringtoria	tree	8
	Other timber tree	tree	8
Industrial tree	Rubber	tree	2,311

95. **Mitigation measures:** Trees and crops cultivated by local residents that will be removed, will be compensated under the provisions of the REMDP. To reduce the impact on further trees and vegetation, DARD offices of Cam Lo and Gio Linh districts will be informed about the construction time and schedule, scope of works as well as location of worker camps and material storage sites. The contrator should also inform Quang Tri Rubber Company, NH9 Forestry Company before removed trees under the management of these two companies. No construction camps, bitumen heating facilities, depots or material storage sites will to be located in or near forested areas. The contractors will not use or permit the use of fuelwood for construction activities or for cooking and water heating in worker's camps. The contractors should not buy or use wood from illegal sources. The PMU assisted by the ESS and CSC will strictly supervise and monitor the protection of trees and other vegetation.

2. Impact on crossing streams or bridge construction locations

96. **Impacts:** Careless construction and poor handling of materials at bridge sites can cause blockages and release of silt into streams and other waterways. Runoff water during rain could bring waste and soil into streams and the Hieu River, leading to a temporary reduction in water quality and impact downstream user of Hieu River including Cam Lo town and Dong Ha city.

97. **Mitigation measures:** The design of bridges will take into account maximum flood levels including appropriate design of abutments. During construction, contractors will confine activity to the dry season and take all reasonable precautions to minimize the release of silt into the ream, and avoid release of any chemical or human waste contaminants into the water..

3. Deterioration of surface water quality

98. **Impacts:** The surface water quality of the subproject area could be degraded due to silt runoff, release of chemicals used in construction and of sanitary wastes from workers camps as follows: (i) surface and subsurface water resources may be contaminated by fuel and chemicals used in construction, or by solid waste and effluent generated by the kitchens and toilets at construction campsites; (ii) streams and the Hieu River may subject to release of silt from borrow materials piled near the construction area (iii) water in streams could be temporary blocked during construction period at the crossing positions. The impacts will mainly on water bodies along the subproject road and worker camps area, especially at crossing point with the Hieu River as the main water source for Cam Lo Water Supply Factory is Hieu River with the intake point located downstream of the subproject area.

99. **Mitigation measures:** In order to minimize this negative impact, the contractor will (i) provide an alternative source of clean water for worker's camps if necessary, (ii) provide adequate drainage facilities at construction sites and worker camps; (iii) store lubricants, oils, paints and other hazardous materials in designated roofed areas with impervious floors at least 50m from water bodies, controlled by authorized personnel only, (v) place sediment ditches or silt fences in suitable locations to avoid runoff, erosion and siltation in to the water bodies and (v) provide silt fences and, for fine material, covers on materials stockpiles and locate them at least 50m away from water bodies. The Contractor will detail proposed measures in the Contractor's Environmental Management Plan (CEMP). The PMU and CSC will be responsible to check the

adequacy of the CEMP to provide the required mitigation monitor the implementation of the mitigation measures.

4. Increased local air pollution due to rock crushing, cutting and filling works

100. **Impacts:** Earthworks and rock crushing activities will be the main sources of dust. Construction machines and vehicles will generate gaseous emissions (NOx SOx, CO, CO_2, etc.) when they are in operation. Bitumen activity will also generate gas and odor. Construction machines will also create noise during their operation. These gaseous emissions, dust and noise could cause respiratory and hearing problems for residents who live along the subproject road likes Ban Chua, Quat Xa, Tan Hoa and Tan Quang villages, Cam Thanh and Cam Tuyen communes. They could also affect sensitive habitats such as forests.

101. **Mitigation measures:** The contractors should not locate any noisy machines or large material storage site near or within forests or residential areas. Warning signs, speed limit sign should be placed at Ban Chua, Quat Xa, Tan Hoa and Tan Quang villages to reduce the transportation speed and reduce dust, gaseous emissions. The contractors will work with the 4 CPCs of Gio An, Hai Thai, Cam Thanh and Cam Tuyen as well as DPCs of Cam Lo and Gio Linh and the representatives of ESS and PMU, to identify areas for depots will also include a materials transportation plan and details such as wetting of areas or stockpiles with fine material in the CEMP. The PMU and CSC will responsible to monitor these mitigation measures.

5. Impact on local traffic

102. **Impacts:** Construction activities on the Subproject road are likely to cause hindrance of traffic flow if not mitigated properly especially as there is no alternative route for most trips. The road runs along cultivated areas and narrow valleys and there is the only route for local people in several villages of Hai Thai and Cam Tuyen including Trang Rong, Ban Chua, Quat Xa communes to access the Ho Chi Minh road and National Road No.9. Local people and people from other areas who travel on the subproject road will be affected during the 24 month construction period.

103. **Mitigation measures:** To minimize the disturbance to local people, the contractor will include in the CEMP, submitted to the CSC, a construction traffic plan indicating the timing of vehicle journeys to avoid peak traffic hours. The contractor will also coordinate with local traffic authorities to implement appropriate traffic diversion schemes to avoid traffic obstruction due to subproject operations to road users and a schedule for the transport of materials and plans for traffic signaling and advisory will be prepared and submitted to the CSC for approval. The contractor will also install bold diversion signs that would be clearly visible even at night and provide flagmen to warn of dangerous conditions. A traffic officer will be designated for each construction site. Guidance for the preparation of traffic management plans is provided as Appendix 6.

6. Safety of local people or construction workers

104. **Impacts:** Works and the public are at risk of accidents associated with construction, particularly excavations, and operations involving heavy machinery. Material transport and construction activities on the existing road may create the risk of traffic safety and affect houses and other structures on roadsides, particularly on the residential areas along the road likes Ban Chua, Quat Xa, Tan Hoa, Tan Quang villages, Cam Tuyen and Cam Thanh communes, Cam Lo district.

105. **Mitigation measures:** The contractors will (i) conduct training for workers on safety, including roles and responsibilities, safe site practices and environmental hygiene (ii) institute site and camp rules such as wearing proper safety apparel such as safety boots, helmets, protective clothes, gloves and ear protection, (iii) ensure vehicle and plant operators are trained and licensed (iv) ensure all excavation sites are fenced with sign boards and perimeter markers and (v) allocate responsibility to supervisor staff to ensure that all safety rules are followed by all staff at all times. The project will take note of opinions and complaints from local people and authorities on safety.

7. Impacts from influx of construction workers

106. ***Impacts:*** About 100 workers will be mobilized discontinuously in 24-month construction phase. The influx of construction workers can cause (i) a burden on local public services like electricity and water supplies; (ii) risks of transmission of diseases in the subproject area; (iii) conditions theat favour thte spread of diseases such as sore eyes, cholera, flu and respiratory problems; (iv) risks of social problems such as those associated with gambling, drug use, prostitution, and violence. The impacts would be on both workers and on the communities near the construction sites in residential.

107. ***Mitigation measures:*** (i) Careful siting of workers' camps and facilities as agreed by local communities and approved by the PMU (ii) Registration of workers with local police while resident in the subproject area (iii) the workers' camps should be located in areas with sufficient drainage to avoid water logging and formation of breeding sites for mosquitoes and flies, (iv) workers' camps and other depots should be kept cleaned to ensure that site drainage continues to be effective (v) workers should have health checks before start work in the subproject and should be trained for living and working behavior before joining the sites, the contractor should establish rules of conduct for workers, facilitate leisure activities such as sports and raise awareness on risks of disease transmission (vi) engaging local people including for unskilled or semi skilled tasks to the extent that they are able and willing to undertake them.

8. Site de-commissioning

108. **Impact:** When construction work has been completed, any un-collected waste or abandoned borrow pits pose potential hazards to people and land as well as being unsightly.

109. **Mitigation measures:** Site cleaning up must be done prior to the completion of works and site handover. The contractors must fill pits, land excavation areas and any landscaping and planting done on land that has been temporarily in the Contractor's possession during construction. Any conditions placed on use if sites by local authorities or in agreements with landowners must be complied with.

C. Potential Impact and Mitigation Measures in the Operation Phase

9. Driving conditions and community safety

110. The upgrading and construction of the road is likely to increase the vehicle speed on the road. Increases in traffic flow indicate additional future traffic should be moderate and unlikely to create many community safety issues.

111. **Mitigation measures:** Quang Tri DOT will install speed limit board and road hump at the residential areas and some other sensitive points. Danger cross signboard will be installed at the the start and end point of the road. Quang Tri DOT will cooperate with local traffic police to navigate the transportation along the whole 23.3 km of the subproject road.

10. Favorable conditions for transportation of goods and people movement

112. **Impacts:** The upgraded road will benefit traffic as well as 9,000 people of Hai Thai commune, Gio Linh district (about 4,000 people) and Cam Tuyen commune, Cam Lo district (about 5,000 people) through connecting these people to the district centers and major transport routes. Direct beneficiaries are estimated to be over 3,400 who will be directly involved in commerce, services, industry and agriculture in Hai Thai commune, Gio Linh district (over 2,160 people) and Cam Tuyen commune of Cam Lo district (over 1,480 people). The road will also serve a total of 8,839ha of industrial and plantation forestry (including rubber, coffee etc.) spread between Hai Thai commune (839ha) and Cam Tuyen commune (8,000ha).

VII. INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

113. The objectives of the stakeholder consultation process was to disseminate information on the subproject and its expected impact, long-term as well as short-term, among primary and secondary stakeholders, and to gather information on relevant issues so that the feedback received could be used to address these issues at early stages of subproject design. Another important objective was to determine the extent of the concerns amongst the community, to address these in the subproject implementation and to suggest appropriate mitigation measures.

A. Public Consultation

114. Stakeholders are people, groups, or institutions that may be affected by, can significantly influence, or are important to the achievement of the stated purpose of a proposed intervention. The stakeholders consulted for the construction of the Gio Linh - Cam Lo inter-district road included representatives from Quang Tri DPI, DONRE, and DARD. Consultation has also been implemented in the form of interview with representatives from 3 CPCs in Cam Lo and Gio Linh districts who live along the subproject road, the beneficiaries and affected people of the subproject implementation. 8 people were consulted, including 2 women. Consultations took place on 28 December 2017.

B. Information Dissemination During Public Consultation

115. Providing information through local authority offices will provide a conduit for the improvement of the subproject implementation to better serve the stakeholders. Public consultation can also assist in:

i) harnessing cooperation from informed people to help local authorities reconfirm the extent of local permits and licenses that will be required at a later stage;
ii) obtaining cooperation from informed residents and groups which to avoid cost and time in dealing with complaints;
iii) identifying local infrastructure subprojects or other local initiatives that will interface with the subproject roads with assistance from informed local authorities;
iv) the collection of relevant information on the current condition of the local environment including aspects of forest and wildlife and conservation.

116. The information disseminated during public consultation included: (i) background of the Project and subproject; (ii) basic information related to ADB and the Government requirement for environmental protection and management; (iii) potential impacts during subproject implementation and mitigation measures; and (iv) the grievance redress mechanism.

C. Results from Public Consultation

117. The results of the public consultations are recorded in Table 11 and 12 below. In general, all the relevant stakeholders support the implementation of the subproject. As the subproject located in the low population density and the main construction work will be upgrade road surface based on the existing road foundation, no house needs to be relocated and no major land acquisition will be required, the local people totally support the subproject.

Table 14 – Main issues and information from local authorities

Main issues	Information from relevant authorities
Forest in the subproject area	Quang Tri DARD: There is no natural forest in the subproject districts that is vulnerable to activities from the subproject
Biodiversity in the subproject area	Quang Tri DONRE: There is no protected area in the subproject and its vicinity. The nearest protected area: Bac Huong Hoa Natural Reserve is about 16 km from the middle point of the subproject road

Table 15 – Main environmental concerns from public consultation

Concerns expressed	How concerns are addressed
Impact on productive land	At the mitigation measures for the land acquisition and resettlement: The REMDP will be updated and validated, and will provide for compensation and support of affected households as appropriate before construction starts

118. The environmental assessment process under the SPS 2009 requires the disclosure of the IEE. The IEE, including the EMP will be displayed at the PPC Headquarter and on the ADB website. Quang Tri PMU will responsible for IEE translation to Vietnamese and disclose at Hai Thai, Cam Thanh and Cam Tuyen communes of Gio Linh and Cam Lo districts.

D. Public Consultation during Detailed Design

119. Further public consultation will take place during detailed design. This will be organized in each of An Thuy, Son Thuy, Cam Thuy, Ngu Thuy Bac communes. Meetings will be announced in advance, and shall be open to all members of public and in a manner free of coercion. Updates on the subproject will be given, including an outline of the improvements to be made, and information on the construction schedule including duration of construction and likely construction impacts on local communities. Views will be recorded and any concerns referred to the design engineers to take consideration of in detailed design.

VIII. GRIEVANCE REDRESS MECHANISM

A. Purpose of the mechanism

120. During the preparation of the subproject, information is disseminated to local people on the scope of the subproject, and environmental and social impacts. Negative impacts of an environmental or social nature, or resettlement impacts, may occur during the construction and operational phases. Any comments/ suggestions of local people will be solved quickly, transparently in accordance with protected the law, particularly for people affected by the subproject. This grievance redress mechanism is classified by level and responsibilities of involved parties.

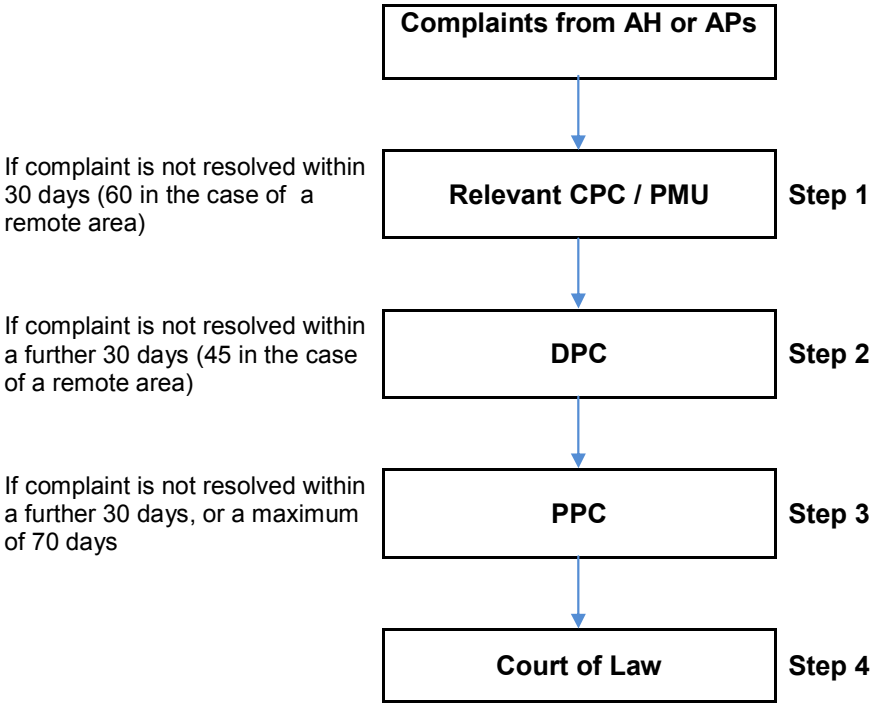
B. Grievance redress process

***Stage 1*:** If a household or individual has any complaint he/she can submit a complaint in written or verbal form to the representative of the CPC-community monitoring board (usually the Deputy Chairman of the commune/town). The CPC will work with PMU to solve complaints and a representative PMU will respond in written form to the complainant. The CPC, as a whole body will meet personally with the aggrieved affected household and will have 30 days and a maximum of 60 days after the lodging of the complaint to resolve the complaint, however, depending upon whether it is a complicated case or case comes from a remote area. The CPC secretariat is responsible for documenting and keeping file of all complaints that it handles.

Stage 2: If after 30 days or 45 days (in remote areas) the aggrieved affected household does not hear from the CPC, or if the affected household is not satisfied with the decision taken on his/her complaint, the affected household may bring the case, either in writing, to any member of the DPC. The DPC in turn will have 30 days or a maximum of 70 days after the lodging of the complaint to resolve the case, however, depending on whether the case is complicated or in remote area. The DPC is responsible for documenting and keeping file of all complaints that it handles and will inform the District Resettlement Committee (DRC) of any decision made and the DRC is responsible for supporting DPC to resolve AH's complaint. The DPC must ensure that the complainant is notified of the decision made

Stage 3: If after 30 days or 45 days (in remote area) the aggrieved affected household does not hear from the DPC, or if the affected household is not satisfied with the decision made on his/her complaint, the affected household may bring the case, either in writing, to any member of the PPC. The PPC has 30 days or a maximum of 70 days to resolve the complaint to the satisfaction of all concerned. However, depending if the case is complicated or from a remote area The PPC is responsible for maintaining records of complaints received, action taken and outcomes.

Stage 4: If efforts to resolve disputes using the grievance procedures remain unresolved or unsatisfactory, after a period of thirty days, complainants have the right to bring the case to a Court of law for adjudication. The decision of the Court is binding on all parties.


Complaints from AH or APs
If complaint is not resolved within 30 days (60 in the case of a remote area)
Relevant CPC / PMU
Step 1
If complaint is not resolved within a further 30 days (45 in the case of a remote area)
DPC
Step 2
If complaint is not resolved within a further 30 days, or a maximum of 70 days
PPC
Step 3
Court of Law
Step 4

IX. ENVIRONMENTAL MANAGEMENT PLAN

A. Implementation Arrangement

121. Quang Tri PMU will recruit one Environment Safeguard Specialist (ESP) under the Loan Implementation Consultants (LIC) to support subproject implementation in Quang Tri. The ESS will support the PMU to update the EMP and as well as monitor the compliance of the contractors during construction phase. The ESS will also be responsible for training and capacity building on the implementation of the EMP.

122. The PMU will engage a Construction Supervision Consultant (CSC) for the monitoring and supervision of the subproject in general and for environmental monitoring as well. The CSC will ensure that the contractors implement the provisions of the subproject EMP.

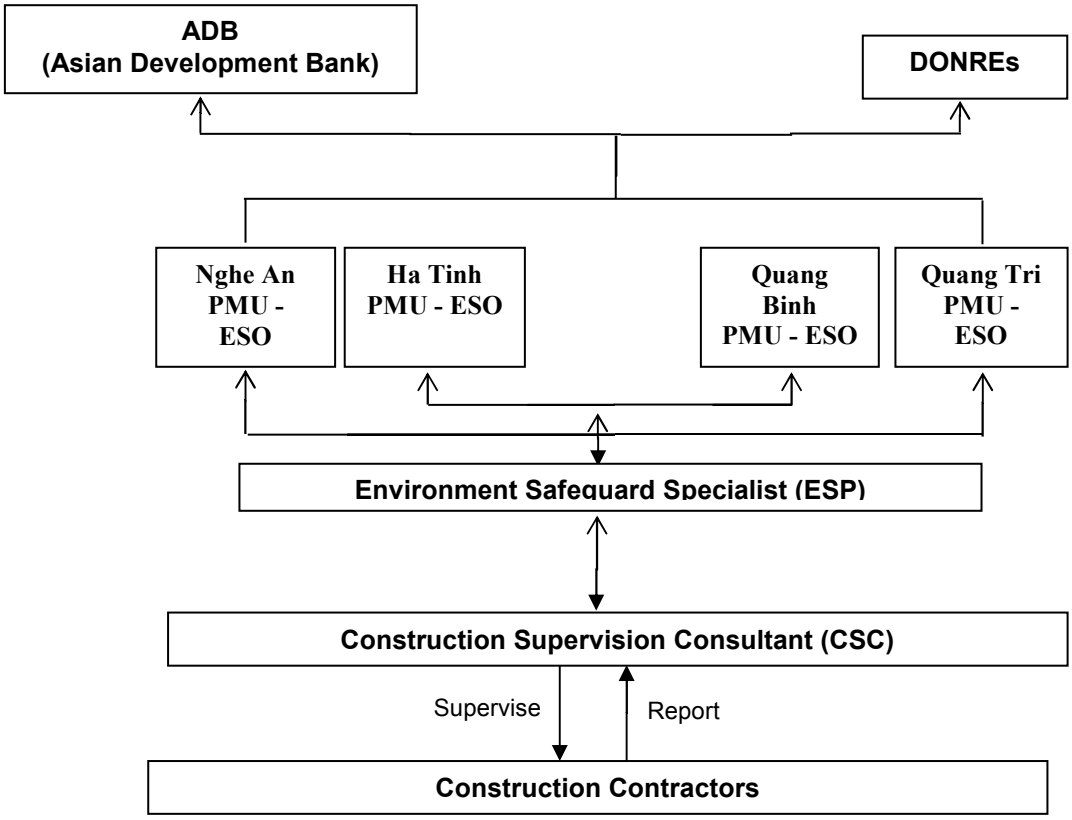
Table 16 – Responsibilities for EMP implementation

Agency	Responsibilities
Quang Tri Project Management Unit under DPI (PMU)	- Ensure that EMP provisions are strictly implemented during the various subproject phases (design/pre-construction, construction and operation) to mitigate environmental impacts to acceptable levels. - Undertake monitoring of the implementation of the EMP (mitigation and monitoring measures) with assistance from CSC and ESP. - Ensure that Subproject implementation complies with ADB's environmental policy and safeguards policy statement (SPS 2009) principles and requirements - For subproject duration, commit and retain dedicated staff within PMU as environment and safeguards staff to oversee EMP implementation - Ensure that environmental protection and mitigation measures in the EMP are incorporated in the detailed design. - With the support from ESP, updated EMP to suitable with any changing in subproject scope or any unanticipated impact rise. - Obtain necessary environmental approval(s) from DONRE prior to award of civil works contracts - Include the Subproject updated EMP in the bid and contract documents for civil works - Establish an environmental grievance redress mechanism, as described in the IEE, to receive and facilitate resolution of affected peoples' concerns, complaints, and grievances about the Subproject's environmental performance - With assistance from ESP, prepare semi-annual environmental monitoring reports for submission to ADB - Based on the results of EMP monitoring, identify environmental corrective actions and prepare a corrective action plan, as necessary, for submission to ADB.
Environmental Safeguards Staff (ESO)	- Support to PMU staff for EMP implementation - Work closely with the ESS forsupervision and monitoring of EMP implementation and preparation of EMP monitoring report
Environment Safeguard Specialist (ESP)	- Update the EMP to ensure it is applicable to current conditions and design changes or whenever subproject scope change or any unanticipated impact arises. - Ensure that the environmental protection and mitigation measures identified in the EMP for the design stage has been incorporated in the detail design; - Assist the PMU to ensure that all environmental requirements and mitigation measures from the IEE and EMP are incorporated in the bidding documents and contracts. - During detailed design phase carry out baseline data collection (as specified in the EMP) - During detailed design phase, prepare method statement (Waste Management and

	Spoils Disposal Plan) described in the IEE/EMP. - Carry out all tasks allocated to the ESS in the EMP. - Work with the PMU to execute any additional environmental assessment prior to subproject construction as required in the EMP (e.g., preparation of new or supplementary environmental assessment in case of any change in alignment that will result in further potential environmental impacts that are not within the scope of the originally prepared IEE. - Undertake environmental management capacity building activities for PMU as described in the IEE and EMP. - Engage international and national environment specialists to ensure proper implementation of EMP provisions. Through these specialists, the ESS shall: (i) ensure proper and timely implementation of ESP's tasks specified in the EMP, (ii) conduct environmental training as specified in the IEE/EMP for PMU, (iii) conduct workers' orientation on EMP provisions, (iv) undertake regular monitoring of the contractor's environmental performance, as scheduled in the EMP (v) conduct field measurements for surface/ground water quality, dust and noise as required in the EMP, and (v) prepare environmental baseline report and environmental semi-annual environmental monitoring reports , as specified in the EMP, for submission to ADB.
Construction Supervision Consultant (CSC)	- Provide the ESS relevant information as well as full access to the subproject site and all project-related facilities (such as construction yards, workers' camps, borrow and quarry areas, crushing plants, concrete mixing plants, etc.) to monitor contractors' implementation of the subproject EMP, assess environmental impacts resulting from on-going site works and operation related facilities, undertake environmental effects monitoring and orientation of workers on EMP implementation. - Undertake day-to-day subproject supervision to ensure that contractors properly implement the EMP. - Orient workers on EMP implementation, and health and safety procedures - Document and report to PMU on occupational accidents, diseases and incidents - As part of regular progress report submission to PMU, prepare reports on the status of the contractors' implementation of the EMP and health and safety issues - Engage an environmental staff to ensure proper implementation of the above tasks.
Contractors	- Recruit or appoint qualified individual to act as the contractor's environmental officer to ensure compliance with environmental statutory and contractual obligations and proper implementation of the Subproject EMP - Ensure full understanding of the EMP and resources required for its implementation when preparing the bid for the work. - Implement additional environmental mitigation measures, as necessary
Quang Tri Department of Transportation (DOT)	- Responsible for operation and maintenance of Subproject road - Implement the EMP monitoring during operation
Quang Tri Department of Natural Resources and Environment (DONRE)	Review and approve environmental assessment reports required by the Government. - Undertake monitoring of the subproject's environmental performance based on their mandate

The organization structure of Environmental Management Plan is showed in the chart below:

Figure 4 – EMP Implementation Organization Chart



B. Environmental Mitigation

123. The anticipated environmental impacts and mitigation measures discussed in the previous section are presented in Table 17. The table also shows responsibilities and timeframe/schedule for implementation of mitigation measures and monitoring.

124. Table 17 shows that most mitigation activities during pre-construction are to be implemented by the ESS while during construction, measures shall be primarily implemented by the contractors. During the operation stage, DOT shall undertake environmental mitigation and monitoring requirements specified in the EMP. To ensure implementation of mitigation measures during construction, the EMP shall be included in the tender and contract documents for civil works. Contractors' conformity with environmental contract procedures and specifications shall be regularly monitored by PMU with assistance from CSC and results shall be reported semi-annually to ADB.

Table 17 - Detail Environmental Mitigation Plan

		Impact Mitigation				
Environmental Concern	Objective	Proposed Mitigation Measures	Responsible to Implement	Timing	Locations	Mitigation Cost
Design and Pre-construction Phase						
1. Land acquisition and resettlement	Control the impact of land acquisition and resettlement	Monitor the compensation process to ensure it is suitable with the Land Acquisition and Resettlement Report	ESP	Before construction	N/A	Included in the contract with ESP
2. Unexploded Ordnance	Avoid accidents due to any kind of UXO	1. Coordinate with appropriate agencies at the design stage to identify if UXO is a potential threat to works 2. Based on the findings, engage an authorized UXO clearing contractor, as necessary. 3. Ensure that the contractors shall only commence site works after the UXO clearing firm has certified that the subproject areas are already cleared.	ESP	Before bidding	N/A	Included in the contract with ESP
3. River Crossings	Ensure adequate clearance for extreme flood events	Designs to take into account maximum flood levels	Design consultant	Before bidding (detailed design phase)	River and stream crossings	Included in design cost
4. Road safety	Discourage unsafe driving on the improved road	Provide safety features such as signage, speed humps to encourage safe driving	Design consultant	Before bidding (detailed design phase)	River and stream crossings	Included in design cost
Construction Phase						
1. Encroachment the forest and disfiguration of landscape	Avoid and minimize the encroachment to the forest and landscape changing	1. Minimize clearance of vegetation cover.. 2. All replanting works to utilize locally available non-invasive species. 3. The contractors will not use or permit the use of wood as a fuel for the execution of any part of the works, including but not limited to the heating of bitumen and bitumen mixtures, and to the extent practicable shall ensure that fuels other than wood are used for cooking, and water heating in all camps and living accommodations. 4. Contractors shall not buy or use wood or other forest products from illegal sources (that come from illegal logging)	CPCs; Contractors	Through out construction phase	Along the subproject road, especially 3.5 km newly construction section; worker camps area	Included in the contract with contractors

		5. No construction camps, bitumen heating machine, material storage sites are to be located in the forest area. 6. Contractors will take all precautions necessary to ensure that damage to vegetation is avoided due to fires resulting from execution of the works. The Contractors will immediately suppress the fire, if it occurs, and shall undertake replanting to replace damaged vegetation.				
2. Streams/ Rivers protection and bridge/culvert construction	Protect Streams/ Rivers and maintain flows	In sections along and near streams and water bodies: 1. No construction waste, including excavated material, to be placed in rivers or streams. 2. Work in streams at bridge repair sites will be scheduled during dry season and work duration shall be as short as possible. 3. Cofferdams, silt fences, sediment barriers or other devices will be used as appropriate based on the design to control release of silt during excavation and boring operations within or near streams. 4. Other erosion control measures above and covering open surfaces with grasses and creepers to reduce runoff will be implemented as early as possible in construction.	Contractors	Through out construction phase	3 stream crossing points and Hieu River crossing point	Included in the contract with contractors
3. Deterioration of surface water quality	To minimize impact from sanitary wastes and prevent potential impact on water quality due to subproject activities	1. Provide adequate drainage facilities at construction sites and worker camps to avoid stagnant water. 2. Store lubricants, fuels and wastes in dedicated secure buildings with impervious floors at least 50 m from water bodies , controlled by authorized personnel 3. Solid waste from construction activities and workers camps will not be thrown in streams, the Hieu River or other water bodies. 4. Construction storage/stockpiles shall be provided with bunds or silt fences to prevent silt run-off. 5. Stockpiles containing fine materials will be covered to reduce wind erosion. 6. Materials stockpiles or borrow sites to be at least 20m from water bodies. 7. Washing of machinery and vehicles in	Contractors	Through out construction phase	Through out construction sites; Hieu River, streams and other water bodies, material storage sites, temporary waste disposal area	Included in the contract with contractors

		surface waters shall be prohibited. 8. Inform 4 CPCs and 2 DCPs in advance construction schedule and scope. 9. Work with relevant Division of 2 DPCs to find out suitable water block/ water cut schedule, avoid impact to downstream users of the Hieu River.				
4. Noise, dust and vibration	To minimize negative impacts from noise, dust and vibration during construction period	1. Restrict works to daylight hours within 500 m of residential settlements. 2. Powered mechanical equipment and vehicle emissions to meet national TCVN/QCVN standards. All construction equipment and vehicles shall have valid certifications indicating compliance to vehicle emission and noise creation standards. 3. Monitor and investigate complaints; propose alternative mitigation measures. 4. Tightly cover trucks transporting construction materials (sand, soil, cement, gravel, etc.) to avoid or minimize spills and dust emissions. 5. On rainless days undertake watering, at least twice per day, on dusty and exposed areas at construction yards, materials storage sites, construction sites, access roads, quarry areas, borrow sites and other subproject areas where residential sites are located nearby. 6. Clean up road surfaces after work. 7. To protect buildings and structures from vibration, non-vibrating rollers shall be used in construction sites near buildings and structures. 8. Structures, which are damaged due to vibration caused by the construction activities, shall be repaired immediately as directed by ESP/PMU. 9. Machinery shall be turned off when not in use. 10. Pile driving to be schedule for daytime if construction site is near residential areas or approved by DONRE, CPCs and ESP/PMU. 11. Impose speed limits on construction machines and transportation vehicles to minimize dust emission along areas where	Contractors	Through out construction phase	Through out construction site	Included in the contract with contractors

		residential areas are located.				
5. Traffic Management	Minimize disturbance of traffic	1. Communicate to the public through local officials regarding the scope and schedule of construction, as well as certain construction activities causing disruptions or access restrictions. 2. In coordination with local traffic authorities, implement appropriate traffic diversion schemes to avoid inconvenience due to subproject operations to road users, ensure smooth traffic flow and avoid or minimize accidents, traffic hold ups and congestion 3. In coordination with local traffic officials, schedule transport of materials to avoid congestion, set up clear traffic signal boards and traffic advisory signs at the roads going in and out the road and bridge construction sites to minimize traffic build-up. 4. Provide safe vehicle and pedestrian access around construction areas. 5. Install bold diversion signs that would be clearly visible even at night and provide flag persons to warn of dangerous conditions. 6. Provide sufficient lighting at night within and in the vicinity of construction sites. 7. Designate traffic officers in construction sites.	Contractors	Through out construction phase	Through out construction sites; at start and end points of the road; at the bridge construction sites.	Included in the contract with contractors
6. Health and safety precautions for workers and public safety	Ensure worker safety	1. Establish safety measures as required by law and by good engineering practice and provide first aid facilities that are readily accessible by workers. 2. Scheduling of regular (e.g., weekly tool box talks) to orient the workers on health and safety issues related to their activities as well as on proper use of personal protective equipment (PPE). 3. Fencing on all excavation, borrow pits and sides of temporary bridges. 4. Workers shall be provided with appropriate PPE such as safety boots, helmets, safety glasses, earplugs, gloves, etc. at no cost to the employee. 5. Where worker exposure to traffic cannot be completely eliminated, protective barriers shall be provided to shield workers from	Contractors	Through out construction phase	Through out construction sites	Included in the contract with contractors

		traffic vehicles. 6. Workers shall be provided with reliable supply of potable water. 7. Construction camps shall be provided with adequate drainage to avoid accumulation of stagnant water. 8. Construction camps shall be provided with toilets/sanitation facilities in accordance with local regulations to prevent any hazard to public health or contamination of land, surface or groundwater. These facilities shall be well maintained to allow effective operation. 9. Ensure reversing signals are installed on all construction vehicles.				
7. Large influx of construction worker	Construction camps and worker camps not to cause any negative impact to surrounding environment (forest area, water bodies, wild animal); control of infectious diseases.	1. Construction and workers' camp location and facilities to be at least 500m from settlements and agreed with local communities and facilities approved by ESS and managed to minimize impacts. 2. Hire and train as many local workers as practicable. 3. Provide adequate housing for all workers at the construction camps and establish clean canteen/eating and cooking areas. 4. Mobile toilets (or at least pit latrines in remote areas) shall be installed and open defecation shall be prohibited. Toilet facilities to be kept clean at all times. 5. Provide separate hygienic sanitation facilities/toilets and bathing areas with sufficient water supplies for male and female workers. 6. Borrow pits and natural depressions with pre-laid impervious liners will be used to dispose of scarified/scraped asphalt, and then covered with soil. This will check potential groundwater contamination. 7. As much as possible, food shall be provided from farms nearby and bush meat supplies will be banned to discourage poaching. 8. Camp site will be cleaned up to the satisfaction of and local community after use. 9. Solid and liquid waste will be managed in	Contractors	Through out construction phase	Through out construction sites and worker camps	Included in the contract with contractors

		line with Waste Management Plan 10. All waste materials shall be removed and disposed to disposal sites approved by local authorities 11. Land used for campsites shall be restored to the original condition as far as practicable and the area shall be planted with appropriate trees / shrubs as soon as practicable after it is vacated and cleaned. 12. Register temporary stay for workers with police.				
8. Site de-commissioning	Provide environmental recovery of the subproject	Contractors to reconfirm and implement recovery (e.g., landscaping, tree replanting) identified at the detailed design stage	Contractors	Through out construction phase	Through out construction sites	Included in the contract with contractors
Operation Phase						
1. Traffic and road safety	Minimize road accident	1. Undertake road safety awareness campaigns for local residents and other road users of Gio Linh - Cam Lo Inter-district road. 2. Install and maintain road warning signs and markings. 3. Monitor road accidents and implement necessary preventive measures (awareness campaigns, provision of appropriate road furniture to enhance road safety and control traffic).	Quang Tri DOT	Through out operation phase	Along the proposed road	Included in operation and maintenance cost

C. Environmental monitoring

1. Compliance Monitoring

125. Table 18 below shows the program for monitoring the compliance various provisions of the EMP during pre-construction, construction and operation phases. ESS needs to implement a number of measures during detailed design phase (e.g., incorporation of environmental design measures into the detailed design, update EMP, etc.) and this will be confirmed by PMU to ADB. During construction, most of the mitigation the contractors shall implement measures and CSC and ESS shall monitor their environmental performance, in terms of implementation of such measures. The timing or frequency of monitoring is also specified in Table 15. During operation EMP implementation shall be the responsibility of Quang Tri DOT.

126. At design phase, PMU shall ensure that EMP measures for the design stage are incorporated in the detailed design. The effective incorporation of the EMP in the civil works contracts shall also be ensured be by PMU with assistance from ESS and this, along with implementation of EMP provisions, shall be audited by ADB as part of the loan conditions.

d. Prior to implementation of the subproject the IEE and EMP will be updated and amended, as necessary, by ESS after the detailed designs are complete and contracting arrangements are known. Such updating shall be based on reconfirmation and any additional information on the assumptions made at this feasibility stage on location scale and expected conditions of the subproject.

2. Environmental Effects Monitoring

127. Table 19 below displays the parameters to be measured before during and after construction, to monitor effects on the environment and detect emerging problems to elicit appropriate action.

Table 18 - Environmental Monitoring Compliance

Performance and Impact Monitoring					
Environmental Concern	Parameter to monitor	Location	Frequency & Verification	Responsible to Monitor	Monitoring Cost
Design and Pre-construction Phase					
1. Land acquisition and resettlement	Compensation documents	N/A	Only one time before the construction commencement	Quang Tri DPI/ DONRE; PMU	Included in the operation budget of PMU
2. Unexploded Ordnance	Checking documents/ certificates	N/A	Once, before construction start	PMU	Included in the operation budget of PMU
3. Designs of river and stream crossings	Adequate to handle extreme flooding events	Stream and river crossings	Once	PMU	Design cost
4. Road safety features	Inclusion of appropriate safety features in the design	Entire alignment	Once	PMU	Design cost
Construction Phase					
1. Encroachment to the forest and landscape disfiguration	Check of implementation	Along the subproject road, especially 3.5 km newly construction section; worker camps area	Before construction commencement and through out construction phase. Part of daily construction supervision	ESP/ PMU CSC	Included in the operation budget of PMU/ ESP/ CSC
2. River/ stream protection and bridge/culvert construction	Check of implementation	Three stream and Hieu River crossing points	Bi-weekly Part of daily construction supervision	ESP/ PMU CSC	Included in the operation budget of PMU/ ESP/ CSC
3. Water resources and water quality	Check of implementation	Through out construction sites, Hieu River and 3 stream crossing points, material storage sites, temporary waste disposal areas	Bi-weekly Part of daily construction supervision	ESP/ PMU CSC	Included in the operation budget of PMU/ ESP/ CSC
4. Noise, dust and vibration	Check of implementation	Through out construction site	Bi-weekly and spot checks Part of daily construction supervision	ESP/ PMU	Included in the operation budget of PMU/ ESP CSC
5. Traffic Management	Check of implementation	Through out construction sites; at start and end of	Bi-weekly Part of daily construction	ESP/ PMU CSC	Included in the operation budget of PMU/ ESP/

		the road; residential areas	supervision		CSC
6. Safety precautions for workers and public safety	Check of implementation. Check compliance to Labor Code of Vietnam and other relevant Decision, Decree and Circular under Government requirements	Through out construction sites	Bi-weekly Part of daily construction supervision	ESP/ PMU CSC	Included in the operation budget of PMU/ ESP/ CSC
7. Large influx of workers. Construction and worker camps, sanitation and diseases	Check of implementation	Through out construction sites and worker camps	Before establishment of the facilities and through out the construction phase Part of daily construction supervision	ESP/ PMU CSC	Included in the operation budget of PMU/ ESP/ CSC
13. Site de-commissioning	Confirmed implementation of required enhancements	Through out construction sites	Before construction and bi-weekly check Part of daily construction supervision	ESP/ PMU CSC	Included in the operation budget of PMU/ ESP/ CSC
Operation Phase					
1. Road safety	Check of implementation	Along the route	Semi-annual	Quang Tri DOT	Included in the operation budget of DOT

Table 19 - Environmental Effects Monitoring

Performance and Impact Monitoring					
Environmental Concern	Parameter to monitor	Location	Frequency & Verification	Responsible to Monitor	Monitoring Cost
Construction Phase					
1. Water resources and water quality	Surface water quality	4 sampling points at 20m downstream of the crossing streams and Hieu River.	1 time before construction start and semi-annually during 2 years construction time (5 times in total)	ESP	8,000 USD
	Ground water quality	4 sampling points near the 4 bridge construction sites.	1 time before construction start and semi-annually during 2 years construction time (5 times in total)	ESP	8,000 USD[13]
2. Noise, dust and vibration	Ambient air quality (temperature, moisture, wind direction and speed, PM10, PM2.5, PB, NO_2, SO_2…); Noise level (average noise level, maximum noise level, vehicles frequency…)	5 monitoring points. 2 at start and end points of the road; 2 points at Tan Quang and Tan Hoa village, Cam Tuyen commune and 1 point at Quat Xa village, Cam Thanh commune	1 time before construction start and semi-annually during 2 years construction time (5 times in total)	ESP	1,500 USD[14]

[13] Figures have been estimated base on environmental monitoring cost norm of Quang Tri Province issued under Decision No. 2841/QD-UBND of Quang Tri PPC dated 23 December 2015.

[14] Figures have been estimated base on environmental monitoring cost norm of Quang Tri Province issued under Decision No. 2841/QD-UBND of Quang Tri PPC dated 23 December 2015.

D. REPORTING

128. The PMU will submit the following reports to ADB:

- *Monitoring report for baseline environment:* this report shows the result of baseline environment as implemented by ESS on ambient air quality, surface water quality... This report will be submitted to ADB before the construction start.
- *Environmental monitoring reports:* Environmental monitoring reports will cover the status of EMP implementation in terms of required mitigation measures for different phases of the subproject, results of environmental effects monitoring (air quality, noise and surface water quality), necessary remedial actions to effectively address negative environmental impacts due to subproject implementation, status of environmental capacity building activities as well as documentation of complaints received and corresponding action/resolution. The environmental monitoring reports will be submitted to ADB semi-annually during the construction phase and annually for two years after completion of construction.

Table 20 – Reporting procedures

Project Phase	Type of Report	Frequency	Responsibility	Submitted to Whom
Construction	**Environmental Performance Report** indicating compliance with EMP and monitoring results at the contractor site	Daily	Construction contractor	CSC
	Subproject EMP Compliance Report indicating compliance with subproject EMP and monitoring results	Quarterly	CSC	PMU
	EMP Compliance Report indicating compliance with subproject EMP and monitoring results	Semi-annually during construction phase	ESP/ PMU	ADB
Operation	**EMP Compliance Report: Operation** indicating compliance with subproject EMP commitments during operation	Annually in the first two years of operation. On-going frequency to be determined based on review after 2 years.	Quang Tri DOT	Quang Tri DONRE

Table 21 – Estimated cost for EMP Implementation (2-year construction/ 4-year in total)

Item	Estimated cost (US$)
1. Environment Safeguard Specialist (ESP)	***21,240***
1 National ESS - 06 man-months (intermittent in the first 2 years;) – 2,000 US$/month	12,000
Per diem for ESP: 48 US$ x 30 days x 6 months	8,640
Travelling cost for 2 round trips: 300 US$ x 2 trips	600
2. Environmental effects monitoring (implemented by ESP)	***17,500***
Ambient air quality: 5 monitoring locations x 5 times x 60 US$/sample[15]	1,500
Ground water quality: 4 monitoring locations x 5 times x 400 US$/sample[16]	8,000
Surface water quality: 4 monitoring locations x 5 times x 400 US$/sample[17]	8,000
3. Training/orientation, local transportation, supplies (by ESP)	***3,000***
a) Training/orientation: 1 formal training course for PMU, CSC, Contractors and DOT office of Cam Lo and Gio Linh districts and other "on the job" training	2,000
b) Local transportation and supplies	1,000
4. Printing Environmental monitoring report by ESS (4 reports)	***600***
Subtotal (1+2+3+4)	**42,340**
5. Contingency	**2,660**
Total (1+2+3+4+5)	**45,000**

E. Capacity Building

129. In Viet Nam, the environmental assessment process is established but environmental awareness and capability for implementation of EMP in infrastructure projects of both the executing agency and the implementation agency (PMU) are limited and in development. The safeguards staff of the PMU is usually responsible for many different task and do not have good background on safeguards issues. Usually, the engineer will also be in charge of the environmental monitoring and his/ her capacity is not suitable to check the adequacy of the subproject EMP. The IEEs and EMP are referred to the environmental department in DONRE for approval. During the Project PPTA phase, Project Preparation Unit has been established under Quang Tri DPI with one staff has been assigned as ESO.

130. The most significant challenge is the lack of human and financial resources and necessary infrastructure. To address this constraint, Quang Tri DPI/PMU will designate a full time staff as environmental safeguards officer (ESO) to handle the environmental aspects of the subproject during implementation stage. The ESO and other relevant staff of PMU will be trained by the Environment Safeguard Specialist (ESP) during subproject implementation as "on the job" training or by a formal training course in roles and responsibilities for EMP implementation.

[15] Figures have been estimated base on environmental monitoring cost norm of Quang Tri province.
[16] Figures have been estimated base on environmental monitoring cost norm of Quang Tri province.
[17] Figures have been estimated base on environmental monitoring cost norm of Quang Tri province.

Table 22 – Detail capacity building program

Objective	1. Build capacity and procedures in undertaking systematic environmental assessments in accordance with Government regulations and ADB guidelines 2. Provide training on international best practice on environmental management, monitoring and reporting. 3. Provide guidance on how to effectively incorporate environmental measures into project design and how to incorporate EMP provisions into tender and contract documents.
Tasks/Scope of Work	1. Undertake training needs analyses and review prevailing government regulations and donor guidelines governing the assessment and management of environmental impacts for road development. 2. Review the skills of PMU and Quang Tri DOT staff to establish existing capacity on environmental assessments, environmental monitoring and implementation of mitigation measures for road development project. 3. Prepare the training plan and relevant training materials. 4. Deliver the training, which may be through a combination of hands-on assistance, on-the-job training, and training workshops. 5. Evaluate the effectiveness of the training measuring improvements in attitudes and skills achieved. 6. Modify the training documents/materials as necessary. 7. Hand-over the amended training documents/ material to the project manager for use in the delivery of the training. 8. Prepare report on result of training.
Time frame	Possible within 3 months after construction commencement
Target participant	Staff in PMU, CSC, Contractors and Quang Tri DOT who responsible for environmental management
Staff resources	National environmental specialist with at least 7 years experience on environmental management of road projects and must possess relevant graduate degree in civil engineering, environmental management and other relevant courses.

X. CONCLUSIONS AND RECOMMENDATIONS

131. This IEE study was carried out in the Technical Assistant for Project Preparation (PPTA) phase. Primary and secondary data were used to assess potential environmental impacts in a comprehensive manner and public consultation and route reconnaissance were carried out in order complete the environmental assessments and recommend suitable mitigation measures. The IEE report provides a picture of potential environmental impacts associated with the upgrading of the subproject road and suitable mitigation measures have been recommended.

132. The implementation of the subproject "Constructing and Upgrading Gio Linh - Cam Lo Inter-district Road of Quang Tri Province" will steadily improve the road quality; make connection between Hai Thai commune in Gio Linh district and Cam Tuyen, Cam Thanh communes in Cam Lo districts, make more convenient for goods transportation as well as people movement in all kind of weather. Several actions are required during the detailed design stage to minimize impacts to acceptable levels. The negative environmental impacts from the upgrading works will mostly take place during the construction stage. All of the impacts during construction phase should be very predictable and manageable and with appropriate mitigation and few residual impacts are likely. Additional human and financial resources will be required to improve environmental capability and to progress and achieve necessary statutory compliance and environmental clearance certification for the subproject or associated activities that also require environmental permits under the environmental laws of Viet Nam – LEP 2014.

133. No further or additional impact assessment is considered necessary at this stage. At the implementation stage, PMU through ESS will develop detail EMP to monitor the schedules of mitigation measures and conduct of environmental effects monitoring activities. EMP must be updated to ensure effective environmental monitoring and should be develop follow-monitoring plan as specified in the EMP. With these measures in place, environmental impacts of the subproject should be manageable and will not result in any residual impacts, which are above accepted environmental standards.

XI. APPENDIX

A. Appendix 1: Photos of the subproject road and the vicinity

Starting point in Hai Thai commune, Gio Linh

Mature tree that may need to be removed

View to Trang Rong gate & the existing spillway

Rubber and turmeric cash crop along the road

Typical Small truck

A vendor with her "portable market" motorbike

Stream crossing at Km11+882.07

A bad road section in Hai Thai commune

Road erosion on a slope section

Colonisation by *Mimosa pigra*

Proposed location for bridge over the Hieu River

A section in 3.5 km new alignment

B. Appendix 2: Source of Reference Information

1. *Quang Tri Status of Environmental Report 2015*
2. *Quang Tri Climate Change Adaptation Plan (2011-2020)*
3. *Feasibility Report of the Subproject*
4. *Environmental Protection Plan (EPP) of the Subproject road.*
5. *Electronic portal of Cam Lo and Gio Linh districts*

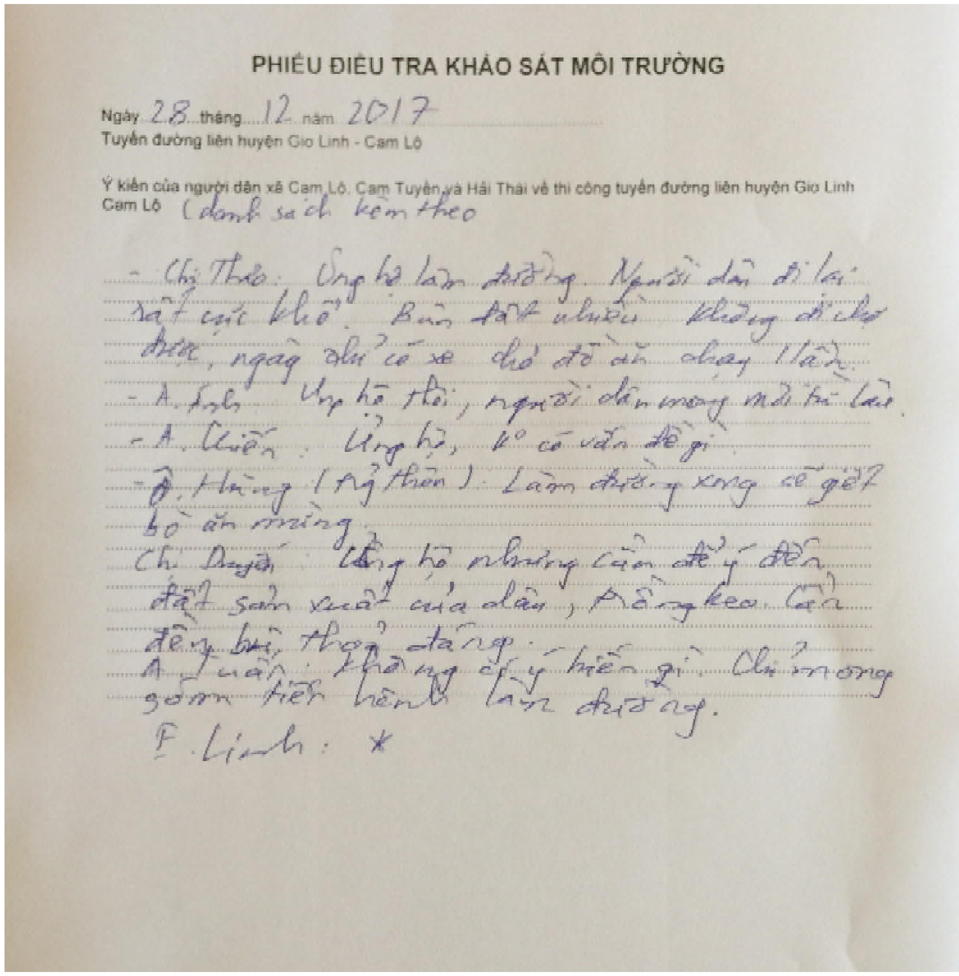
C. Appendix 3: Environmental Mitigation Measures to Include into Bidding Documents

1. Encroachment the forest and disfiguration of landscape	1. Minimized vegetation covers clearances. 2. Prohibit cutting of trees for firewood and for use in subproject. 3. During replanting/replant vegetation cover works, new alien plant species (i.e., species not currently established in the country or region of the subproject) shall not be used. Invasive species shall not be introduced into new environments. 4. The contractors will not use or permit the use of wood as a fuel for the execution of any part of the works, including but not limited to the heating of bitumen and bitumen mixtures, and to the extent practicable shall ensure that fuels other than wood are used for cooking, and water heating in all camps and living accommodations. 5. Contractors shall not buy or use wood from the illegal sources (that come from the illegal logging) 6. No construction camps, bitumen heating machine, material storage sites are to be located in the forest area. 7. Contractors will take all precautions necessary to ensure that damage to vegetation is avoided due to fires resulting from execution of the works. The Contractors will immediately suppress the fire, if it occurs, and shall undertake replanting to replace damaged vegetation.
2. Streams/ Rivers protection and bridge/culvert construction	1. Implement agreed designs for bridges/ culverts sufficient to control flooding as designed. In sections along and near streams and water bodies: 2. Rocks and stones will be disposed not to block streams. 3. Work in streams at bridge repair sites will be scheduled during dry season and work duration shall be as short as possible. 4. Cofferdams, silt fences, sediment barriers or other devices will be used as appropriate based on the design to prevent migration of silt during excavation and boring operations within streams. If cofferdams are used, these will be dewatered and cleaned to prevent siltation by pumping from cofferdams to a settling basin or a containment unit. 5. Other erosion control measures above and covering open surfaces with grasses and creepers to reduce runoff will be implemented as early as possible in construction.
3. Deterioration of surface water quality	1. Province adequate drainage facilities at construction sites and worker camps to avoid stagnant water. 2. Store lubricants, fuels and wastes in dedicated enclosures at least 50 m from water bodies on high and impervious ground with top cover 3. Solid waste from construction activities and workers camps will not be thrown in streams, Hieu River and other water bodies. 4. Construction storage/stockpiles shall be provided with bunds to prevent silted run-off. 5. Stockpiled materials will be covered to reduce silted run-off. 6. No stockpiling or borrow sites at least 50m of water bodies. 7. Washing of machinery and vehicles in surface waters shall be prohibited. 8. Inform 3 CPCs and 2 DCPs in advance construction schedule and scope. 9. Work with relevant Division of 2 DPCs to find out suitable water block/ water cut schedule, avoid impact to downstream users of Hieu River.
4. Noise, dust and vibration	1. Restrict works to daylight hours within 500 m of residential settlements. 2. Recycle debris generated by dismantling of existing pavement subject to the suitability of the material. 3. Powered mechanical equipment and vehicle emissions to meet national TCVN/QCVN standards. All construction equipment and vehicles shall have valid certifications indicating compliance to vehicle emission and noise creation standards. 4. Monitor and investigate complaints; propose alternative mitigation measures. 5. Keep material storage site moist 6. Tightly cover trucks transporting construction materials (sand, soil, cement, gravel, etc.) to avoid or minimize spills and dust emission. 7. On rainless day undertake watering, at least twice per day, on dusty and exposed areas at construction yards, materials storage sites, construction sites, access roads, quarry areas, borrow sites and other subproject areas where residential sites are located nearby. 8. Clean up road surfaces after work. 9. To protect buildings and structures from vibration, non-vibrating roller shall be used in construction sites near buildings and structures.

	10. Structures, which are damaged due to vibration caused by the construction activities, shall be repaired immediately as directed by ESP/PMU. 11. Machinery shall be turned off when not in use. 12. Pile driving during to be schedule for daytime if construction site is near residential areas or approved by DONRE, CPCs and ESP/PMU. 13. Impose speed limits on construction machines and transportation vehicles to minimize dust emission along areas where residential areas are located.
5. Traffic Management	1. Communicate to the public through local officials regarding the scope and schedule of construction, as well as certain construction activities causing disruptions or access restrictions. 2. In coordination with local traffic authorities, implement appropriate traffic diversion schemes to avoid inconvenience due to subproject operations to road users, ensure smooth traffic flow and avoid or minimize accidents, traffic hold ups and congestion 3. In coordination with local traffic officials, schedule transport of materials to avoid congestion, set up clear traffic signal boards and traffic advisory signs at the roads going in and out the road and bridge construction sites to minimize traffic build-up. 4. Provide safe vehicle and pedestrian access around construction areas. 5. Install bold diversion signs that would be clearly visible even at night and provide flag persons to warn of dangerous conditions. 6. Provide sufficient lighting at night within and in the vicinity of construction sites. 7. Designate traffic officers in construction sites.
6. Health and safety precautions for workers and public safety	1. Establish safety measures as required by law and by good engineering practice and provide first aid facilities that are readily accessible by workers. 2. Scheduling of regular (e.g., weekly tool box talks) to orient the workers on health and safety issues related to their activities as well as on proper use of personal protective equipment (PPE). 3. Fencing on all excavation, borrow pits and sides of temporary bridges. 4. Workers shall be provided with appropriate PPE such as safety boots, helmets, safety glasses, earplugs, gloves, etc. at no cost to the employee. 5. Where worker exposure to traffic cannot be completely eliminated, protective barriers shall be provided to shield workers from traffic vehicles. 6. Workers shall be provided with reliable supply of potable water. 7. Construction camps shall be provided with adequate drainage to avoid accumulation of stagnant water. 8. Construction camps shall be provided with toilets/sanitation facilities in accordance with local regulations to prevent any hazard to public health or contamination of land, surface or groundwater. These facilities shall be well maintained to allow effective operation. 9. Ensure reversing signals are installed on all construction vehicles.
7. Large influx of construction worker	1. Construction and worker camp location and facilities located at least 500m from settlements and agreed with local communities and facilities approved by ESS and managed to minimize impacts. 2. Hire and train as many local workers as possible. 3. Provide adequate housing for all workers at the construction camps and establish clean canteen/eating and cooking areas. 4. Mobile toilets (or at least pit latrines in remote areas) shall be installed and open defecation shall be prohibited and prevented by cleaning lavatories daily and by keeping toilets clean at all times. 5. Provide separate hygienic sanitation facilities/toilets and bathing areas with sufficient water supply for male and female workers. 6. Borrow pits and natural depressions with pre-laid impervious liners will be used to dispose of scarified/scraped asphalt, and then covered with soil. This will check potential groundwater contamination. 7. As much as possible, food shall be provided from farms nearby and bush meat supplies will be banned to discourage poaching. 8. Camp site will be cleaned up to the satisfaction of and local community after use. 9. Solid and liquid waste will be managed in line with Waste Management Plan 10. All waste materials shall be removed and disposed to disposal sites approved by local

	authorities 11. Land used for campsites shall be restored to the original condition as far as practicable and the area shall be planted with appropriate trees / shrubs as soon as practicable after it is vacated and cleaned. 12. Register temporary stay for workers with police.
8. Site de-comissioning	Contractors to reconfirm and implement recovery (e.g., landscaping, tree replanting) identified at the detailed design stage

D. Appendix 4: Consultation minute and list of interviewees



PHIẾU ĐIỀU TRA KHẢO SÁT MÔI TRƯỜNG

Ngày 28 tháng 12 năm 2017

Tuyến đường liên huyện Gio Linh - Cam Lộ

Ý kiến của người dân xã Cam Lộ, Cam Tuyền và Hải Thái về thi công tuyến đường liên huyện Gio Linh Cam Lộ (danh sách kèm theo

- Chị Thảo: Ủng hộ làm đường. Người dân đi lại rất cực khổ. Bùn đất nhiều không đi chợ được, ngay cả có xe chở đồ ăn chạy 1 lần.
- A. [illegible] Ủng hộ thôi, người dân mong mỏi từ lâu.
- A. Chiến: Ủng hộ, k° có vấn đề gì.
- Ô. Hùng (trg thôn): Làm đường xong sẽ giết bò ăn mừng.

Chị Duyên: Ủng hộ nhưng cần để ý đến đất sản xuất của dân, trồng keo. Cần đền bù thoả đáng.

A. Tuấn: Không có ý kiến gì. Chỉ mong sớm tiến hành làm đường.

F. Linh: *

DANH SÁCH NGƯỜI DÂN THAM DỰ NHẬN TIỀN HỖ TRỢ
DỰ ÁN HỖ TRỢ KỸ THUẬT CHUẨN BỊ DỰ ÁN HẠ TẦNG CƠ BẢN
PHÁT TRIỂN TOÀN DIỆN BỐN TỈNH MIỀN TRUNG (PPTA-8957)

Quảng Trị, ngày 28 tháng 12 năm 2016

Nhóm Tư vấn môi trường thực hiện khảo sát tại:

Xã Cam Tuyền, Cam An huyện Cam Lộ, Gio Linh tỉnh Quảng Trị

1. Danh sách nhận tiền hỗ trợ

STT	Họ tên	Ký nhận
1	Lê Thị Thảo	
2	Hoàng Ngọc Anh	
3	Hoàng Văn Chiến	
4	Nguyễn Văn Hạ	
5	Nguyễn Thị Duyên	
6	Nguyễn Văn Tuấn	
7	Nguyễn Đường Trường Linh	
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E. Appendix 5: National Technical Regulations of Vietnam

NATIONAL TECHNICAL REGULATION

ON SURFACE WATER QUALITY

1. GENERAL PROVISIONS

1.1. Scope of application

1.1.1. This regulation specifies the limit value of surface water quality parameters.

1.1.2. This regulation applies to assess and control the quality of surface water source, as a basis for the protection and use of water appropriately.

1.2. Explanation of terms

Surface water referred to in this Regulation is water flowing through or stagnate on the ground, streams, canals, ditches, gullies, arroyos, lakes, ponds, swamps, ...

2. TECHNICAL REGULATIONS

Limit values of the surface water quality parameters are specified in Table 1.

Table 1. Limit values of the surface water quality parameters

No.	Parameters	Unit	Limit values			
			A		B	
			A1	A2	B1	B2
1	pH		6-8.5	6-8.5	5.5-9	5.5-9
2	Dissolved oxygen (DO)	mg/l	≥ 6	≥ 5	≥ 4	≥ 2
3	Total suspended solids (TSS)	mg/l	20	30	50	100
4	COD	mg/l	10	15	30	50
5	BOD_5 (20^0C)	mg/l	4	6	15	25
6	Ammonium (NH^+_4) (as N)	mg/l	0.1	0.2	0.5	1
7	Chloride (Cl^-)	mg/l	250	400	600	-
8	Fluoride (F^-)	mg/l	1	1.5	1.5	2
9	Nitrite (NO^-_2) (as N)	mg/l	0.01	0.02	0.04	0.05
10	Nitrate (NO^-_3) (as N)	mg/l	2	5	10	15
11	Phosphate (PO_4^{3-}) (as P)	mg/l	0.1	0.2	0.3	0.5
12	Cyanide (CN-)	mg/l	0.005	0.01	0.02	0.02
13	Arsenic (As)	mg/l	0.01	0.02	0.05	0.1
14	Cadmium (Cd)	mg/l	0.005	0.005	0.01	0.01
15	Lead (Pb)	mg/l	0.02	0.02	0.05	0.05
16	Chrom III (Cr^{3+})	mg/l	0.05	0.1	0.5	1

17	Chrom VI (Cr^{6+})	mg/l	0.01	0.02	0.04	0.05
18	Copper (Cu)	mg/l	0.1	0.2	0.5	1
19	Zinc (Zn)	mg/l	0.5	1.0	1.5	2
20	Nickel (Ni)	mg/l	0.1	0.1	0.1	0.1
21	Iron (Fe)	mg/l	0.5	1	1.5	2
22	Mercury (Hg)	mg/l	0.001	0.001	0.001	0.002
23	Surface-active substances	mg/l	0.1	0.2	0.4	0.5
24	Total oil & grease	mg/l	0.01	0.02	0.1	0.3
25	Phenol (Total)	mg/l	0.005	0.005	0.01	0.02
26	Organic chlorine pesticide					
	Aldrin + Dieldrin	µg/l	0.002	0.004	0.008	0.01
	Endrin	µg/l	0.01	0.012	0.014	0.02
	BHC	µg/l	0.05	0.1	0.13	0.015
	DDT	µg/l	0.001	0.002	0.004	0.005
	Endosunfan(Thiodan)	µg/l	0.005	0.01	0.01	0.02
	Lindan	µg/l	0.3	0.35	0.38	0.4
	Chlordane	µg/l	0.01	0.02	0.02	0.03
	Heptachlor	µg/l	0.01	0.02	0.02	0.05
27	Organic phosphorus pesticide					
	Parathion	µg/l	0.1	0.2	0.4	0.5
	Malathion	µg/l	0.1	0.32	0.32	0.4
28	Herbicide					
	2.4D	µg/l	100	200	450	500
	2.4.5T	µg/l	80	100	160	200
	Paraquat	µg/l	900	1200	1800	2000
29	Total radioactivity α	Bq/l	0.1	0.1	0.1	0.1
30	Total radioactivity β	Bq/l	1.0	1.0	1.0	1.0
31	E.coli	MPN/ 100ml	20	50	100	200
32	Coliform	MPN/ 100ml	2500	5000	7500	10000

Note: The classification of surface water to assess and control the quality of water for various purposes of water use:

A1 - Good use for the purpose of domestic water supply and other purposes, such as type A2, B1 and B2.

A2 – Used for the purpose of domestic water supply but applying the appropriate treatment technology; aquatic plant and animal conservation, or purposes of use as type B1 and B2.

B1 - Use for irrigation and drainage purpose or other purposes with similar water quality requirements or other purposes of use such as type B2.

B2 – Water transportation and other purposes with low water quality requirements.

3. METHOD FOR DETERMINATION

3.1. Sampling for surface water quality monitoring conducted under the guidance of national standards:

- TCVN 5992:1995 (ISO 5667-2: 1991) - Water quality - Sampling; Guidance on sampling techniques.

- TCVN 5993:1995 (ISO 5667-3: 1985) - Water quality - Sampling; Guidance on storage and handling of samples.

- TCVN 5994:1995 (ISO 5667-4: 1987) - Water quality - Sampling; Guidance on sampling in natural and artificial lakes and ponds.

- TCVN 5996:1995 (ISO 5667-6: 1990) - Water quality - Sampling; Guidance on sampling in rivers and streams.

3.2. Analytical methods to determine the parameters of surface water quality shall comply with the guidance of the national standards or corresponding analytical standards of international organizations:

-TCVN 6492-1999 (ISO 10523-1994) - Water quality - Determination of pH.

-TCVN 5499-1995. Water quality - Determination of dissolved oxygen - Winkler method.

- TCVN 6625-2000 (ISO 11923-1997) - Determination of suspended solids by filtration through glass-fibre filters

- TCVN 6001-1995 (ISO 5815-1989) - Water quality - Determination of biochemical oxygen demand after 5 days (BOD 5) - Dilution and seeding method.

- TCVN 6491-1999 (ISO 6060-1989) - Water quality - Determination of the chemical oxygen demand.

- TCVN 6494-1999 - Water quality - Determination of ions of fluoride, chloride, nitrite, Ortho-phosphorus, bromide, nitrate and soluble sulfate in liquid ion chromatography.

- TCVN 6194-1996 (ISO 9297-1989) - Water quality - Determination of chloride. The method of titration of nitrate silver with chromate indicator (MO method).

- TCVN 6195-1996 (ISO 10359-1-1992) - Water quality - Determination of fluoride - Electrochemical probe method for potable and lightly polluted water

- TCVN 6178-1996 (ISO 6777-1984) - Water quality - Determination of nitrite. Molecular absorption spectrometric method.

- TCVN 6180-1996 (ISO 7890-3-1988) - Water quality - Spectrometric method using sulfosalicylic acid

- TCVN 5988-1995 (ISO 5664-1984) - Water quality - Determination of ammonium - Distillation and titration method.

- TCVN 6181-1996 (ISO 6703-1-1984) - Water quality - Determination of total cyanide.

- TCVN 6336-1998 (ASTM D 2330-1988) - Test method for Methylene Blue Active Substances

- TCVN 5991-1995 (ISO 5666-3-1984) - Water quality - Determination of total mercury by flameless atomic absorption spectrometry - Method after digestion with bromine

- TCVN 6002-1995 (ISO 6333-1986) - Water quality - Determination of manganese - Formaldoxime spectrometric method

- TCVN 6053-1995 (ISO 9696-1992) - Water quality - Measurement of gross alpha activity in non-saline water - Thick source method

- TCVN 6177-1996 (ISO 6332-1988) - Water quality - Determination of iron - Spectrometric method using 1,10 - phenanthroline

- TCVN 6193-1996 (ISO 8288-1986) - Water quality - Determination of cobalt, nickel, copper, zinc, cadmium and lead - Flame atomic absorption spectrometric methods

- TCVN 6197-1996 (ISO 5961-1994) - Water quality - Determination of cadmium by atomic absorption spectrometry

- TCVN 6222-1996 (ISO 9174-1990) - Water quality. Methods for the determination of total chromium by atomic absorption spectrometry

- TCVN 6626-2000 (ISO 11969-1996) - Water quality - Determination of arsenic - Atomic absorption spectrometric method (hydride technique)

- TCVN 6216-1996 (ISO 6439-1990) - Water quality - Determination of phenol index - 4-Aminoantipyrine spectrometric methods after distillation

- TCVN 5070-1995 - Water quality - Weight method for determination of oil and oil products

- TCVN 6053-1995 (ISO 9696-1992) - Water quality - Measurement of gross alpha activity in non-saline water - Thick source method

- TCVN 6219-1995 (ISO 9697-1992) - Water quality - Measurement of gross beta activity.

- TCVN 6187-1-1996 (ISO 9308-1-1990) - Water quality - Detection and enumeration of coliform organisms, thermotolerant coliform organisms and presumptive Escherichia coli - Part 1: Membrane filtration method

The parameters specified in this Regulation not having national standards guiding the analytical method shall apply the corresponding analytical standards of the international organizations

4. IMPLEMENTATION ORGANIZATION

This Regulation shall apply in substitution for TCVN 5942:1995 - Water quality - surface water quality standards in the List of Vietnamese standards on environment which is mandatorily applied and issued together with Decision No. 35/2002/QD-BKHCNMT dated June 25, 2002 of the Minister of Science, Technology and Environment.

In case the national standards referred in this Regulation amended and supplemented or superseded shall be applied under new documents.

QCVN 09 : 2008/BTNMT

NATIONAL TECHNICAL REGULATION

ON UNDERGROUND WATER QUALITY

Introduction

QCVN 09:2008 / BTNMT was written by the Compilation Board of national technical regulations on water quality, submitted by the General Department of Environment and Legal Department for approval and issued under the Decision No. 16/2008/QD-BTNMT dated December 31, 2008 of the Minister of Natural resources and Environment.

NATIONAL TECHNICAL REGULATION

ON GROUND WATER QUALITY

1. GENERAL PROVISIONS

1.1. Scope of application

1.1.1. This regulation specifies the limit value of underground water quality parameters.

1.1.2. This regulation applies to assess and control the quality of underground water source, as a basis for the orientation of various purposes of use.

1.2. Explanation of terms

Underground water in this Regulation is the water in the soil and rocks underground.

2. TECHNICAL REGULATIONS

Limit values of the underground water quality parameters are specified in Table 1.

Table 1: Limit values of the ground water quality parameters

No.	Parameters	Unit	Limit values
1	pH	-	5.5 - 8.5
2	Hardness (as CaCO3)	mg/l	500
3	Total solids	mg/l	1500
4	COD ($KMnO_4$)	mg/l	4
5	Ammonium (as N)	mg/l	0.1
6	Chloride (Cl-)	mg/l	250
7	Fluoride (F-)	mg/l	1.0
8	Nitrite (NO^-_2) (as N)	mg/l	1.0
9	Nitrate (NO^-_3) (as N)	mg/l	15
10	Sulgreasee (SO_4^{2-})	mg/l	400
11	Cyanide (CN-)	mg/l	0.01
12	Phenol	mg/l	0.001
13	Asenic (As)	mg/l	0.05

14	Cadimi (Cd) Cadmium (Cd)	mg/l	0.005
15	Lead (Pb)	mg/l	0.01
16	Chromium VI (Cr6 +)	mg/l	0.05
17	Copper (Cu)	mg/l	1.0
18	Zinc (Zn)	mg/l	3.0
19	Manganese (Mn)	mg/l	0.5
20	Mercury (Hg)	mg/l	0.001
21	Iron (Fe)	mg/l	5
22	Selenium (Se)	mg/l	0.01
23	Total radioactivity α	Bq/l	0.1
24	Total radioactivity β	Bq/l	1.0
25	E.Coli	MPN/100ml	Not found
26	Coliform	MPN/100ml	3

3. METHOD FOR DETERMINATION

3.1. Sampling for underground water quality monitoring conducted under the guidance of national standards:

- TCVN 5992:1995 (ISO 5667-2: 1991) - Water quality - Sampling - Guidance on sampling techniques

- TCVN 5993:1995 (ISO 5667-3: 1985) - Water quality -sampling -Guidance on the preservation and handling of samples

- TCVN 6000:1995 (ISO 5667-11: 1992) - Water quality -sampling -Guidance on the sampling of groundwaters

3.2. Analytical methods to determine the parameters of underground water quality shall comply with the guidance of the national standards or corresponding analytical standards of international organizations:

- TCVN 6492-1999 (ISO 10523-1994) - Water quality - Determination of pH

- TCVN 2672-78 – Potable water – Method for determing the general hardness

- TCVN 6178-1996 (ISO 6777-1984) - Water quality -Determination of nitrite - Molecular absorption spectrometric method

- TCVN 6180-1996 (ISO 7890-3-1988) - Water quality - Determination of nitrate - Spectrometric method using sulfosalicylic acid

- TCVN 6200-1996 (ISO 9280-1990) - Water quality - Determination of sulgreasee - Gravimetric method using barium chloride

- TCVN 6181-1996 (ISO 6703-1-1984) Water quality - Determination of total cyanide

- TCVN 5988-1995 (ISO 5664-1984) - Water quality - Determination of ammonium -Distillation and titration method

- TCVN 6194-1996 (ISO 9297-1989) Water quality -Determination of chloride - Silver nitrate titration with chromate indicator (Mohr's method)

- TCVN 6195-1996 (ISO 10359-1-1992) - Water quality - Determination of fluoride - Part 1: Electrochemical probe method for potable and lightly polluted water

- TCVN 6216-1996 (ISO 6439-1990) - Water quality - Determination of phenol index -4-Aminoantipyrine spectrometric methods after distillation

- TCVN 6626-2000 (ISO 11969-1996) - Water quality - Determination of arsenic - Atomic absorption spectrometric method (hydride technique)

- TCVN 6193-1996 (ISO 8288-1986) - Water quality - Determination of cobalt, nickel, copper, zinc, cadmium and lead - Flame atomic absorption spectrometric methods

- TCVN 6197-1996 (ISO 5961-1994) - Water quality - Determination of cadmium by atomic absorption spectrometry

- TCVN 6002-1995 (ISO 6333-1986) - Water quality - Determination of manganese - Formaldoxime spectrometric method

- TCVN 6177-1996 (ISO 6332-1988) - Water quality - Determination of iron - Spectrometric method using 1,10 - phenanthroline

- TCVN 6183-1996 (ISO 9965-1993) -Water quality - Determination of selenium - Atomic absorption spectrometric method (hydride technique)

- TCVN 59910-1995 (ISO 5666-3-1984) Water quality - Determination of total mercury by flameless atomic absorption spectrometry - Method after digestion with bromine

- TCVN 6222-1996 (ISO 9174-1990) - Water quality -Determination of chromium - Atomic absorption spectrometric methods

- TCVN 6187-1-1996 (ISO 9308-1-1990) - Water quality - Detection and enumeration of coliform organisms, thermotolerant coliform organisms and presumptive Escherichia coli - Part 1: Membrane filtration method

The parameters specified in this Regulation not having national standards guiding the analytical method shall apply the corresponding analytical standards of the international organizations

4. IMPLEMENTATION ORGANIZATION

This Regulation shall apply in substitution for TCVN 5944:1995- Water quality - underground water quality standards in the List of Vietnamese standards on environment which is mandatorily applied and issued together with Decision No. 35/2002/QD-BKHCNMT dated June 25, 2002 of the Minister of Science, Technology and Environment.

In case the national standards referred in this Regulation amended and supplemented or superseded shall be applied under new document

QCVN 05:2013/BTNMT

NATIONAL TECHNICAL REGULATIONS ON AMBIENT AIR QUALITY

Introduction

QCVN 05:2013/BTNMT was written by the Compilation Board of national technical regulations on ambient air quality, submitted by the General Department of Environment and Legal Department for approval and issued under the Circular No. 32/2013/TT-BTNMT dated October 25, 2013 of the Minister of Natural resources and Environment.

National Technical Regulation on Ambient Air Quality

1. GENERAL PROVISIONS

1.1. Scope of applications

1.1.1. This Regulation deals with limitations on values of basic factors including sulphur dioxide (SO2), carbon monoxide (CO), dioxide nitrogen (NO2), ozone (O3), total suspended particles (TSP), PM10, PM2.5, particles, and lead (Pb) in ambient air.

1.1.2. This Regulation applies to supervision and assessment of ambient air quality.

1.1.3. This Regulation does not apply to air within manufacturing facilities and indoor air.

1.2. Interpretation of terms

In this Regulation, the terms below are construed as follows:

1.2.1. Total suspended particles (TSP) is total particles with aerodynamic diameter less than or equal to 100 μm.

1.2.2. Particle PM_{10} is total suspended particles with aerodynamic diameter less than or equal to 10 μm.

1.2.3. Particle $PM_{2,5}$ is total suspended particles with aerodynamic diameter less than or equal to 2,5 μm.

1.2.4. Average 1 hour: The arithmetic average of the measured values over a period of 1 hour.

1.2.5. Average 8 hours: The arithmetic average of the measured values over a period of 8 consecutive hours.

1.2.6. Average 24 hours: The arithmetic average of the measured values over a period of 24 consecutive hours (a day).

1.2.7. Annual average: The arithmetic average of the 24-hour average values measured over a period of one year.

2. Technical Reputation

Maximum value of basic parameters of ambient air is specified in Table 1.

Table 1: Maximum value of basic parameters of ambient aire

Unit: Micro gram over cubic meter ($\mu g/m^3$)

No.	Parameter	Average 1 hour	Average 8 hours	Average 24 hours	Annual average
1	SO_2	350	-	125	50

2	CO	30,000	10,000	-	-
3	NO_2	200	-	100	40
4	O_3	200	120	-	-
5	Total Suspended Particle (TSP)	300	-	200	100
6	Dust PM_{10}	-	-	150	50
7	Dust $PM_{2.5}$	-	-	50	25
8	Pb	-	-	1.5	0.5
Note: (-) unspecified					

F. Appendix 6: Guidelines for Traffic Management Plan Preparation

I. Objectives of a traffic management plan

1. A traffic management plan should set out the measures required to ensure the safety of road users around work zones and to permit the flow of traffic, reducing impedance to the extent practicable. It should provide for as much protection as practicable to all people on the work site, consistent with minimizing disruption and risk to road users and minimizing the number of signs and devices used to achieve this. It should ensure that:

- Fixed work areas are marked by barrier boards and delineation devices
- Condition signs are used where the road surface at the work area is sufficiently different from the approach roads as to be hazardous to traffic.
- The needs of all non vehicular users (pedestrians, cyclists, school children, etc.) as well as drivers and passengers of vehicles and work crews are provided for.

2. To be able to achieve this a traffic management plan should:

- Provide clear guidance to drivers, cyclists and pedestrians as they approach and travel through temporary traffic control zones
- Ensure the staff who operate the traffic control systems are adequately trained
- Keep the public well informed and
- Make appropriate arrangements for property owners, residents, businesses, emergency services and schools in the work zones.

3. Traffic Management Plans should comply with the Law on Road Traffic (2008).

II. Control Measures

A. Signs and Signals

4. All signs used in traffic management plans must be compliant with the National Standards on Traffic Signs (November 2016).

5. Cones and bollards should be used to define the traffic path past or through work areas and must have reflective bands if required for night use.

6. Signs include warning signs, such as "roadworks ahead" signs or those indicating road conditions such as "loose gravel", and instructions such as "prepare to stop". Signs should be clearly read from a vehicle, be in local language and use reflective lettering and backgrounds.

7. The placement and spacing of signs should be designed, taking into account the likely length of traffic queues, estimated by considering the expected delay in minutes, hourly volumes at the time of the work and type or mix of traffic (longer queues where there are heavy vehicles). Signs should cover the estimate queue length plus 10% to allow for some greater demand.

8. Figure 1 below provides guidance for the layout of signage for a worksite that occupies half of the carriageway.

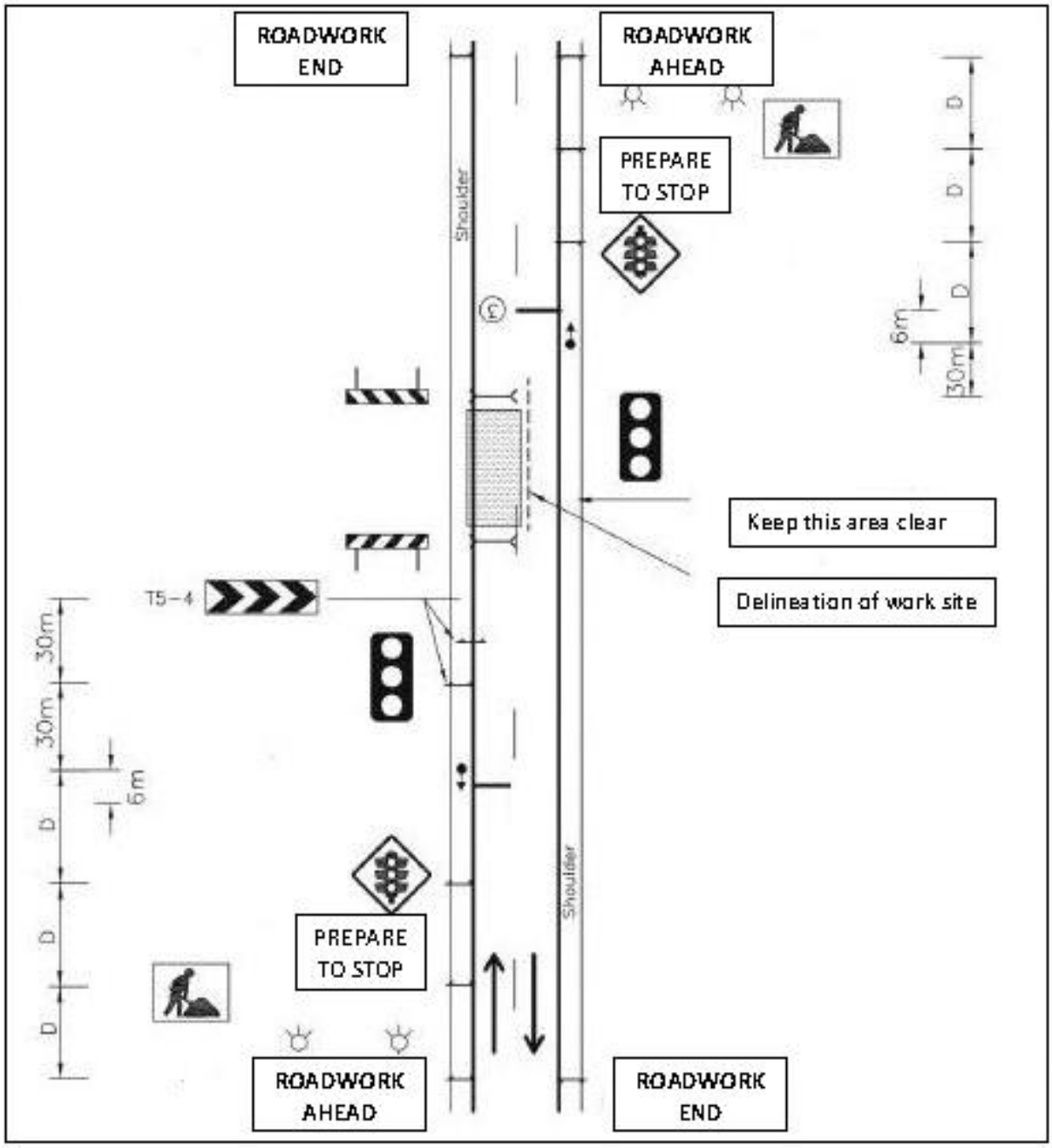

Figure 1: Specimen layout design for traffic signs at a work site occupying half of the carriageway

B. Traffic Controllers

9. Individuals employed to control traffic must be trained, equipped with high visibility clothing. In most situations, shift work will be necessary to ensure protection during night hours. Traffic controllers should only manage traffic in one lane and one direction.

III. Public Information

10. The public should be kept continuously informed by providing prior notification and regular updates. Public meetings should be held prior to the works both to inform local residents of the works program and methods and to obtain feedback and suggestions. Noticeboards should be established to provide updates on matters such as work schedules and any service disruptions. The project Grievance Redress Mechanism is applicable for issues that arise over traffic management.

11. Local traffic police should be consulted during management plan preparation and the plan should reflect requirements and advice given

IV. Steps in Traffic Management Plan Preparation

1. Review of construction schedule and methods
2. Identify routes for traffic diversions, where available and practicable
3. Assess requirements for traffic control measures and detour routes
4. Conduct community consultation and information meetings
5. Identify areas for temporary parking
6. Consult with local traffic police
7. Place signs and control systems as the work